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22 March 2018

Mr. Joshua Haugh
Division of Environmental Remediation
New York State Department of Environmental Conservation
1130 N. Westcott Road
Schenectady, New York 12306-2014

RE: Remedial Investigation/Feasibility Study Letter Work Plan
Contract/Work Assignment No: D007624-38
Admiral Cleaners, Watervliet, New York
Site No. 401075

Dear Mr. Haugh:

This Letter Work Plan describes the activities proposed for performance of a Soil Vapor Intrusion (SVI) Evaluation, Remedial Investigation (RI), and Feasibility Study (FS) at the Admiral Cleaners Site (No. 401075) (Site) in the City of Watervliet, Albany County, New York (Figure 1). EA Engineering, P.C. and Its Affiliate EA Science and Technology (EA) will complete an RI/FS to meet the specific objectives outlined in the Work Assignment (WA) issuance of Notice to Proceed. EA has prepared this Letter Work Plan to include EA's Generic Field Activities Plan (FAP) as **Attachment A**; a site-specific Health and Safety Plan (HASP) as **Attachment B**; and a site-specific Quality Assurance Project Plan (QAPP) as **Attachment C**. The specific objectives for the RI/FS, as detailed in the WA issuance package, are presented below:

- Identify the source area of subsurface contaminants of potential concern (COPCs).
- Determine the nature and extent of contamination resulting from historical site operations.
- Evaluate potential exposure pathways.
- Evaluate potential remedial alternatives.

This Letter Work Plan and attachments provides the framework for the SVI evaluation and RI field activities at the Site. The protocol and procedures for this SVI evaluation and RI are in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2010)[1].

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[1] NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

The following tasks will be completed as part of the overall RI/FS:

- **Task 1**—Preliminary Activities
- **Task 2**—Soil Vapor Intrusion Evaluation
- **Task 3**—RI
- **Task 4**—FS

SITE DESCRIPTION

The Site is a rectangular parcel totaling 0.17 acre located at 617 19th Street, Watervliet, Albany County, New York (Figures 1 and 2), between 6th Avenue and 7th Avenue. The parcel has approximately 45 feet (ft) of frontage on 19th Street and a depth of approximately 100 ft. The Site consists of a vacant brick and concrete block commercial building and a small grassy area located behind the building. The building comprises approximately 75% of the parcel and the grassy area is enclosed by a wooden fence. The Site is located in an urban area with mixed commercial and residential use. The Site is bordered by an unoccupied residential building to the west, a mixed-use building containing a commercial day care and residences to the east, and residences to the north.

SITE HISTORY

The building was constructed in 1950 and was used as a dry cleaning facility until 2013. During its operation, the facility used tetrachloroethene (PCE) as a cleaning solvent. In 2007, the NYSDEC issued a Consent Order, ordering the facility to obtain required owner/manager and operator dry cleaning certifications. In November 2008, a third-party inspection indicated that the PCE concentration in the facility's dry cleaning machine was 845 ppm, more than double the limit of 300 ppm published in 6 New York Codes Rules and Regulations 232.6(a)(6). The NYSDEC performed a follow-up inspection in February 2009, discovering that the facility had failed to comply with the 2007 Consent Order and had not performed the mandatory remedy within the required timeframe following the 2008 inspection. The NYSDEC also found evidence of improper disposal of PCE-contaminated wastes (NYSDEC 2009)[2]. A second Consent Order was issued in April 2009 to address the violations noted in the 2009 inspection. Dry cleaning operations ceased in 2013 due to continued violations of environmental regulations.

The Site was then operated as a dry cleaning drop shop, where garments were brought in and sent to be dry cleaned at another local facility, until 2017. A limited investigation was performed in April 2016 as part of a potential real estate transaction. The investigation identified petroleum-related (the non-chlorinated hydrocarbons may not be gasoline-related, but a result of petroleum-based solvent use, e.g., Stoddard solvent) volatile organic compounds (VOCs) and chlorinated VOCs (CVOCs) in soil, groundwater, and sub-slab soil vapor at the Site. The NYSDEC was notified of the findings and the Site was listed in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site in August 2017[3].

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[2] NYSDEC. 2009. *Order on Consent File No. R4-2009-0219-25*. April.

[3] NYSDEC. 2017. *Inactive Hazardous Waste Disposal Site Classification Notice. Site Name: Admiral Cleaners. Site No. 401075*. August.

PREVIOUS INVESTIGATIONS

The Chazen Companies (Chazen) performed a limited subsurface investigation at the Site in 2016 as part of a potential real estate transaction (Chazen 2016)[4]. Three soil borings (two interior and one exterior) were advanced using direct-push technology. Soil boring SB-1 was completed in the rear of the building and soil boring SB-2 was completed in the front of the building. Soil boring SB-3 was completed outside the building near the rear door. Field screening was completed with a photoionization detector (PID). Soil with solvent-like odors was encountered in soil borings SB-1 and SB-3, and PID readings for the two locations ranged from 1.7 to 1,118 parts per million (ppm). Two subsurface soil samples were collected at these borings.

Groundwater was observed at approximately 9.5 ft below ground surface (bgs) and a grab sample was collected from soil boring SB-1. No groundwater or soil samples were collected from soil boring SB-2, which exhibited no field evidence of solvent impacts. A sub-slab soil vapor sample was collected from the center of the building over a 1-hour period.

The soil and groundwater samples were submitted for laboratory analysis of VOCs via U.S Environmental Protection Agency (EPA) Method 8260, and the sub-slab soil vapor sample submitted for laboratory analysis of VOCs via EPA Method TO-15. A summary of analytes which exceeded 6 New York Codes, Rules and Regulations (NYCRR) Part 375Unrestricted Use Soil Cleanup Objectives *(*SCO) is presented below:

- **SB-1**: One chlorinated VOC (CVOC) cis-1,2-Dichloroethylene, (cis-1,2-DCE) was observed at a concentration of 3 parts per million (ppm), which exceeded the Unrestricted Use SCO of 0.25 ppm, but was less than the Commercial SCO of 500 ppm.

- **SB-3**: Nine VOCs exceeded their respective Unrestricted Use SCOs, including CVOCs and petroleum-related contaminants. One VOC, 1,2,4-Trimethylbenzene (260 ppm), exceeded its Commercial SCO (190 ppm).

- **SB-1(Groundwater):** Sixteen contaminants, including PCE, its degradation products, and petroleum-related contaminants, were detected at concentrations which exceeded their respective NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Groundwater Standards. Cis-1,2-DCE was detected at 4,400 micrograms per liter (µg/L), a concentration three orders of magnitude greater than its standard of 5 µg/L.

- **SV-1**: Eight VOCs were identified in the sub-slab soil vapor sample. PCE was reported at a concentration of 5,600 micrograms per cubic meter (µg/m3). Per New York State Department of Health (NYSDOH) SVI Guidance, concentrations of PCE exceeding 1,000 µg/m3 require mitigation to minimize the potential for indoor air exposure (NYSDOH 2006).

An RI and SVI evaluation was recommended based on these field and analytical observations.

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[4] The Chazen Companies. 2016. *Re: Limited Subsurface Sampling Report, Former Dry Cleaner Property, 617 19th Street, City of Watervliet, Albany County, New York.* April.

