REMEDIAL INVESTIGATION WORK PLAN
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

by Haley & Aldrich of New York
Rochester, New York

for New York State Department of Environmental Conservation
Albany, New York

File No. 129309-003
January 2020

HALEY ALDRICH

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9 January 2020
File No. 129309-003

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Attention: George Heitzman

Subject: Remedial Investigation Work Plan
Portion of 65 Trowbridge Street
Rochester, New York

Dear Mr. Heitzman:

On behalf of William B. Morse Lumber Co. (Morse Lumber), Haley & Aldrich of New York is submitting for the review and approval of the New York State Department of Environmental Conservation (NYSDEC) this draft Remedial Investigation Work Plan (RIWP) for the portion of 65 Trowbridge Street which was part of the former Canal Street MGP Facility (Site). This document is being submitted as part of Morse Lumber's Brownfield Cleanup Program application for the Site. This RIWP has been developed based on the NYSDEC's "Technical Guidance for Site Investigation and Remediation" (DER-10 dated May 2010).

Please do not hesitate to contact us if there are any questions regarding this submittal or any other aspects of the project.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

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Senior Geologist

Janice Szucs

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Senior Project Manager

Glenn M. White, CHMM
Associate

Enclosures

c: Morse Lumber; Attn: William Morse, III
Forsyth Howe O'Dwyer Kalb & Murphy; Attn: Robert Koegel, Esq.

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SIGNATURE PAGE FOR

REPORT ON
REMEDIAL INVESTIGATION WORK PLAN
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

PREPARED FOR

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NY

PREPARED BY:

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1. Introduction

On behalf of William B. Morse Lumber Co. (Morse Lumber), Haley & Aldrich of New York (Haley & Aldrich) has prepared this Remedial Investigation Work Plan (RIWP) for the portion of Morse Lumber's 65 Trowbridge Street property (see Figure 1) in Rochester, New York, which was once part of a manufactured gas plant facility (Site). This RIWP is being submitted as part of the Brownfield Cleanup Program (BCP) Application submitted by the Site owner Morse Lumber and was prepared in accordance with the regulations and guidance applicable to the BCP.

The Site encompasses the northern and eastern portion of a former manufacture gas plant (MGP) facility which ceased operation in the early 1890's. The former MGP was operated by the Municipal Gas Light Company of the City of Rochester (New York), which was a predecessor company to the Rochester Gas and Electric Corporation. The Site location is shown on Figure 1. Existing Site features are shown on Figure 2. The Site is a 1.2-acre portion of a 1.8-acre parcel (65 Trowbridge Street). The Site is currently an open lot used by Morse Lumber as a lumber yard storage area. The Site contains an active railroad track used exclusively to deliver lumber to Morse Lumber and is also traversed by inactive railroad tracks. Addendum Item #2 of the BCP Application provides a detailed description of the Site, historic use and regulatory history including a summary of previous site characterization activities.

The land is currently active and zoned "Center City District" which allows for Commercial and Industrial use. The Site is located in an urban area surrounded by commercial and industrial properties served by municipal water. The Site owner plans to continue Site use for commercial or industrial use consistent with current zoning.

1.1 PURPOSE

A site characterization has been performed for the anticipated contaminants from an MGP and has determined the nature and extent of volatile organic compound (VOC), semi-volatile organic compound (SVOC) and metals contaminants. Results of previous site characterization activities are summarized on Tables 1 and 2 and Figure 3. Details on previous site characterization activities are provided in Addendum Item #2 of the BCP Application.

Because the site characterization did not include analysis for emerging contaminants, pesticides, herbicides or polychlorinated biphenyls (PCBs), a targeted remedial investigation (RI), described in this work plan, was requested by NYSDEC during the BCP pre-application meeting on 31 October 2018. The RI will be performed upon acceptance of the Site into the BCP and approval of this RIWP. This RI will also include groundwater sampling and analysis of VOCs, SVOCs and metals.

Results of sample analyses will be used to confirm the results of the previous site characterization activities and compared to NYSDEC Part 375 Restricted Commercial Use Soil Cleanup Objectives (SCOs) for soil, and NYSDEC Technical & Operational Guidance Series Table 1, Class GA standards and guidance values for groundwater in order to characterize the nature and extent of contaminants at the Site.

2. Remedial Investigation

This section describes the field activities to be conducted during the RI and provides the sampling scope, objectives, methods, anticipated number of samples, and sample locations. A summary of the sampling and analysis plan is provided in Table III and Figure 4. The following activities will be conducted to fill data gaps and determine the nature and extent of contamination at the Site.

2.1 UTILITY MARK OUT

Field personnel will mobilize to the Site to stake (with flagging or paint) the proposed soil sample locations. Once the sample locations are marked, Dig Safely New York will be contacted to mark underground utilities. If necessary, the adjacent property owners and/or private vendors will be contacted for assistance with mark out of utilities. Once the utilities are marked, field equipment and personnel will be mobilized to the Site.

2.2 SOIL SAMPLING

To understand surface soil conditions, additional on-Site soil samples will be collected to meet NYSDEC DER-10 requirements for remedial investigations.

The sampling and analysis plan is summarized in Table 3. Soil samples representative of Site conditions will be collected at six locations widely distributed across the Site as shown on Figure 4 from 0 to 6 inches below ground surface (bgs) and 6 to 12 inches bgs. Soil samples will be analyzed for:

- Target Compound List (TCL) VOCs using EPA method 8260B
- TCL SVOCs using EPA method 8270C
- Total Analyte List (TAL) Metals using EPA method 6010
- PCBs using EPA method 8082;
- Pesticides using EPA 8081; and,
- Herbicides using EPA method 8151.

Soil samples will be collected using a hand-held auger, stainless-steel trowel or sampling spoon. The presence of staining, odors, and photoionization detector (PID) response will be noted. Samples will be placed in laboratory provided clean bottle ware. VOC grab samples will be collected using terra cores. At each sample location, a composite of the sampling interval will be collected for SVOC and inorganics analysis from five grab samples within a one square foot area. Surface soil sampling methods are described in the Field Sampling Plan (FSP) provided as Appendix A. A Quality Assurance Project Plan (QAPP) is provided as Appendix B. Laboratory data will be reported in ASP Category B deliverable format.

2.3 GROUNDWATER SAMPLING

The purpose of the groundwater sampling is to obtain current groundwater data and analyze for additional parameters (i.e., per- and polyfluoroalkyl substances [PFAS] and 1,4-dioxane) to meet NYSDEC DER-10 requirements for remedial investigations. Groundwater flow generally flows north and east towards the Genesee River. Refer to Figure 5 for the groundwater elevation and contours. The sampling and analysis plan is summarized in Table III. Monitoring well details are summarized in Table IV. Well locations are provided on Figure 2.

On-Site wells MW-2, MW-3, MW-4, MW-5, and MW-7, and off-Site wells MW-1, MW-6, MW-8, MW-9 and MW-10 will be analyzed for:

- TCL VOCs using EPA method 8260B;
- TCL SVOCs using EPA method 8270C; and,
- Total and Dissolved TAL metals using EPA method 6010.

On-Site wells MW-4 and MW-5, and off-Site well MW-1 will be sampled and analyzed for:

- PFAS using EPA method 537; and,
- 1,4-Dioxane using EPA method 8260B.

Monitoring wells have not been sampled since 2015, with the exception of the October 2018 sampling of MW-9, which was sampled by Stantec on behalf of East House as part of a NYSDEC Brownfield Remedial Investigation for a nearby off-site property. Prior to the sampling event, the condition of each well will be inspected to determine if the wells have integrity issues and can be sampled. If 4 inches or more of sediment is observed at the bottom of a well, the well will be developed by surging a pump in the well several times to pull fine-grained material from the well. Development will be completed until the water is visibly clear or 10 well volumes are removed, if possible.

Groundwater wells will be sampled using low-flow sampling methods as described in the Field Sampling Plan (FSP). Following the low-flow purge, samples will be collected from monitoring wells for analysis of the analytes mentioned above.

The FSP presented in Appendix A details field procedures and protocols that will be followed during field activities. The Quality Assurance Project Plan (QAPP) presented in Appendix B details the analytical methods and procedures that will be used to analyze samples collected during field activities. Select wells to be sampled for PFAS will be done so following the purge and sampling method provided in the attached FSP and QAPP that have been approved by the NYSDEC for use at other sites (see Appendix C).

3. Health and Safety Plan and Community Air Monitoring Plan

3.1 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) has been prepared in accordance with NYSDEC and NYSDOH guidelines and is provided as Appendix D of this work plan. The HASP includes a description of health and safety protocols to be followed by Haley & Aldrich field staff during implementation of the remedy, including monitoring within the work area, along with response actions should impacts be observed. The HASP has been developed in accordance with Occupational Health and Safety Administration (OSHA) 40 CFR Part 1910.120 regulatory requirements for use by Haley & Aldrich field staff that will work at the Site during planned activities. Contractors or other personnel who perform work at the Site are required to develop their own health and safety plan and procedures of comparable or higher content for their respective personnel in accordance with relevant OSHA regulatory requirements for work at hazardous waste Sites as well as general industry as applicable based on the nature of work being performed.

3.2 COMMUNITY AIR MONITORING PLAN

Community air monitoring will be performed according to the NYSDOH generic Community Air Monitoring Plan (CAMP). A copy of the NYSDOH generic CAMP is included as Appendix E of this RIWP. This plan requires real-time monitoring of VOCs and particulates at the upwind and downwind perimeter of designated work areas when certain activities are in progress. The CAMP will contain conservative monitoring threshold values established by the NYSDOH and provisions requiring that response actions are promptly implemented, if necessary, to reduce emissions at the work Site perimeter to levels deemed acceptable by NYSDOH and NYSDEC, including but not limited to ceasing work if necessary.

4. Reporting

Following completion of the work, a summary of the RI will be provided to NYSDEC in a Remedial Investigation Report to support implementation of the proposed IRM. The report will include:

- Summary of the RI activities;
- Figure showing sampling locations;
- Tables summarizing laboratory analytical results;
- Laboratory analytical data reports;
- Field sampling data sheets;
- Findings regarding the nature and extent of contamination at the Site; and,
- Conclusions and recommendations.

5. Schedule

The Site owner plans to implement this RIWP in the spring of 2020 upon acceptance of the Site into the BCP and approval by the Department to enable implementation of the accompanying interim remedial measure work plan in the fall of 2020 and preparation of associated Site closure documents (FER, SMP, EE) that are necessary for issuance of a Certificate of Completion in early 2021.

References

1. Brownfield Cleanup Program Application, Portion of 65 Trowbridge Street, Rochester, New York, Rochester Gas & Electric Corp., Haley & Aldrich of New York, January 2020.

2. Interim Remedial Measures Work Plan, 65 Trowbridge Street, Rochester, New York, Rochester Gas & Electric Corp., Haley & Aldrich of New York, January 2019.

3. Program Policy DER-10, “Technical Guidance for Site Investigation and Remediation,” New York State Department of Environmental Conservation, May 2010.

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TABLES

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-10	SB-1	SB-2	SB-3
Sample Date	Restricted	12/01/2006	11/28/2006	11/27/2006	11/29/2006	11/30/2006	11/30/2006	12/05/2006	12/04/2006	08/29/2008	09/02/2008	09/22/2009	09/22/2009	12/01/2006	12/01/2006	11/27/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Sample Depth (bgs)	Use	2 - 4 (ft)	14 - 15 (ft)	8 - 10 (ft)	8 - 10 (ft)	8 - 10 (ft)	12 - 13.5 (ft)	2 - 4 (ft)	6 - 8 (ft)	4 - 6 (ft)	4 - 5 (ft)	9 - 10 (ft)	9 - 10 (ft)	2 - 4 (ft)	4 - 6 (ft)	8 - 10 (ft)
Lab Sample ID		A6E53501	A6E27405	A6E21904	A6E37705	A6E42501	A6E42502	A6E62901	A6E53508	A8A71301	A8A71801	RSI0894-01	RSI0894-04	A6E53502	A6E53503	A6E21901
Inorganic Compounds (ug/kg)																
Aluminum	-	4340000 J	5660000 J	7190000 J	2760000 J	6410000	1410000	3180000	3860000 J	5560000 J	5360000 J	-	-	5020000 J	5220000 J	5830000 J
Antimony	-	6800 UJ	6800 U	7200 U	5800 U	9400 U	6700 U	7900 U	6800 UJ	7400 UJ	7000 UJ	-	-	6900 UJ	8600 UJ	7000 U
Arsenic	16000	3300 J	**58900 J**	6500	1600	13000	2900	3500	2400 J	3800	2800	-	-	4900 J	8800 J	5500
Barium	400000	58900	72000 J	49600	16800 J	85200	16800	42800	43200	51800 J	30400 J	-	-	49400	385000	62100
Beryllium	590000	560 U	570 U	600 U	490 U	780 U	560 U	660 U	570 U	610 U	590 U	-	-	570 U	720 U	590 U
Cadmium	9300	560 U	570 U	600 U	490 U	860	560 U	660 U	570 U	610 U	590 U	-	-	570 U	720 U	590 U
Calcium	-	32100000	43100000 J	8540000 J	1170000 J	8180000	55600000	69500000	28500000	2900000 J	17700000 J	-	-	11000000	51400000	11100000 J
Chromium	-	6200 J	13400	9300	3700	13000	4800	5900	5500 J	12800 J	7100 J	-	-	6600 J	8300 J	12000
Cobalt	-	5600 U	5700 U	6600	4900 U	7800 U	5600 U	6600 U	5700 U	6100 U	5900 U	-	-	6200	7200 U	5900 U
Copper	270000	104000 J	41200 J	9500	6000	18300	3300	47000	16000 J	4300 J	8800 J	-	-	77600 J	138000 J	12200
Cyanide, Total	27000	1100 UJ	1700	930 U	1000 U	1500 U	940 U	720 U	720 UJ	1300	1000 U	-	-	950 UJ	1100 UJ	1100 U
Iron	-	9820000	21200000	19400000 J	5760000 J	13000000	9150000	3940000	7690000	15800000	9920000	-	-	11800000	21600000	15300000 J
Lead	1000000	147000	400000 J	21800	2600 J	65000	16700	108000	82300	60400	5000	-	-	143000	969000	27700
Magnesium	-	14200000 J	23700000	5530000 J	1140000	2050000	34700000	34800000	9200000 J	1830000 J	4750000 J	-	-	3730000 J	5630000 J	3910000 J
Manganese	10000000	341000 J	490000 J	320000 J	65700 J	448000	483000	156000	238000 J	531000	372000	-	-	264000 J	402000 J	360000 J
Mercury	2800	410 J	18	32	5 U	140	5.5 U	340	10 J	67	10	-	-	581 J	737 J	520
Nickel	310000	7000	13500	11400	5000	7900	4500 U	6800	6000	7700 J	7300 J	-	-	11000	12700	10700
Potassium	-	716000	632000	639000	373000	579000	708000	417000	757000	850000 J	1010000 J	-	-	796000	1030000	1100000
Selenium	1500000	660 U	1800	1800	570 U	2500	760	780 U	670 U	730 U	690 U	-	-	690	2800	1200
Silver	1500000	1200 U	1100 U	1200 U	970 U	1600 U	1100 U	1300 U	1100 U	1200 U	1200 U	-	-	1200 U	1400	1200 U
Sodium	-	124000	229000	80400	59900	78200 U	89900	132000	103000	90200	132000	-	-	443000	601000	146000
Thallium	-	1100 U	1100 U	1200 U	970 U	1600 U	1100 U	1300 U	1100 U	1200 U	1200 U	-	-	1100 U	1400 U	1200 U
Vanadium	-	9700	12800	17000	5900	14300	5700	8000	8400	16900 J	11100 J	-	-	13400	13200	15700
Zinc	10000000	104000 J	123000 J	59600	13800 J	170000	31600	70400	38700 J	166000	25200	-	-	71100 J	350000 J	57800
Other (s.u.)																
Corrosivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Semi-Volatile Organic Compounds (ug/kg)																
2,2'-oxybis(1-Chloropropane)	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2,4,5-Trichlorophenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2,4,6-Trichlorophenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2,4-Dichlorophenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2,4-Dimethylphenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2,4-Dinitrophenol	-	11000 U	10000 UJ	2000 UJ	1900 UJ	2600 U	1900 U	22000 UJ	1900 UJ	11000 UJ	1900 UJ	-	-	2000 U	11000 U	2100 UJ
2,4-Dinitrotoluene	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2,6-Dinitrotoluene	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2-Chloronaphthalene	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2-Chlorophenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2-Methylnaphthalene	-	2100 U	470 J	34 J	370 U	510 U	360 U	130 J	380 U	2200 U	370 U	5.8 U	5.9 U	390 U	2200 U	410 U
2-Methylphenol	500000	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
2-Nitroaniline	-	11000 U	10000 U	2000 U	1900 U	2600 U	1900 U	22000 U	1900 U	11000 U	1900 U	-	-	2000 U	11000 U	2100 U
2-Nitrophenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
3,3'-Dichlorobenzidine	-	10000 U	9700 U	1900 U	1800 U	2500 U	1800 U	21000 U	1800 U	10000 U	1800 U	-	-	1900 U	11000 U	2000 U
3-Nitroaniline	-	11000 U	10000 U	2000 U	1900 U	2600 U	1900 U	22000 U	1900 U	11000 U	1900 U	-	-	2000 U	11000 U	2100 U
4,6-Dinitro-2-methylphenol	-	11000 U	10000 U	2000 U	1900 U	2600 U	1900 U	22000 U	1900 U	11000 UJ	1900 UJ	-	-	2000 U	11000 U	2100 U
4-Bromophenyl phenyl ether	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
4-Chloro-3-methylphenol	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
4-Chloroaniline	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
4-Chlorophenyl phenyl ether	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
4-Methylphenol	500000	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
4-Nitroaniline	-	11000 U	10000 U	2000 U	1900 U	2600 U	1900 U	22000 U	1900 U	11000 U	1900 U	-	-	2000 U	11000 U	2100 U
4-Nitrophenol	-	11000 U	10000 U	2000 U	1900 U	2600 U	1900 U	22000 U	1900 U	11000 U	1900 UJ	-	-	2000 U	11000 U	2100 U

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Sample Date	Restricted	12/01/2006	11/28/2006	11/27/2006	11/29/2006	11/30/2006	11/30/2006	12/05/2006	12/04/2006	08/29/2008	09/02/2008	09/22/2009	09/22/2009	12/01/2006	12/01/2006	11/27/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Sample Depth (bgs)	Use	2 - 4 (ft)	14 - 15 (ft)	8 - 10 (ft)	8 - 10 (ft)	8 - 10 (ft)	12 - 13.5 (ft)	2 - 4 (ft)	6 - 8 (ft)	4 - 6 (ft)	4 - 5 (ft)	9 - 10 (ft)	9 - 10 (ft)	2 - 4 (ft)	4 - 6 (ft)	8 - 10 (ft)
Lab Sample ID		A6E53501	A6E27405	A6E21904	A6E37705	A6E42501	A6E42502	A6E62901	A6E53508	A8A71301	A8A71801	RSI0894-01	RSI0894-04	A6E53502	A6E53503	A6E21901
Acenaphthene	500000	2100 U	720 J	43 J	370 U	510 U	88 J	4300 U	380 U	2200 U	370 U	860 J	560 J	15 J	84 J	410 U
Acenaphthylene	500000	2100 U	320 J	400 U	370 U	510 U	360 U	820 J	380 U	2200 U	370 U	7.4 U	7.5 U	390 U	2200 U	26 J
Acetophenone	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Anthracene	500000	58 J	2000	24 J	370 U	38 J	47 J	160 J	380 U	2200 U	370 U	1300 J	710 J	40 J	190 J	65 J
Atrazine	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Benzaldehyde	-	2100 UJ	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 UJ	2200 UJ	410 U
Benzo(a)anthracene	5600	220 J	2400	400 U	370 U	55 J	360 U	520 J	19 J	2200 U	370 U	9.3 U	9.4 U	120 J	460 J	210 J
Benzo(a)pyrene	1000	220 J	**2000**	400 U	370 U	56 J	360 U	1000 J	380 U	2200 U	370 U	11 U	12 U	120 J	410 J	220 J
Benzo(b)fluoranthene	5600	230 J	3300	400 U	370 U	77 J	360 U	1200 J	380 U	2200 U	370 U	18 U	19 U	140 J	560 J	240 J
Benzo(g,h,i)perylene	500000	130 J	1200 J	400 U	370 U	43 J	360 U	4400	380 U	2200 U	370 U	11 U	11 U	80 J	260 J	210 J
Benzo(k)fluoranthene	56000	110 J	2000 U	400 U	370 U	510 U	360 U	340 J	380 U	2200 U	370 U	24 U	24 U	61 J	160 J	88 J
Biphenyl	-	2100 U	180 J	44 J	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
bis(2-Chloroethoxy)methane	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
bis(2-Chloroethyl)ether	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
bis(2-Ethylhexyl)phthalate	-	2100 U	2000 U	400 U	160 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	81 J	2200 U	76 U
Butyl benzylphthalate	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Caprolactam	-	11000 U	10000 U	2000 U	1900 U	2600 U	1900 U	22000 U	1900 U	11000 U	1900 U	-	-	2000 U	11000 U	2100 U
Carbazole	-	2100 U	380 J	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	12 J	55 J	410 U
Chrysene	56000	200 J	2500	400 U	370 U	61 J	360 U	630 J	380 U	2200 U	370 U	5.7 U	5.7 U	110 J	410 J	210 J
Dibenz(a,h)anthracene	560	44 J	380 J	400 U	370 U	510 U	360 U	**610 J**	380 U	2200 U	370 U	8.8 U	8.9 U	23 J	75 J	45 J
Dibenzofuran	350000	2100 U	610 J	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	8 J	50 J	410 U
Diethyl phthalate	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Dimethyl phthalate	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Di-n-butylphthalate	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Di-n-octyl phthalate	-	2100 U	2000 U	22 J	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	8 J	2200 U	410 U
Fluoranthene	500000	320 J	6500	400 U	370 U	88 J	50 J	870 J	22 J	2200 U	370 U	150	130	210 J	900 J	400 J
Fluorene	500000	2100 U	1200 J	27 J	370 U	29 J	36 J	110 J	380 U	2200 U	370 U	1800 J	1100 J	14 J	73 J	23 J
Hexachlorobenzene	6000	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Hexachlorobutadiene	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Hexachlorocyclopentadiene	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Hexachloroethane	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Indeno(1,2,3-cd)pyrene	5600	130 J	1200 J	400 U	370 U	33 J	360 U	2300 J	380 U	2200 U	370 U	5.5 U	5.6 U	68 J	230 J	160 J
Isophorone	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Naphthalene	500000	2100 U	3800	78 J	370 U	510 U	360 U	220 J	380 U	2200 U	370 U	9.5 U	9.6 U	390 U	2200 U	410 U
Nitrobenzene	69000	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
N-Nitrosodi-n-propylamine	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
N-Nitrosodiphenylamine	-	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Pentachlorophenol	6700	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 UJ	370 UJ	-	-	390 U	2200 U	410 U
Phenanthrene	500000	200 J	7000	100 J	370 U	100 J	150 J	420 J	31 J	2200 U	370 U	7300 J	4300 J	140 J	710 J	230 J
Phenol	500000	2100 U	2000 U	400 U	370 U	510 U	360 U	4300 U	380 U	2200 U	370 U	-	-	390 U	2200 U	410 U
Pyrene	500000	250 J	5200	32 J	370 U	140 J	56 J	1200 J	26 J	2200 U	370 U	250	170	150 J	650 J	510
Total Petroleum Hydrocarbons (ug/kg)																
Diesel Range Organics	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fuel oil	-	-	-	-	-	-	-	-	-	-	-	5600 U	5500 U	-	-	-
Gasoline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gasoline Range Organics	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kerosene	-	-	-	-	-	-	-	-	-	-	-	5600 U	5500 U	-	-	-
Motor Oil	-	-	-	-	-	-	-	-	-	-	-	11000 U	11000 U	-	-	-
PHC as #2 Fuel Oils C10-C23 #2 Diesel, #2 Fuel Oil	-	-	-	-	-	-	-	-	-	-	-	5600 U	5500 U	-	-	-
Total Petroleum Hydrocarbon - Diesel (#4 Fuel Oil)	-	-	-	-	-	-	-	-	-	-	-	320000 J	140000	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C6-C10) GRO	-	-	-	-	-	-	-	-	-	-	-	2200 U	2200 U	-	-	-

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-10	SB-1	SB-2	SB-3
Sample Date	Restricted	12/01/2006	11/28/2006	11/27/2006	11/29/2006	11/30/2006	11/30/2006	12/05/2006	12/04/2006	08/29/2008	09/02/2008	09/22/2009	09/22/2009	12/01/2006	12/01/2006	11/27/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Sample Depth (bgs)	Use	2 - 4 (ft)	14 - 15 (ft)	8 - 10 (ft)	8 - 10 (ft)	8 - 10 (ft)	12 - 13.5 (ft)	2 - 4 (ft)	6 - 8 (ft)	4 - 6 (ft)	4 - 5 (ft)	9 - 10 (ft)	9 - 10 (ft)	2 - 4 (ft)	4 - 6 (ft)	8 - 10 (ft)
Lab Sample ID		A6E53501	A6E27405	A6E21904	A6E37705	A6E42501	A6E42502	A6E62901	A6E53508	A8A71301	A8A71801	RSI0894-01	RSI0894-04	A6E53502	A6E53503	A6E21901
Total Petroleum Hydrocarbons - Fuel Oil #6	-	-	-	-	-	-	-	-	-	-	-	1000000 J	470000	-	-	-
Volatile Organic Compounds (ug/kg)																
1,1,1-Trichloroethane	500000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,1,2,2-Tetrachloroethane	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,1,2-Trichloroethane	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,1-Dichloroethane	240000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,1-Dichloroethene	500000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,2,4-Trichlorobenzene	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,2,4-Trimethylbenzene	190000	-	-	-	-	-	-	-	-	-	-	0.4 UJ	9.6 J	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,2-Dibromoethane (Ethylene Dibromide)	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,2-Dichlorobenzene	500000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,2-Dichloroethane	30000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,2-Dichloropropane	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,3,5-Trimethylbenzene	190000	-	-	-	-	-	-	-	-	-	-	0.35 UJ	2 J	-	-	-
1,3-Dichlorobenzene	280000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
1,4-Dichlorobenzene	130000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
2-Butanone (Methyl Ethyl Ketone)	500000	12 U	6 J	11 U	11 U	66	11 U	13 U	11 U	24	11 U	-	-	12 U	12 U	12 U
2-Hexanone	-	12 U	12 U	11 U	11 U	16 U	11 U	13 U	11 U	14 U	11 U	-	-	12 U	12 U	12 U
2-Phenylbutane (sec-Butylbenzene)	500000	-	-	-	-	-	-	-	-	-	-	0.48 UJ	4.1 J	-	-	-
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	-	12 U	12 U	11 U	11 U	16 U	11 U	13 U	11 U	14 U	11 U	-	-	12 U	12 U	12 U
Acetone	500000	24 U	20 U	13 U	7 J	240	16 J	26 U	23 U	44 U	22 U	-	-	25 U	23 U	25 UJ
Benzene	44000	6 U	37	6 U	6 U	8 U	6 U	6 U	6 U	7 UJ	5 UJ	0.27 U	0.27 U	6 U	6 U	6 U
Bromodichloromethane	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Bromoform	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Bromomethane (Methyl Bromide)	-	6 UJ	6 U	6 R	6 R	8 R	6 R	6 R	6 UJ	7 U	5 U	-	-	6 UJ	6 UJ	6 R
Carbon disulfide	-	12 U	12 U	11 U	11 U	16 U	11 U	13 U	11 U	2 J	11 U	-	-	12 U	12 U	12 U
Carbon tetrachloride	22000	6 U	6 U	6 U	6 U	8 U	6 U	6 UJ	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Chlorobenzene	500000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 UJ	5 UJ	-	-	6 U	6 U	6 U
Chloroethane	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Chloroform (Trichloromethane)	350000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Chloromethane (Methyl Chloride)	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
cis-1,2-Dichloroethene	500000	6 U	6 U	9	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	1 J
cis-1,3-Dichloropropene	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Cyclohexane	-	12 U	10 J	11 U	11 U	16 U	11 U	13 U	11 U	14 U	11 U	-	-	12 U	12 U	12 U
Cymene (p-Isopropyltoluene)	-	-	-	-	-	-	-	-	-	-	-	0.44 UJ	6.1 J	-	-	-
Dibromochloromethane	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Dichlorodifluoromethane (CFC-12)	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Ethylbenzene	390000	6 U	210	23	6 U	8 U	6 U	6 U	6 U	7 U	5 U	0.38 UJ	0.38 UJ	6 U	6 U	6 U
Isopropylbenzene	-	6 U	23	7	6 U	8 U	6 U	6 U	6 U	7 U	5 U	0.82 U	0.82 U	6 U	6 U	6 U
Methyl acetate	-	12 U	12 U	11 UJ	11 U	16 U	11 U	13 UJ	11 U	14 U	11 U	-	-	12 U	12 U	12 UJ
Methyl cyclohexane	-	12 U	63	2 J	11 U	3 J	11 U	13 U	11 U	14 U	11 U	-	-	12 U	12 U	12 U
Methyl Tert Butyl Ether	500000	12 U	12 U	11 U	11 UJ	16 UJ	11 UJ	13 U	11 U	14 U	11 U	0.54 U	0.53 U	12 U	12 U	12 U
Methylene chloride	500000	16 U	10 J	7 U	18 U	14 U	10 U	12 U	13 U	17 U	11 U	-	-	14 U	12 U	6 U
Naphthalene	500000	-	-	-	-	-	-	-	-	-	-	0.33 U	18	-	-	-
n-Butylbenzene	500000	-	-	-	-	-	-	-	-	-	-	0.48 UJ	0.47 UJ	-	-	-
n-Propylbenzene	500000	-	-	-	-	-	-	-	-	-	-	0.44 U	1.7 J	-	-	-
Styrene	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
tert-Butylbenzene	500000	-	-	-	-	-	-	-	-	-	-	0.57 UJ	0.57 UJ	-	-	-
Tetrachloroethene	150000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	1 J	-	-	6 U	6 U	6 U
Toluene	500000	6 U	45	6 U	6 U	8 U	6 U	6 U	6 U	7 UJ	5 UJ	0.41 U	0.41 U	6 U	6 U	6 U
trans-1,2-Dichloroethene	500000	6 U	6 U	6 U	6 UJ	8 UJ	6 UJ	6 UJ	6 U	7 U	5 U	-	-	6 U	6 U	6 U
trans-1,3-Dichloropropene	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Trichloroethene	200000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 UJ	5 UJ	-	-	6	6 U	6 U

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-10	SB-1	SB-2	SB-3
Sample Date	Restricted	12/01/2006	11/28/2006	11/27/2006	11/29/2006	11/30/2006	11/30/2006	12/05/2006	12/04/2006	08/29/2008	09/02/2008	09/22/2009	09/22/2009	12/01/2006	12/01/2006	11/27/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Sample Depth (bgs)	Use	2 - 4 (ft)	14 - 15 (ft)	8 - 10 (ft)	8 - 10 (ft)	8 - 10 (ft)	12 - 13.5 (ft)	2 - 4 (ft)	6 - 8 (ft)	4 - 6 (ft)	4 - 5 (ft)	9 - 10 (ft)	9 - 10 (ft)	2 - 4 (ft)	4 - 6 (ft)	8 - 10 (ft)
Lab Sample ID		A6E53501	A6E27405	A6E21904	A6E37705	A6E42501	A6E42502	A6E62901	A6E53508	A8A71301	A8A71801	RSI0894-01	RSI0894-04	A6E53502	A6E53503	A6E21901
Trichlorofluoromethane (CFC-11)	-	6 UJ	6 U	6 U	6 U	8 U	6 U	6 U	6 UJ	7 U	5 U	-	-	6 UJ	6 UJ	6 U
Trifluorotrichloroethane (Freon 113)	-	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Vinyl chloride	13000	6 U	6 U	6 U	6 U	8 U	6 U	6 U	6 U	7 U	5 U	-	-	6 U	6 U	6 U
Xylene (total)	500000	18 U	190	10 J	17 U	24 U	17 U	20 U	17 U	21 U	16 U	0.92 UJ	0.91 UJ	18 U	18 U	19 U

Notes:

1. Data qualifiers definced as follows:

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R = Rejected during validation.

2. Results bold and highlighted exceed New York State Department of Environmental Conservation's Part 375 Restricted Commercial Use Soil Cleanup Objectives.

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-10	SB-11	SB-12	SB-12	SB-13	SB-13	SB-13	SB-13
Sample Date	Restricted	11/27/2006	11/27/2006	11/30/2006	11/30/2006	11/30/2006	11/29/2006	11/28/2006	11/28/2006	11/29/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	N
Sample Depth (bgs)	Use	8 - 10 (ft)	8 - 9.5 (ft)	6 - 8 (ft)	10 - 12 (ft)	6 - 8 (ft)	10 - 12 (ft)	4 - 6 (ft)	12 - 13.2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	4 - 6 (ft)	4 - 6 (ft)	6 - 8 (ft)
Lab Sample ID		A6E21902	A6E21903	A6E42505	A6E42504	A6E42503	A6E37701	A6E27408	A6E27401	A6E37702	A6E27402	A6E27403	A6E27404	A6E27406	A6E27406RI	A6E27407
Inorganic Compounds (ug/kg)																
Aluminum	-	5500000 J	4320000 J	3020000	10400000	4650000	5700000 J	3730000 J	1380000 J	6800000 J	6610000 J	4820000 J	3090000 J	2410000 J	-	-
Antimony	-	6700 U	6700 U	6800 U	7900 U	6000 U	6800 U	6600 U	6500 U	6200 U	6200 U	7100 U	6400 U	5600 U	-	-
Arsenic	16000	7900	2500	1600	4900	3400	**21500**	**30000 J**	2600 J	4600	4000 J	10400 J	1500 J	1500 J	-	-
Barium	400000	96600	34000	19800	86600	28100	**1960000 J**	43000 J	11600 J	51500 J	60900 J	67900 J	20700 J	19700 J	-	-
Beryllium	590000	560 U	560 U	560 U	660 U	500 U	750	550 U	540 U	520 U	520 U	600 U	530 U	470 U	-	-
Cadmium	9300	560 U	560 U	560 U	660 U	500 U	5500	550 U	540 U	520 U	520 U	600 U	530 U	470 U	-	-
Calcium	-	21100000 J	2980000 J	40900000	23900000	36100000	8260000 J	29200000 J	11600000 J	29000000 J	3340000 J	41800000 J	54500000 J	51300000 J	-	-
Chromium	-	8700	6300	3800	12800	6900	11100	7500	3200	8900	9500	10200	5400	4300	-	-
Cobalt	-	5600 U	5600 U	5600 U	7000	5000 U	28800	5500 U	5400 U	5300	6400	9100	5300 U	4700 U	-	-
Copper	270000	33600	8200	6800	17500	14300	14100	49000 J	5400 J	9300	11300 J	149000 J	11000 J	7300 J	-	-
Cyanide, Total	27000	1000 U	1200 U	1000 U	1200 U	1200 U	1300 U	900 U	990 U	980 U	890 U	1100 U	880 U	1600	-	-
Iron	-	15300000 J	10700000 J	5700000	17900000	11000000	59100000 J	17500000	4860000	15100000 J	14400000	33600000	9870000	7990000	-	-
Lead	1000000	131000	7300	5600	125000	29000	24500 J	116000 J	27400 J	9000 J	12400 J	**4050000 J**	5300 J	2900 J	-	-
Magnesium	-	5250000 J	1750000 J	13300000	6640000	8020000	1880000	12100000	4210000	2900000	1840000	15700000	12600000	16300000	-	-
Manganese	10000000	1030000 J	129000 J	183000	336000	481000	**12300000 J**	334000 J	168000 J	158000 J	648000 J	374000 J	460000 J	291000 J	-	-
Mercury	2800	360	5.9 U	13	160	70	14	370	86	24	18	2100	16	5.6 U	-	-
Nickel	310000	9600	6800	4800	15100	8400	26500	14400	4300 U	10800	10000	14900	6100	5100	-	-
Potassium	-	753000	544000	601000	1520000	1010000	498000	612000	358000	919000	646000	824000	585000	440000	-	-
Selenium	1500000	1600	910	660 U	1700	1100	6300	1600	640 U	2000	1100	3800	690	550 U	-	-
Silver	1500000	1100 U	1100 U	1200 U	1300 U	1000 U	1100 U	1100 U	1100 U	1000 U	1000 U	1800	1000 U	940 U	-	-
Sodium	-	159000	134000	76900	120000	105000	111000	108000	54100 U	58100	54300	156000	115000	98000	-	-
Thallium	-	1100 U	1100 U	1100 U	1300 U	1100	4800	1100 U	1100 U	1000 U	1000 U	1200 U	1000 U	940 U	-	-
Vanadium	-	17200	11900	5600 U	18400	12400	53800	11700	5400 U	13600	18500	15700	11600	9100	-	-
Zinc	10000000	57500	23800	20200	73100	30200	838000 J	89600 J	23100 J	40000 J	45500 J	144000 J	19100 J	15600 J	-	-
Other (s.u.)																
Corrosivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Semi-Volatile Organic Compounds (ug/kg)																
2,2'-oxybis(1-Chloropropane)	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2,4,5-Trichlorophenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2,4,6-Trichlorophenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2,4-Dichlorophenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2,4-Dimethylphenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2,4-Dinitrophenol	-	2000 UJ	2000 UJ	1900 UJ	2200 U	2000 U	2300 UJ	10000 UJ	2000 U	2000 UJ	2000 U	11000 UJ	9000 UJ 1900 U	1900 UJ	19000 UJ	-
2,4-Dinitrotoluene	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2,6-Dinitrotoluene	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2-Chloronaphthalene	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2-Chlorophenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2-Methylnaphthalene	-	390 U	21 J	370 U	420 U	29 J	3000	340 J	160 J	380 U	390 U	290 J	680 J 560	1400	1400 J	-
2-Methylphenol	500000	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
2-Nitroaniline	-	2000 U	2000 U	1900 U	2200 U	2000 U	2300 U	10000 U	2000 U	2000 U	2000 U	11000 U	19000 U 1900 U	1900 U	19000 U	-
2-Nitrophenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
3,3'-Dichlorobenzidine	-	1900 U	1900 U	1800 U	2000 U	1800 U	2100 U	9500 U	1900 U	1800 U	1900 U	10000 U	18000 U 1800 U	1800 U	18000 U	-
3-Nitroaniline	-	2000 U	2000 U	1900 U	2200 U	2000 U	2300 U	10000 U	2000 U	2000 U	2000 U	11000 U	19000 U 1900 U	1900 U	19000 U	-
4,6-Dinitro-2-methylphenol	-	2000 U	2000 U	1900 U	2200 U	2000 U	2300 U	10000 U	2000 U	2000 U	2000 U	11000 U	19000 U 1900 U	1900 U	19000 U	-
4-Bromophenyl phenyl ether	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
4-Chloro-3-methylphenol	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
4-Chloroaniline	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
4-Chlorophenyl phenyl ether	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
4-Methylphenol	500000	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
4-Nitroaniline	-	2000 U	2000 U	1900 U	2200 U	2000 U	2300 U	10000 U	2000 U	2000 U	2000 U	11000 U	19000 U 1900 U	1900 U	19000 U	-
4-Nitrophenol	-	2000 U	2000 U	1900 U	2200 U	2000 U	2300 U	10000 U	2000 U	2000 U	2000 U	11000 U	19000 U 1900 U	1900 U	19000 U	-

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-10	SB-11	SB-12	SB-12	SB-13	SB-13	SB-13	SB-13
Sample Date	Restricted	11/27/2006	11/27/2006	11/30/2006	11/30/2006	11/30/2006	11/29/2006	11/28/2006	11/28/2006	11/29/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	N
Sample Depth (bgs)	Use	8 - 10 (ft)	8 - 9.5 (ft)	6 - 8 (ft)	10 - 12 (ft)	6 - 8 (ft)	10 - 12 (ft)	4 - 6 (ft)	12 - 13.2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	4 - 6 (ft)	4 - 6 (ft)	6 - 8 (ft)
Lab Sample ID		A6E21902	A6E21903	A6E42505	A6E42504	A6E42503	A6E37701	A6E27408	A6E27401	A6E37702	A6E27402	A6E27403	A6E27404	A6E27406	A6E27406RI	A6E27407
Acenaphthene	500000	390 U	87 J	370 U	420 U	59 J	960	100 J	2200	51 J	28 J	460 J	3800 U 63 J	82 J	3700 U	-
Acenaphthylene	500000	390 U	400 U	370 U	420 U	140 J	110 J	870 J	370 J	380 U	390 U	780 J	3800 U 46 J	73 J	3700 U	-
Acetophenone	-	390 U	400 U	370 U	420 U	380 U	250 J	2000 U	58 J	380 U	390 U	2200 U	3800 U 220 J	370 U	3700 U	-
Anthracene	500000	52 J	150 J	370 U	88 J	81 J	560	610 J	1600	61 J	93 J	2200	260 J 180 J	240 J	340 J	-
Atrazine	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Benzaldehyde	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Benzo(a)anthracene	5600	230 J	260 J	14 J	140 J	170 J	330 J	2100	1700	53 J	100 J	4200	230 J 120 J	160 J	210 J	-
Benzo(a)pyrene	1000	260 J	190 J	8 J	100 J	240 J	300 J	**2400**	**1500**	28 J	71 J	**3800**	3800 U 70 J	89 J	3700 U	-
Benzo(b)fluoranthene	5600	290 J	210 J	11 J	160 J	200 J	260 J	4800	1600	45 J	99 J	5300	3800 U 99 J	210 J	3700 U	-
Benzo(g,h,i)perylene	500000	280 J	110 J	370 U	63 J	200 J	120 J	1600 J	640	380 U	29 J	2700	3800 U 26 J	28 J	3700 U	-
Benzo(k)fluoranthene	56000	110 J	77 J	370 U	420 U	380 U	440 U	2000 U	400 U	24 J	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Biphenyl	-	390 U	400 U	370 U	420 U	48 J	760	130 J	610	380 U	27 J	130 J	330 J 220 J	530	3700 U	-
bis(2-Chloroethoxy)methane	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
bis(2-Chloroethyl)ether	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 UJ	380 U	390 UJ	2200 U	3800 U 380 U	370 U	3700 U	-
bis(2-Ethylhexyl)phthalate	-	78 U	400 U	370 U	420 U	150 J	110 U	2000 U	400 U	97 U	99 J	2200 U	3800 U 380 U	370 U	3700 U	-
Butyl benzylphthalate	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Caprolactam	-	2000 U	2000 U	1900 U	2200 U	2000 U	2300 U	10000 U	2000 UJ	2000 U	2000 UJ	2400 J	19000 U 1900 U	1900 U	19000 U	-
Carbazole	-	25 J	64 J	370 U	47 J	380 U	440 U	160 J	400 U	21 J	390 U	490 J	3800 U 380 U	370 U	3700 U	-
Chrysene	56000	230 J	210 J	10 J	130 J	170 J	330 J	2300	1500	51 J	100 J	3900	200 J 130 J	180 J	3700 U	-
Dibenz(a,h)anthracene	560	63 J	37 J	370 U	27 J	36 J	31 J	490 J	180 J	380 U	390 U	**670 J**	3800 U 19 J	21 J	3700 U	-
Dibenzofuran	350000	390 U	56 J	370 U	23 J	380 U	56 J	280 J	140 J	57 J	390 U	640 J	3800 U 170 J	410	3700 U	-
Diethyl phthalate	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Dimethyl phthalate	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Di-n-butylphthalate	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Di-n-octyl phthalate	-	20 J	20 J	370 U	420 U	380 U	30 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	21 J	3700 U	-
Fluoranthene	500000	320 J	480	17 J	220 J	180 J	620	2900	2900	210 J	290 J	9700	490 J 360 J	500	500 J	-
Fluorene	500000	21 J	79 J	370 U	40 J	96 J	520	180 J	1300	81 J	75 J	1100 J	310 J 190 J	350 J	3700 U	-
Hexachlorobenzene	6000	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Hexachlorobutadiene	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Hexachlorocyclopentadiene	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Hexachloroethane	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Indeno(1,2,3-cd)pyrene	5600	230 J	110 J	370 U	54 J	100 J	88 J	1300 J	520	380 U	26 J	2400	3800 U 22 J	24 J	3700 U	-
Isophorone	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Naphthalene	500000	390 U	40 J	13 J	420 U	130 J	2300	260 J	240 J	380 U	390 U	420 J	3800 U 84 J	240 J	350 J	-
Nitrobenzene	69000	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
N-Nitrosodi-n-propylamine	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
N-Nitrosodiphenylamine	-	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Pentachlorophenol	6700	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Phenanthrene	500000	200 J	540	20 J	230 J	320 J	2000	1000 J	4200	320 J	260 J	7000	680 J 510	870	880 J	-
Phenol	500000	390 U	400 U	370 U	420 U	380 U	440 U	2000 U	400 U	380 U	390 U	2200 U	3800 U 380 U	370 U	3700 U	-
Pyrene	500000	320 J	490	13 J	210 J	360 J	1100	2900 J	4000	120 J	270 J	8100	430 J 300 J	390 J	480 J	-
Total Petroleum Hydrocarbons (ug/kg)																
Diesel Range Organics	-	-	-	-	-	-	-	-	550000	-	-	-	-	-	-	340000
Fuel oil	-	-	-	-	-	-	-	-	610000 U	-	-	-	-	-	-	120000 U
Gasoline	-	-	-	-	-	-	-	-	61000 U	-	-	-	-	-	-	12000 U
Gasoline Range Organics	-	-	-	-	-	-	-	-	420000	-	-	-	-	-	-	360000
Kerosene	-	-	-	-	-	-	-	-	61000 U	-	-	-	-	-	-	12000 U
Motor Oil	-	-	-	-	-	-	-	-	61000 U	-	-	-	-	-	-	12000 U
PHC as #2 Fuel Oils C10-C23 #2 Diesel, #2 Fuel Oil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbon - Diesel (#4 Fuel Oil)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #2	-	-	-	-	-	-	-	-	550000	-	-	-	-	-	-	340000
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #4	-	-	-	-	-	-	-	-	61000 U	-	-	-	-	-	-	12000 U
Total Petroleum Hydrocarbons (C6-C10) GRO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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ROCHESTER, NY

Location	Part 375	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-10	SB-11	SB-12	SB-12	SB-13	SB-13	SB-13	SB-13
Sample Date	Restricted	11/27/2006	11/27/2006	11/30/2006	11/30/2006	11/30/2006	11/29/2006	11/28/2006	11/28/2006	11/29/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	N
Sample Depth (bgs)	Use	8 - 10 (ft)	8 - 9.5 (ft)	6 - 8 (ft)	10 - 12 (ft)	6 - 8 (ft)	10 - 12 (ft)	4 - 6 (ft)	12 - 13.2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	4 - 6 (ft)	4 - 6 (ft)	6 - 8 (ft)
Lab Sample ID		A6E21902	A6E21903	A6E42505	A6E42504	A6E42503	A6E37701	A6E27408	A6E27401	A6E37702	A6E27402	A6E27403	A6E27404	A6E27406	A6E27406RI	A6E27407
Total Petroleum Hydrocarbons - Fuel Oil #6	-	-	-	-	-	-	-	-	61000 U	-	-	-	-	-	-	12000 U
Volatile Organic Compounds (ug/kg)																
1,1,1-Trichloroethane	500000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,1,2,2-Tetrachloroethane	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,1,2-Trichloroethane	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,1-Dichloroethane	240000	6 U	6 U	6 U	6 U	6 U	160 U	6 UJ	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,1-Dichloroethene	500000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,2,4-Trichlorobenzene	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,2,4-Trimethylbenzene	190000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,2-Dibromoethane (Ethylene Dibromide)	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,2-Dichlorobenzene	500000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,2-Dichloroethane	30000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,2-Dichloropropane	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,3,5-Trimethylbenzene	190000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	280000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
1,4-Dichlorobenzene	130000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
2-Butanone (Methyl Ethyl Ketone)	500000	12 U	11 U	12 U	27	11 U	320 U	12	310 U	59 U	12 U	13 U	290 U	550 U	-	-
2-Hexanone	-	12 U	11 U	12 U	12 U	11 U	320 U	12 U	310 U	59 U	12 U	13 U	290 U	550 U	-	-
2-Phenylbutane (sec-Butylbenzene)	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	-	12 U	11 U	12 U	12 U	11 U	320 U	12 U	310 U	59 U	12 U	13 U	290 U	550 U	-	-
Acetone	500000	9 U	23 UJ	10 J	100	11 J	650 U	38 U	610 U	120 U	20 U	7 U	580 U	1100 U	-	-
Benzene	44000	6 U	6 U	6 U	2 J	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Bromodichloromethane	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Bromoform	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Bromomethane (Methyl Bromide)	-	6 R	6 R	6 R	6 R	6 R	160 R	6 R	150 UJ	29 R	6 U	6 U	140 R	280 UJ	-	-
Carbon disulfide	-	12 U	11 U	12 U	12 U	11 U	320 U	12 U	310 U	59 U	12 U	13 U	290 U	550 U	-	-
Carbon tetrachloride	22000	6 U	6 U	6 UJ	6 U	6 U	160 U	6 U	150 U	29 UJ	6 U	6 U	140 U	280 U	-	-
Chlorobenzene	500000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Chloroethane	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Chloroform (Trichloromethane)	350000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Chloromethane (Methyl Chloride)	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
cis-1,2-Dichloroethene	500000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
cis-1,3-Dichloropropene	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Cyclohexane	-	12 U	11 U	12 U	12 U	11 U	320 U	12 U	310 U	59 U	12 U	1 J	430	5100	-	-
Cymene (p-Isopropyltoluene)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Dichlorodifluoromethane (CFC-12)	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Ethylbenzene	390000	6 U	6 U	6 U	6 U	6 U	500	1 J	1200	29 U	6 U	6 U	140 U	270 J	-	-
Isopropylbenzene	-	6 U	6 U	6 U	6 U	6 U	510	8	1000	29 U	6 U	6 U	120 J	540	-	-
Methyl acetate	-	12 UJ	11 UJ	12 U	12 U	11 U	320 UJ	12 UJ	310 U	59 U	12 U	13 U	290 UJ	550 U	-	-
Methyl cyclohexane	-	12 U	11 U	12 U	12 U	11 U	3800	18	2400	6 J	12 U	3 J	6400	34000	-	-
Methyl Tert Butyl Ether	500000	12 U	11 U	12 U	12 UJ	11 UJ	320 U	12 U	310 U	59 U	12 U	13 U	290 U	550 U	-	-
Methylene chloride	500000	6 U	7 U	13 U	12 U	10 U	170	14 J	120 U	130 J	10 J	7 U	98 J	150 U	-	-
Naphthalene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propylbenzene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
tert-Butylbenzene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	150000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	1 J	140 U	280 U	-	-
Toluene	500000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
trans-1,2-Dichloroethene	500000	6 U	6 U	6 UJ	6 UJ	6 UJ	160 U	6 U	150 U	29 UJ	6 U	6 U	140 U	280 U	-	-
trans-1,3-Dichloropropene	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Trichloroethene	200000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-10	SB-11	SB-12	SB-12	SB-13	SB-13	SB-13	SB-13
Sample Date	Restricted	11/27/2006	11/27/2006	11/30/2006	11/30/2006	11/30/2006	11/29/2006	11/28/2006	11/28/2006	11/29/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006	11/28/2006
Sample Type	Commercial	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	N
Sample Depth (bgs)	Use	8 - 10 (ft)	8 - 9.5 (ft)	6 - 8 (ft)	10 - 12 (ft)	6 - 8 (ft)	10 - 12 (ft)	4 - 6 (ft)	12 - 13.2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	4 - 6 (ft)	4 - 6 (ft)	6 - 8 (ft)
Lab Sample ID		A6E21902	A6E21903	A6E42505	A6E42504	A6E42503	A6E37701	A6E27408	A6E27401	A6E37702	A6E27402	A6E27403	A6E27404	A6E27406	A6E27406RI	A6E27407
Trichlorofluoromethane (CFC-11)	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Trifluorotrichloroethane (Freon 113)	-	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Vinyl chloride	13000	6 U	6 U	6 U	6 U	6 U	160 U	6 U	150 U	29 U	6 U	6 U	140 U	280 U	-	-
Xylene (total)	500000	17 U	17 U	17 U	19 U	17 U	730	3 J	790	88 U	18 U	19 U	610	4400	-	-

Notes:

1. Data qualifiers definced as follows:

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R = Rejected during validation.

2. Results bold and highlighted exceed New York State Department of Environmental Conservation's Part 375 Restricted Commercial Use Soil Cleanup Objectives.

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	SB-14	SB-14	SB-16	SB-16	SB-16	SB-16	SB-17	SB-17	SB-19	SB-19	SB-20	SB-21	SB-21	SB-21	TP-1
Sample Date	Restricted	11/29/2006	11/29/2006	12/05/2006	12/05/2006	12/05/2006	12/05/2006	12/04/2006	12/04/2006	12/01/2006	12/01/2006	08/26/2008	08/28/2008	08/28/2008	08/28/2008	08/25/2008
Sample Type	Commercial	N	N	N	FD	N	N	N	N	N	N	N	N	N	FD	N
Sample Depth (bgs)	Use	6 - 8 (ft)	10 - 12 (ft)	0 - 2 (ft)	0 - 2 (ft)	2 - 4 (ft)	12 - 14 (ft)	0 - 2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	0.5 - 2.5 (ft)	6.5 - 8.5 (ft)	6.5 - 8.5 (ft)	10 - 11 (ft)
Lab Sample ID		A6E37703	A6E37704	A6E62902	A6E62904	A6E73001	A6E62903	A6E53513	A6E53510	A6E53504	A6E53505	A8A47507	A8A62903	A8A62904	A8A62905	A8A47501
Inorganic Compounds (ug/kg)																
Aluminum	-	4140000 J	-	3650000	3930000	516000	3260000	4150000 J	5330000 J	5000000 J	6050000 J	4550000 J	5740000 J	5910000 J	4050000 J	6550000 J
Antimony	-	6500 U	-	7300 U	7300 U	10300 U	6800 U	6600 UJ	7400 UJ	6300 UJ	8200 UJ	7900 UJ	6800 UJ	6900 UJ	7300 UJ	8100 UJ
Arsenic	16000	1600	-	5800	6400	2300	2000	**16600 J**	3400 J	4400 J	3900 J	3000	4700	5100	4000	3100
Barium	400000	28700 J	-	36500	42700	6100	23900	60400	117000	42900	246000	53800 J	61700 J	64700 J	53100 J	52800 J
Beryllium	590000	540 U	-	610 U	610 U	850 U	570 U	550 U	620 U	520 U	680 U	660 U	570 U	580 U	610 U	680 U
Cadmium	9300	540 U	-	610 U	610 U	850 U	570 U	550 U	670	520 U	680 U	660 U	570 U	580 U	610 U	680 U
Calcium	-	2320000 J	-	94600000	144000000	236000000	32900000	70400000	7670000	24500000	4570000	37100000 J	28500000 U	14400000 U	14100000 U	14300000 U
Chromium	-	6500	-	6000	6400	1700 U	5000	16800 J	9100 J	7600 J	10000 J	7900 J	8000 J	14100 J	6100 J	7600 J
Cobalt	-	5400 U	-	6100 U	6100 U	8500 U	5700 U	5500 U	6400	5200 U	6900	6600 U	5700 U	5800 U	6100 U	6800 U
Copper	270000	9300	-	24200	23900	3400 U	8200	51400 J	6000 J	35900 J	8900 J	81700 J	26700 J	62800 J	22400 J	13400 J
Cyanide, Total	27000	1000 U	-	1000 U	740 U	11500	760 U	1100 UJ	660 UJ	1100 UJ	1200 UJ	1100 U	2600	730 U	930 U	700 U
Iron	-	9010000 J	-	12100000	11000000	1310000	8450000	13700000	13200000	11900000	16100000	8880000	12700000	12100000	8760000	11700000
Lead	1000000	16800 J	-	50000	82300	9300	2800	185000	13200	137000	89000	53500	167000	107000	71000	25100
Magnesium	-	1450000	-	35400000	19600000	71100000	8600000	21600000 J	3320000 J	8120000 J	2950000 J	9710000 J	7910000 U	4360000 U	3820000 U	4230000 U
Manganese	10000000	246000 J	-	262000	259000	233000	296000	345000 J	3040000 J	324000 J	1310000 J	299000	363000	354000	343000	325000
Mercury	2800	5 U	-	100	110	24	5 U	1100 J	25 J	428 J	142 J	7	300	320	448	54
Nickel	310000	7900	-	9200	8600	6800 U	6200	11200	6600	9600	11600	8100 J	9400 J	10800 J	6300 J	8600 J
Potassium	-	662000	-	736000	853000	342000 U	727000	838000	462000	836000	952000	1100000 J	945000 J	853000 J	613000 J	1450000 J
Selenium	1500000	730	-	1100	1000	1000 U	670 U	730	970	1300	800 U	780 U	670 U	680 U	720 U	800 U
Silver	1500000	1100 U	-	1200 U	1200 U	980 U	1100 U	1200 U	1300 U	1100 U	1300 U	1300 U	1100 U	1200 U	1200 U	1400 U
Sodium	-	106000	-	85500	96300	85400 U	112000	222000	68900	90800	68100 U	285000 U	184000 U	193000 U	110000 U	161000 U
Thallium	-	1100 U	-	1200 U	1200 U	1700 U	1100 U	1100 U	1200 U	1000 U	1400 U	1300 U	1100 U	1200 U	1200 U	1400 U
Vanadium	-	12800	-	9100	9800	8500 U	8900	10200	15700	11600	14200	10800 J	13400 J	13800 J	9900 J	13600 J
Zinc	10000000	18700 J	-	126000	125000	41800	18800	1290000 J	110000 J	56600 J	184000 J	49100	69500	65100	37400	50000
Other (s.u.)																
Corrosivity	-	-	-	-	-	8.98	-	-	-	-	-	-	-	-	-	-
Semi-Volatile Organic Compounds (ug/kg)																
2,2'-oxybis(1-Chloropropane)	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2,4,5-Trichlorophenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2,4,6-Trichlorophenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2,4-Dichlorophenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2,4-Dimethylphenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2,4-Dinitrophenol	-	2000 UJ	-	10000 UJ	10000 UJ	-	1900 UJ	19000 UJ	2100 UJ	20000 U	2100 U	2000 UJ	19000 UJ	2000 UJ	2000 UJ	2100 UJ
2,4-Dinitrotoluene	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2,6-Dinitrotoluene	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2-Chloronaphthalene	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2-Chlorophenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2-Methylnaphthalene	-	3400	-	69 J	61 J	-	370 U	3800 U	420 U	4200	28 J	28 J	3700 U	390 U	390 U	400 U
2-Methylphenol	500000	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
2-Nitroaniline	-	2000 U	-	10000 U	10000 U	-	1900 U	19000 U	2100 U	20000 U	2100 U	2000 U	19000 U	2000 U	2000 U	2100 U
2-Nitrophenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
3,3'-Dichlorobenzidine	-	1900 U	-	9600 U	9600 U	-	1800 U	18000 U	2000 U	19000 U	2000 U	1900 U	18000 U	1900 U	1900 U	2000 U
3-Nitroaniline	-	2000 U	-	10000 U	10000 U	-	1900 U	19000 U	2100 U	20000 U	2100 U	2000 U	19000 U	2000 U	2000 U	2100 U
4,6-Dinitro-2-methylphenol	-	2000 U	-	10000 U	10000 U	-	1900 U	19000 U	2100 U	20000 U	2100 U	2000 U	19000 UJ	2000 UJ	2000 UJ	2100 U
4-Bromophenyl phenyl ether	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
4-Chloro-3-methylphenol	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
4-Chloroaniline	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
4-Chlorophenyl phenyl ether	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
4-Methylphenol	500000	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
4-Nitroaniline	-	2000 U	-	10000 U	10000 U	-	1900 U	19000 U	2100 U	20000 U	2100 U	2000 U	19000 U	2000 U	2000 U	2100 U
4-Nitrophenol	-	2000 U	-	10000 U	10000 U	-	1900 U	19000 U	2100 U	20000 U	2100 U	2000 U	19000 U	2000 U	2000 U	2100 U

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location Sample Date Sample Type Sample Depth (bgs) Lab Sample ID	Part 375 Restricted Commercial Use	SB-14 11/29/2006 N 6 - 8 (ft) A6E37703	SB-14 11/29/2006 N 10 - 12 (ft) A6E37704	SB-16 12/05/2006 N 0 - 2 (ft) A6E62902	SB-16 12/05/2006 FD 0 - 2 (ft) A6E62904	SB-16 12/05/2006 N 2 - 4 (ft) A6E73001	SB-16 12/05/2006 N 12 - 14 (ft) A6E62903	SB-17 12/04/2006 N 0 - 2 (ft) A6E53513	SB-17 12/04/2006 N 10 - 12 (ft) A6E53510	SB-19 12/01/2006 N 2 - 4 (ft) A6E53504	SB-19 12/01/2006 N 8 - 10 (ft) A6E53505	SB-20 08/26/2008 N 4 - 6 (ft) A8A47507	SB-21 08/28/2008 N 0.5 - 2.5 (ft) A8A62903	SB-21 08/28/2008 N 6.5 - 8.5 (ft) A8A62904	SB-21 08/28/2008 FD 6.5 - 8.5 (ft) A8A62905	TP-1 08/25/2008 N 10 - 11 (ft) A8A47501
Acenaphthene	500000	390 U	-	130 J	2000 U	-	370 U	3800 U	420 U	540 J	62 J	100 J	3700 U	390 U	390 U	400 U
Acenaphthylene	500000	390 U	-	400 J	280 J	-	370 U	1100 J	420 U	1200 J	420 U	63 J	3700 U	390 U	390 U	400 U
Acetophenone	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Anthracene	500000	45 J	-	420 J	170 J	-	370 U	240 J	420 U	1900 J	140 J	220 J	3700 U	390 U	17 J	12 J
Atrazine	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Benzaldehyde	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 UJ	420 UJ	390 U	3700 U	390 U	390 U	400 U
Benzo(a)anthracene	5600	75 J	-	1100 J	790 J	-	370 U	**2300 J**	420 U	1500 J	240 J	650	340 J	23 J	55 J	30 J
Benzo(a)pyrene	1000	53 J	-	**1500 J**	990 J	-	370 U	**1700 J**	420 U	**1600 J**	180 J	560	200 J	25 J	46 J	28 J
Benzo(b)fluoranthene	5600	91 J	-	1600 J	1200 J	-	370 U	3700 J	420 U	1500 J	200 J	550	410 J	20 J	44 J	35 J
Benzo(g,h,i)perylene	500000	33 J	-	2400	1600 J	-	370 U	6000	420 U	1300 J	100 J	420	400 J	20 J	38 J	20 J
Benzo(k)fluoranthene	56000	390 U	-	500 J	370 J	-	370 U	1200 J	420 U	3900 U	93 J	250 J	98 J	10 J	22 J	7 J
Biphenyl	-	140 J	-	2000 U	140 J	-	370 U	3800 U	420 U	920 J	420 U	390 U	3700 U	390 U	390 U	400 U
bis(2-Chloroethoxy)methane	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
bis(2-Chloroethyl)ether	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
bis(2-Ethylhexyl)phthalate	-	230 U	-	2000 U	2000 U	-	62 U	3800 U	420 U	3900 U	420 U	230 J	3700 U	390 U	390 U	77 J
Butyl benzylphthalate	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Caprolactam	-	2000 U	-	10000 U	10000 U	-	1900 U	19000 U	2100 U	20000 U	2100 U	2000 U	19000 U	2000 U	2000 U	2100 U
Carbazole	-	390 U	-	41 J	2000 U	-	370 U	3800 U	420 U	3900 U	61 J	59 J	3700 U	390 U	390 U	400 U
Chrysene	56000	76 J	-	1200 J	870 J	-	370 U	2200 J	420 U	1500 J	210 J	600	3700 U	390 U	390 U	400 U
Dibenz(a,h)anthracene	560	390 U	-	280 J	300 J	-	370 U	**670 J**	420 U	260 J	34 J	120 J	3700 U	8 J	11 J	400 U
Dibenzofuran	350000	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	150 J	34 J	66 J	3700 U	390 U	390 U	400 U
Diethyl phthalate	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Dimethyl phthalate	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Di-n-butylphthalate	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Di-n-octyl phthalate	-	20 U	-	2000 U	2000 U	-	17 U	3800 U	420 U	3900 U	11 J	390 U	3700 U	390 U	390 U	400 U
Fluoranthene	500000	200 J	-	2700	1200 J	-	370 U	2400 J	420 U	2600 J	480	1100	430 J	20 J	79 J	44 J
Fluorene	500000	35 J	-	2000 U	47 J	-	370 U	3800 U	420 U	2100 J	68 J	120 J	3700 U	390 U	9 J	400 U
Hexachlorobenzene	6000	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Hexachlorobutadiene	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Hexachlorocyclopentadiene	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Hexachloroethane	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Indeno(1,2,3-cd)pyrene	5600	25 J	-	1300 J	850 J	-	370 U	3500 J	420 U	660 J	92 J	330 J	300 J	18 J	31 J	17 J
Isophorone	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Naphthalene	500000	2100	-	160 J	80 J	-	370 U	3800 U	38 J	1200 J	81 J	42 J	78 J	9 J	100 J	78 J
Nitrobenzene	69000	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
N-Nitrosodi-n-propylamine	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
N-Nitrosodiphenylamine	-	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Pentachlorophenol	6700	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 UJ	3700 UJ	390 UJ	390 UJ	400 UJ
Phenanthrene	500000	170 J	-	2400	500 J	-	370 U	980 J	420 U	7800	540	1000	280 J	17 J	72 J	35 J
Phenol	500000	390 U	-	2000 U	2000 U	-	370 U	3800 U	420 U	3900 U	420 U	390 U	3700 U	390 U	390 U	400 U
Pyrene	500000	210 J	-	3200	1200 J	-	370 U	4600 J	420 U	4200	370 J	1100	610 J	20 J	81 J	38 J
Total Petroleum Hydrocarbons (ug/kg)																
Diesel Range Organics	-	-	3300 U	-	-	-	-	-	-	-	-	-	-	-	-	-
Fuel oil	-	-	110000 U	-	-	-	-	-	-	-	-	-	-	-	-	-
Gasoline	-	-	3600 J	-	-	-	-	-	-	-	-	-	-	-	-	-
Gasoline Range Organics	-	-	4600	-	-	-	-	-	-	-	-	-	-	-	-	-
Kerosene	-	-	11000	-	-	-	-	-	-	-	-	-	-	-	-	-
Motor Oil	-	-	11000 U	-	-	-	-	-	-	-	-	-	-	-	-	-
PHC as #2 Fuel Oils C10-C23 #2 Diesel, #2 Fuel Oil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbon - Diesel (#4 Fuel Oil)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #2	-	-	11000 U	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #4	-	-	11000 U	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C6-C10) GRO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	SB-14	SB-14	SB-16	SB-16	SB-16	SB-16	SB-17	SB-17	SB-19	SB-19	SB-20	SB-21	SB-21	SB-21	TP-1
Sample Date	Restricted	11/29/2006	11/29/2006	12/05/2006	12/05/2006	12/05/2006	12/05/2006	12/04/2006	12/04/2006	12/01/2006	12/01/2006	08/26/2008	08/28/2008	08/28/2008	08/28/2008	08/25/2008
Sample Type	Commercial	N	N	N	FD	N	N	N	N	N	N	N	N	N	FD	N
Sample Depth (bgs)	Use	6 - 8 (ft)	10 - 12 (ft)	0 - 2 (ft)	0 - 2 (ft)	2 - 4 (ft)	12 - 14 (ft)	0 - 2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	0.5 - 2.5 (ft)	6.5 - 8.5 (ft)	6.5 - 8.5 (ft)	10 - 11 (ft)
Lab Sample ID		A6E37703	A6E37704	A6E62902	A6E62904	A6E73001	A6E62903	A6E53513	A6E53510	A6E53504	A6E53505	A8A47507	A8A62903	A8A62904	A8A62905	A8A47501
Total Petroleum Hydrocarbons - Fuel Oil #6	-	-	11000 U	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds (ug/kg)																
1,1,1-Trichloroethane	500000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1,2,2-Tetrachloroethane	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1,2-Trichloroethane	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1-Dichloroethane	240000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,1-Dichloroethene	500000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,4-Trichlorobenzene	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,4-Trimethylbenzene	190000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dibromoethane (Ethylene Dibromide)	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichlorobenzene	500000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethane	30000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloropropane	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,3,5-Trimethylbenzene	190000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	280000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,4-Dichlorobenzene	130000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
2-Butanone (Methyl Ethyl Ketone)	500000	2300 U	6 J	12 U	13 U	-	11 U	11 U	7 J	11 J	12 U	12 U	15	12 U	6 J	12 U
2-Hexanone	-	2300 U	11 U	12 U	13 U	-	11 U	11 U	13 U	12 U	12 U	12 U	11 U	12 U	11 U	12 U
2-Phenylbutane (sec-Butylbenzene)	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	-	2300 U	11 U	12 U	13 U	-	11 U	11 U	13 U	12 U	12 U	12 U	11 U	12 U	11 U	12 U
Acetone	500000	4600 U	17 J	25 U	25 U	-	10 J	23 U	28	50	24 U	24 U	110	44 U	48 U	30 U
Benzene	44000	1100 U	6 U	6 U	6 U	-	6 U	10	6 U	3 J	6 U	6 UJ	2 J	4 J	2 J	6 J
Bromodichloromethane	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Bromoform	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Bromomethane (Methyl Bromide)	-	1100 U	6 R	6 R	6 R	-	6 R	6 UJ	6 UJ	6 UJ	6 UJ	6 U	6 U	6 U	6 U	6 U
Carbon disulfide	-	2300 U	11 U	12 U	13 U	-	11 U	11 U	13 U	1 J	12 U	1 J	3 J	2 J	2 J	12 U
Carbon tetrachloride	22000	1100 U	6 U	6 UJ	6 UJ	-	6 UJ	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Chlorobenzene	500000	1100 U	6 U	6 U	6 U	-	6 U	6 UJ	6 U	6 U	6 U	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Chloroethane	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Chloroform (Trichloromethane)	350000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Chloromethane (Methyl Chloride)	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
cis-1,2-Dichloroethene	500000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	2 J
cis-1,3-Dichloropropene	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Cyclohexane	-	3100	11 U	12 U	13 U	-	11 U	11 U	2 J	12 U	12 U	12 U	11 U	12 U	11 U	12 U
Cymene (p-Isopropyltoluene)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Dichlorodifluoromethane (CFC-12)	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Ethylbenzene	390000	750 J	6 U	6 U	6 U	-	6 U	6 U	7	5 J	6 U	6 U	6 U	6 U	6 U	6 U
Isopropylbenzene	-	1500	6 U	6 U	6 U	-	6 U	6 U	6 U	3 J	6 U	6 U	6 U	6 U	6 U	6 U
Methyl acetate	-	2300 U	11 U	12 UJ	13 UJ	-	11 UJ	11 U	13 U	12 U	12 U	12 U	11 U	12 U	11 U	12 U
Methyl cyclohexane	-	16000	19	12 U	13 U	-	11 U	11 U	1 J	12 U	12 U	12 U	11 U	12 U	11 U	12 U
Methyl Tert Butyl Ether	500000	2300 U	11 UJ	12 U	13 U	-	11 U	11 U	13 U	12 U	12 U	12 U	11 U	12 U	11 U	12 U
Methylene chloride	500000	790 J	11 U	8 U	9 U	-	10 U	12 U	16 U	13 U	12 U	13 U	9 U	8 U	11 U	13 U
Naphthalene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propylbenzene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	2 J	6 U	6 U	6 U	6 U	6 U	6 U
tert-Butylbenzene	500000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	150000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Toluene	500000	1100 U	6 U	6 U	6 U	-	6 U	6 U	2 U	9	6 U	6 UJ	6 U	6 UJ	6 UJ	6 UJ
trans-1,2-Dichloroethene	500000	1100 U	6 UJ	6 UJ	6 UJ	-	6 UJ	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
trans-1,3-Dichloropropene	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Trichloroethene	200000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	SB-14	SB-14	SB-16	SB-16	SB-16	SB-16	SB-17	SB-17	SB-19	SB-19	SB-20	SB-21	SB-21	SB-21	TP-1
Sample Date	Restricted	11/29/2006	11/29/2006	12/05/2006	12/05/2006	12/05/2006	12/05/2006	12/04/2006	12/04/2006	12/01/2006	12/01/2006	08/26/2008	08/28/2008	08/28/2008	08/28/2008	08/25/2008
Sample Type	Commercial	N	N	N	FD	N	N	N	N	N	N	N	N	N	FD	N
Sample Depth (bgs)	Use	6 - 8 (ft)	10 - 12 (ft)	0 - 2 (ft)	0 - 2 (ft)	2 - 4 (ft)	12 - 14 (ft)	0 - 2 (ft)	10 - 12 (ft)	2 - 4 (ft)	8 - 10 (ft)	4 - 6 (ft)	0.5 - 2.5 (ft)	6.5 - 8.5 (ft)	6.5 - 8.5 (ft)	10 - 11 (ft)
Lab Sample ID		A6E37703	A6E37704	A6E62902	A6E62904	A6E73001	A6E62903	A6E53513	A6E53510	A6E53504	A6E53505	A8A47507	A8A62903	A8A62904	A8A62905	A8A47501
Trichlorofluoromethane (CFC-11)	-	1100 U	6 U	6 U	6 U	-	6 U	6 UJ	6 UJ	6 UJ	6 UJ	6 U	6 U	6 U	6 U	6 U
Trifluorotrichloroethane (Freon 113)	-	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 UJ	6 U	6 U	6 U	6 UJ
Vinyl chloride	13000	1100 U	6 U	6 U	6 U	-	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Xylene (total)	500000	1400 J	3 J	19 U	19 U	-	16 U	17 U	8 J	13 J	18 U	18 U	17 U	18 U	17 U	17 U

Notes:

1. Data qualifiers definced as follows:

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R = Rejected during validation.

2. Results bold and highlighted exceed New York State Department of Environmental Conservation's Part 375 Restricted Commercial Use Soil Cleanup Objectives.