TASK 1 – PRELIMINARY ACTIVITIES

Prior to the preparation of this Letter Work Plan, a scoping session and site visit with NYSDEC and EA was conducted during the first SVI sampling event during the week of 11 December 2017.

Subsequent to the site visit, EA obtained and reviewed available historical and/or background information (documents, photographs, maps, etc.) provided electronically by NYSDEC.

TASK 2 – SOIL VAPOR INTRUSION EVALUATION

The primary focus of the SVI evaluation is to identify the presence or absence of potential site-related contaminants in sub-slab soil vapor and indoor air. The SVI field activities will include the collection of sub-slab soil vapor, indoor air, and outdoor air samples at various locations throughout the Site and surrounding structures. The SVI evaluation will include installation of temporary soil vapor points and two rounds of soil vapor intrusion sampling. The SVI evaluation field activities to be conducted will include the following:

- ***Indoor Air Monitoring/Soil Vapor Intrusion Evaluation—***Evaluate the migration of vapors into onsite and offsite residential and/or commercial structures through the collection of sub-slab soil vapor, indoor air, and outdoor air samples.

- ***Data Validation/Determination of Usability***—An independent third-party data validator will review all analytical data generated during the course of the SVI evaluation.

SVI evaluation field activities will be conducted in two field events. The first took place during the week of 11 December 2017 and sample locations are presented in **Figure 3.** A re-sample event will be conducted in Spring 2018. A second full SVI sampling event will be completed during the 2018-19 heating season. Indoor air, outdoor air, and sub-slab soil vapor intrusion sampling and analytical procedures will be completed in accordance with Section 11.1 of the Generic FAP (Attachment A). Air samples will be submitted to Eurofins Air Toxics (Air Toxics) located in Folsom, California for chemical analysis. The number of samples for each event are provided in the Site-specific QAPP (Attachment C). Sample locations for the second event will be determined in conjunction with the NYSDEC PM based on analytical results from the first event.

REPORTING

Work completed under this task will be summarized in a stand-alone SVI evaluation letter report, which will include tables, graphs, and figures based on analytical results from field efforts. A draft and final version of the document will be submitted to the NYSDEC for review, comment, and approval.

TASK 3 – REMEDIAL INVESTIGATION

The focus of the RI is to determine the nature and extent of contaminants in environmental media where concentrations exceed all applicable and relevant Standards, Criteria, and Guidance (SCG). Field investigation activities will be conducted in a manner consistent with the EA

Generic FAP (Attachment A). Proposed sample locations are presented on **Figure 4**. Daily field reports and activity-specific field forms (e.g., boring logs, groundwater purge logs, etc.) will be completed for each day onsite field activities are conducted. These field forms are included in the Generic FAP as an attachment. A site-specific HASP Addendum (Attachment B) has been developed to address site-specific work items related to this investigation. The Community Air Monitoring Program (CAMP), as described in Section 12 of the Generic FAP, will be implemented during drilling or other intrusive activities.

Environmental Sampling and Analysis

The field sampling procedures and protocols, number of environmental samples to be collected from each media, as well as the QA/QC procedures, are provided in the site-specific QAPP Addendum provided as Attachment C to this Letter Work Plan. Soil and groundwater samples will be submitted to Con-Test Analytical Laboratory (Con-Test) located in East Longmeadow, Massachusetts for chemical analysis. The samples will be labeled, handled, and packaged following the procedures described in the EA Generic QAPP (EA 2011)[5] and site-specific QAPP Addendum (Attachment C). Quality assurance (QA)/quality control (QC) samples will be collected at the frequency detailed in the EA Generic QAPP, QAPP Addendum, and Table 1 of the QAPP Addendum.

The RI field activities to be conducted will include the following:

Remedial Investigation Phase I

- ***Geophysical Evaluation*****—**Field sampling locations will be marked and a geophysical survey will be completed to identify subsurface anomalies and/or obstructions. An EA subcontractor, New York Leak Detection, Inc. (NYLD) of Jamesville, New York, will conduct a geophysical survey using ground-penetrating radar technology across the entire Site (0.17 acres) to identify and/or locate any potential areas of concern (e.g., buried drums and debris) that may be present as a result of historical operations at the Site. A report will be prepared with figures illustrating survey findings.

- ***Evaluation of Debris (building)***—Building debris samples will be collected from the Site from floor drains, sumps, and dry wells at the Site. Specific locations will be chosen based on field observations and historical information on dry cleaning machinery locations, targeting potential contamination sources. EA will collect debris samples using hand equipment from up to eight locations. Debris samples will be submitted to Con-Test and analyzed for target compound list (TCL) VOCs, TCL semi-volatile organic compounds (SVOCs), TCL polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) inorganics.

- ***Evaluation of Onsite Soil (subsurface)*****—**The drilling subcontractor, AzTech Technologies, Inc. (AzTech) of Albany, New York will be responsible for contacting Dig Safely New York and identifying any subsurface utility lines in locations where soil borings will be completed. Soil borings will be advanced using direct-push technology to an anticipated depth of 25 ft bgs, or refusal, shallow bedrock is anticipated. Soil

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[5] EA. 2011. Generic QAPP.

sampling activities will be completed in accordance with Section 3 of the Generic FAP (Attachment A). Up to 20 subsurface soil samples will be collected from up to 20 locations. Soil samples will be submitted to Con-Test and analyzed for the full list of potential contaminants (i.e., TCL VOCs, TCL SVOCs, TCL PCBs, and TAL inorganics), excluding pesticides.

- ***Evaluation of Onsite Soil (surface)***—Up to five surface soil samples will be collected from up to five sample locations. Soil samples will be submitted to Con-Test and analyzed for the full list of potential contaminants (i.e., TCL VOCs, TCL SVOCs, TCL PCBs, TCL Pesticides, and TAL inorganics).

- ***Evaluation of Groundwater (in situ)***—One *in situ* groundwater grab sample will be collected from up to 14 soil boring locations using the Screen Point 16 *in situ* sampling method. Borings selected for groundwater grab sampling will be advanced to the desired groundwater sampling interval. Upon reaching the desired depth, the Geoprobe© rods will be retracted a few inches to expose the screen to formation water. A peristaltic pump and tubing will be used to collect groundwater grab samples. Groundwater samples will be analyzed for TCL VOCs.

- ***Evaluation of Groundwater***—Six soil borings will be converted to temporary monitoring wells with 1-inch (in.) prepacked screens. Typically the length of a monitoring well screen is 10 ft., but depending on depth to bedrock at the Site, the well screen may be shortened to 5 ft. The temporary monitoring wells will be completed as a flush mount. The newly installed monitoring wells will be developed no sooner than 24 hours following installation. The wells will be developed using surging and pumping techniques. Well development will be considered complete when temperature, conductivity, and pH have stabilized and a turbidity of less than 50 nephelometric turbidity units (NTUs) has been achieved. After two weeks, EA will complete one groundwater sampling event to evaluate local groundwater flow patterns and overall groundwater quality with respect to NYSDEC Ambient Water Quality Standards (AWQS). Groundwater samples will be submitted to Con-Test and analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, and TAL inorganics. A subset of three wells will be sampled and submitted to Con-Test for analyzed for perfluorinated compounds (PFCs), pesticides and 1,4-dioxane.

- ***Evaluation of Soil Vapor***—AzTech will install six onsite soil vapor points using direct-push drilling techniques to collect soil vapor samples for analysis of VOCs.

- ***Site Survey***—Popli Design Group (PDG) of Penfield, New York will complete a site survey of all investigation locations including monitoring well top of casing elevations by a licensed professional land surveyor.

- ***Data Validation/Determination of Usability***—An independent third-party data validator, Environmental Data Services, LTD (EDS) will review the analytical data generated during the course of the RI. All soil vapor samples will be validated and 10 percent of soil and groundwater samples, with the exception of toxicity characteristic leaching procedure (TCLP) analyses used to determine the disposition of investigation derived wastes, will be validated.

- ***Summary Letter Report***—EA will prepare a summary letter report of Phase I field activities and analytical results.

Remedial Investigation Phase II

Field activities, sample locations, and analytical methods will be refined, as needed, in consultation with the NYSDEC Project Manager. Upon approval by the NYSDEC Project Manager, EA will implement Phase II of the RI and additional soil borings will be installed/sampled and sub-slab soil vapor/indoor air samples will be collected based on the results of Phase I.

The following is a brief description of the tasks that may be completed under Phase II of the RI:

- ***Evaluation of Onsite Soil (subsurface)***—AzTech will advance soil borings to further delineate the nature and extent of impacts of source area soil, using direct-push drilling techniques. EA will collect samples from up to ten soil boring locations. Soil samples will be submitted to Con-Test and analyzed for COPCs identified during Phase I. One additional soil sample will be collected and analyzed for waste characterization purposes using the toxicity characteristic leaching procedure (TCLP).

- ***Evaluation of Groundwater***—In accordance with Section 4 of the Generic FAP (Attachment A), AzTech will convert five soil borings to temporary wells with 1-in. prepacked screens. Additionally, permanent 2-in. overburden monitoring wells will be installed at the remaining five soil borings. EA will develop the permanent and temporary monitoring wells in accordance with Section 5 of the Generic FAP (Attachment A). The newly installed monitoring wells will be developed no sooner than 24 hours following installation. The wells will be developed using surging and pumping techniques. Well development will be considered complete when temperature, conductivity, and pH have stabilized and a turbidity of less than 50 nephelometric turbidity units (NTUs) has been achieved. EA will conduct one groundwater sampling event at existing and newly installed monitoring wells to evaluate local groundwater flow patterns and overall groundwater quality with respect to NYSDEC AWQS. Groundwater samples will be analyzed for COPCs identified during Phase I.

- ***Microbiological Community Structure Sampling*—**EA will deploy bio-trap samplers at three monitoring well locations located across the groundwater contamination plume. Bio-trap samplers will be supplied and analyzed by Microbial Insights, Inc. The community structures will be analyzed using Microbial Insights CENSUS analysis for *Dehalococcoides spp*. (DHC), DHC Functional Genes (tceA, bvcA, vcrA), *Dehalobacter, Desulfuromonas*, and *Methanogens*. Additional wet chemistry data including alkalinity, major anions, total organic carbon and dissolved gases (ethene, ethane, and methane) will be collected at the biotrap locations.

- ***Hydrogeologic Evaluation***—EA will evaluate hydraulic data from all temporary and permanent wells to determine groundwater flow direction, gradient, and to monitor seasonal fluctuations. Slug tests will be performed at permanent (2-in.) well locations to determine hydraulic conductivity. Porosity will be estimated based on soil classification.

- ***Evaluation of Soil Vapor***—AzTech will install five additional soil vapor points using direct-push techniques adjacent to the five permanent groundwater monitoring wells to collect soil vapor samples for analysis of VOCs.
- ***Site Survey and Basemap Preparation***—PDG will survey all RI Phase II investigation locations including monitoring well top of casing elevations, perform a topographic survey, and prepare a site base map by a licensed professional land surveyor.

DECONTAMINATION PROCEDURES AND INVESTIGATION DERIVED WASTE

In accordance with the appropriate activity sections of the Generic FAP (Attachment A), non-dedicated equipment and tools used to collect samples for chemical analysis will be decontaminated prior to and between each sample interval.

IDW including personal protective equipment, solids and liquids generated during the well drilling, well development, and well sampling activities, will be stored, handled and disposed of in accordance with the Section 13 of EA's Generic FAP (Attachment A) and Section 3.6 of the site-specific HASP Addendum (Attachment B). Drummed materials will be clearly labeled as to their contents and origin. Drill cuttings and purge water will be will be stored onsite and managed in accordance with NYSDEC DER-10 (NYSDEC 2010)[6], pending analytical results from the remedial investigation.

REMEDIAL INVESTIGATION REPORTING

EA will prepare a summary letter report describing the supply well search, field activities and analytical results following Phase I of the RI.

Following the completion of Phase II field activities and receipt of analytical data, EA will prepare an RI Report in accordance with NYSDEC DER-10 Section 3.14 (NYSDEC 2010)[6], and will include at a minimum:

- Summary of field activities, analytical data, figures depicting impacted media
- Identification and characterization of contaminant sources, concentrations, and estimated volume of contamination
- Description of site physical characteristics including geology and hydrogeology
- A conceptual site model and qualitative human health exposure assessment
- Summary of any remaining data gaps
- Upload analytical data to the EQuIS
- Conclusions/recommendations based on investigation results.

EA will prepare an initial draft and one revision to the RI report. Electronic copies of the initial report and two hard copies of the final report (Appendices provided on CD) will be submitted to

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[6] NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

the NYSDEC and NYSDOH. Any and all original sampling forms and photographs generated during the field activities will be submitted to NYSDEC as part of the final report.

TASK 4 – FEASIBILITY STUDY REPORT

The FS will be prepared to support an informed risk management decision regarding which remedy appears to be the most appropriate, cost effective, and protective of public health and the environment. The FS will be conducted in accordance with NYSDEC DER-10 (NYSDEC 2010)[6] and the most recent versions of the 1988 EPA publication *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA/540/G-89/004).[7] A scoping meeting between the NYSDEC and EA will be held to discuss the remedial alternatives applicable to the site during the finalization of the RI Report. Based on discussions during the scoping meeting, EA will submit a brief letter report identifying potential technologies and remedial alternatives to be considered for the site, along with the conceptual details of the remedial alternatives that will be evaluated in the FS.

The FS Report will be stamped by a Professional Engineer licensed to practice in New York State. EA will prepare an initial draft report for NYSDEC review and comment and one revision. Two hard copies of the final FS report will be submitted to the NYSDEC.

PROJECT SCHEDULE

An updated project schedule is included with this letter. SVI evaluation activities were conducted the week of 11 December 2017. Laboratory and data validation reports were received in January 2018. Please feel free to contact me if you have any questions or concerns at (315) 565-6565.

Sincerely yours,
EA SCIENCE AND TECHNOLOGY

Christopher Schroer
Project Manager

EA ENGINEERING, P.C.