Location	Part 375	TP-2	TP-2	TP-3	TP-3	TP-4
Sample Date	Restricted	08/25/2008	08/25/2008	08/25/2008	08/25/2008	08/25/2008
Sample Type	Commercial	N	N	N	N	N
Sample Depth (bgs)	Use	1 - 3 (ft)	8 - 10 (ft)	4 - 6 (ft)	7 - 9 (ft)	8 - 10 (ft)
Lab Sample ID		A8A47502	A8A47503	A8A47504	A8A47505	A8A47506
Inorganic Compounds (ug/kg)						
Aluminum	-	10500000 J	3490000 J	5540000 J	4780000 J	5740000 J
Antimony	-	9500 UJ	7800 UJ	7100 UJ	6900 UJ	7800 UJ
Arsenic	16000	**67900**	1900	3100	2100	4400
Barium	400000	288000 J	29600 J	30200 J	28500 J	62800 J
Beryllium	590000	880	650 U	590 U	570 U	650 U
Cadmium	9300	1300	650 U	590 U	570 U	650 U
Calcium	-	23900000 U	31200000 U	25200000 U	26200000 U	21800000 U
Chromium	-	18000 J	5000 J	6900 J	5400 J	9200 J
Cobalt	-	8900	6500 U	5900 U	5700 U	6500 U
Copper	270000	204000 J	11200 J	11400 J	8900 J	22200 J
Cyanide, Total	27000	1200 U	950 U	990 U	710 U	3700
Iron	-	25700000	6890000	11300000	8550000	14200000
Lead	1000000	**731000**	8100	8500	7300	84900
Magnesium	-	8820000 U	6310000 U	6930000 U	5960000 U	5380000 U
Manganese	10000000	517000	337000	412000	294000	763000
Mercury	2800	**5800**	169	11	597	200
Nickel	310000	23600 J	5200 J	9100 J	6200 J	8000 J
Potassium	-	1400000 J	777000 J	840000 J	886000 J	1050000 J
Selenium	1500000	940 U	770 U	700 U	680 U	770 U
Silver	1500000	1600	1300 U	1200 U	1100 U	1300 U
Sodium	-	188000 U	140000 U	110000 U	141000 U	163000 U
Thallium	-	1600 U	1300 U	1200 U	1100 U	1300 U
Vanadium	-	32800 J	8000 J	12000 J	10300 J	17900 J
Zinc	10000000	271000	20100	27600	21800	41500
Other (s.u.)						
Corrosivity	-	-	-	-	-	-
Semi-Volatile Organic Compounds (ug/kg)						
2,2'-oxybis(1-Chloropropane)	-	9600 U	390 U	370 U	380 U	390 U
2,4,5-Trichlorophenol	-	9600 U	390 U	370 U	380 U	390 U
2,4,6-Trichlorophenol	-	9600 U	390 U	370 U	380 U	390 U
2,4-Dichlorophenol	-	9600 U	390 U	370 U	380 U	390 U
2,4-Dimethylphenol	-	9600 U	390 U	370 U	380 U	390 U
2,4-Dinitrophenol	-	50000 UJ	2000 UJ	1900 UJ	2000 UJ	2000 UJ
2,4-Dinitrotoluene	-	9600 U	390 U	370 U	380 U	390 U
2,6-Dinitrotoluene	-	9600 U	390 U	370 U	380 U	390 U
2-Chloronaphthalene	-	9600 U	390 U	370 U	380 U	390 U
2-Chlorophenol	-	9600 U	390 U	370 U	380 U	390 U
2-Methylnaphthalene	-	9600 U	390 U	370 U	380 U	390 U
2-Methylphenol	500000	9600 U	390 U	370 U	380 U	390 U
2-Nitroaniline	-	50000 U	2000 U	1900 U	2000 U	2000 U
2-Nitrophenol	-	9600 U	390 U	370 U	380 U	390 U
3,3'-Dichlorobenzidine	-	47000 U	1900 U	1800 U	1800 U	1900 U
3-Nitroaniline	-	50000 U	2000 U	1900 U	2000 U	2000 U
4,6-Dinitro-2-methylphenol	-	50000 U	2000 U	1900 U	2000 U	2000 U
4-Bromophenyl phenyl ether	-	9600 U	390 U	370 U	380 U	390 U
4-Chloro-3-methylphenol	-	9600 U	390 U	370 U	380 U	390 U
4-Chloroaniline	-	9600 U	390 U	370 U	380 U	390 U
4-Chlorophenyl phenyl ether	-	9600 U	390 U	370 U	380 U	390 U
4-Methylphenol	500000	9600 U	390 U	370 U	380 U	390 U
4-Nitroaniline	-	50000 U	2000 U	1900 U	2000 U	2000 U
4-Nitrophenol	-	50000 U	2000 U	1900 U	2000 U	2000 U

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	TP-2	TP-2	TP-3	TP-3	TP-4
Sample Date	Restricted	08/25/2008	08/25/2008	08/25/2008	08/25/2008	08/25/2008
Sample Type	Commercial	N	N	N	N	N
Sample Depth (bgs)	Use	1 - 3 (ft)	8 - 10 (ft)	4 - 6 (ft)	7 - 9 (ft)	8 - 10 (ft)
Lab Sample ID		A8A47502	A8A47503	A8A47504	A8A47505	A8A47506
Acenaphthene	500000	400 J	390 U	370 U	23 J	390 U
Acenaphthylene	500000	1600 J	21 J	8 J	380 U	390 U
Acetophenone	-	9600 U	390 U	370 U	380 U	390 U
Anthracene	500000	2600 J	37 J	370 U	12 J	12 J
Atrazine	-	9600 U	390 U	370 U	380 U	390 U
Benzaldehyde	-	9600 U	390 U	370 U	380 U	390 U
Benzo(a)anthracene	5600	**15000**	160 J	18 J	21 J	58 J
Benzo(a)pyrene	1000	**19000**	140 J	17 J	17 J	56 J
Benzo(b)fluoranthene	5600	**18000**	140 J	25 J	23 J	73 J
Benzo(g,h,i)perylene	500000	18000	76 J	41 J	15 J	48 J
Benzo(k)fluoranthene	56000	4600 J	60 J	14 J	10 J	24 J
Biphenyl	-	9600 U	390 U	370 U	380 U	390 U
bis(2-Chloroethoxy)methane	-	9600 U	390 U	370 U	380 U	390 U
bis(2-Chloroethyl)ether	-	9600 U	390 U	370 U	380 U	390 U
bis(2-Ethylhexyl)phthalate	-	9600 U	390 U	370 U	380 U	390 U
Butyl benzylphthalate	-	9600 U	390 U	370 U	380 U	390 U
Caprolactam	-	50000 U	2000 U	1900 U	2000 U	2000 U
Carbazole	-	650 J	8 J	370 U	380 U	390 U
Chrysene	56000	15000	150 J	370 U	380 U	390 U
Dibenz(a,h)anthracene	560	**7400 J**	26 J	370 U	380 U	16 J
Dibenzofuran	350000	450 J	390 U	370 U	380 U	390 U
Diethyl phthalate	-	9600 U	390 U	370 U	380 U	390 U
Dimethyl phthalate	-	9600 U	390 U	370 U	380 U	390 U
Di-n-butylphthalate	-	9600 U	390 U	370 U	380 U	390 U
Di-n-octyl phthalate	-	9600 U	390 U	370 U	380 U	390 U
Fluoranthene	500000	19000	230 J	9 J	83 J	87 J
Fluorene	500000	630 J	12 J	370 U	40 J	390 U
Hexachlorobenzene	6000	9600 U	390 U	370 U	380 U	390 U
Hexachlorobutadiene	-	9600 U	390 U	370 U	380 U	390 U
Hexachlorocyclopentadiene	-	9600 U	390 U	370 U	380 U	390 U
Hexachloroethane	-	9600 U	390 U	370 U	380 U	390 U
Indeno(1,2,3-cd)pyrene	5600	**10000**	73 J	23 J	13 J	37 J
Isophorone	-	9600 U	390 U	370 U	380 U	390 U
Naphthalene	500000	330 J	390 U	370 U	8 J	390 U
Nitrobenzene	69000	9600 U	390 U	370 U	380 U	390 U
N-Nitrosodi-n-propylamine	-	9600 U	390 U	370 U	380 U	390 U
N-Nitrosodiphenylamine	-	9600 U	390 U	370 U	380 U	390 U
Pentachlorophenol	6700	9600 UJ	390 UJ	370 UJ	380 UJ	390 UJ
Phenanthrene	500000	11000	110 J	370 U	56 J	46 J
Phenol	500000	9600 U	390 U	370 U	380 U	390 U
Pyrene	500000	16000	200 J	18 J	120 J	76 J
Total Petroleum Hydrocarbons (ug/kg)						
Diesel Range Organics	-	-	-	-	-	-
Fuel oil	-	-	-	-	-	-
Gasoline	-	-	-	-	-	-
Gasoline Range Organics	-	-	-	-	-	-
Kerosene	-	-	-	-	-	-
Motor Oil	-	-	-	-	-	-
PHC as #2 Fuel Oils C10-C23 #2 Diesel, #2 Fuel Oil	-	-	-	-	-	-
Total Petroleum Hydrocarbon - Diesel (#4 Fuel Oil)	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #2	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C12-C24) Fuel Oil #4	-	-	-	-	-	-
Total Petroleum Hydrocarbons (C6-C10) GRO	-	-	-	-	-	-

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	TP-2	TP-2	TP-3	TP-3	TP-4
Sample Date	Restricted	08/25/2008	08/25/2008	08/25/2008	08/25/2008	08/25/2008
Sample Type	Commercial	N	N	N	N	N
Sample Depth (bgs)	Use	1 - 3 (ft)	8 - 10 (ft)	4 - 6 (ft)	7 - 9 (ft)	8 - 10 (ft)
Lab Sample ID		A8A47502	A8A47503	A8A47504	A8A47505	A8A47506
Total Petroleum Hydrocarbons - Fuel Oil #6	-	-	-	-	-	-
Volatile Organic Compounds (ug/kg)						
1,1,1-Trichloroethane	500000	7 U	6 U	6 U	6 U	6 U
1,1,2,2-Tetrachloroethane	-	7 U	6 U	6 U	6 U	6 U
1,1,2-Trichloroethane	-	7 U	6 U	6 U	6 U	6 U
1,1-Dichloroethane	240000	7 U	6 U	6 U	6 U	6 U
1,1-Dichloroethene	500000	7 U	6 U	6 U	6 U	6 U
1,2,4-Trichlorobenzene	-	7 U	6 U	6 U	6 U	6 U
1,2,4-Trimethylbenzene	190000	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	-	7 U	6 U	6 U	6 U	6 U
1,2-Dibromoethane (Ethylene Dibromide)	-	7 U	6 U	6 U	6 U	6 U
1,2-Dichlorobenzene	500000	7 U	6 U	6 U	6 U	6 U
1,2-Dichloroethane	30000	7 U	6 U	6 U	6 U	6 U
1,2-Dichloropropane	-	7 U	6 U	6 U	6 U	6 U
1,3,5-Trimethylbenzene	190000	-	-	-	-	-
1,3-Dichlorobenzene	280000	7 U	6 U	6 U	6 U	6 U
1,4-Dichlorobenzene	130000	7 U	6 U	6 U	6 U	6 U
2-Butanone (Methyl Ethyl Ketone)	500000	13 U	11 U	11 U	11 U	11 U
2-Hexanone	-	13 U	11 U	11 U	11 U	11 U
2-Phenylbutane (sec-Butylbenzene)	500000	-	-	-	-	-
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	-	13 U	11 U	11 U	11 U	11 U
Acetone	500000	27 U	23 U	22 U	22 U	40 U
Benzene	44000	7 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Bromodichloromethane	-	7 U	6 U	6 U	6 U	6 U
Bromoform	-	7 U	6 U	6 U	6 U	6 U
Bromomethane (Methyl Bromide)	-	7 U	6 U	6 U	6 U	6 U
Carbon disulfide	-	13 U	11 U	11 U	1 J	11 U
Carbon tetrachloride	22000	7 U	6 U	6 U	6 U	6 U
Chlorobenzene	500000	7 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Chloroethane	-	7 U	6 U	6 U	6 U	6 U
Chloroform (Trichloromethane)	350000	7 U	6 U	6 U	6 U	6 U
Chloromethane (Methyl Chloride)	-	7 U	6 U	6 U	6 U	6 U
cis-1,2-Dichloroethene	500000	7 U	6 U	6 U	6 U	6 U
cis-1,3-Dichloropropene	-	7 U	6 U	6 U	6 U	6 U
Cyclohexane	-	13 U	11 U	11 U	11 U	11 U
Cymene (p-Isopropyltoluene)	-	-	-	-	-	-
Dibromochloromethane	-	7 U	6 U	6 U	6 U	6 U
Dichlorodifluoromethane (CFC-12)	-	7 U	6 U	6 U	6 U	6 U
Ethylbenzene	390000	7 U	6 U	6 U	6 U	6 U
Isopropylbenzene	-	7 U	6 U	6 U	6 U	6 U
Methyl acetate	-	13 U	11 U	11 U	11 U	11 U
Methyl cyclohexane	-	13 U	11 U	11 U	11 U	11 U
Methyl Tert Butyl Ether	500000	13 U	11 U	11 U	11 U	11 U
Methylene chloride	500000	13 U	17 U	13 U	16 U	10 U
Naphthalene	500000	-	-	-	-	-
n-Butylbenzene	500000	-	-	-	-	-
n-Propylbenzene	500000	-	-	-	-	-
Styrene	-	7 U	6 U	6 U	6 U	6 U
tert-Butylbenzene	500000	-	-	-	-	-
Tetrachloroethene	150000	6 J	6 U	6 U	6 U	6 U
Toluene	500000	7 UJ	6 UJ	6 UJ	6 UJ	6 UJ
trans-1,2-Dichloroethene	500000	7 U	6 U	6 U	6 U	6 U
trans-1,3-Dichloropropene	-	7 U	6 U	6 U	6 U	6 U
Trichloroethene	200000	15 J	6 UJ	6 UJ	6 UJ	6 UJ

TABLE I
SUMMARY OF SOIL ANALYTICAL RESULTS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Part 375	TP-2	TP-2	TP-3	TP-3	TP-4
Sample Date	Restricted	08/25/2008	08/25/2008	08/25/2008	08/25/2008	08/25/2008
Sample Type	Commercial	N	N	N	N	N
Sample Depth (bgs)	Use	1 - 3 (ft)	8 - 10 (ft)	4 - 6 (ft)	7 - 9 (ft)	8 - 10 (ft)
Lab Sample ID		A8A47502	A8A47503	A8A47504	A8A47505	A8A47506
Trichlorofluoromethane (CFC-11)	-	7 U	6 U	6 U	6 U	6 U
Trifluorotrichloroethane (Freon 113)	-	7 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Vinyl chloride	13000	7 U	6 U	6 U	6 U	6 U
Xylene (total)	500000	20 U	17 U	16 U	16 U	17 U

Notes:

1. Data qualifiers defined as follows:

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R = Rejected during validation.

2. Results bold and highlighted exceed New York State Department of Environmental Conservation's Part 375 Restricted Commercial Use Soil Cleanup Objectives.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-1	MW-1	MW-1	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3
Sample Date		TOGS 1.1.1	12/26/2006	10/12/2007	09/22/2008	12/26/2006	10/12/2007	10/12/2007	09/22/2008	10/08/2009	06/30/2015	06/30/2015	12/27/2006	10/11/2007	09/24/2008	10/08/2009
Sample Type		Class GA Water	N	N	N	N	N	FD	N	N	N	FD	N	N	N	N
Lab Sample ID		Quality Standards	A6F46701	A7B81404	A8B65301	A6F46702	A7B81401	A7B81402	A8B65302	RSJ0681-04	480-83176-2	480-83176-3	A6F49503	A7B81407	A8B79407	RSJ0681-02
Volatile Organic Compounds (ug/l)																
1,1,1-Trichloroethane	N	5	5 U	5 U	5 UJ	5 U	5 U	5 U	5 UJ	-	1 U	1 U	5 U	5 U	5 U	-
1,1,2,2-Tetrachloroethane	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,1,2-Trichloroethane	N	1	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,1-Dichloroethane	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,1-Dichloroethene	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,2,4-Trichlorobenzene	N	5	5 U	5 UJ	5 U	5 U	5 UJ	5 UJ	5 U	-	1 U	1 U	5 U	5 UJ	5 U	-
1,2,4-Trimethylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	N	0.04	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,2-Dibromoethane (Ethylene Dibromide)	N	0.0006	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,2-Dichlorobenzene	N	3	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,2-Dichloroethane	Y	0.6	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,2-Dichloropropane	N	1	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,3,5-Trimethylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	N	3	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
1,4-Dichlorobenzene	N	3	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
2-Butanone (Methyl Ethyl Ketone)	Y	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	-	10 U	10 U	10 U	10 U	10 U	-
2-Hexanone	N	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	-	5 U	5 U	10 U	10 U	10 U	-
2-Phenylbutane (sec-Butylbenzene)	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	N	-	10 U	10 U	10 U	10 U	10 U	10 U	10 U	-	5 U	5 U	10 U	10 U	10 U	-
Acetone	Y	50	4.2 U	20 U	20 U	20 U	20 U	20 U	20 U	-	10 U	10 U	2.6 U	20 U	20 U	-
Benzene	Y	1	5 U	5 U	5 U	**52**	**24**	**23**	**29**	**29**	**16**	**20**	**1.6 J**	5 U	**6.1**	**24 J**
Bromodichloromethane	N	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Bromoform	N	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 UJ	1 UJ	5 U	5 U	5 U	-
Bromomethane (Methyl Bromide)	N	5	5 U	5 UJ	5 UJ	5 U	5 UJ	5 UJ	5 UJ	-	1 U	1 U	5 U	5 UJ	5 UJ	-
Carbon disulfide	Y	60	10 U	10 U	10 U	10 U	10 U	10 U	10 U	-	1 U	1 U	10 U	10 U	10 U	-
Carbon tetrachloride	N	5	5 U	5 U	5 UJ	5 U	5 U	5 U	5 UJ	-	1 U	1 U	5 U	5 U	5 U	-
Chlorobenzene	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Chloroethane	N	5	5 UJ	5 UJ	5 U	5 UJ	5 UJ	5 UJ	5 U	-	1 U	1 U	5 U	5 UJ	5 U	-
Chloroform (Trichloromethane)	Y	7	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Chloromethane (Methyl Chloride)	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
cis-1,2-Dichloroethene	Y	5	5 U	5 U	5 U	1.1 J	5 U	5 U	2.4 J	-	0.89 J	1.2	**96**	**22**	**170**	-
cis-1,3-Dichloropropene	N	0.4	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Cyclohexane	Y	-	5 U	5 U	5 U	0.75 J	5 U	5 U	0.27 J	-	1 U	1 U	5 U	5 U	5 U	-
Cymene (p-Isopropyltoluene)	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	N	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 UJ	1 UJ	5 U	5 U	5 U	-
Dichlorodifluoromethane (CFC-12)	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Ethylbenzene	Y	5	5 U	5 U	5 U	**6.6**	1.8 J	1.6 J	0.61 J	1	1.3	1.9	**38**	5 U	**190**	**140**
Isopropylbenzene	Y	5	5 U	5 U	5 U	0.5 J	5 U	5 U	0.56 J	-	1 U	1 U	**12**	5 U	**58**	-
Methyl acetate	N	-	10 UJ	10 U	10 U	10 UJ	10 U	10 U	10 U	-	2.5 U	2.5 U	10 U	10 U	10 U	-
Methyl cyclohexane	Y	-	10 U	10 U	10 U	2.2 J	10 U	10 U	10 U	-	0.64 J	0.86 J	9 J	10 U	60	-
Methyl Tert Butyl Ether	Y	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.16 U	1 U	1 U	5 U	5 U	5 U	1.9 J
Methylene chloride	N	5	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	-	1 U	1 U	5 U	5 UJ	5 UJ	-
Naphthalene	Y	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	Y	5	5 U	5 U	5 U	1.5 J	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
tert-Butylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Toluene	Y	5	5 U	5 U	5 U	**18**	5 U	5 U	5 U	0.51 U	0.6 J	0.81 J	0.79 J	5 U	3.6 J	4.7 J
trans-1,2-Dichloroethene	Y	5	5 U	5 U	5 U	5 U	5 U	5 U	0.38 J	-	1 U	1 U	**5.1**	0.82 J	**6.4**	-
trans-1,3-Dichloropropene	N	0.4	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-
Trichloroethene	Y	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	**57**	**38**	**6.2 J**	-
Trichlorofluoromethane (CFC-11)	N	5	5 U	5 U	5 UJ	5 U	5 U	5 U	5 UJ	-	1 U	1 U	5 U	5 U	5 U	-
Trifluorotrichloroethane (Freon 113)	N	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	5 U	5 U	5 U	-

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-1	MW-1	MW-1	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3
Sample Date		TOGS 1.1.1	12/26/2006	10/12/2007	09/22/2008	12/26/2006	10/12/2007	10/12/2007	09/22/2008	10/08/2009	06/30/2015	06/30/2015	12/27/2006	10/11/2007	09/24/2008	10/08/2009
Sample Type		Class GA Water	N	N	N	N	N	FD	N	N	N	FD	N	N	N	N
Lab Sample ID		Quality Standards	A6F46701	A7B81404	A8B65301	A6F46702	A7B81401	A7B81402	A8B65302	RSJ0681-04	480-83176-2	480-83176-3	A6F49503	A7B81407	A8B79407	RSJ0681-02
Volatile Organic Compounds (ug/l)																
Vinyl chloride	Y	2	5 U	5 U	5 U	5 U	5 U	5 U	5 U	-	1 U	1 U	**5.9**	5 U	**24**	-
Xylene (total)	Y	5	15 U	15 U	15 U	**13 J**	2.4 J	1.3 J	1.1 J	1.7 J	1.1 J	2.2	**25**	15 U	**100**	**100 J**

Notes:
1. Data qualifiers definced as follows:
   U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-3	MW-4	MW-4	MW-4	MW-5	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6
Sample Date		TOGS 1.1.1	06/30/2015	12/27/2006	10/12/2007	09/24/2008	12/27/2006	10/12/2007	09/23/2008	06/30/2015	12/28/2006	12/28/2006	10/12/2007	09/24/2008	09/24/2008	07/01/2015
Sample Type		Class GA Water	N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Lab Sample ID		Quality Standards	480-83176-4	A6F49501	A7B81403	A8B79402	A6F49502	A7B81406	A8B72701	480-83176-1	A6F53001	A6F53004	A7B81405	A8B79403	A8B79404	480-83176-6
Volatile Organic Compounds (ug/l)																
1,1,1-Trichloroethane	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1,2,2-Tetrachloroethane	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1,2-Trichloroethane	N	1	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1-Dichloroethane	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1-Dichloroethene	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,2,4-Trichlorobenzene	N	5	1 U	5 U	5 UJ	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U	1 U
1,2,4-Trimethylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	N	0.04	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	N	0.0006	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,2-Dichlorobenzene	N	3	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,2-Dichloroethane	Y	0.6	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,2-Dichloropropane	N	1	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,3,5-Trimethylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	N	3	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,4-Dichlorobenzene	N	3	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
2-Butanone (Methyl Ethyl Ketone)	Y	50	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	50 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	N	50	5 U	10 U	10 UJ	10 U	10 U	10 U	10 U	25 U	10 U	10 U	10 U	10 U	10 U	5 U
2-Phenylbutane (sec-Butylbenzene)	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	N	-	5 U	10 U	10 UJ	10 U	10 U	10 U	10 U	25 U	10 U	10 U	10 U	10 U	10 U	5 U
Acetone	Y	50	10 U	3.2 U	20 UJ	20 U	20 U	5.8 J	20 U	50 U	20 U	20 U	20 U	20 U	20 U	10 U
Benzene	Y	1	**4.2**	5 U	5 UJ	0.67 J	5 U	5 U	5 U	5 U	5 U	5 U	1 J	5 U	5 U	1 U
Bromodichloromethane	N	50	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Bromoform	N	50	1 UJ	5 U	5 UJ	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	1 U
Bromomethane (Methyl Bromide)	N	5	1 U	5 U	5 UJ	5 UJ	5 U	5 UJ	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 UJ	1 U
Carbon disulfide	Y	60	1 U	10 U	10 UJ	10 U	10 U	0.76 J	10 U	5 U	10 U	10 U	10 U	10 U	10 U	1 U
Carbon tetrachloride	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Chlorobenzene	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Chloroethane	N	5	1 U	5 U	5 UJ	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U	1 U
Chloroform (Trichloromethane)	Y	7	1 U	5 U	5 UJ	5 U	1 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Chloromethane (Methyl Chloride)	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
cis-1,2-Dichloroethene	Y	5	**91**	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
cis-1,3-Dichloropropene	N	0.4	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Cyclohexane	Y	-	1.4	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Cymene (p-Isopropyltoluene)	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	N	50	1 UJ	5 U	5 UJ	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	1 U
Dichlorodifluoromethane (CFC-12)	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Ethylbenzene	Y	5	**46**	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Isopropylbenzene	Y	5	**13**	5 U	5 UJ	5 U	3.5 J	1.5 J	1.2 J	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Methyl acetate	N	-	2.5 U	10 U	10 UJ	10 U	10 U	10 U	10 U	13 U	10 UJ	10 UJ	10 U	10 U	10 U	2.5 U
Methyl cyclohexane	Y	-	19	10 U	0.53 J	10 U	10 U	10 U	10 U	5 U	10 U	10 U	10 U	10 U	10 U	1 U
Methyl Tert Butyl Ether	Y	10	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Methylene chloride	N	5	1 U	5 U	5 UJ	5 UJ	5 U	5 UJ	5 UJ	5 U	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	1 U
Naphthalene	Y	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	Y	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
tert-Butylbenzene	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Toluene	Y	5	1.1	5 U	0.56 J	5 U	0.44 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
trans-1,2-Dichloroethene	Y	5	3.9	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1.8 J	0.94 J	1 J	1 U
trans-1,3-Dichloropropene	N	0.4	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Trichloroethene	Y	5	**70**	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	2.4 J	2.3 J	1.1 J	1.6 J	1.7 J	0.72 J
Trichlorofluoromethane (CFC-11)	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Trifluorotrichloroethane (Freon 113)	N	5	1 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC TOGS 1.1.1 Class GA Water Quality Standards	MW-3	MW-4	MW-4	MW-4	MW-5	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6
Sample Date			06/30/2015	12/27/2006	10/12/2007	09/24/2008	12/27/2006	10/12/2007	09/23/2008	06/30/2015	12/28/2006	12/28/2006	10/12/2007	09/24/2008	09/24/2008	07/01/2015
Sample Type			N	N	N	N	N	N	N	N	N	FD	N	N	FD	N
Lab Sample ID			480-83176-4	A6F49501	A7B81403	A8B79402	A6F49502	A7B81406	A8B72701	480-83176-1	A6F53001	A6F53004	A7B81405	A8B79403	A8B79404	480-83176-6
Volatile Organic Compounds (ug/l)																
Vinyl chloride	Y	2	**16**	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 U
Xylene (total)	Y	5	**48**	15 U	15 UJ	15 U	15 U	15 U	15 U	10 U	15 U	15 U	15 U	15 U	15 U	2 U

Notes:
1. Data qualifiers definced as follows:
   U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-7	MW-7	MW-8	MW-9	MW-9	MW-9	MW-10
Sample Date		TOGS 1.1.1	12/28/2006	07/01/2015	09/24/2008	09/24/2008	10/08/2009	10/2/2018*	10/08/2009
Sample Type		Class GA Water	N	N	N	N	N	N	N
Lab Sample ID		Quality Standards	A6F53002	480-83176-5	A8B79405	A8B79401	RSJ0681-05	480-142788-4	RSJ0681-03
Volatile Organic Compounds (ug/l)									
1,1,1-Trichloroethane	N	5	5 U	1 U	5 U	5 U	-	20 U	-
1,1,2,2-Tetrachloroethane	N	5	5 U	1 U	5 U	5 U	-	20 U	-
1,1,2-Trichloroethane	N	1	5 U	1 U	5 U	5 U	-	20 U	-
1,1-Dichloroethane	N	5	5 U	1 U	5 U	5 U	-	20 U	-
1,1-Dichloroethene	N	5	5 U	1 U	5 U	5 U	-	20 U	-
1,2,4-Trichlorobenzene	N	5	5 U	1 U	5 U	5 U	-	20 U	-
1,2,4-Trimethylbenzene	Y	-	-	-	-	-	1500	1500 B	0.53 J
1,2-Dibromo-3-chloropropane (DBCP)	N	0.04	5 U	1 U	5 U	5 U	-	20 U	-
1,2-Dibromoethane (Ethylene Dibromide)	N	0.0006	5 U	1 U	5 U	5 U	-	20 U	-
1,2-Dichlorobenzene	N	3	5 U	1 U	5 U	5 U	-	20 U	-
1,2-Dichloroethane	Y	0.6	5 U	1 U	5 U	**2.9 J**	-	20 U	-
1,2-Dichloropropane	N	1	5 U	1 U	5 U	5 U	-	20 U	-
1,3,5-Trimethylbenzene	Y	-	-	-	-	-	420	390 B	0.22 U
1,3-Dichlorobenzene	N	3	5 U	1 U	5 U	5 U	-	20 U	-
1,4-Dichlorobenzene	N	3	5 U	1 U	5 U	5 U	-	20 U	-
2-Butanone (Methyl Ethyl Ketone)	Y	50	10 U	10 U	10 U	12	-	200 U	-
2-Hexanone	N	50	10 U	5 U	10 U	10 U	-	100 U	-
2-Phenylbutane (sec-Butylbenzene)	Y	-	-	-	-	-	9.2	20 U	0.3 U
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	N	-	10 U	5 U	10 U	10 U	-	100 U	-
Acetone	Y	50	20 U	10 U	20 U	24	-	200 U	-
Benzene	Y	1	5 U	1 U	0.53 J	**1400**	**1400**	**880 B**	**1.2**
Bromodichloromethane	N	50	5 U	1 U	5 U	5 U	-	20 U	-
Bromoform	N	50	5 U	1 U	5 U	5 U	-	20 U	-
Bromomethane (Methyl Bromide)	N	5	5 U	1 U	5 UJ	5 UJ	-	20 U	-
Carbon disulfide	Y	60	10 U	1 U	10 U	10 U	-	20 U	-
Carbon tetrachloride	N	5	5 U	1 U	5 U	5 U	-	20 U	-
Chlorobenzene	N	5	5 U	1 U	5 U	5 U	-	20 U	-
Chloroethane	N	5	5 U	1 U	5 U	5 U	-	20 U	-
Chloroform (Trichloromethane)	Y	7	5 U	1 U	5 U	5 U	-	20 U	-
Chloromethane (Methyl Chloride)	N	5	5 U	1 U	5 U	5 U	-	20 U	-
cis-1,2-Dichloroethene	Y	5	5 U	1 U	**13**	5 U	-	20 U	-
cis-1,3-Dichloropropene	N	0.4	5 U	1 U	5 U	5 U	-	20 U	-
Cyclohexane	Y	-	5 U	1 U	5 U	210	-	250	-
Cymene (p-Isopropyltoluene)	Y	-	-	-	-	-	6.9	20 U	0.31 U
Dibromochloromethane	N	50	5 U	1 U	5 U	5 U	-	20 U	-
Dichlorodifluoromethane (CFC-12)	N	5	5 U	1 U	5 U	5 U	-	20 U	-
Ethylbenzene	Y	5	5 U	1 U	5 U	**260**	**840**	**900 B**	0.18 U
Isopropylbenzene	Y	5	5 U	1 U	5 U	**23**	**62**	**72 B**	0.19 U
Methyl acetate	N	-	10 UJ	2.5 U	10 U	10 U	-	50 U	-
Methyl cyclohexane	Y	-	10 U	1 U	10 U	130 J	-	180	-
Methyl Tert Butyl Ether	Y	10	5 U	1 U	5 U	**130 J**	**140**	**62**	0.16 U
Methylene chloride	N	5	5 UJ	1 U	5 UJ	5 UJ	-	20 U	-
Naphthalene	Y	10	-	-	-	-	**620**	**310 B**	1
n-Butylbenzene	N	-	-	-	-	-	0.28 U	55 B	0.28 U
n-Propylbenzene	Y	-	-	-	-	-	160	180 B	0.18 U
Styrene	Y	5	5 U	1 U	5 U	5 U	-	20 U	-
tert-Butylbenzene	Y	-	-	-	-	-	0.84 J	20 U	0.3 U
Tetrachloroethene	N	5	5 U	1 U	5 U	5 U	-	20 U	-
Toluene	Y	5	5 U	1 U	5 U	**180**	**290**	**230 B**	0.6 J
trans-1,2-Dichloroethene	Y	5	5 U	1 U	3.3 J	5 U	-	20 U	-
trans-1,3-Dichloropropene	N	0.4	5 U	1 U	5 U	5 U	-	20 U	-
Trichloroethene	Y	5	5 U	1 U	5 U	5 U	-	20 U	-
Trichlorofluoromethane (CFC-11)	N	5	5 U	1 U	5 U	5 U	-	20 U	-
Trifluorotrichloroethane (Freon 113)	N	5	5 U	1 U	5 U	5 U	-	20 U	-

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-7	MW-7	MW-8	MW-9	MW-9	MW-9	MW-10
Sample Date		TOGS 1.1.1	12/28/2006	07/01/2015	09/24/2008	09/24/2008	10/08/2009	10/2/2018*	10/08/2009
Sample Type		Class GA Water	N	N	N	N	N	N	N
Lab Sample ID		Quality Standards	A6F53002	480-83176-5	A8B79405	A8B79401	RSJ0681-05	480-142788-4	RSJ0681-03
Volatile Organic Compounds (ug/l)									
Vinyl chloride	Y	2	5 U	1 U	**3.2 J**	5 U	-	20 U	-
Xylene (total)	Y	5	15 U	2 U	15 U	**1500**	**2800**	**1800 B**	0.66 U

Notes:

1. Data qualifiers defined as follows:
   - U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   - J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   - J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   - UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   - R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-1	MW-1	MW-1	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3	MW-4
Sample Date		TOGS 1.1.1	12/26/2006	10/12/2007	09/22/2008	12/26/2006	10/12/2007	10/12/2007	09/22/2008	06/30/2015	06/30/2015	12/27/2006	10/11/2007	09/24/2008	06/30/2015	12/28/2006
Sample Type		Class GA Water	N	N	N	N	N	FD	N	N	FD	N	N	N	N	N
Lab Sample ID		Quality Standards	A6F46701	A7B81404	A8B65301	A6F46702	A7B81401	A7B81402	A8B65302	480-83176-2	480-83176-3	A6F49503	A7B81407	A8B79407	480-83176-4	A6F53003
Semi-Volatile Organic Compounds (ug/l)																
2,2'-oxybis(1-Chloropropane)	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2,2'-oxybis(2-Chloropropane)	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2,4,6-Trichlorophenol	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2,4-Dichlorophenol	N	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2,4-Dimethylphenol	Y	50	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2,4-Dinitrophenol	N	10	47 UJ	980 UJ	250 UJ	47 UJ	49 UJ	47 UJ	53 UJ	9.3 U	9.2 U	50 UJ	50 UJ	53 UJ	9.3 U	56 UJ
2,4-Dinitrotoluene	N	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2,6-Dinitrotoluene	N	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2-Chloronaphthalene	N	10	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2-Chlorophenol	N	-	9 U	200 UJ	50 U	9 U	10 UJ	9 UJ	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2-Methylnaphthalene	Y	-	9 UJ	200 U	50 U	3 J	0.9 J	0.6 J	10 U	4.6 U	0.77 J	3 J	10 UJ	7 J	1.3 J	11 UJ
2-Methylphenol	Y	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
2-Nitroaniline	N	5	47 U	980 U	250 U	47 U	49 U	47 U	53 U	9.3 U	9.2 U	50 U	50 UJ	53 U	9.3 U	56 U
2-Nitrophenol	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
3,3'-Dichlorobenzidine	N	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
3-Nitroaniline	N	5	47 U	980 U	250 U	47 U	49 U	47 U	53 U	9.3 U	9.2 U	50 U	50 UJ	53 U	9.3 U	56 U
4,6-Dinitro-2-methylphenol	N	-	47 U	980 U	250 U	47 U	49 U	47 U	53 U	9.3 U	9.2 U	50 U	50 UJ	53 UJ	9.3 U	56 U
4-Bromophenyl phenyl ether	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
4-Chloro-3-methylphenol	N	-	9 U	200 U	50 R	9 U	10 U	9 U	10 R	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
4-Chloroaniline	N	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
4-Chlorophenyl phenyl ether	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
4-Methylphenol	Y	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	9.3 U	9.2 U	10 U	10 UJ	10 U	9.3 U	11 U
4-Nitroaniline	N	5	47 U	980 U	250 UJ	47 U	49 U	47 U	53 UJ	9.3 U	9.2 U	50 U	50 UJ	53 U	9.3 U	56 U
4-Nitrophenol	N	-	47 U	980 U	250 R	47 U	49 U	47 U	53 R	9.3 U	9.2 U	50 U	50 UJ	53 R	9.3 U	56 U
Acenaphthene	Y	20	9 U	200 UJ	50 U	2 J	2 J	1 J	0.5 J	1.9 J	2.3 J	1 J	10 UJ	9 J	5	11 U
Acenaphthylene	Y	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	1 J	10 UJ	7 J	2 J	11 U
Acetophenone	Y	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.3 J	11 U
Anthracene	Y	50	9 U	200 U	50 U	1 J	0.7 J	0.8 J	0.6 J	0.44 J	0.41 J	10 U	10 UJ	0.3 J	0.28 J	11 U
Atrazine	N	7.5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 UJ	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Benzaldehyde	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 UJ	4.6 UJ	10 U	10 UJ	10 U	4.7 UJ	11 U
Benzo(a)anthracene	Y	0.002	9 U	**10 J**	50 U	9 U	**0.2 J**	**0.2 J**	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Benzo(a)pyrene	Y	0	9 U	10 J	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Benzo(b)fluoranthene	Y	0.002	9 U	**17 J**	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Benzo(g,h,i)perylene	Y	-	9 U	8 J	50 U	9 U	10 UJ	9 UJ	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Benzo(k)fluoranthene	N	0.002	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Biphenyl	Y	5	9 U	200 U	50 U	0.6 J	0.4 J	0.2 J	0.5 J	4.6 U	4.6 U	3 J	10 UJ	**15**	2.5 J	11 U
bis(2-Chloroethoxy)methane	Y	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
bis(2-Chloroethyl)ether	N	1	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
bis(2-Ethylhexyl)phthalate	Y	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	2.7 J	1.7 J	10 U	10 UJ	10 U	4.6 UJ	11 U
Butyl benzylphthalate	N	50	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Caprolactam	N	-	47 U	980 U	250 U	47 U	49 U	47 U	53 U	4.6 U	4.6 U	50 U	50 UJ	53 U	4.7 U	56 U
Carbazole	Y	-	9 U	200 U	50 U	1 J	0.7 J	0.8 J	0.9 J	0.73 J	0.85 J	10 U	10 UJ	0.2 J	4.7 U	11 U
Chrysene	Y	0.002	9 U	**8 J**	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Dibenz(a,h)anthracene	N	-	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Dibenzofuran	Y	-	9 U	200 U	50 U	1 J	0.8 J	0.7 J	0.6 J	0.47 J	0.56 J	10 U	10 UJ	0.3 J	9.3 U	11 U
Diethyl phthalate	Y	50	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	0.4 J	4.7 U	11 U
Dimethyl phthalate	N	50	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Di-n-butylphthalate	Y	50	9 U	200 U	50 U	9 U	0.3 J	9 U	10 U	0.3 J	4.6 U	0.6 J	10 UJ	10 U	4.7 U	11 U
Di-n-octyl phthalate	Y	50	9 U	200 UJ	50 U	9 U	10 UJ	9 UJ	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	0.6 U
Fluoranthene	Y	50	9 U	14 J	50 U	2 J	1 J	1 J	1 J	0.98 J	0.81 J	10 U	10 UJ	10 U	0.42 J	11 U
Fluorene	Y	50	9 U	200 U	50 U	2 J	1 J	1 J	0.8 J	1.4 J	1.6 J	10 U	10 UJ	1 J	2.3 J	11 U
Hexachlorobenzene	N	0.04	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-1	MW-1	MW-1	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3	MW-4
Sample Date		TOGS 1.1.1	12/26/2006	10/12/2007	09/22/2008	12/26/2006	10/12/2007	10/12/2007	09/22/2008	06/30/2015	06/30/2015	12/27/2006	10/11/2007	09/24/2008	06/30/2015	12/28/2006
Sample Type		Class GA Water	N	N	N	N	N	FD	N	N	FD	N	N	N	N	N
Lab Sample ID		Quality Standards	A6F46701	A7B81404	A8B65301	A6F46702	A7B81401	A7B81402	A8B65302	480-83176-2	480-83176-3	A6F49503	A7B81407	A8B79407	480-83176-4	A6F53003
Semi-Volatile Organic Compounds (ug/l)																
Hexachlorobutadiene	N	0.5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Hexachlorocyclopentadiene	N	5	9 U	200 U	50 UJ	9 U	10 U	9 U	10 UJ	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 UJ
Hexachloroethane	N	5	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Indeno(1,2,3-cd)pyrene	Y	0.002	9 U	**7 J**	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Isophorone	N	50	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Naphthalene	Y	10	9 U	200 U	50 U	**68**	4 J	2 J	7 J	6.6 J	**29 J**	**33**	10 UJ	**100**	6.2 J	11 U
Nitrobenzene	N	0.4	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
N-Nitrosodi-n-propylamine	N	-	9 U	200 UJ	50 U	9 U	10 UJ	9 UJ	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
N-Nitrosodiphenylamine	N	50	9 U	200 U	50 U	9 U	10 U	9 U	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Pentachlorophenol	Y	1	47 U	980 U	250 UJ	47 U	49 U	47 U	53 UJ	9.3 U	9.2 U	50 U	50 UJ	53 UJ	9.3 U	56 U
Phenanthrene	Y	50	9 U	10 J	50 U	5 J	3 J	3 J	3 J	2.2 J	2.3 J	10 U	10 UJ	1 J	0.56 J	11 U
Phenol	Y	1	9 U	200 UJ	50 U	9 U	10 UJ	9 UJ	10 U	4.6 U	4.6 U	10 U	10 UJ	10 U	4.7 U	11 U
Pyrene	Y	50	9 U	13 J	50 U	1 J	0.8 J	1 J	0.5 J	0.65 J	0.55 J	10 U	10 UJ	10 U	0.58 J	11 U

Notes:

1. Data qualifiers definced as follows:
   U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-4	MW-4	MW-5	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-7	MW-7
Sample Date		TOGS 1.1.1	10/12/2007	09/24/2008	12/27/2006	10/12/2007	09/23/2008	06/30/2015	12/28/2006	12/28/2006	10/12/2007	09/24/2008	09/24/2008	07/01/2015	12/28/2006	07/01/2015
Sample Type		Class GA Water	N	N	N	N	N	N	N	FD	N	N	FD	N	N	N
Lab Sample ID		Quality Standards	A7B81403	A8B79402	A6F49502	A7B81406	A8B72701	480-83176-1	A6F53001	A6F53004	A7B81405	A8B79403	A8B79404	480-83176-6	A6F53002	480-83176-5
Semi-Volatile Organic Compounds (ug/l)																
2,2'-oxybis(1-Chloropropane)	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
2,2'-oxybis(2-Chloropropane)	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
2,4,6-Trichlorophenol	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
2,4-Dichlorophenol	N	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
2,4-Dimethylphenol	Y	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
2,4-Dinitrophenol	N	10	47 UJ	61 UJ	47 UJ	48 UJ	62 UJ	9.4 U	48 U	48 U	49 UJ	56 UJ	50 UJ	9.3 U	64 U	9.4 U
2,4-Dinitrotoluene	N	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
2,6-Dinitrotoluene	N	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
2-Chloronaphthalene	N	10	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
2-Chlorophenol	N	-	9 UJ	12 U	9 U	10 UJ	12 U	4.7 U	10 U	10 U	10 UJ	11 U	10 U	4.7 U	13 U	4.7 U
2-Methylnaphthalene	Y	-	9 UJ	12 U	9 UJ	2 J	0.4 J	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
2-Methylphenol	Y	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
2-Nitroaniline	N	5	47 UJ	61 U	47 U	48 U	62 U	9.4 U	48 U	48 U	49 U	56 U	50 U	9.3 UJ	64 U	9.4 U
2-Nitrophenol	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
3,3'-Dichlorobenzidine	N	5	9 UJ	12 U	9 U	10 U	12 UJ	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
3-Nitroaniline	N	5	47 UJ	61 U	47 U	48 U	62 U	9.4 U	48 U	48 U	49 U	56 U	50 U	9.3 UJ	64 U	9.4 U
4,6-Dinitro-2-methylphenol	N	-	47 UJ	61 UJ	47 U	48 U	62 U	9.4 U	48 U	48 U	49 U	56 UJ	50 UJ	9.3 U	64 U	9.4 U
4-Bromophenyl phenyl ether	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
4-Chloro-3-methylphenol	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 U	13 U	4.7 U
4-Chloroaniline	N	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
4-Chlorophenyl phenyl ether	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
4-Methylphenol	Y	-	9 UJ	12 U	9 U	10 U	12 U	9.4 U	10 U	10 U	10 U	11 U	10 U	9.3 U	13 U	9.4 U
4-Nitroaniline	N	5	47 UJ	61 U	47 U	48 U	62 U	9.4 U	48 U	48 U	49 U	56 U	50 U	9.3 UJ	64 U	9.4 U
4-Nitrophenol	N	-	47 UJ	61 R	47 U	48 U	62 R	9.4 U	48 U	48 U	49 U	56 R	50 U	9.3 U	64 U	9.4 U
Acenaphthene	Y	20	9 UJ	12 U	5 J	4 J	2 J	1.5 J	10 U	10 U	10 UJ	11 U	10 U	4.7 UJ	13 U	4.7 U
Acenaphthylene	Y	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Acetophenone	Y	-	9 UJ	12 U	9 U	10 U	12 U	0.86 J	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Anthracene	Y	50	9 UJ	12 U	9 U	0.4 J	0.2 J	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Atrazine	N	7.5	9 UJ	12 U	9 U	10 U	12 U	4.7 UJ	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Benzaldehyde	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 UJ	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 UJ
Benzo(a)anthracene	Y	0.002	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	**0.3 J**	11 U	10 U	4.7 UJ	13 U	4.7 U
Benzo(a)pyrene	Y	0	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Benzo(b)fluoranthene	Y	0.002	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	**0.2 J**	11 U	10 U	4.7 UJ	13 U	4.7 U
Benzo(g,h,i)perylene	Y	-	9 UJ	12 U	9 U	10 UJ	12 U	4.7 U	10 U	10 U	0.4 J	11 U	10 U	4.7 UJ	13 U	4.7 U
Benzo(k)fluoranthene	N	0.002	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Biphenyl	Y	5	9 UJ	12 U	9 U	10 U	0.6 J	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
bis(2-Chloroethoxy)methane	Y	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
bis(2-Chloroethyl)ether	N	1	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
bis(2-Ethylhexyl)phthalate	Y	5	9 UJ	12 U	9 U	10 U	12 U	3.6 J	10 U	10 U	10 U	11 U	10 U	4.8 UJ	13 U	5 UJ
Butyl benzylphthalate	N	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Caprolactam	N	-	47 UJ	61 U	47 U	48 U	62 U	4.7 U	48 U	48 U	49 U	56 U	50 U	4.7 UJ	64 U	4.7 U
Carbazole	Y	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Chrysene	Y	0.002	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Dibenz(a,h)anthracene	N	-	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Dibenzofuran	Y	-	9 UJ	12 U	9 U	10 U	12 U	9.4 U	10 U	10 U	10 U	11 U	10 U	9.3 UJ	13 U	9.4 U
Diethyl phthalate	Y	50	9 UJ	12 U	9 U	10 U	0.6 J	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Dimethyl phthalate	N	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Di-n-butylphthalate	Y	50	0.3 J	12 U	1 J	0.6 J	0.7 J	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Di-n-octyl phthalate	Y	50	9 UJ	12 U	9 U	10 UJ	12 U	4.7 U	0.6 U	0.5 J	10 UJ	11 U	10 U	4.7 UJ	0.9 U	4.7 U
Fluoranthene	Y	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	0.6 J	11 U	10 U	4.7 UJ	13 U	4.7 U
Fluorene	Y	50	9 UJ	12 U	1 J	0.8 J	0.6 J	0.37 J	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Hexachlorobenzene	N	0.04	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-4	MW-4	MW-5	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-7	MW-7
Sample Date		TOGS 1.1.1	10/12/2007	09/24/2008	12/27/2006	10/12/2007	09/23/2008	06/30/2015	12/28/2006	12/28/2006	10/12/2007	09/24/2008	09/24/2008	07/01/2015	12/28/2006	07/01/2015
Sample Type		Class GA Water	N	N	N	N	N	N	N	FD	N	N	FD	N	N	N
Lab Sample ID		Quality Standards	A7B81403	A8B79402	A6F49502	A7B81406	A8B72701	480-83176-1	A6F53001	A6F53004	A7B81405	A8B79403	A8B79404	480-83176-6	A6F53002	480-83176-5
Semi-Volatile Organic Compounds (ug/l)																
Hexachlorobutadiene	N	0.5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Hexachlorocyclopentadiene	N	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 UJ	10 UJ	10 U	11 U	10 U	4.7 UJ	13 UJ	4.7 U
Hexachloroethane	N	5	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Indeno(1,2,3-cd)pyrene	Y	0.002	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	**0.2 J**	11 U	10 U	4.7 UJ	13 U	4.7 U
Isophorone	N	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Naphthalene	Y	10	9 UJ	12 U	1 J	10 U	12 U	4.7 UJ	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 UJ
Nitrobenzene	N	0.4	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
N-Nitrosodi-n-propylamine	N	-	9 UJ	12 U	9 U	10 UJ	12 U	4.7 U	10 U	10 U	10 UJ	11 U	10 U	4.7 UJ	13 U	4.7 U
N-Nitrosodiphenylamine	N	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Pentachlorophenol	Y	1	47 UJ	61 UJ	**7 J**	48 U	62 UJ	9.4 U	48 U	48 U	49 U	56 UJ	50 UJ	9.3 U	64 U	9.4 U
Phenanthrene	Y	50	9 UJ	12 U	0.9 J	0.4 J	0.7 J	4.7 U	10 U	10 U	10 U	11 U	10 U	4.7 UJ	13 U	4.7 U
Phenol	Y	1	9 UJ	12 U	9 U	10 UJ	12 U	4.7 U	10 U	10 U	10 UJ	11 U	10 U	4.7 U	13 U	4.7 U
Pyrene	Y	50	9 UJ	12 U	9 U	10 U	12 U	4.7 U	10 U	10 U	0.7 J	11 U	10 U	4.7 UJ	13 U	4.7 U

Notes:

1. Data qualifiers definced as follows:
   U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-8	MW-9	MW-9	MW-9	MW-10
Sample Date		TOGS 1.1.1	09/24/2008	09/24/2008	10/14/2009	10/2/2018*	10/08/2009
Sample Type		Class GA Water	N	N	N	N	N
Lab Sample ID		Quality Standards	A8B79405	A8B79401	RSJ0913-01	480-142788-4	RSJ0681-03
Semi-Volatile Organic Compounds (ug/l)							
2,2'-oxybis(1-Chloropropane)	N	-	11 U	11 U	-	-	-
2,2'-oxybis(2-Chloropropane)	N	-	-	-	3.8 U	-	-
2,4,5-Trichlorophenol	N	-	11 U	11 U	0.93 U	-	-
2,4,6-Trichlorophenol	N	-	11 U	11 U	0.94 U	-	-
2,4-Dichlorophenol	N	5	11 U	11 U	0.74 U	-	-
2,4-Dimethylphenol	Y	50	11 U	12	0.91 U	-	-
2,4-Dinitrophenol	N	10	53 UJ	54 UJ	2.1 U	-	-
2,4-Dinitrotoluene	N	5	11 U	11 U	0.42 U	-	-
2,6-Dinitrotoluene	N	5	11 U	11 U	0.48 U	-	-
2-Chloronaphthalene	N	10	11 U	11 U	0.079 U	-	-
2-Chlorophenol	N	-	11 U	11 U	0.48 U	-	-
2-Methylnaphthalene	Y	-	11 U	11 U	45	-	0.095 U
2-Methylphenol	Y	-	11 U	2 J	0.22 U	-	-
2-Nitroaniline	N	5	53 U	54 U	0.47 U	-	-
2-Nitrophenol	N	-	11 U	11 U	0.57 U	-	-
3,3'-Dichlorobenzidine	N	5	11 U	11 U	0.35 R	-	-
3-Nitroaniline	N	5	53 U	54 U	1.5 U	-	-
4,6-Dinitro-2-methylphenol	N	-	53 UJ	54 UJ	2.1 U	-	-
4-Bromophenyl phenyl ether	N	-	11 U	11 U	0.85 U	-	-
4-Chloro-3-methylphenol	N	-	11 U	11 U	0.56 U	-	-
4-Chloroaniline	N	5	11 U	11 U	0.31 U	-	-
4-Chlorophenyl phenyl ether	N	-	11 U	11 U	0.16 U	-	-
4-Methylphenol	Y	-	11 U	6 J	6.1 J	-	-
4-Nitroaniline	N	5	53 U	54 U	0.43 R	-	-
4-Nitrophenol	N	-	53 R	54 R	1.4 U	-	-
Acenaphthene	Y	20	11 U	11 U	0.11 U	-	2.9
Acenaphthylene	Y	-	11 U	11 U	0.044 U	-	0.047 U
Acetophenone	Y	-	11 U	21	0.96 U	-	-
Anthracene	Y	50	11 U	11 U	0.053 U	-	0.06 U
Atrazine	N	7.5	11 U	11 U	1 U	-	-
Benzaldehyde	N	-	11 U	11 U	0.25 U	-	-
Benzo(a)anthracene	Y	0.002	11 U	11 U	0.06 U	-	0.085 U
Benzo(a)pyrene	Y	0	11 U	11 U	0.086 U	-	0.053 U
Benzo(b)fluoranthene	Y	0.002	11 U	11 U	0.059 U	-	0.14 U
Benzo(g,h,i)perylene	Y	-	11 U	11 U	0.074 U	-	0.067 U
Benzo(k)fluoranthene	N	0.002	11 U	11 U	0.062 U	-	0.099 U
Biphenyl	Y	5	11 U	0.2 J	0.62 U	-	-
bis(2-Chloroethoxy)methane	Y	5	11 U	3 J	0.35 U	-	-
bis(2-Chloroethyl)ether	N	1	11 U	11 U	0.17 U	-	-
bis(2-Ethylhexyl)phthalate	Y	5	11 U	11 U	4.5 U	-	-
Butyl benzylphthalate	N	50	11 U	11 U	1.6 U	-	-
Caprolactam	N	-	53 U	54 U	4.3 U	-	-
Carbazole	Y	-	11 U	11 U	0.084 U	-	-
Chrysene	Y	0.002	11 U	11 U	0.26 U	-	0.08 U
Dibenz(a,h)anthracene	N	-	11 U	11 U	0.19 U	-	0.062 U
Dibenzofuran	Y	-	11 U	11 U	1.5 U	-	-
Diethyl phthalate	Y	50	0.5 J	0.6 J	0.1 U	-	-
Dimethyl phthalate	N	50	11 U	11 U	0.28 U	-	-
Di-n-butylphthalate	Y	50	11 U	11 U	0.51 J	-	-
Di-n-octyl phthalate	Y	50	11 U	11 U	0.23 U	-	-
Fluoranthene	Y	50	11 U	11 U	0.092 U	-	0.058 U
Fluorene	Y	50	11 U	11 U	0.07 U	-	0.057 U
Hexachlorobenzene	N	0.04	11 U	11 U	0.42 U	-	-

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location Sample Date Sample Type Lab Sample ID	Detected?	NYSDEC TOGS 1.1.1 Class GA Water Quality Standards	MW-8 09/24/2008 N A8B79405	MW-9 09/24/2008 N A8B79401	MW-9 10/14/2009 N RSJ0913-01	MW-9 10/2/2018* N 480-142788-4	MW-10 10/08/2009 N RSJ0681-03
Semi-Volatile Organic Compounds (ug/l)							
Hexachlorobutadiene	N	0.5	11 U	11 U	2.4 U	-	-
Hexachlorocyclopentadiene	N	5	11 U	11 U	2.4 U	-	-
Hexachloroethane	N	5	11 U	11 U	2.7 U	-	-
Indeno(1,2,3-cd)pyrene	Y	0.002	11 U	11 U	0.14 U	-	0.062 U
Isophorone	N	50	11 U	11 U	0.3 U	-	-
Naphthalene	Y	10	11 U	3 J	**150**	-	0.053 U
Nitrobenzene	N	0.4	11 U	11 U	0.51 U	-	-
N-Nitrosodi-n-propylamine	N	-	11 U	11 U	0.43 U	-	-
N-Nitrosodiphenylamine	N	50	11 U	11 U	0.25 U	-	-
Pentachlorophenol	Y	1	53 UJ	54 UJ	4.8 U	-	-
Phenanthrene	Y	50	11 U	0.3 J	0.11 U	-	0.081 U
Phenol	Y	1	11 U	**60**	**32**	-	-
Pyrene	Y	50	11 U	11 U	0.064 U	-	0.056 U

Notes:

1. Data qualifiers definced as follows:
   U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   R = Rejected during validation.
2. Results in **bold** exceed criteria.
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TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-1	MW-1	MW-1	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4	MW-5
Sample Date		TOGS 1.1.1	12/26/2006	10/12/2007	09/22/2008	12/26/2006	10/12/2007	10/12/2007	09/22/2008	06/30/2015	06/30/2015	12/27/2006	10/11/2007	09/24/2008	06/30/2015	12/28/2006	10/12/2007	09/24/2008	12/27/2006
Sample Type		Class GA Water	N	N	N	N	N	FD	N	N	FD	N	N	N	N	N	N	N	N
Lab Sample ID		Quality Standards	A6F46701	A7B81404	A8B65301	A6F46702	A7B81401	A7B81402	A8B65302	480-83176-2	480-83176-3	A6F49503	A7B81407	A8B79407	480-83176-4	A6F53003	A7B81403	A8B79402	A6F49502
Inorganic Compounds (ug/l)																			
Aluminum, Dissolved	Y	-	-	-	190 U	-	-	-	190 U	-	-	-	-	258	-	-	-	190 U	-
Antimony, Dissolved	N	3	-	-	600 U	-	-	-	600 U	-	-	-	-	600 U	-	-	-	600 U	-
Arsenic, Dissolved	N	25	-	-	10 U	-	-	-	10 U	-	-	-	-	10 U	-	-	-	10 U	-
Barium, Dissolved	Y	1000	-	-	181	-	-	-	80.2	-	-	-	-	184	-	-	-	187	-
Beryllium, Dissolved	N	3	-	-	5 U	-	-	-	5 U	-	-	-	-	5 U	-	-	-	5 U	-
Cadmium, Dissolved	N	5	-	-	1 U	-	-	-	1 U	-	-	-	-	1 U	-	-	-	1 U	-
Calcium, Dissolved	Y	-	-	-	166000	-	-	-	76800	-	-	-	-	127000	-	-	-	135000	-
Chromium, Dissolved	N	50	-	-	10 U	-	-	-	10 U	-	-	-	-	10 U	-	-	-	10 U	-
Cobalt, Dissolved	N	-	-	-	50 U	-	-	-	50 U	-	-	-	-	50 U	-	-	-	50 U	-
Copper, Dissolved	N	200	-	-	20 U	-	-	-	20 U	-	-	-	-	20 U	-	-	-	20 U	-
Iron, Dissolved	Y	300	-	-	**728**	-	-	-	100 U	-	-	-	-	100 U	-	-	-	100 U	-
Lead, Dissolved	N	25	-	-	3 U	-	-	-	3 U	-	-	-	-	3 U	-	-	-	3 U	-
Magnesium, Dissolved	Y	35000	-	-	26200	-	-	-	**36600**	-	-	-	-	**45800**	-	-	-	**50900**	-
Manganese, Dissolved	Y	300	-	-	**494**	-	-	-	**388**	-	-	-	-	293	-	-	-	15 U	-
Mercury, Dissolved	N	0.7	-	-	0.3 U	-	-	-	0.3 U	-	-	-	-	0.3 U	-	-	-	0.3 U	-
Nickel, Dissolved	N	100	-	-	40 U	-	-	-	40 U	-	-	-	-	40 U	-	-	-	40 U	-
Potassium, Dissolved	Y	-	-	-	9270	-	-	-	14200	-	-	-	-	9190	-	-	-	7150	-
Selenium, Dissolved	Y	10	-	-	6.1 U	-	-	-	6.1 U	-	-	-	-	6.1 U	-	-	-	6.1 U	-
Silver, Dissolved	N	50	-	-	10 U	-	-	-	10 U	-	-	-	-	10 U	-	-	-	10 U	-
Sodium, Dissolved	Y	20000	-	-	**47900**	-	-	-	**55100**	-	-	-	-	14900	-	-	-	7830	-
Thallium, Dissolved	N	0.5	-	-	10 U	-	-	-	10 U	-	-	-	-	10 U	-	-	-	10 U	-
Vanadium, Dissolved	N	-	-	-	50 U	-	-	-	50 U	-	-	-	-	50 U	-	-	-	50 U	-
Zinc, Dissolved	Y	2000	-	-	88.9	-	-	-	20 U	-	-	-	-	20 U	-	-	-	20 U	-
Aluminum, Total	Y	-	655	117000	190 U	763	560	518	669	740 J	180 J	190 U	190 U	405	310 J	1480	19600	887	8840
Antimony, Total	N	3	600 R	600 U	600 U	600 R	600 U	600 U	600 U	20 U	20 U	600 U	600 U	600 U	20 U	600 U	600 U	600 U	600 U
Arsenic, Total	Y	25	10 U	**120**	10 U	10 U	10 U	10 U	10 U	13 J	10 J	10 U	10 U	10 U	15 U	10 U	14.5	10 U	23.3
Barium, Total	Y	1000	104	**1630**	223	93.2	102	107	98.2	120	110	48.3	63.5	222	140	136	397	201	300
Beryllium, Total	N	3	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 U	2 U	5 U	5 U	5 U	2 U	5 U	5 U	5 U	5 U
Cadmium, Total	Y	5	1 U	**6.1**	1 U	1 U	1 U	1 U	1 U	2 U	2 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U
Calcium, Total	Y	-	114000	424000	160000	83600	80500	83800	80700	83800	80100	98300	91200	127000	96000	91000	209000	143000	264000
Chromium, Total	Y	50	10 U	**180**	10 U	10 U	10 U	10 U	10 U	4 U	4 U	10 U	10 U	10 U	4 U	10 U	40.1	10 U	19.5
Cobalt, Total	Y	-	50 U	66.2	50 U	50 U	50 U	50 U	50 U	0.93 J	4 U	50 U	50 U	50 U	4 U	50 U	50 U	50 U	50 U
Copper, Total	Y	200	20 U	**1970**	20 U	20 U	20 U	20 U	20 U	10 U	10 U	20 U	20 U	20 U	10 U	20 U	41.4	20 U	20 U
Cyanide, Total	Y	200	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron, Total	Y	300	**11800**	**246000**	**18100**	**8850**	**7830**	**7770**	**6520**	**16100 J**	**10800 J**	**547**	**433**	**14800**	**4100 J**	**1960**	**45100**	**1130**	**39500**
Lead, Total	Y	25	12.2	**3940**	4.3	16.2	11.8	12.1	14.6	17	10 U	3 U	3 U	3 U	10 U	6.6	**89.8**	3 U	**44.8**
Magnesium, Total	Y	35000	24100	**165000**	24800	**38200**	**35800**	**37500**	**37300**	**51000**	**45500**	33300	24400	**44900**	22800	**184000**	**82800**	**54300**	**103000**
Manganese, Total	Y	300	**382**	**4080**	**469**	**740**	**604**	**604**	**436**	**630 J**	**490 J**	**667**	15 U	**321**	88 J	**490**	**2590**	113	**1400**
Mercury, Total	Y	0.7	0.3 U	**20.8**	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.2 U	0.2 U	0.3 U	0.3 U	0.3 U	0.2 U	0.3 U	0.3 U	0.3 U	0.3 U
Nickel, Total	Y	100	40 U	**154**	40 U	40 U	40 U	40 U	40 U	1.7 J	10 U	40 U	40 U	40 U	2.9 J	40 U	40 U	40 U	40 U
Potassium, Total	Y	-	8720	25500	8730	10700	12200	12800	13800	12900	12600	7480	6090	9150	6800	7380	11700	7730	11800
Selenium, Total	Y	10	6.1 U	6.2	6.1 U	6.1 U	6.1 U	6.1 U	6.1 U	25 U	25 U	6.1 U	6.1 U	6.1 U	25 U	6.1 U	6.1 U	7	6.1 U
Silver, Total	Y	50	10 U	10.4	10 U	10 U	10 U	10 U	10 U	6 U	6 U	10 U	10 U	10 U	6 U	10 U	10 U	10 U	10 U
Sodium, Total	Y	20000	**58900**	**44700**	**46600**	**49700**	**65600**	**70100**	**53800**	**45400**	**44900**	11700	9840	14300	**23000**	7110	9570	8260	17500
Thallium, Total	N	0.5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	20 U	10 U	10 U	10 U	10 U
Vanadium, Total	Y	-	50 U	217	50 U	50 U	50 U	50 U	50 U	1.6 J	5 U	50 U	50 U	50 U	5 U	50 U	50 U	50 U	50 U
Zinc, Total	Y	2000	30.8	**3990**	123	20 U	20 U	20 U	20 U	17 J+	10 U	20 U	20 U	20 U	19 J+	32	126	20 U	115

Notes:

1. Data qualifiers definced as follows:
   U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
   J = The analyte was identified; the associated numerical value is the approximate concentration of the analyte in the sample.
   J+ = The analyte was identified biased high; the associated numerical value is the approximate concentration of the analyte in the sample.
   UJ = The analyte was not detected above the reported sample quantitation limit. However the reported quantitation limit is approximateand may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
   R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-7	MW-7	MW-8	MW-9	MW-9
Sample Date		TOGS 1.1.1	10/12/2007	09/23/2008	06/30/2015	12/28/2006	12/28/2006	10/12/2007	09/24/2008	09/24/2008	07/01/2015	12/28/2006	07/01/2015	09/24/2008	09/24/2008	10/2/2018*
Sample Type		Class GA Water	N	N	N	N	FD	N	N	FD	N	N	N	N	N	N
Lab Sample ID		Quality Standards	A7B81406	A8B72701	480-83176-1	A6F53001	A6F53004	A7B81405	A8B79403	A8B79404	480-83176-6	A6F53002	480-83176-5	A8B79405	A8B79401	480-142788-4
Inorganic Compounds (ug/l)																
Aluminum, Dissolved	Y	-	-	190 U	-	-	-	-	190 U	190 U	-	-	-	190 U	190 U	-
Antimony, Dissolved	N	3	-	600 U	-	-	-	-	600 U	600 U	-	-	-	600 U	600 U	-
Arsenic, Dissolved	N	25	-	10 U	-	-	-	-	10 U	10 U	-	-	-	10 U	10 U	-
Barium, Dissolved	Y	1000	-	396	-	-	-	-	78.2	75.8	-	-	-	208	78.8	-
Beryllium, Dissolved	N	3	-	5 U	-	-	-	-	5 U	5 U	-	-	-	5 U	5 U	-
Cadmium, Dissolved	N	5	-	1 U	-	-	-	-	1 U	1 U	-	-	-	1 U	1 U	-
Calcium, Dissolved	Y	-	-	233000	-	-	-	-	72500	70500	-	-	-	184000	35400	-
Chromium, Dissolved	N	50	-	10 U	-	-	-	-	10 U	10 U	-	-	-	10 U	10 U	-
Cobalt, Dissolved	N	-	-	50 U	-	-	-	-	50 U	50 U	-	-	-	50 U	50 U	-
Copper, Dissolved	N	200	-	20 U	-	-	-	-	20 U	20 U	-	-	-	20 U	20 U	-
Iron, Dissolved	Y	300	-	100 U	-	-	-	-	100 U	100 U	-	-	-	208	100 U	-
Lead, Dissolved	N	25	-	3 U	-	-	-	-	3 U	3 U	-	-	-	3 U	3 U	-
Magnesium, Dissolved	Y	35000	-	**63900**	-	-	-	-	**197000**	**190000**	-	-	-	**50500**	19200	-
Manganese, Dissolved	Y	300	-	**1000**	-	-	-	-	40.9	40.6	-	-	-	**1420**	129	-
Mercury, Dissolved	N	0.7	-	0.3 U	-	-	-	-	0.3 U	0.3 U	-	-	-	0.3 U	0.3 U	-
Nickel, Dissolved	N	100	-	40 U	-	-	-	-	40 U	40 U	-	-	-	40 U	40 U	-
Potassium, Dissolved	Y	-	-	6080	-	-	-	-	12000	11700	-	-	-	14100	26900	-
Selenium, Dissolved	Y	10	-	6.8	-	-	-	-	6.1 U	6.1 U	-	-	-	6.1 U	6.1 U	-
Silver, Dissolved	N	50	-	10 U	-	-	-	-	10 U	10 U	-	-	-	10 U	10 U	-
Sodium, Dissolved	Y	20000	-	**21200**	-	-	-	-	**76900**	**75600**	-	-	-	**96700**	**300000**	-
Thallium, Dissolved	N	0.5	-	10 U	-	-	-	-	10 U	10 U	-	-	-	10 U	10 U	-
Vanadium, Dissolved	N	-	-	50 U	-	-	-	-	50 U	50 U	-	-	-	50 U	50 U	-
Zinc, Dissolved	Y	2000	-	20 U	-	-	-	-	20 U	20 U	-	-	-	20 U	20 U	-
Aluminum, Total	Y	-	16900	190 U	390 J	190 U	190 U	4190	190 U	190 U	200 UJ	190 U	200 UJ	190 U	67500	-
Antimony, Total	N	3	600 U	600 U	20 U	600 U	600 U	600 U	600 U	600 U	20 U	600 U	20 U	600 U	600 U	-
Arsenic, Total	Y	25	**44.5**	21.4	9.5 J	10 U	10 U	10 U	10 U	10 U	15 U	10 U	15 U	10 U	**45.8**	-
Barium, Total	Y	1000	819	580	300	61.9	62	128	92.9	91.4	80	68.2	41	292	499	-
Beryllium, Total	N	3	5 U	5 U	2 U	5 U	5 U	5 U	5 U	5 U	2 U	5 U	2 U	5 U	5 U	-
Cadmium, Total	Y	5	1.3	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	2 U	1 U	1 U	-
Calcium, Total	Y	-	329000	245000	234000	57500	57500	88200	72800	71900	82000	138000	113000	195000	742000	-
Chromium, Total	Y	50	43	10 U	4 U	10 U	10 U	10 U	10 U	10 U	4 U	10 U	4 U	10 U	**121**	-
Cobalt, Total	Y	-	50 U	50 U	0.87 J	50 U	50 U	50 U	50 U	50 U	4 U	50 U	4 U	50 U	50 U	-
Copper, Total	Y	200	45	20 U	10 U	20 U	20 U	20 U	20 U	20 U	10 U	20 U	1.9 J	20 U	190	-
Cyanide, Total	Y	200	10 U	10 U	10 U	10 U	25.5	10 U	10 U	10 U	10	10 U	10 U	10 U	10 U	-
Iron, Total	Y	300	**47700**	**25200**	**13700 J**	100 U	100 U	**9920**	**2740**	**2640**	**1300 J**	**559**	140 J	**21100**	**128000**	-
Lead, Total	Y	25	**112**	3 U	10 U	3 U	3 U	23.7	3 U	3 U	10 U	3 U	10 U	3 U	**830**	-
Magnesium, Total	Y	35000	**124000**	**67400**	**51900**	**221000**	**219000**	**218000**	**194000**	**191000**	**170000**	25800	18300	**51500**	**344000**	-
Manganese, Total	Y	300	**1540**	**1090**	**1100 J**	22.1	22.5	172	42.3	41.7	34 J	**854**	**730 J**	**1490**	**4450**	-
Mercury, Total	Y	0.7	0.3 U	0.3 U	0.2 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.2 U	0.3 U	0.2 U	0.3 U	0.3 U	-
Nickel, Total	Y	100	40 U	40 U	3.6 J	40 U	40 U	40 U	40 U	40 U	10 U	40 U	4.2 J	40 U	**112**	-
Potassium, Total	Y	-	11600	7100	4200	10400	10400	13300	12200	12000	9100	6330	6500	14900	40200	-
Selenium, Total	Y	10	6.1 U	6.1 U	25 U	6.1 U	9.6	6.1 U	6.1 U	6.1 U	25 U	6.1 U	25 U	6.1 U	6.1 U	-
Silver, Total	Y	50	10 U	10 U	6 U	10 U	10 U	10 U	10 U	10 U	6 U	10 U	6 U	10 U	10 U	-
Sodium, Total	Y	20000	**22100**	**22600**	11300 J+	**61800**	**61800**	**75500**	**76600**	**75400**	**36400**	13300	8500 J+	**100000**	**265000**	-
Thallium, Total	N	0.5	10 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U	20 U	10 U	10 U	-
Vanadium, Total	Y	-	50 U	50 U	5 U	50 U	50 U	50 U	50 U	50 U	5 U	50 U	5 U	50 U	130	-
Zinc, Total	Y	2000	251	20 U	110	20 U	20 U	66.1	20 U	20 U	22 J+	29.1	46	20 U	587	-

Notes:

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   R = Rejected during validation.
2. Results in **bold** exceed criteria.
3. * = Sample collected by Stantec, Inc. on October 2, 2018.

TABLE II
SUMMARY OF GROUNDWATER ANALYTICAL DATA
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Location	Detected?	NYSDEC	MW-9	MW-9	MW-9	MW-9	MW-10
Sample Date		TOGS 1.1.1	10/08/2009	10/09/2009	10/12/2009	10/2/2018*	10/08/2009
Sample Type		Class GA Water	N	N	N	N	N
Lab Sample ID		Quality Standards	RSJ0681-05	RSJ0681-06	RSJ0752-01	480-142788-4	RSJ0681-03
Total Petroleum Hydrocarbons (ug/L)							
Diesel Range Organics	Y	-	-	-	2900	-	2200
Fuel oil	Y	-	-	1100 U	-	-	2200
Kerosene	N	-	-	190 U	-	-	160 U
Motor Oil	N	-	-	130 U	-	-	110 U
PHC as #2 Fuel Oils C10-C23 #2 Diesel, #2 Fuel Oil	N	-	-	46 U	-	-	40 U
PHC as Gasoline	Y	-	24000	-	-	-	19 J
Total Petroleum Hydrocarbon - Diesel (#4 Fuel Oil)	N	-	-	130 U	-	-	110 U
Total Petroleum Hydrocarbons (C6-C10) GRO	Y	-	-	8600	-	-	24 U
Total Petroleum Hydrocarbons - Fuel Oil #6	Y	-	-	110 U	-	-	6800

Notes:
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TABLE III
SAMPLE AND ANALYSIS PLAN
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Boring Number	**Soil Sample Depth**	**Target Compound List VOCs (8260B)**	**Target Compound List SVOCs (8270C)**	**Total Analyte List Metals (6010)**	**PCBs (8082)**	**Pesticides (8081)**	**Herbicides (8151)**	**PFAS (537)**	**1,4-Dioxane (8260B)**
SOIL									
SB-22	0-6"	X	X	X	X	X	X		
	6-12"	X	X	X	X	X	X		
SB-23	0-6"	X	X	X	X	X	X		
	6-12"	X	X	X	X	X	X		
SB-24	0-6"	X	X	X	X	X	X		
	6-12"	X	X	X	X	X	X		
SB-25	0-6"	X	X	X	X	X	X		
	6-12"	X	X	X	X	X	X		
SB-26	0-6"	X	X	X	X	X	X		
	6-12"	X	X	X	X	X	X		
SB-27	0-6"	X	X	X	X	X	X		
	6-12"	X	X	X	X	X	X		
GROUNDWATER									
MW-1	-	X	X	X				X	X
MW-2	-	X	X	X					
MW-3	-	X	X	X				X	X
MW-4	-	X	X	X				X	X
MW-5	-	X	X	X				X	X
MW-6	-	X	X	X					
MW-7	-	X	X	X					
MW-8	-	X	X	X					
MW-9	-	X	X	X					
MW-10	-	X	X	X				X	X

Notes:
PCBs - Polychlorinated biphenyls
PFAS - Per- and Polyfluoroalkyl Substances
QAQC samples include:
- MS/MSD - 1 for every 20 samples
- Field Duplicate - 1 for every 20 samples
- Equipment Rinse Blank - 1 per sampling pump, 1 set per 20 samples
- Trip Blanks - 1 per cooler of samples to be analyzed for VOCs

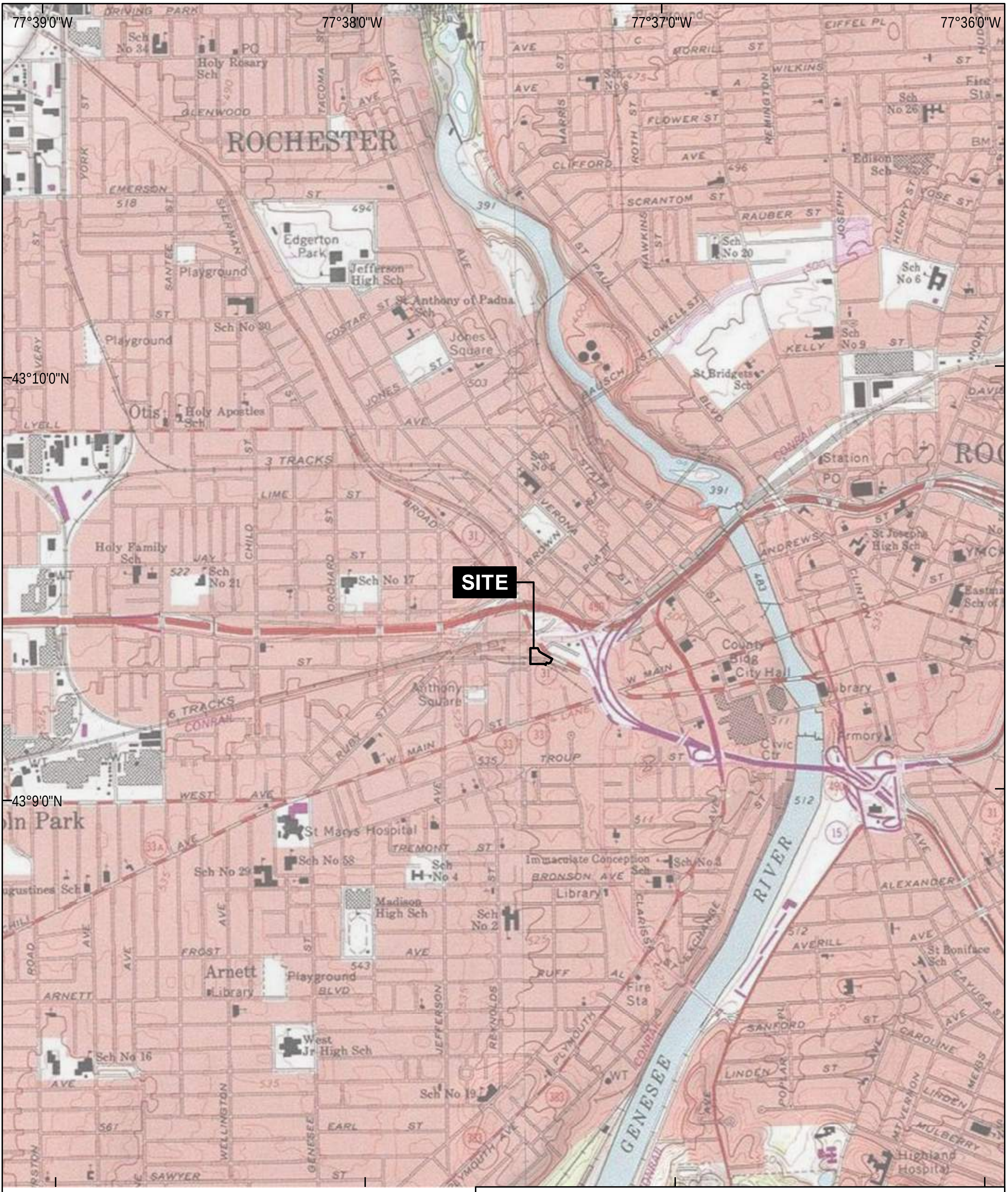
TABLE IV
SUMMARY OF MONITORING WELL DETAILS
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NY

Well ID	Ground Elevation (ft)	PVC Riser Elevation (ft)	Well Diameter (in)	Top of Well Screen (ft bgs)	Bottom of Well Screen (ft bgs)	Well Depth (ft)	Top of Well Screen Elevation (ft)	Bottom of Well Screen Elevation (ft)	Well Depth Elevation (ft)	Bedrock Elevation (ft)
MW-1	514.07	513.77	2.0	2.5	7.5	9.5	511.3	506.27	504.27	506.57
MW-2	512.75	512.53	2.0	5.0	15.00	17	507.53	497.53	495.53	497.15
MW-3	513.57	516.59	2.0	3.0	11.1	13.1	513.59	505.49	503.49	502.47
MW-4	513.1	515.9	2.0	4.0	13.00	15	511.9	502.9	500.9	500.1
MW-5	514.23	514.05	2.0	4.5	13.5	15.5	509.55	500.55	498.55	500.73
MW-6	511.8	511.67	2.0	4.5	10.5	12.5	507.17	501.17	499.17	501.3
MW-7	514.59	514.49	2.0	7.0	12.5	14.5	507.49	501.99	499.99	504.59
MW-8	512.69	513.02	2.0	3.0	12.00	12	510.02	501.02	501.02	503.69
MW-9	513.53	513.89	2.0	2.0	8.5	8.5	511.89	505.39	505.39	508.03
MW-10	513.20	512.92	2.0	8.0	12.00	14	504.92	500.92	498.92	503.20

NOTE:

1. Elevations shown reference the North American Vertical Datum 1988 (NAVD88).

FIGURES



MAP SOURCE: USGS
SITE COORDINATES: 43°09'19"N, 77°37'25"W

HALEY ALDRICH

PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
JANUARY 2020

FIGURE 1

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LEGEND

⊕	SOIL BORING LOCATION
▲	MONITORING WELL LOCATION
----	APPROXIMATE LIMITS OF FORMER MUNICIPAL GAS LIGHT COMPANY MANUFACTURED GAS PLANT
🟨	PROPOSED BROWNFIELD CLEANUP PROGRAM SITE
▭▭	RAILROAD
— · —	PARCEL BOUNDARY LINE
— S —	SEWER LINE
— FO —	FIBER OPTIC LINE
— x —	FENCE LINE
HYD.	HYDRANT
⋈	VALVE
D.I. □	DRAIN INLET
L.P.	LIGHT POLE
U.P. ○	UTILITY POLE

NOTES

1. LOCATIONS OF SOIL BORINGS AND MONITORING WELLS WERE SURVEYED BY PARRONE ENGINEERING AND FISHER ASSOCIATES.
2. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM PARRONE ENGINEERING DRAWING 6192.DWG.