Donald

Donald F. Conan, P.E., P.G.
Contract Manager

Attachment A – Generic Field Activities Plan
Attachment B – Health and Safety Plan Addendum
Attachment C – Quality Assurance Project Plan

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[7] EPA. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.* October.

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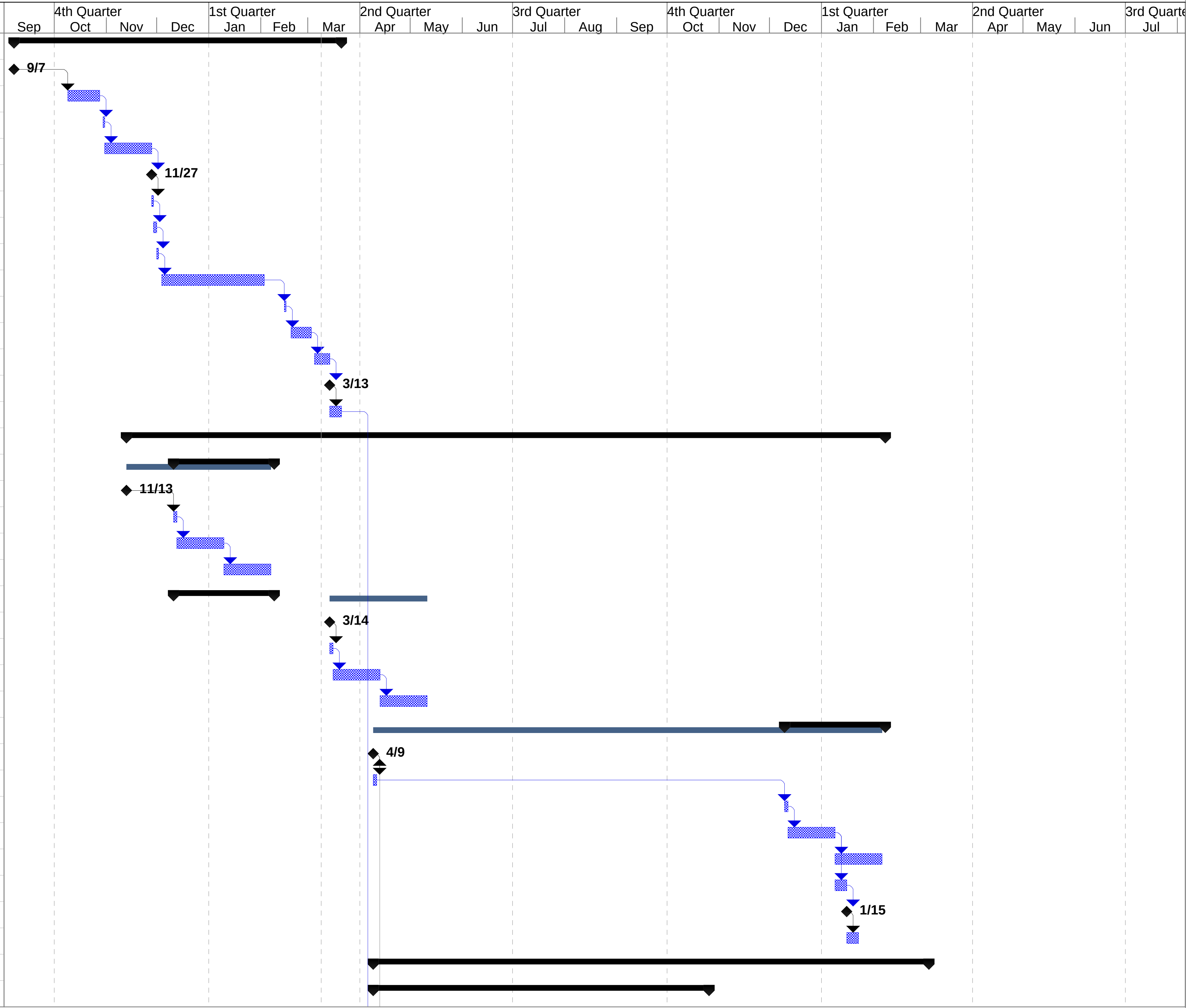
Project Schedule

NYSDEC - Admiral Dry Cleaners
EA Project No.: 14907.38
(September 2017 - June 2019)

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Task 1 - Preliminary Activities**	**139 days**	**Thu 9/7/17**	**Tue 3/20/18**	
2	WA Issuance	0 days	Thu 9/7/17	Thu 9/7/17	
3	Prepare WA Package	15 days	Mon 10/9/17	Fri 10/27/17	2
4	Submit WA Package to NYSDEC	1 day	Mon 10/30/17	Mon 10/30/17	3
5	NYSDEC Review	20 days	Tue 10/31/17	Mon 11/27/17	4
6	WA Package Revisions, as necessary	0 days	Mon 11/27/17	Mon 11/27/17	5
7	Submit Final WA Package	1 day	Tue 11/28/17	Tue 11/28/17	6
8	Final NYSDEC Review and Approvals	2 days	Wed 11/29/17	Thu 11/30/17	7
9	NYSDEC Issuance of Approvals	1 day	Fri 12/1/17	Fri 12/1/17	8
10	Prepare Letter Workplan	45 days	Mon 12/4/17	Fri 2/2/18	9
11	Submit Letter Workplan to NYSDEC	1 day	Thu 2/15/18	Thu 2/15/18	10
12	NYSDEC Review	10 days	Mon 2/19/18	Fri 3/2/18	11
13	Letter Workplan Revisions, as necessary	7 days	Mon 3/5/18	Tue 3/13/18	12
14	Submit Final Letter Workplan	0 days	Tue 3/13/18	Tue 3/13/18	13
15	Final NYSDEC Review and Approval	5 days	Wed 3/14/18	Tue 3/20/18	14
16	**Task 2 - Soil Vapor Intrusion Evaluation**	**324 days**	**Mon 11/13/17**	**Thu 2/7/19**	
17	**SVI Sampling (Round 1)**	**44 days**	**Mon 12/11/17**	**Thu 2/8/18**	
18	Mobilization	0 days	Mon 11/13/17	Mon 11/13/17	
19	Collect SVI Samples	2 days	Mon 12/11/17	Tue 12/12/17	18
20	Laboratory Analysis	20 days	Wed 12/13/17	Tue 1/9/18	19
21	Data Validation	20 days	Wed 1/10/18	Tue 2/6/18	20
22	**SVI Sampling (Round 1) - Re-Sample**	**44 days**	**Mon 12/11/17**	**Thu 2/8/18**	
23	Mobilization	0 days	Wed 3/14/18	Wed 3/14/18	
24	Collect SVI Samples	2 days	Wed 3/14/18	Thu 3/15/18	23
25	Laboratory Analysis	20 days	Fri 3/16/18	Thu 4/12/18	24
26	Data Validation	20 days	Fri 4/13/18	Thu 5/10/18	25
27	**SVI Sampling (Round 2)**	**44 days**	**Mon 12/10/18**	**Thu 2/7/19**	
28	Mobilization	0 days	Mon 4/9/18	Mon 4/9/18	38
29	Install SVI sampling points	2 days	Mon 4/9/18	Tue 4/10/18	28
30	Collect SVI Samples	2 days	Mon 12/10/18	Tue 12/11/18	29
31	Laboratory Analysis	20 days	Wed 12/12/18	Tue 1/8/19	30
32	Data Validation	20 days	Wed 1/9/19	Tue 2/5/19	31
33	Prepare SVI Letter Report	5 days	Wed 1/9/19	Tue 1/15/19	31
34	Submit SVI Letter Report	0 days	Tue 1/15/19	Tue 1/15/19	33
35	NYSDEC Review & Acceptance Letter SVI Repo	5 days	Wed 1/16/19	Tue 1/22/19	34
36	**Task 3 - Remedial Investigation**	**237 days**	**Mon 4/9/18**	**Tue 3/5/19**	
37	**Phase 001 - Soil Borings / Well Installation**	**144 days**	**Mon 4/9/18**	**Thu 10/25/18**	