HALEY ALDRICH

PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

SITE PLAN

SCALE: AS SHOWN
JANUARY 2020

FIGURE 2

Saved by: QROWLAND Printed: 3/4/2019 12:49 PM Sheet: FIGURE 2_RIWP
V:\RGE\129309\003_RAWP\CAD\129309_003_C-102.DWG

MW-2	- 12/26/2006	- 10/12/2007	- 9/22/2008	- 10/8/2009	- 6/30/2015	14 - 15 (ft) 11/28/2006
Volatile Organic Compounds						
Benzene	*52 [B]*	*23 [B]/24 [B]*	*29 [B]*	*29 [B]*	*20 [B]/16 [B]*	37
Ethylbenzene	*6.6 [B]*	1.6 J/1.8 J	0.61 J	1	1.9/1.3	210
Toluene	*18 [B]*	5 U/5 U	5 U	0.51 U	0.81 J/0.6 J	45
Xylene (total)	*13 J [B]*	1.3 J/2.4 J	1.1 J	1.7 J	2.2/1.1 J	190
Semi-Volatile Organic Compounds						
Benzo(a)anthracene	9 U	*0.2 J [B]/0.2 J [B]*	10 U	-	4.6 U/4.6 U	2400
Benzo(a)pyrene	9 U	9 U/10 U	10 U	-	4.6 U/4.6 U	*2000 [A]*
Naphthalene	*68 [B]*	2 J/4 J	7 J	-	29 J [B]/6.6 J	3800
Inorganic Compounds						
Arsenic	10 U	10 U/10 U	10 U	-	10 J/13 J	*58900 J [A]*
Iron	*8850 [B]*	*7770 [B]/7830 [B]*	*6520 [B]*	-	*10800 J [B]/16100 J [B]*	21200000
Magnesium	*38200 [B]*	*37500 [B]/35800 [B]*	*37300 [B]*	-	*45500 [B]/51000 [B]*	23700000
Manganese	*740 [B]*	*604 [B]/604 [B]*	*436 [B]*	-	*490 J [B]/630 J [B]*	490000 J
Sodium	*49700 [B]*	*70100 [B]/65600 [B]*	*53800 [B]*	-	*44900 [B]/45400 [B]*	229000

SB-16.	0 - 2 (ft) 12/5/2006	12 - 14 (ft) 12/5/2006
Semi-Volatile Organic Compounds		
Benzo(a)pyrene	990 J/1500 J [A]	370 U

MW-4	- 12/28/2006	- 10/12/2007	- 9/24/2008	8 - 10 (ft) 11/29/2006
Inorganic Compounds				
Iron	*1960 [B]*	*45100 [B]*	*1130 [B]*	5760000 J
Lead	6.6	*89.8 [B]*	3 U	2600 J
Magnesium	*184000 [B]*	*82800 [B]*	*54300 [B]*	1140000
Manganese	*490 [B]*	*2590 [B]*	113	65700 J

SEE NOTES 8 & 9

MW-7	- 12/28/2006	- 7/1/2015	6 - 8 (ft) 12/4/2006
Inorganic Compounds			
Iron	*559 [B]*	140 J	7690000
Manganese	*854 [B]*	*730 J [B]*	238000 J

*NOT SAMPLED IN OCTOBER 2007 OR SEPTEMBER 2008 DUE TO LACK OF WATER

SB-12.	2 - 4 (ft) 11/28/2006	8 - 10 (ft) 11/28/2006
Semi-Volatile Organic Compounds		
Benzo(a)pyrene	71 J	*3800 [A]*
Dibenz(a,h)anthracene	390 U	*670 J [A]*
Inorganic Compounds		
Lead	12400 J	*4050000 J [A]*

TP-2.	1 - 3 (ft) 8/25/2008	8 - 10 (ft) 8/25/2008
Semi-Volatile Organic Compounds		
Benzo(a)anthracene	*15000 [A]*	160 J
Benzo(a)pyrene	*19000 [A]*	140 J
Benzo(b)fluoranthene	*18000 [A]*	140 J
Dibenz(a,h)anthracene	*7400 J [A]*	26 J
Indeno(1,2,3-cd)pyrene	*10000 [A]*	73 J
Inorganic Compounds		
Arsenic	*67900 [A]*	1900
Mercury	*5800 [A]*	169

SB-10.	4 - 6 (ft) 11/28/2006	12 - 13.2 (ft) 11/28/2006
Semi-Volatile Organic Compounds		
Benzo(a)pyrene	*2400 [A]*	*1500 [A]*
Inorganic Compounds		
Arsenic	*30000 J [A]*	2600 J

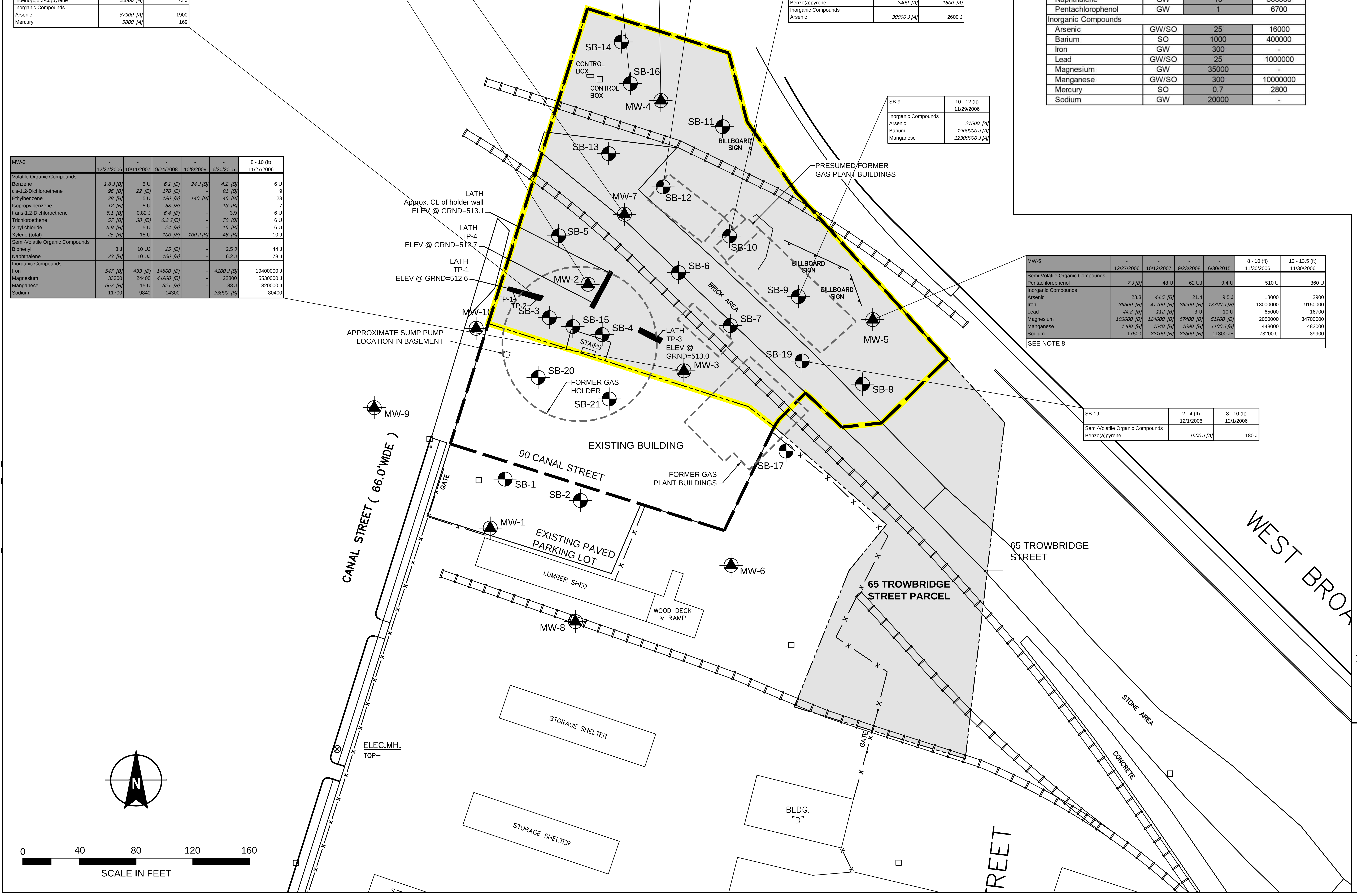
SB-9.	10 - 12 (ft) 11/29/2006
Inorganic Compounds	
Arsenic	*21500 [A]*
Barium	*1960000 J [A]*
Manganese	*12300000 J [A]*

MW-3	- 12/27/2006	- 10/11/2007	- 9/24/2008	- 10/8/2009	- 6/30/2015	8 - 10 (ft) 11/27/2006
Volatile Organic Compounds						
Benzene	*1.6 J [B]*	5 U	*6.1 [B]*	*24 J [B]*	*4.2 [B]*	6 U
cis-1,2-Dichloroethene	*96 [B]*	*22 [B]*	*170 [B]*	-	*91 [B]*	9
Ethylbenzene	*38 [B]*	5 U	*190 [B]*	*140 [B]*	*46 [B]*	23
Isopropylbenzene	*12 [B]*	5 U	*58 [B]*	-	*13 [B]*	7
trans-1,2-Dichloroethene	*5.1 [B]*	0.82 J	*6.4 [B]*	-	3.9	6 U
Trichloroethene	*57 [B]*	*38 [B]*	*6.2 J [B]*	-	*70 [B]*	6 U
Vinyl chloride	*5.9 [B]*	5 U	*24 [B]*	-	*16 [B]*	6 U
Xylene (total)	*25 [B]*	15 U	*100 [B]*	*100 J [B]*	*48 [B]*	10 J
Semi-Volatile Organic Compounds						
Biphenyl	3 J	10 UJ	*15 [B]*	-	2.5 J	44 J
Naphthalene	*33 [B]*	10 UJ	*100 [B]*	-	6.2 J	78 J
Inorganic Compounds						
Iron	*547 [B]*	*433 [B]*	*14800 [B]*	-	*4100 J [B]*	19400000 J
Magnesium	33300	24400	*44900 [B]*	-	22800	5530000 J
Manganese	*667 [B]*	15 U	*321 [B]*	-	88 J	320000 J
Sodium	11700	9840	14300	-	*23000 [B]*	80400

MW-5	- 12/27/2006	- 10/12/2007	- 9/23/2008	- 6/30/2015	8 - 10 (ft) 11/30/2006	12 - 13.5 (ft) 11/30/2006
Semi-Volatile Organic Compounds						
Pentachlorophenol	*7 J [B]*	48 U	62 UJ	9.4 U	510 U	360 U
Inorganic Compounds						
Arsenic	23.3	*44.5 [B]*	21.4	9.5 J	13000	2900
Iron	*39500 [B]*	*47700 [B]*	*25200 [B]*	*13700 J [B]*	13000000	9150000
Lead	*44.8 [B]*	*112 [B]*	3 U	10 U	65000	16700
Magnesium	*103000 [B]*	*124000 [B]*	*67400 [B]*	*51900 [B]*	2050000	34700000
Manganese	*1400 [B]*	*1540 [B]*	*1090 [B]*	*1100 J [B]*	448000	483000
Sodium	17500	*22100 [B]*	*22600 [B]*	11300 J+	78200 U	89900

SEE NOTE 8

SB-19.	2 - 4 (ft) 12/1/2006	8 - 10 (ft) 12/1/2006
Semi-Volatile Organic Compounds		
Benzo(a)pyrene	*1600 J [A]*	180 J



	Matrix Exceeded	TOGS 1.1.1 Class GA Water Quality Standards/ Guidance Values (ug/L)	Restricted Commercial Use (ug/kg)
Volatile Organic Compounds			
Benzene	GW	1	44000
cis-1,2-Dichloroethene	GW	5	500000
Ethylbenzene	GW	5	390000
Isopropylbenzene	GW	5	-
Toluene	GW	5	500000
trans-1,2-Dichloroethene	GW	5	500000
Trichloroethene	GW	5	200000
Vinyl chloride	GW	2	13000
Xylene (total)	GW	5	500000
Semi-Volatile Organic Compounds			
Benzo(a)anthracene	GW/SO	0.002	5600
Benzo(a)pyrene	SO	0	1000
Benzo(b)fluoranthene	SO	0.002	5600
Biphenyl	GW	5	-
Dibenz(a,h)anthracene	SO	-	560
Indeno(1,2,3-cd)pyrene	SO	0.002	5600
Naphthalene	GW	10	500000
Pentachlorophenol	GW	1	6700
Inorganic Compounds			
Arsenic	GW/SO	25	16000
Barium	SO	1000	400000
Iron	GW	300	-
Lead	GW/SO	25	1000000
Magnesium	GW	35000	-
Manganese	GW/SO	300	10000000
Mercury	SO	0.7	2800
Sodium	GW	20000	-

LEGEND

SOIL BORING LOCATION

MONITORING WELL LOCATION

65 TROWBRIDGE STREET PARCEL

APPROXIMATE LIMITS OF FORMER MUNICIPAL GAS LIGHT COMPANY MANUFACTURED GAS PLANT

RAILROAD

PARCEL BOUNDARY LINE

HISTORIC SITE FEATURES

PROPOSED BROWNFIELD CLEANUP PROGRAM SITE

NOTES:

1. GROUNDWATER UNITS IN UG/L. SOIL UNITS IN UG/KG.
2. CHEMICALS SHOWN IN DATABOXES HAVE SAMPLE RESULT(S) GREATER THAN ONE OR MORE CRITERIA AT THE LOCATION.
3. SOIL SCREENING CRITERIA CODES ARE SHOWN IN [ ]. SOIL SHOWN IN WHITE BOXES.
   [A] - INDICATES RESULT IS GREATER THAN PART 375 RESTRICTED COMMERCIAL USE CRITERIA.
4. GROUNDWATER SCREENING CRITERIA CODES ARE SHOWN IN [ ]. GROUNDWATER SHOWN IN GRAY BOXES.
   [B] - INDICATES RESULT IS GREATER THAN NYSDEC TOGS 1.1.1 CLASS GA WATER QUALITY STANDARDS OR GUIDANCE VALUES.
5. QUALIFIERS ARE AS FOLLOWS:
   J - THE ANALYTE WAS POSITIVELY IDENTIFIED; THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION OF THE ANALYTE IN THE SAMPLE.
   J+ - BIASED HIGH
   U - THE ANALYTE WAS ANALYZED FOR BUT WAS NOT DETECTED ABOVE THE REPORTED SAMPLE QUANTITATION LIMIT.
   UJ - THE ANALYTE WAS NOT DETECTED ABOVE THE REPORTED SAMPLE QUANTITATION LIMIT. HOWEVER, THE REPORTED QUANTITATION LIMIT IS APPROXIMATE AND MAY OR MAY NOT REPRESENT THE ACTUAL LIMIT OF QUANTITATION NECESSARY TO ACCURATELY AND PRECISELY MEASURE THE ANALYTE IN THE SAMPLE.
6. LOCATIONS OF SOIL BORINGS AND MONITORING WELLS WERE SURVEYED BY PARRONE ENGINEERING.
7. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM PARRONE ENGINEERING DRAWING 6192.DWG.
8. METALS AND SVOCS LABORATORY RESULTS FOR OCTOBER 2007 MAY NOT BE REPRESENTATIVE OF THE GROUNDWATER CONDITION AT THIS LOCATION DUE TO SUSPENDED SOIL PARTICLES IN THE SAMPLES FOR MW-4 AND MW-5.
9. METALS AND SVOCs LABORATORY RESULTS FOR SEPTEMBER 2008 MAY NOT BE REPRESENTATIVE OF THE GROUNDWATER CONDITION AT THIS LOCATION DUE TO SUSPENDED SOIL PARTICLES IN THE SAMPLE FOR MW-4.
10. ONLY MW-2, MW-3, MW-5, AND MW-7 WERE SAMPLED DURING THE JUNE 2015 EVENT.

HALEY ALDRICH

PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

SITE PLAN SHOWING SOIL AND WATER EXCEEDANCES 2006-2015

SCALE: AS SHOWN
jANUARY 2020

FIGURE 3

MARCH, HEATHER
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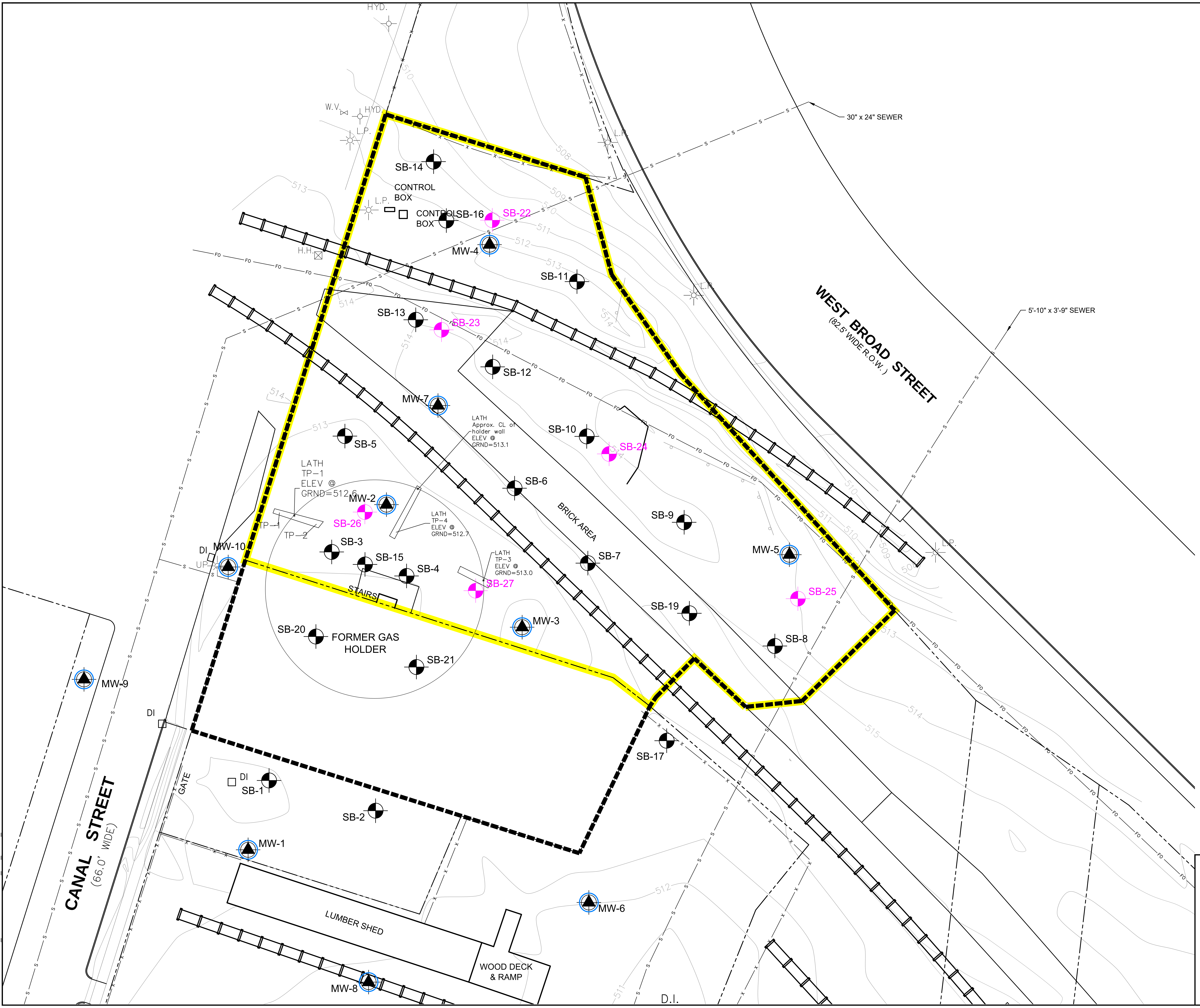
\CAD\DRAWINGS\2019-0305-HAI-DATABOXES-D6_COMMERCIAL_WI_PROPOSEDAREA.DWG

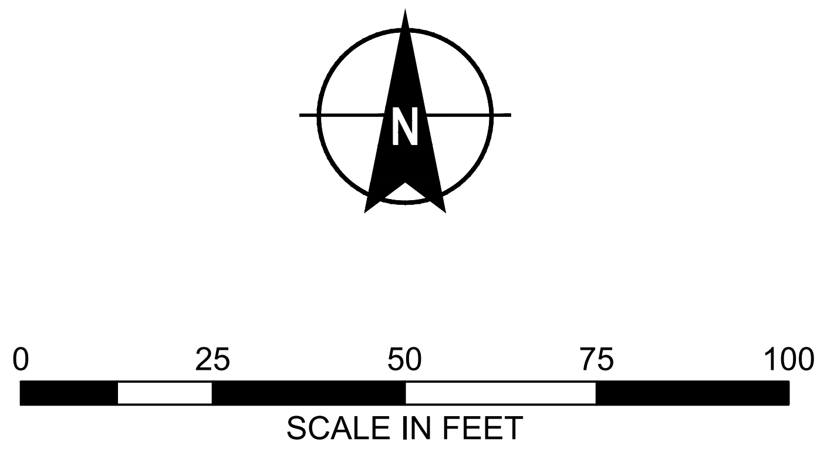


LEGEND

- HISTORIC SOIL BORING LOCATION
- MONITORING WELL LOCATION TO BE SAMPLED DURING REMEDIAL INVESTIGATION
- PROPOSED SOIL BORING LOCATIONS
- APPROXIMATE LIMITS OF FORMER MUNICIPAL GAS LIGHT COMPANY MANUFACTURED GAS PLANT
- PROPOSED BROWNFIELD CLEANUP PROGRAM SITE
- RAILROAD
- PARCEL BOUNDARY LINE
- S — SEWER LINE
- FO — FIBER OPTIC LINE
- X — FENCE LINE
- HYD. — HYDRANT
- VALVE
- D.I. — DRAIN INLET
- L.P. — LIGHT POLE
- U.P. — UTILITY POLE

NOTES

1. LOCATIONS OF SOIL HISTORIC BORINGS AND MONITORING WELLS WERE SURVEYED BY PARRONE ENGINEERING AND FISHER ASSOCIATES.
2. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM PARRONE ENGINEERING DRAWING 6192.DWG.



HALEY ALDRICH

PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

REMEDIAL INVESTIGATION SAMPLING LOCATIONS

SCALE: AS SHOWN
JANUARY 2020

FIGURE 4

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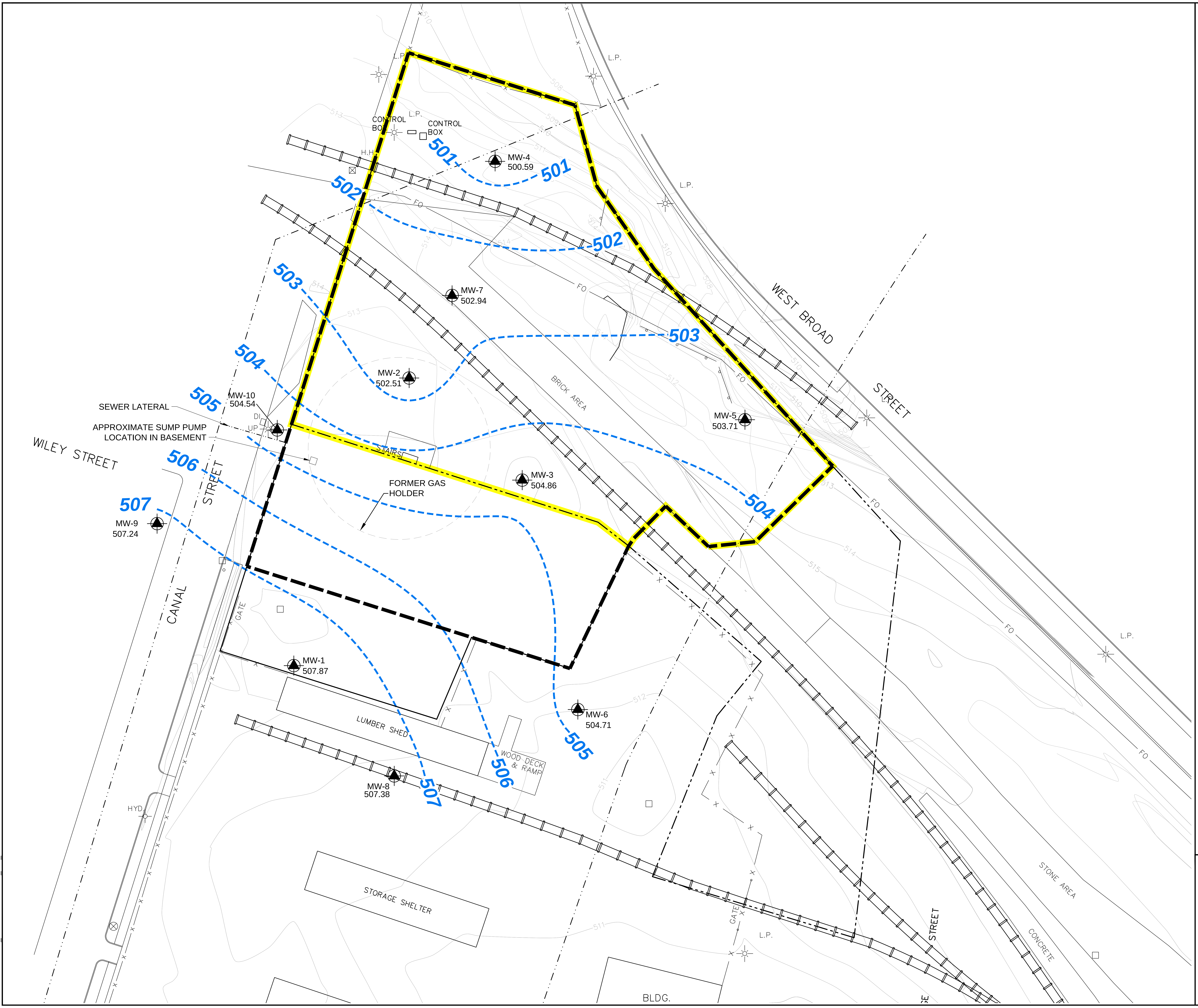

LEGEND

▲	MONITORING WELL LOCATION
— — —	APPROXIMATE LIMITS OF FORMER MUNICIPAL GAS LIGHT COMPANY MANUFACTURED GAS PLANT
┼┼┼┼	RAILROAD
— · —	PARCEL BOUNDARY LINE
— · · —	SEWER LINE
—F.O.—	FIBER OPTIC LINE
—X—	FENCE LINE
HYD	HYDRANT
LP	LIGHT POLE
504 - - -	INFERRED GROUNDWATER ELEVATION CONTOUR OCTOBER 2009
UP	UTILITY POLE
DI	DRAIN INLET
— · — · —	SEWER LINE
🟨	PROPOSED BROWNFIELD CLEANUP PROGRAM SITE

NOTES

1. LOCATIONS OF SOIL BORINGS AND MONITORING WELLS WERE SURVEYED BY PARRONE ENGINEERING.
2. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM PARRONE ENGINEERING DRAWING 6192.DWG.
3. GROUNDWATER LEVELS COLLECTED IN OCTOBER 2009.

HALEY ALDRICH

PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

2009 GROUNDWATER ELEVATIONS AND CONTOUR MAP

SCALE: AS SHOWN
JANUARY 2020

FIGURE 5

HMARCH
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Sheet: FIGURE 3

APPENDIX A

Field Sampling Plan

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REPORT ON

FIELD SAMPLING PLAN
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

by
Haley & Aldrich of New York
Rochester, New York

for
William B. Morse Lumber Co.
Rochester, New York

File No. 129309-003
January 2020

Table of Contents

Table of Contents

1. Introduction

This Field Sampling Plan (FSP) has been prepared as a component of the Remedial Investigation Work Plan (RIWP) and Interim Remedial Measures Work Plan (IRMWP) for the portion of 65 Trowbridge Street (Site) in Rochester, New York. This document was prepared to establish field procedures for field data collection to be performed in support of the RIWP for the Site.

The RIWP and IRMWP includes this Field Sampling Plan, a Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Community Air Monitoring Plan (CAMP), which are included as part of this plan by reference.

The standard operating procedures (SOP) included as components of this plan will provide the procedures necessary to meet the project objectives. The SOPs will be used as reference for the methods to be employed for field sample collection and handling and the management of field data collected in the execution of the approved RIWP and IRMWP. The SOPs include numerous methods to execute the tasks of the RIWP and IRMWP. The Project Manager will select the appropriate method as required by field conditions and/or the objective the respective project task at the time of sample collection. Field procedures will be conducted in general accordance with the New York State Department of Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (DER-10) when applicable.

2. Field Program

This FSP provides the general purpose of sampling as well as procedural information. The RIWP and IRMWP contains the details on sampling and analysis (locations, depths, frequency, analyte lists, etc.).

The field program has been designed to acquire the necessary data to comply with the RIWP and IRMWP, and includes the following tasks:

- Soil sampling;
- Groundwater sampling;
- Sampling of investigation of derived wastes (IDW) as needed for disposal.

Site characterization has been performed for the anticipated contaminants based on the Site's uses and has determined the nature and extent of volatile organic compound (VOC), semi-volatile organic compound (SVOC) and metals contaminants. Because the site characterization did not include analysis for pesticides, herbicides, polychlorinated biphenyls (PCBs) and emerging contaminants, a targeted remedial investigation will be performed. The sampling will be conducted so that samples collected will retain, as much as possible, its original physical form and chemical composition.

These SOPs presented herein may be changed as required, dependent on-site conditions, or equipment limitations, at the time of sample collection. If the procedures employed differ from the SOP, the deviations will be documented in the associated sampling report.

3. Utility Clearance

Invasive remedial activities such as excavation or remedial construction activities require location of underground utilities prior to initiating work. Such clearance is sound practice in that it minimizes the potential for damage to underground facilities and more importantly, is protective of the health and safety of personnel. Under no circumstances will invasive activities be allowed to proceed without obtaining proper utility clearance by the appropriate public agencies and/or private entities. This clearance requirement applies to all work on both public and private property, whether located in a dense urban area or a seemingly out-of-the-way rural location.

The field staff or drilling contractor performing the work will be responsible for obtaining utility clearance.

Utility clearance is required by law, and obtaining clearance includes contacting a public or private central clearance agency via a “one-call” telephone service and providing the proposed exploration location information. It is important to note that public utility agencies may not, and usually do not have information regarding utility locations on private property.

Before beginning subsurface work at any proposed exploration locations, it is critical that all readily available information on underground utilities and structures be obtained. This includes publicly available information as well as information in the possession of private landowners. Any drawings obtained must be reviewed in detail for information pertaining to underground utilities.

Using the information obtained, the site should be viewed in detail for physical evidence of buried lines or structures, including pavement cuts and patches, variation in or lack of vegetation, variations in grading, etc. Care must also be taken to avoid overhead utilities as well. Presence of surface elements of buried utilities should be documented, such as manholes, gas or water service valves, catch basins, monuments or other evidence.

Overhead utility lines must be taken into account when choosing exploration and excavation locations. Most states require a minimum of 10 ft of clearance between equipment and energized wires. Such separation requirements may also be voltage-based and may vary depending on state or municipality regulations. In evaluating clearance from overhead lines, the same restrictions may apply to “drops”, or wires on a utility pole connecting overhead and underground lines.

Using the information obtained and observations made, proposed exploration or construction locations should be marked in the field. Marking locations can be accomplished using spray paint on the ground, stakes, or other means. All markings of proposed locations should be made in white, in accordance with the generally accepted universal color code for facilities identification (AWMA 4/99):

- White: Proposed Excavation or Drilling location
- Pink: Temporary Survey Markings
- Red: Electrical Power Lines, Cables, Conduit and Lighting Cables
- Yellow: Gas, Oil, Steam, Petroleum or Gaseous Materials
- Orange: Communication, Alarm or Signal Lines, Cables or Conduits
- Blue: Potable Water
- Purple: Reclaimed Water, Irrigation and Slurry Lines
- Green: Sewers and Drain Lines

In order to effectively evaluate the proposed locations with these entities, detailed, accurate measurements between the proposed locations and existing surface features should be obtained. Such features can be buildings, street intersections, utility poles, guardrails, etc.

Obtaining the utility clearance generally involves two entities:

- The designated “One-Call” underground facilities protection organization for the area; and the landowner.
- In addition, a third-party utility locator company will be utilized to locate underground utilities outside of the public right-of-way followed by “soft dig” excavation techniques to confirm or deny the presence of underground utilities in the area.

Both entities must be contacted, and the proposed locations evaluated in light of information available for existing underground facilities. The detailed measurement information described above will be required by the “one call” agency. The owners of the applicable, participating underground utilities are obligated to mark their respective facilities at the site in the colors described above. Utility stake-out activities will typically not commence for approximately 72 hours after the initial request is made.

The public and private utility entities generally only mark the locations of their respective underground facilities within public rights-of-way. Determination of the locations of these facilities on private property will be the responsibility of the property owner or Contractor. If available information does not contain sufficient detail to locate underground facilities with a reasonable amount of confidence, alternate measures may be appropriate, as described below. In some cases, the memory of a long-time employee of a facility on private property may be the best or only source of information. It is incumbent on the Consultant or Contractor to exercise caution and use good judgement when faced with uncertainty.

Note: It is important to note that not all utilities are participants in the “one-call” agency or process. As such, inquiries must be made with the “one-call” agency to determine which entities do not participate, so they can be contacted independently.

Most utility stakeouts have a limited time period for which they remain valid, typically two to three weeks. It is critical that this time period be taken into account to prevent expiration of clearance prior to completion of the invasive activities, and the need to repeat the stake-out process.

Care must be exercised to document receipt of notice from the involved agencies of the presence or absence of utilities in the vicinity of the proposed locations.

Most agencies will generally provide a telephone or fax communication indicating the lack of facilities in the project area. If contact is not made by all of the agencies identified by the “one-call” process, do not assume that such utilities are not present. Re-contact the “one-call” agency to determine the status.

For complicated sites with multiple proposed locations and multiple utilities, it is advisable to arrange an on-site meeting with utility representatives. This will minimize the potential for miscommunication amongst the involved parties.

Completion of the utility stake out process is not a guarantee that underground facilities will not be encountered in excavations or boreholes; in fact, most “one-call” agencies and individual utilities do not offer guarantees, nor do they accept liability for damage that might occur. In areas outside the public right-of-way, a utility locating service will be utilized to locate underground utilities. It is advisable that any invasive activities proceed with extreme caution in the upper four to five feet in the event the clearance has failed to identify an existing facility. This may necessitate hand-excavation or probing to confirm potential presence of shallow utilities. If uncertainty exists for any given utility, extra activities can be initiated to solve utility clearance concerns. These options include:

- Screening the proposed work areas with utility locating devices, and/or hiring a utility locating service to perform this task. The private utility locating service is a growing industry that has formed a national organization. The National Utility Locate Contractors Association (NULCA) can be reached at 715-635-6004.
- Hand digging, augering or probing to expose or reveal shallow utilities and confirm presence and location. In northern climates, this may require advancing to below frost line, typically at least four feet.
- Using "soft dig" techniques that utilize specialized tools and compressed air to excavate soils and locate utilities. This technique is effective in locating utilities to a depth of four to five feet.

Equipment/Materials:

- White Spray paint
- Wooden stakes, painted white or containing white flagging
- Color-code key
- Available drawings

References:

1. New York State Code Rule 753
2. American Public Works Association, April 1999, Uniform Color Code (http://www.apwa.net/)

4. Field Data Recording

This procedure describes protocol for documenting the investigation activities in the field. Field data serves as the cornerstone for an environmental project, not only for site characterization but for additional phases of investigation or remedial design. Producing defensible data includes proper and appropriate recording of field data as it is obtained in a manner to preserve the information for future use. This procedure provides guidelines for accurate, thorough collection and preservation of written and electronic field data.

Field data to be recorded during the project generally includes, but is not limited to, the following:

- general field observations;
- numeric field measurements and instrument readings;
- quantity estimates;
- sample locations and corresponding sample numbers;
- relevant comments and details pertaining to the samples collected;
- documentation of activities, procedures and progress achieved;
- contractor pay item quantities;
- weather conditions;
- a listing of personnel involved in site-related activities;
- a log of conversations, site meetings and other communications; and,
- field decisions and pertinent information associated with the decisions.

4.1 WRITTEN FIELD DATA

Written field data will be collected using a standardized, pre-printed field log form. In general, use of a field log form is preferable as it prompts field personnel to make appropriate observations and record data in a standardized format. This promotes completeness and consistency from one person to the next. Otherwise, electronic data collection using a handheld device produces equal completeness and consistency using a preformatted log form.

In the absence of an appropriate pre-printed form, the data should be recorded in an organized and structured manner in a dedicated project field logbook. Logbooks must be hard cover, bound so that pages cannot be added or removed, and should be made from high-grade 50% rag paper with a water-resistant surface.

The following are guidelines for use of field log forms and logbooks:

1. Information must be factual and complete. Do not abbreviate.
2. All entries will be made in black indelible ink with a ballpoint pen and will be written legibly. Do not use “rollerball” or felt tip-style pens, since the water-soluble ink can run or smear in the presence of moisture.
3. All pages in a logbook must be consecutively numbered. Field log forms should also be consecutively numbered.
4. Each day’s work must start a new logbook page.
5. At the end of each day, the current logbook page must be signed and dated by the field personnel making the entries.
6. When using field log forms, they must also be signed and dated.

7. Make data entries immediately upon obtaining the data. Do not make temporary notes in other locations for later transfer to log forms or logbooks; this only increases the potential for error or loss of data.
8. Entry errors are to be crossed out with a single line, dated and initialed by the person making the correction.
9. Do not leave blanks on log forms, if no entry is applicable for a given data field, indicate so with "NA" or a dash ("--").
10. At the earliest practical time, photocopies of log forms and logbook pages should be made and placed in the project file as a backup in the event the book or forms are lost or damaged.
11. Logbooks should be dedicated to one project only, i.e., do not record data from multiple projects in one logbook.

4.2 ELECTRONIC DATA

Electronic data recording involves electronic measurement of field information through the use of monitoring instruments, sensors, gauges, and equipment controls. The following is a list of guidelines for proper recording and management of electronic field data:

1. Field data management should follow requirements of a project-specific data management plan (DMP), if applicable.
2. Use only instruments that have been calibrated in accordance with manufacturer's recommendations.
3. Usage of instruments, controls and computers for the purpose of obtaining field data should only be performed by personnel properly trained and experienced in the use of the equipment and software.
4. Use only fully licensed software on personal computers and laptops.
5. Loss of electronic files may mean loss of irreplaceable data. Every effort should be made to back up electronic files obtained in the field as soon as practical. A backup file placed on the file server will minimize the potential for loss.
6. Electronic files, once transferred from field instruments or laptops to office computers, should be protected if possible, to prevent unwanted or inadvertent manipulation or modification of data. Several levels of protection are usually available for spreadsheets, including making a file "read-only" or assigning a password to access the file.
7. Protect CD disks from exposure to moisture, excessive heat or cold, magnetic fields, or other potentially damaging conditions.
8. Remote monitoring is often used to obtain stored electronic data from site environmental systems. A thorough discussion of this type of electronic field data recording is beyond the scope of this Section. Such on-site systems are generally capable of storing a limited amount of data as a comma-delimited or spreadsheet file. Users must remotely access the monitoring equipment files via modem or other access and download the data. In order to minimize the potential for loss of data, access and downloading of data should be performed frequently enough to ensure the data storage capacity of the remote equipment is not exceeded.

Equipment/Materials:

- Appropriate field log forms, or iPad® or equivalent with preformatted log forms.
- Indelible ball point pen (do not use “rollerball” or felt-tip style pens);
- Straight edge;
- Pocket calculator; and
- Laptop computer (if required).

5. Aquifer Characterization

This procedure describes measurement of water levels in groundwater monitoring.

Water levels in monitoring wells will be measured prior to the sampling event. Water levels will be acquired in a manner that provides accurate data that can be used to calculate vertical and horizontal hydraulic gradients and other hydrogeologic parameters. Accuracy in obtaining the measurements is critical to ensure the usability of the data.

5.1 PROCEDURE

In order to provide reliable data, water level monitoring events should be collected over as short a period of time as practical. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements must be noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data must note if any of these controls are in effect during the groundwater level collection period. Due to possible changes during the groundwater level collection period, it is imperative that the time of data collection at each station be accurately recorded.

The depth to groundwater will be measured with an electronic depth-indicating probe. Prior to obtaining a measurement, a fixed reference point on the well casing will be established for each well to be measured. Unless otherwise established, the reference point is typically established and marked on the north side of the well casing. Do not use protective casings or flush-mounted road boxes as a reference, due to the potential for damage or settlement. The elevation of the reference point shall be obtained by accepted surveying methods, to the nearest 0.01 ft.

The water level probe will be lowered into the well until the meter indicates (via indicator light or tone) the water is reached. The probe will be raised above water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements and a depth reading taken. This procedure will be followed three times or until a consistent value is obtained. The value will be recorded to the nearest 0.01 feet on the Groundwater Level Monitoring Report form.

Upon completion, the probe will be raised to the surface and together with the amount of cable that entered the well casing, will be decontaminated in accordance with methods described in Equipment Decontamination Procedure.

Equipment/Materials:

- Battery-operated, non-stretch electronic water level probe with permanent markings at 0.01 ft. increments (traceable to national measurement standards), such as the Solinst Model 101 or equivalent.
- The calibrated cable on the depth indicator will be checked against a surveyor’s steel tape once per quarter year. A new cable will be installed if the cable has changed by more than 0.01% (0.01 feet for a 100-foot cable). See also the Field Instruments – Use and Calibration Procedure.
- Groundwater Level Monitoring Report form.

References:

1. ASTM 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)
2. ASTM D6000 Guide for Presentation of Water Level Information from Ground Water Sites

6. Sample Collection for Laboratory Analysis

6.1 SOIL SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following procedure is an introduction to soil sampling techniques and an outline of field staff responsibilities.

6.1.1 Preparatory Requirements

Prior to the beginning of any remedial investigation or remedial measures activities, staff must attend a project briefing for the purpose of reviewing the project work plan, site and utility plans, drawings, applicable regulations, sampling location, depth, and criteria, site contacts, and other related documents. Health and safety concerns will be documented in a site-specific Health & Safety Plan.

A file folder for the field activities should be created and maintained such that all relevant documents and log forms likely to be useful for the completion of field activities by others are readily available in the event of personnel changes.

6.1.1.1 Excavation Soil Sampling

Excavation programs are by nature more destructive than other subsurface remedial methods. Field staff should be clear as to the expectations of the client and project manager with regard to site damage and restoration efforts, prior to the start of work. All applicable safety standards must be complied with including establishment of exclusion zones, installation of safety fencing, use of trench boxes, maintenance of proper slopes or benching, and provision of access and egress. The Occupational Safety and Health Administration's (OSHA) Excavation and Trenching Standard Title 29 of the Code of Federal Regulation (CFR) Part 1926.650 covers requirements for excavation and trenching standards which may be accessed through their website www.OSHA.gov or from your Health & Safety Administrator.

6.1.1.2 Stockpile Soil Sampling

Excavated soil should be temporarily placed in secure stockpiles pending characterization and off-Site disposal at licensed waste management facilities. Impacted soil should be placed in dedicated stockpiles on top of and completely covered with polyethylene sheeting of at least 6 millimeters in thickness to prevent exposure to the elements. Covers should be anchored when the stockpile is not in active use or during non-working periods and inspected at least weekly and after each rain event. The sheeting should be repaired or replaced as needed.

6.1.2 Soil Classification

The stratigraphic log is a factual description of the soil at the borehole location and is relied upon to interpret the soil characteristics, and their influence and significance in the subsurface environment. The accuracy of the stratigraphic log is to be verified by the person responsible for interpreting subsurface conditions. An accurate description of the soil stratigraphy is essential for a reasonable understanding of the subsurface conditions. Confirmation of the field description by examination of representative soil samples by the project geologist, hydrogeologist, or geotechnical engineer (whenever practicable) is recommended.

The ability to describe and classify soil correctly is a skill that is learned from a person with experience and by systematic training and comparison of laboratory results to field descriptions.

6.1.2.1 Data Recording

Several methods for classifying and describing soils or unconsolidated sediments are in relatively widespread use. The Unified Soil Classification System (USCS) is the most common. With the USCS, a soil is first classified according to whether it is predominantly coarse-grained or fine-grained.

The description of fill soil is similar to that of natural undisturbed soil except that it is identified as fill and not classified by USCS group, relative density, or consistency. Those logging soils must attempt to distinguish between soils that have been placed (i.e., fill) and not naturally present; or soils that have been naturally present but disturbed (i.e., disturbed native).

It is necessary to identify and group soil samples consistently to determine the subsurface pattern or changes and non-conformities in soil stratigraphy in the field at the time of drilling. The stratigraphy in each borehole during drilling is to be compared to the stratigraphy found at the previously completed boreholes to ensure that pattern or changes in soil stratigraphy are noted and that consistent terminology is used.

Visual examination, physical observations and manual tests (adapted from ASTM D2488, visual-manual procedures) are used to classify and group soil samples in the field and are summarized in this subsection. ASTM D2488 should be reviewed for detailed explanations of the procedures. Visual-manual procedures used for soil identification and classification include:

- visual determination of grain size, soil gradation, and percentage fines;
- dry strength, dilatancy, toughness, and plasticity (thread or ribbon test) tests for identification of inorganic fine-grained soil (e.g., CL, CH, ML, or MH); and
- soil compressive strength and consistency estimates based on thumb indent and pocket penetrometer (preferred) methods.

Soil characteristics like plasticity, strength and dilatancy should be determined using the Haley & Aldrich Soil Identification Field Form.

6.1.2.2 Field Sample Screening

Upon the collection of soil samples, the soil is screened with a photoionization detector (PID) for the presence of organic vapor. This is accomplished by running the PID across the soil sample. The highest reading and sustained readings are recorded.

Note: The PID measurement must be done upwind of the excavating equipment or any running engines so that exhaust fumes will not affect the measurements.

Another method of field screening is head space measurements. This consists of placing a portion of the soil sample in a sealable glass jar, placing aluminum foil over the jar top, and tightening the lid. Alternatively, plastic sealable bags may be utilized for field screen in lieu of glass containers. The jar should only be partially filled. Shake the jar and set aside for at least 30 minutes. After the sample has equilibrated, the lid of the jar can be opened; the foil is punctured with the PID probe and the air (headspace) above the soil sample is monitored. This headspace reading on the field form or in the field book is recorded. All head space measurements must be completed under similar conditions to allow comparability of results. Soil classification and PID readings will be recorded in the daily field report.

Equipment/Materials:

- Pocket knife or small spatula
- Small handheld lens
- Stratigraphic Log (Overburden) (Form 2001)
- Tape Measure

References:

1. American Society for Testing and Materials (1991), Standard D1452-80, "Practice for Soil Investigation and Sampling by Auger Borings", Annual Book of ASTM Standard, Section 4, Volume 04.08.
2. ASTM Standards on Environmental Sampling (1995), Standard D 2488-93, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)"
3. ASTM Standards on Environmental Sampling (1995), Standard D 4700-91, "Guide for Soil Sampling from the Vadose Zone".
4. ASTM Standards on Environmental Sampling (1995), Standard D 1586-92, "Test Method for Penetration Test and Split-Barrel Sampling of Soils".
5. ASTM Standard D 2487, "Classification of Soils for Engineering Purposes (Unified Soil Classification System)".
6. Geotechnical Gauge, Manufactured by W.F. McCollough, Beltsville, MD.
7. Sand Grading Chart, by Geological Specialty Company, Northport, Alabama.

6.1.3 Soil Sampling

Soil samples will be collected with the use a hand auger, stainless steel trowel or sampling spoon. If it is necessary to relocate any proposed sampling location due to terrain, utilities, access, etc., the Project Manager must be notified, and an alternate location will be selected.

Prior to use and between each sampling location at an environmental site, the sampling equipment must be decontaminated. All decontamination must be conducted in accordance with the project specific plans or the methods presented in SOP 7.0.

6.1.4 Soil Sampling Collection Using a Hand Auger

Soil sampling techniques are dependent upon the sample interval of interest, the type of soil material to be sampled, and the requirements for handling the sample after retrieval. The most common method for collection of surficial soil samples involves the use of a stainless-steel trowel. The sampling equipment is cleaned between sample locations. The soil sampling procedure is outlined below:

- Soil samples will be collected from the hand auger using a pre-cleaned stainless-steel trowel or other appropriate tool.

- A new pair of disposable gloves will be used at each sample location;

- Any surficial debris (i.e., grass cover, gravel) should be removed from the area where the sample is to be collected using a separate pre-cleaned device. Gravel presents difficulties for the laboratory in terms of sample preparation and is typically not representative of contaminant concentrations in nearby soil.

- A pre-cleaned sampling tool will be used to remove the sample from the layer of exposed soil.

- When only one sample container is required, the collected soil will be placed directly into the clean, pre-labeled sample jar. When more than one sample container is required for non-volatiles parameters of analysis (i.e. total metals) or samples will be split for field duplicate analyses, the soil sample will be placed in a pre-cleaned stainless-steel bowl, mixed, and then placed into the respective sample containers. It is important that soil samples be mixed as thoroughly as possible to ensure that the sample is as representative as possible of the sample interval. Soil samples collected for volatile organic compounds analyses shall not be mixed. Soil samples collected for volatile organic compounds analyses will be collected using Terra Cores and placed directly in Terra Core kit bottle ware proved by the laboratory.

- Samples will be placed on ice or cooler packs in laboratory supplied shipping coolers after collection.

Note: For the collection of soil samples for the analysis of volatile organic compounds (VOCs), soil samples will be transferred directly into a sample jar without headspace. Samples for VOCs will be collected first, without homogenization or extra handling to limit the loss of the constituents of interest.

6.1.5 Excavation Sample Collection

The following describes the collection of soil samples for chemical analysis from an excavation pit or trench during IRMWP activities.

- Using the backhoe, excavate a trench as specified in the IRMWP. Place excavated soils on plastic sheets.

- Record in the Field Logbook the depth intervals from which the samples are being collected.

- Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

- If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless-steel spoon or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or,

- If a composite sample is collected, place a sample from each sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

- The excavation should be backfilled in accordance with the project-specific work plan or related document.

Soil samples must be placed into laboratory glassware and labeled. Analytical samples are kept in a cooler with ice, and a Chain of Custody form is maintained until transfer to the analytical laboratory. Applicable environmental sampling protocols must be followed as given in OP3000 General Environmental Field Procedures and Protocol, OP3001 Preservation and Shipment of Environmental Samples, and OP3006 Procedures for Subsurface Soil Sampling for Chemical Analysis.

6.1.6 Stockpile Sampling Collection

Soil sampling techniques are dependent upon the sample interval of interest, the type of soil material to be sampled, and the requirements for handling the sample after retrieval. The most common method for collection of surficial soil samples involves the use of a stainless-steel trowel. Soil samples may also be collected with stainless-steel spoons. The sampling equipment is cleaned between sample locations. The stockpile soil sampling procedure is outlined below:

- Stockpile soil samples will be collected using a pre-cleaned stainless-steel trowel or other appropriate tool. Each sample will consist of soil from 6 inches below the soil pile surface. If a composite sample is required, then the composite sample will be comprised of soil collected from four randomly selected areas of the pile.;

- A new pair of disposable gloves will be used at each sample location;

- Any surficial debris (i.e., grass cover, gravel) should be removed from the area where the sample is to be collected using a separate pre-cleaned device. Gravel presents difficulties for the laboratory in terms of sample preparation and is typically not representative of contaminant concentrations in nearby soil.

- A pre-cleaned sampling tool will be used to remove the sample from the layer of exposed soil.

- When only one sample container is required, the collected soil will be placed directly into the clean, pre-labeled sample jar. When more than one sample container is required for non-volatiles parameters of analysis (i.e. total metals) or samples will be split for field duplicate analyses, the soil sample will be placed in a pre-cleaned stainless-steel bowl, mixed, and then placed into the respective sample containers. It is important that soil samples be mixed as thoroughly as possible to ensure that the sample is as representative as possible of the sample interval. Soil samples collected for volatile organic compounds analyses shall not be mixed.

- Samples will be placed on ice or cooler packs in laboratory supplied shipping coolers after collection.

Note: For the collection of soil samples for the analysis of volatile organic compounds (VOCs), soil samples will be transferred directly into a sample jar without headspace. Samples for VOCs will be collected first, without homogenization or extra handling to limit the loss of the constituents of interest.

6.1.7 **Sampling Techniques**

The following procedure describes typical soil sample collection methods for submission of samples to a laboratory for chemical analysis. The primary goal of soil sampling is to collect representative samples for examination and chemical analysis (if required).

Environmental soil samples obtained for chemical analyses are collected with special attention given to the rationale behind determining the precise zone to sample, the specifics of the method of soil extraction and the requisite decontamination procedures. Preservation, handling and glassware for environmental soil samples varies considerably depending upon several factors including the analytical method to be conducted, and the analytical laboratory being used.

6.1.7.1 Grab Versus Composite Samples

A grab sample is collected to identify and quantify conditions at a specific location or interval. The sample is comprised of the minimum amount of soil necessary to make up the volume of sample dictated by the required sample analyses. Composite samples may be obtained from several locations or along a linear trend (in a test pit or excavation). Sampling may occur within or across stratification.

6.2 GROUNDWATER SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following section describes two techniques for groundwater sampling: "Low Stress/Low Flow Methods" and "Typical Sampling Methods."

"Low Stress/Low Flow" methods will be employed when collecting groundwater samples for the evaluation of volatile constituents (i.e. dissolved oxygen (DO)) or in fine-grained formations where sediment/colloid transport is possible. Analyses typically sensitive to colloidal transport issues include polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs) and metals.

The "Typical Sampling Methods" will be employed where the collection of parameters less sensitive to turbidity/sediment issues are being collected (general chemistry, pesticides and other semi-volatile organic compounds (SVOCs)).

NOTE: If non-aqueous phase liquids (NAPL) (light or dense) are detected in a monitoring well, groundwater sample collection will not be conducted, and the Project Manager must be contacted to determine a course of action.

6.2.1 **Preparatory Requirements**

- Verify well identification and location using borehole log details and location layout figures. Note the condition of the well and record any necessary repair work required.

- Prior to opening the well cap, measure the breathing space above the well casing with a handheld organic vapor analyzer to establish baseline breathing space VOC levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the HASP, field personnel should adjust their PPE accordingly.

- Prior to commencing the groundwater purging/sampling, a water level must be obtained to determine the well volume for hydraulic purposes. In some settings, it may be necessary to allow the water level time to equilibrate. This condition exists if a watertight seal exists at the well cap and the water level has fluctuated above the top of screen; creating a vacuum or pressurized area in this air space. Three water level checks will verify static water level conditions have been achieved.

- Calculate the volume of water in the well. Typically overburden well volumes consider only the quantity of water standing in the well screen and riser; bedrock well volumes are calculated on the quantity of water within the open core hole and within the overburden casing.

6.2.2 Well Development

Well development is completed to remove fine grained materials from the well but in such a manner as to not introduce fines from the formation into the sand pack. Well development continues until the well responds to water level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

- Attach appropriate pump and lower tubing into well.
- Gauge well and calculate one well volume. Turn on pump. If well runs dry, shut off pump and allow to recover.
- Surging will be performed by raising and lowering the pump several times to pull fine-grained material from the well. Periodically measure turbidity level using a La Motte turbidity reader.
- The second and third steps will be repeated until turbidity is less than 50 nephelometric turbidity units (NTU) or when 10 well volumes have been removed.
- All water generated during cleaning and development procedures will be collected and contained on site in 55-gallon drums for future analysis and appropriate disposal.

Equipment:

- Appropriate health and safety equipment
- Knife
- Power source (generator)
- Field book
- Well Development Form (Form 3006)
- Well keys
- Graduated pails
- Pump and tubing
- Cleaning supplies (including non-phosphate soap, buckets, brushes, laboratory-supplied distilled/deionized water, tap water, cleaning solvent, aluminum foil, plastic sheeting, etc.) Water level meter
- PH/temperature/conductivity meter
- Clear glass jars (e.g., drillers' jars)

References:

1. Environmental Protection Agency (1986), RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

2. Environmental Protection Agency (1987), A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001.

3. Environmental Protection Agency (1988), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER-9950.1.

6.2.3 Well Purging and Stabilization Monitoring (Low Stress/Low Flow Method)

The preferred method for groundwater sampling will be the low stress/low flow method described below.

- Bladder pumps/submersible variable rate pumps (i.e., Grundfos™ Rediflo or equivalent) are typically employed.

- Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified by the project requirements. The pump intake must be at the midpoint of the well screen to prevent disturbance and resuspension of any sediment in the screen base.

- Before starting the pump, measure the water level again with the pump in the well leaving the water level measuring device in the well when completed.

- Purge the well at 100 to a maximum of 500 milliliters per minute (mL/min). During purging, the water level should be monitored approximately every 5 minutes, or as appropriate. A steady flow rate should be maintained that results in drawdown of 0.3 feet or less. The rate of pumping should not exceed the natural flow rate conditions of the well. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record adjustments made to the pumping rates and water levels immediately after each adjustment.

- During the purging of the well, monitor and record the field indicator parameters (pH, temperature, conductivity, oxidation-reduction (redox) reaction potential (ORP), dissolved oxygen (DO), and turbidity) approximately every five minutes. Stabilization is considered to be achieved when the final groundwater flow rate is achieved, and three consecutive readings for each parameter are within the following limits:

    - pH: 0.1 pH units of the average value of the three readings;
    - Temperature: 3 percent of the average value of the three readings;
    - Conductivity: 0.005 milliSiemen per centimeter (mS/cm) of the average value of the three readings for conductivity <1 mS/cm and 0.01 mS/cm of the average value of the three readings for conductivity >1 mS/cm;
    - ORP: 10 millivolts (mV) of the average value of the three readings;
    - DO: 10 percent of the average value of the three readings; and
    - Turbidity: 10 percent of the average value of the three readings, or a final value of less than 50 nephelometric turbidity units (NTU).

- The pump must not be removed from the well between purging and sampling.

6.2.4 Sampling Techniques

- If an alternate pump is utilized, the first pump discharge volumes should be discarded to allow the equipment a period of acclimation to the groundwater.

- Samples are collected directly from the pump with the groundwater being discharged directly into the appropriate sample container. Avoid handling the interior of the bottle or bottle cap and don new gloves for each well sampled to avoid contamination of the sample.

- Order of sample collection:

    - Polyfluoroalkyl substances (PFAS)
    - Volatile organic compounds (VOC)
    - 1,4-Dioxane
    - Semi-volatile organic compounds (SVOC)
    - Total Analyte List (TAL) metals

- For low stress/low flow sampling, samples should be collected at a flow rate between 100 and 500 mL/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 feet.

- The pumping rate used to collect a sample for VOC should not exceed 100 mL/min. Samples should be transferred directly to the final container 40 mL glass vials completely full and topped with a Teflon cap. Once capped the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present, the sample will be discarded, and recollected until free of air.

- All samples must be labeled with:

    - A unique sample number
    - Date and time
    - Parameters to be analyzed
    - Project Reference ID
    - Samplers initials

- Labels should be written in indelible ink and secured to the bottle with clear tape.

Equipment/Materials:

- pH meter, conductivity meter, DO meter, ORP meter, nephelometer, temperature gauge
- Field filtration units (if required)
- Purging/sampling equipment
    - Peristaltic Pump (not suitable for VOCs/SVOCs or depths >25 feet);
    - Suction Pumps (not suitable for VOCs/SVOCs, or depths >25 feet);
    - Submersible Pumps (suitable for VOCs/SVOCs at low flow rates (LFR));
    - Air Lift Pumps (not suitable for VOCs/SVOCs);
    - Bladder Pumps (suitable for LFR and VOCs/SVOCs);
    - Inertia Pumps (gaining acceptability for VOCs/SVOCs); and
- Water level probe
- Sampling materials (containers, logbook/forms, coolers, chain of custody)
- Work Plan
- Health and Safety Plan

Note: Peristaltic pump use for VOC collection is not acceptable on NYSDEC/EPA/RCRA sites; this technique has gained acceptance in select areas where it is permissible to collect VOCs using a peristaltic pump at a low flow rate (e.g. Michigan).

Note: 1,4-Dioxane and PFAS purge and sample techniques will be conducted following the NYSDEC-approved Avangrid Field Sampling Plan.

Field Notes:

- Field notes must document all the events, equipment used, and measurements collected during the sampling activities. Section 2.0 describes the data/recording procedure for field activities.
- The logbook should document the following for each well sampled:
    - Identification of well
    - Well depth
    - Static water level depth and measurement technique
    - Sounded well depth
    - Presence of immiscible layers and detection/collection method
    - Well yield – high or low
    - Purge volume and pumping rate
    - Time well purged
    - Measured field parameters
    - Purge/sampling device used
    - Well sampling sequence
    - Sampling appearance
    - Sample odors
    - Sample volume
    - Types of sample containers and sample identification
    - Preservative(s) used
    - Parameters requested for analysis
    - Field analysis data and method(s)
    - Sample distribution and transporter
    - Laboratory shipped to
    - Chain of custody number for shipment to laboratory
    - Field observations on sampling event
    - Name collector(s)
    - Climatic conditions including air temperature
    - Problems encountered and any deviations made from the established sampling protocol.

A standard log form for documentation and reporting groundwater purging and sampling events are presented on the Groundwater Sampling Record, Low Flow Groundwater Sampling Form, and Low Flow Monitored Natural Attenuation (MNA) Field Sampling Form. Refer to Appendix A for example field forms.

Groundwater/Decon Fluid Disposal:

- Groundwater disposal methods will vary on a case-by-case basis but may range from:
    - Off-site treatment at private treatment/disposal facilities or public owned treatment facilities

  - On-site treatment at Facility operated facilities
  - Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime
- Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers.

References:

1. ASTM D5474: Guide for Selection of Data Elements for Groundwater Investigations
2. ASTM D4696: Guide for Pore-liquid Sampling from the Vadose Zone
3. ASTM D5979: Guide for Conceptualization and Characterization of Groundwater Systems
4. ASTM D5903: Guide for Planning and Preparing for a Groundwater Sampling Event
5. ASTM D4448: Standard Guide for Sampling Groundwater Wells
6. ASTM D6001: Standard Guide for Direct Push Water Sampling for Geo-environmental Investigations.
7. USEPA: Low-flow (Minimal Drawdown) Groundwater Sampling Procedures (EPA/540/S-95/504)
8. USEPALL: RCRA Groundwater Monitoring: Draft Technical guidance (EPA/530 R 93 001)

6.3 SAMPLE HANDLING AND SHIPPING

Sample management is the continuous care given to each sample from the point of collection to receipt at the analytical laboratory. Good sample management ensures that samples are properly recorded, properly labeled, and not lost, broken, or exposed to conditions which may affect the sample's integrity.

All sample submissions must be accompanied with a chain of custody (COC) document to record sample collection and submission. Personnel performing sampling tasks must check the sample preparation and preservation requirements to ensure compliance with the Quality Assurance Project Plan.

The following sections provide the minimum standards for sample management.

6.3.1 Sample Handling

Prior to entering the field area where sampling is to be conducted, especially at sites with defined exclusion zones, the sampler should ensure that all materials necessary to complete the sampling are on hand. If samples must be maintained at a specified temperature after collection, dedicated coolers and ice must be available for use. Conversely, when sampling in cold weather, proper protection of water samples, trip blanks, and field blanks must be considered. Sample preservation will involve pH adjustment, cooling to 4°C, and sample filtration and preservation.

6.3.2 Sample Labeling

Samples must be properly labeled immediately upon collection.

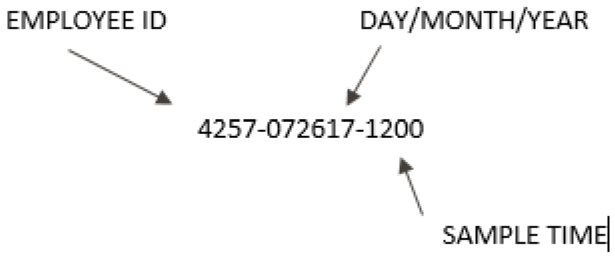
Note that the data shown on the sample label is the minimum data required. The sample label data requirements are listed below for clarity.

- Project name
- Sample number
- Sampler's initials
- Date of sample collection

- Time of sample collection
- Analysis required
- Preservatives

However, to ensure that samples are not confused, a clear notation should be made on the container with a permanent marker indicating the last three digits of the sample number. If the containers are too soiled for marking, the container can be put into a "zip lock" bag which can then be labeled.

The unique sample identification number will follow the format below.



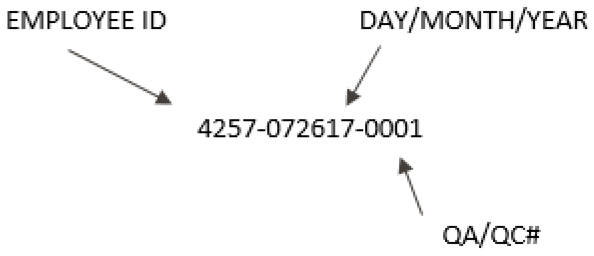
All sample names will be as follows:

- Employee ID

- Date: Enter the six-digit date when the sample was collected. Note that for one-digit days, months, and/or years, add zeros so that the format is MMDDYY (050210). There should be NO slashes, dashes, or periods in the date.

- Time: Enter the four-digit time in MILITARY TIME. Note that for one-digit times a zero should be added to four digits, (i.e. 8 AM is 0800 military time, 1:30 PM is 1330). There should be NO colons, slashes, dashes, or periods in the time. This should match the time on the chain of custody. (Note: For Field Duplicates, Field Blanks, Equipment Blanks, Trip Blanks, and other QA/QC samples, sample time will NOT be used. This will simplify sample naming for the QA/QC samples and avoid identifying the parent sample for blind duplicates.

The unique sample identification number for QA/QC samples will follow the format below.



The QA/QC samples will be numbered consecutively as collected.

Examples of this naming convention are as follows:

Sample Name:	Comments
1234-050202-0001	TB
1234-050202-0002	TB
1234-050202-0003	FD
1234-050202-0004	EB

NOTE: The QA/QC Sample # resets to 0001 EACH DAY, this will avoid having to look back to the previous day for the correct sequential number.

6.3.3 Field Code

The field code will be written in the 'Comments' field on the chain of custody for EVERY sample but will not be a part of the actual sample name. Enter the one/two-character code for type of sample (must be in CAPITALS):

N	Normal Field Sample
FD	Field Duplicate (note sample number (i.e. 0001) substituted for time)
TB	Trip Blank (note sample number (i.e. 0001) substituted for time)
EB	Equipment Blank (note sample number (i.e. 0001) substituted for time)
FB	Field Blank (note sample number (i.e. 0001) substituted for time)
KD	Known Duplicate
FS	Field Spike Sample
MS	Matrix Spike Sample (note on ‘Comments’ field of COC – laboratory to spike matrix.
MD	Matrix Spike Duplicate Sample (note on ‘Comments’ field of COC – laboratory to spike matrix.
RM	Reference Material

The sample labeling – both chain and sample bottles must be EXACTLY as detailed above. In addition, the Field Sample Key for each sample collected must be filled out.

6.3.4 Packaging

Sample container preparation and packing for shipment should be completed in a well-organized and clean area, free of any potential cross contamination. The following is a list of standard guidelines which must be followed when packing samples for shipment.

- Double bag ice in "Zip Lock" bags.
- Double check to ensure trip and temperature blanks have been included for all shipments containing VOCs, or where otherwise specified in the QAPP.
- Enclose the Chain of Custody form in a "Zip Lock" bag.
- Ensure custody seals (two, minimum) are placed on each cooler. Coolers with hinged lids should have both seals placed on the opening edge of the lid. Coolers with "free" lids should have seals placed on opposite diagonal corners of the lid. Place clear tape over custody seals.
- Containers should be wiped clean of all debris/water using paper towels (paper towels must be disposed of with other contaminated materials).
- Clear, wide packing tape should be placed over the sample label for protection.
- Do not bulk pack. Each sample must be individually padded.

- Large glass containers (1 liter and up) require much more space between containers.
- Ice is not a packing material due to the reduction in volume when it melts.

Note: Never store sterile sample containers in enclosures containing equipment which use any form of fuel or volatile petroleum-based product. When conducting sampling in freezing conditions at sites without a heated storage area (free of potential cross contaminants), unused trip blanks should be isolated from coolers immediately after receipt. Trip blanks should be double bagged and kept from freezing.

6.3.5 Chain-of-Custody Records

Chain of custody (COC) forms will be completed for all samples collected. The form documents the transfer of sample containers. The COC record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The COC document will be signed and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a COC form. The cooler will be sealed properly for shipment. The laboratory will maintain a copy for their records. One copy will be returned with the data deliverables package.

The following list provides guidance for the completion and handling of all COCs:

- COCs used should be a Haley & Aldrich standard form or supplied by the analytical laboratory.
- COCs must be completed in black ball point ink only.
- COCs must be completed neatly using printed text.
- If a simple mistake is made, cross out the error with a single line and initial and date the correction.
- Each separate sample entry must be sequentially numbered.
- If numerous repetitive entries must be made in the same column, place a continuous vertical arrow between the first entry and the next different entry.
- When more than one COC form is used for a single shipment, each form must be consecutively numbered using the "Page ___ of ___" format.
- If necessary, place additional instructions directly onto the COC in the Comment Section. Do not enclose separate instructions.
- Include a contact name and phone number on the COC in case there is a problem with the shipment.
- Before using an acronym on a COC, define clearly the full interpretation of your designation [i.e., polychlorinated biphenyls (PCBs)].

6.3.6 Shipment

Prior to the start of the field sampling, the carrier should be contacted to determine if pickup will be at the field site location. If pick-up is not available at the Site, the nearest pick-up or drop off location should be determined. Sample shipments must not be left at unsecured drop locations.

Copies of all shipment manifests must be maintained in the field file.

7. Field Instruments – Use and Calibration

A significant number of field activities involve usage of electronic instruments to monitor for environmental conditions and health and safety purposes. It is imperative the instruments are used and maintained properly to optimize their performance and minimize the potential for inaccuracies in the data obtained. This section provides guidance on the usage, maintenance and calibration of electronic field equipment.

- All monitoring equipment will be in proper working order and operated in accordance with manufacturer's recommendations.

- Field personnel will be responsible for ensuring that the equipment is maintained and calibrated in the field in accordance with manufacturer's recommendations.

- Instruments will be operated only by personnel trained in the proper usage and calibration.

- Personnel must be aware of the range of conditions such as temperature and humidity for instrument operation. Usage of instruments in conditions outside these ranges will only proceed with approval of the Project Manager and/or Health and Safety Officer as appropriate.

- Instruments that contain radioactive source material, such as x-ray fluorescence (XRF) analyzers or moisture-density gauges require specific transportation, handling and usage procedures that are generally associated with a license from the Nuclear Regulatory Commission (NRC) or an NRC-Agreement State. Under no circumstance will operation of such instruments be allowed on site unless by properly authorized and trained personnel, using the proper personal dosimetry badges or monitoring instruments.

7.1 GENERAL PROCEDURE DISCUSSION

Care must be taken to minimize the potential for transfer of contaminated materials to the ground or onto other materials. Regardless of the size or nature of the equipment being decontaminated, the process will utilize a series of steps that involve removal of gross material (dirt, grease, oil etc.), washing with a detergent, and multiple rinsing steps. In lieu of a series of washes and rinse steps, steam cleaning with low-volume, high-pressure equipment (i.e., steam cleaner) is acceptable.

Exploration equipment, and all monitoring equipment in contact with the sampling media must be decontaminated prior to initiating site activities, in between exploration locations to minimize cross-contamination, and prior to mobilizing off site after completion of site work.

The following specific decontamination procedure is recommended for sampling equipment and tools:

- Brush loose soil off equipment;
- Wash equipment with laboratory grade detergent (i.e., Alconox or equivalent);
- Rinse with tap water;
- Rinse equipment with distilled water;
- Allow water to evaporate before reusing equipment; and
- Wrap equipment in aluminum foil when not being used.

7.2 DECONTAMINATION OF MONITORING EQUIPMENT

Because monitoring equipment is difficult to decontaminate, care should be exercised to prevent contamination. Sensitive monitoring instruments should be protected when they are at risk of exposure to contaminants. This may include enclosing them in plastic bags allowing an opening for the sample intake. Ventilation ports should not be covered.

If contamination does occur, decontamination of the equipment will be required; however, immersion in decontamination fluids is not possible. As such, care must be taken to wipe the instruments down with detergent-wetted wipes or sponges, and then with de-ionized water-wetted wipes or sponges.

7.3 DISPOSAL OF WASH SOLUTIONS AND CONTAMINATED EQUIPMENT

All contaminated wash water, rinses, solids and materials used in the decontamination process that cannot be effectively decontaminated (such as polyethylene sheeting) will be containerized and disposed of in accordance with applicable regulations. All containers will be labeled with an indelible marker as to contents and date of placement in the container, and any appropriate stickers required (such as PCBs). Storage of decontamination wastes on site will not exceed 90 days under any circumstances.

Equipment/Materials:

Decontamination equipment and solutions are generally selected based on ease of decontamination and disposability.

- Polyethylene sheeting;
- Metal racks to hold equipment;
- Soft-bristle scrub brushes or long-handle brushes for removing gross contamination and scrubbing with wash solutions;
- Large galvanized wash tubs, stock tanks, or wading pools for wash and rinse solutions;
- Plastic buckets or garden sprayers for rinse solutions;
- Large plastic garbage cans or other similar containers lined with plastic bags can be used to store contaminated clothing;
- Contaminated liquids and solids should be segregated and containerized in DOT-approved plastic or metal drums, appropriate for offsite shipping/disposal if necessary.

Reference:

1. ASTM D5088 - Practice for Decontamination of Field Equipment Used at Non-Radioactive Waste Sites

8. Investigation Derived Waste Disposal

8.1 RATIONALE/ASSUMPTIONS

This procedure applies to the disposition of investigation derived waste (IDW) including soils and/or groundwater. IDW is dealt with the following "Best Management Practices" and is not considered a listed waste due to the lack of generator knowledge concerning chemical source, chemical origin, and timing of chemical introduction to the subsurface.

Consequently, waste sampling and characterization is performed to determine if the wastes exhibit a characteristic of hazardous waste. The disposal of soil cuttings, test pit soils and/or purged groundwater will be reviewed on a case by case basis prior to initiation of field activities. Two scenarios typically exist:

- When no information is available in the area of activity or investigation, and impacted media/soils are identified. Activities such as new construction and /or maintenance below grade may encounter environmental conditions that were unknown.
- Disposal Required/Containerization Required – When sufficient Site information regarding the investigative Site conditions warrant that all materials handled will be contained and disposed.

If a known listed hazardous and/or characteristically hazardous waste/contaminated environmental media is being handled, then handling must be performed in accordance with RCRA Subtitle C (reference 2, Part V, Section 1(a),(b),(c)).

The following outlines the waste characterization procedures to be employed when IDW disposal is required.

The following procedure describes the techniques for characterization of IDW for disposal purposes. IDW may consist of soil cuttings (augering, boring, well installation soils, test pit soils), rock core or rock flour (from coring, reaming operations), groundwater (from well development, purging and sampling activities), decontamination fluids, personal protective equipment (PPE), and disposal equipment (DE).

8.2 PROCEDURE

The procedures for handling and characterization of field activity generated wastes are:

A.) Soil Cuttings - Soils removed from boring activities will be contained within an approved container, suitable for transportation and disposal.

  - Once placed into the approved container, any free - liquids (i.e., groundwater) will be removed for disposal as waste fluids or solidified within the approved container using a solidification agent such as Speedy Dri (or equivalent).
  - Contained soils will be screened for the presence of Volatile Organic Compounds (VOCs), using a Photo ionization detector (PID); this data will be logged for future reference.
  - Once screened, full and closed; the container will be labeled and placed into the container storage area. At a minimum, the following information will be shown on each container label: date of filling/generation, Site name, source of soils (i.e., borehole or well), and contact.

  - Prior to container closure, representative samples from the containers will be collected for waste characterization purposes and submitted to the project laboratory.
  - Typically, at a location where an undetermined site-specific parameter group exists, sampling and analysis may consist of the full RCRA Waste Characterization (ignitability, corrosivity, reactivity, toxicity), or a subset of the above based upon data collected, historical information, and generator knowledge.

B.) Groundwater - purging, and sampling groundwater, which requires disposal, will be contained.

  - Containment may be performed in 55-gallon drums, tanks suitable for temporary storage (i.e., Nalgene tanks 500 to 1,000 gallons) or if large volumes of groundwater are anticipated, tanker trailer (5,000 to 10,000 gallons ±), or drilling "Frac" tanks may be utilized (20,000 gallons ±). In all cases the container/tank used for groundwater storage must be clean before use such that cross contamination does not occur.

C.) Decon Waters/Decon Fluids - Decon waters and/or fluids will be segregated, contained, and disposed accordingly.

  - Decon waters may be disposed of with the containerized groundwater once analytical results have been acquired.

D.) PPE/DE – A number of disposal options exists for spent PPE/DE generated from investigation tasks. The options typically employed are:

  - Immediately disposed of within on-Site dumpster/municipal trash; or
  - If known to be contaminated with RCRA hazardous waste, dispose off-Site at a RCRA Subtitle C facility.
  - Spent Solvent/Acid Rinses - The need for sampling must be determined in consultation with the waste management organization handling the materials. If known that only the solvent and/or acids are present, then direct disposal/treatment using media specific options may be possible without sampling (i.e., incineration).
  - PPE/DE – Typically not sampled and included with the disposal of the solid wastes.

Equipment/Materials:

- Sample spoons, trier, auger,
- Sample mixing bowl,
- Sampling bailer, or pump,
- Sample glassware.

References:

1. New York State Department of Environmental Conservation Technical Guidance for Site Investigation and Remediation, DER-10, (3 May 2010).
2. USEPA RCRA - Guidance and Policies: Management of Remediation Waste Under RCRA (October 1998).
3. USEPA RCRA - Management of Contaminated Media (October 1998).
4. USEPA CERCLA Guidance (Options Relevant to RCRA Facilities): Guide to Management of Investigation - Derived Wastes (January 1992).

5. USEPA Office of Solid Waste- SW846 Chapter 9 Sampling Plan, Chapter 10 Sampling Methods (September 1986).
6. The Occupational Safety and Health Administration’s (OSHA) Excavation and Trenching Standard Title 29 of the Code of Federal Regulation (CFR) Part 1926.650.

APPENDIX A

Field Forms

Field Sampling Form

Location:

Job Number: ____________________
Well ID: ____________________
Field Sampling Crew: ___________

Date: ________________________
Start Time: ________________________
Finished Time: ________________________

Initial Depth to Water: ____________________
Well Depth: ____________________
Depth to top of screen: ____________________
Depth to bottom of screen: ____________________
Depth of Pump Intake: ____________________

Purging Device:________________
Tubing present in well? __________
Tubing type: __________________

Time Elapsed (24 hour)	Depth to Water (from casing)	Pump Setting (ml/min or gal/min)	Purge Rate (ml/min or gal/min)	Cumulative Purge Volume (liters or gallons)	Temperature (degrees Celsius)	pH	Conductivity us/cm	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments

Comments:

HALEY ALDRICH

DAILY FIELD REPORT

Page of

Project

Location

Client

Contractor

Weather

Report No. 20

Date

Page of

File No.

Temperature

Field Representative(s) **Time on site** **Report/Travel/Other** **Total hours**

Distribution:

Haley & Aldrich, Inc.

Form 4004

HALEY ALDRICH

EQUIPMENT CALIBRATION LOG

Project: ______________________________

Location: ______________________________

Model Name: ______________________________

Model Number: ____________________ **Serial Number:** ____________________

Cal. Standards: ______________________________

____

____

Instruments will be calibrated in accordance with manufacturer's recommendations at least once per day.

Date	Time	Calibration Satandard Solution	Calibration Result	Calibrated by

Other Comments: ______________________________

SAMPLE IDENTIFICATION KEY

Page of

PROJECT ____________________

LOCATION ____________________

CLIENT ____________________

CONTRACTOR ____________________

H&A FILE NO. ____________________

PROJECT MGR. ____________________

Sample ID	Parent Sample ID	Location ID	Sample Date	Sample Time (military)	Sample Type Code	Filtered (Water Only T/D/N)	Composite Y/N	Soil Type	Depth To Top Of Sample	Depth To Bottom Of Sample	C.O.C. Number	Notes	Collected By

Notes:

Common Sample Type Codes:

N Normal Environmental Sampl
WG Groundwater
WS Surface Water
SO Soil
GS Soil Gas
SE Sediment
WQ Water for Quality Control
FD Field Duplicate
EB Equipment Blank
TB Trip Blank
MS Matris Spike
MSD Matrix Spike Duplicate

see Memorandum dated 08/08/05 from Melanie Satanek "Sample Labeling for Submission to Analytical Laboratory" for less common codes

APPENDIX B

Quality Assurance Project Plan

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REPORT ON

QUALITY ASSURANCE PROJECT PLAN PORTION OF 65 TROWBRIDGE STREET ROCHESTER, NEW YORK

by
Haley & Aldrich of New York
Rochester, New York

for
William B. Morse Lumber Co.
Rochester, New York

File No. 129309-003
January 2020

Executive Summary

This Quality Assurance Project Plan (QAPP) outlines the scope of the quality assurance and quality control (QA/QC) activities associated with the site monitoring activities associated with the Remedial Investigation Work Plan (RIWP) and Interim Remedial Measures Work Plan (IRMWP) for the portion of 65 Trowbridge Street (Site) in Rochester, New York.

Protocols for sample collection, sample handling and storage, chain-of-custody procedures, and laboratory and field analyses are described herein or specifically referenced to related project documents.

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1. Project Description

This Quality Assurance Project Plan (QAPP) has been prepared as a component of the RIWP and IRMWP for the portion of 65 Trowbridge Street (Site) in Rochester, New York.

1.1 PROJECT OBJECTIVES

The primary objective for data collection activities is to collect sufficient data necessary to monitor the nature of any remaining groundwater and soil impacts.

1.2 SITE DESCRIPTION AND HISTORY

The general Site description and Site history is provided in the Site Description and History Summary that accompanies the RIWP and IRMWP appended to the Brownfield Cleanup Program application for the Site and incorporated herein by reference.

1.3 LABORATORY PARAMETERS

Laboratory parameters are listed in Table I.

The laboratory parameters for soil include:

- Target Compound List volatile organic compounds (VOCs) using EPA method 8260B
- Target Compound List semi-volatile organic compounds (SVOCs) using EPA method 8270C
- Total Analyte List (TAL) Metals using EPA method 6010
- Polychlorinated biphenyls (PCBs) using EPA method 8082
- Pesticides using EPA 8081
- Herbicides using EPA method 8151

The laboratory parameter for groundwater include:

- Target Compound List SVOCs using EPA method 8270C
- Total and dissolved TAL metals using EPA method 6010

Select monitoring well analyses include:

- Per- and polyfluoroalkyl substances (PFAS) using EPA method 537
- 1,4-Dioxane using EPA method 8260B

Note: 1,4-Dioxane and PFAS sampling techniques will be conducted following the NYSDEC-approved Avangrid Field Sampling Plan.

During the collection of groundwater samples, pH, specific conductivity, temperature, dissolved oxygen (DO), and oxidation/reduction potential (ORP) will be measured.

Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

1.4 SAMPLING LOCATIONS

The RIWP and IRMWP provides the locations of soil samples and groundwater monitoring wells that will be sampled.

2. Project Organization and Responsibilities

This section defines the roles and responsibilities of the individuals who will perform the RIWP and IRMWP monitoring activities. A NYSDOH certified analytical laboratory will perform the analyses of environmental samples collected at the Site.

2.1 MANAGEMENT RESPONSIBILITIES

The Project Manager is responsible for managing the implementation of the RIWP and IRMWP monitoring and coordinating the collection of data. The Project Manager is responsible for technical quality control and project oversight. The Project Manager responsibilities include the following:

- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule restraints;
- Review work performed to ensure quality, responsiveness, and timeliness;
- Communicate with the client point of contact concerning the progress of the monitoring activities;
- Assure corrective actions are taken for deficiencies cited during audits of RIWP and IRMWP monitoring activities; and,
- Overall Site health and safety plan compliance.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

The Quality Assurance team will consist of a Quality Assurance Officer and the Data Validation staff. Quality Assurance responsibilities are described as follows:

2.2.1 Quality Assurance (QA) Officer

The QA Officer reports directly to the Project Manager and will be responsible for overseeing the review of field and laboratory data. Additional responsibilities include the following:

- Assure the application and effectiveness of the QAPP by the analytical laboratory and the project staff;
- Provide input to the Project Manager as to corrective actions that may be required as a result of the above-mentioned evaluations;
- Prepare and/or review data validation and audit reports.

The QA Officer will be assisted by the data validation staff in the evaluation and validation of field and laboratory generated data.

2.2.2 Data Validation Staff

The data validation staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by the guidelines presented in Section 9.2 of this document and be presented in a Data Usability Summary Report (DUSR) for submittal to the QA Officer.

2.3 LABORATORY RESPONSIBILITIES

Laboratory services in support of the RIWP and IRMWP monitoring include the following personnel:

2.3.1 Laboratory Project Manager

The Laboratory Project Manager will report directly to the QA Officer and Project Manager and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports.

2.3.2 Laboratory Operations Manager

The Laboratory Operations Manager will report to the Laboratory Project Manager and will be responsible for coordinating laboratory analysis, supervising in-house chain-of-custody reports, scheduling sample analyses, overseeing data review and overseeing preparation of analytical reports.

2.3.3 Laboratory QA Officer

The Laboratory QA Officer will have sole responsibility for review and validation of the analytical laboratory data. The Laboratory QA Officer will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory. The QA Officer will also define appropriate QA procedures, overseeing QA/QC documentation.

2.3.4 Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Operations Manager and will be responsible for the following:

- Receive and inspect the incoming sample containers;
- Record the condition of the incoming sample containers;
- Sign appropriate documents;
- Verify chain-of-custody and its correctness;
- Notify the Project Manager and Operations Manager of sample receipt and inspection;
- Assign a unique identification number and enter each into the sample receiving log;
- Initiate transfer of samples to laboratory analytical sections; and
- Control and monitor access/storage of samples and extracts.

2.3.5 Laboratory Technical Personnel

The laboratory technical staff will have the primary responsibility in the performance of sample analysis and the execution of the QA procedures developed to determine the data quality. These activities will include the proper preparation and analysis of the project samples in accordance with the laboratory's Quality Assurance Manual (QAM) and associated Standard Operating Procedures (SOP).

2.4 FIELD RESPONSIBILITIES

2.4.1 Field Coordinator

The Field Coordinator is responsible for the overall operation of the field team and reports directly to the Project Manager. The Field Coordinator works with the project Health & Safety Officer (HSO) to conduct operations in compliance with the project Health & Safety Plan (HASP). The Field Coordinator will facilitate communication and coordinate efforts between the Project Manager and the field team members.

Other responsibilities include the following:

- Develop and implement field-related work plans, ensuring schedule compliance, and adhering to management-developed project requirements;
- Coordinate and manage field staff;
- Perform field system audits;
- Oversee quality control for technical data provided by the field staff;
- Prepare and approve text and graphics required for field team efforts;
- Coordinate and oversee technical efforts of subcontractors assisting the field team;
- Identify problems in the field; resolve difficulties in consultation with the Project QAO, and Project Manager; implement and document corrective action procedures; and,
- Participate in preparation of the final reports.

2.4.2 Field Team Personnel

Field Team Personnel will be responsible for the following:

- Perform field activities as detailed in the RIWP and IRMWP, and in compliance with the Field Sampling Plan (FSP) and QAPP.
- Immediately report any accidents and/or unsafe conditions to the Site Health & Safety Officer and take reasonable precautions to prevent injury.

3. Sampling Procedures

The FSP provides the SOPs for sampling of soil and groundwater required by the RIWP and IRMWP.

3.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the laboratory performing the analysis. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the U.S. EPA, “Specifications and Guidance for Obtaining Contaminant-Free Sample Containers”, April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used will be maintained by the laboratory.

The appropriate sample containers, preservation method, maximum holding times, and handling requirements for each sampling task are provided in Table II.

3.2 SAMPLE LABELING

Each sample will be labeled with a unique sample number that will facilitate tracking and cross-referencing of sample information:

- Employee ID-Day/Month/Year-Sample Time

Equipment rinse blank and field duplicate samples also will be numbered with a unique sample number to prevent analytical bias of field QC samples.

Refer to the FSP for the sample labeling procedures.

3.3 FIELD QC SAMPLE COLLECTION

3.3.1 Equipment Rinse Blank Sample Collection

Equipment rinse blank samples will be collected when non-dedicated sampling equipment is used to collect samples. Equipment rinse blanks consist of distilled water that has been routed through decontaminated sampling equipment and collected into the appropriate containers. The containers will be filled in order of decreasing analyte volatility (i.e., VOC first, SVOC second and followed by the containers for the remaining analyses).

A separate equipment rinse blank sample will be collected for PFAS using the sample collection procedure described in Section 8.1.1 of the NYSDEC-approved Avangrid Field Sampling Plan.

3.3.2 Field Duplicate Sample Collection

3.3.2.1 Water Samples

Field duplicate samples will be collected by filling the first sample container to the proper level and sealing and then repeated for the second set of sample container.

1. The samples are properly labeled as specified in Section 3.2.
2. Steps 1 through 4 are repeated for the bottles for each analysis. The samples are collected in order of decreasing analyte volatility as detailed in Section 3.3.1.
3. Chain-of-custody documents are executed.
4. The samples will be handled as specified in Table II.

3.3.2.2 Soil Samples

Soil field duplicates will be collected as specified in the following procedure:

1. The split-spoon sampler or trowel will be retrieved from the sampling point.
2. Soil for VOC analysis will be removed from the sampling device as specified in the FSP.
3. Soil for non-VOC analysis will be removed from the sampling device and placed in a stainless-steel mixing bowl. The soil will be thoroughly homogenized using stainless steel utensils and the sample containers will be filled in order of decreasing analyte volatility.

4. Custody Procedures

Sample custody is addressed in three parts: field sample collection, laboratory analysis and final project files. Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample.

A sample is under custody if:

1. The item is in actual possession of a person;
2. The item is in the view of the person after being in actual possession of the person;
3. The item was in actual possession and subsequently stored to prevent tampering; or
4. The item is in a designated and identified secure area.

4.1 FIELD CUSTODY PROCEDURES

Field personnel will keep written records of field activities on applicable preprinted field forms or in a bound field notebook to record data collecting activities. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Field Coordinator.

The beginning of each entry in the logbook or preprinted field form will contain the following information:

- Date
- Start time
- Weather
- Names of field personnel (including subcontractors)
- Level of personal protection used at the Site
- Names of all visitors and the purpose of their visit.

For each measurement and sample collected, the following information will be recorded:

- Detailed description of sample location,
- Equipment used to collect sample or make measurement and the date equipment was calibrated,
- Time sample was collected,
- Description of the sample conditions,
- Depth sample was collected (if applicable),
- Volume and number of containers filled with the sample; and,
- Sampler's identification.

4.1.1 Field Procedures

The following procedure describes the process to maintain the integrity of the samples:

- Upon collection samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. Refer to the FSP for sample packaging procedures.

- Samples will be assigned a unique sample number and will be affixed to a sample label. Refer to the FSP for sample labeling procedures.

- Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms.

- Appropriate volumes will be collected to ensure that the appropriate reporting limits can be successfully achieved and that the required QC sample analyses can be performed.

4.1.2 Transfer of Custody and Shipment Procedures

- A chain-of-custody (COC) record will be completed at the time of sample collection and will accompany each shipment of project samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time of sample transfer on the COC record.

- Samples will be shipped or delivered in a timely fashion to the laboratory so that holding times and/or analysis times as prescribed by the methodology can be met.

- Samples will be transported in containers (coolers) which will maintain the refrigeration temperature for those parameters for which refrigeration is required in the prescribed preservation protocols.

- Samples will be placed in an upright position and limited to one layer of samples per cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping containers will be secured with strapping tape and custody tape for shipment to the laboratory.

- When samples are split with the NYSDEC representatives, a separate chain-of-custody will be prepared and marked to indicate with whom the samples are shared. The person relinquishing the samples will require the representative’s signature acknowledging sample receipt.

- If samples are sent by a commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of the permanent record. Commercial carriers will not sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.

- Samples will be picked up by a laboratory courier or transported to the laboratory the same day they are collected unless collected on a weekend or holiday. In these cases, the samples will be stored in a secure location until delivery to the laboratory. Additional ice will be added to the cooler as needed to maintain proper preservation temperatures.

4.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

A sample custodian will be designated by the laboratory and will have the responsibility to receive all incoming samples. Once received, the custodian will document if the sample is received in good condition (i.e., unbroken, cooled, etc.) and that the associated paperwork, such as chain-of-custody forms have been completed. The custodian will sign the chain-of-custody forms.

The custodian will also document if sufficient sample volume has been received to complete the analytical program. The sample custodian will then place the samples into secure, limited access storage (refrigerated storage, if required). The sample custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log with the verified time and date of receipt also noted.

Consistent with the analyses requested on the chain-of-custody form, analyses by the laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage with internal chain-of-custody sign-out procedures followed.

4.3 STORAGE OF SAMPLES

Empty sample bottles will be returned to secure and limited access storage after the available volume has been consumed by the analysis. Upon completion of the entire analytical work effort, samples will be disposed of by the sample custodian. The length of time that samples are held will be at least thirty (30) days after reports have been submitted. Disposal of remaining samples will be completed in compliance with all Federal, State and local requirements.

4.4 FINAL PROJECT FILES CUSTODY PROCEDURES

The final project files will be the central repository for all documents with information relevant to sampling and analysis activities as described in this QAPP. The Haley & Aldrich Project Manager will be the custodian of the project file. The project files including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and data reviews will be maintained in a secured, limited access area and under custody of the Project Director or his designee.

The final project file will include the following:

- Project plans and drawings
- Field data records
- Sample identification documents and soil boring/monitoring well logs
- All chain-of-custody documentation
- Correspondence
- References, literature
- Laboratory data deliverables
- Data validation and assessment reports
- Progress reports, QA reports
- Final report

The laboratory will be responsible for maintaining analytical logbooks, laboratory data and sample chain of custody documents. Raw laboratory data files and copies of hard copy reports will be inventoried and maintained by the laboratory for a period of six (6) years at which time the laboratory will contact the Haley & Aldrich Project Manager regarding the disposition of the project related files.

5. Calibration Procedures and Frequency

5.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

Several field instruments will be used for both on-site screening of samples and for health and safety monitoring, as described in the Health and Safety Plan (HASP). On-site air monitoring for health and safety purposes may be accomplished using a vapor detection device, such as a Photo-ionization Detector (PID).

Field instruments will be calibrated at the beginning of each day and checked during field activities to verify performance. Instrument specific calibration procedures will be performed in accordance with the instrument manufacturer's requirements.

5.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Reference materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the preparation and use of reference materials including solutions, standards and reagents through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be rated as "reagent grade" or better. All gases will be "high" purity or better. All Standard Reference Materials (SRMs) or Performance Evaluation (PE) materials will be obtained from approved vendors of the National Institute of Standards and Technology (formerly National Bureau of Standards), the U.S. EPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA) certified commercial sources.

6. Analytical Procedures

Analytical procedures to be utilized for analysis of environmental samples will be based on referenced USEPA analytical protocols and/or project specific SOP.

6.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH, temperature, ORP, DO and specific conductivity during sampling of groundwater, and the qualitative measurement of Volatile Organic Compounds (VOC) during the collection of soil samples.

6.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory analyses will be based on the U.S. EPA methodology requirements promulgated in:

- "Test Methods for Evaluating Solid Waste," SW-846 EPA, Office of Solid Waste, and promulgated updates, 1986.

6.2.1 List of Project Target Compounds and Laboratory Detection Limits

The laboratory reporting limits (RLs) and associated method detection limits (MDLs) for the target analytes and compounds for the environmental media to be analyzed are presented in Table II. MDLs have been experimentally determined by the project laboratory using the method provided in 40 CFR, Part 136 Appendix B.

Laboratory parameters for soil samples are listed in the RIWP and IRMWP. Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

6.2.2 List of Method Specific Quality Control (QC) Criteria

The laboratory SOPs include a section that presents the minimum QC requirements for the project analyses. Section 7.0 references the frequency of the associated QC samples for each sampling effort and matrix.

7. Internal Quality Control Checks

This section presents the internal quality control checks that will be employed for field and laboratory measurements.

7.1 FIELD QUALITY CONTROL

7.1.1 Equipment Rinse Blanks

Internal quality control checks will include analysis of equipment blanks to validate successful equipment cleaning activities. Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

The frequency of equipment rinse sample preparation will be for each type of sampling equipment on which decontamination procedures have been performed as part of each sampling event.

A separate equipment rinse blank sample will be collected for PFAS using the sample collection procedure described in Section 8.1.1 of the NYSDEC-approved Avangrid Field Sampling Plan.

7.1.2 Trip Blanks

Trip blanks samples will be prepared by the project laboratory using ASTM Type II or equivalent water placed within pre-cleaned 40 milliliter (ml) VOC vials equipped with Teflon septa. Trip blanks will accompany each sample delivery group (SDG) of environmental samples collected for analysis of VOCs.

Trip blank samples will be placed in each cooler that stores and transports project samples that are to be analyzed for VOCs.

7.2 LABORATORY PROCEDURES

Procedures which contribute to maintenance of overall laboratory quality assurance and control include appropriately cleaned sample containers, proper sample identification and logging, applicable sample preservation, storage and analysis within prescribed holding times, and use of controlled materials.

7.2.1 Field Duplicate Samples

The precision or reproducibility of the data generated will be monitored through the use of field duplicate samples. Field duplicate analysis will be performed at a frequency of 1 in 20 project samples.

Precision will be measured in terms of the absolute value of the relative percent difference (RPD) as expressed by the following equation:

$$RPD = [|R1-R2|/[(R1+R2)/2]] \times 100\%$$

Acceptance criteria for duplicate analyses performed on solid matrices will be 100% and aqueous matrices will be 35%. RPD values outside these limits will require an evaluation of the sampling and/or analysis procedures by the project QA Officer and/or laboratory QA Director. Corrective actions may include re-analysis of additional sample aliquots and/or qualification of the data for use.

7.2.2 Matrix Spike Samples

Ten percent of each project sample matrix for each analytical method performed will be spiked with known concentrations of the specific target compounds/analytes.

The amount of the compound recovered from the sample compared to the amount added will be expressed as a percent recovery. The percent recovery of an analyte is an indication of the accuracy of an analysis within the site-specific sample matrix. Percent recovery will be calculated for MS/MSD using the following equation.

$$\% \text{ Recovery} = \frac{\text{Spiked Sample - Background}}{\text{Known Value of Spike}} \times 100\%$$

If the quality control value falls outside the control limits (UCL or LCL) due to sample matrix effects, the results will be reported with appropriate data qualifiers. To determine the effect a non-compliant MS recovery has on the reported results, the recovery data will be evaluated as part of the validation process.

7.2.3 Laboratory Control Sample (LCS) Analyses

The laboratory will perform LCS analyses prepared from Standard Reference Materials (SRMs). The SRMs will be supplied from an independent manufacturer and traceable to NIST materials with known concentrations of each target analyte to be determined by the analytical methods performed. In cases where an independently supplied SRM is not available, the LCS may be prepared by the laboratory from a reagent lot other than that used for instrument calibration.

The laboratory will evaluate LCS analyses in terms of percent recovery using the most recent laboratory generated control limits.

LCS recoveries that do not meet acceptance criteria will be deemed invalid. Analysis of project samples will cease until an acceptable LCS analysis has been performed. If sample analysis is performed in association with an out-of-control LCS sample analysis, the data will be deemed invalid.

Corrective actions will be initiated by the Haley & Aldrich QA Officer and/or Laboratory QA Officer to investigate the problem. After the problem has been identified and corrected, the solution will be noted in the instrument run logbook and re-analysis of project samples will be performed, if possible.

The analytical anomaly will be noted in the sample delivery group (SDG) Case Narrative and reviewed by the data validator. The data validator will confirm that appropriate corrective actions were implemented and recommend the applicable use of the affected data.

7.2.4 Surrogate Compound/Internal Standard Recoveries

For VOCs, surrogates will be added to each sample prior to analysis to establish purge and trap efficiency. Quantitation will be accomplished via internal standardization techniques.

The recovery of surrogate compounds and internal standards will be monitored by laboratory personnel to assess possible site-specific matrix effects on instrument performance.

For semi-volatile organics analyses, surrogates will be added to the raw sample to assess extraction efficiency. Internal standards will be added to all sample extracts and instrument calibration standard immediately before analysis for quantitation via internal standardization techniques.

Method specific quality control (QC) limits are provided in the attached laboratory method SOPs. Surrogate compound/internal standard recoveries that do not fall within accepted QC limits for the analytical methodology performed will have the analytical results flagged with data qualifiers as appropriate by the laboratory and will not be noted in the laboratory report Case Narrative.

To ascertain the effect non-compliant surrogate compound/internal standard recoveries may have on the reported results, the recovery data will be evaluated as part of the validation process. The data validator will provide recommendations for corrective actions including but not limited to additional data qualification.

7.2.5 Calibration Verification Standards

Calibration verification (CV) standards will be utilized to confirm instrument calibrations and performance throughout the analytical process. CV standards will be prepared as prescribed by the respective analytical protocols. Continuing calibration will be verified by compliance with method-specific criteria prior to additional analysis of project samples.

Non-compliant analysis of CV standards will require immediate corrective action by the project laboratory QA officer and/or designated personnel. Corrective action may include re-analysis of each affected project sample, a detailed description of the problem, the corrective action undertaken, the person who performed the action, and the resolution of the problem.

7.2.6 Laboratory Method Blank Analyses

Method blank sample analysis will be performed as part of each analytical batch for each methodology performed. If target compounds are detected in the method blank samples, the reported results will be flagged by the laboratory in accordance with standard operating procedures. The data validator will provide recommendations for corrective actions including but not limited to additional data qualification.

8. Data Quality Objectives

Sampling that will be performed as described in the RIWP is designed to produce data of the quality necessary to achieve the minimum standard requirements of the field and laboratory analytical objectives described below. These data are being obtained with the primary objective to assess levels of contaminants of concern associated with the Site.

The overall project data quality objective (DQO) is to implement procedures for field data collection, sample collection, handling, and laboratory analysis and reporting that achieve the project objectives. The following section is a general discussion of the criteria that will be used to measure achievement of the project DQO.

8.1 PRECISION

8.1.1 Definition

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The overall precision of measurement data is a mixture of sampling and analytical factors. The analytical results from the field duplicate samples will provide data on sampling precision. The results from duplicate samples created by the laboratory will provide data on analytical precision. The measurement of precision will be stated in terms of relative percent difference (RPD).

8.1.2 Field Precision Sample Objectives

Field precision will be assessed through collection and measurement of field duplicate samples at a rate of 1 duplicate per 20 investigative samples. The RPD criteria for the project field duplicate samples will be +/- 100% for soil, +/- 35 % for groundwater for parameters of analysis detected at concentrations greater than 5 times (5X) the laboratory reporting limit (RL).

8.1.3 Laboratory Precision Sample Objectives

Laboratory precision will be assessed through the analysis of laboratory control and laboratory control duplicate samples (LCS/LCSD) and matrix spike and matrix spike duplicate (MS/MSD) samples for groundwater and soil samples and the analysis of laboratory duplicate samples for air and soil vapor samples. Air and soil vapor laboratory duplicate sample analyses will be performed by analyzing the same SUMMA canister twice. The RPD criteria for the air/soil vapor laboratory duplicate samples will be +/- 35 % for parameters of analysis detected at concentrations greater than 5 times (5X) the laboratory reporting limit (RL).

8.2 ACCURACY

8.2.1 Definition

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation and analytical procedure limitations.

8.2.2 Field Accuracy Objectives

Sampling bias will be assessed by evaluating the results of field equipment rinse and trip blanks. Equipment rinse and trip blanks will be collected as appropriate based on sampling and analytical methods for each sampling effort.

If non-dedicated sampling equipment is used, equipment rinse blanks will be collected by passing ASTM Type II water over and/or through the respective sampling equipment utilized during each sampling effort. One equipment rinse blank will be collected for each type of non-dedicated sampling equipment used for the sampling effort. Equipment rinse blanks will be analyzed for each target parameter for the respective sampling effort for which environmental media have been collected. (Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.)

Trip blank samples will be prepared by the laboratory and provided with each shipping container that includes containers for the collection of groundwater samples for the analysis of VOC. Trip blank samples will be analyzed for each VOC for which groundwater samples have been collected for analysis.

8.3 LABORATORY ACCURACY OBJECTIVES

Analytical bias will be assessed through the use of laboratory control samples (LCS) and Site-specific matrix spike (MS) sample analyses. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

One (1) set of MS/MSD analyses will be performed with each batch of twenty (20) project samples collected for analysis to assess the accuracy of the identification and quantification of analytes within the Site-specific sample matrices. Additional sample volume will be collected at sample locations selected for the preparation of MS/MSD samples so that the standard laboratory reporting limits (RLs) are achieved.

The accuracy of analyses that include a sample extraction procedure will be evaluated through the use of system monitoring or surrogate compounds. Surrogate compounds will be added to each sample, standard, blank, and QC sample prior to sample preparation and analysis. Surrogate compound percent recoveries will provide information on the effect of the sample matrix on the accuracy of the analyses.

8.4 REPRESENTATIVENESS

8.4.1 Definition

Representativeness expresses the degree to which sample data represent a characteristic of a population, a parameter variation at a sampling point or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied through the proper selection of sampling locations, the quantity of samples and the use of appropriate procedures to collect and analyze the samples.

8.4.2 Measures to Ensure Representativeness of Field Data

Representativeness will be addressed by prescribing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches).

8.5 COMPLETENESS

8.5.1 Definition

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the total amount of the anticipated to be obtained. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a sufficient degree of confidence.

8.5.2 Field Completeness Objectives

Completeness is a measure of the amount of valid measurements obtained from measurements taken in this project versus the number planned. Field completeness objective for this project will be greater than (>) 90%.

8.5.3 Laboratory Completeness Objectives

Laboratory data completeness objective is a measure of the amount of valid data obtained from laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total laboratory data set. The completeness goal will be >90%.

8.6 COMPARABILITY

8.6.1 Definition

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another.

8.6.2 Measures to Ensure Comparability of Laboratory Data

Comparability of laboratory data will be measured from the analysis of Standard Reference Materials (SRM) obtained from either EPA Cooperative Research and Development Agreement (CRADA) suppliers or the National Institute of Standards and Technology (NIST). The reported analytical data will also be presented in standard units of mass of contaminant within a known volume of environmental media. The standard units for various sample matrices are as follows:

- Solid Matrices – mg/kg of media (Dry Weight).
- Aqueous Matrices – ng/L for PFAS analyses, ug/L of media for organic analyses, and mg/L for inorganic analyses.

8.7 LEVEL OF QUALITY CONTROL EFFORT

Equipment rinse blanks for non-dedicated sampling equipment will be prepared by field personnel and submitted for analysis of target parameters. Equipment rinse blank samples will be analyzed to check for potential cross-contamination between sampling locations that may be introduced during the investigation. One (1) equipment rinse blank will be collected per sampling event to the extent that non-dedicated sampling equipment is used.

A separate equipment rinse blank sample will be collected for PFAS using the sample collection procedure described in Section 8.1.1 of the NYSDEC-approved Avangrid Field Sampling Plan.

Trip blanks will be used to assess the potential for contamination during sample storage and shipment. Trip blanks will be provided with the sample containers to be used for the collection of groundwater samples for the analysis of VOC. Trip blanks will be preserved and handled in the same manner as the project samples. One (1) trip blank will be included along with each shipping container containing project samples to be analyzed for VOC.

Method blank samples will be prepared by the laboratory and analyzed concurrently with all project samples to assess potential contamination introduced during the analytical process.

Field duplicate samples will be collected and analyzed to determine sampling and analytical reproducibility. One (1) field duplicate will be collected for every 20 or fewer investigative samples collected for off-Site laboratory analysis.

Matrix spikes will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected. One (1) matrix spike/matrix spike duplicate (MS/MSD) will be collected for every 20 or fewer investigative samples per sample matrix.

(Note: Soil MS/MSD samples require triple sample volume for VOC only. Aqueous MS/MSD samples require triple the normal sample volume for VOC analysis and double the volume for the remaining parameters.)

9. Data Reduction, Validation and Reporting

Data generated by the laboratory operation will be reduced and validated prior to reporting in accordance with the following procedures:

9.1 DATA REDUCTION

9.1.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. The pH, conductivity, temperature, turbidity, DO, ORP and breathing zone VOC readings collected in the field will be generated from direct read instruments. The data will be written into field logbooks immediately after measurements are taken. If errors are made, data will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry.

9.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures are provided by the appropriate chapter of USEPA, “Test Methods for Evaluating Solid Waste”, SW-846, Third Edition. Errors will be noted; corrections made with the original notations crossed out legibly. Analytical results for soil samples will be calculated and reported on a dry weight basis.

9.1.3 Quality Control Data

Quality control data (e.g., laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. Data determined to be acceptable will be entered into the laboratory information management system.

Unacceptable data will be appropriately qualified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

9.2 DATA VALIDATION

Data validation procedures of the analytical data will be performed by the Haley & Aldrich QA Officer or designee using the following documents as guidance for the review process:

- "U.S. EPA National Functional Guidelines for Organic Data Review”, and the "U.S. EPA National Functional Guidelines for Inorganic Data Review".
- The specific data qualifiers used will be applied to the reported results as presented and defined in the EPA National Functional Guidelines. Validation will be performed by qualified personnel at the direction of the Haley & Aldrich QAO.
- The completeness of each data package will be evaluated by the Data Validator. Completeness checks will be administered on all data to determine that the deliverables are consistent with

the NYSDEC Analytical Services Protocol (ASP) Category A and Category B data package requirements. The validator will determine whether the required items are present and request copies of missing deliverables (if necessary) from the laboratory.

9.3 DATA REPORTING

Data reporting procedures will be carried out for field and laboratory operations as indicated below:

- Field Data Reporting: Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of measurements made in the field and documentation of field calibration activities.

- Laboratory Data Reporting: The laboratory data reporting package will enable data validation based on the protocols described above. The final laboratory data report format will include the QA/QC sample analysis deliverables to enable the development of a data usability summary report (DUSR) based on Department DER-10 Appendix 2B.

10. Performance and System Audits

A performance audit is an independent quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

10.1.1 Internal Field Audit Responsibilities

Internal audits of field activities will be initiated at the discretion of the Project Manager and will include the review of sampling and field measurements. The audits will verify that all procedures are being followed. Internal field audits will be conducted periodically during the project. The audits will include examination of the following:

- Field sampling records, screening results, instrument operating records
- Sample collection
- Handling and packaging in compliance with procedures
- Maintenance of QA procedures
- Chain-of-custody reports

10.1.2 External Field Audit Responsibilities

External audits may be conducted by the Project Coordinator at any time during the field operations. These audits may or may not be announced and are at the discretion of the NYSDEC. The external field audits can include (but are not limited to) the following:

- Sampling equipment decontamination procedures
- Sample bottle preparation procedures
- Sampling procedures
- Examination of health and safety plans
- Procedures for verification of field duplicates
- Field screening practices

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

10.2.1 Internal Laboratory Audit Responsibilities

The laboratory system audits are typically conducted by the laboratory QA Officer or designee on an annual basis. The system audit will include an examination of laboratory documentation including: sample receiving logs, sample storage, chain-of-custody procedures, sample preparation and analysis and instrument operating records.

At the conclusion of internal system audits, reports will be provided to the laboratory's operating divisions for appropriate comment and remedial/corrective action where necessary. Records of audits and corrective actions will be maintained by the Laboratory QA Officer.

10.2.2 External Laboratory Audit Responsibilities

External audits will be conducted as required, by the NYSDOH or designee. External audits may include any of the following:

- Review of laboratory analytical procedures
- Laboratory on-site visits
- Submission of performance evaluation samples for analysis

Failure of any of the above audit procedures can lead to laboratory de-certification. An audit may consist of but not limited to:

- Sample receipt procedures
- Custody, sample security and log-in procedures
- Review of instrument calibration logs
- Review of QA procedures
- Review of logbooks
- Review of analytical SOPs
- Personnel interviews

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

- Comparison of resulting data to the SOP or method
- Verification of initial and continuing calibrations within control limits
- Verification of surrogate recoveries and instrument timing results
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable
- Assurance that samples are run within holding times

11. Preventive Maintenance

11.1 FIELD INSTRUMENT PREVENTIVE MAINTENANCE

The field equipment preventive maintenance program is designed to ensure the effective completion of the sampling effort and to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities
- Maintenance schedules
- Inventory of critical spare parts and equipment

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that an inventory of spare parts will be maintained with the field equipment. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or cannot be obtained in a timely manner.

11.2 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventive maintenance. The extent of the preventive maintenance will be a function of the complexity of the equipment.

Generally, annual preventive maintenance service will involve cleaning, adjusting, inspecting and testing procedures designed to deduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

Maintenance records will be placed on file at the laboratory and can be made available upon request.

12. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

12.1 FIELD MEASUREMENTS

Field generated information will be reviewed by the Field Coordinator and typically include evaluation of bound logbooks/forms, data entry and calculation checks. Field data will be assessed by the Project Coordinator who will review the field results for compliance with the established QC criteria that are specified in Section 7.0 of this QAPP. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Accuracy will be measured by determining the percent recovery (% R) of calibration check standards. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a field sample and will be measured by determining the relative percent difference (RPD). Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

$$\text{Completeness} = \frac{\text{Valid (usable) Data Obtained}}{\text{Total Data Planned}} \times 100$$

12.2 LABORATORY DATA

Surrogate, internal standard and matrix spike recoveries will be used to evaluate data quality. The laboratory quality assurance/quality control program will include the following elements:

- Precision, in terms of relative percent difference (RPD), will be determined by relative sample analysis at a frequency of one duplicate analysis for each batch of ten project samples or a frequency of 10 percent (10%). RPD is defined as the absolute difference of duplicate measurements divided by the mean of these analyses normalized to percentage.

- Accuracy, in terms of percent recovery (recovery of known constituent additions or surrogate recoveries), will be determined by the analysis of spiked and unspiked samples. MS/MSD will be used to determine analytical accuracy. The frequency of MS/MSD analyses will be one project sample MS/MSD per set of 20 project samples.

- One method blank will be prepared and analyzed with each batch of project samples. The total number of method blank sample analyses will be determined by the laboratory analytical batch size.

- Standard Reference Materials (SRMs) will be used for each analysis. Sources of SRM's include the U.S. EPA, commercially available material from CRADA certified vendors and/or laboratory produced solutions. SRMs, when available and appropriate, will be processed and analyzed on a frequency of one per set of samples.

- Completeness is the evaluation of the amount of valid data generated versus the total set of data produced from a particular sampling and analysis event. Valid data is determined by independent confirmation of compliance with method-specific and project-specific data quality objectives. The calculation of data set completeness will be performed by the following equation.

$$\frac{Number\ of\ Valid\ Sample\ Results}{Total\ Number\ of\ Samples\ Planned} X\ 100 = \%\ Complete$$

13. Quality Assurance (QA) Reports

Critically important to the successful implementation of the QA Plan is a reporting system that provides the means by which the program can be reviewed, problems identified, and programmatic changes made to improve the plan.

QA reports to management include:

- Audit reports, internal and external audits with responses
- Performance evaluation sample results; internal and external sources
- Daily QA/QC exception reports/corrective actions

QA/QC corrective action reports will be prepared by the Haley & Aldrich QA Officer when appropriate and presented to the project and/or laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the laboratory QA personnel will be distributed and reviewed by various levels of the laboratory management.

References

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TABLES

TABLE I

ANALYTE DETECTION LIMITS IN GROUNDWATER AND SOIL

PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
GROUNDWATER				
Volatile Organic Compounds (8260C)				
Methylene chloride	75-09-2	ug/l	0.7	2.5
1,1-Dichloroethane	75-34-3	ug/l	0.7	2.5
Chloroform	67-66-3	ug/l	0.7	2.5
Carbon tetrachloride	56-23-5	ug/l	0.134	0.5
1,2-Dichloropropane	78-87-5	ug/l	0.133	1
Dibromochloromethane	124-48-1	ug/l	0.149	0.5
1,1,2-Trichloroethane	79-00-5	ug/l	0.5	1.5
Tetrachloroethene	127-18-4	ug/l	0.181	0.5
Chlorobenzene	108-90-7	ug/l	0.7	2.5
Trichlorofluoromethane	75-69-4	ug/l	0.7	2.5
1,2-Dichloroethane	107-06-2	ug/l	0.132	0.5
1,1,1-Trichloroethane	71-55-6	ug/l	0.7	2.5
Bromodichloromethane	75-27-4	ug/l	0.192	0.5
trans-1,3-Dichloropropene	10061-02-6	ug/l	0.164	0.5
cis-1,3-Dichloropropene	10061-01-5	ug/l	0.144	0.5
1,3-Dichloropropene, Total	542-75-6	ug/l	0.144	0.5
Bromoform	75-25-2	ug/l	0.65	2
1,1,2,2-Tetrachloroethane	79-34-5	ug/l	0.144	0.5
Benzene	71-43-2	ug/l	0.159	0.5
Toluene	108-88-3	ug/l	0.7	2.5
Ethylbenzene	100-41-4	ug/l	0.7	2.5
Chloromethane	74-87-3	ug/l	0.7	2.5
Bromomethane	74-83-9	ug/l	0.7	2.5
Vinyl chloride	75-01-4	ug/l	0.0699	1
Chloroethane	75-00-3	ug/l	0.7	2.5
1,1-Dichloroethene	75-35-4	ug/l	0.142	0.5
trans-1,2-Dichloroethene	156-60-5	ug/l	0.7	2.5
Trichloroethene	79-01-6	ug/l	0.175	0.5
1,2-Dichlorobenzene	95-50-1	ug/l	0.7	2.5
1,3-Dichlorobenzene	541-73-1	ug/l	0.7	2.5
1,4-Dichlorobenzene	106-46-7	ug/l	0.7	2.5
Methyl tert butyl ether	1634-04-4	ug/l	0.7	2.5
p/m-Xylene	179601-23-1	ug/l	0.7	2.5
o-Xylene	95-47-6	ug/l	0.7	2.5
Xylene (Total)	1330-20-7	ug/l	0.7	2.5
cis-1,2-Dichloroethene	156-59-2	ug/l	0.7	2.5
1,2-Dichloroethene (total)	540-59-0	ug/l	0.7	2.5
Styrene	100-42-5	ug/l	0.7	2.5
Dichlorodifluoromethane	75-71-8	ug/l	1	5
Acetone	67-64-1	ug/l	1.46	5
Carbon disulfide	75-15-0	ug/l	1	5
2-Butanone	78-93-3	ug/l	1.94	5
4-Methyl-2-pentanone	108-10-1	ug/l	1	5
2-Hexanone	591-78-6	ug/l	1	5
Bromochloromethane	74-97-5	ug/l	0.7	2.5
1,2-Dibromoethane	106-93-4	ug/l	0.65	2
n-Butylbenzene	104-51-8	ug/l	0.7	2.5
sec-Butylbenzene	135-98-8	ug/l	0.7	2.5
tert-Butylbenzene	98-06-6	ug/l	0.7	2.5
1,2-Dibromo-3-chloropropane	96-12-8	ug/l	0.7	2.5
Isopropylbenzene	98-82-8	ug/l	0.7	2.5
p-Isopropyltoluene	99-87-6	ug/l	0.7	2.5

TABLE I
ANALYTE DETECTION LIMITS IN GROUNDWATER AND SOIL
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
Volatile Organic Compounds (8260B)				
Naphthalene	91-20-3	ug/l	0.7	2.5
n-Propylbenzene	103-65-1	ug/l	0.7	2.5
1,2,3-Trichlorobenzene	87-61-6	ug/l	0.7	2.5
1,2,4-Trichlorobenzene	120-82-1	ug/l	0.7	2.5
1,3,5-Trimethylbenzene	108-67-8	ug/l	0.7	2.5
1,2,4-Trimethylbenzene	95-63-6	ug/l	0.7	2.5
Methyl Acetate	79-20-9	ug/l	0.234	2
Cyclohexane	110-82-7	ug/l	0.271	10
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	ug/l	0.7	2.5
Methyl cyclohexane	108-87-2	ug/l	0.396	10
1,4-Dioxane	123-91-1	ug/l	41.1	250
Semi Volatile Organic Compounds (8270C)				
Acenaphthene	83-32-9	ug/l	0.014	0.10
2-Chloronaphthalene	91-58-7	ug/l	0.018	0.20
Fluoranthene	206-44-0	ug/l	0.021	0.10
Hexachlorobutadiene	87-68-3	ug/l	0.047	0.50
Naphthalene	91-20-3	ug/l	0.049	0.10
Benzo(a)anthracene	56-55-3	ug/l	0.020	0.10
Benzo(a)pyrene	50-32-8	ug/l	0.015	0.10
Benzo(b)fluoranthene	205-99-2	ug/l	0.012	0.10
Benzo(k)fluoranthene	207-08-9	ug/l	0.009	0.10
Chrysene	218-01-9	ug/l	0.012	0.10
Acenaphthylene	208-96-8	ug/l	0.012	0.10
Anthracene	120-12-7	ug/l	0.015	0.10
Benzo(ghi)perylene	191-24-2	ug/l	0.014	0.10
Fluorene	86-73-7	ug/l	0.015	0.10
Phenanthrene	85-01-8	ug/l	0.023	0.10
Dibenzo(a,h)anthracene	53-70-3	ug/l	0.013	0.10
Indeno(1,2,3-cd)Pyrene	193-39-5	ug/l	0.012	0.10
Pyrene	129-00-0	ug/l	0.019	0.10
2-Methylnaphthalene	91-57-6	ug/l	0.022	0.10
Pentachlorophenol	87-86-5	ug/l	0.014	0.80
Hexachlorobenzene	118-74-1	ug/l	0.009	0.80
Hexachloroethane	67-72-1	ug/l	0.063	0.80
Bis(2-chloroethyl)ether	111-44-4	ug/l	0.506	2.00
3,3'-Dichlorobenzidine	91-94-1	ug/l	1.623	5.02
2,4-Dinitrotoluene	121-14-2	ug/l	1.165	5.02
2,6-Dinitrotoluene	606-20-2	ug/l	0.932	5.02
4-Chlorophenyl phenyl ether	7005-72-3	ug/l	0.488	2.00
4-Bromophenyl phenyl ether	101-55-3	ug/l	0.379	2.00
Bis(2-chloroisopropyl)ether	108-60-1	ug/l	0.528	2.00
Bis(2-chloroethoxy)methane	111-91-1	ug/l	0.502	5.02
Hexachlorocyclopentadiene	77-47-4	ug/l	0.688	20.02
Isophorone	78-59-1	ug/l	1.205	5.02
Nitrobenzene	98-95-3	ug/l	0.772	2.00
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	ug/l	0.419	2.00
n-Nitrosodi-n-propylamine	621-64-7	ug/l	0.644	5.02
Bis(2-Ethylhexyl)phthalate	117-81-7	ug/l	1.536	3.00
Butyl benzyl phthalate	85-68-7	ug/l	1.172	5.02
Di-n-butylphthalate	84-74-2	ug/l	0.389	5.02
Di-n-octylphthalate	117-84-0	ug/l	1.274	5.02
Diethyl phthalate	84-66-2	ug/l	0.382	5.02

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Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
Semi Volatile Organic Compounds (8270C)				
Dimethyl phthalate	131-11-3	ug/l	1.820	5.02
Biphenyl	92-52-4	ug/l	0.459	2.00
4-Chloroaniline	106-47-8	ug/l	1.070	5.02
2-Nitroaniline	88-74-4	ug/l	0.499	5.02
3-Nitroaniline	99-09-2	ug/l	0.815	5.02
4-Nitroaniline	100-01-6	ug/l	0.801	5.02
Dibenzofuran	132-64-9	ug/l	0.499	2.00
Acetophenone	98-86-2	ug/l	0.528	5.02
2,4,6-Trichlorophenol	88-06-2	ug/l	0.612	5.02
P-Chloro-M-Cresol	59-50-7	ug/l	0.351	2.00
2-Chlorophenol	95-57-8	ug/l	0.480	2.00
2,4-Dichlorophenol	120-83-2	ug/l	0.411	5.02
2,4-Dimethylphenol	105-67-9	ug/l	1.780	5.02
2-Nitrophenol	88-75-5	ug/l	0.848	10.01
4-Nitrophenol	100-02-7	ug/l	0.673	10.01
2,4-Dinitrophenol	51-28-5	ug/l	6.661	20.02
4,6-Dinitro-o-cresol	534-52-1	ug/l	1.816	10.01
Phenol	108-95-2	ug/l	0.568	5.02
3-Methylphenol/4-Methylphenol	106-44-5	ug/l	0.480	5.02
2,4,5-Trichlorophenol	95-95-4	ug/l	0.775	5.02
Carbazole	86-74-8	ug/l	0.491	2.00
TAL Metals (6010)				
Aluminum, Total	7429-90-5	mg/l	0.00327	0.01
Antimony, Total	7440-36-0	mg/l	0.000429	0.004
Arsenic, Total	7440-38-2	mg/l	0.000165	0.0005
Barium, Total	7440-39-3	mg/l	0.000173	0.0005
Beryllium, Total	7440-41-7	mg/l	0.000107	0.0005
Cadmium, Total	7440-43-9	mg/l	0.0000599	0.0002
Calcium, Total	7440-70-2	mg/l	0.0394	0.1
Chromium, Total	7440-47-3	mg/l	0.000178	0.001
Cobalt, Total	7440-48-4	mg/l	0.000163	0.0005
Copper, Total	7440-50-8	mg/l	0.000384	0.001
Iron, Total	7439-89-6	mg/l	0.0191	0.05
Lead, Total	7439-92-1	mg/l	0.000343	0.001
Magnesium, Total	7439-95-4	mg/l	0.0242	0.07
Manganese, Total	7439-96-5	mg/l	0.00044	0.001
Nickel, Total	7440-02-0	mg/l	0.000556	0.002
Potassium, Total	7440-09-7	mg/l	0.0309	0.1
Selenium, Total	7782-49-2	mg/l	0.00173	0.005
Silver, Total	7440-22-4	mg/l	0.000163	0.0004
Sodium, Total	7440-23-5	mg/l	0.0293	0.1
Thallium, Total	7440-28-0	mg/l	0.000143	0.0005
Vanadium, Total	7440-62-2	mg/l	0.00157	0.005
Zinc, Total	7440-66-6	mg/l	0.00341	0.01
PFAS (537)				
Perfluorobutanoic Acid (PFBA)	375-22-4	ng/l	0.3732	2
Perfluoropentanoic Acid (PFPeA)	2706-90-3	ng/l	0.464	2
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	ng/l	0.38	2
Perfluorohexanoic Acid (PFHxA)	307-24-4	ng/l	0.492	2
Perfluoroheptanoic Acid (PFHpA)	375-85-9	ng/l	0.372	2
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	ng/l	0.436	2
Perfluorooctanoic Acid (PFOA)	335-67-1	ng/l	0.46	2

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Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
PFAS (537)				
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	ng/l	0.194	2
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	ng/l	0.52	2
Perfluorononanoic Acid (PFNA)	375-95-1	ng/l	0.436	2
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	ng/l	0.56	2
Perfluorodecanoic Acid (PFDA)	335-76-2	ng/l	0.62	2
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	ng/l	0.2908	2
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2355-31-9	ng/l	0.2504	2
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	ng/l	0.424	2
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	ng/l	0.386	2
Perfluorooctanesulfonamide (FOSA)	754-91-6	ng/l	0.556	2
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	ng/l	0.3728	2
Perfluorododecanoic Acid (PFDoA)	307-55-1	ng/l	0.592	2
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	ng/l	0.314	2
Perfluorotetradecanoic Acid (PFTA)	376-06-7	ng/l	0.988	2
SOIL				
Volatile Organic Compounds (8260C)				
Methylene chloride	75-09-2	ug/kg	2.29	5
1,1-Dichloroethane	75-34-3	ug/kg	0.145	1
Chloroform	67-66-3	ug/kg	0.14	1.5
Carbon tetrachloride	56-23-5	ug/kg	0.23	1
1,2-Dichloropropane	78-87-5	ug/kg	0.125	1
Dibromochloromethane	124-48-1	ug/kg	0.14	1
1,1,2-Trichloroethane	79-00-5	ug/kg	0.267	1
Tetrachloroethene	127-18-4	ug/kg	0.196	0.5
Chlorobenzene	108-90-7	ug/kg	0.127	0.5
Trichlorofluoromethane	75-69-4	ug/kg	0.695	4
1,2-Dichloroethane	107-06-2	ug/kg	0.257	1
1,1,1-Trichloroethane	71-55-6	ug/kg	0.167	0.5
Bromodichloromethane	75-27-4	ug/kg	0.109	0.5
trans-1,3-Dichloropropene	10061-02-6	ug/kg	0.273	1
cis-1,3-Dichloropropene	10061-01-5	ug/kg	0.158	0.5
1,3-Dichloropropene, Total	542-75-6	ug/kg	0.158	0.5
1,1-Dichloropropene	563-58-6	ug/kg	0.328	5
Bromoform	75-25-2	ug/kg	0.246	4
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	0.166	0.5
Benzene	71-43-2	ug/kg	0.166	0.5
Toluene	108-88-3	ug/kg	0.543	1
Ethylbenzene	100-41-4	ug/kg	0.141	1
Chloromethane	74-87-3	ug/kg	0.932	4
Bromomethane	74-83-9	ug/kg	0.581	2
Vinyl chloride	75-01-4	ug/kg	0.335	1
Chloroethane	75-00-3	ug/kg	0.452	2
1,1-Dichloroethene	75-35-4	ug/kg	0.238	1
trans-1,2-Dichloroethene	156-60-5	ug/kg	0.137	1.5
Trichloroethene	79-01-6	ug/kg	0.137	0.5
1,2-Dichlorobenzene	95-50-1	ug/kg	0.144	2
1,3-Dichlorobenzene	541-73-1	ug/kg	0.148	2
1,4-Dichlorobenzene	106-46-7	ug/kg	0.171	2
Methyl tert butyl ether	1634-04-4	ug/kg	0.201	2
p/m-Xylene	179601-23-1	ug/kg	0.56	2
o-Xylene	95-47-6	ug/kg	0.291	1
Xylene (Total)	1330-20-7	ug/kg	0.291	1
cis-1,2-Dichloroethene	156-59-2	ug/kg	0.175	1
1,2-Dichloroethene (total)	540-59-0	ug/kg	0.137	1
Dibromomethane	74-95-3	ug/kg	0.239	10

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ROCHESTER, NEW YORK

Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
Volatile Organic Compounds (8260C)				
Styrene	100-42-5	ug/kg	0.196	1
Dichlorodifluoromethane	75-71-8	ug/kg	0.915	10
Acetone	67-64-1	ug/kg	4.811	10
Carbon disulfide	75-15-0	ug/kg	4.55	10
2-Butanone	78-93-3	ug/kg	2.22	10
Vinyl acetate	108-05-4	ug/kg	0.153	10
4-Methyl-2-pentanone	108-10-1	ug/kg	1.28	10
1,2,3-Trichloropropane	96-18-4	ug/kg	0.177	10
2-Hexanone	591-78-6	ug/kg	1.18	10
Bromochloromethane	74-97-5	ug/kg	0.205	2
2,2-Dichloropropane	594-20-7	ug/kg	0.45	5
1,2-Dibromoethane	106-93-4	ug/kg	0.279	1
1,3-Dichloropropane	142-28-9	ug/kg	0.183	5
1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	0.318	1
Bromobenzene	108-86-1	ug/kg	0.219	5
n-Butylbenzene	104-51-8	ug/kg	0.228	1
sec-Butylbenzene	135-98-8	ug/kg	0.217	1
tert-Butylbenzene	98-06-6	ug/kg	0.247	5
o-Chlorotoluene	95-49-8	ug/kg	0.221	5
p-Chlorotoluene	106-43-4	ug/kg	0.183	5
1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	0.396	5
Hexachlorobutadiene	87-68-3	ug/kg	0.348	5
Isopropylbenzene	98-82-8	ug/kg	0.109	1
p-Isopropyltoluene	99-87-6	ug/kg	0.109	1
Naphthalene	91-20-3	ug/kg	0.65	4
Acrylonitrile	107-13-1	ug/kg	0.514	10
n-Propylbenzene	103-65-1	ug/kg	0.171	1
1,2,3-Trichlorobenzene	87-61-6	ug/kg	0.322	2
1,2,4-Trichlorobenzene	120-82-1	ug/kg	0.272	2
1,3,5-Trimethylbenzene	108-67-8	ug/kg	0.193	2
1,2,4-Trimethylbenzene	95-63-6	ug/kg	0.334	2
1,4-Dioxane	123-91-1	ug/kg	35.1	100
1,4-Diethylbenzene	105-05-5	ug/kg	4	4
4-Ethyltoluene	622-96-8	ug/kg	0.234	4
1,2,4,5-Tetramethylbenzene	95-93-2	ug/kg	0.156	4
Ethyl ether	60-29-7	ug/kg	0.26	5
trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	0.392	5
Semivolatile Organic Compounds (8270D)				
Acenaphthene	83-32-9	ug/kg	17.3012	133.6
1,2,4-Trichlorobenzene	120-82-1	ug/kg	19.1048	167
Hexachlorobenzene	118-74-1	ug/kg	18.704	100.2
Bis(2-chloroethyl)ether	111-44-4	ug/kg	22.6452	150.3
2-Chloronaphthalene	91-58-7	ug/kg	16.5664	167
1,2-Dichlorobenzene	95-50-1	ug/kg	29.9932	167
1,3-Dichlorobenzene	541-73-1	ug/kg	28.724	167
1,4-Dichlorobenzene	106-46-7	ug/kg	29.1582	167
3,3'-Dichlorobenzidine	91-94-1	ug/kg	44.422	167
2,4-Dinitrotoluene	121-14-2	ug/kg	33.4	167

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Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
Semivolatile Organic Compounds (8270D)				
2,6-Dinitrotoluene	606-20-2	ug/kg	28.6572	167
Fluoranthene	206-44-0	ug/kg	19.1716	100.2
4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	17.869	167
4-Bromophenyl phenyl ether	101-55-3	ug/kg	25.4842	167
Bis(2-chloroisopropyl)ether	108-60-1	ug/kg	28.5236	200.4
Bis(2-chloroethoxy)methane	111-91-1	ug/kg	16.7334	180.36
Hexachlorobutadiene	87-68-3	ug/kg	24.4488	167
Hexachlorocyclopentadiene	77-47-4	ug/kg	151.302	477.62
Hexachloroethane	67-72-1	ug/kg	27.0206	133.6
Isophorone	78-59-1	ug/kg	21.6766	150.3
Naphthalene	91-20-3	ug/kg	20.3406	167
Nitrobenzene	98-95-3	ug/kg	24.716	150.3
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	ug/kg	19.0046	133.6
n-Nitrosodi-n-propylamine	621-64-7	ug/kg	25.7848	167
Bis(2-Ethylhexyl)phthalate	117-81-7	ug/kg	57.782	167
Butyl benzyl phthalate	85-68-7	ug/kg	42.084	167
Di-n-butylphthalate	84-74-2	ug/kg	31.6632	167
Di-n-octylphthalate	117-84-0	ug/kg	56.78	167
Diethyl phthalate	84-66-2	ug/kg	15.4642	167
Dimethyl phthalate	131-11-3	ug/kg	35.07	167
Benzo(a)anthracene	56-55-3	ug/kg	18.8042	100.2
Benzo(a)pyrene	50-32-8	ug/kg	40.748	133.6
Benzo(b)fluoranthene	205-99-2	ug/kg	28.1228	100.2
Benzo(k)fluoranthene	207-08-9	ug/kg	26.72	100.2
Chrysene	218-01-9	ug/kg	17.368	100.2
Acenaphthylene	208-96-8	ug/kg	25.7848	133.6
Anthracene	120-12-7	ug/kg	32.565	100.2
Benzo(ghi)perylene	191-24-2	ug/kg	19.6392	133.6
Fluorene	86-73-7	ug/kg	16.2324	167
Phenanthrene	85-01-8	ug/kg	20.3072	100.2
Dibenzo(a,h)anthracene	53-70-3	ug/kg	19.3052	100.2
Indeno(1,2,3-cd)Pyrene	193-39-5	ug/kg	23.2798	133.6
Pyrene	129-00-0	ug/kg	16.5998	100.2
Biphenyl	92-52-4	ug/kg	38.744	380.76
4-Chloroaniline	106-47-8	ug/kg	30.394	167
2-Nitroaniline	88-74-4	ug/kg	32.1976	167
3-Nitroaniline	99-09-2	ug/kg	31.4962	167
4-Nitroaniline	100-01-6	ug/kg	69.138	167
Dibenzofuran	132-64-9	ug/kg	15.7982	167
2-Methylnaphthalene	91-57-6	ug/kg	20.1736	200.4
Acetophenone	98-86-2	ug/kg	20.6746	167
2,4,6-Trichlorophenol	88-06-2	ug/kg	31.6632	100.2
P-Chloro-M-Cresol	59-50-7	ug/kg	24.883	167
2-Chlorophenol	95-57-8	ug/kg	19.7394	167
2,4-Dichlorophenol	120-83-2	ug/kg	26.8536	150.3
2,4-Dimethylphenol	105-67-9	ug/kg	55.11	167
2-Nitrophenol	88-75-5	ug/kg	62.792	360.72
4-Nitrophenol	100-02-7	ug/kg	68.136	233.8
2,4-Dinitrophenol	51-28-5	ug/kg	77.822	801.6
4,6-Dinitro-o-cresol	534-52-1	ug/kg	80.16	434.2
Pentachlorophenol	87-86-5	ug/kg	36.74	133.6

TABLE I
ANALYTE DETECTION LIMITS IN GROUNDWATER AND SOIL
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
Semivolatile Organic Compounds (8270D)				
Phenol	108-95-2	ug/kg	25.217	167
2-Methylphenol	95-48-7	ug/kg	25.885	167
3-Methylphenol/4-Methylphenol	106-44-5	ug/kg	26.1522	240.48
2,4,5-Trichlorophenol	95-95-4	ug/kg	31.9972	167
Benzoic Acid	65-85-0	ug/kg	169.004	541.08
Benzyl Alcohol	100-51-6	ug/kg	51.102	167
Carbazole	86-74-8	ug/kg	16.2324	167
Pesticides (8081B)				
Delta-BHC	319-86-8	mg/kg	0.00031349	0.0016008
Lindane	58-89-9	mg/kg	0.000298149	0.000667
Alpha-BHC	319-84-6	mg/kg	0.000189428	0.000667
Beta-BHC	319-85-7	mg/kg	0.00060697	0.0016008
Heptachlor	76-44-8	mg/kg	0.000358846	0.0008004
Aldrin	309-00-2	mg/kg	0.000563615	0.0016008
Heptachlor epoxide	1024-57-3	mg/kg	0.00090045	0.0030015
Endrin	72-20-8	mg/kg	0.00027347	0.000667
Endrin aldehyde	7421-93-4	mg/kg	0.00070035	0.002001
Endrin ketone	53494-70-5	mg/kg	0.000412206	0.0016008
Dieldrin	60-57-1	mg/kg	0.00050025	0.0010005
4,4'-DDE	72-55-9	mg/kg	0.000370185	0.0016008
4,4'-DDD	72-54-8	mg/kg	0.000570952	0.0016008
4,4'-DDT	50-29-3	mg/kg	0.00128731	0.0030015
Endosulfan I	959-98-8	mg/kg	0.000378189	0.0016008
Endosulfan II	33213-65-9	mg/kg	0.000534934	0.0016008
Endosulfan sulfate	1031-07-8	mg/kg	0.000317492	0.000667
Methoxychlor	72-43-5	mg/kg	0.0009338	0.0030015
Toxaphene	8001-35-2	mg/kg	0.0084042	0.030015
cis-Chlordane	5103-71-9	mg/kg	0.000557612	0.002001
trans-Chlordane	5103-74-2	mg/kg	0.000528264	0.002001
Chlordane	57-74-9	mg/kg	0.00530265	0.0130065
Herbicides (8151A)				
2,4-D	94-75-7	mg/kg	0.0104895	0.1665
2,4,5-T	93-76-5	mg/kg	0.0051615	0.1665
2,4,5-TP (Silvex)	93-72-1	mg/kg	0.0044289	0.1665
Polychlorinated biphenyls (PCBs) (8082A)				
Aroclor 1016	12674-11-2	ug/kg	2.9748	33.5
Aroclor 1221	11104-28-2	ug/kg	3.3567	33.5
Aroclor 1232	11141-16-5	ug/kg	7.102	33.5
Aroclor 1242	53469-21-9	ug/kg	4.5158	33.5
Aroclor 1248	12672-29-6	ug/kg	5.025	33.5
Aroclor 1254	11097-69-1	ug/kg	3.6649	33.5
Aroclor 1260	11096-82-5	ug/kg	6.1908	33.5
Aroclor 1262	37324-23-5	ug/kg	4.2545	33.5
Aroclor 1268	11100-14-4	ug/kg	3.4706	33.5
PCBs, Total	1336-36-3	ug/kg	2.9748	33.5
Metals (6010C)				
Aluminum, Total	7429-90-5	mg/kg	1.08	4
Antimony, Total	7440-36-0	mg/kg	0.152	2
Arsenic, Total	7440-38-2	mg/kg	0.0832	0.4
Barium, Total	7440-39-3	mg/kg	0.0696	0.4
Beryllium, Total	7440-41-7	mg/kg	0.0132	0.2
Cadmium, Total	7440-43-9	mg/kg	0.0392	0.4
Calcium, Total	7440-70-2	mg/kg	1.4	4
Chromium, Total	7440-47-3	mg/kg	0.0384	0.4

TABLE I
ANALYTE DETECTION LIMITS IN GROUNDWATER AND SOIL
PORTION OF 65 TROWBRIDGE STREET
ROCHESTER, NEW YORK

Analyte	CAS Number	Units	Method Detection Limit (MDL)	Reporting Limit (RL)
Metals (6010C)				
Cobalt, Total	7440-48-4	mg/kg	0.0664	0.8
Copper, Total	7440-50-8	mg/kg	0.1032	0.4
Iron, Total	7439-89-6	mg/kg	0.3612	2
Lead, Total	7439-92-1	mg/kg	0.1072	2
Magnesium, Total	7439-95-4	mg/kg	0.616	4
Manganese, Total	7439-96-5	mg/kg	0.0636	0.4
Nickel, Total	7440-02-0	mg/kg	0.0968	1
Potassium, Total	7440-09-7	mg/kg	5.76	100
Selenium, Total	7782-49-2	mg/kg	0.1032	0.8
Silver, Total	7440-22-4	mg/kg	0.1132	0.4
Sodium, Total	7440-23-5	mg/kg	1.26	80
Thallium, Total	7440-28-0	mg/kg	0.126	0.8
Vanadium, Total	7440-62-2	mg/kg	0.0812	0.4
Zinc, Total	7440-66-6	mg/kg	0.1172	2
Mercury, Total	7439-97-6	mg/kg	0.016896	0.08

Notes:

1. The information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.
2. Laboratory parameters for soil samples will be determined by the Excavation Work Plan. Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

TABLE II
SUMMARY OF ANALYSIS METHOD, PRESERVATION METHOD, HOLDING TIME, SAMPLE SIZE REQUIREMENTS AND SAMPLE CONTAINERS

PORTION OF 54 TROWBRIDGE STREET
ROCHESTER, NEW YORK

Analysis/Method	Sample Type	Preservation	Holding Time	Volume/Weight	Container
Volatile Organic Compounds/8260C	Soil	1 - 1 Vial MeOH/2 Vial Water	14 days	120 mL	3 - 40ml glass vials
Semivolatile Organic Compounds/8270D	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Pesticides/8081B	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Herbicides/8151A	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Polychlorinated Biphenyls/8082A	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Metals/6010D	Soil	Cool, 4 ± 2 °C	180 days	60 mL	1 - 2 oz Glass
Volatile Organic Compounds/8260C	Groundwater	HCl, Cool, 4 ± 2 ^{o}C	14 days	120 mL	3 - 40ml glass vials
1,4-Dioxane	Groundwater	Cool, 4 ± 2 °C	7 days	120 mL	3 - 40ml glass vials
Semivolatile Organic Compounds/8270D	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	2 - 250 mL amber glass
TAL Metals 6020	Groundwater	HNO_3Cool, 4 ± 2 ^{o}C	180 days	500 mL	1 - 500 mL plastic bottle
PFAS 537	Groundwater	H2O Cool, 4 ± 2 °C	14 days	500 mL	2 - teflon free 250 ml plastic containers

Notes:
1. Refer to text for additional information.

APPENDIX C

Emerging Contaminant Field Sampling Plan

PARSONS

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September 14, 2018

Mr. Tracy L. Blazicek, CHMM, PMP
Manager – Programs/Projects
Environmental Remediation
NYSEG
PO Box 5224
Binghamton, NY 13902-5224

Re: New York State Emergent Contaminant Field Sampling Plan and Quality Assurance Project Plan

Dear Mr. Blazicek,

Parsons is pleased to provide Avangrid with this Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) specific to emergent contaminants groundwater sampling in New York State. This FSP is presented in a way that can be applied to any sampling program where per and polyfluoroalkyl substances (PFAS) and 1,4-dioxane will be a required analysis in addition to the existing analyte list already in place for a given site.

1.0 INTRODUCTION

The objective of this PFAS-specific FSP is to outline methods and procedures that will allow consistency in investigatory field activities, in particular, groundwater sample collection and submission for analysis of emergent contaminants. The methods and procedures described in this FSP have been prepared in accordance with the most recent and applicable United States Environmental Protection Agency (USEPA) regulatory guidance and requirements.

One of the target analytes, PFAS, can be found in many standard environmental sampling materials, including: Fluoropolymer bailer/tubing, some decontamination solutions, and pump bladders/valves. One of the principal PFAS contaminants of concern, perfluorooctanoic acid (PFOA), has been broadly utilized in the production of various everyday items such as: waterproof/stain-resistant clothing, non-stick cookware, and many commonly used plastics. Another of the target analytes, 1,4-dioxane, has been used many products including the manufacturing of pharmaceuticals, personal care products, polyethylene terephthalate (PET) plastic, paint strippers, dyes, greases, varnishes and waxes. The field activities and methods herein have been appropriately modified to prevent cross-contamination, and to avoid the introduction of external contaminant sources during field and sampling events. **Table 1** includes a summary of prohibited and acceptable items for PFAS and 1,4-dioxane sampling.

The New York State Specific QAPP is included in **Appendix A** of this document.

2.0 ANTICIPATED FIELD ACTIVITIES

As discussed in **Section 1**, PFAS and 1-4, dioxane can be found in commonly used sampling materials and equipment. Alternative materials such as those listed in Table 1 will be used to reduce the potential for cross-contamination or the introduction of externally-sourced PFAS during sampling events.

2.1 Groundwater Monitoring and Sampling

Groundwater samples may be collected using various methods depending on specific project objectives. These methods may include purging and sampling, or low-flow sampling techniques to collect representative groundwater samples.

SPECIAL PRECAUTIONS FOR PFAS AND 1,4-DIOXANE SAMPLING

Refer to **TABLE 1** for special clothing, personal protection equipment (PPE), supply and equipment requirements for PFAS and 1,4-dioxane sampling.

Bottles for PFAS samples should be stored and shipped to and from laboratory in separate coolers from other bottleware/samples.

DO NOT mix bottleware for PFAS samples with other bottleware to make bottle sets for sample locations.

Change nitrile gloves prior to handling bottles for PFAS analysis and collection of samples for PFAS analysis.

A 1,4-dioxane and PFAS sampling checklist is included as **Appendix B** and should be filled out daily by field personnel.

Hand Bailing

- Equipment and Supplies
    - Well gauging and sampling logs (no weatherproof field books permitted);
    - Project plans;
    - PPE in accordance with the Health and Safety Plan (HASP) and free of PFAS containing products (see **Table 1**);
    - Photoionization Detector (PID), or other monitoring equipment if required by HASP;
    - PFAS free water level probe (see **Table 1** for list of PFAS free equipment);
    - PFAS free electronic oil/water interface probe (see **Table 1** for list of PFAS free equipment);
    - Disposable High-density polyethylene (HDPE) bailers and/or stainless-steel bailers;
    - PFAS-free polypropylene rope;
    - Temperature, conductivity, and pH meter;
    - Turbidity meter;
    - Graduated 5-gallon buckets plus lids;
    - Decontamination supplies;

  - HDPE plastic sheeting;
  - Clear tape, duct tape;
  - Coolers and ice;
  - Laboratory sample bottles, chain of custody, and shipping labels.
- Purging
  - Prior to sampling, the static water level and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
  - Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. Calibration results will be recorded in the field log notebook.
  - Initiate bailing of the well from the bottom. Lower and raise the bailer slowly to avoid causing turbidity. Keep the polypropylene rope on the plastic sheet. Pour the groundwater from the bailer into a graduated 5-gallon bucket to measure the volume withdrawn from the well.
  - Continue bailing the well until at least three well volumes have been removed or until the well is dry. If the well is dry, allow sufficient time for the well to recover before proceeding. Record this information on a Standard Groundwater Sampling Log (**Appendix C**).
  - During the removal of successive well volumes, measure the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log.
- Sampling
  - Keep sample bottles cool and with their caps on until they are ready to receive samples. Sample bottles for PFAS samples should be kept separate from other sample bottles. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QAPP.
  - Minimize agitation of the water in the well; begin sampling by lowering the bailer slowly into the well. Lower it only far enough to fill it completely.
  - Place a sample of well water in a container and measure and record the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log. Turbidity reading should be less than 50

Nephelometric Turbidity Units (NTUs) before sample collection. If turbidity levels remain high, discuss the possibility of having the analytical laboratory filter samples prior to analysis.

- Record the appearance of the groundwater on a Standard Groundwater Sampling Log.
- A PFAS field blank should be collected daily during sampling activities. The PFAS field blank is a PFAS sample bottle pre-filled at the laboratory and sent with the sample bottles. Open the PFAS field blank bottle provided by the analytical laboratory and carefully transfer the contents to the appropriate bottle for the PFAS analysis. Gloves should be changed prior to handling the PFAS field blank bottle.
- When you are ready to fill the bottles, remove them from their transport containers (except for PFAS bottles). Prepare them to receive the samples.
- Samples are transferred directly from the bailer to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it. Samples should be collected in the order specified for the project.
- Inspect labels to see that the samples are properly identified.
- The volatile organic compounds Volatile Organic Compounds (VOC) containers should be filled first with zero headspace, from one bailer, and then securely capped.
- Fill each sample container in accordance with the QAPP or other sampling outline.
- Return each sample bottle to its proper transport container.
- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled (samples should not be allowed to freeze).
- Record the date and time.
- Secure the well head.
- The sample containers will be labeled, placed in a laboratory-supplied cooler (keeping PFAS sample bottles separate from other sample bottles), with protective packaging (*i.e.,* bubble wrap) and packed on ice (to maintain a temperature of 4˚ C). Do not use ice packs.
- A PFAS equipment blank should be collected daily from each sample set-up. The equipment blank is collected by pouring or pumping deionized water provided by the analytical laboratory through sample apparatuses and collecting in appropriate sample bottles. Gloves should be changed prior to collecting the equipment blank sample.
- A temperature blank in the appropriate sample bottle (i.e., no Teflon lined caps for PFAS temperature blank bottles) should accompany each cooler.
- Check that PFAS field blank, and equipment blanks are included in the PFAS designated coolers.

  - The cooler will be shipped overnight or delivered to the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) -certified laboratory for analysis.
  - Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the specific work plan. Samples will be managed in accordance with the QAPP. Chain of Custody procedures will be followed as outlined in the QAPP.

Pumping

- Equipment and Supplies
  - Well gauging and sampling logs (no weatherproof field books permitted);
  - Project plans;
  - PPE in accordance with the HASP and free of PFAS containing products (see **Table 1**);
  - PID, or other monitoring equipment if required by HASP;
  - PFAS-free water level probe (see **Table 1** for list of PFAS-free equipment);
  - PFAS free electronic oil/water interface probe (see **Table 1** for list of PFAS-free equipment);
  - PFAS-free polypropylene rope;
  - Temperature, conductivity, and pH meter;
  - Turbidity meter;
  - Graduated 5-gallon buckets plus lids;
  - Generator
  - PFAS-free peristaltic or bladder pump (See **Table 1** for list of PFAS-free equipment);
  - HDPE plastic tubing (appropriately sized for the chosen peristaltic or bladder pump);
  - HDPE plastic sheeting
  - Clear tape, duct tape;
  - Decontamination supplies;
  - HDPE plastic sheeting;
  - Clear tape, duct tape;
  - Coolers and ice;
  - Laboratory sample bottles, chain of custody, and shipping labels.

- Purging
  - Prior to sampling, the static water level will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurement will be recorded in the field book.
  - Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. Calibration results will be recorded in the field log notebook.
  - Prepare the pump for operation. Follow the manufacturer's directions.
  - Lower the pump intake to just below the top of the water column.
  - Pump the groundwater into a graduated 5-gallon bucket. Continue pumping until at least three well volumes have been removed or the well is pumped dry. Lower the pump's intake as necessary.
  - If the well is pumped dry, allow sufficient time for the well to recover before proceeding. Record this information on a Standard Groundwater Sampling Log (**Appendix C**).
  - During the removal of successive well volumes, measure the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log.
- Sampling
  - Keep sample bottles cool and with their caps on until they are ready to receive samples. Sample bottles for PFAS samples should be kept separate from other sample bottles. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QAPP.
  - Place a sample of well water in a container and measure and record the water temperature, pH, conductivity, and turbidity with calibrated meters. Record the data on the Groundwater Sampling Field Log (**Appendix C**). Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the NYSDEC manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
  - Record the appearance of the groundwater on a Standard Groundwater Sampling Log.
  - A PFAS field blank should be collected daily during sampling activities. The PFAS field blank is a PFAS sample bottle pre-filled at the laboratory and sent with the sample bottles. Open the PFAS field blank bottle provided by the analytical laboratory and carefully transfer the contents to the appropriate bottle for the PFAS analysis. Gloves should be changed prior to handling the PFAS field blank bottle.

- When you are ready to fill the bottles, remove them from their transport containers (except for PFAS bottles). Prepare them to receive the samples.
- Samples are transferred directly to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it. Samples should be collected in the order specified for the project.
- Inspect labels to see that the samples are properly identified.
- Fill each sample container in accordance with the QAPP or other sampling outline.
- Return each sample bottle to its proper transport container.
- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.
- Close the PFAS field blank bottle and return it to the PFAS designated cooler. Be sure to change gloves prior to handling the PFAS field blank bottle. Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- The sample containers will be labeled, placed in a laboratory-supplied cooler (keeping PFAS sample bottles separate from other sample bottles), with protective packaging (*i.e.,* bubble wrap) and packed on ice (to maintain a temperature of 4˚ C). Do not use ice packs.
- A PFAS equipment blank should be collected daily from each sample set-up. The equipment blank is collected by pouring or pumping deionized water provided by the analytical laboratory through sample apparatuses and collecting in appropriate sample bottles. Gloves should be changed prior to collecting the equipment blank sample.
- A temperature blank in the appropriate sample bottle (i.e., no Teflon lined caps for PFAS temperature blank bottles) should accompany each cooler.
- Check that PFAS field blank, and equipment blanks are included in the PFAS designated coolers.
- The cooler will be shipped overnight or delivered to the ELAP-certified laboratory for analysis.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP. Chain of Custody procedures will be followed as outlined in the QAPP.

Low Flow Purging and Sampling

- Equipment and Supplies
  - Well gauging and sampling logs (no weatherproof field books permitted);
  - Project plans;
  - PPE in accordance with the HASP and free of PFAS containing products (see **Table 1**);
  - PID, or other monitoring equipment if required by HASP;
  - PFAS-free water level probe (see **Table 1** for list of PFAS-free equipment);
  - PFAS-free electronic oil/water interface probe (see **Table 1** for list of PFAS-free equipment);
  - Polypropylene rope;
  - Temperature, conductivity, and pH meter;
  - Turbidity meter;
  - Graduated 5-gallon buckets;
  - PFAS-free peristaltic or bladder pump capable of achieving flow rates of 0.5 liters per minute or less (see **Table 1** for list of PFAS-free equipment);
  - HDPE plastic tubing (appropriately sized for the chosen peristaltic or bladder pump);
  - Flow-through cell;
  - Generator;
  - Extension cords;
  - Decontamination supplies;
  - HDPE plastic sheeting;
  - Clear tape; duct tape
  - Coolers and ice;
  - Laboratory sample bottles, chains of custody, and shipping labels.
- Purging
  - Equipment will be decontaminated prior to use at each location.
  - Prior to sampling, the static water level will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. NAPL thickness will be confirmed using a clear PFAS-free bailer or a weighted string. The measurements will be recorded on the field data sheets.

- Prior to commencing sampling activities and daily thereafter, the groundwater quality monitoring probes/meters including pH, conductivity, oxidation reduction potential (ORP), dissolved oxygen, and turbidity will be calibrated in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. The dissolved oxygen probe will be checked against a zero-dissolved oxygen solution. In addition, the dissolved oxygen calibration will be corrected for local barometric pressure and elevation. Calibration results will be recorded on the field data sheets.

- The intake of the peristaltic or bladder pump will be positioned in the center of the screened interval and the upper end of the tubing will be connected to the flow-through cell. Flow-rate shall not exceed 0.5 liters/min (500 ml/min). Initially, a flow-rate between 200 ml/min and 500 ml/min will be used. The drawdown will be monitored using a water-level probe and the flow-rate will be reduced if the drawdown exceeds 0.3 feet. Efforts should be made to minimize the generation of air bubbles in the sample tubing by either increasing the flow rate as appropriate or restricting flow by clamping the tubing.

- During purging pH, specific conductivity, temperature, ORP (redox), dissolved oxygen, and turbidity will be monitored and recorded at time intervals sufficient to evacuate the volume of the flow-through cell. This information along with water-level readings to monitor drawdown will be recorded on a Low-Flow Groundwater Sampling Log (**Appendix C**).

- Well sampling will commence after equilibration of water quality parameters. The equilibration guidelines are as follows:

Temperature	± 3% of measurement
pH	± 0.1 pH units
Specific conductance	± 3% of measurement
Redox	±10 mV
DO	±10% of measurement
Turbidity*	± 10% of measurement

1. Turbidity readings should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the NYSDEC manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
2. If the water level will not stabilize even at lower flow rates, then the well will not be able to be sampled using the low flow method. In this situation, the well will be pumped to dryness and the water will be allowed to recover prior to collection of the sample. Purge water will be containerized for characterization and disposal in accordance with the overall Field Sampling Plan.

Sampling

- Prior to filling the sample bottles, the temperature, pH, dissolved oxygen, conductivity, and ORP will be measured within a flow-through cell. Turbidity will be measured with a hand-held turbidity meter. All measurements will be recorded on a Low Flow Groundwater Sampling Log. Turbidity reading should be less than 50 NTUs before sample collection. If turbidity levels remain high, consult the Project Manager to discuss the possibility of having the analytical laboratory filter samples prior to analysis.
- Prior to collecting the sample, the flow-through cell will be disconnected from the tubing.
- Laboratory provided sample containers appropriate to meet USEPA requirements for each analysis will be used. Groundwater will be allowed to flow from the tubing into the sample container carefully to limit aeration of the sample. If preservative is present in a container, the container will not be overfilled.
- Keep sample bottles cool and with their caps on until they are ready to receive samples. Sample bottles for PFAS samples should be kept separate from other sample bottles. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement as specified in the QAPP.
- Record the appearance of the groundwater on a Standard Groundwater Sampling Log.
- A PFAS field blank should be collected daily during sampling activities. The PFAS field blank is a PFAS sample bottle pre-filled at the laboratory and sent with the sample bottles. Open the PFAS field blank bottle provided by the analytical laboratory and carefully transfer the contents to the appropriate bottle for the PFAS analysis. Gloves should be changed prior to handling the PFAS field blank bottle.
- When you are ready to fill the bottles, remove them from their transport containers (except for PFAS bottles). Prepare them to receive the samples.
- Samples are transferred directly to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it. Samples should be collected in the order specified for the project.
- Inspect labels to see that the samples are properly identified.
- Fill each sample container in accordance with the QAPP or other sampling outline.
- Return each sample bottle to its proper transport container.
- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.

- Close the PFAS filed blank bottle and return it to the PFAS designated cooler. Be sure to change gloves prior to handling the PFAS field blank bottle. Samples must not be allowed to freeze.
- Record the date and time.
- Secure the well head.
- The sample containers will be labeled, placed in a laboratory-supplied cooler (keeping PFAS sample bottles separate from other sample bottles), with protective packaging (*i.e.,* bubble wrap) and packed on ice (to maintain a temperature of 4° C). Do not use ice packs.
- A PFAS equipment blank should be collected daily from each sample set-up. The equipment blank is collected by pouring or pumping deionized water provided by the analytical laboratory through sample apparatuses and collecting in appropriate sample bottles. Gloves should be changed prior to collecting the equipment blank sample.
- A temperature blank in the appropriate sample bottle (i.e., no Teflon lined caps for PFAS temperature blank bottles) should accompany each cooler.
- Check that PFAS field blank, and equipment blanks are included in the PFAS designated coolers.
- The cooler will be shipped overnight or delivered to the ELAP-certified laboratory for analysis.
- Samples for laboratory analysis will be submitted to an approved NYSDOH ELAP-certified laboratory. Analyses will be conducted using USEPA methodologies as specified in the Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP. Chain of Custody procedures will be followed as outlined in the QAPP.