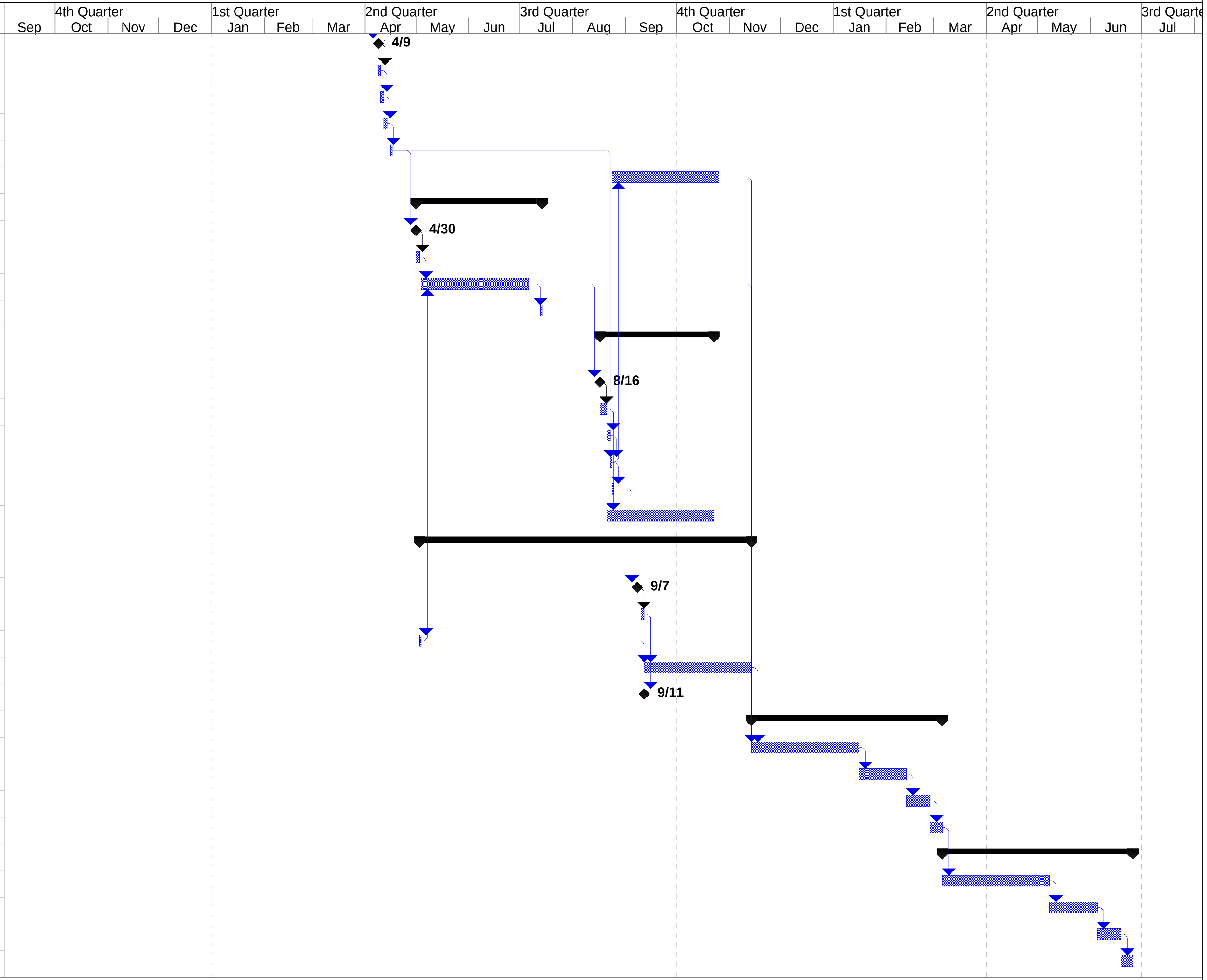


Project: Admiral Dry Cleaners
Date: Fri 3/9/18

Task	▨	Project Summary	▬	Inactive Task	▭	Duration-only	▬	Finish-only	]
Split	┅	External Tasks	▨	Inactive Milestone	◇	Manual Summary Rollup	▬	Progress	▬
Milestone	◆	External Milestone	◆	Inactive Summary	▭	Manual Summary	▬	Deadline	⇩
Summary	▬	Inactive Task	◆	Manual Task	▬	Start-only	[		

NYSDEC - Admiral Dry Cleaners
EA Project No.: 14907.38
(September 2017 - June 2019)