Sincerely,

PARSONS

Sara M. Weishaupt

Sara Weishaupt
Project Manager

cc: Heather Phillip, Parsons

Enc: Table 1 – Prohibited and Acceptable Items for Emergent Contaminant Sampling
Appendix A – New York State Specific Quality Assurance Project Plan – Emergent Contaminant Sampling
Appendix B – 1,4 Dioxane and PFAS Sampling Checklist
Appendix C – Standard Groundwater Sampling Log

Table 1

Table 1
Prohibited and Acceptable Items for Emergent Contaminant Sampling

Prohibited	Acceptable
Field Equipment	
Teflon® containing materials	High Density High density polyethylene (HDPE), stainless steel or polypropylene materials
Low density polyethylene (LDPE) materials	Acetate liners Silicone Tubing
Waterproof field books, waterproof paper and waterproof sample bottle labels	Loose non-waterproof paper and non-waterproof sample labels
Waterproof markers / Sharpies®	Pens
Post-It Notes®	Tape; loose leaf paper
Chemical (blue) ice packs	Wet Ice
Field Clothing and PPE	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing Gore-TexTM	Well-laundered clothing made of natural fibers (preferable cotton)
Clothing laundered using fabric softener	No fabric softener
Boots containing Gore-TexTM or treated with water-resistant sprays	Boots made with polyurethane and PVC
Coated Tyvek®	Laundered cotton clothing
No cosmetics, moisturizers, hand cream, or other related products as part of personal leaning/showering routine on the morning of sampling	Sunscreens - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss My Face, and baby sunscreens that are "chemical free", "toxin free", or "natural"
Sunscreens or insecticides except as noted on right	Insect Repellents - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, Baby Ganics Sunscreen and insect repellant - Avon Skin So Soft Bug Guard Plus - SPF 30 Lotion
Sample Containers	
LDPE or glass containers	HDPE or polypropylene
Teflon®-lined caps	Unlined polypropylene caps
Rain Events	
Waterproof or resistant rain gear	Wet weather gear made of polyurethane and PVC only; field tents that are only touched or moved prior to and following sampling activities
Equipment Decontamination	
Decon 90® Water from an on-site well	Alconox® and/or Liquinox®

Table 1
Prohibited and Acceptable Items for Emergent Contaminant Sampling

Prohibited	Acceptable
Food Considerations	
All food and drink, with exceptions noted on right	Bottled water and hydration fluids (i.e., Gatorade® and Powerade®) to be brought and consumed only in the staging areas
Vehicle Considerations	
Vehicle fabrics, carpets and mats may contain PFASs	Avoid utilizing areas inside vehicle as sample staging areas.

Appendix A

New York State Specific Quality Assurance Project Plan – Emergent Contaminant Sampling

New York State Specific
Quality Assurance Project Plan (QAPP)

Prepared For:

AVANGRID
89 East Avenue
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Prepared By:

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Syracuse, NY 13212

September 2018

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LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
BFB	4-Bromofluorobenzene
ºC	Degrees Celsius
CAR	Corrective Action Request
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm/s	centimeter per second
cy	cubic yards
DER	Division of Environmental Remediation
DFTPP	decafluorotriphenylphosphine
DOT	Department of Transportation
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
EIMS	Environmental Information Management System
FSP	Field Sampling Plan
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detection
GC/MS	Gas Chromatography/Mass Spectroscopy
ICP	Inductively Coupled Plasma
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
ICP/AES	Inductively Coupled Plasma/Atomic Emission Spectroscopy
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System

LIST OF ACRONYMS
(CONTINUED)

LNAPL	Light Non-aqueous Phase Liquid
LPM	Laboratory Project Manager
MD	Matrix Duplicate
MDL	method detection limit
mg/kg	milligram per kilogram
mL	milliliter
MS	Matrix Spike
MSB	Matrix Spike Blank
MS/MD	Matrix Spike/Matrix Duplicate
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSD	Matrix Spike Duplicate
NCM	Nonconformance Memo
ng	nanograms
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM	Operations Manager
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
PE	Performance Evaluation
PFAS	Polyfluoroalkyl Substances
PFOA	perflourooctanoic acid
PID	photoionization detector
PQL	practical quantitation limit
PRRL	Project Required Quantitation Limit
PT	Performance Testing
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control

LIST OF ACRONYMS
(CONTINUED)

QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
ug	micrograms
USEPA	Unites States Environmental Protection Agency
VOC	Volatile Organic Compound
VTSR	validated time of sample receipt

SECTION 1

PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared to support activities and specifies quality assurance/quality control (QA/QC) procedures for field sampling and laboratory measurements of polyfluoroalkyl substances (PFAS) pertaining to AVANGRID sites regulated by the New York State Department of Environmental Conservation (NYSDEC). The specific objectives of the QAPP are:

- Foster data quality that is sufficient to meet the investigation objectives and to support the decision-making process; and
- Provide a standard for control and review of measurement data to confirm that the data are scientifically sound, representative, comparable, defensible, and of known quality.

This QAPP has been prepared in accordance with USEPA guidance (USEPA, 2000a, 2002b). Project or site specific work plans will have additional scope and quality requirements that may not be addressed in this QAPP.

Project scope and descriptions of the work assignment are provided in the work plans and Field Sampling Plan (FSP). The target analytes, polyfluoroalkyl substances (PFAS), can be found in many standard environmental sampling materials, including: Fluoropolymer bailer/tubing, some decontamination solutions, and pump bladders/valves. One specific PFAS compound, perflourooctanoic acid (PFOA), has been broadly utilized in the production of various everyday items such as: waterproof/stain-resistant clothing, non-stick cookware, and many commonly used plastics. The field activities and methods herein have been appropriately modified to prevent cross-contamination, and to avoid the introduction of external contaminant sources.

SECTION 2

PROJECT ORGANIZATION

2.1 PROJECT AND TEAM ORGANIZATION

The project organization and the function and responsibility of each group affected by the QAPP are presented in the site work plans or scoping documents. The project organization is designed to promote the exchange of information and for efficient project operation. Key contact information is also summarized in the scoping documents.

2.1.1 Analytical Services

The analytical laboratory (or laboratories) will analyze environmental samples collected from the AVANGRID PFAS sites. Laboratory operations will be conducted under the supervision of a general manager or laboratory director and a quality assurance manager. A project manager and alternate will be assigned. The project manager will be the primary point of contact and will be responsible for coordination and quality of all laboratory activities associated with the project. The laboratory's project manager will manage project sample receipt, analysis scheduling, and data reporting. In case of temporary absence, the direct supervisor will assume the responsibilities of the absent employee or delegate the responsibility to qualified personnel. Sample Management Staff is responsible for receiving, logging, and maintaining internal custody of samples during the sample's residence in the laboratory. In addition, the laboratory will ensure that project analytical requirements are met; monitor project analytical compliance and immediately notify Parsons if conflict or discrepancies arise; initiate and implement appropriate corrective actions; ensure adequate quality review of deliverables prior to release; and participate in coordination meetings.

2.2 SPECIAL TRAINING/CERTIFICATION

Management and field personnel must review the requirements of this QAPP to make certain that persons assigned to specific tasks have appropriate credentials and experience. The Field Team Leaders will check that all onsite personnel have read and understood the QAPP.

Field personnel will be required to adhere to the project Health and Safety Plan (HASP) and FSP. They must also follow applicable task-specific health and safety plans that project subcontractors develop before they begin investigation activities.

Laboratories will have trained and experienced staff capable of performing the analyses specified in this QAPP. Laboratories will have New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certification for all project analyses where applicable. Additionally, the laboratories must be able to demonstrate that they have analyzed performance-evaluation or proficiency-testing samples within 12 months of beginning the analyses.

All personnel independent of the laboratory generating the data who are performing data validation and verification must have experience in data validation, quality assurance oversight, and auditing. The data validator must have a Bachelor's degree in chemistry or natural sciences with a minimum of 20 credit hours in chemistry; one year experience in the implementation and application of analytical laboratory methodologies; and one year experience evaluating data packages of all matrices (e.g., soil, water, air, tissue) for compliance and usability with respect to the USEPA National Functional Guidelines with regional modifications.

SECTION 3

DATA QUALITY OBJECTIVES AND DATA QUALITY CRITERIA

3.1 INTRODUCTION

A systematic planning process will develop site-specific data quality objective (DQOs). These DQOs will clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential errors. These parameters, in turn, will be the basis for establishing the quality and quantity of data needed to support the utility of the data. This section was prepared in accordance with USEPA Guidance for the Data Quality Objectives Process (USEPA, August 2000). Project DQOs will be developed using the “seven-step” DQO process, consisting of the following steps:

Step 1: State the problem
Step 2: Identify the decision
Step 3: Identify inputs to the decision
Step 4: Define the study boundaries
Step 5: Define the decision rule
Step 6: Specify tolerable limits of decision error
Step 7: Optimize the design

Data quality objectives specify the underlying reason for collecting the data and the data type, quality, quantity, and uses needed to make decision, and they provide the basis for designing data collection activities. DQOs and quality assurance objectives are related data quality planning and evaluation tools for all sampling and analysis tools.

The purpose of this QAPP is to provide a standard for control and review of measurement data to ensure they are scientifically sound, representative, comparable, defensible, and of known quality. The data will be used to evaluate the physical and chemical attributes of samples collected. The project objective for analytical testing is to characterize the physical characteristics and chemical constituents and to provide data to support the decision-making process.

The data produced during sampling activities will be compared with the defined QA objectives and criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) to see that the data reported are representative of actual conditions at the site.

This data assessment activity is an on-going coordinated process with data production and is intended to assure that data produced during the project are acceptable for use in subsequent evaluations. Both statistical and qualitative evaluations will be used to assess the quality of the data. The primary evaluation of the data will be based upon the field quality control samples described in Section 8.1.1 and the laboratory quality control samples described in Section 8.1.2. The “blank” samples (laboratory QC blank samples and field QC blank samples) will be used to evaluate whether or not the laboratory and/or the field team’s procedures for handling of samples represent a possible source of sample contamination. Laboratory duplicate sample results will be used to evaluate analytical precision. Field duplicate sample results will be used to evaluate the overall precision of the sampling and analysis process, as well as sample representativeness and site heterogeneity. Laboratory control samples will be used to evaluate the accuracy of analytical results, as well other analysis-specific criteria, such as surrogate compound recoveries for PFAS. Matrix spike/matrix spike duplicate (MS/MSD) analysis of project samples will be used to evaluate potential sample matrix effects on the analytical results (both of the sample utilized for MS/MSD and of other samples collected from the site). For all sample results, the impact of sample-specific, analysis-specific, and site-specific factors will be evaluated and an assessment will be made as to their impact, if any, on the data. Duplicate sample (field and laboratory QC samples) results will be used to evaluate data precision.

3.1.1 Data Use Objectives

Data use objectives define why analyses are being conducted and how ultimately the data will be used to meet the overall project objectives. For the AVANGRID PFAS activities, these project objectives are stated in the scoping documents or project work plans.

3.2 DATA QUALITY OBJECTIVES (PARCCS PARAMETERS)

3.2.1 Introduction

DQOs are based on the premise that different data uses require different levels of data quality. The term *data quality* refers to a degree of uncertainty with respect to PARCCS data quality indicators. Specific objectives are established to develop sampling protocols and identify applicable documentation, sample handling procedures, and measurement system procedures. These DQOs are established by onsite conditions, objectives of the project, and knowledge of available measurement systems. Overall work assignment DQOs are presented and discussed in detail in this QAPP. A wide range of data quality is achieved through the use of various analytical methods. The following data quality levels are widely accepted as descriptions of the different kinds of data that can be generated for various purposes:

- **Level I, Field screening or analysis using portable instruments (e.g., photoionization detector [PID]):** Results are often not compound-specific but results are available in real time. Depending on the analysis being performed and the instrumentation used, the results may be considered qualitative, semi-quantitative, or quantitative.
- **Level II, Field analysis using more sophisticated portable analytical instruments (e.g., on-site mobile laboratory):** There is a wide range in the quality of data that can be generated depending on the use of suitable calibration standards, reference materials, and sample preparation equipment. Results are available in real-time or typically within hours of sample collection.

- **Level III, All analyses performed in an off-site analytical laboratory using methods other than USEPA-approved analytical methods**: These data generally do not include the level of formal documentation required under Level IV and are not subject to formal data validation. These data are typically used for engineering studies (e.g., treatability testing), site investigations and remedial design.
- **Level IV, Data generated using USEPA methods and enhanced by a rigorous QA program, supporting documentation, and data validation procedures:** These data are typically used for engineering studies (e.g., treatability testing), risk assessment, site investigations, and remedial design, and may be suitable for litigation/enforcement activities. Results are both qualitative and quantitative.

Project data quality level requirements for sample analyses have been determined to be as follows:

- Level I data quality will be obtained for field screening data collected with portable instruments such as pH meters, temperature probes, and Photoionization Detectors (PIDs) which will be used for health and safety and field operational monitoring. In addition, these instruments or field test kits may be used to produce data for determining where to collect a sample to assess impacts and for field screening of samples to be designated for laboratory confirmation analyses.
- A Level II data quality assurance program will be executed by the field team for obtaining data.
- A Level III data quality assurance program will be executed by the laboratory for chemical analyses not required to be Level IV, such as pH.
- A Level IV data quality assurance program will be executed, in general, by the laboratory for chemical analyses necessary to meet the work assignment objectives.

3.2.2 PARCCS Parameters (Data Quality Indicators)

3.2.2.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), absolute difference (D), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

The objectives for precision for each chemical are based on the capabilities of the approved EPA analytical method with respect to laboratory performance. For this project, field-sampling precision will be determined by analyzing coded (blind) duplicate samples for the same parameters, and then, during data validation, calculating the %RPD for duplicate sample results. Field duplicate precision criteria for the water samples will be 30%RPD. The laboratory will determine analytical precision by calculating the %RPD or %D, as applicable to the analytical method being used, e.g., pH will be evaluated using %D.

The laboratory will determine analytical precision by calculating the RPD for the results of the analysis of the laboratory duplicates and matrix spike duplicates. The formula for calculating %RPD is as follows:

$$\%RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD	=	Relative percent difference
V1, V2	=	Values to be compared
|V1 - V2|	=	Absolute value of the difference between the two values
(V1 + V2)/2	=	Average of the two values

For data evaluation purposes, in instances where both sample concentrations are less than five times (<5x) the RL, duplicate precision will be evaluated using the calculated %D result. In this instance, the applicable precision criterion will be two times the RL (2xRL). If a value is not detected, the %RPD criterion will be considered to be not applicable and the %RPD will not be calculated (i.e. precision will not be quantitatively determined). The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, are presented in Table 3.1.

3.2.2.2 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987) or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity that is recovered or measured. The recovery of a given analyte depends on the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are less than the quantitation limits are less accurate because they are more affected by such factors as instrument "noise." Higher concentrations will not be as affected by instrument noise or other variables and, thus, will be more accurate.

The objectives for accuracy for each chemical are based on the capabilities of the approved USEPA analytical method with respect to laboratory performance. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), the percent recoveries of matrix spike compounds added to selected samples, and the percent recoveries of spike compounds added to laboratory control samples (LCS). An LCS will be analyzed to provide additional information on analytical accuracy. Additionally, initial and continuing calibrations must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a *spike,* added to a sample (matrix spike or laboratory control). The accuracy on a per sample basis will be measured using surrogates for the organics analyses. The %R is calculated as follows:

Matrix Spike Recovery:

$$\% \text{ Recovery} = \frac{SSR - SR}{SA} \times 100$$

where:

%R = Percent recovery

SSR = Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added

SR = Sample result: the background value; *i.e.*, the concentration of the analyte obtained by analyzing the sample

SA = Spiked analyte: concentration of the analyte spike added to the sample

Surrogate Recovery:

$$\% \text{ Recovery} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) spiked}} \times 100$$

LCS Recovery:

$$\% \text{ Recovery} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) spiked}} \times 100$$

The acceptance limits for accuracy for each parameter are presented in Table 3.1.

3.2.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or an environmental condition. Representativeness is a qualitative parameter and is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. An important factor in the selection of sample locations and sampling procedures will be obtaining representative samples.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree technically possible, that the data derived represents the in-place quality of the material sampled. Care will be exercised to see that chemical compounds are not introduced to the sample from sample containers, handling, and analysis. Field blanks, equipment rinse blanks, trip blanks, and laboratory method/prep blanks will be analyzed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded (blind) field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis such that the reported results are representative of the sample received. Chain-of-custody procedures will be followed to document the possession of sample containers from the time of container preparation through sample collection and receipt back at the laboratory. Field QC samples will be collected and analyzed to provide information to evaluate sample representativeness. Details of field QC sample collection (field blanks, equipment rinse blanks, trip blanks, temperature blanks, field duplicates) and chain-of-custody procedures are presented in Section 4.2 and Section 8.1.1.

3.2.2.4 Completeness

Completeness is defined as the percentage of measurements that meet the project's data quality objectives (USEPA, 1987). Completeness is calculated for each method (or analyte) and sample matrix for an assigned group of samples. Completeness for a data set represents the results usable for data interpretation and decision making. The completeness objective for the analytical and field data is 95%. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness

V = Number of measurements judged valid (not rejected during data validation)

T = Total number of measurements

Completeness, which is expressed as a percentage, is calculated by subtracting the number of rejected and unreported results from the total planned results and dividing by the total number of results. Results rejected because of out-of-control analytical conditions, severe matrix effects, broken or spilled samples, or samples that could not be analyzed for any other reason, negatively affect influence completeness and are subtracted from the total number of results to calculate completeness.

3.2.2.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be managed by:

- Using identified standard methods (including laboratory standard operating procedures) for both sampling and analysis phases of this project
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST)
- Requiring that calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable)
- Using standard reporting units and reporting formats including the reporting of QC data
- Performing data validation on the analytical results, including the use of data qualifiers in all cases where appropriate
- Evaluating the sample collection information and analytical QC sample results
- Requiring that the significance of all validation qualifiers be assessed any time an analytical result is used for any purpose.

By taking these steps during the investigation, future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

3.2.2.6 Sensitivity and Quantitation Limits

When selecting an analytical method during the DQO process, the achievable detection limit (MDL) and method reporting limit (RL) must be evaluated to verify that the method will meet the project quantitation limits necessary to support project decision making requirements. This process ensures that the analytical method sensitivity has been considered and that the methods used can produce data that satisfy users’ needs while making the most effective use of resources. The concentration of any one target compound that can be detected and/or quantified is a measure of sensitivity for that compound. Sensitivity is instrument, compound, method, and matrix specific and achieving the required project quantitation limit (RL) and/or method detection limit (MDL) objectives depends on instrument sensitivity and potential matrix effects. With regard to instrument sensitivity, it is important to monitor the instrument performance to ensure consistent instrument performance at the low end of the calibration range. Instrument sensitivity will be monitored through the analysis of method/prep blanks, calibration check samples, and low standard evaluations.

Laboratories generally establish limits that are reported with the analytical results; these results may be called reporting limits, detection limits, quantitation limits, or other terms. These laboratory-specific limits, apply undiluted analyses and must be less than or equal to the project RLs. The RL, also known as the practical quantitation limit (PQL), represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and with confidence in both identification and quantitation. Throughout various documents RL and PQL may be interchanged, but they effectively have the same meaning. The RLs are established based on specific knowledge about the analyte, sample matrix, project specific requirements, and regulatory requirements. The RL is typically established by the laboratory at the level of the lowest calibration standard and is generally in the range of two to ten times the MDL.

The MDL is defined as "the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results" (40 CFR 136 Appendix B). MDLs are experimentally determined and verified for each target analyte of the methods in the sampling program. The laboratory will determine MDLs for each analyte and matrix type prior to analysis of project samples. In addition, when multiple instruments are employed for the analysis of the same method, each individual instrument will maintain a current MDL study. MDLs are statistically calculated in accordance with the Title 40, Code of Federal Regulations Part 136 (40 CFR 136) as promulgated in September 2017. If risk-based project objectives are developed, then where practicable, MDLs must be lower than the risk-based criteria determined for the project.

Laboratory RLs and MDLs for all analyses will meet at a minimum the standards criteria specified in the NYSDEC 6 NYCRR Part 375 Soil Cleanup Objectives for Unrestricted Use and/or the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations."

All analytical results will be reported to the MDL. Analytical results below the MDL will be flagged with a *U* at the RL to indicate the data are non-detect. However, the laboratory will flag analytes detected at a level less than the RL but greater than the MDL (or the laboratory's determined minimum reportable concentration) with a *J* to denote an estimated concentration.

When results are corrected for dry weight, the reporting limits are then elevated accordingly. To compensate for the low solids, modifications are made either to increase the initial volume extracted/digested or to reduce the final volume of extract/digestate.

For samples that do not meet the project-specified RLs or MDLs, (taking into consideration elevated detection limits due to percent solids or percent moisture and aliquots used for the designated analysis), the laboratory must make available compelling documentation (e.g., screening data) and a justifiable explanation for its inability to meet the specified limits using the project protocols. It must also provide an appropriate, justifiable explanation of the issues and resolution in the analytical report/data package (dilution factor, interference, etc.). Excessive, unnecessary dilutions on any sample for a project are unacceptable. The laboratory will analyze all samples initially undiluted, unless for gas chromatography/mass spectroscopy (GC/MS) analyses (i.e., SW8260C and SW8270D), a preliminary GC-screen is performed and indicates that GC/MS instrument damage or compromise may occur if the sample is not analyzed initially at dilution. In this instance, the sample will be analyzed at the lowest possible dilution factor. If multiple extractions/ analyses are performed (such as undiluted and diluted analyses), resulting in several data sets for the same sample, the laboratory will report all data and results from each of the multiple analyses in the data package.

Quantitation limits for all definitive data quality level laboratory analytical methods, compounds, and matrices are presented in Table 3.2.

TABLE 3.1
QUALITY CONTROL LIMITS FOR WATER SAMPLES

			Laboratory Accuracy and Precision				
Analytical Parameters	**Analytical Method**	**Matrix Spike (MS) Compounds**	**MS/MSD (a) % Recovery**	**MS/MSD RPD (b)**	**LCS (c) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
PFAS	537 modified	all PFAS	70-130 or lab QC limit	0-20 or lab QC limit	70-130	Select tracer PFAS	Lab QC Limit

(a) Matrix Spike/Matrix Spike Duplicate

(b) Relative Percent Difference

(c) Laboratory Control Sample

NA - Not Applicable

TABLE 3.2
QUANTITATION LIMITS
AVANGRID NYSDEC PFAS SITES

CAS NO.	COMPOUND	NYSDEC Class GA Ambient Water Quality Standards/Guidance Criteria (1)	Quantitation Limit	UNITS
Per- and Polyfluoroalkyl substances (Modified EPA Method 537)				
2355-31-9	2-(N-methyl perfluorooctanesulfonamido) acetic acid	NS	20	ng/L
27619-97-2	6:2 Fluorotelomer sulfonate	NS	2	ng/L
39108-34-4	8:2 Fluorotelomer sulfonate	NS	2	ng/L
2991-50-6	N-Ethyl-N-((heptadecafluorooctyl)sulphonyl) glycine	NS	20	ng/L
375-73-5	Perfluorobutanesulfonic acid (PFBS)	NS	2	ng/L
375-22-4	Perfluorobutanoic Acid	NS	2	ng/L
	Perfluorodecane Sulfonic Acid	NS	2	ng/L
335-76-2	Perfluorodecanoic acid (PFDA)	NS	2	ng/L
307-55-1	Perfluorododecanoic acid (PFDoA)	NS	2	ng/L
375-92-8	Perfluoroheptane Sulfonate (PFHPS)	NS	2	ng/L
375-85-9	Perfluoroheptanoic acid (PFHpA)	NS	2	ng/L
355-46-4	Perfluorohexanesulfonic acid (PFHxS)	NS	2	ng/L
307-24-4	Perfluorohexanoic acid (PFHxA)	NS	2	ng/L
375-95-1	Perfluorononanoic acid (PFNA)	NS	2	ng/L
754-91-6	Perfluorooctane Sulfonamide (FOSA)	NS	2	ng/L
1763-23-1	Perfluorooctanesulfonic acid (PFOS)	70	2	ng/L
335-67-1	Perfluorooctanoic acid (PFOA)	70	2	ng/L
2706-90-3	Perfluoropentanoic Acid (PFPeA)	NS	2	ng/L
376-06-7	Perfluorotetradecanoic acid (PFTA)	NS	2	ng/L
72629-94-8	Perfluorotridecanoic Acid (PFTriA)	NS	2	ng/L
2058-94-8	Perfluoroundecanoic Acid (PFUnA)	NS	2	ng/L

NOTES:

(1) Groundwater criteria obtained from the NYSDEC document entitled, "Division of Water Technical and Operational Gidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwter Effluent Limitations, June 1998; Errata Sheet for June 1998 Edition.

ng/L Nanograms per liter

NS No Standard

SECTION 4

DATA ACQUISITION

4.1 SAMPLING METHODS

Any non-disposable sampling equipment used for chemical sampling will be cleaned and decontaminated prior to use to prevent potential cross-contamination between each use. The project Field Activities Plan documents standard operating procedures, best practices, and field decontamination methods to mitigate cross contamination. Additionally, this QAPP describes management, handling, and tracking procedures for investigation-derived waste, including solid and liquid materials, and personal protective equipment.

The special precautions described here will be taken to confirm that each sample collected is representative of the conditions at that location and that the sampling and handling procedures neither alter nor contaminate the sample. If failure in the sampling or measurement system occurs, the procedures specified in Section 10.3 of this QAPP will be followed to identify who is responsible for implementing the appropriate corrective action. This section presents sample container preparation procedures, sample preservation procedures, and sample holding times.

For this program, the laboratory will purchase and distribute certified clean sample containers with chemical preservatives. The sample containers used for chemical analysis must be virgin bottleware, I-Chem^{TM} Series 300 (or equivalent). Vendors are required to provide documentation of analysis for each lot of containers, and the documentation will be kept on file at the laboratory. Alternatively, the laboratory may perform testing to certify that the sample containers are not contaminated. Since the containers supplied by the laboratory will be certified clean, the bottles will not be rinsed in the field prior to use.

Laboratory-supplied sample kits (coolers containing field chain-of-custody forms, custody seals, sample containers, preservatives, and packing material) will be prepared by the laboratory's Sample Management Staff and shipped to the Field Team Leader. The type of containers, required sample volumes, preservation techniques, and holding times for specific analyses are presented in the Table 4.1.

Samples requiring chemical preservation will be collected in sample containers provided by the analytical laboratory that already contain sufficient quantities of the appropriate preservative(s) to ensure that the sample is kept in accordance with the method requirements. The laboratory must provide an adequate amount of pre-preserved bottles with traceable high-purity preservatives, and additional preservative for use if the added amount is not sufficient, based on request by the Field Team Leader and on an as-needed basis if additional bottleware is needed during the field activities. The field team must verify that the preservative has been added appropriately.

TABLE 4.1

WATER SAMPLE CONTAINERIZATION, PRESERVATION, AND HOLDING TIMES

Analysis	Bottle Type	Preservation (a)	Holding Time (b)
PFAS	2-250 mL HDPE	Cool to 4°C	14 days for extraction, 40 days for analysis

(a) All samples to be preserved in ice during collection and transport.

(b) Days from sample collection.

4.2 SAMPLE HANDLING AND CUSTODY

This section presents sample handling and custody procedures for both the field and laboratory. Implementation of proper handling and custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the chain of custody and transfer of samples will be trained as to the purpose and procedures prior to implementation. For transfer of samples within the laboratory, an internal chain of custody will be required.

4.2.1 Sample Handling

Samples to be collected for the work assignment are specified in the work plan and FSP. After the samples are collected, they will be split as necessary among preserved containers appropriate to the parameters to be analyzed. Each container will be provided with a sample label that will be filled out at the time of collection. The sampler will print label information, specified below, on each label either before or immediately after collecting the sample with an indelible writing instrument. The label will be protected from water and solvents with clear label packing tape.

The following information, at a minimum, is required on each sample label (note: the location ID and the sample ID as described in the Data Management section below inherently identify some of this information, see below):

- Client
- Project name
- Sampling location
- Sample number
- Date and time of sample collection
- Parameters to be analyzed
- Preservative(s) added, if any
- Initials of the sampler.

Following sample collection, excess soil, water, etc., will be wiped from the outside of the sample containers with a paper towel and the lids will be checked to verify they are tightly closed. Each glass container will be wrapped with bubble wrap to minimize breakage during transport. Bottles containing soil, sediment, and water samples will be placed in separate Ziploc® bags (one bag) and set on ice (ice bath not necessary). Documentation of equipment and methods used in the field for treating the samples will be maintained in the field logs, and a chain of custody will be initiated to document transfer of the samples from the field team to the laboratory. In preparation for shipment to the analytical laboratory, the shipment cooler will be packaged as follows:

- Fill a dry shipment cooler with inert cushioning to a depth of 1 inch to prevent bottle breakage. A separate shipment cooler will be used for PFAS samples.
- Place the bagged samples and the laboratory-provided temperature blank upright in the sample cooler. The temperature blank should be placed in the center (horizontally and vertically) with the samples surrounding.
- Place additional cushioning material around the sample bottles as necessary.
- Place bags of ice in the remaining void space to keep the samples cooled to 4°C.
- Complete the chain-of-custody form (see Section 4.2.2). Place the chain-of-custody form in a polyethylene, sealable bag (such as a 1-gal Ziploc® bag or equivalent) and tape the bag to the interior of the cooler lid. Field personnel retain a copy of the chain-of-custody form; another copy is transmitted to the Quality Assurance Officer (QAO) and the Project Manager specified.
- Prior to sealing for shipment, the list of samples will be checked against the container contents to verify the presence of each sample listed on the chain-of-custody record including the temperature blank.
- Affix a custody seal to the cooler.
- Seal the cooler securely with packing tape, taking care not to cover labels if already present.
- Label the cooler appropriately in accordance with the Department of Transportation (DOT) regulations (49 CFR 171 through 179).
- Ship the samples in accordance with the DOT requirements outlined in 49 CFR 171 through 179. Complete the carrier bill of lading and retain a copy on file.
- Samples will be delivered to the laboratory by the most expedient means to meet holding times. Whenever practicable, samples will be shipped on the day of collection for delivery to the laboratory the morning of the day after collection. The laboratory will be required to adhere to holding times for sample analyses. Laboratory performance requirements for analysis turnaround time will be established using the validated time of sample receipt (VTSR) in accordance to NYSDEC requirements. The field team will carefully coordinate sampling activities with the laboratory to see that holding times are met.

The required holding times must be adhered to for the initial sample preparation/analysis. If subsequent reanalysis or re-extraction becomes necessary because of method requirements or additional requirements stated here, the laboratory will make every effort to perform those re-extractions and/or reanalysis within the primary holding times. Any holding time that is exceeded will be reported immediately to the Project Manager and the QAO by the laboratory QA manager.

4.2.2 Field Sample Custody

The primary objective of sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of samples from the moment of their collection through analysis until their final disposition. A sample (or sample container) will be considered under custody if:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with custody seals placed on the sample cooler so that no one can tamper with it after having been in physical custody
- In a secured area that is restricted to authorized personnel.

The sample custody flowchart is shown in Figure 4.1.

DATA REQUIRED ON CHAIN-OF-CUSTODY
Project name and client Signatures of samplers Sample number, date and time of collection, and grab or composite sample designation Signatures of individuals involved in sample transfer If applicable, the air bill or other shipping number
ADDITIONAL ITEMS THAT SHOULD BE INCLUDED:
Sample matrix Number of sample containers Analyses to be performed, Preservative(s) Name of the analytical laboratory to which the samples are sent Method of sample shipment Project number.

A chain-of-custody record will accompany the samples from the time the samples leave the original sampler’s possession through the sample shipments’ receipt at the laboratory. Triplicate copies of the chain-of-custody record must be completed for each sample set collected. See chart for data requirements.

If samples are split and sent to different laboratories, a copy of the chain-of-custody record is sent with each sample.

The REMARKS space on the chain-of-custody form is used to indicate if the sample is a matrix spike/matrix spike duplicate (MS/MSD), or any other sample information for the laboratory. Since they are not specific to any one-sample point, blanks are indicated on separate rows. Immediately prior to sealing the sample cooler, the sampler will sign the chain-of-custody form and write the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper air bill number on the top of the chain-of-custody form. Mistakes will be crossed out with a single line in ink and initialed by the author.

Sampling personnel will retain one copy of the chain-of-custody form, and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs his or her name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. Field personnel then relinquish the cooler to personnel responsible for shipment, typically an overnight carrier.

The chain-of-custody seal must be broken to open the sample cooler. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Field Team Leader for direction on whether to proceed with the analyses.

Sampling personnel record the information placed on the chain-of-custody record in the field logs. They also include in the log a detailed description of the exact locations from which the samples were collected, any pertinent conditions under which the samples were obtained, and the lot number of the containers used.

4.2.3 Laboratory Sample Management

The laboratory has a designated Sample Management Staff responsible for receiving samples in the laboratory, opening the coolers, checking the sample integrity and custody seals, logging samples into the laboratory information management system (LIMS), and controlling the handling and storage of samples while in the laboratory. The laboratory is a secure facility and only authorized laboratory personnel are allowed to handle active samples. The laboratory maintains an SOP for sample management.

4.2.4 Sample Receipt and Logging

Upon receipt at the laboratory, sample-receiving personnel inspect the samples for integrity of the custody seal, check the shipment against the chain-of-custody form, and note any discrepancies. Specifically, the sample-receiving personnel note any damaged or missing sample containers. At this time, the field chain-of-custody record is completed and signed by the Sample Management Staff.

Using the temperature blank in each cooler, the temperature of each incoming sample cooler is measured and recorded during the sample receipt and log-in procedures before samples are placed in laboratory cold storage. Similarly, the laboratory documents that its cold storage facilities are being maintained through daily (at a minimum) documented temperature measurements using a thermometer.

Upon receipt, Sample Management Staff measure and record on the preservation documentation sheet the pH of acid- or base-preserved aqueous samples. Any problems observed during sample receipt must be communicated to the Field Team Leader and/or the QAO verbally and either by fax transmission or email within 24 hr (preferably 3 hr beginning with the normal business day or immediately following for problems noted during second shifts or weekends) after discovery and before samples are released to the laboratory for analysis. Problems may include but are not limited to broken bottles, errors or ambiguities in paper work, insufficient sample volume or weight, inappropriate pH, and elevated temperature.

When the shipment is inspected and the chain-of-custody record agree, the sample receiving personnel enter the sample and analysis information into the LIMS and assign each sample a unique laboratory number. This number is affixed to each sample bottle.

4.2.5 Sample Storage Security

While in the laboratory, the samples and aliquots that require cold storage will be stored and will be maintained in a secured refrigerator unless they are being used for preparation and/or analysis. All of the refrigerators in the laboratory used for storage of samples have restricted access and are numbered. In addition, dedicated refrigerators are designated for extracts and analytical standards. The sample storage areas are in the laboratory, and access is limited to laboratory personnel. Specific requirements for sample storage are described below:

- Samples will be removed from the shipping container and stored in their original containers unless damaged.
- Damaged samples will be disposed in an appropriate manner, and the disposal will be documented or repacked as necessary and appropriate.
- Samples and extracts will be stored in a secure area designed to comply with the storage method(s) defined in the contract.
- The storage area will be kept secure at all times. The sample custodian or designated personnel will monitor access to the storage area.
- Standards or reagents will not be stored with samples or sample extracts.

The following standard operating procedures for laboratory sample security will be implemented to confirm that the laboratory satisfies sample chain-of-custody requirements:

- Samples will be stored in a secure area.
- Access to the laboratory will be through a monitored area. Other outside access doors to the laboratory will be kept locked.
- Visitors must sign a visitor’s log and will be escorted while in the laboratory.
- Refrigerators, freezers, and other sample storage areas will be securely maintained.

4.2.6 Retention and Disposal of Samples

The laboratory must retain all excess samples within their original sample bottles for a minimum of 30 days in cold storage (below 4 degrees Celsius) following submission of the validated data to AVANGRID. At that time, the laboratory must contact the Field Team Leader for authorization for responsible disposal or further storage instructions. At the point at which the laboratory is provided authorization to dispose of the samples, the laboratory will be responsible, and will assume all liability for proper characterization and disposal of samples and bottleware in accordance with all local, state, and federal regulations.

FIGURE 4.1

SAMPLE CUSTODY FLOW CHART

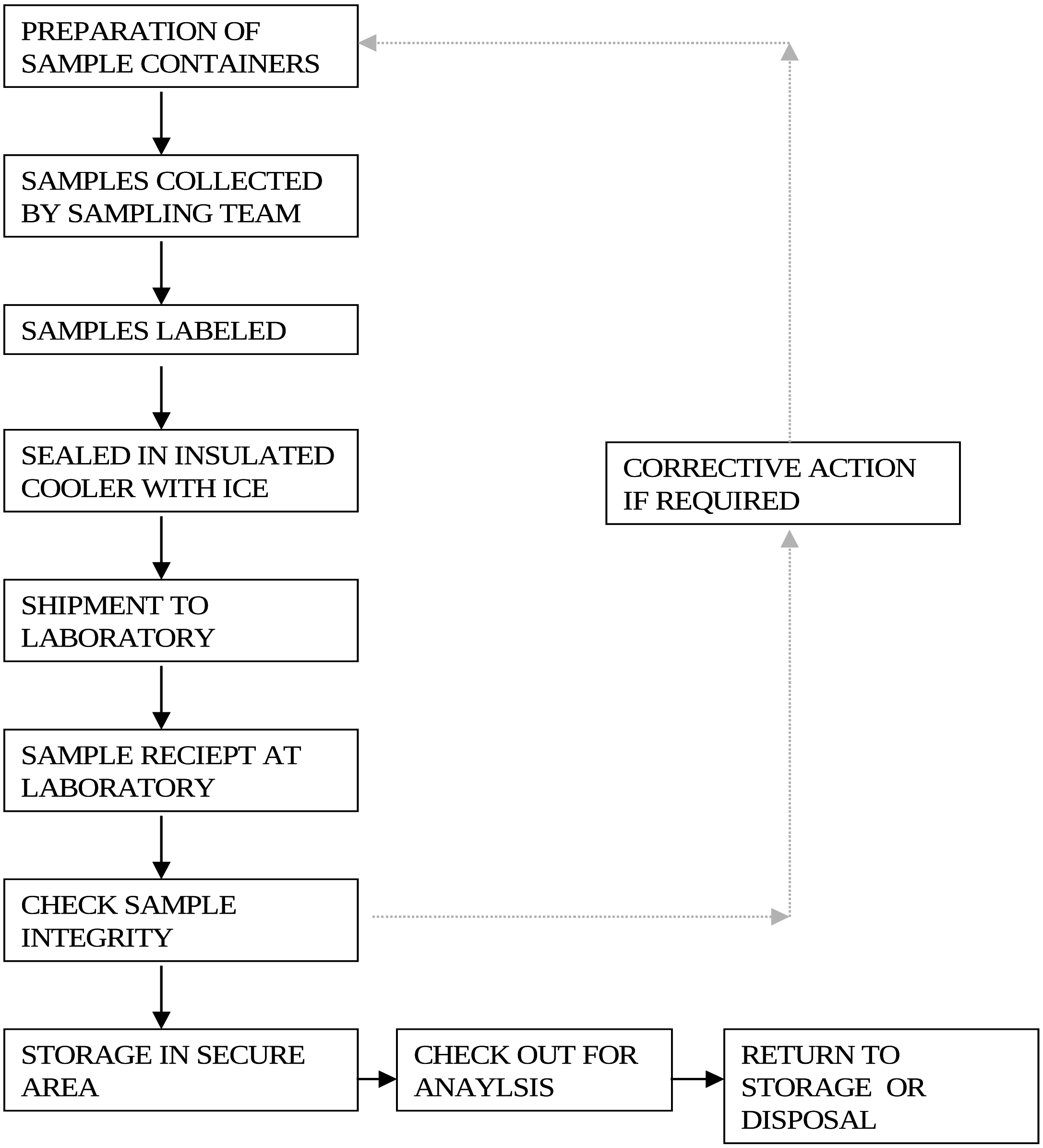
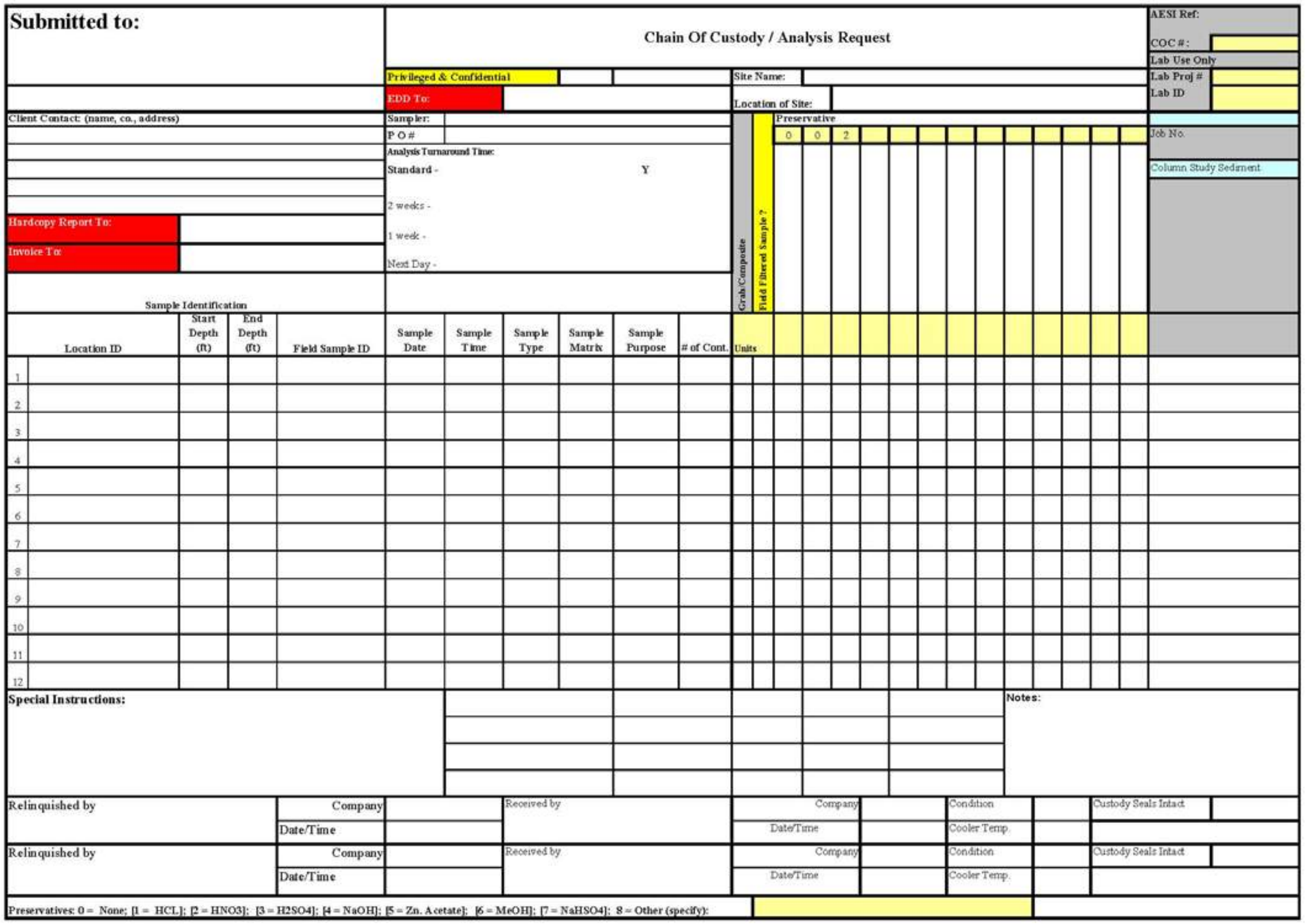


FIGURE 4.2

EXAMPLE CHAIN-OF-CUSTODY RECORD



Submitted to:

Chain Of Custody / Analysis Request

AESI Ref:
COC #:
Lab Use Only
Lab Proj #
Lab ID

Privileged & Confidential
EDD To:
Site Name:
Location of Site:

Client Contact: (name, co., address)
Sampler:
P O #
Analysis Turnaround Time:
Standard - Y
2 weeks -
1 week -
Next Day -

Hardcopy Report To:
Invoice To:

Job No.
Column Study Sediment

Sample Identification

	Location ID	Start Depth (ft)	End Depth (ft)	Field Sample ID	Sample Date	Sample Time	Sample Type	Sample Matrix	Sample Purpose	# of Cont.	Grab/Composite	Field Filtered Sample ?	Preservative 0	0	2											
											Units															
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Special Instructions:

Notes:

Relinquished by Company
Date/Time
Received by Company
Date/Time
Condition
Cooler Temp.
Custody Seals Intact

Relinquished by Company
Date/Time
Received by Company
Date/Time
Condition
Cooler Temp.
Custody Seals Intact

Preservatives: 0 = None; [1 = HCL]; [2 = HNO3]; [3 = H2SO4]; [4 = NaOH]; [5 = Zn. Acetate]; [6 = MeOH]; [7 = NaHSO4]; 8 = Other (specify):

SECTION 5

DATA MANAGEMENT

5.1 INTRODUCTION

The electronic data management systems for each work assignment will be implemented to process the information effectively without loss or alteration. As of April 1, 2011, the New York State Division of Environmental Remediation (DER) has implemented an Environmental Information Management System (EIMS). The EIMS uses the database software application EQuIS$_{\text{TM}}$ from EarthSoft® Inc. In an effort to improve the management of environmental data and reduce paper quantities, all laboratory analytical data minus instrument raw data must be submitted in the DEC-approved Electronic Data Deliverable (EDD).

Data providers must download and install the EQuIS Data Processor (EDP) to check their properly formatted EDD as well as the NYSDEC DER Format file. The EDP performs a series of formatting checks on the EDD and identifies any errors in the data file prior to submission. All EDDs are to be error free when submitted. It is important that the most recent version of the EDP and NYSDEC format file are employed since the valid values used by EIMS are periodically updated for the EDP.

5.2 FIELD DATA MANAGEMENT

The Field Team Leader will manage data generated in the field. He or his designee will be responsible for recording and documenting sampling activities in the field logs, on sampling records (as appropriate), and on chain-of-custody forms (when samples are collected) as described in Section 4.2.2. The records may be photocopied and stored in the project file along with the original.

A sample nomenclature system will be coordinated with the Data Management Team. Each sample name will be unique to include location ID and field sample ID. The Database Manager will add data to EIMS through the input module of the system.

DATA INPUT TO EIMS MAY INCLUDE:

- Sample planning information (e.g., sample depth)
- Chain-of-custody data
- Sediment coring logs
- Geotechnical data
- Location and geographic data
- Field measurements
- Meteorological data
- Waste characterization data
- Groundwater levels
- Radiodating data
- Laboratory analytical data

5.3 LABORATORY DATA MANAGEMENT

Laboratory data management involves several important stages that include data transformation, review, verification, and validation, as well as data storage, retrieval, and security. The laboratory will implement a data management system to manage the data from its generation in the laboratory to its final reporting and storage. The data management system will include, but not be limited to, the use of standard record-keeping practices, standard document control systems, and the electronic data management system.

The laboratory data reduction, verification, validation, and reporting procedures and project data management activities, data/information exchange procedures ensure that complete documentation is maintained, transcription and reporting errors are minimized, and data are properly review.

Specific laboratory data management requirements and procedures are discussed in Sections 6 and 9 of this QAPP.

SECTION 6

DOCUMENTS AND RECORDS

6.1 INTRODUCTION

Records will be maintained to document accurately the data generation process during investigation in the field, sample analysis in the lab, and during data validation. Project documentation will be maintained in general accordance with guidelines in the National Enforcement Investigation Center Policies and Procedures (USEPA, 1986). A project file will be maintained that will contain appropriate project documentation; see components in chart. Some of this documentation may be retained electronically in lieu of paper copies. Table 6.1 summarizes the types of project documents and records.

MINIMUM COMPONENTS OF PROJECT FILE
- Project plans and specifications - Field logs and data records - Photographs, maps, and drawings - Sample identification documents - Chain-of-custody records - Data review notes - Report notes and calculations - Progress and technical reports and - Correspondence and other pertinent information - Full analytical data deliverables package provided by the lab, including QC documentation and electronic data deliverable

6.2 FIELD RECORDS

Field personnel are responsible for documenting sample handling activities, observations, and data in field sampling records including field logs, chain-of-custody records, photographs, and pre-design investigation records. The Field Team Leader is responsible for maintaining these documents. Each record is described below.

6.2.1 Field Log

A Field Log will be used to document pre-design investigation activities. The field log will have consecutively numbered pages, and documentation will be recorded using waterproof ink. Incomplete lines, pages, and changes in the log will be lined out with a single line, dated, and initialed. More detailed procedures for documenting investigation activities (such as field sampling records and boring log forms) and type of information to include in the field log may be developed.

MINIMUM REQUIREMENT FOR INFORMATION IN FIELD LOG

- Responsible person’s name
- Date and time of activity
- Equipment and methods used for field preparation of samples
- Field measurements of samples (*e.g.*, pH, temperature)
- Information coordinating sample handling activities with appropriate field activities and chain-of-custody documentation

Daily calibration activities:

Calibrator’s name
Instrument name and model
Date and time of calibration
Standards used and their source
Temperature (if appropriate)
Results of calibration
Corrective actions taken (if any)

6.2.2 Electronic Field Data Management

The field sampling program will have an electronic data management component. The system will be designed to specify the necessary samples taken at any given location and to provide the ability to be updated and amended in the field. This will provide a management system that efficiently tracks the needs of the sampling scope. As the samples are taken, log entries are put in the database, and sample labels are printed. At any given time a chain-of-custody record can be printed as well.

6.2.3 Chain-of-Custody Record

The chain of custody record establishes the documentation necessary to trace sample possession from the date and time of sample collection, through sample shipment, to the date and time of arrival at the laboratory designated to perform analysis. The ability to trace the history of a sample is essential to show that the sample collected was, indeed, the sample analyzed and that the sample was not subjected to biasing influences. Evidence of sample traceability and integrity is provided by chain-of-custody procedures. These procedures are necessary to support the validity of the data and will accompany each shipping container.

A copy of the chain-of-custody record will be detached and kept with the field log or placed in the project file; the original record will accompany the shipment.

6.3 LABORATORY RECORDS

Laboratories providing analytical support for this project must maintain records to ensure that all aspects of the analytical processes are adequately documented to ensure legal defensibility of the data.

When a mistake is made, the wrong entry is crossed out with a single line, initialed, and dated by the person making the entry, and the correct information recorded. Obliteration of an incorrect entry or writing over it is not allowed, nor is the use of correction tape or fluid on any laboratory records.

Overwriting or disposal of any electronic media prior to a 5-yr expiration period is strictly prohibited. All electronic and hardcopy data must be stored in an easily accessible climate-controlled environment. The laboratory will exercise “best practices” in terms of frequent, redundant electronic backup procedures on proper long-term storage media to assure that all electronic data representing sample analyses will be maintained for the 5-yr storage period. Electronic data must be stored in a secure, limited-access area with redundant copies stored in fireproof vaults and/ or stored off-site of the laboratory facilities.

Sample preparation in the laboratory must be fully documented and include sample preparation conditions (such as digestion temperatures). In addition, documentation must allow complete traceability to all prepared or purchased reagents, acids and solvents, and reference solutions. All spike solutions and calibration standards must be used prior to labeled expiration dates and stored in accordance with manufacturers recommended conditions. Complete and unequivocal documentation must exist to enable traceability of all prepared spike solutions, calibration standards, and prepared reagents back to the reference materials utilized. Organic extracts must be stored in the same type of vials (amber or clear) as the associated standards at the appropriate storage temperatures.

The unit conventions set forth in the figures for reported data will be consistent with standard laboratory procedures. Reporting units used are those commonly used for the analyses performed. Concentrations in soil and sediment samples will be expressed in terms of weight per unit dry weight, with moisture content reported for each sample.

Laboratory records used to document analytical activities in the laboratory will include reagent and titrant preparation records, standard preparation logs, sample preparation logs, bench data sheets, instrument run logs, and strip chart recordings/chromatograms/computer output. Additional records will include calibration records, maintenance records, nonconformance memos, and Corrective Action Request (CAR) forms.

LAB RECORDS SHOULD CONVEY:
- What was done - When it was done - Who did it and - What was found

REQUIREMENTS FOR LAB RECORDKEEPING
- Data entries must be made in indelible water-resistant ink - Date of each entry and observer must be clear - Observer uses his or her full name or initials - Initial and signature log is maintained so the recorder of every entry can be identified - Information must be recorded in notebook or on other records when the observations are made - Recording information on loose pieces of paper not allowed

6.3.1 Operational Calibration Records

Operational calibration records will document the calibration of instruments and equipment that are corrected on an operational basis. Such calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibrations are maintained in the following documents:

- Standard preparation information, to trace the standards to the original source solution of neat compound, is maintained in LIMS or laboratory standard preparation logs.
- Instrument logbook provides an ongoing record of the calibration for a specific instrument. The logbook should be indexed in the laboratory operations records and should be maintained at the instrument by the chemist. The chemist must sign and date all entries, and the QM or his designee must review them.
- For Level IV data packages, copies of the raw calibration data will be kept with the analytical sample data so the results can readily be processed and verified as one complete data package. If samples from several projects are processed together, the calibration data is copied and included with each group of data. The laboratory will maintain all calibration, analysis, and corrective action documentation (both hard copy and electronic data) for a minimum of 7 years. The documentation maintained must be sufficient to show all factors used to derive the final (reported) value for each sample. Documentation must include all calculation factors such as dilution factor, sample aliquot size, and dry-weight conversion for solid samples. The individual who performs hand calculations must sign and date them. This documentation must be stored with the

raw data. Calculations performed by the data system will be documented and stored as electronic and hard copy data. The instrument printouts will be kept on file, and the electronic data will be stored by the laboratory for a minimum of 7 years.

6.3.2 Maintenance Records

Maintenance records will be used to document maintenance activities, service procedures, and schedules. They must be traceable to each analytical instrument, tool, or gauge. The individual responsible for the instrument must review, maintain, and file these records. These records may be audited by the QAO to verify compliance. Logs must be established to record and control maintenance and service procedures and schedules.

6.3.3 Nonconformance Memos

Nonconformance Memos (NCM) may be either a hard copy record or an electronic database record. In either case, review and release of the record must be documented by the initiator, the analytical group leader where appropriate, the laboratory project manager, and the laboratory QA manager. All internal laboratory nonconformance documentation will be communicated to the Field Team Leader by the laboratory project manager verbally and summarized in the report narrative. The NCM will be used to document equipment that fails calibration and will identify any corrective actions taken.

6.3.4 Corrective Action Request (CAR) Forms

The laboratory must use CAR forms to document any incidents requiring corrective action. The CAR form will be issued to the personnel responsible for the affected item or activity. A copy will also be submitted to the laboratory project manager. The individual to whom the CAR is addressed will return the requested response promptly to the QA personnel and will affix his or her signature and date to the corrective action block after stating the cause of the conditions and corrective action to be taken. QA personnel will maintain a log for status of CAR forms to confirm the adequacy of the intended corrective action and to verify its implementation. CARs will be retained in the project record file.

6.3.5 Analytical Data Reports

Analytical data will be reported as an Electronic Data Deliverable (EDD) and as an analytical data package. The analytical laboratories are required to submit all data, preliminary and final, in formatted EDDs in accordance with NYSDEC’s requirements. The laboratory must meet 100% compliance with these requirements. The Parsons Database Manager will submit written requests dictating the requirements and appropriate files to be supplied by the laboratory. The specifications of the EDD are presented in Section 5.

Analytical data reports will be provided by the laboratory within 28 calendar days following receipt of a complete Sample Delivery Group (SDG) and will include the specifications identified in Attachment 1. An SDG is considered to include all samples received for the same project or site, to a maximum of twenty investigative samples not to exceed 5 consecutive days of sampling.

The data package provided by the laboratory will be Level IV data in the NYSDEC ASP Category B format, unless an alternative requirement is specified in a laboratory statement of work (SOW) and will contain all information to support the data validation in accordance with the USEPA Region II Standard Operating Procedures (SOP) as described in Section 9. Additionally, the completed copies of the chain-of-custody records, accompanying each sample from the time of initial bottle preparation to completion of analysis, must be attached to the analytical reports.

6.4 DATA VALIDATION AND AUDIT RECORDS

Data validation personnel are responsible for documenting validation procedures and results in the form of a data usability summary report (DUSR). The QAO will be responsible for maintaining this report and the QAO will be responsible for its distribution. Additionally, audit reports will be prepared and distributed by the QAO. A brief description of each record is described below.

6.4.1 Data Usability Summary Reports

The DUSR will be prepared as required by NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B, May, 2010. The DUSR will summarize the impacts of using data that do not achieve overall data quality objectives or that do not meet PARCC and sensitivity criteria identified in Section 3.3. Additionally, the report will be used to identify, assess and present issues associated with the overall data.

6.4.2 Audit Reports

Among other QA audit reports, which may be generated during the conduct of activities, a final audit report for this project may be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified

TABLE 6.1
SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS

-	**PERSON RESPONSIBLE FOR**		
REPORT	**MAINTENANCE**	**DISTRIBUTION**	**STORAGE**
PROJECT FILES AND FIELD SAMPLING RECORDS			
Field Log	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Photographs	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Chain-of-Custody	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Field Sampling Records	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
LABORATORY RECORDS			
Reagent and Titrant Preparation Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Standards Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Sample Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Bench Data Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Instrument Run Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory

TABLE 6.1
SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS (CONT.)

-	PERSON RESPONSIBLE FOR		
REPORT	**MAINTENANCE**	**DISTRIBUTION**	**STORAGE**
Strip Chart Recordings/ Chromatograms/Computer Output	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Analytical Data Reports	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Log-in Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Maintenance Records	Quality Assurance Manager	Laboratory Project Manager	Instrument Maintenance Logbook at Laboratory
Periodic Calibration Records	Quality Assurance Manager	Laboratory Project Manager	QA Files at Laboratory
Operational Calibration Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Nonconformance Memos	Quality Assurance Manager	Laboratory Project Manager	Maintained in Database File at Laboratory
Corrective Action Request Forms	Quality Assurance Manager	Laboratory Project Manager	Client Correspondence Records at Laboratory
DATA VALIDATION AND AUDIT RECORDS			
Data Validation Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location
Audit Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location

SECTION 7

ANALYTICAL PROCEDURES

7.1 INTRODUCTION

To meet program specific regulatory requirements for chemicals of concern, all methods will be followed as stated, with some specific requirements noted below. Chemical analyses for inorganics, organics, and wet chemistry parameters will be conducted in accordance with the QAPP, the scoping documents or work plans, laboratory’s SOPs (maintained “on-file” at the laboratory), and with referenced analytical methods including USEPA SW846 Test Methods for Evaluating Solid Waste, Physical, and Chemical (USEPA, 1997), and Methods for Chemical Analysis of Water and Wastes (USEPA, 1983). Where requirements conflict, the technical and QA/QC requirements in this QAPP take precedence.

7.2 STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOPs) are a written step-by-step description of laboratory operating procedures exclusive of analytical methods. Laboratories providing analytical support for this project will be required to document all procedures in SOPs. The SOPs must address the following areas:

- Storage containers and sample preservatives
- Sample receipt and logging
- Sample custody
- Sample handling procedures
- Sample transportation
- Glassware cleaning
- Laboratory security
- QC procedures and criteria
- Equipment calibration and maintenance
- Documentation
- Safety
- Data handling procedures
- Document control
- Personnel training and documentation
- Sample and extract storage
- Preventing sample contamination
- Traceability of standards
- Data reduction and validation

- Maintaining instrument records and logbooks
- Nonconformance
- Corrective actions
- Records management

SECTION 8

QUALITY CONTROL

8.1 INTRODUCTION

A QC program is a systematic process that controls the validity of analytical results by measuring the accuracy and precision of method and matrix, developing expected control limits, using these to detect anomalous events, and requiring corrective action techniques to prevent or minimize the recurrence of these events. QC measurements for analytical protocols are designed to evaluate laboratory performance, and measurement biases resulting from the sample matrix and field performance.

- **Field performance:** QC samples are used to evaluate the effectiveness of the sampling program to obtain representative samples, eliminating any cross contamination. These samples will include trip blanks, field duplicates and rinse blanks.
- **Sample performance:** Factors associated with sample preparation and analysis influence accuracy and precision. Such factors are monitored by the use of internal QC samples. QC field samples are analyzed to evaluate measurement bias due to the sample matrix based on evaluation of matrix spike (MS) and matrix spike duplicate (MSD) samples. If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.
- **Laboratory method performance:** All QC criteria for method performance should be met for all target analytes for data to be reported. These criteria generally apply to instrument detector assessment (such as, tunes, ICP interference check sample), calibration, method blanks, and LCS. Variances will be documented and noted in the case narrative of the report.

8.1.1 Field Quality Control Samples

QC samples will be collected in the field as part of the sampling program to allow evaluation of data quality. Field QA/QC samples will consist of the collection and analysis of field blanks, equipment rinse blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples, at a frequency of 1:20 for each sample media. Temperature blanks will accompany each sample shipment container (cooler) shipped to the laboratory for sample analysis. An equipment rinse blank will be collected from disposable sampling equipment at a frequency of once per lot. For PFAS sampling, equipment rinse blanks and field blanks will be collected daily. Standard sample identifiers will identify field QA/QC samples and they may provide no indication of their nature as QA/QC samples.

A summary of the type and collection frequency of field QC sample to be collected respective to the sampling programs specified in this QAPP, is included in Table 8.1. A description of each QC sample is included below.

8.1.1.1 Equipment Rinse Blanks

To assess field sampling and decontamination performance, equipment rinse blanks will be used to evaluate the effectiveness of the decontamination procedures for chemical sampling equipment. Equipment rinse blanks will be collected as part of all chemical sampling programs, except for waste characterization. An equipment rinse blank is a sample of deionized water provided by the laboratory that is poured over or through the sampling equipment (such as split spoon, wipe template) into the sample container. An equipment rinse blank will be collected at a frequency of 1:20 samples per type of sample collection activity using non-disposable sampling equipment. An equipment rinse blank will be collected from disposable sampling equipment at a frequency of once per lot. For PFAS sampling, equipment rinse blanks will be collected daily using laboratory supplied PFAS-free water.

8.1.1.2 Field Duplicates

Coded (blind) field duplicates will be used to assess the precision of field sampling procedures. Precision of a sample is calculated by quantifying the RPD between two sample measurements (Section 3.2.2.1). If the RPD of field duplicate results is greater than the precision criterion, environmental results for the field duplicate pair will be qualified as estimated. The Field Leader responsible for sample collection and processing should be notified to identify the source of variability (if possible), and corrective action should be taken (Section 10.3).

Coded (blind) field duplicates will be collected to evaluate the representativeness and effectiveness of homogenization and proper mixing for soil and aqueous samples. The field duplicate will be analyzed for all of the parameters for which the associated samples are being analyzed. The samples will be labeled in such a manner that the laboratory will not be able to identify the sample as a duplicate sample. This will eliminate bias that could arise by laboratory personnel.

8.1.1.3 Trip Blanks

During field sampling and sample shipping, contamination may be introduced to the samples that could affect the accuracy of analysis results. Trip blanks will be used during sample shipment to detect cross-contamination. Each cooler of aqueous samples sent to the laboratory for analysis of VOCs only will contain one trip blank. Trip blanks are prepared only when VOCs samples are taken and are analyzed for VOCs analytes. The trip blank consists of a VOC sample vial filled in the laboratory with Environmental Information Management System (ASTM) Type II reagent grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks will not be analyzed for the NYSDEC PFAS projects.

8.1.1.4 Field Blank

The primary purpose of this type of blank is to provide an additional check on possible sources of contamination. A field blank serves a similar purpose as a trip blank regarding water quality and sample bottle preparation. However, it is primarily used to indicate potential contamination from ambient air as well as from sampling instruments used to collect and transfer samples from point of collection into sample containers. A field blank will be collected daily for PFAS sampling using laboratory supplied PFAS-free water.

8.1.1.5 Temperature Blank

The temperature blank is used to indicate the temperature of the sample cooler upon receipt at the laboratory. A temperature blank consists of laboratory reagent in a 40-ml glass vial sealed with a Teflon® septum. Any cooler temperature exceeding the allowable 4 ± 2 degrees Celsius (°C) must be noted and the QAO notified prior to sample analyses.

8.1.2 Laboratory Quality Control Samples

QC data from the laboratory are necessary to determine precision and accuracy of the analyses and to demonstrate the absence of interferences and contamination of glassware and reagents. The laboratory will analyze QC samples routinely as part of the laboratory QC procedures. Laboratory QC results will consist of analysis of MS/MSD, LCS, method/preparation blanks, and surrogate spikes. The frequency of the analysis of laboratory QC is summarized in Table 8.2. QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. These laboratory QC sample analyses will be run independently of the field QC samples. Results of these analyses will be reported with the sample data and kept in the project QC data file.

QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. Re-preparation and/or reanalysis of the laboratory QC samples due to a failing recovery and/or precision failure without the re-preparation and reanalysis of the associated samples is prohibited. In all events, QC failures, holding time exceedances, or any other non-standard occurrence must be communicated immediately to the QAO and prior to reporting and then, with approval to report the data, summarized in the case narrative. If the criteria are not met, appropriate corrective action must be taken as specified in Section 9.1 and Section 10.

8.1.2.1 Matrix Spike/Matrix Spike Duplicate/ Matrix Duplicates

MS/MSD samples for organics, metals, and wet chemistry parameters will be taken at a frequency of 1 per 20 field samples (per SDG) per matrix per method. A “batch” is considered up to twenty samples from the same matrix, of the same extraction/digestion type, prepared and/or analyzed by a given analyst, within 12-hr, within an extraction/digestion event, whichever is more frequent. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes by spiking a normal field sample with a known concentration of the analyte of interest. Samples identified as blanks (e.g., trip blank, field blank, equipment rinse blank) will not be used for the MS/MSD preparation or analysis.

Spiked samples will be analyzed, and the percent recovery will be calculated. Results of the analysis will be used to evaluate accuracy and precision of the actual sample matrix. For MS/MSD, the result will be compared and used to evaluate the precision of the actual sample matrix. The percent recovery for each analyte in the MS and MSD should fall within the limits established by laboratory QC protocol.

The original sample, MS, and MSD sample aliquots will be treated exactly the same throughout the sample preparation and analysis and will not be homogenized more than any other project sample (either in the field or at the laboratory). The spike samples will be analyzed for the same parameters as the sample. Field personnel must indicate on the chain-of-custody form which sample(s) are designated as MS/MSD. If samples are not designated for these QC purposes and/or insufficient sample is available the Project Manager and/or QAO will be notified for resolution.

8.1.2.2 Laboratory Control Samples

Laboratory Control Samples (LCS) are designed to check the accuracy of the analytical procedure by measuring a known concentration of an analyte of interest. An LCS will be analyzed for each analytical batch requested for sample preparation and analysis. LCSs must be prepared at a frequency of one per batch for all analytical methods. If high LCS recoveries are observed and the associated samples are reported as “not detected” for the requested target analytes, no action is necessary other than to note the issue in the case narrative of the final analytical report.

8.1.2.3 Method and Preparation Blanks

Laboratory blank samples (also referred to as method or preparation blanks) are designed to detect contamination resulting from the laboratory environment or sample preparation procedure. Method blanks verify that method interferences caused by contaminants in solvents, reagents, glassware, or in other sample processing hardware, are known. Method blanks will be analyzed for each analytical batch using similar preparation techniques (separatory funnel and liquid/liquid extraction) to assess possible contamination and evaluate which corrective measures may be taken, if necessary.

Method blanks associated with field samples must undergo all of the processes performed on investigative samples, including but not limited to pre-filtration and sample cleanups. The blank will be deionized water for water samples or a purified solid matrix such as sodium sulfate for extractable soil samples. Where all the field samples in a batch do not require an additional cleanup procedure, an additional blank may be prepared to check the performance of the additional cleanup and will be associated with the field samples getting the specific additional cleanup. Where this is done, both blanks will be reported, and the procedure described in the case narrative. Method blanks must be prepared at a frequency of one per analytical batch.

8.1.2.4 Surrogate Spike Analyses

Surrogate spikes (applicable to organic analysis only) are used to determine the efficiency of analyte recovery in sample preparation and analysis. Calculated percent recovery of the spikes is used to measure the accuracy of the analytical method. A surrogate spike is prepared by adding a known amount of a compound similar in type to the analytes of interest. Surrogate compounds will be added to all samples analyzed by USEPA Methods, including method blanks, MS/MSDs, project environmental samples, and duplicate samples in accordance with the method.

8.2 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

8.2.1 Field Equipment

Equipment failure will be minimized by routinely inspecting all field equipment to ensure that it is operational and by performing preventative maintenance procedures. Field sampling equipment will be inspected prior to sample collection activities, and repairs will be made prior to decontamination and reuse of the sampling equipment. PFAS-specific requirements for field sampling equipment are described in the FSP. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure, based on the manufacturer’s instructions or recommendations. Maintenance will be performed in accordance with the schedule specified by the manufacturer to minimize the downtime of the measurement system. Qualified personnel must perform maintenance work.

MINIMUM ROUTINE PREVENTIVE MAINTENANCE
Removal of foreign debris from exposed surfaces
Storage in a cool dry place protected from the elements
Daily inspections
Verification of instrument calibrations (Section 8.3.1)

A list of critical spare parts will be developed prior to the initiation of fieldwork. Field personnel will have ready access to critical spare parts to minimize downtime while fieldwork is in progress. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

Non-routine maintenance procedures require field equipment to be inspected prior to initiation of fieldwork to determine whether or not it is operational. If it is not operational, it will be serviced or replaced. Batteries will be fully charged or fresh, as applicable.

8.2.2 Laboratory Instrumentation

Periodic preventive maintenance is required for all sensitive equipment. Instrument manuals will be kept on file for reference if equipment needs repair. The troubleshooting section of factory manuals may be used in assisting personnel in performing maintenance tasks.

Major instruments in the laboratory are covered by annual service contracts with manufacturers or other qualified personnel (internal or external). Under these agreements, trained service personnel make regular preventive maintenance visits. Maintenance is documented and maintained in permanent records by the individual responsible for each instrument.

The laboratory manager is responsible for preparation, documentation, and implementation of the program. The laboratory QA manger reviews implementation to verify compliance during scheduled internal audits.

Written procedures will establish the schedule for servicing critical items to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule and arrange any necessary and prompt service. Qualified personnel will perform required service.

8.3 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Instruments (field and laboratory) used to perform chemical measurements will be properly calibrated prior to use to obtain valid and usable results. The requirement to properly calibrate instruments prior to use applies equally to field instruments as it does to fixed laboratory instruments to generate appropriate data to meet DQOs.

8.3.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures of field instruments (such as PID, pH, temperature), will conform to manufacturer's standard instructions to ensure that the equipment functions within the allowable tolerances established by the manufacturer and required by the project. Personnel performing instrument calibrations must be trained in its proper operation and calibration. Records of all instrument calibration will be maintained by the Field Team Leader in the field log (Section 6.2) and will be subject to audit by the QAO or authorized personnel. The Field Team Leader will maintain copies of all the instrument manuals on the site.

8.3.2 Laboratory Instruments

A formal calibration program will control instruments and equipment used in the laboratory. The program will verify that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity or whose performance is expected at a stated level will be subject to calibration. Laboratory personnel or external calibration agencies or equipment manufacturers will calibrate the instruments using reference standards. Upon request, the laboratory will provide all data and information to demonstrate that the analytical system was properly calibrated at the time of analysis including calibration method, frequency, source of standards, concentration of standards, response factors, linear range, check standards, and all control limits. This data will be documented in a calibration record (Section 6.3.1). Calibration records will be prepared and maintained for each piece of equipment subject to calibration.

This section provides an overview of the practices used by the laboratory to implement a calibration program. Detailed calibration procedures, calibration frequencies, and acceptance criteria are specified in the laboratory’s analytical method SOPs. The requirements for the calibration of instruments and equipment depend on the type and expected performance of individual instruments and equipment. Therefore, the laboratory will use the guidelines provided here to develop a calibration program.

Two types of calibration are described in this section: periodic calibration and operational calibration. The results of the calibration activities will be documented in the analytical data package and the calibration records (Section 6.3.1).

- **Periodic calibration:** Performed at prescribed intervals for equipment, such as balances and thermometers. In general, equipment which can be calibrated periodically is a distinct, singular purpose unit and is relatively stable in performance.
- **Operational calibration:** routinely performed as part of an analytical procedure or test method, such as the development of a standard curve for use with an atomic absorption spectrophotometer. Operational calibration is generally performed for instrument systems.

Equipment that cannot be calibrated or becomes inoperable will be removed from service. Such equipment must be repaired and satisfactorily recalibrated before reuse. For equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken, and the analyst achieves an acceptable calibration. This type of failure will be documented in an NCM (Section 10).

8.3.3 Calibration System

The calibration system includes calibration procedures, equipment identification, calibration frequency, calibration reference standards, calibration failure, and calibration records. These elements are described next.

8.3.3.1 Calibration Procedures

Written procedures will be used by the laboratory for all instruments and equipment subject to calibration. Whenever possible, recognized procedures, such as those published by ASTM or USEPA, will be adopted. If established procedures are not available, a procedure will be developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured. Calibration procedure established by the laboratory must, at a minimum, meet the calibration requirements of the method on which the SOP is based.

MINIMUM CALIBRATION PROCEDURES
Equipment to be calibrated
Reference standards used for calibration
Calibration technique and sequential actions
Acceptable performance tolerances
Frequency of calibration
Calibration documentation format

8.3.3.2 Equipment Identification

Equipment that is subject to calibration is identified by a unique number assigned by the laboratory. Calibration records reference the specific instrument identification.

8.3.3.3 Calibration Frequency

Instruments and equipment will be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Calibration frequency will be based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

8.3.3.4 Calibration Reference Standards

Two types of reference standards will be used by the laboratory for calibration:

- **Physical standards**, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration. Physical reference standards that have known relationships to nationally recognized standards (such as NIST) or accepted values of natural physical constants will be used whenever possible. If national standards do not exist, the basis for the reference will be documented. Physical reference standards will be used only for calibration and will be stored separately from equipment used in analyses. In general, physical standards will be recalibrated annually by a certified external agency, and documentation will be maintained. Balances will be calibrated against class "S" weights by an outside source annually. Physical standards such as the laboratory's class "S" weights will be recertified annually.
- **Chemical standards,** such as vendor certified stock solutions and neat compounds, will generally be used for operational calibration. The laboratory, to provide traceability for all standards used for calibration and QC samples, will document standard preparation activities.

8.3.4 Operational Calibration

Operational calibration will generally be performed as part of the analytical procedure and will refer to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Formulas used for calibration are listed in Table 8.3.

8.3.4.1 Preparation of a Calibration Curve

Preparation of a standard calibration curve will be accomplished by analyzing calibration standards that are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards will be chosen to cover the working range of the instrument or method. All sample measurements will be made within this working range. Average response factors will be used or a calibration curve will be prepared by plotting or regressing the instrument responses versus the analyte concentrations. Where appropriate a best-fit curve may be used for nonlinear curves and the concentrations of the analyzed samples will be back-calculated from the calibration curve.

8.3.4.2 Periodic Calibration

Periodic calibrations are performed for equipment (such as balances and thermometers), that is required in the analytical method, but that is not routinely calibrated as part of the analytical procedure. Table 8.4 lists the periodic calibration requirements used by the laboratories.

8.4 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

In the laboratory, personnel qualifying reagents and standards must be trained to perform the associated instrumental analysis, including instrument calibration, calculations, and data interpretation. Laboratory personnel must document the purchase, receipt, handling, storage, and tracking of supplies and consumables used during analysis. For example, analytical standards, source materials, and reference materials used for instrumental calibration/tunes/checks must be certified and traceable to the USEPA or NIST through reference numbers documented directly in each analytical sequence. Calibration for all requested analyses must be verified by an independent second source reference. Adhering to these procedures precludes the use of expired supplies and consumables or supplies and consumables that do not meet standard acceptance criteria.

Records must be maintained on reagent and standard preparation in the LIMS reagent system or laboratory standard preparation logs. The records should indicate traceability of the standards to their original source solution or neat compound, the name of the material, concentration, the method and date of preparation, the expiration date, storage conditions, and the preparer’s initials. Each prepared reagent or standard should be labeled with a unique identifier that links the solution to the preparation documentation that specifies an expiration and/or re-evaluation date for the solution.

TABLE 8.1

SUMMARY OF FIELD QC SAMPLE TYPES AND COLLECTION FREQUENCY

Field QC Sample Type	Sample Type	Collection Frequency
Equipment Rinse Blank	Water	1:20 samples per type of sample collection activity using non-disposable sampling equipment. Once per lot for disposable sampling equipment. Daily for PFAS sampling.
Field Blank	Water	Daily for PFAS sampling.
Trip Blank$^{(1)}$	Water	One per cooler of aqueous VOC samples
Field Duplicates	Water	1:20 Samples
Extra Volume Sample (collected for MS/MSD)	Water	1:20 Samples

Field QA/QC samples will be identified by using standard sample identifiers that will provide no indication of their nature as QA/QC samples.

Notes: (1) – Not analyzed for NYSDEC PFAS projects.

TABLE 8.2

LABORATORY QUALITY CONTROL SAMPLE FREQUENCY

QC Sample	Frequency
Method/prep Blanks	1 per analytical batch of 1-20 samples, per preparation event
Laboratory Control Sample	1 per analytical batch of 1-20 samples, per preparation event
Surrogates	Spiked into all field and QC samples (Organic Analyses)
Matrix Spike/Matrix Spike Duplicate or Matrix (Laboratory) Duplicate	1 per batch of 1-20 samples

TABLE 8.3

OPERATIONAL CALIBRATION FORMULAS

Application	Formula	Symbols
Linear calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$CF = A_x / C$	C = concentration (µg/L) CF = calibration factor Ax = peak size of target compound in sample extract
Response factors [2]	$RRF = C_{is} A_x / C_x A_{is}$	C = concentration (µg/L) RF = internal standard response factor Cis = concentration of the internal standard (µg/L) Ax = area of the characteristic ion for the target compound Ais = area of the characteristic ion for the internal standard

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique

Note: For organic analysis, the laboratory will make efforts to use the best curve technique for each analyte. This practice is described in detail in the laboratory calibration criteria documents for GC analysis. This may require the use of a quadratic curve for some compounds.

TABLE 8.4

PERIODIC CALIBRATION REQUIREMENTS

Instrument	Calibration Frequency		Corrective Actions
Analytical Balances	Daily:	Sensitivity (with a Class S-verified weight)	Adjust sensitivity
	Annually:	Calibrated by outside vendor against certified Class S weights	Service balance
Thermometers	Annually:	Calibrated against certified NIST thermometers	Tag and remove from service
Automatic Pipettors	Quarterly:	Gravimetric check	Service or replacement

TABLE 8.5

SAMPLE CONCENTRATION CALCULATION FORMULAS

Application	Formula	Symbols
Linear regression calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$C = A_x V_f / CF\ V_i$	C = concentration (µg/L) CF = calibration factor A_x = peak size of target compound in sample extract V_f = final volume of extracted sample (mL) V_i = initial volume of sample extracted (mL)
Response factors [2]	$C = C_{is}\ A_x V_f / RF\ A_{is}\ V_I$	C = concentration (µg/L) RF = internal standard response factor C_{is} = concentration of the internal standard (µg/L) A_x = area of the characteristic ion for the target compound V_f = final volume of extracted sample (mL) A_{is} = area of the characteristic ion for the internal standard V_i = initial volume of sample extracted (mL)
Residues [3]	$R = (W - T)/V \times 1{,}000{,}000$	R^6 = residue concentration (mg/L) W = weight of dried residue + container (g) T = tare weight of container (g) V = volume of sample used (mL)
Solid samples [4]	$K = C\ V\ D / W\ (\%S/100)$	K = dry-weight concentration (mg/kg) C = analytical concentration (mg/L) V = final volume (mL) of processed sample solution D = dilution factor W = wet weight (g) of as-received sample taken for analysis %S = percent solids of as-received sample

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique
3. Used for total, filterable, nonfilterable, and volatile residues as well as gravimetric oil and grease
4. Used to calculate the dry-weight concentration of a solid sample from the analytical concentration of the processed sample.
5. Conversion factor to convert g/mL to mg/L:

$$\frac{mg}{L} = \frac{g}{mL} \times \frac{10^3 mL}{L} \times \frac{10^3 mg}{g}$$

SECTION 9

DATA VALIDATION AND USABILITY ELEMENTS

9.1 DATA REVIEW, VERIFICATION, AND VALIDATION

The data collected during this project will undergo a systematic review for compliance with the DQOs and performance objectives as stated in Section 3. In particular, field, laboratory, and data management activities will be reviewed to confirm compliance with the method QC criteria for performance and accuracy and to show that data were collected in a manner that is appropriate for accomplishing the project objectives. These data will be evaluated as to their usability during data verification. In particular, data outside QC criteria, but not rejected, will be reviewed for possible high and low bias. All data will be validated following verification and reduction.