ID	Task Name	Duration	Start	Finish	Predecessors
38	Mobilization	0 days	Mon 4/9/18	Mon 4/9/18	15
39	Building Inspection and GPR Survey	1 day	Mon 4/9/18	Mon 4/9/18	38
40	Soil Boring Installation	2 days	Tue 4/10/18	Wed 4/11/18	39
41	Well Installation	2 days	Thu 4/12/18	Fri 4/13/18	40
42	Well Development	1 day	Mon 4/16/18	Mon 4/16/18	41
43	Laboratory Analysis and Data Validation	45 days	Fri 8/24/18	Thu 10/25/18	53
44	**Phase 002 - Groundwater Sampling**	**54 days**	**Mon 4/30/18**	**Fri 7/13/18**	
45	Mobilization (2 weeks after development)	0 days	Mon 4/30/18	Mon 4/30/18	42FS+10 days
46	Groundwater Sampling	2 days	Tue 5/1/18	Wed 5/2/18	45
47	Laboratory Analysis and Data Validation	45 days	Fri 5/4/18	Thu 7/5/18	59,46
48	Submit Summary Letter Report	1 day	Fri 7/13/18	Fri 7/13/18	47FS+5 days
49	**Phase 003 - Supplemental Soil Borings / Well Installation**	**47 days**	**Thu 8/16/18**	**Mon 10/22/18**	
50	Soil Boring Mobilization	0 days	Thu 8/16/18	Thu 8/16/18	47FS+30 days
51	Soil Boring Installation	2 days	Fri 8/17/18	Mon 8/20/18	50
52	Well Installation	2 days	Tue 8/21/18	Wed 8/22/18	51
53	Permanent SV Sampling Point Installation	1 day	Thu 8/23/18	Thu 8/23/18	42,52
54	Well Development	1 day	Fri 8/24/18	Fri 8/24/18	53
55	Laboratory Analysis and Data Validation	45 days	Tue 8/21/18	Mon 10/22/18	51
56	**Phase 004 - Groundwater/Soil Vapor Sampling (Round 2)**	**139 days**	**Thu 5/3/18**	**Tue 11/13/18**	
57	Groundwater Sampling Mobilization	0 days	Fri 9/7/18	Fri 9/7/18	54FS+10 days
58	Groundwater Sampling	2 days	Mon 9/10/18	Tue 9/11/18	57
59	Soil Vapor Sampling	1 day	Thu 5/3/18	Thu 5/3/18	46
60	Laboratory Analysis and Data Validation	45 days	Wed 9/12/18	Tue 11/13/18	58,59
61	IDW Disposal	0 days	Tue 9/11/18	Tue 9/11/18	58
62	**Phase 005 -Remedial Investigation Report**	**80 days**	**Wed 11/14/18**	**Tue 3/5/19**	
63	Prepare and Submit Draft RI	45 days	Wed 11/14/18	Tue 1/15/19	43,47,60
64	NYSDEC Review & Approval of Draft RI	20 days	Wed 1/16/19	Tue 2/12/19	63
65	Prepare and Submit Final RI	10 days	Wed 2/13/19	Tue 2/26/19	64
66	NYSDEC Review & Approval of Final RI	5 days	Wed 2/27/19	Tue 3/5/19	65
67	**Task 4 - Feasibility Study**	**80 days**	**Wed 3/6/19**	**Tue 6/25/19**	
68	Prepare and Submit Draft FS	45 days	Wed 3/6/19	Tue 5/7/19	66
69	NYSDEC Review & Approval of Draft FS	20 days	Wed 5/8/19	Tue 6/4/19	68
70	Prepare and Submit Final FS	10 days	Wed 6/5/19	Tue 6/18/19	69
71	NYSDEC Review & Approval of Final FS	5 days	Wed 6/19/19	Tue 6/25/19	70



Project: Admiral Dry Cleaners
Date: Fri 3/9/18

Task	▨	Project Summary	▬	Inactive Task	▭	Duration-only	▬	Finish-only	]
Split	┈	External Tasks	▨	Inactive Milestone	◇	Manual Summary Rollup	▬	Progress	—
Milestone	◆	External Milestone	◆	Inactive Summary	▭	Manual Summary	▬	Deadline	⇩
Summary	▬	Inactive Task	◆	Manual Task	▬	Start-only	[		

Figures

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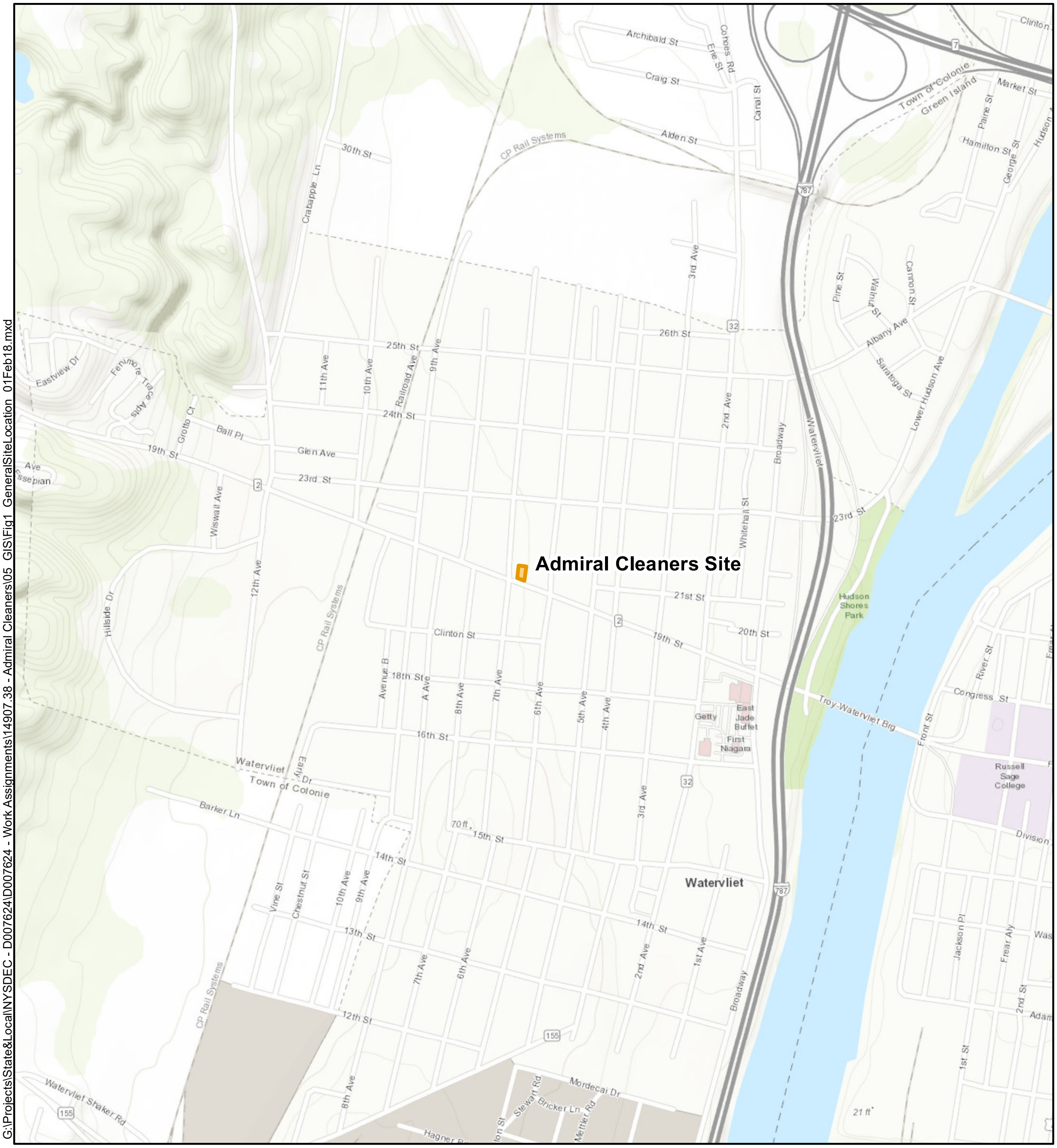

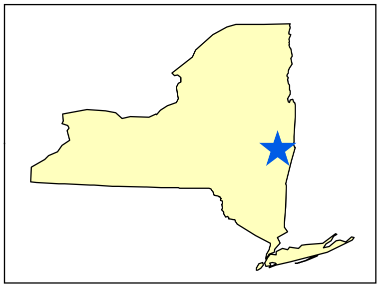

Legend

★ Site Location

▭ Admiral Cleaners Site Boundary

Figure 1
GENERAL SITE LOCATION

Admiral Cleaners
Watervliet, Albany County, NY

0 250 500 1,000
Feet

1 inch = 1,000 feet

N

Map Date: 2/1/2018
Projection: NAD 1983 State Plane New York
East FIPS 3101 Feet

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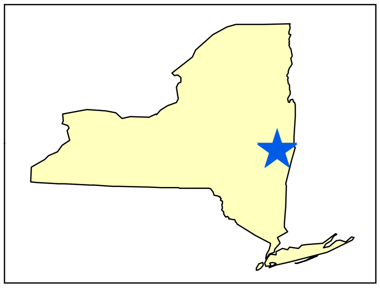