Qualified data validation personnel will assess and verify data; they will review the data against QC criteria, DQOs (Sections 3 and 9.2.2), analytical method, and USEPA Region 2 SOPs for data review to identify outliers or errors and to flag suspect values. Field and laboratory activities that should be reviewed include, at a minimum, sample collection, handling, and processing techniques; field documentation records; verification of proper analytical methods; analytical results of QC samples; and calibration records for laboratory instruments and field equipment. A review of such elements is necessary to demonstrate whether the DQOs outlined in 3 were met. Samples that deviate from the experimental design and affect the project objectives must be reported to the QAO and data validation personnel.

Departures from standard procedures (in the FSP, this QAPP, or the laboratory SOPs, may lead to exclusion of that data from the project database or validation process, based on discussions with and approval. However, routine field audits involving thorough reviews of sample collection procedures and sample documentation should preclude such deviations from occurring. Additionally, routine laboratory audits will be used to document proper sample receipt, storage, and analysis; instrument calibration; use of the proper analytical methods; and use of QC samples specified in Section 8 to assist in appropriately qualifying the data.

The laboratory’s analytical report for each sample delivery group (SDG) will be assembled by collecting and incorporating all the data for each analysis associated with the reported samples; the analytical narratives; and other report-related information such as copies of chain-of-custody forms, communication records, and nonconformance forms. The information included in the analytical data report is summarized in Attachment 1.

Before the laboratory submits data, the laboratory’s data review process will include a full first level “technical” review by the laboratory’s analyst during sample analysis and data generation. The review must include a check of all QC data for errors in transcription, calculations, and dilution factors and for compliance with QC requirements. Failure to meet method performance QC criteria may result in the reanalysis of the sample or analytical batch. After the initial review is completed, the data will be collected from summary sheets, workbooks, or computer files and assembled into a data package.

The laboratory's first review will be followed by a second-level technical review of the data package. The second level review may be performed by a peer trained in the procedures being reviewed or by the appropriate analytical group supervisor. The reviewer will check the data packages for completeness and compliancy with the project requirements and will certify that the report meets the DQOs for PARCCS specifications. The report narrative will be generated at this stage of the data review. Any problems discovered during the review and the corrective actions necessary to resolve them will be communicated to the responsible individual, who will discuss the findings with the laboratory QA manager for resolution.

The first and second review will be conducted throughout sample analysis and data generation to validate data integrity during collection and reporting of analytical data. Data review checklists will be used to document the performance and review of the QC and analytical data.

Before the laboratory's final release to the client, the data will undergo a final review by the laboratory's QA officer or his/her designee. This third level review is to confirm that the report is complete and meets project requirements for performance and documentation. The laboratory's QA officer must review reports involving non-conforming data issues. A summary of all non-conformances will be included in the case narrative. The report will then be released to the client for data validation, and a copy will be archived by the laboratory for a period of 7 yrs.

The laboratory analytical data will be validated using project-specific data validation procedures to confirm that data meet the applicable data quality objectives. Depending on the type of data and the intended data uses, the data validation process for a given SDG (or a specific percentage of sample analyses) or analytical method may be performed following a Level IV protocol (full validation), or a Level III protocol (sample plus QC summary data only, no raw data review). The project-specific Level III data validation protocol will provide a level of review resulting in the generation of a data usability summary report (DUSR), as defined by NYSDEC DER-10 requirements. Level III validation will be performed on all DQO Level III and all DQO Level IV data. Ten percent (10%) of the DQO Level IV Data for each analytical method will undergo a Level IV validation. Certain geotechnical and field screening data may be evaluated in a manner suitable for the intended data uses.

A data validation report will be issued and reviewed by the QAO before finalization. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCCS criteria for each analytical method. The validation criteria are objective and are not sample dependent, except for consideration of sample matrix effects. The criteria specify performance requirements that should be under the control of the field-sampling contractor or analytical laboratory. This QAPP will be the primary reference for evaluating the data.

After data validation, the data will be evaluated for consistency with site conditions and developed conceptual models. Data validation personnel will prepare a project DUSR that summarizes the implications of the use of any data out of criteria. In addition, the data usability report will include the percentage of sample completeness for critical and non-critical samples and a discussion of any issues in representativeness of the data that may develop as a result of validation. The data usability report will address overall data quality and achievement of PARCCS criteria and assess issues associated with the overall data and data quality for all validated Level III and Level IV data.

9.2 VERIFICATION AND VALIDATION METHODS

9.2.1 Laboratory

The laboratory will verify and assess analytical data against the stated requirements on the chain-of-custody record, the sample handling procedures (Section 4), and the QC parameters. The laboratory data reviewers will also check that transcriptions of raw or final data and calculations were performed correctly and are verified.

Following data verification, analytical data generated by the laboratory will be reduced and managed based on the procedures specified in this QAPP and analytical methodologies. Data reduction includes all processes that change either the values or numbers of data items. The data reduction processes used in the laboratory includes establishment of calibration curves, calculation of sample concentrations from instrument responses, and computation of QC parameters. Table 8.5 lists the formulas used to calculate sample concentrations.

The reduction of instrument responses to sample concentrations takes different forms for different types of methods. For most analyses, the sample concentrations are calculated from the measured instrument responses using a calibration curve. The sample concentrations can be back-calculated from a regression equation fitted to calibration data. For gravimetric and titrimetric analyses, the calculations are performed according to equations given in the method. For chromatographic analyses, the unknown concentrations are determined using either calibration factors (external standard procedure) or relative response factors (internal standard procedure). GC analyses are generally quantitated using the external standard technique; GC/MS analyses are quantitated using the internal standard technique. These calculations are generally performed by the associated computerized data systems.

Validated analytical data will be loaded into a database and reported in tabular format. Database fields will include the field sample identification, laboratory sample identification, blinded sample number, analytical results, detection limits, and validation qualifiers. The usability of the data will be evaluated by the QAO or designee.

9.2.2 Analytical Data Validation

The data review process is performed in two phases:

1. **Initial phase, contract compliance screening (CCS)**: Review of sample data deliverables for completeness. Completeness is evaluated by ensuring that all required data deliverables are received in a legible format with all required information. The CCS process also includes a review of the chain-of-custody forms, case narratives, and RLs. Sample resubmission requests, documentation of nonconformances with respect to data

deliverable completeness, and corrective actions often are initiated during the CCS review. The results of the CCS process are incorporated into the data validation process.

2. **Second phase, data validation:** A project-specific data validation procedure based on a “Level III” or the “Level IV” validation protocol will be performed on the analytical results from the fixed-base laboratory or laboratories, with the exception of the bench-scale testing data. The Level III validation protocol, which be applied to Level III data packages and Level IV data packages not receiving “full” Level IV validation includes a review of summary information to determine adherence to analytical holding times; results from analysis of field duplicates, method blanks, field blanks, surrogate spikes, MS/MSDs, LCSs, and sample temperatures during shipping and storage. Data qualifiers are applied to analytical results during the data validation process based on adherence to method protocols and laboratory-specific QA/QC limits. The Level IV validation protocol incorporates the Level III validation protocol and adds calculation checks from the raw data of reported and summarized sample data and QC results.

FULL VALIDATION (USEPA LEVEL IV EQUIVALENT)	
Organic Analytical Methods	**Inorganic Constituents, Wet Chemistry Parameters**
Percentage of solids Sample preservation and holding times Instrument tuning Instrument calibrations Blank results System monitoring compounds or surrogate recovery compounds (as applicable) Internal standard recovery results MS and MSD results LCS results Target compound identification Chromatogram quality Duplicate results Compound quantitation and reported RLs System performance and Results verification	Percentage of solids Sample preservation and holding times Calibrations Blank results Interference check samples (inorganics only) LCSs Project Required Reporting Limit (PRRL) standard check samples Duplicates MSs (pre-digestions and post-digestions for inorganics only) ICP serial dilutions and Results verification and reported detection limits

The laboratory will send the required analytical data package deliverables, consisting of hardcopy versions and the EDD, following completion of the laboratory’s validation process (Section 9.2.2). Data validation will be performed in accordance with the USEPA Region 2 Data

Validation SOPs for organic and inorganic data review (USEPA, 2016a, 2016b, 2016c, 2016d, 2016e). In addition, Parsons will refer to this QAPP and the Work Assignment Scoping Documents to verify that DQOs were met. If problems are identified during data validation, the QAO and the laboratory QA manager will be alerted, and corrective actions will be requested. The LPM and data validation chemists will maintain close contact with the QAO to ensure all nonconformance issues are acted upon prior to data manipulation and assessment routines.

Data validation will be conducted using the USEPA guidelines (USEPA, 2017a, 2017b) as supplementary guidelines. Where USEPA guidelines and SW-846 disagree, this QAPP and data validation professional judgment will prevail.

Trained and experienced data validation chemists will perform the data validation work. The QAO will review the data validation report before it is finalized. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCCS criteria for each analytical method. A detailed assessment of each SDG will follow. Based on the results of data validation, the validated analytical results reported will be assigned a usability flag (see chart below).

USABILITY FLAGS FOR VALIDATED RESULTS	
U	Not detected at given value
UJ	Analyte not detected; associated quantitation limit is an approximate (estimated) values.
J	Estimated value
J+	Estimated biased high
J-	Estimated biased low
N	Presumptive evidence at the value given
NJ	Analysis indicates presence of analyte tentatively identified; the associated numerical value is its approximate concentration
R	Result not useable and
No flag	Result accepted without qualification

9.3 RECONCILIATION WITH USER REQUIREMENTS

Following data validation by qualified personnel, the data will be evaluated by the QAO and the project manager as to consistency with site conditions and developed conceptual models to determine whether field and analytical data meet the requirements for decision making. Specifically, the results of the measurements will be compared to the DQOs (Section 3).

The DQOs will be considered complete and satisfied if the data are identified as usable and if no major data gaps are identified. For example, the objective for data collected under the characterization program is to further refine the limits of dredging and/or capping. If the collected data sufficiently characterizes these limits in a manner that is acceptable for remedial action, then the DQO is satisfied. In cases where data may be considered not usable (for example, rejected during data validation), resampling may be required at a specific location. If resampling is not possible, the data will be identified and noted in the project database to make data users aware of its limitations.

SECTION 10

ASSESSMENT AND OVERSIGHT

10.1 ASSESSMENTS AND RESPONSE ACTIONS

Performance and system audits of both field and laboratory activities may be performed. Any such audits will be performed at a frequency to be determined to ensure that sampling and analysis activities are completed in accordance with the procedures specified in the FSP and this QAPP.

Quality assurance audits will be carried out under the direction of the QAO on field activities, including sampling and field measurements. They will be implemented to verify that established procedures are being followed and to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s).

The QAO will plan, schedule, and approve system and performance audits based on procedures customized to the project requirements. If required, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. Quality auditing personnel will not have responsibility for field or laboratory project work.

10.2 PROJECT-SPECIFIC AUDITS

Project-specific audits include system and performance audits of sampling and analysis procedures, and of associated recordkeeping and data management procedures. Project-specific audits will be performed on a discretionary basis at a frequency determined by the project manager.

10.2.1 System Audits

The QAO may perform system audits. Such audits will encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory QC procedures and associated documentation may be system-audited including the field log, field sampling records, laboratory analytical records, sample handling, processing, and packaging in compliance with the established procedures, maintenance of QA procedures, and chain-of-custody procedures. These audits may be carried out during execution of the project to confirm that sampling crews employ consistent procedures. However, if conditions adverse to quality are detected additional audits may occur.

Findings from the audit will be summarized and provided to the PM and/or designated personnel so that necessary corrective action can be monitored from initiation to closure.

10.2.2 Performance Audits

The laboratory may be required to conduct an analysis of PE samples or provide proof that PE samples were submitted by an approved USEPA or NYSDEC performance testing provider within the past 12 months. If necessary, proof that applicable PE samples have been analyzed at the laboratory within the past 12 months will be included in the laboratory procurement package.

10.2.3 Formal Audits

Formal audits are any system or performance audit that the QAO documents and implements. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklist to verify objectively that QA requirements have been developed, documented, and instituted in accordance with contractual and project criteria. At the discretion of the project manager, the QAO or designated personnel may conduct formal audits on project and subcontractor work during the course of the project.

Auditors who have performed the site audit after gathering and evaluating all data will write audit reports. Items, activities, and documents determined by lead auditors to be in noncompliance must be identified at exit interviews conducted with the involved management. Noncompliance will be logged and documented through audit findings. These findings will be attached to and become part of the integral audit report. These audit-finding forms are directed to management to resolve satisfactorily the noncompliance in a specified and timely manner.

The QAO has overall responsibility to see that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports will be submitted to the PM after completion of the audit. Serious deficiencies will be reported to the PM on an expedited basis. Audit checklists, audit reports, audit findings, and acceptable resolutions will be approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

10.2.4 Laboratory Audits

Internal laboratory audits will be performed routinely to review and evaluate the adequacy and effectiveness of the laboratory’s performance and QA program, to ascertain if the QAPP is being completely and uniformly implemented, to identify nonconformances, and to verify that identified deficiencies are corrected. The laboratory QA manager is responsible for such audits and will perform them according to a schedule planned to coincide with appropriate activities on the project schedule and sampling plans. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QAPP
- When necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit
- When requested by the laboratory’s project manager or QA manager.

10.2.4.1 Laboratory Performance Audits

Performance audits are independent sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process. Performance audits are conducted by introducing control samples, in addition to those used routinely, into the data production process. These control samples include PE samples of known concentrations. The results of performance audits will be evaluated against acceptance criteria. The results will be summarized and maintained by the laboratory QA manager and distributed to the supervisors who must investigate and respond to any results that are outside control limits.

10.2.4.2 Laboratory Internal Audits

The laboratory QA manager conducts routine internal audits of each laboratory section for completeness, accuracy, and adherence to SOPs. The laboratory audit team will verify that the laboratory's measurement systems are operated within specified acceptable control criteria and that a system is in place to confirm that out-of-control conditions are efficiently identified and corrected.

10.2.4.3 Laboratory Data Audits

The laboratory will maintain raw instrument data for sample analyses on magnetic tape media or optical media in a secured fireproof safe. During routine audits, the audit team will verify the processing of the raw data file by reviewing randomly selected electronic data files and comparing the results with the hardcopy report. Tapes will be archived for a period of 7 yr. Tapes will be also available for audit by the QAO upon request.

10.2.4.4 Laboratory Audit Procedures

Prior to an audit, the designated lead auditor will prepare an audit checklist. During an audit and upon its completion, the auditor will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will prepare and submit an audit report to the designated responsible individual of the audited group, the PM, and the QAO. Minor administrative findings that can be resolved to the satisfaction of the auditor during an audit need not be cited as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project will be included in the audit report.

The designated responsible individual of the audited group will prepare and submit to the QAO a reply to the audit. This reply will include, at a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the audit report, the reply to the audit, and any supporting documents. It is the responsibility of the designated responsible individual of the audited group to conform to the established procedures, particularly as to development and implementation of such corrective action.

10.2.4.5 Laboratory Documentation

To confirm that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures, a checklist will be completed during each audit. The checklist will detail the activities to be executed and ensure that the auditing plan is accurate. Audit checklists will be prepared in advance and will be available for review.

AUDIT CHECKLIST (AT MINIMUM)
Date and type of audit
Name and title of auditor
Description of group, task, or facility being audited
Names of lead technical personnel present at audit
Checklist of audit items according to scope of audit
Deficiencies or non-conformances

Following each system, performance, and data audit, the QAO or his designee will prepare a report to document the findings of the specific audit. The report will be submitted to the designated individual of the audited group to ensure that objectives of the QA program are met.

MINIMUM CONTENT OF AUDIT REPORT
Description and date of audit
Name of auditor
Copies of completed, signed, and dated audit form and/or checklist
Summary of findings including any nonconformance or deficiencies
Date of report and appropriate signatures
Description of corrective actions

The QAO will maintain a copy of the signed and dated report for each audit. If necessary, a second copy will be placed in project files.

10.3 CORRECTIVE ACTIONS

Corrective action procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected. Corrective action enables significant conditions adverse to quality to be noted promptly at the site, laboratory, or subcontractor location. Additionally, it allows for the cause of the condition to be identified and corrective action to be taken to rectify the problem and to minimize the effect on the data set. Further, corrective action is intended to minimize the possibility of repetition.

Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, PM, FTL, and involved subcontractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action. Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The designated responsible individual of the audited group will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Events that trigger corrective actions
When predetermined acceptance standards are not attained
When a deviation from SOP is required or observed
When procedure or data compiled are determined to be deficient
When equipment or instrumentation is found to be faulty
When samples and analytical test results are not clearly traceable
When QA requirements have been violated
When designated approvals have been circumvented
As a result of system and performance audits
As a result of a management assessment
As a result of laboratory/field comparison studies
As required by analytical method

All project personnel have the responsibility, as part of normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Specifically, the laboratory must designate the assigned individual to act as the primary laboratory contact responsible for timely identification and resolution of any and all issues including contract and administrative issues. Any phone calls initiated by personnel or designated representatives to the laboratory with respect to corrective actions must be returned in a timely manner on a normal business day if the designate individual (or alternate) is not available at the initiation of the phone call.

Project management and related staff, including field investigation teams, remedial design planning personnel, and laboratory groups will monitor on-going work performance as part of daily responsibilities. Work may be audited at the site, the laboratories, or subcontractor locations. Activities or documents ascertained to be noncompliant with QA requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the QAO, PM, or designated personnel.

Personnel assigned to QA functions will have the responsibility to issue and control CAR forms (Figure 10.1). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered.

Similar to the CAR, the laboratory will record and report nonconformances internally using the laboratory’s nonconformance documentation tracking system in the form of an NCM. Each NCM is traceable so that it can be cross-referenced with its resolution to the associated project records. The laboratory QA manager summarizes critical nonconformances, such as reissued reports and client complaints, in a monthly report to the laboratory management staff. Management of the NCM is described in Section 6.3. Corrective action procedures applicable to QC requirements that do not meet the criteria of this QAPP are described in the following sections.

Consistent, frequent contacts between laboratory personnel, the QAO, or designated personnel are required.

TYPICAL CONTENT OF NCM FORMS
Problem description and root cause
Corrective action
Client notification summary
QA verification
Approval history action

FIGURE 10.1

CORRECTIVE ACTION REQUEST FORM

CORRECTIVE ACTION REQUEST

Number ______________________ Date:____________________

TO: ______________________

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (a) to resolve the noted conditions and (b) to prevent it from recurring. Your written response is to be returned to the Project quality assurance manager by _______________.

Condition:

Reference Documents:

_______________ ___________ ______________ ___________ _____________ ___

Originator Date Approval Date Approval Date

Response

Cause of Condition:

Corrective Action

(A) Resolution:

(B) Prevention

(B2) Affected Documents

Signature_____________________ Date_________

CA Follow-up

Corrective Action verified by:______________________ Date ________

SECTION 11

REPORTS TO MANAGEMENT

11.1 QA REPORTS

Management personnel receive QA reports appropriate to their level of responsibility. The PM receives copies of all QA documentation. QC documentation is retained within the department that generated the product or service except where this documentation is a deliverable for a specific contract. QC documentation is also submitted to the project QAO for review and approval. Previous sections detailed the QA activities and the reports, which they generate. Among other QA audit reports that may be generated during the conduct of activities, a final audit report for this project will be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified.

Additionally, any incidents requiring corrective action will be fully documented.

SECTION 12

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ATTACHMENT 1

SUMMARY OF ANALYTICAL DATA PACKAGE (DQO LEVEL IV)

1.0 INTRODUCTION

In order for data to be used for decision-making purposes it is essential that it be of known and documented quality. Verification and validation of data requires that appropriate quality assurance and quality control (QA/QC) procedures be followed, and that adequate documentation be included for all data generated both in the laboratory and in the field.

The QA/QC documentation provided by any laboratory, in conjunction with sample results, allows for evaluation of the following indicators of data quality:

- Integrity and stability of samples;
- Instrument performance during sample analysis;
- Possibility of sample contamination;
- Identification and quantitation of analytes;
- Analytical precision; and
- Analytical accuracy.

General laboratory documentation requirements discussed in this document are formatted into two sections, organic and inorganic analyses. These specifications are intended to establish general, analytical documentation requirements that laboratories should meet when generating data for this project.

2.0 GENERAL DOCUMENTATION REQUIREMENTS

2.1 Data Package Format

Each data package for Level IV data submitted will consist of five sections:

- Case narrative;
- Chain-of-custody documentation
- Summary of results for environmental samples;
- Summary of QA/QC results; and
- Raw data.

Level II data packages will not contain the raw data.

Data packages will be consistent with, and will supply the data and documentation required for NYSDEC ASP-defined deliverables (i.e. Category B and Category A). Summaries of data and results may be presented in a Contract Laboratory Program (CLP) type format or an equivalent format that supplies the required information as stated below. All laboratory data qualifiers shall be defined in the deliverable.

In cases where the laboratory has varied from established methodologies, they will be required to provide the Standard Operating Procedures (SOPs) for those methods and added as an attachment to the Work Assignment Scoping Documents or as variances to this QAPP. Inclusion of these SOPs will aid in final review of the data by data reviewers and users.

2.2 Case Narrative

The case narrative will be written on laboratory letterhead and the release of data will be authorized by the laboratory manager or their designee. The Case Narrative will consist of the following information:

- Client's sample identification and the corresponding laboratory identification;
- Parameters analyzed for each sample and the methodology used. EPA method numbers should be cited when applicable;
- Whether the holding times were met or exceeded;
- Detailed description of all analytical and/or sample receipt problems encountered;
- Discussion of reasons for any QA/QC sample result exceedances; and
- Observations regarding any occurrences which may adversely impact sample integrity or data quality.

2.3 Chain-of-Custody

Legible copies of all Chain-of-Custody forms for each sample shall be submitted in the data package. Copies of any internal laboratory tracking documents should also be included. It is anticipated that Chain-of-Custody forms and/or internal laboratory tracking documents will include the following information:

- Date and time of sampling and shipping;
- Sampler and shipper names and signatures;
- Type of sample (grab or composite);
- Analyses requested;
- Project, site, and sampling station names;
- Date and time of sample receipt;
- Laboratory sample receiver name and signature;
- Observed sample condition at time of receipt;
- Sample and/or cooler temperatures at time of receipt;
- Air bill numbers;
- Custody seal; and
- Sample numbers.

3.0 ORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

These requirements are applicable to organic methods (e.g., VOCs, SVOCs, PFAS).

3.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample.

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample extraction and/or analysis;
- Weights or volumes of sample used for extraction and/or analysis;
- Identification of instruments used for analysis;
- Gas Chromatography (GC) column and detector specifications;
- Dilution or concentration factor for the sample;
- Percent Difference between columns, if applicable;
- Percent Moisture or Percent Solids for soil samples;
- Method Detection Limits (MDLs) or sample Reporting Limits (RLs);
- Analytical results and associated units;
- Discussion of any manual integrations; and
- Definitions for any laboratory data qualifiers used.

3.2 Summary of QA/QC Sample Results (as applicable)

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms should, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

3.2.1 Instrument Calibration (for each instrument used)

- **GC/MS Tuning**. Report mass listings, ion abundance criteria, and percent relative abundances. List the instrument identification (ID) and the date and time of analysis. Ensure that all ion abundances have been appropriately normalized.
- **Initial Calibration**. Report analyte concentrations of initial calibration standards and the date and time of analysis. List the instrument identification (ID), response factors (RF), relative response factors (RRF), or calibration factors (CF), percent relative

standard deviation (%RSD), and retention time (RT) for each analyte. The initial calibration (IC) report must also include a sample identifier (ID), associated injection volume or quantity of sample analyzed, the acceptance criteria, such as minimum RF values, and associated maximum %RSD values.

- **Continuing Calibration**. Report the concentration of the calibration standard used for the continuing calibration and for the mid-level standard, and the date and time of analysis. List the ID, RF, RRF, CF, percent difference (%D), and RT for each analyte.
- **Quantitation Limit** or Project Required Reporting Limit (PRRL) Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each analyte analyzed. The date and time of analysis must also be reported.

3.2.2 Method Blank Analysis

List environmental samples and QC analyses associated with each method blank. Report concentrations of any analytes found in method blanks above the instrument detection limit.

3.2.3 Surrogate Standard Recovery

Report the name and concentration of each surrogate compound added. List percent recoveries of all surrogates in the samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Also include acceptance ranges that the laboratory used for the analysis.

3.2.4 Internal Standard Summary

Report internal standard area counts of the associated calibration standard and retention times, include upper and lower acceptance limits. List internal standard area counts and retention times for all samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Include the ID and the date and time of analysis.

3.2.5 Compound Confirmation

Report retention times of each compound on both columns as well as retention time windows of the associated standard. In addition, report determined concentrations from each column and percent differences between results. List the ID and the date and time of analysis. A summary should be generated for each sample, including dilutions and reanalyses, blanks, MSs, and MSDs.

3.2.6 Peak Resolution Summary

For primary and secondary columns report retention times of any target compounds and/or surrogates that coelute in the standards (ie. the Performance Evaluation Mixture for Contract Laboratory Program pesticides). Calculate and report the percent resolution between each pair of compounds which coelute. Include the ID, column ID, and the date and time of analysis.

3.2.7 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analysis

Report the name and concentration of each spiking compound. Samples are to be spiked with specified compounds of potential concern. List sample results, spiked sample results, duplicate spiked sample results, percent recovery (%R) and the relative percent difference (RPD) between the MS and MSD (if applicable). Acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.8 Laboratory Duplicate Analysis

When performed, report the RPD between duplicate analyses, along with the associated acceptance criteria.

3.2.9 Laboratory QC Check Sample Analysis

Also known as the Laboratory Control Sample (LCS) or Matrix Spike Blank (MSB). Report the name and concentration of each spiking compound. List the QC check sample and duplicate (if applicable) results, %R, and RPD, if performed in duplicate. The acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.10 Other QC Criteria

- **Retention time windows determination**. Report the retention time window for each analyte, for both primary and confirmation analyses.
- **Compound identification**. Report retention times and concentrations of each analyte detected in samples.
- **MDL determination**. List most recent method detection limits, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Additional method suggested QC parameters, if required**.
- **Any Performance Evaluation (PE) samples** (if identified) associated with the environmental samples.

3.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Raw data for compound identification and quantitation must be sufficient to verify each result.

3.3.1 Gas Chromatographic (GC) Analyses

This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for both primary and confirmation analyses are to be included. Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Area print-outs or quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in “job file” in laboratory, unless otherwise requested;
- Percent Moisture or Percent Solids for soil samples; and
- GC/MS confirmation, as applicable.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

3.3.2 Gas Chromatographic / Mass Spectrometric (GC/MS) Analyses

This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Mass spectrometer tuning and mass calibration (BFB, DFTPP);
- Initial and continuing instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Ion scans and enhanced spectra of target analytes and tentatively identified compounds (TICs), with the associated best-match spectra;
- Area print-outs and quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;

- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Moisture Content (Percent Moisture) for sediment samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.0 INORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

4.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample:

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample digestion and/or analysis;
- Weights or volumes of sample used for digestion and/or analysis;
- Identification of instruments and analytical techniques used for analysis;
- Instrument specifications;
- Dilution or concentration factor for the sample;
- Percent Moisture or Percent Solids for soil samples;
- Detection Limits: MDLs, RLs;
- Analytical results and associated units; and
- Definitions for any laboratory data qualifiers used.

4.2 Summary of QA/QC Results

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms shall, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

4.2.1 Instrument Calibration Verification (if applicable)

The order for reporting of calibration verifications for each analyte must follow the chronological order in which the standards were analyzed.

- **Initial Calibration Verification.** Report the source for the calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Continuing Calibration Verification**. Report the source for calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Quantitation Limit** or PRRL Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.

4.2.2 Blank Analysis

Report analyte concentrations above the instrument detection limits found in the initial calibration blanks (ICBs), continuing calibration blanks (CCBs), and in method/ preparation blanks. The date and time of analysis must also be reported. The order for reporting ICB and CCB results for each analyte must follow the chronological order in which the blanks were analyzed.

4.2.3 Matrix Spike (MS) Analysis

Report concentrations of the unspiked sample result, the spiked sample result and the concentration of the spiking solution added to the pre-digestion spike for each analyte. Calculate and report the %R and list control limits. If performed in duplicate, provide the %R for the MSD and the RPD.

4.2.4 Post Digestion Spike Analysis (if applicable)

In addition to matrix spikes, post-digestion spikes are often required by the method. Report concentrations of the unspiked sample results, spiked sample results, and the concentration of the spiking solution added. Calculate and report the %R and list control limits.

4.2.5 Laboratory Duplicate Analysis

Report concentrations of original and duplicate sample results. Calculate and report the RPD and list control limits.

4.2.6 Laboratory Control Sample

Identify the source for the LCS. Report the found concentration of the laboratory control sample and the true concentration for all analytes. Calculate and report the %R and list control limits.

4.2.7 Other QC Criteria (if applicable)

- **Method of Standard Additions (MSA)**. This summary must be included if MSA analyses are performed. Report absorbance values with corresponding concentration values. Report the final analyte concentration and list the associated correlation coefficient and control limits.
- **ICP-AES Serial Dilution**. Report initial and serial dilution results, associated %D, and control limits.
- **ICP-AES Linear Dynamic Ranges.** For each instrument and wavelength used, report the date on which linear ranges were established, the integration time, and the upper limit concentration.
- **MDL Determination**. List most recent method detection limits as determined using the September 2017 promulgation of the 40CFR136, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Any Performance Evaluation (PE) Samples** (if identified) associated with the environmental samples.

4.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Data should be organized sequentially by method and analysis date. Raw data for compound identification and quantitation must be sufficient to verify each result.

4.3.1 Atomic Absorption (AA) and Atomic Emission (AE) Spectrometric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).
- Measurement print-outs for all instruments used or copies of logbook pages for analyses that do not provide instrument print-outs;
- Absorbance units, emission intensities, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, etc.;
- Instrument analysis logs for each instrument used or summary of sample analyses;

- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested;
- Wavelengths used for the analyses; and
- Percent Moisture or Percent Solids for soil samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.2 Titrimetric and Colorimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;
- Titrant volumes, titration end-points, absorbance units, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, sample volumes, solution normalities, etc.;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Wavelengths used for the analyses.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.3 Gravimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;

- Weights, sample volumes, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, drying times, drying temperatures, etc.; and
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards maintained in “job file” in laboratory, unless otherwise requested.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

SUMMARY OF REQUIRED LABORATORY DELIVERABLES FOR LEVEL IV DQO DATA PACKAGE (REQUIREMENTS WILL VARY BY METHOD)

Method Requirements	Laboratory Deliverables
Requirements for all methods:	
Parsons project identification number	Case narrative
Discussion of unusual circumstances or problems	Case narrative
Analytical method description and reference citation	Case narrative
Field sample identification	Signed chain-of-custody forms and sample results form
Laboratory assigned sample number	Signed chain-of-custody forms and sample results form
Sample matrix description	Signed chain-of-custody forms and sample results form
Date of sample collection	Signed chain-of-custody forms and sample results form
Date of sample receipt at laboratory	Signed chain-of-custody forms
Analytical method description and reference citation	Signed chain-of-custody forms and case narrative
Sample analysis results	USEPA CLP form or equivalent sample analysis results summary form (e.g., ASP Form I-VOA)
Dates of sample preparation and analysis (including first run and any subsequent runs)	Specific deliverable depends on type of analysis
Laboratory analytical QC batch info and sample analysis associations	Specific deliverable depends on type of analysis
Instrument analysis sequence log	Specific deliverable depends on type of analysis
Analytical holding times compliance	USEPA CLP form or equivalent holding time summary form
Method detection limit (MDL) determination	USEPA CLP form or equivalent MDL summary form
Method reporting limits (RLs) achieved	Specific deliverable depends on type of analysis (see below)
Dilution or concentration factors	Specific deliverable depends on type of analysis
Discussion of unusual circumstances or problems	Case narrative
Laboratory Control Sample (LCS) results	USEPA CLP form or equivalent LCS results summary form
“Raw” analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
Matrix spike / matrix spike duplicate	USEPA CLP form or equivalent MS/MSD summary form (e.g., NYSDEC ASP Form III-SV
Method blank analysis	USEPA CLP form or equivalent method blank summary form (e.g., NYSDEC ASP Form IV-SV)
GC/MS instrument performance check. Tuning and mass calibration (abundance) using 4-bromofluorobenzene (BFB) for method SW8260C and decafluoro-triphenyphosphene (DFTPP) for method SW8270CD	USEPA CLP form or equivalent instrument tuning/performance check summary form
Internal Standard Area Counts and Retention Time, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form VIII-SV)
GC/MS initial calibration data	USEPA CLP form or equivalent initial calibration summary form (e.g., NYSDEC ASP Form VI-SV)
GC/MS continuing calibration data.	USEPA CLP form or equivalent continuing calibration summary form (e.g., NYSDEC ASP Form VII-SV)
GC/MS calibration verification (initial and continuing)/2nd source calibration verification (ICV/CCV)	USEPA CLP form or equivalent calibration verification summary form
GC continuing calibration data for volatile and semivolatile analyses. If calibration factors are used, calibration factors and their percent differences from the initial calibration must be reported. Retention time windows and analyte retention times must be included in this form	USEPA CLP form or equivalent calibration verification summary form
GC/MS internal standard area and retention time summary data	USEPA CLP form or equivalent internal standard summary form
GC second column confirmation, as applicable. To be done for all compounds that are detected above method detection limits	Chromatograms of all confirmations of all samples and the standard laboratory form for all positive results
Surrogate Compound percent recovery summary	USEPA form or equipment percent recovery summary form (e.g., NYSDEC ASP Form II-SV)
“Raw” analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index
Requirements for inorganic analytical methods:	
Initial and Continuing Calibration Verification	USEPA CLP form or equivalent calibration verification summary form(s) (e.g., NYSDEC ASP Form II-IN)

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
ICP Interference Check Sample (ICS), as applicable	USEPA CLP form or equivalent ICS standard summary form (e.g., NYSDEC ASP Form IV-IN)
ICP Interelement Correction Factors, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form XII-IN
Instrument Detection Limit (IDL) or MDL determination	USEPA CLP form or equivalent IDL or MDL summary form(s)
Post-digestion spike, as applicable	USEPA CLP form or equivalent post-digestion spike summary form(s) (e.g., NYSDEC ASP Form V-IN)
ICP linear range	USEPA CLP form or equivalent linear range summary form(s) (e.g., NYSDEC ASP Form XII-IN)
ICP serial dilution, as applicable	USEPA CLP form or equivalent serial dilution summary form(s) (e.g., NYSDEC ASP Form IX-IN)
Method of standard addition (MSA), as applicable	USEPA CLP form or equivalent MSA summary form(s)
Laboratory duplicate results, as applicable	USEPA CLP form or equivalent duplicate analysis summary form(s) (e.g., NYSDEC ASP Form VI-IN)
Requirements for other methods:	
Preparation and analysis logs	No format
Sample results	No format
MS/MSD results	No format
Lab duplicate sample results	No format
Laboratory control sample	Control limits
Method blank results	No format
Initial calibration results	No format
Continuing calibration check (calibration verification)	No format. Report percent relative standard deviation or percent difference from initial calibration

Appendix B

1,4 Dioxane and PFAS Sampling Checklist

1,4 DIOXANE AND PFAS SAMPLING CHECKLIST

Site Name: ______________________ Task: ______________________

Weather (temp/precip): ______________________ Date: ______________________

Field Clothing and PPE:

☐ Ansell TNT® Powder-Free Nitrile Gloves ONLY

☐ No clothing or boots containing Gore-Tex™

☐ No clothing or boots treated with water-resistant spray

☐ Safety boots made from polyurethane and PVC or leather boots covered with overboots

☐ No materials containing Tyvek®

☐ Field crew has not used fabric softener on clothing

☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products this morning

☐ Field crew has not applied unauthorized sunscreen or insect repellant

☐ Samplers don fresh nitrile gloves for each sample collected

Field Equipment:

☐ No Teflon® or LDPE containing materials other than QED brand LDPE

☐ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene or QED brand LDPE

☐ No waterproof field books, waterproof paper or waterproof bottle labels, waterproof markers/Sharpies®

☐ No plastic clipboards, binders, or spiral hard cover notebooks

☐ No Post-It Notes®

☐ Coolers filled with regular ice only; no chemical (blue) ice packs in possession

Sample Containers:

☐ Containers for PFASs Shipped in separate cooler

☐ Sample containers made of HDPE or polypropylene

☐ Caps are unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

☐ Wet weather gear made of polyurethane and PVC only

Equipment Decontamination:

☐ "PFAS-free" water on-site for decontamination of sample equipment; no other water sources to be used

☐ Alconox® or 7th Generation Free & Clear Dish Soap to be used as decontamination cleaning agents

Food Considerations:

☐ No food or drink on-site with exception of bottled water and/or hydration drinks (*i.e.*, Gatorade® and Powerade®) that is available for consumption only in the staging area

Vehicle Considerations:

☐ Avoid utilizing areas inside vehicle as sample staging areas

If any applicable boxes cannot be checked, the field team leader shall describe the deviations on the back and work with field personnel to address issues prior to commencement work. See additional information on the back of this form.

Sampling Equipment and Supply Summary (include brand names and serial numbers where available)

Decontamination Fluid Source(s): ______________________

Soap and other fluids used: ______________________

Gloves: ______________________ : Rope: ______________________

Sampling Equipment: ______________________

Field Team Names: ______________________

Field Team Leader Signature: ______________________

Deviation Summary:

If possible, materials identified as potentially containing PFASs should be relocated to a separate area of the site as far away as possible from the sampling location(s) and containerized if practicable. Notes should include method of response including type of materials on site and how they were moved and containerized.

Field Team Leader Name: ______________________________

Field Team Leader Signature: ______________________________Time: ________________________

Appendix C

Standard Groundwater Sampling Log

Low Flow Ground Water Sampling Log

Date
Personnel
Weather
Site Name
Evacuation Method
Well #
Site Location
Sampling Method
Project #

Well information:

Depth of Well ft.
Depth to Water ft.
H_{wc} ft.
Depth to Intake ft.

*Measurements taken from:
☐ Top of Well Casing
☐ Top of Protective Casing
☐ (Other, Specify)

Start Purge Time:

		10%	0.1	3%	10 mV	10%	10%	100 - 500 mL/min
Elapsed Time (min)	**Depth to Water (ft)**	**Temperature (celsius)**	**pH**	**Conductivity (ms/cm)**	**Oxidation Reduction Potential**	**Dissolved Oxygen (mg/L)**	**Turbidity (NTU)**	**Flow Rate (mL/min)**

End Purge Time:

Water Sample

Time Collected:
Total volume of purged water removed: (gallons)

Physical appearance at start:
Color
Odor
Sheen/Free Product

Physical appearance at stop:
Color
Odor
Sheen/Free Product

Field Test Results:

Dissolved ferrous iron:
Dissolved total iron:
Dissolved total manganese:

Sample	Container Type	# Collected	Field Filtered	Preservative	Container pH
VOCs - 8260	40mL Voa			HCL	-
PAH +1,4 Dx - 8270	1000mL Amber			None	-
Metals/Hg	500mL Plastic			HNO3	-
PFC Mod 537	250mL Plastic			None	-

APPENDIX D

Health and Safety Plan

HALEY & ALDRICH, INC.

SITE-SPECIFIC SAFETY PLAN

FOR

PORTION OF 65 TROWBRIDGE STREET

Project/File No. 129309-002

December 2019

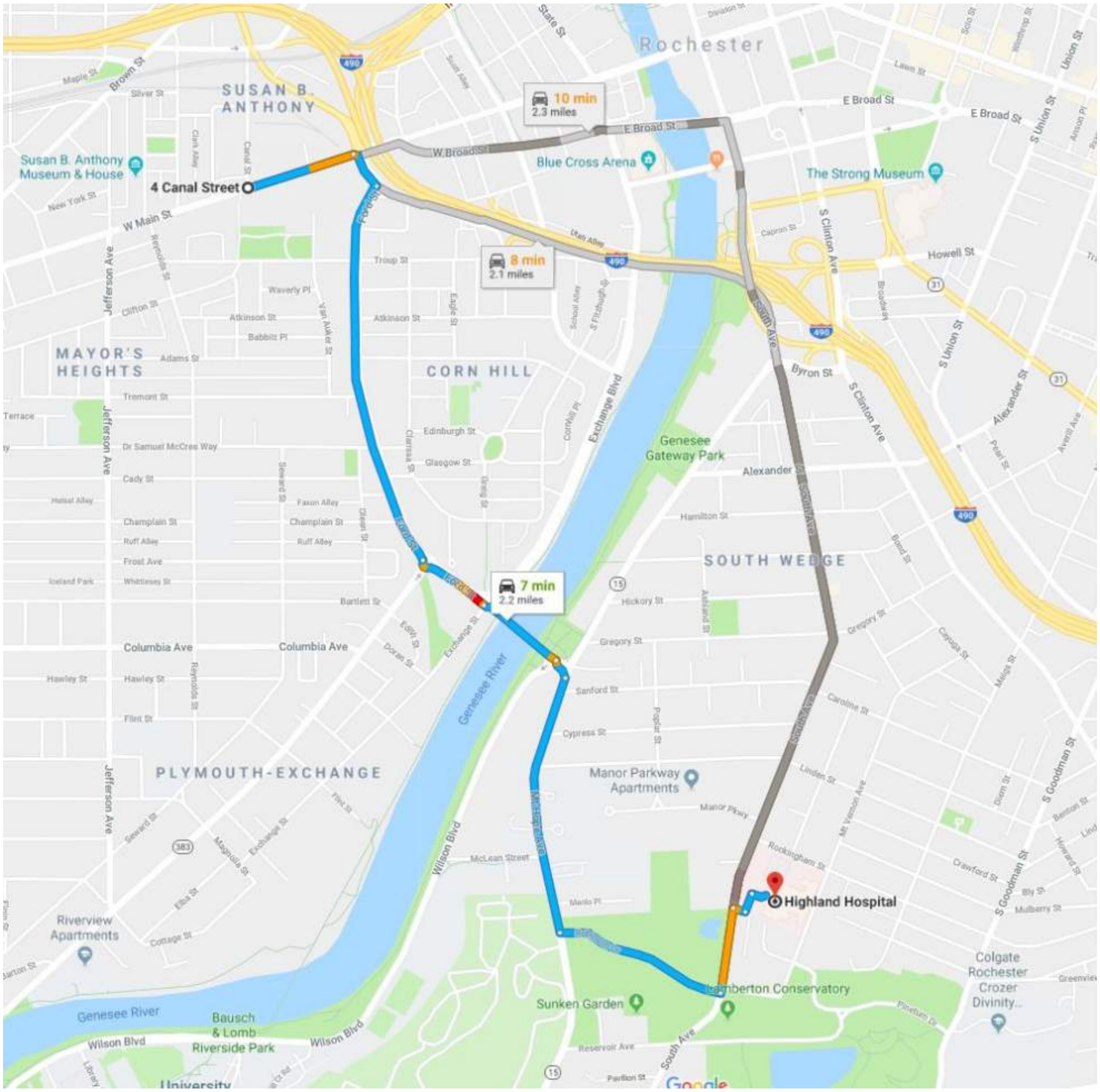
Prepared By: Lydell, Robert **Date: 03-13-2019**

EMERGENCY INFORMATION

Project Name : Portion of 65 Trowbridge Street	**H&A File No : 129309-002**
Location : 65 Trowbridge Street, Rochester, NY	
Client/Site Contact: Phone Number: Emergency Phone Number:	William B. Morse Lumber Co. William B. Morse, III 585-325-1400
H&A Project Manager: Phone Number:	Szucs, Janice 585-321-4211
Regional Health & Safety Manager: Emergency Phone Number:	Nostrant, Dave 585-370-2410
Nearest Hospital: Address: (see map on next page) Phone Number:	**Highland Hospital** 1000 South Avenue Rochester, NY 14620 585-473-2200
Liberty Mutual Claim Policy	**WC7-Z11-254100-039**
Other Local Emergency Response Number:	911
Other Ambulance, Fire, Police, or Environmental Emergency Resources:	Fire 585-428-7037

Emergency Hospital

Highland Hospital
1000 South Avenue Rochester, NY 14620
585-473-2200



STOP WORK

In accordance with H&A Stop Work Policy (OP1035), any individual has the right to refuse to do work that they believe to be unsafe and they have the obligation and responsibility to stop others from working in an unsafe manner without fear of retaliation. STOP Work Policy is the stop work policy for all personnel and subcontractors on the Site. When work has been stopped due to an unsafe condition, H&A site management (e.g., Project Manager, Site Safety Manager) and the H&A Senior Project Manager will be notified immediately. Reasons for issuing a stop work order include, but are not limited to:

- **The belief/perception that injury to personnel or accident causing significant damage to property or equipment is imminent.**
- **A H&A subcontractor is in breach of site safety requirements and / or their own site HASP.**
- **Identifying a sub-standard condition (e.g., severe weather) or activity that creates an unacceptable safety risk as determined by a qualified person.**

Work will not resume until the unsafe act has been stopped OR sufficient safety precautions have been taken to remove or mitigate the risk to an acceptable degree. Stop work orders will be documented as part of an on-site stop work log, on daily field reports to include the activity(ies) stopped, the duration, person stopping work, person in-charge of stopped activity(ies), and the corrective action agreed to and/or taken. Once work has been stopped, only the H&A SM or SSO can give the order to resume work. H&A senior management is committed to support anyone who exercises his or her “Stop Work” authority.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Project Name	Canal Street	**Project Number**	129309-002
Project Start Date	05-01-2019	**Project End Date**	12-31-2019
Client Site/Contact: Phone:	**William B. Morse, III** 585-325-1400		
H&A Project Manager: Phone:	**Szucs, Janice** 585-321-4211		
H&A Site Safety Officer Phone:			

APPROVALS: The following signatures constitute approval of this Health & Safety Plan

Electronic Signature

Yet to Approve
Site Project Manager Date

Yet to Approve
Corporate H&S Date

This document is valid for a maximum time period of one year after completion. The document must be reviewed if the scope of work or nature of site hazards changes and must be updated as warranted.

PROJECT INFORMATION

Site Overview/History

The Site encompasses a portion of a former manufacture gas plant (MGP) facility which ceased operation in the early 1890's. The former MGP was operated by the Municipal Gas Light Company of the City of Rochester (New York), which was a predecessor company to RG&E. The Site is a 1.2-acre portion of a 1.8-acre parcel (65 Trowbridge Street). The Site is currently an open lot used by Morse Lumber as a lumber yard storage area. The Site contains an active railroad track (used exclusively to deliver lumber to Morse Lumber) and is also traversed by inactive railroad tracks.

The land is currently active and zoned "Center City District" which allows for Commercial and Industrial use. The Site is located in an urban area surrounded by commercial and industrial properties. The Site owner plans to continue Site use for commercial or industrial use consistent with current zoning.

Site Classification	Commercial	**Site Status**	Partially Active	**Regulatory Authority**	HAZWOPER

Project Summary

Upon approval from New York State Department of Environmental Conservation into their Brownfield Cleanup Program and approval of the Remedial Investigation Work Plan (RIWP) and Interim Remedial Measures Work Plan (IRMWP) for the Site, Haley & Aldrich will implement the RIWP, which includes soil and groundwater sampling and IRMWP which includes excavation monitoring and stockpile soil sampling.

Project Tasks

Task 1	Task Name: **Soil Sampling with Hand Auger**
Soil samples will be collected at six locations from zero to six inches below ground surface (bgs) and six to twelve inches bgs. Soil samples will be collected from the borings for laboratory chemical analysis for VOCs, SVOCs, metals, PCBs, pesticides and herbicides	
Start Date : 05-01-2019	End Date : 12-31-2019
H&A Site Supervisor: Lydell, Robert	Subcontractor: None
Task 2	Task Name: **Water Sampling**
Groundwater samples will be collected from pre-existing wells and analyzed for VOCs, SVOCs, metals, 1,4-dioxane and PFAS using low-flow sampling methods. Monitoring wells will be purged using low-flow purging techniques. Following the purge, one groundwater sample will be collected from each monitoring well for laboratory analysis. Field parameters collected during groundwater sampling will consist of pH, oxidation/reduction potential (ORP), turbidity, temperature, conductivity, and dissolved oxygen.	
Start Date : 05-01-2019	End Date : 12-31-2019
H&A Site Supervisor: Lydell, Robert	Subcontractor: None
Task 3	Task Name: **Excavation / Trenching Oversight**

Excavation of soils within the Site boundary will be removed up to one foot below ground surface using conventional excavation equipment and methods. Soil removal actions will be performed to specified excavation limits. Prior to the start of excavation, excavation limits will be located based on existing mapping and flagged, and the depth of shallow utilities will be confirmed by hand clearing. Due to the presence of an active railroad track on the Site, excavation will not take place within a 30-ft wide corridor, i.e., 15 ft on either side of the railroad track centerline.	
Start Date : 05-01-2019	End Date : 12-31-2019
H&A Site Supervisor: Lydell, Robert	Subcontractor: HCS
Task 4	Task Name**: Excavation and Stockpile Soil Sampling**
Documentation samples will be collected from the base of the excavations. Since excavation depth is anticipated to be ~1 ft, sampling personnel will enter excavations to collect samples. Excavated soils will be temporarily placed in secure stockpiles on the Site and sampled for on-Site reuse or off-Site disposal at a NYSDEC-permitted waste management facility.	
Start Date : 05-01-2019	End Date : 12-31-2019
H&A Site Supervisor: Lydell, Robert	Subcontractor: None

HAZARD ASSESSMENT AND CONTROLS

The following site and task specific hazards have been identified. Associated controls have been defined and are also listed below.

Site Chemical Hazards

Source of Information: Previous investigation

COC	Location/Media	Concentration	Units
Naphthalene	**Soil**	**18**	**ug/kg**
Benzene	**Soil**	**1,100**	**ug/kg**
Toluene	**Soil**	**1,100**	**ug/kg**
Ethylbenzene	**Soil**	**1,200**	**ug/kg**
Xylenes	**Soil**	**4,400**	**ug/kg**
Naphthalene	**Water**	**620**	**ug/L**
Benzene	**Water**	**1,400**	**ug/L**
Toluene	**Water**	**290**	**ug/L**
Ethylbenzene	**Water**	**900**	**ug/L**
Xylenes	**Water**	**1,800**	**ug/L**

Naphthalene

General Information - Naphthalene can be found as a white solid in various shapes with a strong odor of coal tar.

Toxicity - Acute (short-term) exposure to naphthalene may cause effects on the blood, resulting in rupturing of blood cells. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is required. Repeated or prolonged exposure may have effects on the blood, resulting in chronic low red blood cell count. The substance may have effects on the eyes, resulting in the development of cataracts. This substance is possibly carcinogenic to humans.

Flammability - Naphthalene, on combustion, forms irritating and toxic gases.

Reactivity - Naphthalene reacts with strong oxidants causing fire and explosion hazards.

First Aid Procedures
Eye: Immediately wash (irrigate) the eyes with large amounts of water for 20 minutes, occasionally lifting the lower and upper lids. Further medical care is required.
Skin: Promptly flush the contaminated skin with water for 20 minutes.
Inhalation: Move the exposed person to fresh air at once.
Ingestion: Rinse the individual´s mouth. Do not induce vomiting. Seek medical attention immediately.

Air Monitoring - Vapor monitoring is required to determine concentrations.

Occupational Exposure Limit(s)

8 Hour TWA - 10 ppm	**IDLH** - 250 ppm

Benzene

Toxicity - Acute (short-term) exposure to benzene has been associated with skin and sensory irritation, central nervous system (CNS) problems (tiredness, dizziness, headache, loss of coordination) and effects on the respiratory system (eye and nose irritation). Prolonged (chronic) exposure to benzene can affect the kidney, liver and blood systems. Long-term exposure to high levels of the benzene compound can lead to leukemia and cancers of the blood-forming organs. Benzene is a known human carcinogen (causes cancer). Workers exposed to high levels of benzene in occupational settings were found to have an increase occurrence of leukemia. Long-term exposure to high levels of benzene in the air can lead to leukemia and cancers of the blood-forming organs.

Flammability - Benzene is volatile at room temperature and the vapor can be flammable at approximately 12,000 ppm. Benzene is heavier than air so its vapors will tend to accumulate in low spots on site.

Reactivity - Benzene is incompatible with oxidizers.

First Aid Procedures
Eye: Immediately wash (irrigate) the eyes with large amounts of water for 20 minutes, occasionally lifting the lower and upper lids.
Skin: Promptly flush the contaminated skin with water for 20 minutes.
Inhalation: Move the exposed person to fresh air at once. Other measures are usually unnecessary.
Ingestion: Do not induce vomiting. Seek medical attention immediately

Air Monitoring - Vapor Monitoring is required to determine concentrations. Monitoring can be specific for benzene using integrated sampling or with a direct reading vapor monitor.

Occupational Exposure Limit(s)

8 - 1 ppm	**STEL** - 5 ppm
IDLH - 500 ppm	

Toluene

General Information - Toluene is a clear colorless liquid with a characteristic aromatic odor. Flash point 40 °F. It is less dense than water (7.2 lb / gal) and insoluble in water. Hence floats on water. Toluene vapors heavier than air.

Toxicity - Acute (short-term) exposure to toluene has been associated with skin and sensory irritation, CNS problems (tiredness, dizziness, headache, loss of coordination) and effects on the respiratory system (eye and nose irritation). Prolonged (chronic) exposure to toluene can affect the kidney, liver and blood systems. Long-term exposure to high levels of the benzene compound can lead to leukemia and cancers of the blood-forming organs. Toluene has been categorized as not classifiable as to human carcinogenicity by both EPA (IRIS 2001) and IARC (1999a, 1999b), reflecting the lack of evidence for the carcinogenicity of these two chemicals.

Flammability -Toluene is flammable. The vapors will form explosive mixtures in the air starting at 11,000 ppm.

Reactivity - Toluene is incompatible with oxidizers.

First Aid Procedures
Eye: Immediately wash (irrigate) the eyes with large amounts of water for 20 minutes, occasionally lifting the lower and upper lids. Further medical care is required.

Skin: Remove contaminated clothing and promptly flush the contaminated skin with water for 20 minutes.
Inhalation: Move the exposed person to fresh air at once. Further medical attention is required.
Ingestion: Rinse the individual´s mouth. Do not induce vomiting. Seek medical attention immediately.

Air Monitoring - Vapor monitoring is required to determine toluene concentrations. Monitoring can be specific for toluene using integrated sampling or with a direct reading vapor monitor.

Occupational Exposure Limit(s)

8 Hour TWA - 10 ppm	**STEL** - 150 ppm
IDLH - 500 ppm	

Ethylbenzene

General Information - Ethylbenzene is a colorless liquid with an aromatic odor.

Toxicity - Acute (short-term) exposure to ethylbenzene can result in irritation to the eyes, the skin, and the respiratory tract. Swallowing the liquid may cause fluid to enter the lungs with the risk of lung inflammation. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness. Prolonged (chronic) to the substance may have effects on the kidneys and liver resulting in impaired functions. Repeated contact with skin may cause dryness and cracking. This substance is possibly carcinogenic to humans.

Flammability - Ethylbenzene vapors mix well with air easily forming explosive mixtures.

Reactivity - Ethylbenzene reacts with strong oxidants. It also attacks plastics and rubbers.

First Aid Procedures
Eye: Immediately wash (irrigate) the eyes with large amounts of water for 20 minutes, occasionally lifting the lower and upper lids.
Skin: Promptly flush the contaminated skin with water for 20 minutes.
Inhalation: Move the exposed person to fresh air at once. Other measures are usually unnecessary.
Ingestion: Rinse the individual´s mouth. Do not induce vomiting. Seek medical attention immediately

Air Monitoring - Vapor monitoring is required to determine concentrations. Monitoring can be specific for ethylbenzene using integrated sampling or with a direct reading vapor monitor.

Occupational Exposure Limit(s)

8 Hour TWA - 5 ppm	**STEL** - 30 ppm
IDLH - 125 ppm	

Xylenes

General Information - p-Xylene is a colorless liquid that is practically insoluble in water and has a sweet odor.

Toxicity - Acute (short-term) exposure to p-xylene can result in irritation of the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, it may result in fluid entering the lower respiratory system and cause inflammation of the lungs. Repeat or prolonged exposure to the liquid will remove fats and oils from the skin and can result in infection. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

Flammability - Both the liquid and the vapor of p-xylene are flammable.

Reactivity - p-Xylene reacts with strong acids and strong oxidants.

First Aid Procedures
Eye: Immediately wash (irrigate) the eyes with large amounts of water for 20 minutes, occasionally lifting the lower and upper lids. Further medical care is required.
Skin: Remove contaminated clothing and promptly flush the contaminated skin with water for 20 minutes.
Inhalation: Move the exposed person to fresh air at once. Artificial respiration may be required.

Air Monitoring - Vapor monitoring is required to determine p-xylene concentrations. Monitoring can be specific for p-xylene using integrated sampling or with a direct reading vapor monitor.

Occupational Exposure Limit(s)	
8 Hour TWA - 100 ppm	**STEL** - 150 ppm
Ceiling - 300 ppm	**IDLH** - 900 ppm

Site Hazards and Controls

Site Hazard Summary

Sun	Lightning Storms	Cold Temperatures
Hot Temperatures (Heat Stress)	Public Road or Right of Way	Railroad Right of Way
Slips and Trips		

SUN

Hazard Information

Acute excessive exposure to solar radiation may cause painful sunburn, and chronic exposure may contribute to eye damage and skin cancer. The average peak intensity of solar ultraviolet (UV) radiation is at midday. Most of the total daily UV is received between 10 AM and 2 PM. UV radiation can reflect off of water, concrete, light colored surfaces, and snow. Cloud cover can reduce UV levels, but overexposure may still occur.

Use the shadow test to determine sun strength: If your shadow is shorter than you are, the sun´s rays are at their peak, and it is important to protect yourself.

Controls

- Wear light-colored, closely woven clothing, which covers as much of the body as practicable.
- Use sunscreens with broad spectrum protection (against both UVA and UVB rays) and sun protection factor (SPF) values of 30 or higher. Ideally, about 1 ounce of sunscreen (about a shot glass or palmful) should be used to cover the arms, legs, neck, and face of the average adult. Sunscreen needs to be reapplied at least every 2 hours to maintain protection.
- Hats should be worn and should be wide brimmed, protecting as much of the face, ears, and neck as possible. Hats should also provide ventilation around the head. Sunscreen should be applied to areas around the head not protected by the hat (ears, lips, neck, etc.).
- Wear sunglasses while working outdoors. Sunglasses should allow no more than 5% of UVA and UVB penetration and should also meet the ANSI Z87.1 standard for safety glasses.
- Use natural or artificial shade, where possible.

LIGHTNING STORMS

Hazard Information

Where the threat of electrical storms and the hazard of lightning are present, staff shall ensure site procedures exist to include the following:

- Detect when lightning is in the near vicinity and when there is a potential for lightning
- Notify appropriate site personnel of these conditions
- Implement protocols to stop work and seek shelter

The basis for an effective site-specific lightning warning system involves the following considerations:

- Time required to cease work or to make operations safe

- Time required to communicate pertinent information
- Time required to safely shelter personnel
- Movement speed of thunderstorms
- Distance between successive cloud-to-ground flashes
- Accuracy of lightning detection system
- Application of the "30-30 Rule"

30-30 Rule
If the time between seeing lightning and hearing thunder is less than 30 seconds, you are in danger of lightning strike.

  - Seek shelter immediately.
  - Stay indoors for more than 30 minutes after hearing the last clap of thunder.

Staff members should consult OP 1054 Electrical Storms & Lightning Protection for additional information regarding lightning storms.

Controls

- Identify and communicate the lightning response plan to be used at the project site. This plan should include staff responsibilities, storm detection methods, time required to cease work, shelter locations, and the process to resume work.
- **When thunderstorms threaten, do not start anything you can´t quickly stop.**
- Monitor the daily weather forecast and communicate it at the daily safety tailgate meeting. If the threat of a storm is in the forecast, the weather will be monitored throughout the workday with appropriate equipment or notification systems.
- Identify shelter locations. Vehicles (not including heavy equipment) can provide immediate protection if you are caught outside when lightning strikes, but should not be the primary safe refuge location. A permanent structure is a better option, if available.
- If you are in or near the water, head toward land immediately and find shelter. Take extra precautions when on the water and in a boat due to the additional dangers of high winds and waves.
- If there is no shelter, find a low-lying, open place that is a safe distance from trees, poles, or metal objects that are high electricity conductors. Make sure it is not likely to flood. Assume a tucked position: Squat low to the ground. Place your hands on your knees with your head tucked between them. Try to touch as little of your body to the ground as possible. Stay aware of your surroundings and the progress of the storm.

COLD TEMPERATURES

Hazard Information

Cold stress may occur at any time work is being performed during low ambient temperatures and high velocity winds. Because cold stress is common and potentially serious illnesses are associated with outdoor work during cold seasons, regular monitoring and other preventative measures are vital.

Staff members should consult OP1003-Cold Stress for additional information on cold weather hazards.

Cold Stress Conditions

Frostbite: Localized injury resulting from cold is included in the generic term "frostbite”. There are several degrees of damage.

Symptoms: Frost nip or incident frostbite; sudden blanching or whitening of the skin.

- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Treatment:

- Bring the victim indoors and heat the areas quickly in water between 102° and 105° F.
    - Never place frostbitten tissue in hot water as the area will have a reduced heat awareness and such treatment could result in burns.
- Give the victim a warm drink (not coffee, tea, or alcohol).
    - The victim should not smoke or do anything that will inhibit blood circulation.
- Keep the frozen parts in warm water or covered with warm clothes for 30 minutes even though the tissue will be very painful as it thaws.
    - Elevate the injured area and protect it from injury.
    - Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas.
- Keep victim warm and get medical care immediately following first aid treatment.
- After thawing, the victim should try to move the injured areas slightly, but no more than can be done without assistance.

Do NOT:

- Rub the frostbitten area(s)
- Use ice, snow, gasoline, or anything cold on frostbite
- Use heat lamps or hot water bottles to rewarm the frostbitten area
- Place the frostbitten area near a hot stove

Hypothermia: Significant loss of body heat that is also a potential hazard during cold weather operations. Hypothermia is characterized as "moderate" or "severe".

Symptoms:

- Early hypothermia - Chills, pale skin, cold skin, muscle rigidity, depressed heart rate, and disorientation
- Moderate hypothermia - Any combination of severe shivering, abnormal behavior, slowing of movements, stumbling, weakness, repeated falling, inability to walk, collapse, stupor, or unconsciousness
- Severe hypothermia - Extreme skin coldness, loss of consciousness, faint pulse, and shallow, infrequent or apparently absent respiration

Death is the ultimate result of untreated hypothermia. The onset of severe shivering signals danger to personnel; exposure to cold shall be immediately terminated for any severely shivering worker.

Treatment: Staff members should seek emergency medical treatment in the event of hypothermia. The following actions can be taken prior to obtaining medical treatment:

- Gently place patients in an environment most favorable to reducing further heat loss from evaporation, radiation, conduction, or convection.
- Remove wet clothing and replace it with dry blankets or sleeping bags.
- Initiate active external rewarming with heat packs (e.g., hot water bottles, chemical packs, etc.) placed in the areas of the armpits, groin, and abdomen.
- Be aware of the risk of causing body surface burns from excessive active external rewarming.

In dire circumstances, rescuers may provide skin-to-skin contact with patients when heat packs are unavailable and such therapy would not delay evacuation.

Controls

- Recognize the environmental and workplace conditions that may be dangerous.
  - When the temperature is below 41° F, workers should be aware that cold stress is a potential hazard.
- Learn signs of cold-induced illnesses and injuries and how to help affected staff members.
  - Observe fellow staff members for signs of cold stress and administer first aid, where necessary.
- Staff members should maintain a clothing level that keeps them warm but dry (not sweating).
  - Staff should wear thermal clothing including gloves and footwear and beneath chemical resistant clothing, when appropriate.
  - Workers should have a spare set of clothing in case work clothes are not warm enough or become wet.
  - If a worker begins to sweat, he/she should remove a layer.
  - If clothing becomes wet and temperatures are below 36° F, clothing must be immediately replaced with dry clothing.
- A warm area for rest breaks should be designated.
  - In cold temperatures, rotate shifts of workers with potential cold stress exposure or take periodic breaks to allow recovery from cold stress.
  - Do not go into the field alone when cold stress could occur.
- Avoid fatigue or exhaustion because energy is needed to keep muscles warm.
- Workers should drink warm liquids (non-alcoholic, non-caffeinated) periodically throughout their shifts so they do not get dehydrated.

HOT TEMPERATURES (HEAT STRESS)

Hazard Information

Heat stress may occur at any time work is being performed at elevated ambient temperatures. Heat stress is one of the most common and potentially serious illnesses associated with outdoor work during hot seasons; therefore, regular monitoring and other preventative measures are vital. Site workers must learn to recognize and treat various forms of heat stress.

H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working when there are hot temperatures or a high heat index.

Staff members should consult OP 1015 Heat Stress for additional information regarding hot weather hazards.

Heat Stress Conditions

Heat Rash: Caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat.
Symptoms: Mild red rash, especially in areas of the body on contract with protective gear.
Treatment: Decrease amount of time in protective gear, and provide powder to help absorb moisture and decrease chaffing.

Heat Cramps: Caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke. This condition is much less dangerous than heat stroke, but it nonetheless must be treated.
Symptoms: Acute painful spasms of voluntary muscles (e.g., abdomen and extremities).
Treatment: Remove the victim to a cool area and loosen clothing. Have the patient drink 1 to 2 cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be 1 to 2 gallons per day.

Heat Exhaustion: A state of definite weakness or exhaustion caused by the loss of fluids from the body.
Symptoms: Pale, clammy, moist skin, profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. The person may have a headache, may vomit, and may be dizzy.
Treatment: Remove the person to a cool place, loosen clothing, and place in a head-low position. Provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 to 2 cups of water immediately and every 20 minutes thereafter until symptoms subside. Total water consumption should be 1 to 2 gallons per day.

Heat Stroke: An acute and dangerous reaction to heat exposure caused by failure of heat regulating mechanisms of the body; the individual´s temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.
Symptoms: Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; unconsciousness or coma.
Treatment: Cool the victim quickly and obtain immediate medical assistance. If the body temperature is not brought down fast, permanent brain damage or death may result. Soak the victim in cool but not cold water, sponge the body with rubbing alcohol or cool water, or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea or alcoholic beverages.

Controls

Practice heat stress management:

- Workers should drink 16 ounces of water before beginning or restarting work after a break. Water should be maintained at 50 to 60 degrees Fahrenheit (°F). Workers should drink one to two 4-ounce cups of water every 30 to 60 minutes during work. The use of alcohol during non-working hours and the intake of caffeine during working hours can lead to an increase in susceptibility to heat stress. Monitor for signs of heat stress (shown in Heat Stress Conditions above).

- Workers should acclimate to site work conditions by slowly increasing workloads (i.e., do not begin site work activities with extremely demanding activities). This acclimation process may require up to two weeks.
- In hot weather, field activities should be conducted in the early morning or evening when temperatures are cooler. Rotate shifts of workers with potential heat stress exposure.
- Adequate shelter should be available to protect personnel from heat, which can decrease physical efficiency and increase the probability of heat stress. Erect temporary shade at the workstation if necessary. A cool area for rest breaks should be designated, preferably air-conditioned.
- Cooling devices should be used to aid natural body ventilation. Note: These devices add weight, and their use should be balanced against worker efficiency.

PUBLIC ROAD OR RIGHT OF WAY

Hazard Information

H&A staff and their subcontractors often conduct work on public roads and/or rights-of-way, exposing them to the hazard of vehicular traffic and exposing the general public to the hazards of the job site.

Where a hazard exists to site workers because of traffic or haulage conditions at work sites encroaching upon public streets or highways, a system of traffic controls, in conformance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), or state program, is required. A Temporary Traffic Control Plan (TTCP) is required to provide for worker protection and the safe passage of traffic through and around job sites with as little inconvenience and delay as possible. TTCPs describes traffic controls to be used for facilitating vehicle and pedestrian traffic through a temporary traffic control zone.

The plan may range in scope from being highly detailed, to referencing typical drawings contained in the MUTCD, standard approved highway agency drawings and manuals, or specific drawings contained in contract documents. The degree of detail in the TTCP depends entirely on the complexity of the situation; the TTCP should be prepared by persons knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed.

H&A Project Managers or their subcontractors need to establish the appropriate control measures and obtain any permits when project work is on, or encroaches upon, a public road way.
Staff members should consult OP 1043 Site Traffic Control for additional information on public road or right-of-way hazards.

Controls

- Define responsibility for establishing temporary traffic control plan.
- Obtain all required permits at the local or district level.
- Retain flagger or police detail, as required.
- Cease work and notify the field supervisor immediately if any field conditions exist so that the safety of any party is jeopardized.

- Utilize protective vehicles whenever appropriate, or position equipment as a barrier between the work and oncoming traffic.

RAILROAD RIGHT OF WAY

Hazard Information

Work that is conducted on a railroad company´s property includes special precautions and requirements. The work can be performed on the line itself or within the right-of-way. Typically, the presence of persons, equipment, and/or material "in the railroad area" (closer than 15 feet of the nearest railroad rail, centenary, electrical wire, signal wire, or other signal facility) must have permission of the railroad company prior to initiating work. All work must be conducted to avoid damage to the railroad company´s trains, tracks, or other facilities and not to interfere with the movement of trains or damage to railroad track ballast.

The railroad company may require a railroad flagger when operation(s) might encroach "in the railroad area". The railroad flagger is assigned to a project to ensure the safe passage of trains or on-track equipment by effectively communicating with trains regarding the movement of equipment on/near active railroad tracks. Notify the flagger each time it is necessary to be "in the railroad area", and then proceed only after the railroad flagger has indicated it is safe to do such. **The tracks must be cleared promptly anytime the railroad flagger indicates to do so.**

Key considerations for railroad safety:

- A 150-car freight train traveling 50 miles per hour takes 8000 ft. (or 1.5 miles) to stop.
- Modern trains are deceptively silent and extremely fast. A train traveling at 125 mph takes only 7 seconds to travel a quarter of a mile.
- Trains produce enormous amounts of wind turbulence. This slipstream is so powerful that it can drag you under the wheels of the train if you are standing directly next to the track.

Controls

- Communication protocols need to be established prior to being "in the railroad area"; the tracks are clearly defined and recognized by all parties involved.
- If a flagger is required, the flagger must inform all workers how he/she will warn workers of an approaching train.
- Complete safety and security awareness training through e-RAILSAFE or other designated vendor.

SLIPS AND TRIPS

Hazard Information

Slip and trip injuries are the most frequent injuries to workers. Both slips and trips result from some kind of unintended or unexpected change in the contact between the foot and the ground or walking surface. This shows that good housekeeping, quality of walking surfaces (flooring), awareness of surroundings, selection of proper footwear, and appropriate pace of walking are critical to preventing fall accidents.

Site workers will be walking on a variety of irregular surfaces that may affect their balance. Extra care must be taken to walk cautiously near any surfaces that are unfamiliar or may have unseen slip or trip hazards such as rivers because the bottom of the river bed maybe slick and may not be visible. Rocks, gradient changes, sandy bottoms, and debris may be present but not observable.

Controls

- Take your time and pay attention to where you are going.
- Adjust your stride to a pace that is suitable for the walking surface and the tasks you are doing.
- Check the work area to identify hazards - beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Establish and utilize a pathway free of slip and trip hazards.
- Choose a safer walking route.
- Carry loads you can see over and are not so heavy as to increase your trip/slip probability.
- Keep work areas clean and free of clutter.
- Communicate hazards to on-site personnel and mitigate hazards as appropriate.

ECONOMICALLY DEPRESSED

Hazard Information

Economically depressed areas may have high crime rates. Projects involving work in and around inactive industrial sites may bring staff into contact with indigent and homeless persons. Staff could be subjected to crime that includes but may not be limited to thievery, vandalism, and violence. Prior to the start of work staff need to have an understanding of the work locations and the potential for exposure to low level crime.

Controls

- Staff members should never work alone in these areas. A buddy system is required.
- Conduct work during daylight hours.
- Secure equipment and vehicles.
- If warranted, contact the local police department for a security detail.
- Leave the work area immediately and contact the local authorities if staff members feel threatened or are threatened.

Task Specific Hazards

TASK 1

Task 1 Soil Sampling with Hand Auger – A hand auger is used to collect surficial soil samples up to eight (8) feet in depth. There are a variety of hand augers such as bucket and bit augers, continuous flight (screw) and post-hole augers. This equipment can be used in a wide variety of soil conditions. The presence of rock layers and collapsing of the borehole usually prohibit sampling at depths greater than 3 to 6 feet. The equipment is inexpensive, easy to operate, and generally works well to sample most soils

When using a hand auger the area in which the bore holes are located needs to be cleared of any underground utilities prior to initiating work. Check boring locations for potential hazards such as poison ivy, evidence of underground piping, rubble, rebar or old foundations. Stretch prior to initiating work. Stand upwind to avoid exposure whenever possible. Use proper tools for hand augering and use proper lifting techniques. Proceed slowly and use caution. The diameter of the boring should be equal to or greater than the diameter of drill augers or geoprobe rods. ONLY remove the auger flights one at a time, as they were put on; do NOT pull the entire auger out of the hole at once.

Avoid twisting and straining with the hand auger. Use a posthole digger to pull and remove debris that cannot be removed with the hand auger. Proceed slowly and use caution. An offset handle (outward closing) style posthole digger should be used. If post hole digger does not work, use a steel spud bar to pry and dislodge debris. Do not attempt to remove objects or debris that are too large to recover with a post hole digger. If you suspect you have encountered a buried metallic object, stop work and immediately and notify the site manager.

Potential Hazards

Repetitive Motion	Manual Lifting/Moving	Ground Disturbance	Hand and Power Tools
Rotating Equipment	Underground Utilities		

TASK 2

Task 2 Water Sampling – Environmental water sampling could include activities such as groundwater sampling from permanent or temporary wells, or surface water sampling from streams, rivers, lakes, ponds, lagoons, and surface impoundments.

Sampling tasks could involve uncapping, purging (pumping water out of the well), and sampling, and/or monitoring, new or existing monitoring wells. A mechanical pump may be used to purge the wells and can be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis. The physical hazards of these operations are primarily associated with the collection methods and procedures used.

When sampling bodies of water containing known or suspected hazardous substances, adequate precautions must be taken to ensure the safety of sampling personnel. The sampling team member collecting the sample should not get too close to the edge, where ground failure or slips, trips or falls may cause him/her to lose his/her balance. The person performing the sampling should have fall restraint or protection for the task. When conducting sampling from a boat in an impoundment or flowing waters, appropriate vessel safety procedures should be followed. Avoid lifting heavy coolers with back muscles; instead, use ergonomic lifting techniques, team lift or mechanical lifts. Wear proper gloves, such as when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

Inhalation and absorption of COCs are the primary routes of entry associated with water sampling, due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During this project, several different groundwater sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains or sprains from hand bailing, and potential eye hazards. Exposure to water containing COCs is also possible. All tools and equipment that will be used at the site must be intrinsically safe (electronics and electrical equipment) and non-sparking or explosion-proof (hand tools).

Potential Hazards			
Manual Lifting/Moving	Congested Area	Hand and Power Tools	Generated Waste

TASK 3

Task 3 Excavation / Trenching Oversight– There are multiple hazards associated with working in and around excavations and trenches including cave-ins, potential running soils, dislodged excavated soils, lack of proper access and egress. Nonfatal, and even fatal, injuries may occur in association with excavation and trenching activities with a greater frequency than one might expect. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, falling objects and toxic exposures.

Excavations five (5) feet deep or greater require a protective system unless the excavation is made entirely in stable rock. If the depth is less than five (5) feet deep, a competent person may determine that a protective system is not required. Trenches 20 feet deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional.

H&A Staff Members shall not enter a trench that is five feet deep or greater unless a protective system is used or the soil(s) have been characterized and benched and/or sloped appropriately.

The following list identifies the types of protective measures that can be used in the event a staff member is required to enter an excavation or trench.

- **Sloping** involves cutting back the trench wall at an angle inclined away from the excavation.

- **Benching** means a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels. Benching cannot be done in Type C soil.
- **Shoring** requires installing aluminum hydraulic or other types of supports to prevent soil movement and cave-ins.
- **Shielding** protects workers by using trench boxes or other types of supports to prevent soil cave-ins.

Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes caused by weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench) and other operations in the vicinity.

Potential Hazards

Excavation/Trenches	Manual Lifting/Moving	Ground Disturbance	Congested Area
Line of Fire	Generated Waste	Rotating Equipment	Underground Utilities
Heavy Equipment			

TASK 4

Task 4 Excavation and Stockpile Soil Sampling –

Soil sampling by H&A staff on active construction sites can be conducted in conjunction with a wide range activity such as building construction, earthwork and soil management related activities. Familiarity with basic heavy construction safety, site conditions (geotechnical and environmental), and potential soil contaminants are essential components of soil sampling performed on active sites.

Potential hazards related to soil sampling at construction sites include but are not limited to encountering site vehicle traffic and heavy equipment operations, manual lifting, generated waste, contact or exposure to impacted soil, and encountering unknown toxic or hazardous substances. Although soil sampling is commonly performed within active excavations, from stockpiles, or within trench excavations, sampling locations and situations will vary depending on site conditions. Care should be taken while entering and exiting excavations or trenches, and when accessing (climbing up or down) soil stockpiles, ensuring that the sampling area is not being actively accessed by construction equipment. Care should also be taken with handling of potentially environmentally impacted soil during sampling, with appropriate PPE identified and used.

At no time during classification activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils without the use of gloves. Staff will have to carry and use a variety of sampling tools, equipment, containers, and

potentially heavy sample bags. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.			
Potential Hazards			
Congested Areas	Manual Lifting/Moving	Ground Disturbance	Hand and Power Tools
Line of Fire	Underground Utilities		

Top Task Specific Hazards

Repetitive Motion

Motion or strain injuries are injuries affecting muscles, nerves, and tendons by repetitive movement and overuse. Almost any kind of awkward or repetitive motion you make could lead to an injury over time. Actions like bending the wrists, twisting at the waist, reaching for materials, working with your hands above the shoulder level, or grasping objects can increase wear and tear on the body. The condition mostly affects the upper body.

Controls

- Arrange your work zone, supplies and tools as much as possible to avoid reaching, leaning, bending, and twisting your waist or wrists.
- During rest breaks, use stretches to loosen up your body.
- Vary tasks if you can so that you are not making the same movement repeatedly over a long period.

Manual Lifting/Moving

Most materials associated with investigation, remediation, or construction-related activities are moved by hand. The human body is subject to damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process.

Controls

- Under no circumstances should any one person lift more than 49 pounds unassisted.
- Always push, not pull, the object when possible.
- Size up the load before you lift. Test by lifting one of the corners or pushing. If it is heavy or feels clumsy, get a mechanical aid or help from another worker. When in doubt, do not lift alone!
- Bend the knees; it is the single most important aspect of lifting.
- When performing the lift:
  - Place your feet close to the object and center yourself over the load
  - Get a good handhold
  - Lift straight up, smoothly and let your legs do the work, not your back!
  - Avoid overreaching or stretching to pick up or set down a load.

  - Do not twist or turn your body once you have made the lift.
  - Make sure beforehand that you have a clear path to carry the load.
  - Set the load down properly.

Ground Disturbance

Ground disturbance is defined as any activity disturbing the ground. Ground disturbance activities include, but are not limited to, excavating, trenching, drilling (either mechanically or by hand), digging, plowing, grading, tunneling and pounding posts or stakes.

Because of the potential hazards associated with striking an underground utility or structure, the operating procedure for underground utility clearance shall be followed prior to performing any ground disturbance activities.

See OPS1020 Working Near Utilities.

Controls

Prior to performing ground disturbance activities, the following requirements should be applied:

- Confirm all approvals and agreements (as applicable) either verbal or written have been obtained.
- Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable
  - Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit.
- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone.
-
- Notifications to landowners and/or tenant, where deemed reasonable and practicable.
- Proximity and Common Right of Way Agreements shall be checked, if the line locator information is inconclusive.

Hand and Power Tools

Hand and power tools can expose staff to a wide range of hazards depending upon the specific tool used. Hazards can include but are not limited to: falling, flying, abrasive, and splashing objects, or harmful dusts, fumes, mists, vapors, or gases. Serious accidents often occur before steps are taken to search out and avoid or eliminate tool-related hazards.

Staff must recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent those hazards.

See OP 1026 Hand and Power Tools for more information.

Controls

- Keep all tools in good condition with regular maintenance.

- Use the right tool for the job. Do not use a tool for a task for which it was not designed.
- Examine each tool for damage before use and do not use damaged tools.
- For any tool that is damaged or otherwise defective, the tool will be red tagged and taken out of service.
- Operate tools per the manufacturers´ instructions.
- Use the appropriate personal protective equipment.
- All electrically powered hand tools will be connected through a ground fault circuit interrupter (GFCI).
- All personnel must be trained on the use of the particular tool they are utilizing.

Rotating Equipment

Exposure to rotating parts can occur when working near a drilling rig, or other similar equipment. All rotating parts should be covered with guards to prevent access by workers. When performing maintenance activities that require the rotating parts to be exposed, workers should not allow loose clothing, hands, or tools to approach the rotating parts. Energy isolation procedures must be followed and guards must be replaced as soon as possible after completing the maintenance task.

Operation of drilling equipment also creates hazards associated with pinch points and rotating equipment. Similarly, these hazards also create pinch point hazards where the body and extremities, especially the hands, can be caught in moving equipment and crushed.

Controls

- Evaluate work procedures to avoid placing the body and extremities in the path of rotating equipment and tools to avoid being struck by moving equipment, tools and machinery.
- Evaluate equipment and tool use procedures to identify pinch points and develop procedures to avoid placing body parts in a position where they can be caught in moving equipment, tools and machinery.
- Follow energy isolation procedures, if required.
- Do not work near rotating equipment with long loose hair, loose clothing or jewelry.

Underground Utilities

Various forms of underground/overhead utility lines or conveyance pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SSO, Project Manager, and Regional H&S Manager shall be notified immediately. Work will be suspended until the client and applicable utility agency is contacted and the appropriate actions for the situation can be addressed.

See OP1020 Work Near Utilities for complete information.

Controls

- Obtain as-built drawings for the areas being investigated from the property owner;
- Visually review each proposed soil boring locations with the property owner or knowledgeable site representative;
- Perform a geophysical survey to locate utilities;
- Hire a private line locating firm to determine the location of utility lines that are present at the property;

- Identifying a no-drill or dig zone;
- Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.

Congested Area

Working in congested areas can expose both workers and the public to a wide range of hazards depending upon the specific activities taking place. Staff members need to understand the work scope, work areas, equipment on-site, and internal traffic patterns to minimize or eliminate their exposure potential.

Controls

- Provide barricades, fencing, warning signs or signals and adequate lighting to protect people while working in or around congested areas.
- Vehicles and heavy equipment with restricted views to the rear should have functioning back-up alarms that are audible above the surrounding noise levels. Whenever possible, use a signaler to assist heavy equipment operators and/or drivers in backing up or maneuvering in congested areas.
- Lay out traffic control patterns to eliminate excessive congestion.
- Workers in congested areas should wear high visibility clothing at all times.
- Be aware of Line of Fire hazards when performing work activities in congested areas.
- Hazards associated with simultaneous operations should be discussed daily at Tailgate Safety Meetings.

Generated Waste

Activities on environmental sites may generate waste that requires regulated handling and disposal.

Excess sample solids, decontamination materials, poly sheeting, used PPE, etc. that are determined to be free of contamination through field or laboratory screening can usually be disposed into client-approved, on-site trash receptacles. Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur. Contaminated materials must be segregated into liquids or solids and drummed separately for off-site disposal.

Controls

- Manage waste properly through good work practices.
- Collect, store, containerize waste, and dispose of it properly.
- All wastes generated shall be containerized in an appropriate container (i.e., open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM.
- Containers should be inspected for damages or defects.
- Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary.
- Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.

TASK PPE AND SAFETY EQUIPMENT

The personal protective equipment and safety equipment (if listed) is specific to the associated task. The required PPE and equipment listed must be on site during the task being performed. Work shall not commence unless the required PPE is present.

The purpose of PPE is to provide a barrier, which will shield or isolate staff members from the physical, biological, chemical, and/or radiological hazards that may be encountered during task activities.

Required PPE	**TASK 1**	**TASK 2**	**TASK 3**	**TASK 4**
	Soil Sampling with Hand Auger	**Water Sampling**	**Excavation / Trenching Oversight**	**Excavation and Stockpile Soil Sampling**
Hard hat	x		x	x
Safety glasses	x	x	x	x
Hard-toed Boots	x	x	x	x
Gloves	x	x	x	x
Long pants and 4	x	x	x	x
Safety vest (Class 2)	x	x	x	x
Hearing Protection			x	x

TRAINING REQUIREMENTS

The table below lists the training requirements staff must have respective to their assigned tasks and that required to access the site.

Task Specific Training				
Required Training	**TASK 1**	**TASK 2**	**TASK 3**	**TASK 4**
	Soil Sampling with Hand Auger	**Water Sampling**	**Excavation / Trenching Oversight**	**Excavation and Stockpile Soil Sampling**
See Site Required Training	--	--	--	--
Site Required Training				
40 Hour Hazwoper				
8 Hour Hazwoper Refresher				

SITE CONTROL

The overall purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. The degree of site control necessary depends on site characteristics, site size, and the surrounding community. The following information identifies the elements used to control the activities and movements of people and equipment at the project site.

Communication

Internal

H&A site personnel will communicate with other H&A staff members and/or subcontractors or contractors with:

- Face-to-Face Communication
- Cell Phones
- Email

External

H&A site personnel will use the following means to communicate with off-site personnel or emergency services.

- Cell Phones
- Email

Visitors

Visitor Access

Authorized visitors that require access to the project site need to be provided with known information with respect to the site operations and hazards as applicable to the purpose of their site visit. Authorized visitors must have the required PPE and appropriate training to access the project site. Haley & Aldrich is responsible for facilitating authorized visitor access.

Zoning

Work Zone

The work zone will be clearly delineated to ensure that the general public or unauthorized worker access is prevented. The following will be used:

- Fences
- Cones

Hazwoper

Designated work areas will be set up as appropriate during the site field activities, as required. The purpose of these procedures is to limit access to areas with potentially elevated chemical presence, prevent the migration of potentially hazardous materials into adjacent clean areas, minimize potential contamination of workers, and to protect public from site hazards. These areas are described in the following:

Exclusion Zone
The Exclusion Zone will be established to ensure contamination from the work conducted in the exclusion does not leave the project site. The zone will be clearly delineated using the following equipment/supplies:

- Fences
- Cones

The Exclusion Zone is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with project site activities. To meet this requirement, the following minimum distances will be used:

- **Direct Push Drilling Activities**. A distance of 20 feet in all directions will be cleared from the rig.
- **HSA Drilling**. Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the bore-hole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.
- **Potholing Activities**. A distance of 25 feet will be cleared in all directions from the backhoe and the location where the excavated soil is deposited.
- **Hand Augering**. A distance of 10 feet will be cleared in all directions from the sampling location in order to accommodate additional sampling equipment.
- **Excavation/Trenching**. A distance of 25 feet in all directions will be cleared. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the EZ and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-areas must be decontaminated or containerized as waste prior to leaving.

Project Site - Access

Work Hours
The following measure(s) will be used to control site entry and exit during site hours.

- Barrier Tape
- Cones

After Hours
The following measure(s) will be used to control site entry and exit during hours that the site is not operating.

- Barrier Tape
- Cones

ENVIRONMENTAL MONITORING

Monitoring procedures will be employed during project activities to assess employee exposure to contaminants. Monitoring will consist primarily of onsite determination of various parameters (e.g., airborne contaminant concentrations), but may be supplemented by more sophisticated monitoring techniques, if necessary.

Monitoring shall be performed within the work area on site in order to detect the presence and relative levels of contaminants. The data collected throughout monitoring shall be used to confirm or upgrade the defined levels of PPE identified within this plan. Monitoring shall be conducted as specified in the table below as work is performed.

Plan Name: Community Air Monitoring Plan (CAMP)

Parameter/ Contaminant	Equipment	Zone Location and Monitoring Interval	Action Level	Response Activity
Volatile Organic Compounds	Photo Ionization Detector Manufacturer and Lamp: miniRae 10.6	Breathing zone and edge of Exclusion Zone.	Varies by COC. For most commonly encountered VOCs other than BTEX, vinyl chloride and vinylidene chloride. > 10 ppm VOCs by PID for 5 minutes	Continue work in required PPE and continue monitoring.
			> 10 ppm VOCs by PID for > 5	Clear instrument and re-monitor the area. Implement PPE upgrades.
			> 50ppm	Evacuate the area and call the RHSM and/or PM for further guidance. Implement engineering controls.
Dust	Dust Monitor (RAM) Manufacturer: TSI	Breathing zone and edge of Exclusion Zone.	< 5 mg/m3	Continue work in required PPE and continue monitoring. Apply standard dust control measures as necessary.
			> 5 mg/m3	Upgrade to Level C. Use tackifier (if approved) to

				stabilize soil exposures or by covering exposed soil and stockpiles with tarpaulins, plastic sheeting or geotextile fabric.
			> 25 mg/m3	Evacuate the area and call the RHSM and/or PM for further guidance. Implement engineering controls.

Volatile Organic Compounds

Photoionization Detectors (PID) can be used to monitor VOC concentrations in work zones and/or at the site perimeter. These instruments do not give specific readings of contaminant concentration (e.g. benzene, TCE, etc.).

- Prior to the beginning of work, obtain background readings with the PID away from the site.
- Monitor the breathing zone when site soil is exposed (e.g., while drilling or excavating is occurring, etc.) with the PID.
- Monitoring should be conducted most frequently (e.g., every 15-30 minutes) when drilling or excavation first begins in a particular area and when soil is removed from the hole. After this, and if no exceedances of exposure limits are noted (see below), monitoring may be conducted less frequently (e.g., every 30-60 minutes).
- H&A general exposure limits will be used when a mixture of potentially volatile chemicals are suspected to be present in soil at the site.

  In summary, if a reading of 10 ppm above background is detected with the PID for 5 minutes or longer, back away for a few minutes. Screen the air again after any vapors/gases have been given a chance to dissipate. If 10 ppm above background is still noted, evacuate the area and call the RHSM and/or PM for further guidance.

- Record monitoring data and PPE upgrades in field book or on Record of Field Monitoring form and maintain with project files.
- Air monitoring for exposure should be based on the frequency established under the Standard Air Monitoring Plan or under the Specific Monitoring Requirements. Record activity, time, location and results of monitoring and actions taken based upon the readings.

It is anticipated that exposure to VOCs can be mitigated during work operations as necessary to control dust emissions by means of limiting the area of exposed soils and through the use of water sprays. If VOCs cannot be controlled by these standard measures, additional measures may be employed such as the use of a vapor suppressant (if approved) to minimize soil exposures or by covering exposed soil and stockpiles with tarpaulins, plastic sheeting or geotextile fabric. Otherwise cease work immediately and contact the Project Manager or the Corporate Health & Safety Manager for assistance. It is not permissible for VOC emissions to escape from the site at any time and perimeter VOC monitoring may be required to insure public safety.

The H&A Site Health and Safety Officer (SHSO) will determine controls, up to and including PPE upgrades based upon visual determination as necessary and the occupational exposure limit, for each known or suspected contaminant.

Dust

Respirable Aerosol Monitors (RAM) can be used to monitor total dust levels in work zones and/or at the site perimeter. These instruments do not give specific readings of contaminant concentration (e.g. metals, asbestos, etc.).

- Prior to the beginning of work obtain background readings with the RAM away from the site.
- Monitor the breathing zone when site soil is exposed (e.g., while drilling or excavating is occurring, etc.) with the RAM.
- Monitoring should be conducted most frequently (e.g., every 15-30 minutes) when drilling or excavation first begins in a particular area and when soil is removed from the hole. After this, and if no exceedances of exposure limits are noted (see below), monitoring may be conducted less frequently (e.g., every 60 minutes).
- H&A dust equivalent action levels will be used when a mixture of metals or semi-volatile organic compounds chemicals are suspected to be present in soil at the site.

  In summary, if a reading of 5 mg/m^3 above background is detected with the RAM for 1 minute or longer, back away for a few minutes. Screen the air again after any dusts have been given a chance to dissipate. If 5 mg/m^3 above background is still noted, apply controls. If controls are ineffective, evacuate the area and call the RHSC and PM for further guidance.

- Record monitoring data and PPE upgrades in field book or on Record of Field Monitoring form and maintain with project files.
- Air monitoring for exposure should be based on the frequency established under the Standard Air Monitoring Plan or under the Specific Monitoring Requirements. Record time, location and results of monitoring and actions taken based upon the readings.

Personal dust monitoring using an industrial hygiene pump and a filter cassette may be conducted on each day of operations. In such cases samples are collected from workers with the greatest potential dust exposure and analyzed by an accredited laboratory for specific contaminants.

It is anticipated that exposure to airborne dust can be mitigated during work operations as necessary to control dust emissions by means of limiting the area of exposed soils and through the use of water sprays. If dust emissions cannot be controlled by these standard measures, additional measures may be employed such as the use of a tackifier (if approved) to stabilize soil exposures or by covering exposed soil and stockpiles with tarpaulins, plastic sheeting or geotextile fabric. Otherwise cease work immediately and contact the Project Manager or the Corporate Health & Safety Manager for assistance.

The H&A Site Safety Officer (SSO) will determine controls, up to and including PPE upgrades based upon visual determination as necessary and the occupational exposure limit, or dust equivalent action level for each known or suspected contaminant.

It is not permissible for dust emissions to escape from the site at any time and perimeter dust monitoring may be required to insure public safety.

Air monitoring will be performed during all Site activities in which impacted or potentially impacted materials are being disturbed or handled. Staffing will include an air monitoring professional who will report to the Site Safety Officer.

Site monitors for community monitoring will be placed in the following locations:

- Upwind Location - The upwind location shall be placed in an upwind area (work area delineation) of the work area, but typically not less than 25 feet from the soil disturbance activity.
- The downwind locations shall be placed at the downwind perimeter of the work area (work area delineation). Monitors shall be placed in a direct downwind line of the work being conducted. Additional downwind monitors should be staged at the perimeter (work area delineation) to the right and left of the straight-line monitors at 45 degree angles if possible

Perimeter or Community Action Levels shall be developed specific to each site and may include action levels for VOCs, dust equivalents and particulate. Action levels for fugitive dust at the site perimeter are based upon the daily PM10 dust standard of 0.15 mg/m3 in the National Ambient Air Quality Standard (NAAQS) for Inhalable Dust.

SPILL CONTAINMENT

An evaluation was conducted to determine the potential for hazardous substance spills at this site.
This evaluation indicates that there is no potential for a hazardous spill of sufficient
size to require containment planning, equipment, and procedures.

DECONTAMINATION

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials, etc.).

Personal Hygiene Safeguards

The following minimum personal hygiene safeguards shall be adhered to:

1. No smoking or tobacco products on any Hazwoper project.
2. No eating or drinking in the exclusion zone.
3. It is required that personnel present on site wash hands before eating, smoking, taking medication, chewing gum/tobacco, using the restroom, or applying cosmetics and before leaving the site for the day.
4. It is recommended that personnel present on site shower or bathe at home at the end of each day of working on the site.

Personal Decontamination

Outer gloves and boots should be decontaminated periodically as necessary and at the end of the day. Brush off solids with a hard brush and clean with soap and water or other appropriate cleaner whenever possible. Remove inner gloves carefully by turning them inside out during removal. Wash hands and forearms frequently. It is good practice to wear work-designated clothing while on-site which can be removed as soon as possible. Non-disposable overalls and outer work clothing should be bagged onsite prior to laundering. If gross contamination is encountered on-site, contact the Project Manager and Regional Health and Safety Manager to discuss proper decontamination procedures.

The steps required for decontamination will depend upon the degree and type of contamination but will generally follow the sequence below.

1. Remove and wipe clean hard hat
2. Rinse boots and gloves of gross contamination
3. Scrub boots and gloves clean
4. Rinse boots and gloves
5. Remove outer boots (if applicable)
6. Remove outer gloves (if applicable)
7. Remove Tyvek coverall (if applicable)
8. Remove respirator, wipe clean and store (if applicable)
9. Remove inner gloves (if out gloves were used)

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles.

This decontamination procedure is applicable to Task(s): 1,2,3

Decontamination Supplies

The following supplies and chemicals will be used to decontaminate any equipment requiring decontamination.

Equipment	
Alconox Soap	Brushes
Disposal bags	5-gallon pails
Distilled/Deionized Water	Paper Towels
Tap water	

Small Equipment Decontamination

Pretreatment of heavily contaminated equipment may be conducted as necessary:

1. Remove gross contamination using a brush or wiping with a paper towel
2. Soak in a solution of Alconox and water (if possible)
3. Wipe off excess contamination with a paper towel

Standard decontamination procedure:

1. Wash using a solution of Alconox and water
2. Rinse with potable water
3. Rinse with methanol
4. Rinse with distilled/deionized water

Inspect the equipment for any remaining contamination and repeat as necessary.

This decontamination procedure is applicable to Task(s): 1,2,3

Large Equipment Decontamination

Equipment components, such as tires, treads, buckets, blades, and drill pipe/bits, that have maximum contact points with contaminated soil or product should be thoroughly decontaminated in an effort to prevent migration of contaminants off the site. This may require a thorough brushing scraping and minor amounts of washing. Provisions, such as cleaning stations, may be required where significant washing or steam cleaning is necessary. In this case, rinsate water/solutions will need to be collected and disposed of appropriately.

Standard Disposal Methods for Contaminated Soils

Contaminated soil cuttings and spoils must be drummed for disposal off-site unless otherwise specifically directed. Soil cuttings and spoils determined to be free of contamination through field screening can usually be returned to the boreholes or excavations from which they came.

EMERGENCY RESPONSE PLAN

Security/Violence

Security - In the event of a breach in security protocol staff need to inform the site supervisor and client or on-site security personnel (if any). Do not engage personnel that are not authorized on site. Contact 911 in the event that equipment or material is missing or intruders escalate their behavior.
Violence - in the event staff witness or are victims of violent behavior immediately inform the site supervisor and/or call 911. Staff should avoid engaging violent personnel and remove themselves from the situation and site until emergency responders arrive.

Medical

If there is an injury or illness associated with an H&A staff member on the job-site stop work, stabilize the situation and secure the site. Assess the severity of the injury or illness to determine the appropriate course of action as listed below.

First Aid Injury

First aid will be addressed using the on-site first aid kit. H&A employees are not required or expected to administer first aid/CPR to any H&A staff member, Contractor, or Civilian personnel at any time and it is H&A´s position that those who do are doing it do so on their behalf and not as a function of their job.

Injury or illness requiring clinic/hospital visit **WITHOUT** ambulance service

Injuries or illnesses requiring hospital service without ambulance services include minor lacerations, minor sprains, etc. The following action will be taken:

- The H&A SHSO will ensure prompt transportation of the injured person to the clinic or hospital identified in the safety plan.
- Another H&A staff member, or contractor on-site, will always drive the injured staff member to the medical facility and remain at the facility until the staff member has been discharged. Staff members will not self-transport to the clinic or hospital.
- If the injured staff member is able to return to the job site the same day, he/she will bring with him/her a statement from the doctor containing such information as:

    - Date
    - Employee´s name
    - Diagnosis
    - Date he/she is able to return to work, regular or light duty
    - Date he/she is to return to doctor for follow-up appointment, if necessary
    - Signature and address of doctor

Injury or illness requiring a hospital visit **WITH** ambulance service

Injuries or illnesses requiring hospital service with ambulance services include severe head injuries, severe lacerations, heart attacks, heat stroke, etc. The following steps will be taken immediately:

- Call for ambulance service and notify the H&A SHSO.

- Comfort the individual until ambulance service arrives.
- While the injured employee is being transported, the H&A SHSO will contact the medical facility to be utilized.
- One designated representative will accompany the injured employee to the medical facility and remain at the facility until final diagnosis and other relevant information is obtained.

Notifications

For all injuries or illness, notify the SHSO and PM who in turn will contact Corporate H&S. Within 24 hours the injured staff member or PM will complete the H&S Reporting Form found on HANK. Minor cuts, scratches, and bruises shall also be reported through the H&S Reporting Form. Notify the client in accordance with their notification protocol. Depending on severity, Human Potential will, as promptly as possible following an injury or illness, ensure appropriate notification has been made to the family of the individual involved.

Severe Weather

Where the threat of electrical storms and the hazard of lightning exist, staff shall ensure that there is the ability to detect when lightning is in the near vicinity and when there is a potential for lightning and to notify appropriate site personnel of these conditions. The weather forecast will be checked on a daily basis and communicated at the daily safety tailgate meetings.

When lightning is detected or observed the information will be communicated to all crews in the field for appropriate action. Field supervisors will make the decision to stay put or to leave the work site. A location will be identified to marshal field staff in the event that staff are required to leave the job site. A similar decision process will be used during heavy rain events. Staff shall seek appropriate shelter and not stay in the open.

Evacuation Alarms

Verbal communication and other means of communication will be used to communicate the evacuation alarm.

Emergency Services

Cellular phone will be used to contact Emergency Services.

Emergency Evacuation Plan

The site evacuation plan is as follows:

1. Establish a designated meeting area to conduct a head count in the event of an emergency evacuation.
2. If the work area is not near an emergency exit, exit via the closest route and meet at the designated meeting area.
3. Notify emergency response personnel (fire, police and ambulance) of the number of missing or unaccounted for employees and their suspected location.
4. Administer first aid in the meeting area as necessary.

Under no circumstances should any personnel re-enter the site area without the approval of the corporate H&S manager, the H&S coordinator, and the fire department official in charge.

ROLES AND RESPONSIBILITIES

REGIONAL HEALTH AND SAFETY MANAGER (RHSM)

The Haley & Aldrich RHSM, Dave Nostrant, is a full-time Haley & Aldrich staff member, trained as a safety and health professional, who is responsible for the interpretation and approval of this Safety Plan. Modifications to this Safety Plan cannot be undertaken by the PM or the SSO without the approval of the RHSM.

Specific duties of the RHSM include:

- Approving and amending the Safety Plan for this project;
- Advising the PM and SHSOs on matter relating to health and safety;
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation;
- Maintaining regular contact with the PM and SSO to evaluate the conditions at the property and new information which might require modifications to the HASP; and
- Reviewing and approving JSAs developed for the site-specific hazards.

PROJECT MANAGER (PM)

The Haley & Aldrich PM, Janice Szucs, is responsible for ensuring that the requirements of this HASP are implemented at that project location. Some of the PM´s specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the RHSM with updated information regarding environmental conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SHSO;
- Maintaining regular communications with the SSO and, if necessary, the RHSM;
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project;
- Providing project scheduling and planning activities; and
- Providing guidance to field personnel in the development of appropriate Job Safety Analysis (JSA) relative to the site conditions and hazard assessment.

SITE HEALTH & SAFETY OFFICER

The SHSO, Robert Lydell, is responsible for field implementation of this HASP and enforcement of safety rules and regulations. SHSO functions may include some or all of the following:

- Act as H&A´s liaison for health and safety issues with client, staff, subcontractors, and agencies;
- Verify that utility clearance has been performed by H&A subcontractors;
- Oversee day-to-day implementation of the Safety Plan by H&A personnel on site;
- Interact with subcontractor project personnel on health and safety matters;
- Verify use of required PPE as outlined in the safety plan;
- Inspect and maintain H&A safety equipment, including calibration of air monitoring instrumentation used by H&A;

- Perform changes to HASP and document as needed and notify appropriate persons of changes;
- Investigate and report on-site accidents and incidents involving H&A and its subcontractors;
- Verify that site personnel are familiar with site safety requirements (e.g., the hospital route and emergency contact numbers); and
- Report accidents, injuries, and near misses to the H&A PM and Regional Health and Safety Manager (RHSM) as needed.

The SHSO will conduct initial site safety orientations with site personnel (including subcontractors) and conduct toolbox and safety meetings thereafter with H&A employees and H&A subcontractors at regular intervals and in accordance with H&A policy and contractual obligations. The SHSO will track the attendance of site personnel at H&A orientations, toolbox talks, and safety meetings.

FIELD PERSONNEL

Haley & Aldrich personnel are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed Safety Plan Acceptance Form and documentation of medical surveillance and training to the SHSO prior to the start of work;
- Attending the pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the Safety Plan to the PM or the SHSO prior to the start of work;
- Stopping work when it is not believed it can be performed safely;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SHSO;
- Complying with the requirements of this safety plan and the requests of the SHSO; and
- Reviewing the established JSAs for the site-specific hazards on a daily basis and prior to each shift change, if applicable.

VISITORS

Authorized visitors (e.g., Client Representatives, Regulators, Haley & Aldrich management staff, etc.) requiring entry to any work location on the site will be briefed by the Site Supervisor on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer´s health and safety policies. In addition, this safety plan specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times. Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

APPENDICES

Appendix A - Task Hazards Summary (***Task summaries are included only if there is more than one task)***

Task 1

Task 2

Task 3

Appendix D – Operating Procedures

OP1033 Tailgate Safety Meetings.pdf

OP1035 Stop Work Authority.pdf

OP1052 Heavy Equipment.pdf

OP1004 Operation and Calibration of PID.pdf

OP1015 Heat Stress.pdf

OP1001 Excavation and Trenching Safety.pdf

OP1003 Cold Stress.pdf

OP1026 Hand Power Tools.pdf

Appendix E – Site Map

HAZARD ASSESSMENT SUMMARY

Project Name:	Portion of 65 Trowbridge Street	**Project Number:**	129309-002
Site Address:	65 Trowbridge Street Rochester, NY		
Health & Safety Plan Prepared by:	Lydell, Robert	**Date:**	01-14-2019
Task:	Task 1		
Task Description:	Soil Sampling with Hand Auger		
Task Start Date	05-01-2019	**Task End Date:**	12-31-2019

POTENTIAL HAZARDS DURING THIS TASK

Hazards	Actions to Eliminate or Minimize Hazards
Repetitive Motion	• Arrange your work zone, supplies and tools as much as possible to avoid reaching, leaning, bending, and twisting your waist or wrists. • During rest breaks, use stretches to loosen up your body. • Vary tasks if you can so that you are not making the same movement repeatedly over for a long period.
Manual Lifting/Moving	• Under no circumstances should any one person lift more than 49 pounds unassisted. • Always push, not pull, the object when possible. • Size up the load before you lift. Test by lifting one of the corners or pushing. If it is heavy or feels clumsy, get a mechanical aid or help from another worker. When in doubt, do not lift alone! • Bend the knees; it is the single most important aspect of lifting. • When performing the lift: ○ Place your feet close to the object and center yourself over the load ○ Get a good handhold ○ Lift straight up, smoothly and let your legs do the work, not your back! ○ Avoid overreaching or stretching to pick up or set down a load. ○ Do not twist or turn your body once you have made the lift.

	○ Make sure beforehand that you have a clear path to carry the load. ○ Set the load down properly.
Ground Disturbance	Prior to performing ground disturbance activities, the following requirements should be applied: • Confirm all approvals and agreements (as applicable) either verbal or written have been obtained. • Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable ○ Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit. • Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone. • • Notifications to landowners and/or tenant, where deemed reasonable and practicable. • Proximity and Common Right of Way Agreements shall be checked, if the line locator information is inconclusive.
Hand and Power Tools	• Keep all tools in good condition with regular maintenance. • Use the right tool for the job. Do not use a tool for a task for which it was not designed. • Examine each tool for damage before use and do not use damaged tools. • For any tool that is damaged or otherwise defective, the tool will be red tagged and taken out of service. • Operate tools per the manufacturers´ instructions. • Use the appropriate personal protective equipment. • All electrically powered hand tools will be connected through a ground fault circuit interrupter (GFCI). • All personnel must be trained on the use of the particular tool they are utilizing
Rotating Equipment	• Evaluate work procedures to avoid placing the body and extremities in the path of rotating equipment and tools

	to avoid being struck by moving equipment, tools and machinery. - Evaluate equipment and tool use procedures to identify pinch points and develop procedures to avoid placing body parts in a position where they can be caught in moving equipment, tools and machinery. - Follow energy isolation procedures, if required. - Do not work near rotating equipment with long loose hair, loose clothing or jewelry.
Underground Utilities	- Obtain as-built drawings for the areas being investigated from the property owner; - Visually review each proposed soil boring locations with the property owner or knowledgeable site representative; - Perform a geophysical survey to locate utilities; - Hire a private line locating firm to determine the location of utility lines that are present at the property; - Identifying a no-drill or dig zone; - Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.

HAZARD CONTROL MEASURES USED DURING THIS TASK

Task Trainings:	NA
Permits and Forms:	
PPE Requirements	Hard hat Safety glasses Hard-toed Boots Gloves Long pants and 4" long sleeve shirt Safety vest (Class 2) Hearing Protection

HAZARD ASSESSMENT SUMMARY

Project Name:	Portion of 65 Trowbridge Street Street	**Project Number:**	129309-002
Site Address:	65 Trowbridge Street Rochester, NY		
Health & Safety Plan Prepared by:	Lydell, Robert	**Date:**	01-14-2019
Task:	Task 2		
Task Description:	Groundwater Sampling		
Task Start Date	05-01-2019	**Task End Date:**	12-31-2019

POTENTIAL HAZARDS DURING THIS TASK

Hazards	Actions to Eliminate or Minimize Hazards
Manual Lifting/Moving	• Under no circumstances should any one person lift more than 49 pounds unassisted. • Always push, not pull, the object when possible. • Size up the load before you lift. Test by lifting one of the corners or pushing. If it is heavy or feels clumsy, get a mechanical aid or help from another worker. When in doubt, do not lift alone! • Bend the knees; it is the single most important aspect of lifting. • When performing the lift: o Place your feet close to the object and center yourself over the load o Get a good handhold o Lift straight up, smoothly and let your legs do the work, not your back! o Avoid overreaching or stretching to pick up or set down a load. o Do not twist or turn your body once you have made the lift. o Make sure beforehand that you have a clear path to carry the load. o Set the load down properly.
Congested Area	• Provide barricades, fencing, warning signs or signals and adequate lighting to protect people while working in or around congested areas. • Vehicles and heavy equipment with restricted views to the rear should have functioning back-up alarms that are

	audible above the surrounding noise levels. Whenever possible, use a signaler to assist heavy equipment operators and/or drivers in backing up or maneuvering in congested areas. • Lay out traffic control patterns to eliminate excessive congestion. • Workers in congested areas should wear high visibility clothing at all times. • Be aware of Line of Fire hazards when performing work activities in congested areas. • Hazards associated with SIMOPs should be discussed daily at Tailgate Safety Meetings.
Hand and Power Tools	• Keep all tools in good condition with regular maintenance. • Use the right tool for the job. Do not use a tool for a task for which it was not designed. • Examine each tool for damage before use and do not use damaged tools. • For any tool that is damaged or otherwise defective, the tool will be red tagged and taken out of service. • Operate tools per the manufacturers´ instructions. • Use the appropriate personal protective equipment. • All electrically powered hand tools will be connected through a ground fault circuit interrupter (GFCI). • All personnel must be trained on the use of the particular tool they are utilizing
Generated Waste	• Manage waste properly through good work practices. • Collect, store, containerize waste, and dispose of it properly • All wastes generated shall be containerized in an appropriate container (i.e., open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM. • Containers should be inspected for damages or defects. • Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary. • Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.

HAZARD CONTROL MEASURES USED DURING THIS TASK	
Task Trainings:	NA
Permits and Forms:	
PPE Requirements	Hard hat Safety glasses Hard-toed Boots Gloves Long pants and 4" long sleeve shirt Safety vest (Class 2) Hearing Protection

HAZARD ASSESSMENT SUMMARY

Project Name:	Portion of 65 Trowbridge Street	**Project Number:**	129309-002
Site Address:	65 Trowbridge Street Rochester, NY		
Health & Safety Plan Prepared by:	Lydell, Robert	**Date:**	01-14-2019
Task:	Task 3		
Task Description:	Excavation / Trenching		
Task Start Date	05-01-2019	**Task End Date:**	12-31-2019

POTENTIAL HAZARDS DURING THIS TASK

Hazards	Actions to Eliminate or Minimize Hazards
Excavation/Trenches	• Do not enter an exaction unless it has been inspected and has appropriate protective measures in place: shoring, benching, or sloping. o Protective measures are required for excavations that are five (5) feet or deeper. If less than five feet a competent person may determine that no protective measures are required . • If entry is required verify with the on-site competent person that: o no atmospheric hazards exist or have the potential to exist o there is no standing water or water removal operations are in place o the daily inspection has occurred o spoil piles, equipment or other is at least two(2) feet from the edge o There is safe access and egress to the excavation which can include ladders (required for depths greater than four feet), steps, ramps or other safe means. The means of access and egress shall be no more than 25´ away in any direction. • If there is any doubt about the safety of the excavation personnel will not enter the excavation or trench and will contact the PM and the Regional Safety Manager. • Do not stand on the long side of the cut. If required ensure there are no tension cracks.

Manual Lifting/Moving	• Under no circumstances should any one person lift more than 49 pounds unassisted. • Always push, not pull, the object when possible. • Size up the load before you lift. Test by lifting one of the corners or pushing. If it is heavy or feels clumsy, get a mechanical aid or help from another worker. When in doubt, do not lift alone! • Bend the knees; it is the single most important aspect of lifting. • When performing the lift: o Place your feet close to the object and center yourself over the load o Get a good handhold o Lift straight up, smoothly and let your legs do the work, not your back! o Avoid overreaching or stretching to pick up or set down a load. o Do not twist or turn your body once you have made the lift. o Make sure beforehand that you have a clear path to carry the load. o Set the load down properly.
Ground Disturbance	Prior to performing ground disturbance activities, the following requirements should be applied: • Confirm all approvals and agreements (as applicable) either verbal or written have been obtained. • Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable o Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit. • Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone. • • Notifications to landowners and/or tenant, where deemed reasonable and practicable.

	• Proximity and Common Right of Way Agreements shall be checked, if the line locator information is inconclusive.
Congested Area	• Provide barricades, fencing, warning signs or signals and adequate lighting to protect people while working in or around congested areas. • Vehicles and heavy equipment with restricted views to the rear should have functioning back-up alarms that are audible above the surrounding noise levels. Whenever possible, use a signaler to assist heavy equipment operators and/or drivers in backing up or maneuvering in congested areas. • Lay out traffic control patterns to eliminate excessive congestion. • Workers in congested areas should wear high visibility clothing at all times. • Be aware of Line of Fire hazards when performing work activities in congested areas. • Hazards associated with SIMOPs should be discussed daily at Tailgate Safety Meetings.
Line of Fire	• Never walk under a suspended load. • Be aware and stay clear of tensioned lines such as cable, chain and rope. • Be cautious of torque stresses that drilling equipment and truck augers can generate. Equipment can rotate unexpectedly long after applied torque force has been stopped. • Springs and other items can release tremendous energy if compressed and suddenly released. • Items under tension and pressure can release tremendous energy if it is suddenly released. • Not all objects may be overhead; be especially mindful of top-heavy items and items being transported by forklift or flatbed. • Secure objects that can roll such as tools, cylinders and pipes. • Stay clear of soil cuttings or soil stockpiles generated during drilling operations and excavations, be aware that chunks of soil, rocks, and debris can fall or roll.
Generated Waste	• Manage waste properly through good work practices. • Collect, store, containerize waste, and dispose of it properly

	- All wastes generated shall be containerized in an appropriate container (i.e., open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM. - Containers should be inspected for damages or defects. - Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary. - Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.
Rotating Equipment	- Evaluate work procedures to avoid placing the body and extremities in the path of rotating equipment and tools to avoid being struck by moving equipment, tools and machinery. - Evaluate equipment and tool use procedures to identify pinch points and develop procedures to avoid placing body parts in a position where they can be caught in moving equipment, tools and machinery. - Follow energy isolation procedures, if required. - Do not work near rotating equipment with long loose hair, loose clothing or jewelry.
Underground Utilities	- Obtain as-built drawings for the areas being investigated from the property owner; - Visually review each proposed soil boring locations with the property owner or knowledgeable site representative; - Perform a geophysical survey to locate utilities; - Hire a private line locating firm to determine the location of utility lines that are present at the property; - Identifying a no-drill or dig zone; - Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.
Heavy Equipment	- Only approach equipment once you have confirmed contact with the operator (e.g., the operator places the bucket on the ground). - Maintain visual contact with operators at all times and keep out of the strike zone whenever possible.

	• Always be alert to the position of the equipment around you. • Always approach heavy equipment with an awareness of the swing radius and traffic routes of each piece of equipment and never go beneath a hoisted load. • Avoid fumes created by heavy equipment exhaust. • Understand the site traffic pattern and position yourself accordingly.

HAZARD CONTROL MEASURES USED DURING THIS TASK

Task Trainings:	NA
Permits and Forms:	
PPE Requirements	Hard hat Safety glasses Hard-toed Boots Gloves Long pants and 4" long sleeve shirt Safety vest (Class 2) Hearing Protection

Excavation and Trenching Safety		**Document #:** OP 1001 Rev.3
Issued Date: 2010	**Issued By:** Corporate Health & Safety	
Revised Date: May 2015	**Approved By:** Brian Fitzpatrick	

Purpose and Scope

PURPOSE

There are multiple hazards associated with working in and around excavations and trenches including cave-ins, potential running soils, dislodged excavated soils, lack of proper access and egress. Nonfatal, and even fatal, injuries may occur in association with excavation and trenching activities with a greater frequency than one might expect. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, falling objects and toxic exposures.

The purpose of this procedure is to provide Haley & Aldrich, Inc. and Haley & Aldrich Construction Service, (Haley & Aldrich), collectively referred to as Haley & Aldrich from hereon, staff engaged in excavation or trenching activities with an understanding of the hazards associated with these activities and to provide methods to control personal exposure to the hazards. This procedure is designed to comply with applicable Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1926.650, Subpart P - Excavations). Please refer to the project specific Health and Safety Plan for additional applicable state regulations requirements, if any.

SCOPE

Provisions for excavation safety in accordance with the OSHA standard shall be included in Health & Safety Plans for all projects involving excavations or trenches greater than 5 feet in depth.

Program Elements

1.0 PROCEDURE

1.1 PERMIT REQUIREMENT

Prior to ground disturbance, clients and/or governmental agencies may require that a permit be obtained. For example, the State of California requires that the construction of trenches or excavations which are five feet or deeper and into which a person is required to descend require a permit. In addition activities in certain areas may require specific environmental/archaeological permits or plans.

Excavations five (5) feet or greater will require shoring, benching and/or sloping for worker protection unless in stable rock. Only authorized personnel are allowed inside the trenches. A Competent Person must be onsite at all the times during the excavation work.

Items such as wetland disturbance permits, dredging or filling permits, storm water discharge permits and critical or sensitive habitat determination and pollution prevention plans may be required. Archaeological sites may also be present. Each location should be evaluated and permits obtained as applicable. These issues shall be discussed during project pre-planning activities. Refer to the relevant regulations regarding these matters.

1.2 APPROVALS

The following requirements apply before work is to begin:

- Approvals and agreements (as applicable) either verbal or written have been obtained.

- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One Call program in North America regarding intent to cause ground disturbance within the search zone.

NOTE: Some private utilities such as sewage and water may not be part of a notification system. It is expected that private locators will communicate the location of these types of UGF's.

Notifications of landowners and/or tenant, where deemed reasonable and practicable.

1.3 ACCESS AND UNDERGROUND UTILITY CLEARANCE

Prior to excavation, Haley & Aldrich staff members will ensure that permission has been gained from the property owner to access the property.

- Before marking any proposed exploration or excavation location, it is critical that all readily available information on underground utilities and structures be obtained. The estimated location of utility installations, such as sewer, gas, telephone, fuel, electric, water, communication or any other underground installation that may be expected to be encountered during excavation work, will be identified with the appropriate authority. Appropriate authorities include client representatives, utility companies, nonprofit organizations (e.g., "Dig-Alert"), and others.
- Available plot plans or drawings shall be reviewed and cross referenced with other sources of information to verify that they are accurate and complete.
- Proximity and Common Right of Way Agreements shall be checked, if the line locator information is inconclusive.

A list of all state "utility locators" is posted on the HANK Safety Homepage under "Guidance Documents". The requirements for utility location are detailed in OP 1020 Utilities.

1.4 UPDATE SITE DRAWING

Ground disturbance activities shall not proceed without an updated Site plan with underground utility locations identified. The Site plan or drawing will be clearly updated indicating the number of facilities/pipelines or utilities, line sizes, locations and alignments. Plot plans shall be retained with the requisite permits.

If a plot plan or drawing is not available, a hand drawn map shall be made during the preplanning phase prior to field activities and shall reflect all available information as accurately as possible.

1.5 JOB SITE SURFACE ENCUMBRANCES

Prior to start of the All surface encumbrances that are located so as to create a hazard to staff members shall be removed or supported, as necessary, to safeguard staff members.

1.6 PRE-JOB SAFETY MEETING

A pre-job safety meeting including a robust *Job Hazard Analysis (JHA)* that utilizes a formal hazard recognition process, completion, reviews and acceptance of the relevant permits (as required in the local permit system) and a review of the HASP with Emergency Response Plan shall be held.

At a minimum, the following topics must be discussed and the meeting recorded (with signed attendance list).

- Review of potential hazards, safe work practice, permitting requirements, etc.
- Agreement that mechanical ground disturbance does not occur unless a Competent Person in charge is present at the job site. A Competent Person shall determine if there is a need to be present during ground disturbance activities if there are no underground facilities/pipelines in the search or drill/dig zones, or when manual potholing is being done (shovels or vacuum excavator).
- With the exception of a pre-risk assessed removal of an empty or de-energized underground facility (UGF) such as a decommissioned Underground Storage Tank (UST), pipeline or flow line, mechanical excavation equipment shall not be used to dig or drill within 2' (60cm) of an underground facility.
- An equipment spotter shall be in place for all excavation within 10’ (3m) proximity of any underground utility. If the attention of the spotter is diverted elsewhere or they leave the site, the excavation operation **SHALL STOP** until his or her return. The spotter shall remain in a safe and designated location, be in constant communication and in the direct vision of the equipment operator at all times during excavation
- All dig zones shall be adequately marked.
- When excavating, proper cutback and shoring shall be done in accordance with local, state and federal regulations and this document.
- Pick axes (or similar tools) can only be used following evaluation and approval by the Project Manager.
- Agree that all workers have the right and responsibility to ‘Stop Work’ when they suspect work practices or conditions might be unsafe.
- Personal protective equipment requirements, including the need for use of fire retardant clothing, shall be discussed and adhered to.

All accidents, injuries, first aids and near miss incidents shall be reported immediately.

1.7 ADDITIONAL PERMIT REQUIREMENT

Additional safe work permits (e.g., *Hot Work Permit*, *Confined Space Permit*, etc.) as per the Haley & Aldrich safety practices may be required. If the excavation is complex or involves multiple underground facilities, job specific practices shall be developed.

1.8 OVER HEAD POWER LINES AND OBSTRUCTIONS

Overhead power lines that may pose a hazard during movement of equipment shall also be clearly indicated and clearances shall be maintained. (Refer to the Utilities Operating Procedure OP 1020.)

Barricades shall be placed to prevent equipment from inadvertently crossing under a line. A spotter is required to assist equipment operators in maintaining required safe distances while equipment is in operation. Same precautions shall be taken when other obstructions, such as fire hydrants, valves, low roof overhanging, are present.

1.9 EXCAVATION DESIGN

All excavations shall comply with regulatory requirements for excavation design.

Staff members and/or Contractors shall not work in excavations in which there is accumulated water or in which water is accumulating, unless adequate precautions have been taken to protect staff members against the hazards posed by water accumulation. (Refer to Construction Checklist for Trenching and Excavation Form) for additional information and requirements.)

Additional requirements related to protective system (e.g., sloping and shoring) are contained in Excavation Protective Systems.

1.10 DAILY INSPECTIONS

Daily inspections of trenches, adjacent areas and protective systems shall be made by the Competent Person (as identified in the HASP) for evidence of a situation that may result in possible cave-ins or other hazardous conditions. Inspections shall be documented and be required when personnel are entering trenches (Refer to Daily Trenching Excavation Inspection Form).

A daily documented inspection shall be conducted by the Competent Person prior to the start of work and frequently throughout the shift (e.g., when additional hazards may be created due to weather.)

Where a Competent Person finds evidence of a situation that could result in a possible cave-in, indications of failure or protective systems, hazardous atmospheres or other hazardous conditions, exposed staff members shall be removed from the hazardous area until the necessary corrective actions have been taken to verify their safety.

Where the stability of adjoining buildings, walls, foundations or other structures is endangered by excavation operations, support systems such as shoring, bracing or underpinning shall be provided to verify the stability of such structures for the protection of staff members.

2.0 SAFE WORK PRACTICES AND REQUIREMENTS

2.1 STABILITY OF ADJACENT STRUCTURES

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of staff members. All underpinning and lateral earth support systems shall be designed by a Registered Professional Engineer with the requisite expertise.

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to staff members shall not be permitted except when:
- A support system, such as underpinning designed by a Registered Professional Engineer is provided to ensure the safety of staff members and the stability of the structure; or
- The excavation is in stable rock as classified by a Competent Person; or
- A Registered Professional Engineer has determined that the structure is a sufficient distance from the excavation so as to be unaffected by the excavation activity; or a Registered Professional Engineer has determined that such excavation will not pose a hazard to staff members. In addition, sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect staff members from the possible collapse of such structures.

2.2 WARNING SYSTEM FOR MOBILE EQUIPMENT

When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system should be utilized, such as barricades, hand or mechanical signals, or stop logs. The mobile equipment are required to maintain a 2 feet distance from the from the edge of excavation.

2.3 FALL PROTECTION

Access shall be restricted or appropriate barriers shall be in place to prevent personnel from falling into excavations.

Where staff members or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided. Adequate barrier physical protection shall be provided at all remotely located excavations where monitoring is absent. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

Excavations and trenches should not be left unattended when the threat of a fall into the excavation is possible. The excavation should be properly barricaded with barricade tape and in some instances secured with a fence to eliminate accidental entry

2.4 MINIMUM LEVEL OF PERSONAL PROTECTIVE EQUIPMENT

All H&A staff engaged in activities in a construction zone must wear a hard hat, OSHA-approved work boots, long pants, and safety eyewear. Hearing protection is highly recommended. Orange safety vests are required on sites when visibility to construction equipment operators or vehicular traffic is a concern and are a standard requirement of many of our clients.

2.5 COMPETENT PERSON

A Competent Person must be present during all excavation work involving trenches or excavations greater than 5 feet in depth. For the purpose of this OP, a Competent Person is defined as an individual, who by education or experience, is capable of evaluating the hazards associated with trench or excavation collapse and is capable of classifying soils in accordance with the criteria specified in Attachment A of this OP. A Competent Person will have the authority to take corrective actions as needed or stop work if he/she determines that a safety hazard exists.

The contractor who operates the heavy equipment typically serves as the excavation Competent Person. For excavation projects on which Haley & Aldrich is contracted to serve in as GC or CM role, we require that our excavation subcontractor provide an excavation Competent Person; however, Haley & Aldrich may elect to assign a staff member trained as an excavation Competent Person to review our subcontractor's compliance with the OSHA excavation standard.

2.6 WORKING NEAR HEAVY EQUIPMENT

When working around heavy equipment, it is good practice to maintain visual contact with the operator if it is necessary to be within the area where the machine is working. Be aware that many large machines have blind spots where the operator cannot see if there is a person present. Never assume that the operator knows where every person on a site is. Be aware of the surroundings at all times. Stay out of the swing radius at all times.

If you must approach a piece of heavy equipment, gain the operators attention; ensure the operator acknowledges your presence and your attention to approach the equipment. Do not approach the equipment until the operator has placed the bucket on the ground, the controls in neutral and has removed their hands from the controls.

H&A staff are prohibited from operating Contractor's or our subcontractor's equipment. Heavy equipment operation will be conducted per the requirements of OP 1052 Heavy Equipment.

2.7 ENTRY INTO A TRENCH OR EXCAVATION AND WORK IN TRENCHES AND EXCAVATIONS

Because of the inherent dangers, entry into trenches and excavations should be avoided if there are means, other than entry, to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified in this OP is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact the Regional Health and Safety Coordinator immediately.

It is Haley & Aldrich's policy to avoid entry into excavations and trenches when possible. However, it is apparent that staff members may have to enter excavations or trenches during the course of the many work activities Haley & Aldrich performs. Examples of excavations or trenches that may require Haley & Aldrich staff members to enter include (but are not limited to):

- Test pit excavations
- Tank removals
- Miscellaneous sampling events
- Site remediation excavations
- Foundation construction
- Caisson installation
- Utility installation

Each staff member in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when:

- Excavations are made entirely in stable rock as determined by a Competent Person.
- Excavations are less than 5 feet in depth and an examination of the excavation by a Competent Person reveal no indication of a potential cave-in. The depth of the excavation is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench, which is greater than three feet in depth, may still pose significant hazard for the staff member involved.

Protective systems may include sloping the excavation walls, shoring the excavation walls, or utilizing a shielding system. The protective system chosen must have the capacity to resist, without failure, all loads to be applied to the system. All lateral earth support systems for excavations equal to or greater than 5 feet in depth must be designed by a Competent Person and any protective systems in excavations greater than 20 feet deep must be designed by a Professional Engineer.

2.8 SLOPING AS A MEANS OF PROTECTION

Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting staff members who must enter trenches or excavations which are greater than 5 feet in depth or where there is danger of collapse.

To assure the safety of the staff members in the excavation and to comply with the requirements specified in 29 CFR 1926.652, excavations may be sloped according to the following guidelines:

- The trench or excavation walls may be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall is at least 11/2: 1 (i.e., equivalent to an angle with the horizontal of 33 degrees or less);
- Alternatively, the maximum allowable slope of excavation walls may be determined by classifying the soil in accordance with Appendix B of this OP and determining the slope in accordance with Appendix C.

2.9 SHORING OR SHIELDING AS A MEANS OF PROTECTION

Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints due to adjacent structures or property lines), the use of shoring or shielding systems may be necessary. Shoring systems may consist of soldier piles and lagging, sheet piles, slurry walls or soil nails and shotcrete designed by a Professional Engineer. Shielding systems typically involves using a trench box used under the supervision of a Competent Person.

Specific procedures for the construction and use of these systems should be provided by the Contractor’s or Subcontractor’s Competent Person or the Professional Engineer responsible for the design of shoring system.

2.10 ACCESS AND EGRESS

A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for staff members.

Ramps and runways constructed of two or more structural members should have the structural members connected together to prevent displacement. Structural members used for ramps and runways should be of uniform thickness. Cleats or other appropriate means used to connect runway structural members should be attached to the bottom of the runway or should be attached in a manner to prevent tripping. Structural ramps used in lieu of steps should be provided with cleats or other surface treatments on the top surface to prevent slipping.

2.11 PROTECTION FROM LOOSE ROCK OR SOIL

Adequate protection should be provided to protect staff members from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection should consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection such as sloping or benching. Protection should be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

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Staff members shall not enter excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect staff members against the hazards posed by water accumulation. The precautions necessary to protect staff members vary with each situation, but could include special support or shield systems to protect from cave-ins in conjunction with water removal to control the level of accumulating water. A safety harness and lifeline may be used in conjunction with all other requirements for confined space entry. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations should be monitored regularly to ensure proper operation. If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains shall be inspected by a Competent Person after every storm event.

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Confined space entry (CSE) rules apply for entry into trenches and excavations greater than 5 feet in depth in which a hazardous atmosphere exists, or could reasonably be expected to exist, such as in excavations in landfill areas or other areas of environmental impacts or potential oxygen-deficient conditions. Staff members must not perform CSE without specific authorization by the Corporate Health and Safety Manager, the Project Manager and without prior training and strict adherence to CSE rules. Appropriate monitoring of air within the excavation shall be conducted prior to CSE.

- Adequate precautions, such as mechanical ventilation, shall be taken prior to entry into trenches and excavations in which the oxygen concentration is less than 19.5 percent or the concentration of flammable gases or vapors is in excess of 10 percent of the lower explosive limit (LEL).
- When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

Appropriate respiratory protection must be donned prior to entry into any trench or excavation in which airborne levels of toxic substances are present at concentrations in excess of their Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL).

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Emergency rescue equipment, such as breathing apparatuses, safety harnesses and lines, or basket stretchers, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use and training on their use must be provided to field personnel.

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Staff members should avoid being underneath loads handled by lifting or digging equipment. Staff members should stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Staff members should stay clear of the opposite edge of a roll-off box or dump truck when they are being loaded. Soils that miss the container pose a great threat to bystanders.

Roles and Responsibilities

1.0 ROLES AND RESPONSIBILITIES

1.1 REGIONAL HEALTH AND SAFETY COORDINATOR (RHSC)/CORPORATE HEALTH AND SAFETY MANAGER (CHSM)

- Will assist Project Managers with compliance with the procedure.
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- Verify the assessment of non-traceable lines

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- Will verify the presence of an excavation Competent Person (typically employed by the Contractor or Subcontractor) on-site during excavation.
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For ground disturbance activities 4' feet (1.22m) or more that require shoring, the Excavation Competent Person (CP) must have the following training and competencies:

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2.0 REFERENCES

OSHA Regulations (Standards - 29 CFR), 1926 Subpart P - Excavations (1926.650 to 1926.652)
OSHA Construction Safety Handbook 2005

3.0 RELATED HALEY & ALDRICH OPERATING PROCEDURES

OP1020 - Utility Clearance
OP2026 - Exploratory Test Pits

4.0 FORMS

Trench/Excavation Safety Daily Field Report
Ground Disturbance Permit
Construction Trench/Excavation Checklist

Excavation and Trenching Safety		**Document #:** OP 1001 Rev.3
Issued Date: 2010	**Issued By:** Corporate Health & Safety	
Revised Date: May 2015	**Approved By:** Brian Fitzpatrick	

Purpose and Scope

PURPOSE

There are multiple hazards associated with working in and around excavations and trenches including cave-ins, potential running soils, dislodged excavated soils, lack of proper access and egress. Nonfatal, and even fatal, injuries may occur in association with excavation and trenching activities with a greater frequency than one might expect. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, falling objects and toxic exposures.

The purpose of this procedure is to provide Haley & Aldrich, Inc. and Haley & Aldrich Construction Service, (Haley & Aldrich), collectively referred to as Haley & Aldrich from hereon, staff engaged in excavation or trenching activities with an understanding of the hazards associated with these activities and to provide methods to control personal exposure to the hazards. This procedure is designed to comply with applicable Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1926.650, Subpart P - Excavations). Please refer to the project specific Health and Safety Plan for additional applicable state regulations requirements, if any.

SCOPE

Provisions for excavation safety in accordance with the OSHA standard shall be included in Health & Safety Plans for all projects involving excavations or trenches greater than 5 feet in depth.

Program Elements

1.0 PROCEDURE

1.1 PERMIT REQUIREMENT

Prior to ground disturbance, clients and/or governmental agencies may require that a permit be obtained. For example, the State of California requires that the construction of trenches or excavations which are five feet or deeper and into which a person is required to descend require a permit. In addition activities in certain areas may require specific environmental/archaeological permits or plans.

Excavations five (5) feet or greater will require shoring, benching and/or sloping for worker protection unless in stable rock. Only authorized personnel are allowed inside the trenches. A Competent Person must be onsite at all the times during the excavation work.

Items such as wetland disturbance permits, dredging or filling permits, storm water discharge permits and critical or sensitive habitat determination and pollution prevention plans may be required. Archaeological sites may also be present. Each location should be evaluated and permits obtained as applicable. These issues shall be discussed during project pre-planning activities. Refer to the relevant regulations regarding these matters.

1.2 APPROVALS

The following requirements apply before work is to begin:

- Approvals and agreements (as applicable) either verbal or written have been obtained.
- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One Call program in North America regarding intent to cause ground disturbance within the search zone.

NOTE: Some private utilities such as sewage and water may not be part of a notification system. It is expected that private locators will communicate the location of these types of UGF's.

Notifications of landowners and/or tenant, where deemed reasonable and practicable.

1.3 ACCESS AND UNDERGROUND UTILITY CLEARANCE

Prior to excavation, Haley & Aldrich staff members will ensure that permission has been gained from the property owner to access the property.

- Before marking any proposed exploration or excavation location, it is critical that all readily available information on underground utilities and structures be obtained. The estimated location of utility installations, such as sewer, gas, telephone, fuel, electric, water, communication or any other underground installation that may be expected to be encountered during excavation work, will be identified with the appropriate authority. Appropriate authorities include client representatives, utility companies, nonprofit organizations (e.g., "Dig-Alert”), and others.
- Available plot plans or drawings shall be reviewed and cross referenced with other sources of information to verify that they are accurate and complete.
- Proximity and Common Right of Way Agreements shall be checked, if the line locator information is inconclusive.

A list of all state “utility locators” is posted on the HANK Safety Homepage under “Guidance Documents”. The requirements for utility location are detailed in OP 1020 Utilities.

1.4 UPDATE SITE DRAWING

Ground disturbance activities shall not proceed without an updated Site plan with underground utility locations identified. The Site plan or drawing will be clearly updated indicating the number of facilities/pipelines or utilities, line sizes, locations and alignments. Plot plans shall be retained with the requisite permits.

If a plot plan or drawing is not available, a hand drawn map shall be made during the preplanning phase prior to field activities and shall reflect all available information as accurately as possible.

1.5 JOB SITE SURFACE ENCUMBRANCES

Prior to start of the All surface encumbrances that are located so as to create a hazard to staff members shall be removed or supported, as necessary, to safeguard staff members.

1.6 PRE-JOB SAFETY MEETING

A pre-job safety meeting including a robust *Job Hazard Analysis (JHA)* that utilizes a formal hazard recognition process, completion, reviews and acceptance of the relevant permits (as required in the local permit system) and a review of the HASP with Emergency Response Plan shall be held.

At a minimum, the following topics must be discussed and the meeting recorded (with signed attendance list).

- Review of potential hazards, safe work practice, permitting requirements, etc.
- Agreement that mechanical ground disturbance does not occur unless a Competent Person in charge is present at the job site. A Competent Person shall determine if there is a need to be present during ground disturbance activities if there are no underground facilities/pipelines in the search or drill/dig zones, or when manual potholing is being done (shovels or vacuum excavator).
- With the exception of a pre-risk assessed removal of an empty or de-energized underground facility (UGF) such as a decommissioned Underground Storage Tank (UST), pipeline or flow line, mechanical excavation equipment shall not be used to dig or drill within 2' (60cm) of an underground facility.
- An equipment spotter shall be in place for all excavation within 10’ (3m) proximity of any underground utility. If the attention of the spotter is diverted elsewhere or they leave the site, the excavation operation **SHALL STOP** until his or her return. The spotter shall remain in a safe and designated location, be in constant communication and in the direct vision of the equipment operator at all times during excavation
- All dig zones shall be adequately marked.
- When excavating, proper cutback and shoring shall be done in accordance with local, state and federal regulations and this document.
- Pick axes (or similar tools) can only be used following evaluation and approval by the Project Manager.
- Agree that all workers have the right and responsibility to ‘Stop Work’ when they suspect work practices or conditions might be unsafe.
- Personal protective equipment requirements, including the need for use of fire retardant clothing, shall be discussed and adhered to.

All accidents, injuries, first aids and near miss incidents shall be reported immediately.

1.7 ADDITIONAL PERMIT REQUIREMENT

Additional safe work permits (e.g., *Hot Work Permit*, *Confined Space Permit*, etc.) as per the Haley & Aldrich safety practices may be required. If the excavation is complex or involves multiple underground facilities, job specific practices shall be developed.

1.8 OVER HEAD POWER LINES AND OBSTRUCTIONS

Overhead power lines that may pose a hazard during movement of equipment shall also be clearly indicated and clearances shall be maintained. (Refer to the Utilities Operating Procedure OP 1020.)

Barricades shall be placed to prevent equipment from inadvertently crossing under a line. A spotter is required to assist equipment operators in maintaining required safe distances while equipment is in operation. Same precautions shall be taken when other obstructions, such as fire hydrants, valves, low roof overhanging, are present.

1.9 EXCAVATION DESIGN

All excavations shall comply with regulatory requirements for excavation design.

Staff members and/or Contractors shall not work in excavations in which there is accumulated water or in which water is accumulating, unless adequate precautions have been taken to protect staff members against the hazards posed by water accumulation. (Refer to Construction Checklist for Trenching and Excavation Form) for additional information and requirements.)

Additional requirements related to protective system (e.g., sloping and shoring) are contained in Excavation Protective Systems.

1.10 DAILY INSPECTIONS

Daily inspections of trenches, adjacent areas and protective systems shall be made by the Competent Person (as identified in the HASP) for evidence of a situation that may result in possible cave-ins or other hazardous conditions. Inspections shall be documented and be required when personnel are entering trenches (Refer to Daily Trenching Excavation Inspection Form).

A daily documented inspection shall be conducted by the Competent Person prior to the start of work and frequently throughout the shift (e.g., when additional hazards may be created due to weather.)

Where a Competent Person finds evidence of a situation that could result in a possible cave-in, indications of failure or protective systems, hazardous atmospheres or other hazardous conditions, exposed staff members shall be removed from the hazardous area until the necessary corrective actions have been taken to verify their safety.

Where the stability of adjoining buildings, walls, foundations or other structures is endangered by excavation operations, support systems such as shoring, bracing or underpinning shall be provided to verify the stability of such structures for the protection of staff members.

2.0 SAFE WORK PRACTICES AND REQUIREMENTS

2.1 STABILITY OF ADJACENT STRUCTURES

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of staff members. All underpinning and lateral earth support systems shall be designed by a Registered Professional Engineer with the requisite expertise.

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to staff members shall not be permitted except when:

- A support system, such as underpinning designed by a Registered Professional Engineer is provided to ensure the safety of staff members and the stability of the structure; or
- The excavation is in stable rock as classified by a Competent Person; or
- A Registered Professional Engineer has determined that the structure is a sufficient distance from the excavation so as to be unaffected by the excavation activity; or a Registered Professional Engineer has determined that such excavation will not pose a hazard to staff members. In addition, sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect staff members from the possible collapse of such structures.

2.2 WARNING SYSTEM FOR MOBILE EQUIPMENT

When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system should be utilized, such as barricades, hand or mechanical signals, or stop logs. The mobile equipment are required to maintain a 2 feet distance from the from the edge of excavation.

2.3 FALL PROTECTION

Access shall be restricted or appropriate barriers shall be in place to prevent personnel from falling into excavations.

Where staff members or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided. Adequate barrier physical protection shall be provided at all remotely located excavations where monitoring is absent. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

Excavations and trenches should not be left unattended when the threat of a fall into the excavation is possible. The excavation should be properly barricaded with barricade tape and in some instances secured with a fence to eliminate accidental entry

2.4 MINIMUM LEVEL OF PERSONAL PROTECTIVE EQUIPMENT

All H&A staff engaged in activities in a construction zone must wear a hard hat, OSHA-approved work boots, long pants, and safety eyewear. Hearing protection is highly recommended. Orange safety vests are required on sites when visibility to construction equipment operators or vehicular traffic is a concern and are a standard requirement of many of our clients.

2.5 COMPETENT PERSON

A Competent Person must be present during all excavation work involving trenches or excavations greater than 5 feet in depth. For the purpose of this OP, a Competent Person is defined as an individual, who by education or experience, is capable of evaluating the hazards associated with trench or excavation collapse and is capable of classifying soils in accordance with the criteria specified in Attachment A of this OP. A Competent Person will have the authority to take corrective actions as needed or stop work if he/she determines that a safety hazard exists.

The contractor who operates the heavy equipment typically serves as the excavation Competent Person. For excavation projects on which Haley & Aldrich is contracted to serve in as GC or CM role, we require that our excavation subcontractor provide an excavation Competent Person; however, Haley & Aldrich may elect to assign a staff member trained as an excavation Competent Person to review our subcontractor's compliance with the OSHA excavation standard.

2.6 WORKING NEAR HEAVY EQUIPMENT

When working around heavy equipment, it is good practice to maintain visual contact with the operator if it is necessary to be within the area where the machine is working. Be aware that many large machines have blind spots where the operator cannot see if there is a person present. Never assume that the operator knows where every person on a site is. Be aware of the surroundings at all times. Stay out of the swing radius at all times.

If you must approach a piece of heavy equipment, gain the operators attention; ensure the operator acknowledges your presence and your attention to approach the equipment. Do not approach the equipment until the operator has placed the bucket on the ground, the controls in neutral and has removed their hands from the controls.

H&A staff are prohibited from operating Contractor's or our subcontractor's equipment. Heavy equipment operation will be conducted per the requirements of OP 1052 Heavy Equipment.

2.7 ENTRY INTO A TRENCH OR EXCAVATION AND WORK IN TRENCHES AND EXCAVATIONS

Because of the inherent dangers, entry into trenches and excavations should be avoided if there are means, other than entry, to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified in this OP is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact the Regional Health and Safety Coordinator immediately.

It is Haley & Aldrich's policy to avoid entry into excavations and trenches when possible. However, it is apparent that staff members may have to enter excavations or trenches during the course of the many work activities Haley & Aldrich performs. Examples of excavations or trenches that may require Haley & Aldrich staff members to enter include (but are not limited to):
- Test pit excavations
- Tank removals
- Miscellaneous sampling events
- Site remediation excavations
- Foundation construction
- Caisson installation
- Utility installation

Each staff member in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when:
- Excavations are made entirely in stable rock as determined by a Competent Person.
- Excavations are less than 5 feet in depth and an examination of the excavation by a Competent Person reveal no indication of a potential cave-in. The depth of the excavation is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench, which is greater than three feet in depth, may still pose significant hazard for the staff member involved.

Protective systems may include sloping the excavation walls, shoring the excavation walls, or utilizing a shielding system. The protective system chosen must have the capacity to resist, without failure, all loads to be applied to the system. All lateral earth support systems for excavations equal to or greater than 5 feet in depth must be designed by a Competent Person and any protective systems in excavations greater than 20 feet deep must be designed by a Professional Engineer.

2.8 SLOPING AS A MEANS OF PROTECTION

Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting staff members who must enter trenches or excavations which are greater than 5 feet in depth or where there is danger of collapse.

To assure the safety of the staff members in the excavation and to comply with the requirements specified in 29 CFR 1926.652, excavations may be sloped according to the following guidelines:

- The trench or excavation walls may be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall is at least 11/2: 1 (i.e., equivalent to an angle with the horizontal of 33 degrees or less);
- Alternatively, the maximum allowable slope of excavation walls may be determined by classifying the soil in accordance with Appendix B of this OP and determining the slope in accordance with Appendix C.

2.9 SHORING OR SHIELDING AS A MEANS OF PROTECTION

Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints due to adjacent structures or property lines), the use of shoring or shielding systems may be necessary. Shoring systems may consist of soldier piles and lagging, sheet piles, slurry walls or soil nails and shotcrete designed by a Professional Engineer. Shielding systems typically involves using a trench box used under the supervision of a Competent Person.

Specific procedures for the construction and use of these systems should be provided by the Contractor's or Subcontractor's Competent Person or the Professional Engineer responsible for the design of shoring system.

2.10 ACCESS AND EGRESS

A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for staff members.

Ramps and runways constructed of two or more structural members should have the structural members connected together to prevent displacement. Structural members used for ramps and runways should be of uniform thickness. Cleats or other appropriate means used to connect runway structural members should be attached to the bottom of the runway or should be attached in a manner to prevent tripping. Structural ramps used in lieu of steps should be provided with cleats or other surface treatments on the top surface to prevent slipping.

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While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signalman through direct voice contact or approved standard hand signals. In addition, all site personnel in the immediate work area shall be made aware of the equipment operations. All equipment and materials, such as pipe, rebar, etc., should be kept out of traffic lanes and access ways. At no time should the maximum load capacity of a piece of heavy equipment be exceeded, nor should any equipment be used for a function it was not designed for. Equipment should be stored so as not to endanger personnel at any time.

2.0 REFERENCES

OSHA Regulations (Standards - 29 CFR), 1926 Subpart P - Excavations (1926.650 to 1926.652)
OSHA Construction Safety Handbook 2005

3.0 RELATED HALEY & ALDRICH OPERATING PROCEDURES

OP1020 - Utility Clearance
OP2026 - Exploratory Test Pits

4.0 FORMS

Trench/Excavation Safety Daily Field Report
Ground Disturbance Permit
Construction Trench/Excavation Checklist

# Cold Stress	**Document #:** OP1003
Issued Date: 2004	**Issued By:** Corporate Health & Safety
Revised Date: June 2015	**Approved By:** Brain Fitzpatrick

Purpose, Scope, and Summary

PURPOSE

Cold weather is a situation that will be encountered during field operations. This procedure is designed to prevent injuries due to cold temperatures, wind chill, or emersion. Injuries from these types of exposures include hypothermia and frost bite, as defined below.

SUMMARY

Cold stress is the term used to describe the effects of low temperatures on the body. Hypothermia and frostbite are the primary concerns. Persons working outdoors or indoors in low temperatures, especially at or below freezing, are subject to potential cold stress. Also, persons briefly immersed in cold water, or even in moderately cold water for extended periods, may suffer from hypothermia. Exposure to extreme cold for a short period of time can cause severe injury to the surface of the body, or can result in profound generalized cooling (hypothermia), possibly causing death. Signs of hypothermia may include sluggishness and inattention. Areas of the body which have high surface area-to-volume ratios, such as fingers, toes, and ears, are the most susceptible to frostbite. Exposed areas, such as the face, may also be rapidly affected. Frostbite may appear as a white patch on the nose, ears, or appendages.

Cold weather requires several adaptations to standard operations from other areas. The two major differences are the impact of cold on the people that are doing the physical work and operation of heavy equipment.

The most important consideration is personnel safety when exposed to low temperatures. Frostbite and hypothermia are two types of cold injury. Personnel shall be protected against these cold injuries during the performance of field activities.

The following personal factors may affect how you, as an individual are affected by the cold: Heart disease; Asthma/bronchitis; Diabetes; Vibration/white finger disease; Previous cold injuries; Constructing garments; Local pressure; Cramped position; Body type; Dehydration; Amount of subcutaneous body fat; Caloric intake; Alcohol; Caffeine and Nicotine use.

TEMPERATURE AND WIND SPEED

The two factors that influence the development of a cold injury are ambient temperature and the velocity of the wind.

Wind chill is used to describe the chilling effect of low temperature in combination with moving air. For instance, 10°F (-12°C) with a wind of 15mph is equivalent in chilling effect to still air at -18°F (-28°C) (refer to Table 1: Temperature and Wind Speeds). As a general rule, the greatest incremental increase in wind chill occurs when a wind speed of 5mph (8kmp) increases to 10mph (16kmp).

Adequately insulated clothing, as defined in the Risk Assessment, shall be provided to staff members to maintain core temperatures above 96.8°F (36°C). The equivalent chill temperature (refer to Table 1) should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

Table 1: Cooling Power of Wind on Exposed Flesh as Equivalent Temperature

Estimated Wind Speed (mph)	**Actual Temperature Measurement (° F) Under Clam Conditions**											
	50	**40**	**30**	**20**	**10**	**0**	**- 10**	**-20**	**-30**	**-40**	**-50**	**-60**
Equivalent Chill Temperature (° F)												
Calm	**50**	**40**	**30**	**20**	**10**	**0**	**- 10**	**-20**	**-30**	**-40**	**-50**	**-60**
5	**48**	**37**	**27**	**16**	**6**	**-5**	**-15**	**-26**	**-36**	**-47**	**-57**	**-68**
10	**40**	**28**	**16**	**4**	**-9**	**-24**	**-33**	**-46**	**-58**	**-70**	**-83**	**95**
15	**36**	**22**	**9**	**-5**	**-18**	**-32**	**-45**	**-58**	**-72**	**-85**	**-99**	**-112**
20	**32**	**18**	**4**	**-10**	**-25**	**-39**	**-53**	**-67**	**-82**	**-96**	**-110**	**-121**
25	**30**	**16**	**0**	**-15**	**-29**	**-44**	**-59**	**-74**	**-88**	**-104**	**-118**	**-133**
30	**28**	**13**	**-2**	**-18**	**-33**	**-48**	**-63**	**-79**	**-94**	**-109**	**-125**	**-140**
35	**27**	**11**	**-4**	**-20**	**-35**	**-51**	**-67**	**-82**	**-98**	**-113**	**-129**	**-145**
40	**26**	**10**	**-6**	**-21**	**-37**	**-53**	**-69**	**-85**	**-100**	**-116**	**-132**	**-148**
Wind Speeds > 40 mph have little additional effect	**LITTLE DANGER** In < 1 hour with dry skin. Maximum danger of false sense of security			**INCREASING DANGER** Danger from freezing of exposed flesh within one minute					**GREAT DANGER** Flesh may freeze within 30 seconds			
Trench Foot and Immersion Foot May Occur at any Point on this Chart												

Adapted from the American Conference of Governmental Industrial Hygienists, TLVs and BEIs for 2010

Core body temperatures of less than 96.8°F (36°C) will very likely result in reduced mental alertness, reduction in making decisions rationally or loss of consciousness with the threat of fatal consequences. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet and head is not likely to occur without the development of the initial signs of hypothermia.

EXPOSURE LIMITS

All work in cold weather shall be within the limits established by the American Conference for Governmental Industrial Hygienists (ACGIH). The Threshold Limit Values (TLVs) are shown in Table 2: Threshold Limit Values. Published TLVs are based on properly clothed staff members. The site shall be prepared with proper clothing readiness for extreme temperature drops within a shift (e.g., in the same day).

The work/warm up regimen in Table 1 assumes that normal work practice provides breaks for staff members to retreat to warm locations every two hours. Additional breaks beyond the TLVs should be identified in the risk assessment. The work/warm up regimen is initiated at -15°F (-26°C) with wind speed of 10mph [miles per hour] (16km/h); however, risks associated with temperatures warmer than -15°F (-26°C) shall have appropriate controls.

The schedule provides for additional breaks as the wind velocity at the work site increases and/or the temperature drops. Warm-up breaks shall begin when the temperature reaches - 15°F (-26°C) with wind speed of 10mph [miles per hour] (16km/h) or greater. (Refer to Table 2.) The work/warm up schedule for a four-hour shift is based on the following:

- The schedule is based on appropriate clothing.
- The schedule applies to moderate-to-heavy work activity with warm-up breaks of ten minutes in a warm location. For light-to-moderate work (limited physical movement), apply the schedule one step lower. For example, at -31°F (-35°C) with no noticeable wind, a staff member at a job with little physical movement shall have a maximum work period of 40 minutes with four breaks in a four-hour period.

The following is suggested as a guide for estimating winds velocity if accurate information is not available:

- 5mph or 8kph = light flag moves.
- 10mph or 16kph = light flag fully extended.
- 15mph or 24kph = raises newspaper sheet.
- 20mph or 32kph = blowing and drifting snow

Table 2: TLVs for Work/Warmup Schedule for a 4 Hour Shift*

Approximate Air Temperature – Sunny Sky		**No Noticeable Wind**		**Wind 5 mph**		**Wind 10 mph**		**Wind 15 mph**		**Wind 20 mph**	
°C	**°F**	**Maximum Work Period**	**Number of Breaks**	**Maximum Work Period**	**Number of Breaks**	**Maximum Work Period**	**Number of Breaks**	**Maximum Work Period**	**Number of Breaks**	**Maximum Work Period**	**Number of Breaks**
-26 to -28	**-15 to -19**	Normal	1	Normal	1	75 min.	2	55 min.	3	40 min.	4
-29 to -31	**-20 to -24**	Normal	1	75 min.	2	55 min.	3	40 min.	4	30 min	5
-32 to -34	**-25 to -29**	75 min.	2	55 min.	3	40 min.	4	30 min	5	**Non-Emergency Work Should Cease**	
-35 to -37	**-30 to -34**	55 min.	3	40 min.	4	30 min	5	**Non-Emergency Work Should Cease**		↓	
-38 to - 39	**-35 to -39**	40 min.	4	30 min	5	**Non-Emergency Work Should Cease**		↓			
-40 to - 42	**-40 to -44**	30 min	5	**Non-Emergency Work Should Cease**		↓					
-43 & below	**-45 and below**	**Non-Emergency Work Should Cease**		↓							

*2008 TLVs and BEIs - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH), 2008 - page 213

SCOPE

This procedure should be followed when staff members working in the field are potentially exposed to cold weather, especially at or below freezing. It also applies to staff members working in refrigerated or other artificially cooled environments, and when working over large bodies of water. It is designed to aid in the prevention or minimization of cold stress injuries.

Program Elements

1.0 PROCEDURE

1.1 PREPARING COLD WEATHER WORK

The general process for preparing to work in cold weather conditions shall be followed:

- Identify the weather conditions and operations that fall within the TLV and include the operations/activities which might generate wind conditions during operation.
- Identify the staff members with conditions and/or risk factors which might contribute to cold stress.
- Establish the clothing requirements for staff members (refer to Appendix A).
- Determine the mandatory work/warm up schedule based on current conditions and the TLV chart.
- Provide a location to warm up during breaks, as required.
- Identify the required fluid and food replacement as necessary and provide during the established break schedule.
- Establish the controls for cold weather situations using the hierarchy of controls, as feasible.
- Provide training to staff members that cover cold stress conditions, effects, recognition and prevention of cold related injuries, and specific legal and regulatory requirements for site.
- Establish specific practices to be followed for cold related emergency situations.
- Establish provisions that first aid be administered immediately to staff members displaying symptoms of cold-related injury (refer to Appendix B – Thermal Hazards).

1.2 EVALUATION AND CONTROLS

Temperature and wind speed monitoring shall be conducted when air temperatures are below 45ºF (7.2ºC). The PM or SSO shall check temperature, wind speed and staff member conditions every hour to determine if conditions have changed that require additional or different controls. Superficial or deep local tissue freezing will occur only at temperatures below 30°F (-1°C) regardless of wind speed.

NOTE: Staff members known to have personal conditions (refer to Appendix B) or are taking medication that interferes with normal body temperature regulation shall be excluded from work in temperatures of 30ºF (-1°C) or below.

At air temperatures of 35.6°F (2°C) or less, staff members who become immersed in water or whose clothing becomes wet shall immediately be provided a change of clothing and be assessed and/or treated for hypothermia. If available clothing does not provide adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

1.3 EQUIVALENT CHILL TEMPERATURES 20°F (-7°C) OR LESS

For work practices at or below 20°F (-7°C), the following shall apply:

- Continuous skin exposure shall not be permitted when the air speed and temperature results in an Equivalent Chill Temperature (ECT) of -25°F (-32°C). (Refer to Table 1 for ECTs.)
- If work is performed continuously in cold weather with an ECT at or below 20°F (-7°C), warm shelters (e.g., tents, trailers, vehicles) shall be made available nearby. Staff members shall use these shelters at regular intervals. The frequent use of shelters depends on the severity of the environmental exposure.
- Staff members experiencing the onsets of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability or euphoria shall immediately return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. When necessary, a change of dry work clothing shall be provided to prevent staff members from returning to their work with wet clothing.
- Dehydration, or the loss of body fluids, occurs insidiously in the cold environment. It might increase the susceptibility of the staff member to cold injury due to a sufficient change in blood flow to the extremities. Staff members shall remain hydrated and shall have caloric intake during the day. The intake of coffee and other caffeinated drinks shall be limited due to a diuretic and circulatory effect.
- If staff members are handling fluids (i.e., gasoline, alcohol or cleaning fluids), precautions shall be taken to avoid soaking of the clothing and skin contact with the fluids.