0 25 50 100
Feet

1 inch = 60 feet

N

Legend

▭ Admiral Cleaners Site Boundary

★ Site Location

Figure 2
SITE LAYOUT
Admiral Cleaners
Watervliet, Albany County, NY

Map Date: 2/1/2018
Projection: NAD 1983 State Plane New York
East FIPS 3101 Feet

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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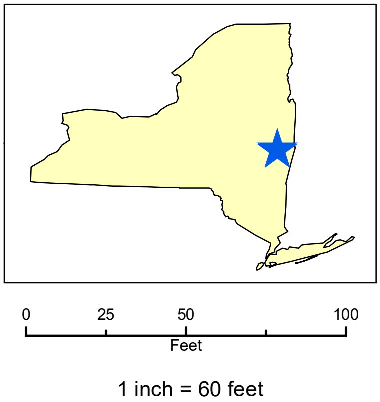

Legend

- □ Admiral Cleaners Site Boundary
- ★ Site Location
- ▲ Indoor Air Locations
- ▲ Outdoor Air Locations
- ▲ Sub-Slab Soil Vapor Sample Locations

Figure 3
Soil Vapor Intrusion Evaluation Sample Locations
Phase 1

Admiral Cleaners
Watervliet, Albany County, NY

Map Date: 2/1/2018
Projection: NAD 1983 State Plane New York East FIPS 3101 Feet

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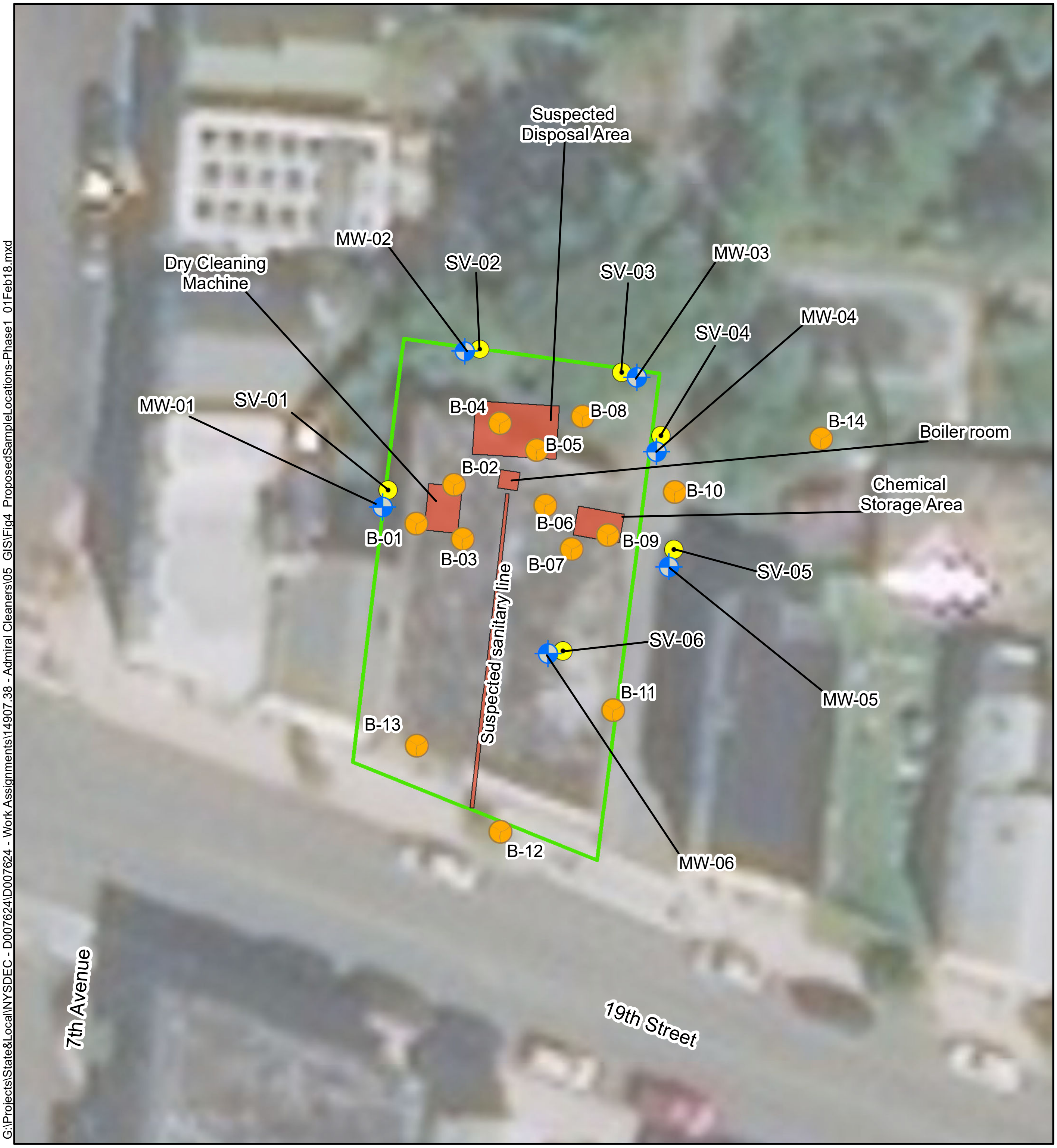

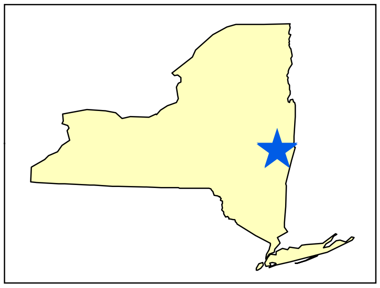

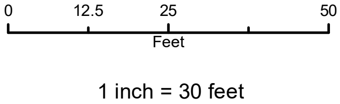

Legend

- ★ Site Location
- 🟩 Admiral Cleaners Site Boundary
- 🟥 Suspected Sources of Contamination
- ● Proposed Soil Boring Locations
- ⊕ Proposed Monitoring Well Locations
- ⊙ Proposed Soil Vapor Point Locations

Figure 4
Remedial Investigation
Proposed Sample Locations
Phase 1
Admiral Cleaners
Watervliet, Albany County, NY

Map Date: 2/1/2018
Projection: NAD 1983 State Plane New York
East FIPS 3101 Feet

Attachment A

Generic Field Activities Plan

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Generic Field Activities Plan

NYSDEC Standby Contract
D007624

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation

Prepared by:

EA ENGINEERING, P.C. and Its Affiliate
EA SCIENCE and TECHNOLOGY

April 2011

Generic Field Activities Plan for Work Assignments

Prepared for

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

Prepared by

EA Engineering, P.C. and its Affiliate
EA Science and Technology
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25 April 2011

Christopher J. Canonica, P.E., Program Manager
EA Engineering, P.C.