1.4 EQUIVALENT CHILL TEMPERATURES 10°F (-12°C) OR LESS

For work practices at or below 10°F (-12°C) ECT, the following shall also apply:

- Staff members shall be under constant protective observation using the buddy system or by supervision.
- The work rate shall not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is required, rest periods shall be taken in heated shelters and the opportunity for changing into dry clothing shall be provided.
- Staff members not acclimated shall not be required to work full time in cold weather in the first few days until they become accustomed to the working conditions. They are required to wear protective clothing.
- Work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Contact with metal (i.e., unprotected metal chair seats) shall be avoided.

1.5 DEVIATIONS FROM REQUIREMENTS

A MoC, including a risk assessment and action plan, is required if deviation from the requirements of this procedure is necessary. Any variation following completion of the MoC shall be authorized by the RHSC. In addition, approval by the CHSM is required.

2.0 SAFE WORK PRACTICES

All staff members working in low temperatures, especially at or below freezing, are to follow specific precautionary measures to prevent cold stress, which include:

- Take a spare set of clothing with you in case your work clothes are not warm enough or become wet.

- Dress in layers. If you are cold, add a layer. If you begin to sweat, remove a layer. Maintain a clothing level that keeps you warm but dry (not sweating).
- Recognize the environmental and workplace conditions that may be dangerous;
- Learn the signs and symptoms of cold-induced illnesses and injuries and what to do to help staff members;
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm;
- When the air temperature is below 41 F, staff should be aware that cold stress is now considered a potential hazard;
- Wearing thermal clothing, including gloves and footwear, beneath chemical resistant clothing where necessary;
- When clothing becomes wet and temperatures are below 36 F, clothing must be replaced immediately;
- Drink warm, palatable drinks to replace liquids. Dehydration is important;
- Never going into the field alone when cold stress could occur;
- Observing fellow staff members for signs of cold stress and administering first aid, as necessary;
- Taking periodic breaks to allow recovery from cold stress; and
- Staff members working near water in which they may become immersed must wear floatation suits offering thermal protection. Brief emersion in water below 60^{o} F or prolonged emersion at even 70^{o} F can produce hypothermia.

3.0 First Aid Procedures

During periods in which the temperature falls below freezing, staff members should observe each other for signs of hypothermia or frostbite. If exposed skin begins to sting or tingle, rub the exposed area to stimulate circulation. However, if the exposed area is numb, do not rub it. Do not use snow; this will only make the injury more serious. Promptly seek a protected or indoor environment. Warm the affected parts in warm water (104 - 133 °F) or by other suitable means. Staff members experiencing signs or symptoms of hypothermia should immediately be taken to a warmer environment. Heating devices should be used to provide relief from cold. Care must be exercised, however, with electrical devices in conductive or moist environments. Combustion devices, such as catalytic heaters, may be used where there is adequate ventilation. They must not be used in tightly closed spaces where accumulation of carbon monoxide can occur.

4.0 TRAINING

Staff members shall be made aware of the factors, which influence the development of cold injury: ambient temperature, the velocity of the wind, and moisture. They shall be made aware of proper protective measures and equipment.

5.0 PERSONAL PROTECTIVE EQUIPMENT

Thermal protective clothing is available from various vendors, and selection assistance is available from your location's administrative assistants or RHSCs. Those who qualify are offered an Allowance", details can be located on Human Potential Policy 11-6 "Clothing, Prescription Safety Eyeglasses, & Safety Footwear Allowance". This policy is located in the staff member handbook. Generally, the following guidelines should be followed:

If there is a need for chemical resistant protective clothing, chemical resistant protective clothing generally does not provide protection against cold stress, and in some instances it can increase susceptibility. For this reason, thermal clothing, gloves, and footwear should be worn beneath chemical resistant personal protective equipment in cold weather. Most extreme weather wear now provides weather temperature ratings on tags or the garment. Observe tags for appropriate temperature protection.

DEFINITIONS

Clothing: When working in cold weather is required, protective clothing shall be identified in the risk assessment Staff members shall be dressed to protect against losing a core body temperature of 96.8°F (36°C). The body can lose heat through extremities and contribute to loss of core body temperature. In this instance, whole body protection applies. Clothing should be carefully selected in consultation with knowledgeable staff members. Specific clothing shall be listed in each Site-specific Health and Safety Plan, when applicable. For additional information, refer to Appendix A - Clothing. Additional clothing shall be identified for individuals with predisposed conditions that contribute to cold stress conditions.

Cold Stress: The production of physiological effects due to cold temperatures and\or wind chill.

Exposure Limits: All work in cold weather shall be within the limits established by the American Conference for Governmental Industrial Hygienists (ACGIH). The Threshold Limit Values (TLVs) are shown in Table 2: Threshold Limit Values. Published TLVs are based on properly clothed staff members. The site shall be prepared with proper clothing readiness for extreme temperature drops within a shift (e.g., in the same day).

Frostbite: Freezing of tissue, often resulting in tissue death.

Hypothermia: Condition of reduced body temperature resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.

Wind Chill: The effect of air movement on apparent temperature in a cold environment.

Responsibilities

CHSM/RHSC

In the scope of this practice, the CHSM and or RHSC shall be responsible for verifying that the requirements of this practice are implemented and enforced on a site-specific basis.

SITE SAFETY OFFICER (SSO)

The Site safety Officer is an on-site person, or designated alternate, who has a working knowledge of all work activities being performed by all members of the workforce at the location.

In the scope of this practice, the SSO shall:

- Evaluate the project scope of work and determine applicable Health, Safety, Security and Environment procedures, including this procedure.
- Verify that elements from Contractor cold stress programs are included in the HASP as necessary.

STAFF MEMBERS

In the scope of this practice, each staff member is responsible for the following:

- Recognizing the hazards of working in cold environments.
- Mitigating the risk of cold stress by establishing and enforcing engineering controls and appropriate work practices.
- Understanding the signs and effects of cold stress.
- Watching for signs of cold stress to prevent further adverse effects.

PROJECT MANAGER

In the scope of this practice, the Project Manager leader is responsible for the following:

- Recognizing that a cold environment is present on their jobsite.
- Understanding cold exposure limits and measurements.
- Identifying at-risk employees.
- Recognizing the hazards of working in cold environments.
- Developing a plan for mitigating the effects of cold environments.
- Assuring that the workforce under his or her control is complying with the mitigation plans.

Appendix A- Glossary

CLOTHING

When working in cold weather is required, protective clothing shall be identified in the risk assessment. Staff members shall be dressed to protect against losing a core body temperature of 96.8°F (36°C). The body can lose heat through extremities and contribute to loss of core body temperature. In this instance, whole body protection applies. Clothing should be carefully selected in consultation with knowledgeable staff members. Specific clothing shall be listed in the Site-specific Health and Safety Plan, when applicable. For additional information, refer to Appendix B- Clothing. Additional clothing shall be identified for individuals when predisposed conditions that contributes to cold stress conditions.

COLD STRESS

The production of physiological effects due to cold temperatures and or wind chill.

EXPOSURE LIMITS

All work in cold weather shall be within the limits established by the American Conference for Government Industrial Hygienists (ACGIH). The Threshold Limit Value (TLV) is shown in Table 2: Threshold Limit Values. Published TLVs are based on properly clothed staff members. The site shall be prepared with proper chemical clothing readiness for extreme temperature drops within a shift (e.g., in the same day).

FROSTBITE

Freezing of the tissue, often resulting in tissue death.

HYPOTHERMIA

Condition of reduced body temperature resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.

WIND CHILL

The effect of air movement on apparent temperature in a cold environment.

Appendix B – Clothing Recommendations

CLOTHING

Protective clothing is needed for work at or below 4°C. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that you can regulate the amount of heat and perspiration you generate while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries.

Clothing should be worn in multiple layers which provide better protection than a single thick garment. The air between layers of clothing provides better insulation than the clothing itself. Having several layers also gives you the option to open or remove a layer before you get too warm and start sweating or to add a layer when you take a break. It also allows you to accommodate changing temperatures and weather conditions. Successive outer layers should be larger than the inner layer; otherwise the outermost layer will compress the inner layers and will decrease the insulation properties of the clothing.

The inner layer should provide insulation and be able to "wick" moisture away from the skin to help keep it dry. Thermal underwear made from polyesters or polypropylene is suitable for this purpose. "Fishnet" underwear made from polypropylene wicks perspiration away from the skin and is significantly thicker than regular underwear. It also keeps the second layer away from the skin. The open mesh pattern enables the moisture to evaporate and be captured on the next layer away from the skin. The second layer covers the "holes" in the fishnet underwear which contributes to the insulation properties of the clothing.

The additional layers of clothing should provide adequate insulation for the weather conditions under which the work being done. They should also be easy to open or remove before you get too warm to prevent excessive sweating during strenuous activity. Outer jackets should have the means for closing off and opening the waist, neck and wrists to help control how much heat is retained or given off. Some jackets have netted pockets and vents around the trunk and under the arm pits (with zippers or Velcro fasteners) for added ventilation possibilities.

For work in wet conditions, the outer layer of clothing should be waterproof. If the work area cannot be shielded against wind, an easily removable windbreak garment should be used. Under extremely cold conditions, heated protective clothing should be made available if the work cannot be done on a warmer day.

Almost 50 percent of body heat is lost through the head. Wool knit cap or a liner under a hard hat can reduce excessive heat loss.

Clothing should be kept clean since dirt fills air cells in fibers of clothing and destroys its insulating ability.

Clothing must be dry. Moisture should be kept off clothes by removing snow prior to entering heated shelters. While the staff member is resting in a heated area, perspiration should be allowed to escape by opening the neck, waist, sleeves and ankle fasteners or by removing outerwear. If the rest area is warm enough it is preferable to take off the outer layer(s) so that the perspiration can evaporate from the clothing.

- If fine manual dexterity is not required, gloves should be used below 4°C for light work and below -7°C for moderate work. For work below -17°C, mittens should be used.
- Cotton is not recommended. It tends to get damp or wet quickly, and loses its insulating properties. Wood and synthetic fibres, on the other hand, do retain heat when wet.

FOOTWEAR

Felt-lined, rubber bottomed, leather-topped boots with removable felt insoles are best suited for heavy work in cold since leather is porous, allowing the boots to "breathe" and let perspiration evaporate. Leather boots can be "waterproofed" with some products that do not block the pores in the leather. However, if work involves standing in water or slush (e.g., fire fighting, farming), the waterproof boots must be worn. While these protect the feet from getting wet from cold water in the work environment, they also prevent the perspiration to escape. The insulating materials and socks will become wet more quickly than when wearing leather boots and increase the risk for frostbite.

Foot Comfort and Safety at Work has some general information how to select footwear. (Also, when trying on boots before purchase, wear the same type of sock that you would wear at work to ensure a proper fit.)

SOCKS

You may prefer to wear one pair of thick, bulky socks or two pairs - one inner sock of silk, nylon, or thin wool and a slightly larger, thick outer sock. Liner socks made from polypropylene will help keep feet dry and warmer by wicking sweat away from the skin. However, as the outer sock becomes damper, its insulation properties decrease. If work conditions permit, have extra socks available so you can dry your feet and change socks during the day. If two pairs of socks are worn, the outer sock should be a larger size so that the inner sock is not compressed.

Always wear the right thickness of socks for your boots. If they are too thick, the boots will be "tight," and the socks will loose much of their insulating properties when they are compressed inside the boot. The foot would also be "squeezed" which would slow the blood flow to the feet and increase the risk for cold injuries. If the socks are too thin, the boots will fit loosely and may lead to blisters.

FACE AND EYE PROTECTION

In extremely cold conditions, where face protection is used, eye protection must be separated from the nose and mouth to prevent exhaled moisture from fogging and frosting eye shields or glasses. Select protective eye wear that is appropriate for the work you are doing, and for protection against ultraviolet light from the sun, glare from the snow, blowing snow/ice crystals, and high winds at cold temperatures.

WHAT ARE SOME ADDITIONAL PREVENTION TIPS?

To prevent excessive sweating while working, remove clothing in the following order:

1. mittens or gloves (unless you need protection from snow or ice),

2. headgear and scarf,

3. then open the jacket at the waist and wrists, and
4. Remove layers of clothing.

As you cool down, follow the reverse order of the above steps.

Prevent contact of bare skin with cold surfaces (especially metallic) below -7°C as well as avoiding skin contact when handling evaporative liquids (gasoline, alcohol, cleaning fluids) below 4°C. Sitting or standing still for prolonged periods should also be avoided.

Balanced meals and adequate liquid intake are essential to maintain body heat and prevent dehydration. Eat properly and frequently. Working in the cold requires more energy than in warm weather because the body is working to keep the body warm. It requires more effort to work when wearing bulky clothing and winter boots especially when walking through snow.

Drink fluids often especially when doing strenuous work. For warming purposes, hot non-alcoholic beverages or soup are suggested. Caffeinated drinks such as coffee should be limited because it increases urine production and contributes to dehydration. Caffeine also increases the blood flow at the skin surface which can increase the loss of body heat.

Alcohol should not be consumed as it causes expansion of blood vessels in the skin (cutaneous vasodilation) and impairs the body's ability to regulate temperature (it affects shivering that can increase your body temperature). These effects cause the body to lose heat and thus increase the risk of hypothermia.

In refrigerated rooms, the air speed should not exceed 1 meter per second. If staff members are simultaneously exposed to vibration and/or toxic substances, reduced limits for cold exposure may be necessary.

CLOTHING MATERIALS

Some of the different types of materials for winter clothing and insulation are discussed below.

Wool - derives its insulating quality from the elastic, three-dimensional wavy crimp in the fiber that traps air between fibers. Depending on the texture and thickness of the fabric, as much as 60-80% of wool cloth can be air. Wool can absorb a fair amount of moisture without imparting a damp feeling because the water “disappears” into the fiber spaces. Even with water in the fabric wool still retains dead air space and will still insulate you. The disadvantage to wool is that it can absorb so much water (maximum absorption can be as much as 1/3 third the garment weight) making wet wool clothing very heavy. Wool releases moisture slowly, with minimum chilling effect. Wool can be woven in very tight weaves that are quite wind resistant. An advantage to wool is that it is relatively inexpensive (if purchased at surplus stores). However, it can be itchy against the skin and some people are allergic to it.

Pile or Fleece fabrics - is a synthetic material often made of a plastic (polyester, polyolefin, polypropylene, etc.). This material has a similar insulated capacity as wool. Its advantages are that it holds less water (than wool) and dries more quickly. Pile is manufactured in a variety of different weights (thicknesses) offering different amounts of loft and insulation. This allows for numerous layering possibilities. The disadvantage of pile is that it has very poor wind resistance and hence a wind shell on top is almost always required. Versions of pile are available that have a middle windproof layer.

Polypropylene and other hydrophobic fabrics - polypropylene is a synthetic, plastic fiber which offers dead air space and a fiber which cannot absorb water. The fiber is hydrophobic so it moves the water vapor away from the source (the body). Polypropylene layers are extremely effective worn directly against the skin as a way of keeping the skin from being wet and reducing evaporative heat loss. As the water moves away from the body it will evaporate, but each additional millimeter of distance between your skin and the point of evaporation decreases the amount of body heat lost in the evaporative process. Some fabrics rely on the chemical nature of the fiber to be hydrophobic. Others fabrics use a molecular coating t0 achieve the same end.

Polarguard™, Hollofil™, Quallofil™ and others - these are synthetic fibers which are primarily used in heavy outer garments like parkas. The fibers are fairly efficient at providing dead air space (though not nearly as efficient as down). Their advantages are that they do not absorb water and dry fairly quickly. Polarguard™ is made in large sheets. Hollofil™ is a fiber similar to Polarguard but hollow. This increases the dead air space and makes the fiber more thermally efficient. Quallofil™ took Hollofil™ one step further by creating four “holes” running through the fiber.

“Superthin” fibers - **Primaloft™, Microloft™, Thinsulate™ and others -** the principal behind these synthetic fibers is that by making the fiber thinner you can increase the amount of dead air space. For example, take an enclosed space 5 inches wide and place 2 dividers into that space, each 1 inch thick. You have an effective air layer of 3 inches. If you take the same 5 inch space and divide it with 4 dividers, each 1/4 inch thick you now have an effective air layer of 4 inches. You have gained one inch. Under laboratory conditions a given thickness of Thinsulate™ is almost twice as warm as the same thickness of down; however, the Thinsulate™ is 40% heavier. Thinsulate™ is made in sheets and therefore tends to be used primarily for outer layers, parkas and pants. New materials such as Primaloft™ and Microloft™ are super thin fibers that are close to the weight of down for an equivalent fiber volume. They are now being used in parkas as an alternative to down. They have similar warmth to weight ratios as down without the worries about getting wet.

Down - feathers are a very efficient insulator. They provide excellent dead air space for very little weight. The major problem with down (and it can be a major problem) in the winter is that down absorbs water. Once the feathers get wet they tend to clump, and lose dead air space. Using down items in the winter takes special care to prevent them from getting wet. Some people are allergic to down.

Cotton - Note: Cotton is basically useless in winter time. It wicks water, but unlike polypropylene, cotton absorbs this moisture and the water occupies the space previously occupied by dead air. This means a loss in dead air space, high evaporative cooling, and a garment that is almost impossible to dry out.

THE BODY AND CLOTHING

Head - because the head has a very high surface to volume ratio and the head is heavily vascularized, you can lose a great deal of heat (up to 70%) from the head. Therefore, hats are essential in winter camping. The adage - if your toes are cold, put on a hat - is true. A balaclava is particularly effective and versatile. A facemask may be required if there are high wind conditions due to the susceptibility of the face to frostbite.

Hands - mittens are warmer that gloves. It is useful to have an inner mitten with an outer shell to give you layering capabilities. However, gloves are always essential as well in winter because of the need for dexterity in various operations.

Feet - finding the right footgear depends a great deal on the activity you are involved in as well as temperature and environment. Regular boots are *not* sufficient. They simply do not provide the necessary dead air space. The options for boots include:

Insulated Boots - Such as Sorels™ or "Mickey Mouse" boots. These are rubber or leather and rubber boots that use a layer of wool felt to provide dead air space. The Mouse boots can be Army surplus or modern copies (avoid the copies since they are often poorly made). With the true Army boots, the black boots are rated to -20 degrees and the white ones to -40 degrees.

Socks - one of the best systems for keeping feet warm is using multiple layers. Start with a hin polypropylene liner sock next to the skin to wick moisture away followed by 1 - 2 pairs of wool or wool/nylon blend socks. Make sure the outer socks are big enough that they can fit comfortably over the inner layers. If they are too tight, they will constrict circulation and increase the chances of frostbite. Keeping your feet dry is essential to keeping your feet warm you may need to change your socks during the day.

Gaiters - are essential if you are working in the snow. They keep snow from getting into your boots and keep your socks and pants legs free from snow.

Outer Layer - it is essential to have an outer layer that is windproof and at least water resistant. In some cases it may be best to have the garment waterproof. It also needs to be able to be ventilated. There is a big trade off between waterproof and ability to ventilate. A completely waterproof item will keep the water that is moving through your other layers trapped, adding to weight and causing some heat loss. However, in wet snow conditions, if the garment is not waterproof it can get wet and freeze. Gore-TexTM and other similar fabrics provide one solution. These fabrics have a thin polymer coating which has pores that are large enough to allow water vapor to pass through but too small to allow water droplets through. Nothing is perfect, however, and although Gore-Tex TM does breathe, it doesn't breathe as well as straight cotton/nylon blends. If you opt for a straight wind garment, 65/35 blends of cotton and nylon work well. The other approach is to have a waterproof garment with sufficient ventilation openings to allow water vapor to escape. This provides the ability to work in wet snow without worrying about getting the garment soaked. Part of the basis for making the decision is the area and you are traveling in. If you are in the dry snow of the Rockies you needn't worry so much about waterproof. If you are in the northeastern mountains where freezing rain is a possibility or very wet snow, you need to be prepared to be wet.

Zippers - are wonderful accessories for winter clothing. Having underarm zippers on jackets can greatly increase your ability to ventilate. Having side zippers on pants can allow you to ventilate and to add or subtract a layer without taking off your boots.

Apparel	Recommendation
Socks	Stretch socks are not advisable, since they restrict circulation. Wool has superior insulating qualities.
Trousers	Wool, thermal, or quilted. Suspenders or coverall-types are recommended, as belts restrict circulation.
Boots	Felt-lined or insulated, rubber bottomed, leather topped.
Shirt	Wool shirt or sweater, over cotton or synthetic wicking material provides best protection.
Head cover	Wool knit hat or hood. Use a liner with hardhats. Use snorkel hoods in extreme environments.
Gloves	Mittens offer better protection, but restrict dexterity. Layers of differing materials may be appropriate for different work. Gortex outer shells are recommended to reduce dampness.
Face mask	In extreme cold, facial protection is important to prevent frostbite. A ski mask or a snorkel hood may be appropriate.
Coat	An anorak, parka, or hooded coat, as appropriate. Down provides good insulation. Synthetics such as thinsulate may be satisfactory. Gortex outer shells are recommended to reduce dampness.
Under garments	In moderate exposures, cotton may be adequate, however polypropylene and other materials, which "wick" moisture away from the skin, may be superior for heavy work.

Appendix C - Thermal Hazards

COLD DISORDERS, HEALTH EFFECTS AND FIRST AID

CHILBLAIN

This is an inflammation of the hands and feet due to exposure to cold and moisture. The hands and feet start to swell, become painful and are the site of localized itching. The symptoms may develop some hours after exposure to cold have ceased and may persist for several days. In extreme cases ulceration can occur.

Prevention: The hands and feet should be kept warm and dry.

First aid treatment requires, where practicable, elevation of the affected area above the heart to reduce the swelling. A clean dressing should be applied to the affected area. Gentle rewarming can be undertaken. Simple analgesia (pain killers) may be used as appropriate. In the susceptible individual, chilblains are likely to recur following exposure to further cold conditions.

TRENCH FOOT

This is caused by continuous exposure to the cold without freezing, combined with constant dampness or immersion in water. It is found most often when wet socks are worn for long periods of time resulting in inflammation, redness, itching, numbness, severe pain and eventually blistering and tissue death.

Prevention is based on wearing well fitting, water resistant, dry footwear.

First aid treatment requires elevating the affected area and keeping it clean, warm and especially dry.

FINGERTIP FISSURES

Deep, intractable and very painful fissuring may occur on the fingertips when exposed to prolonged or repeated cold conditions. A combination of cold and drying of the skin may be responsible. Fingertip fissures may be so painful as to prevent use of the affected fingers.
Prevention requires keeping the hands as warm as possible and maintaining skin hydration through moisturizing cream.

First Aid treatment can be difficult, but very good results have been reported with the tissue adhesive

Histoacryl®- butyl-2-cyanoacrylate, a medical form of irritating Superglue®.

FROSTNIP

This is the freezing of the skin and superficial tissue. The skin turns white after exposure to cold wind. This superficial freezing of tissue affects mostly the face (ears, nose, cheeks) and fingers. The first symptoms include a stinging, pricking pain. Contrary to frostbite, the underlying tissue is not frozen.

Operation and Calibration of PID	**Document #:** OP1004
Issued Date: 2002	**Issued By:** Corporate health& Safety
Revised Date: June 2015	**Approved By:** Brian Fitzpatrick

Purpose, Summary, Scope

PURPOSE

This procedure describes the operation and calibration techniques for the Model PI 101 Photoionization Detector, manufactured by HNU Systems, Inc. The instrument will measure organic vapor levels. There are three direct reading ranges: 0-20 ppm, 0-200 ppm and 0-2,000 ppm at a minimum gain (all specifications are benzene referred). The detection limit is 0.1 ppm. The linear range is 0.1-600 ppm. The response time is less than 3 seconds to 90% of full scale. The instrument will have an 11.7 eV UV lamp.

Equipment & Supplies

SUPPORTING MATERIALS

- HNU PI 101 instrument with 10.2 or 11.7 eV UV lamp
- Span gas cylinders: 100 ppm isobutylene in air
- Calibration "Tee" with rotometer

Program Elements

1.0 PROCEDURE

1.1 OPERATION

The location and extent of use of the PID will be determined by the Safety Officer.

The following procedures will be performed daily, prior to initiation of air monitoring activities and after an instrument warm-up period. The following are general operating instructions for the instrument; more detailed instructions are provided in the manufacturer's operation manual.

Instrument zero: Turn the function switch to the stand-by position. If the meter does not read zero, rotate the zero potentiometer until a zero reading is obtained. Wait 15-20 seconds to ensure that the reading is stable. If not, readjust andre-check.

Calibration: Turn the function switch to the measurement range to be used for sampling. Attach the 8" probe extension to the calibration "Tee", then attach the calibration gas cylinder and rotometer to the remaining connections on the "Tee". Open the cylinder until a slight flow is detected on the rotometer. The HNU unit draws the volume of sample for detection and the excess is indicated on the rotometer. Adjust the span potentiometer so that the instrument reading is the exact value of the calibration gas. Close and remove the span gas. If the instrument span setting is changed, the instrument zero step will be repeated.

All calibration checks will be documented in the Site Log Book.

Operation: Verify that the function switch is at the measurement range in use during normal sampling. Note the instrument readings during the site visit.

1.2 REPAIR AND MAINTANENCE

If the instrument fails to function as per manufacturer's specifications, it will be replaced with a spare. The defective unit should be sent to the manufacturer for diagnostic treatment and correction.

Responsibilities

The Site Technician will be responsible for the calibration, operation and maintenance of the photoionization detector (PID).

The Safety Officer will be responsible for insuring that the work is performed and that the required data is collected.

Appendix A- Haley & Aldrich Related Procedures

OP1005	Operation/Calibration of FID Flame Ionization Detector
OP1006	Operation of Draeger Gas Detector Pump
OP1007	Field Monitoring for Volatile Organics (breathing space-work zone)
OP1009	Medical Surveillance Program
OP1010	Health and Safety Plans

Heat Stress	**Document #:** OP1015 Rev.3
Issued Date: 2004	**Issued By:** Corporate Health & Safety
Revised Date: June 2015	**Approved By:** Brian Fitzpatrick

Purpose, Scope, Summary

PURPOSE

The purpose of this Operating Procedure (OP) is to establish a hot environments program and to assure that staff members know and recognize symptoms of heat stress and are prepared to take appropriate remedial and corrective action.

SCOPE

This OP should be followed when H&A Staff members working in the field are potentially exposed to hot working conditions. It also applies to H&A Staff members working in facilities and such where there is radiant heat sources such as furnaces, boilers, etc. It is designed to aid in the prevention or minimization of heat stress illnesses.

SUMMARY

Heat stress is a disruption of normal body functions that occurs when high heat and humidity are coupled with hard work or use of equipment that interferes with the body’s normal temperature regulating system. The human body normally controls heat buildup by the evaporation of perspiration and reduced activity. The use of personal protective equipment (principally impermeable and semi permeable work clothes) and job performance requirements can impair the body’s ability to dissipate heat buildup. This increase in internal core temperatures can continue until it reaches a level that involuntarily shuts down the body’s ability to function properly. These conditions range from heat cramps to more serious and potentially fatal, heat stroke.

ENVIRONMENTAL CONDITIONS
Ambient temperature, relative humidity, air movement, and radiant heat play major roles in heat stress. Obviously, higher temperatures enhance the likelihood of producing discomfort and heat stress. The higher the relative humidity the less evaporation of perspiration takes place and thus evaporative cooling is reduced.

Air movement (fans or natural breezes) aids in evaporative and corrective cooling. The greater
The air movement, the greater the cooling effect except at temperatures higher than body temperature. When the air temperature is greater than 95 degrees F, the process of moving air across the body actually creates a greater risk than a cooling effect. Direct radiant heat can add significantly to heat stress as evidence of working in the sun. Shade is a valuable deterrent to heat stress.

PERSONAL CONDITIONS
Physical conditions, such as age, physical condition, clothing and level of exertion play a major role in determining a person's ability to withstand heat stress. Age is a major factor. Generally speaking, younger persons are more resistant to heat stress. Those in poor physical condition, overweight, not used to physical exertion, or involved with excessive alcohol are more subject to heat stress. An individual's geographical background also plays a significant role in the tolerance of working in hot work conditions such as Tucson and Southern California.

WORKING CONDITIONS
Working conditions are just an important factor to heat stress as those mentioned above. The use of personal protective equipment can interfere with normal cooling mechanisms and greatly enhance the possibility of heat stress. Working long hours can produce fatigue that makes heat stress more likely. Working during the hottest part of the day, particularly in bright sunlight, also promotes the onset of heat stress.

There are no Federal Occupational Safety and Health Administration (OSHA) standards regulating exposure to hot environments. However, the American Conference of Governmental Industrial Hygienists (ACGIH) has developed recommended heat stress threshold limit values (TLVs). These recommended TLVs have been used in the development of this SOP.

Program Elements

1.0 PROCEDURE

1.1 STANDARD WORK PRACTICES FOR HOT ENVIRONMENTS

- Prior to entering hot work environments, provide training regarding the hazards, precautions, and first-aid for heat stress.
- Include appropriate guidance in Health and Safety Plans.
- Wear light weight and colored clothing.
- Ensure that an ample supply of suitable fluids is available.
- Ensure that a proper rest area is available.
- Take adequate breaks.
- Conduct labor intensive work during cooler part of the day.
- Ensure that staff members remain alert for symptoms of heat stress and practice good avoidance techniques.
- Ensure that observation for appearance of heat stress symptoms is maintained.

- Ensure that first-aid measures are employed rapidly when symptoms appear.
- Observe each other for the early symptoms of heat stress.
- Try to eliminate excessive amounts of alcohol from non-work hour activities.

1.2 PREPARING FOR HOT WEATHER WORK

The PM and/or SSO shall take the following steps when preparing to work in hot weather conditions:

- Identify work that can pose a risk of heat stress and Ultraviolet (UV) exposure.
- Identify at-risk employees (refer to Section 3 Acronyms, Definitions and Language).
- Identify possible controls:
    - Establish controls for hot weather situations using Table 3: Summary of Control Measures as feasible.
    - Determine mandatory work and rest regimens based on current conditions, workload, clothing requirements, temperature and humidity for Threshold Limit Value (TLV).
    - Identify required fluid and food replacement schedules.
    - Provide a location to cool down during breaks.
    - Establish requirements to address UV exposure.
    - Monitor workers in extreme heat conditions.
- Establish emergency response procedures to be followed for heat-related emergency situations.
- Provide for first aid and establish the requirement that first aid be administered immediately to employees displaying symptoms of heat-related illness.
- Provide training to employees and verify training records about site legal and regulatory requirements and about the characteristics and effects of heat stress and the recognition and prevention of heat-related injuries.

1.3 IDENTIFICATION OF WORK CONDITIONS

Hot weather is a condition that will be encountered during field operations. When work takes place outdoors during warm weather, the PM and/or SSO shall identify working conditions for both heat stress conditions and UV exposure.

2.0 EXPOSURE GUIDELINES

The PM or SSO shall use the following exposure guidelines to evaluate the working environment for conditions which may lead to employee heat-related illnesses.

2.1 HEAT INDEX

The Heat Index (HI) can be used as a first indicator of thermal comfort. Refer to Appendix A –Heat Index Chart. The HI can be obtained by directly measuring the dry bulb temperature and relative humidity. The dry bulb temperature and relative humidity forecast can be obtained by checking the local weather station information or measured by using a wet bulb thermometer.
A direct reading of HI can be obtained by placing a heat stress monitor in full shade at the workplace.

The HI does not take into account acclimation, clothing or nature of work; therefore, if the HI is at 80°F (26.7°C) or above, further evaluation is required to adjust workload and acclimation (see Section 2.3 Heat Stress Exposure Guidelines of this procedure) and clothing (see Section 2.4 Heat Stress and Clothing Guidelines of this procedure).

2.2 HEAT EXPOSURE LIMITS AND MEASUREMENT

The TLV is a means of providing heat exposure limits and gauging potential heat impacts. To determine the TLV, the Wet Bulb Globe Temperature (WBGT) index is measured.

The WBGT is calculated using a formula that takes into account air temperature, speed of air movement, radiant heat from hot objects, sunshine and body cooling due to sweat evaporation.

WBGT direct reading meters, often called ‘heat stress analyzers’, are also available. These meters give direct WBGT readings; no calculations are necessary.

A trained staff member shall take WBGT measurements. If a WBGT direct reading meter is not available, two different methods are used to calculate WBGT in the workplace: one for workplaces with direct sunlight, and the other for workplaces without direct sunlight. In addition, when conditions of the workplace fluctuate widely, time-weighted WBGT is often used.

The WBGT calculation is used in determining heat stress exposure guidelines (see Section 2.3 of this practice) and heat stress and clothing guidelines (see Section 2.4 of this procedure).

2.3 HEAT STRESS EXPOSURE GUIDELINES

Heat stress exposure guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) are shown in Table 1: ACGIH Screening Criteria for Heat Stress Exposure. This table is used to determine the allocation of work in a work/rest cycle, which is dependent on the type of work and WBGT values.

Table 1: ACGIH Screening Criteria for Heat Stress

Allocation of Work In a Work/Rest Cycle (WBGT Values in °F (°C))								
Work Load	**Acclimated (Action Limit)**				**Not Acclimated (Action Limit)**			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
Continuous Work	87.8 (31)	82.4 (28)	—	—	82.4 (28)	77 (25)	—	—
75% Work/ 25% Rest	87.7 (31)	84.2 (29)	81.5 (27.5)	—	83.3 (28.5)	78.8 (26)	75.2 (24)	—
50% Work/ 50% Rest	89.6 (32)	86 (30)	84.2 (29)	82.4 (28)	85.1 (29.5)	80.6 (27)	77.9 (25.5)	76.1 (24.5)
25% Work/ 75% Rest	90.5 (32.5)	88.7 (31.5)	86.9 (30.5)	86 (30)	86 (30)	84.2 (29)	82.4 (29)	81.5 (27.5)

Table 1 is based on five-day work weeks and eight-hour work days with conventional breaks.

Conventional breaks include a 15-minute break in a four-hour period and a half-hour lunch in an eight-hour period. The ACGIH exposure limits are intended to protect most workers from heat-related illnesses. The limits are higher than that if they had been developed to prevent discomfort. A safety factor should be used to protect sensitive individuals or increase comfort.

Examples to clarify work load intensity:

- Rest: sitting (quietly or with moderate arm movements).
- Light work: sitting or standing to control machines, performing light hand or arm work (e.g., using a table saw), occasional walking, driving.
- Moderate work: walking about with moderate lifting and pushing or pulling, walking at a moderate pace, scrubbing in a standing position.
- Heavy work: digging, carrying, pushing/pulling heavy loads, walking at a fast pace, pick and shovel work, carpenter sawing by hand.
- Very heavy: very intense activity at a fast to maximum pace (e.g., shoveling wet sand).

For example, in order to minimize heat stress exposure, an employee who is acclimated and is performing heavy work such as shoveling dirt in a temperature of 78°F (25.6°C), would fall into a work/rest regimen of 100% work.

Table 2: Correction of TLV for clothing.

Clothing Type	WBGT Correction (in °F [°C])
Work Clothes (long-sleeved shirts and pants)	0 (0)
Cloth coveralls (woven material)	+3 (0)
Spunbonded Meltdown Spunbonded polypropylene coveralls	+6 (+0.5)
Polyolefin coveralls	+8 (+1)
Double-layer woven clothing	+9 (+3)
Limited-use vapor-barrier coveralls	+18 (+11)

TLVs assume that workers who are exposed to these conditions are adequately hydrated, are not taking medication, are wearing lightweight clothing and are in generally good health.

When the WBGT is at a temperature that exceeds the TLV, ‘Stop Work’ should be enforced. (Refer to the Stop Work Operating Procedure).

2.4 HEAT STRESS AND CLOTHING GUIDELINES

The exposure potential should be adjusted for staff members wearing heavy clothing. The ACGIH recommendations for these conditions are listed in Table 2: Correction of TLV for clothing.

For example, an acclimated worker wearing double-layer woven clothing doing moderate work in 30ºC would have a corrected exposure level of 30 + 3 = 33ºC (91.4ºF). This would lower the allowable exposure to 0-25% work from 25-50% work.

For Fire Retardant Clothing (FRC), there is no WBGT correction. FRC can be obtained in various weight materials. The lightest weight FRC should be worn during work in warm environments.

No second layer of clothing should be worn except for cotton or under armor undergarments.

These values are not to be used for completely encapsulating suits. The assumption is that coveralls are worn with only modest clothing underneath, not a second layer of clothing.

3.0 IDENTIFYING AT-RISK EMPLOYEES

The PM and/or SSO should also be aware that certain personal factors or conditions put employees at greater risk for heat-related illnesses. These conditions include:

- Age.
- Weight.
- Metabolism.
- Alcohol or drug use.
- Pre-existing medical conditions.
- Level of physical fitness.
- Use of medications.
- Individual sensitivity to heat.
- Possibility of hypertension.

See Appendix B – Heat Stress Contributors for other influencing factors.

NOTE Staff members with any 'at-risk' conditions may require more stringent work/rest regimens or controls.

The Haley & Aldrich Medical Surveillance Program includes a screening program for identifying at risk employees shall include identification of health conditions that are aggravated by extreme environmental temperatures.

4.0 HEALTH AND SAFETY GUIDELINES

The PM and/or SSO shall develop control measures to protect employees from heat-related illness. Controls shall be based on a risk assessment approach. Conditions and available controls will vary from site to site. Therefore, the HASP shall define and document the site specific control plan. Controls shall be appropriate for the risks that are associated with heat hazards.

4.1 ACCLIMATION

The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimation. Acclimation is a response by the body that results in increased heat tolerance.

People differ in their ability to acclimate to heat. Usually, acclimation is obtained in four to five days. However, it is lost in approximately the same amount of time. After a period of acclimation, the same activity will produce fewer cardiovascular demands. The worker will perspire more efficiently, leading to better evaporative cooling, and thus will more easily be able to maintain normal body temperatures.

All site workers who could be exposed to hot weather conditions shall be acclimated or go through an acclimation process, as necessary. Where workers are already acclimated, no acclimation process is necessary. A previously acclimated person is someone who has already been in similar working and heat conditions. Where workers are not acclimated, the recommendations applicable to Not Acclimated in Table 1 in Section 2.3 of this practice shall be followed for four to five days until acclimation is obtained. (Note: Application of Table 1 in Section 2.3 shall include clothing corrections from Table 2 and corrections for risk factors from Section 3.0 Identifying At-risk Employees.)

4.2 FLUID AND NUTRIENT REPLACEMENT

Cool (50°-60°F [10°-15°C]) water or other cool liquid, except alcoholic beverages, should be made available to workers. Workers should drink small amounts frequently (e.g., one cup [237ml] every 20 minutes). Ample supplies of liquids should be placed close to the work area. Although some commercial replacement drinks contain salt, this is not necessary for acclimated people, because most people have enough salt in their normal diets. Commercial replacement drinks contain high amounts of sugar and may contribute to an individual's inability to cope with the warm environment. If used, commercial replacement drinks should not be used at full strength and should be diluted with water on at least a one-to-one ratio. Energy drinks shall not be used while working in warm environments.

Poor nutrition, over eating or under eating are factors contributing to heat stress. During hot conditions, employees should eat small, regular meals.

4.3 SUNSCREEN

Outdoor workers are exposed not only to potential heat illness, but also to UV radiation. Long-term exposure to UV radiation poses additional risks and can lead to a variety of skin disorders, including skin cancer and cataracts of the eyes. As protection from UV exposure, sunscreen and appropriate eye protection should be considered in addition to the controls listed below.

The 'sun protection factor' (SPF) measures the protection provided by sunscreens. The higher the SPF, the better the protection from UVR. The minimum SPF that should be used is SPF 30+. No sunscreen offers complete protection from UVR.

Sunscreen shall be applied liberally and evenly to all exposed skin areas. Allow sunscreen to be slowly absorbed into the skin, rather than rubbing it in completely. Apply sunscreen at least 20 minutes before going outside. Put it on whenever you are outside or travelling in the car. You should even use sunscreen in the winter months and on cloudy days. If using a new sunscreen for the first time, test it first on a small area of skin before applying. Reapply sunscreen at least every two hours when outdoors and more frequently if you are sweating.

Use lip balms containing sunscreen.

4.4 ENGINEERING CONTROLS

Engineering controls including general ventilation and spot cooling by local exhaust ventilation at points of high heat production may be helpful. Shielding is required as protection from radiant heat sources. Evaporative cooling and mechanical refrigeration are other ways to reduce heat. Cooling fans can also reduce heat in hot conditions. Equipment modifications, the use of power tools to reduce manual labor and personal cooling devices or protective clothing are other ways to reduce the hazards of heat exposure for staff members.

4.4.1 VENTILATION

General ventilation is used to dilute hot air with cooler air (generally cooler air that is introduced from the outside). This technique clearly works better in cooler climates than in hot ones. A permanently installed ventilation system usually handles large areas or entire buildings. Portable or local exhaust systems may be more effective or practical in smaller areas.

4.4.2 AIR COOLING/AIR TREATMENT

Air cooling and treatment differs from ventilation because it reduces the temperature of the air by removing heat (and sometimes humidity) from the air.

Air conditioning is a method of air cooling, but it is expensive to install and operate. An alternative is the use of chillers to circulate cool water through heat exchangers over which air from the ventilation system is then passed. Chillers, like general dilution ventilation, are more efficient in cooler climates than in warmer ones. Local air cooling can be effective in reducing air temperature in specific areas. Two methods have been used successfully in industrial settings. One type, cool rooms, can be used to enclose a specific work place or to offer a recovery area near hot jobs. The second type is a portable blower with built-in air chiller. The main advantage of a blower, aside from portability, is its minimal set-up time.

4.4.3 CONVECTION

Another way to reduce heat stress is to increase the air flow or convection using fans, etc. in the work area (as long as the air temperature is less than skin temperature). Changes in air speed can help workers stay cooler by increasing both the convective heat exchange (the exchange between the skin surface and the surrounding air) and the rate of evaporation. Because this method does not actually cool the air, any increases in air speed must impact the worker directly to be effective.

If the temperature is higher than 95° F, the hot air passing over the skin may actually make the worker hotter and offset any increase gained in evaporative cooling. Increases in air speed have no effect on workers wearing vapor-barrier clothing.

4.4.4 HEAT CONDUCTION

Heat conduction solutions include insulating the hot surface(s) that generate(s) the heat and changing the surface itself.

4.4.5 RADIANT HEAT

Simple engineering controls, such as shields or barriers, can be used to reduce the problem of radiant heat - heat coming from hot surfaces within the worker’s line of sight. Any shield, whether temporary or permanent, should be situated so as not to interfere with the air flow. The reflective surface of the shield should be kept clean to maintain its effectiveness. Contact the CHSD for additional guidance as appropriate.

4.5 WORK PRACTICES

Work practices such as providing plenty of drinking water -- as much as a quart per staff member per hour -- at the workplace can help reduce the risk of heat disorders. Training first aid staff members to recognize and treat heat stress disorders and making the names of trained staff known to all staff members is essential. Locations should also consider an individual staff member's physical condition when determining his or her fitness for working in hot environments. Older staff members, obese staff members and those on some types of medication are at greater risk. These conditions should be discussed with the company doctor at some time during your medical exam.

4.5.1 WORK AND REST

Work and rest periods with longer rest periods in a cool area can help staff members avoid heat stress. If possible, heavy work should be scheduled during the cooler parts of the day and appropriate protective clothing provided. Hot jobs should be scheduled for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year. Reduce the physical demands of work, e.g., excessive lifting or digging with heavy objects; Provide recovery areas, e.g., air-conditioned enclosures and rooms; Use shifts, e.g., early morning, cool part of the day, or night work; Use intermittent rest periods with water breaks based on work rest calculations; Use relief workers; Use worker pacing; and Assign extra workers and limit worker occupancy, or the number of workers present, especially in confined or enclosed spaces. Supervisors should be trained to detect early signs of heat stress and should permit staff members to interrupt their work if they are extremely uncomfortable. The American Conference of Governmental Industrial Hygienists (ACGIH) has developed recommended heat stress threshold limit values (TLVs). These may be found in their annual handbook.

4.5.2 ACCLIMATIZATION

Acclimatization to the heat through short exposures followed by longer periods of work in the hot environment can reduce heat stress. New staff members and staff members returning from an absence of two weeks or more should have 5-day period of acclimatization. This period should begin with 50 percent of the normal workload and time exposure the first day and gradually building up to 100 percent on the fifth day.

4.5.3 STAFF MEMBER EDUCATION

Staff member education is vital so that staff members are aware of the need to replace fluids and salt lost through sweat and can recognize dehydration, exhaustion, fainting, heat cramps, salt deficiency, heat exhaustion, and heat stroke as heat disorders. Staff members should also be informed of the importance of daily weighing before and after extremely heavy work activity days to avoid and recognize dehydration.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

5.1 REFLECTIVE CLOTHING

Reflective clothing, which can vary from aprons and jackets to suits that completely enclose the worker from neck to feet, can stop the skin from absorbing radiant heat. However, since most reflective clothing does not allow air exchange through the garment, the reduction of radiant heat exposure must more than offset the corresponding loss in evaporative cooling. For this reason, reflective clothing should be worn as loosely as possible. In extreme situations where radiant heat is high, auxiliary cooling systems can be used under the reflective clothing.

5.2 ICE VESTS

Commercially available ice vests, though heavy, may accommodate numerous ice packets, which are usually filled with water. Carbon dioxide, dry ice, can also be used as a coolant. The cooling offered by ice packets lasts only two to four or less hours at moderate to heavy heat loads, making frequent replacement necessary. However, ice vests do not encumber the worker with air supply or power cords, therefore permitting maximum mobility. Cooling with ice is also relatively inexpensive.

5.3 WETTED CLOTHING

Another simple and inexpensive personal cooling technique that is effective when reflective or other impermeable protective clothing is worn is the use of wetted terry cloth coveralls or wetted two-piece, whole-body cotton suits. This approach to auxiliary cooling can be quite effective under conditions of high temperatures and low humidity where evaporation from the wetted garment is not restricted.

5.4 WATER COOLED CLOTHING

These garments range from a hood which cools only the head, to vests and “long johns”, which offer partial or complete body cooling. This equipment requires a battery-driven circulating pump, liquid-ice coolant and a container. Although this system has the advantage of allowing wearer mobility, the weight of the other components limits the amount of ice that can be carried and thus reduces the effective use time. The heat transfer rate in liquid cooling systems may limit their use to low-activity jobs; even in such jobs, their service time is only about 20 minutes per pound of cooling ice. An outer insulating jacket should be an integral part of these systems to keep outside heat from melting the ice.

5.5 AIR CIRCCULATION COOLING

The most highly effective, as well as the most complicated, personal cooling system is one that uses circulating air. By directing compressed air around the body from a supplied air system, both evaporative and convective cooling are improved. The greatest advantage occurs when circulating air is used with impermeable garments or double cotton overalls.

One type, used when respiratory protection is also necessary, forces exhaust air from a supplied-air hood (“bubble hood”) around the neck and down inside an impermeable suit. The air then escapes through openings in the suit.

Air can also be supplied directly to the suit without using a hood. This can be done three ways:

- By a single inlet
- By a distribution tree
- By a perforated vest

Also, a vortex tube can be used to reduce the temperature of circulating air. The cooled air from this tube can be introduced either under the clothing or into a bubble hood. The use of a vortex tube acts as a heat pump which separates the air stream into a hot and a cold stream and also can be used to heat in cold climates. It is, however, noisy and requires a constant source of compressed air supplied through an attached air hose. One problem with this system is the limited mobility of workers whose suits are attached to an air hose. These systems should therefore be used in work areas where there is not much moving around or climbing.

5.6 RESPIRATOR USAGE

The use of respiratory equipment itself and its additional restrictions adds stress to the user, and this stress will contribute to the overall heat stress of the worker.

5.7 CHEMICAL PROTECTIVE CLOTHING

Chemical protective clothing such as the totally encapsulated chemical protection suits will also add to the heat stress problem. Frequent rotation of workers may be necessary. Refer to Table 2 for a determination of how protective clothing can affect the work/rest cycle.

Table 3, from the Canadian Centre for Occupational Health and Safety, provides a summary of these controls.

NOTE: Controls shall be identified and documented in the HASP.

Table 3: Summary of Control Measures

Method of Control	Action
Engineering Controls	
Reduce body heat production	Mechanize tasks
Stop exposure to radiant heat from hot objects	Insulate hot surfaces by using reflective shields, aprons and remote controls
Reduce convective heat gain	Lower air temperature. Increase air speed if temperature is below 95° F (35° C). Increase ventilation. Provide shaded observation booths.
Increase perspiration evaporation	Reduce humidity. Use a fan to increase air speed and movement.
Wear appropriate clothing	Wear loose clothing that permits perspiration evaporation but stops radiant heat. Use cooled protective clothing for extreme conditions.
Administrative Controls	
Acclimation	Allow sufficient time before full workload
Work duration	Shorten exposure time and use frequent rest breaks
Rest area	Provide cool (air-conditioned or shaded) break areas
Water	Provide cool drinking water
Work pace	If practical, allow workers to set their own pace of work
First aid & medical monitoring	Define emergency procedures. Train staff members to recognize symptoms

6.0 MEASUREMENT

Portable heat stress meters or monitors are used to measure heat conditions. These instruments can calculate both the indoor and outdoor Wet Bulb Globe Test (WBGT) index according to established ACGIH Threshold Limit Value equations. With this information and information on the type of work being performed, heat stress meters can determine how long a person can safely work or remain in a particular hot environment.

6.1 WORKER MONITORING

Medical surveillance is an effective means of preventing heat illnesses. The medical surveillance program may be used as an added precaution to the controls in Table 3. Medical surveillance is required:

- When working on HAZWOPER sites where wearing semi-permeable or impermeable clothing at temperatures above 70°F (21°C) or with heavy work rates may occur.
- Unusual temporary circumstances or emergency conditions where provisions of Section 2.3 Identification of Work Conditions and Section 2.4 cannot be fully met.

The medical surveillance program shall be planned with the assistance of CWI and the Corporate H&S. The Corporate Health & Safety Director (CHSD) shall specify the leading indicators to be used (e.g., heart rate, body temperature, blood pressure, respiration rate, and other) and frequency of measurement. Monitoring shall be conducted by a person competent in the monitoring technique and allowable measures.

7.0 ESTABLISHING EMERGENCY RESPONSE

Specific procedures to be followed for heat-related emergency situations shall be established and documented in the HASP.

7.1 PROVIDING FOR FIRST AID

Provisions shall be established that first aid shall be administered immediately to employees displaying symptoms of a heat-related illness. Symptoms of heat disorders and treatment are outlined below

HEAT STROKE occurs when the body's system of temperature regulation fails and body temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of work load and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

TREATMENT: If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment. Regardless of the worker's protests, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

HEAT EXHAUSTION. The signs and symptoms of heat exhaustion are headache, nausea, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment. Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency.

TREATMENT: Workers suffering from heat exhaustion should be removed from the hot environment and given fluid replacement. They should also be encouraged to get adequate rest.

HEAT CRAMPS are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused by both too much and too little salt. Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (±0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments. Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Recent studies have shown that drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

HEAT COLLAPSE ("Fainting"). In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable. To prevent heat collapse, the worker should gradually become acclimatized to the hot environment.

HEAT RASHES are the most common problem in hot work environments. Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

HEAT FATIGUE. A factor that predisposes an individual to heat fatigue is lack of acclimatization. The use of a program of acclimatization and training for work in hot environments is advisable. The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

SUNBURN: When out in the sun, you are exposed to ultraviolet radiation (UVR), which can burn and damage the skin. UVR is made up of a combination of UVA and UVB rays. Only broad-spectrum sunscreens filter out 96.7% of UVR and protect the skin from both UVA and UVB rays. Sunscreens work by either absorbing UVR (chemical filters) or reflecting UVR (physical blockers). Skin Cancer is a potential outcome of sun exposure and is a serious disease that can cause disfigurement and death.

8.0 VARIATIONS TO HEAT STRESS DEFINED PRACTICE

Before deviating from the requirements of this document, a MoC that includes a risk assessment and action plan is required, as detailed in OP 1037 *Management of Change*. Following completion of the MoC, the RHSC shall authorize and the CHSM shall approve any variation. The exceptions process does not need to be followed for variations that impose more stringent requirements than those outlined in this document.

Training

When heat stress conditions such as those noted in Section 2.0 or at risk employees such as those noted in Section 3.0 are present at a worksite, the SSO shall consider heat stress when conducting work risk assessments for the project. Appropriate information regarding heat stress hazards, controls and emergency response shall be discussed at site specific tailgate safety meetings. All personnel working in the field shall receive training on heat stress hazards, controls and emergency response during their annual health and safety training.

Responsibilities

PROJECT MANAGER (PM)

- Verifying that heat stress is considered and addressed in project planning, risk assessments and the preparation of the HASP.

- Verifying that the elements of this OP are documented in the HASP as necessary.

- Verify that elements from Contractor heat stress programs are included in their HASP, as necessary.

SITE SAFETY OFFICER (SSO)

- Recognizing when warm environmental conditions are present.

- Understanding Heat Exposure Limits and Measurements.
- Identifying at-risk employees.
- Recognizing the hazard of working in warm environments.
- Developing a plan for mitigating the effects of warm environments.
- Assuring that the workforce under their control is complying with the mitigation plans

STAFF MEMBERS

- Recognizing the hazard of working in warm environments.
- Mitigating the risk of heat stress by establishing and enforcing engineering controls, appropriate work practices.
- Understanding the signs and effects of heat stress.
- Watching for signs of heat stress to prevent further adverse effects.
- Reporting issues associated with heat stress to the SSO, PM or LHSC.

CORPORATE HEALTH & SAFETY DIRECTOR

- Establishing and maintaining this procedure.
- Developing heat stress guidelines for implementation.
- Authorizing modifications to guidance in the procedure.

LHSC

- Reviewing HASPs for inclusion of this procedure.
- Reviewing implementation of this procedure regionally.
- Approving modifications to guidance in the procedure.

Definitions

Acclimatization

Acclimatization is a physiological adjustment to work under hot conditions. A gradual conditioning to improve a person's ability to withstand heat stress conditions and enhance the ability to perform work under those conditions.

Heat Stress

Heat stress is a basic term used to describe the illness which may be suffered by the body as a result of overexposure to heat. These illnesses include heat cramps, heat exhaustion, and heat stroke.

Heat Cramps

Heat cramps, or painful spasms of the muscles, are caused when staff members drink large quantities of water but fail to replace their bodies' salt loss. Tired muscles -- those used for performing the work -- are usually the ones most susceptible to cramps. Cramps may occur during or after working hours and may be relieved by taking liquids by mouth or saline solutions intravenously for quicker relief, if medically determined to be required.

Heat Exhaustion

Heat exhaustion results from loss of fluid through sweating when a staff member has failed to drink enough fluids or take in enough salt or both. The staff member with heat exhaustion still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, the complexion pale or flushed, and the body temperature normal or slightly higher.

Heat Rash

Also known as prickly heat, heat rash may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation.

Heat Stroke

Heat stroke is the most serious health problem for staff members in hot environments. It is caused by the failure of the body's internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include (1) mental confusion, delirium, loss of consciousness, convulsions or coma; (2) a body temperature of 106 degrees F or higher; and (3) hot dry skin which may be red, mottled, or bluish. Victims of heat stroke will die unless treated promptly.

Metabolic Heat

Metabolic heat is generated by the metabolic functions of the body.

Radiant Heat

Radiant heat is produced by the absorption of electromagnetic energy such as sunlight. Only the object absorbing the radiation is heated. The air through which the radiation passes is not affected.

Relative Humidity

Relative humidity is the ratio of the actual partial pressure of the water vapor in air to the saturation pressure of pure water at the same temperature.

Appendix A – References

2010 TLVs® and BEIs®; Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: ACGIH, 2010 p. 221

Canadian Centre for Occupational Safety and Health

National Institute for Occupational Safety & Health. Occupational Exposure to Hot Environments. Publication # 86-113.

National Institute for Occupational Safety & Health. Working in Hot Environments. Publication # 86-112.
National Safety Council. Fundamentals of Industrial Hygiene, Fourth Ed. 1996

Occupational Safety & Health Administration, OSHA Technical Manual, Section III, Chapter 4, Heat Stress.

Occupational Safety & Health Administration, Safety & Health Topics, Heat Stress.

Occupational Safety & Health Administration, Fact Sheet, Protecting Workers from Effects of Heat

Occupational Safety & Health Administration, Fact Sheet, Working Outdoors in Warm Climates

National Oceanic and Atmospheric Administration, Heat Stress Index

Appendix B – Heat Index Chart

HEAT INDEX °F (°C)													
Relative Humidity (%)													
Temp.	40	45	50	55	60	65	70	75	80	85	90	95	100
110 (47)	136 (58)												
108 (43)	130 (54)	137 (58)											
106 (41)	124 (51)	130 (54)	137 (58)										
104 (40)	119 (48)	124 (51)	131 (55)	137 (58)									
102 (39)	114 (46)	119 (48)	124 (51)	130 (54)	137 (58)								
100 (38)	109 (43)	114 (46)	119 (48)	124 (51)	130 (54)	137 (58)							
98 (37)	105 (41)	109 (43)	114 (46)	118 (48)	124 (51)	129 (54)	136 (58)						
96 (36)	101 (38)	104 (40)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	132 (56)					
94 (34)	97 (36)	100 (38)	103 (39)	106 (41)	110 (43)	114 (46)	119 (48)	124 (51)	129 (54)	135 (57)			
92 (33)	94 (34)	96 (36)	99 (37)	101 (38)	105 (41)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	131 (55)		
90 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	103 (39)	106 (41)	109 (43)	113 (45)	117 (47)	122 (50)	127 (53)	132 (56)
88 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	98 (37)	100 (38)	103 (39)	106 (41)	110 (43)	113 (45)	117 (47)	121 (49)
86 (30)	85 (29)	87 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	102 (39)	105 (41)	108 (42)	112 (44)
84 (29)	83 (28)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	92 (33)	94 (34)	96 (36)	98 (37)	100 (38)	103 (39)
82 (28)	81 (27)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	91 (33)	93 (34)	95 (35)
80 (27)	80 (27)	80 (27)	81 (27)	81 (27)	82 (28)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	86 (30)	87 (31)

Category	**Heat Index**	**Possible Heat Disorders for Staff Members in High Risk Groups**
Extreme Danger	130 (54) or higher	Heat Stroke of Sunstroke Likely
Danger	105 -129 (41-54)	Sunstroke, Muscle Cramps, and/or Heat Exhaustion Likely. Heat Stroke Possible with Prolonged Exposure/Physical Activity
Extreme Caution	90 -105 (32-41)	Sunstroke, Muscle Cramps, and/or Heat Exhaustion Possible with Prolonged Exposure/Physical Activity
Caution	80-90 (27-32)	Fatigue Possible with Prolonged Exposure/Physical Activity

Hand Power Tools	**Document #:** OP1026
Issued Date: 2009	**Issued By:** Corporate Health & Safety
Revised Date: June 2015	**Approved By:** Brian Fitzpatrick

Purpose, Summary, Scope

PURPOSE

The objective of the hand and power tool safety program is to ensure employees using these tools inspect, operate and, when necessary, remove damaged hand and power tools from service.

In general, all employees shall comply with 29 CFR 1910 Subpart P when using hand and power tools at Haley & Aldrich places of employment. Prior to allowing an employee to use a tool, project managers and supervisors shall ensure that all employees have received proper and adequate training. All Haley & Aldrich employee must:

- Keep all tools in good condition with regular maintenance.
- Use the proper tool for the job.
- Examine each tool for damage before use and do not use damaged tools.
- Operate tools according to the manufacturers' instructions.
- Properly use of the correct personal protective equipment recommended by the tool manufacturer.

SUMMARY

Haley & Aldrich project managers and supervisors shall determine the need to control employee exposures to hand and power tool hazards to which their employees may be exposed. In general, Haley & Aldrich follows best management practices for controlling employee exposures and utilizes a hierarchy of control approach to minimize exposures to an acceptable level.

SCOPE

This program applies to all places of employment where Haley & Aldrich employees work and hand and power tools are used.

EQUIPMENT

CONDITION OF TOOLS

All hand tool and power tools and similar equipment, whether furnished by the employer or the employee, will be maintained in a safe condition.

GUARDING OF HAND POWER TOOLS

All power tools designed with guards shall be equipped with such guards shall be equipped with such guards when in use. All belts, gears, shafts, sprockets, drums, spindles, fly wheels, chains, pulleys or other reciprocating, rotating or moving parts of tools shall be guarded if those parts may expose to contact by employees or otherwise create a hazard. Methods of guarding will include points of rotating parts, ingoing nip points and flying chips and sparks. Guarding requirements shall meet the requirements of 29 CFR 1910.242.

POINT OF OPERATION SAFETY

Point of operation is the area around a tool where work is actually performed or material being preceded whereby the operation exposes an employee or employees to injury.

PERSONAL PROTECTION EQUIPMENT

Employees using hand and power tools exposed to the hazard of falling, flying, abrasive and splashing objects, or exposed to flying dusts, fumes or mists, vapors or gases will be fitted with the particular personal protective equipment necessary to protect them from the specific hazard. Safety eyewear, hard hats, steel-toed shoes and the like are required on all construction sites. The specific PPE to be used will be based upon a work risk assessment or JHA as appropriate and will be based upon the hazards.

SWITCHES

All hand held powered tools will be fitted with either a momentary contact "on-off" control or may have a lock on control provided that turnoff can be accomplished by a single motion using the same finger or fingers that turn it on or a pressure switch that constant pressure is need to run and will shut off when the pressure is released.

DEFECTIVE OR DAMAGED EQUIPMENT

Equipment which is defective or has been damaged shall be tagged “DO NOT USE” and/or the controls locked and removed from service. Tools returned to service after repair shall have the repair verified by the CHSM, RHSC or SSO prior to use checking for the requirements of Section 2.2, 2.3 and 2.5 above.

Program Elements

1.0 PROCEDURE

Using the requirements established in this procedure, Haley & Aldrich project managers and supervisors shall determine the need to control employee exposures to hand and power tool hazards to which their employees may be exposed. These general requirements meet the requirements of 29 CFR 1910.242.

1.1 TRAINING AND AUTHORIZATION

Only employees who are trained and authorized can perform work using hand and power tools.

1.2 TRAINING

- Employees, who conduct work utilizing hand or power tools, and project managers and supervisors who have employees directly reporting to them, and perform work using hand or power tools are required to be trained.
- Haley & Aldrich project managers and supervisors may train their own employees in specific company policies, procedures, and equipment as needed to ensure the safety of their employees.
- Haley & Aldrich contractors are permitted to show written records of equivalent training. The Haley & Aldrich project manager will enforce the specification section for non-compliance if records of equivalent training cannot be produced, or if procedures are found not to be in compliance with this document.

1.3 AUTHORIZATION

- The project manager or supervisor provides specific authorization after the employee satisfies the training requirements of this procedure.
- Training must include the safe operation, uses and care of the tool and its implements.
- The project manager or supervisor must ensure that the employee is thoroughly familiar with the equipment (within the context of his/her job function) and with the manufacturer's procedures.
- The project manager or supervisor shall provide additional on-the-job training if the employee is not thoroughly familiar with the tools and/or written procedures.
- When the project manager or supervisor is satisfied with training and authorization requirements, he/she may authorize an employee to perform work with hand and power tools.
- Authorization stipulates the specific tools, or types of tools on which the authorized employee may perform work with.
- Each project manager or supervisor must maintain records of authorized employees, and the type of on-the-job training, if any, that was given.

1.4 REAUTHORIZATION AND RETRAINING

Hand and power tool reauthorization is required when:

- An authorized employee's job changes or if he/she is reassigned.
- New hand or power tool is being used.
- New handling procedures are to be implemented.

Hand and power tool retraining and/or reauthorization is required when:

- A project manager or supervisor has reason to believe that an employee has inadequate knowledge of hand and power tool procedures or policy.

Responsibilities

PROJECT MANAGERS AND SUPERVISORS

- Read and understand instructional documents provided by the manufacturer before use of any tool.
- Provide authorization for employees to use tools, and maintain records of authorized employees.
- Provide additional on-the-job training if the employee is not thoroughly familiar with the equipment and/or written procedures.
- Provide safe hand and power tool equipment to employees.
- Remove defective hand and power tools from service.
- Maintain inventory inspection records of hand and power tools.
- Ensure that at least annually, the organization's hand and power tool procedures and employee authorizations are reviewed and updated as needed.

AUTHORIZED EMPLOYEES

- Read and understand instructional documents provided by the manufacturer for the hand and power tool prior to use.
- Recognize the conditions of work that require hand and power tool inspection.
- Use the materials and procedures specified in this chapter to implement the hand and power tool program safety.

ALL EMPLOYEES

- Understand the general reasons for hand and power tool safety.
- Recognize when a hand power tool being used.
- Understand the importance of not tampering with or removing a safety guard.

References

OSHA Standard 29 CFR Part 1926.300, Subpart 1, Tools – Hand and Power, Department of Labor, Occupational Health and Safety Administration.

OSHA Standard 29 CFR Part 1910, Subpart P, Hand and Portable Tools, Department of Labor, Occupational Health and Safety Administration.

Appendix A- Specific Hand and Power Tool Equipment

The project manager or supervisor, whose employees perform work using hand and power tools, is responsible for providing safe operation of tools to those employees while ensuring that employees inspect the tool prior to use and use it correctly.

Wrenches

Wrenches including adjustable, pipe, box end and socket style wrenches will not be used when the jaws or socket are stripped or sprung in such a way that slippage occurs.

Impact Tools

Impact tools such as drill pins or punches, wedges and chisels will be kept free of mushroomed heads.

Wooden Handles of Tools

Wooden handled tools will be kept free of cracks and splinters and will be kept tightly attached to the working end of the tool.

Electrical Powered Tools

- Electrical power operated tools will be of the approved double-insulated type and used with an approved grounding device such as a GFI (Ground Fault Indicator) to prevent the unlikely event of an electrical shock.
- The use of electrical cords for hoisting or lowering tools is prohibited.
- Keep cords and hoses away from heat, oil, and sharp edges.

Pneumatic Powered Tools

- Pneumatic powered tools will be secured to the hose or connection by a positive means to prevent them from being accidentally expelled.
- All pneumatically driven nail guns, staplers and other similar tools provided with automatic fastener feeds which operate at more than 100 psi pressure to the tool will have a safety device on the muzzle end to prevent the tool from ejecting fasteners unless the muzzle is in contact with the work surface.
- Supplied compressed air will not be used for cleaning purposes except when reduced to 30 psi and when proper personal protective equipment is used.
- The safe operating pressure stated by the manufacturer will not be exceeded.
- The use of hoses for hoisting or lowering is prohibited.
- All hoses exceeding inch inside diameter will have a safety device to reduce pressure, should the hose fail.
- Airless spray guns, which atomize paints and fluids and operated at pressure of 1,000 psi or more, will be equipped with an automatic or visible manual safety device, which prevents

the accidental pulling of the trigger to prevent the release of paint or fluid until the device is manually released.
- Abrasive blasting nozzles will be equipped with a valve, which must be activated manually for operation, and a holding rack for non-operation.

Fuel-Powered Tools

All fuel-powered tools will be stopped while being refueled, serviced, or maintained and fuel will be transported, handled, and stored in accordance with policies and procedures. When fuel-powered tools are used in enclosed spaces, the applicable requirements for toxic gas monitoring and use of personal protective equipment will be applied.

Powder-Actuated Tools

- Only employees who have been trained in the safe operation of the particular tool in use will be allowed to operate a powder-actuated tool.
- The tool will be tested each day before loading, to see that safety devices are in proper working condition. The method of testing will be inn accordance to manufacturer's recommended procedures.
- Any tool found not in proper working order, or develops a defect during use, will be immediately removed from service and not used until properly repaired by an authorized provider.
- Proper protective equipment will be utilized when operating these types of devices.
- Tools will not be loaded until just prior to the intended firing time. At no time, loaded or unloaded are the tools to be pointed at any employees. Hands will be kept clear of the open barrel. Loaded tools will not be left unattended.
- Tools shall not be used in an explosive environment.
- All tools will be used with the correct shield, guard, or attachment recommended by the manufacturer.
- All powder-actuated tools will be registered with the Corporate Health & Safety Manager.

Jacks: lever action, screw and hydraulic

- The manufacturer's rated capacity will be legibly marked on all jacks and shall not be exceeded. All jacks will have a positive stop to prevent and stop over travel.
- When providing a firm foundation, the jack base will be blocked or cribbed as well as the cap to prevent slippage.
- Jacks will be maintained according to the manufacturer's recommendations and inspected at least every 6 months and prior to use. For jacks subjected to abusive conditions, such as freezing, load shock or extreme heat, the jack will be examined for possible defects. Any jack found out of order will be tagged accordingly and not be used until repaired by a qualified person.

Tailgate Safety Meetings	**Document #:** OP1033
Issued Date: 2009	**Issued By:** Corporate Health & Safety
Revised Date: June 2015	**Approved By:** Brian Fitzpatrick

Purpose, Summary, Scope

PURPOSE

This procedure provides guidance on the delivery of tailgate safety meetings.

SUMMARY

During fieldwork, site-specific operational and safety topics must be communicated to all staff members on site. Inasmuch as site conditions may be dynamic during active site work, Project Managers (PMs) shall ensure that up to date information is provided to staff members. The mechanism for communicating this information is the tailgate safety meeting.

It is important to note that the frequency of the meetings will vary based upon site activities, site conditions, and client requirements (i.e. if the client requires daily meetings and/or meeting prior to each field task, meetings will be held at that frequency).

At a minimum, meetings shall be held with field staff every 5 working days.

SCOPE

This program applies to all places of fieldwork where Haley & Aldrich staff members work.

DOCUMENTATION

Each Tailgate Safety Meeting shall be documented on the Health & Safety Tailgate Meeting form which can be found on the Health & Safety Home Page of Haley & Aldrich Intranet.

Program Elements

1.0 PROCEDURE

Tailgate Safety Meetings shall be held at the start of each project. The meetings shall be specific to site activities and conditions, discuss and resolve the risks and mitigations discuss health, safety, security and environmental concerns and raise the safety consciousness of each worker before they start work.

These meetings shall include, but are not limited to:

- A review of relevant Health and Safety Plan (HASP) elements to be performed at an appropriate frequency. A review shall be done whenever the HASP is updated and should also be done regularly to remind staff members of relevant elements.
- A Hazard Communication (HAZCOM) review.
- Address the risks of issues arising from the site walk and the location of on-site equipment and materials.
- Complete the Tailgate Safety Meeting forms.
- A review of applicable permits.
- A review of the right and obligation to 'Stop Work.'
- Completion and review of job hazard analyses (JHA) for the tasks to be completed. This is a site-specific risk assessment; therefore, the focus should be on how to complete activities on a given site during that activity. The JHA hazard analysis discussion should include identification of 'Stop Work' triggers, and these shall be documented on the JHA form.
- Implement the controls set forth in the HASP and JHA's. Verify that all parties on site have a complete understanding of the work plan and controls that are in place.
- Allocate resources and complete permits.

Meetings are usually conducted by the PM or SSO, or both.

1.2 STOP WORK AUTHORITY AND MANAGEMENT OF CHANGE

The PM or SSO shall identify and communicate additional hazards throughout the project and utilize 'Stop Work' and Management of Change when necessary. Competent persons responsible for monitoring the work shall communicate changes in conditions to the PM or SSO.

Before work starts, the delegation of authority shall be communicated for coordination of the 'Stop Work' activities, and mitigation actions following a 'Stop Work' intervention (see OP 1035).

Changes to scope of work shall be documented in the HASP, followed by a Tailgate Safety Meeting to communicate the changes to the staff members.

1.3 DOCUMENTING THE TAILGATE SAFETY MEETING

The Tailgate Safety Meeting form is located on the Haley & Aldrich Intranet on the Forms & Templates Page under Health & Safety. The Tailgate Safety Meeting form shall be used to document the following:

- During the meeting, prior to starting work:
  - Record of meeting discussion.
  - Other site activities which may impinge on operational safety.
  - Planned activities.
  - Communicating and documenting changes in scope of work.
  - Muster point locations.
  - Hazards and controls as detailed in the HASP.

- Site-safety discussion topics.
- Emergency information.
- Authorizations, duties and responsibilities.
- Permits.
- Sign-in times and workforce signatures. By signing, individuals confirm their fitness for duty; an understanding of the hazards and controls associated with their assigned tasks and their obligation to 'Stop Work.'

After the completion of work:

- Best practices observed during work.
- Lessons learned, including incidents, near-miss reports and any other concerns or observations.
- Post-job review.
- All 'Stop Work' interventions.
- Sign-out times and workforce signatures. By signing, individuals confirm that they have left uninjured, unless they have been affected by an incident or received first aid, which should be documented as part of the post-job review.

1.4 COMMUNICATION OF SITE SPECIFIC TOPICS

The PM or SSO shall prepare for the meeting from the following site-specific topics:

- Job Hazard Analyses.
- HASP.
- Scope of Work.
- Client's Requirements.

The PM and SSO shall inform site staff members of the presence of subcontractors and their activities.

1.5 TAILGATE MEETING LOCATIONS

Tailgate safety Meetings shall be held in a location which is safe for staff members, has a minimum of background noise, is large enough to safely and comfortably accommodate the workforce and is undercover during inclement weather. Generally, meetings will be held within the Support Zone.

Training

The authority to stop work will be communicated to all field staff annually during their HAZWOPER update training.

Responsibilities

PROJECT MANAGERS

- Verify or delegate the responsibility to verify that the Tailgate Safety Meeting is carried out according to the requirements set by this procedure.
- Establish the clear expectation to exercise 'Stop Work.'

SITE SAFETY OFFICERS

- Participate in the Tailgate Safety Meeting whenever the scope of work requires a permit to work.
- Verify in the meeting that all site personnel involved in a work activity are competent and correctly prepared for the work they will perform, and verify that workers have a clear understanding of the scope of work, hazards, controls and mitigations.
- Confirming that 'Stop Work' requirements and obligations are understood thoroughly by the workforce.
- Documenting the Tailgate Safety Meeting

STAFF MEMBERS

- Understanding their authority and obligations under the scope of work described in the Tailgate Safety Meeting.
- Signing the appropriate documentation that they attended the meeting.

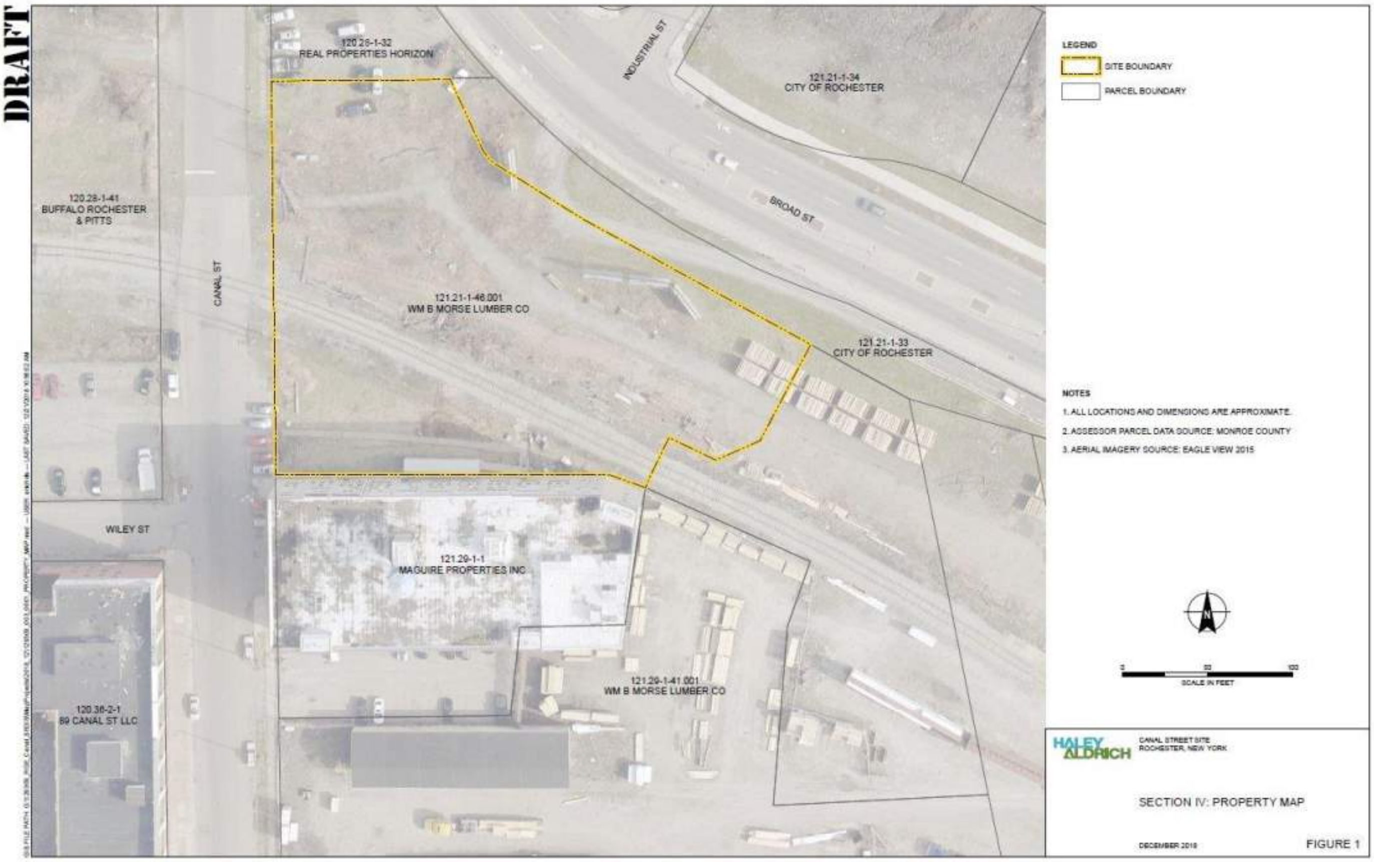
CORPORATE HEALTH AND SAFETY MANAGER

- Responsible for monitoring compliance with the requirements of this program.
- Maintain associated documents, processes and training materials.
- Communicate lessons learned.

References

Title 8, California Code of Regulations, Construction Safety Orders, Section 1509 (e)

Tailgate Safety Meeting Form http://intranet/Forms-and-Templates/Health-and-Safety.aspx


DRAFT
120.28-1-32
REAL PROPERTIES HORIZON
INDUSTRIAL ST
121.21-1-34
CITY OF ROCHESTER
120.28-1-41
BUFFALO ROCHESTER
& PITTS
BROAD ST
CANAL ST
121.21-1-46.001
WM B MORSE LUMBER CO
121.21-1-33
CITY OF ROCHESTER
WILEY ST
121.29-1-1
MAGUIRE PROPERTIES INC
121.29-1-41.001
WM B MORSE LUMBER CO
120.36-2-1
89 CANAL ST LLC
LEGEND
SITE BOUNDARY
PARCEL BOUNDARY
NOTES
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: MONROE COUNTY
3. AERIAL IMAGERY SOURCE: EAGLE VIEW 2015
N
0
50
100
SCALE IN FEET
HALEY ALDRICH
CANAL STREET SITE
ROCHESTER, NEW YORK
SECTION IV: PROPERTY MAP
DECEMBER 2018
FIGURE 1

Site Map

Appendix F – Monitoring Plan Documentation

CAMP.pdf

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 mcg/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 mcg/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 mcg/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 E

Community Air Monitoring Plan

Appendix 1A
New York State Department of Health
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