Date

April 2011

CONTENTS

LIST OF FIGURES

1. PURPOSE AND OBJECTIVES

1.1 PURPOSE

This Generic Field Activities Plan (FAP) has been prepared as a generic document of potential field activities that EA Engineering, P.C. and its affiliate EA Science and Technology (EA) will perform or oversee for standby subcontract work assignments issued by the New York State Department of Environmental Conservation (NYSDEC) under Superfund Standby Contract No. D007624. The principle purpose of this document is to define, detail, and provide rationale for potential field activities that will be performed with each site-specific Work Plan.

1.2 FIELD ACTIVITY PLAN OBJECTIVES

An initial step in every work assignment is the development of a site-specific Work Plan, which includes the preparation of a FAP, which describes anticipated field activities. This FAP provides detailed information about field activities that the consultant (EA), NYSDEC, and/or subcontractor personnel will potentially perform on or adjacent to a work assignment site. This information includes the definition, rationale, protocol, and any construction details or operation and maintenance of field activities.

The elements of this Generic FAP have been prepared in accordance with the most recent and applicable guidelines and requirements of the NYSDEC and the New York State Department of Health (NYSDOH), including *DER-10 Technical Guidance for Site Investigation and Remediation* (2010)[1]. In addition, technical guidance from the United States Environmental Protection Agency (USEPA) has been implemented into potential field activities. Site-specific work plans, which include the FAP, will be developed separately under each individual work assignment or as requested by the NYSDEC.

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[1] New York State Department of Environmental Conservation, 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

2. BRIEF DESCRIPTION AND RATIONALE OF FIELD ACTIVITIES

The primary focus of a work assignment is to evaluate existing on-site conditions, groundwater flow direction, the nature and extent of potential contamination, and possible human exposure to contaminants through a systematic site investigation/characterization or a full scale remedial investigation.

The following tasks are anticipated to be completed by EA under standby contract D007624 as part of a site investigation/characterization and/or remedial investigation:

SECTION	**FIELD ACTIVITY**
3.	***Direct-Push/Macro-Core® Drilling*—**Identify possible source areas, characterize the overall volume and distribution of contaminants in an area of concern, delineate the limit and extent of contaminants of concern (COCs), and determine if the site should/should not remain part of Inactive Hazardous Waste Site listing based.
4.	***Monitoring Well Installation and Construction*—**Identify hydrogeologic characteristics, groundwater constituents, contaminant plume transport, and the hydraulic relationship between the site and localized groundwater flow.
5.	***Monitoring Well Development*—**Develop wells at an appropriate time interval post-installation using surging and/or pumping techniques. Monitor temperature, conductivity, pH, and turbidity for stabilization and appropriate values.
6.	***Groundwater Monitoring and Sampling*—**Conduct periodic monitoring/sampling events to delineate the extent of COCs within a groundwater monitoring well network. Monitor groundwater elevations to determine the local groundwater flow gradient and direction.
7.	***Exploratory Test Pits/Trenches*—**Provide field identification/verification of potential contaminant source areas and subsurface impact areas.
8.	***Surface Water Sampling*—**Collect surface water from surface water bodies (i.e. storm sewers, ditches, streams, etc.) on or adjacent to the site that may act as a conveyance of COCs.
9.	***Sediment Sampling*—**Collect sediment samples on or adjacent to the site, typically completed in conjunction with surface water sampling.
10.	***Soil Vapor Point Installation and Sampling*—**Install soil vapor points using direct-push technologies for the purpose of collecting representative soil vapor

samples for laboratory analysis, at relevant locations as determined by the NYSDEC and in consultation with the NYSDOH.

11. ***Indoor Air Monitoring/Soil Vapor Intrusion Evaluation—***Evaluate the migration of vapors into on-site and off-site residential, commercial, and/or industrial structures through the collection of sub-slab vapor, indoor air, and outdoor ambient air samples.

12. ***Community Air Monitoring—***Monitor volatile organic compounds (VOCs) and particulate levels at the perimeter of the work area in real-time. May consist of a combination of continuous and periodic monitoring, which will be contingent upon site-specific field and construction activities.

13. ***Storage and Disposal of Waste—***EA will provide proper storage, handling, and disposal of investigative-derived waste.

14. ***Site Survey and Base Map Preparation—***Involves the surveying of all investigation/characterization locations, performing a topographic survey, and preparation of a site base map by a licensed professional land surveyor. EA will locate all field sampling locations using a high-precision global positioning system (GPS) unit as directed by the NYSDEC.

Details of each anticipated field activity are provided in the following sections.

3. DIRECT-PUSH/MACRO-CORE® DRILLING AND SAMPLING

The purpose of direct-push/Macro-Core® drilling and sampling is to evaluate the shallow overburden at a site and to assess the nature and extent of contamination.

3.1 DIRECT-PUSH/MACRO-CORE® SOIL BORINGS

During a direct-push/Macro-Core® drilling program, subsurface soil samples are collected continuously from each soil boring until a unit of low permeability (e.g., clay, bedrock) is encountered. Soil borings are commonly used to classify shallow overburden soils, collect soil samples, delineate the limits and extent of COCs, install temporary monitoring wells/piezometers, and install soil vapor points.

During direct-push/Macro-Core® drilling, the subsurface soil are extracted, screened, and classified to identify soil types, visualize potential contaminants, assess VOC vapors within the soil, and collect representative soil samples from selected depth intervals. Photoionization detector (PID) or flame ionization detector (FID), visual, and olfactory observations are used when selecting soil samples for potential laboratory analysis. The selection of subsurface soil for laboratory analysis will be made in consultation with the NYSDEC field representative, when present on-site, and are based the following parameters:

1. Subsurface soil materials that exhibit visual or olfactory signs of contamination
2. Subsurface soil materials that cause a sustained response above the measured background response on a calibrated PID of FID screening instrument
3. A combination of Items 1 and 2.

Any soil samples collected will be submitted to an approved NYSDOH Laboratories Approval Program (ELAP)-certified laboratory for analytical analysis using USEPA methods.

Soil samples are collected from the most contaminated interval at each soil boring location, i.e. high PID reading, visually stained, or strong odor, and sent for laboratory analysis. If no contamination is detected or observed, a subsurface soil sample is collected at the water table interface or directly above the low permeability unit; whichever occurs first.

Soil borings will be classified and logged according to the Unified Soil Classification System. A field record of each soil boring's classification, sampling interval, PID reading, and other field observations will be recorded on a soil boring log form provided in Appendix A.

Drill cuttings exhibiting gross contamination (i.e., staining, free product, visual, olfactory, high PID screening) generated during a direct-push/Macro-Core® drilling program will be drummed in accordance with Section 13 (Storage and Disposal of Waste).

4. MONITORING WELL INSTALLATION AND CONSTRUCTION

Monitoring wells are installed and constructed to identify hydrogeologic characteristics, groundwater constituents, contaminant plume transport, and the hydraulic relationship between the site and localized groundwater flow direction. Monitoring wells may be installed in overburden or bedrock and within confined and/or unconfined aquifers in order to delineate the nature and extent of a contaminant plume on an areal and vertical basis. The exact location of monitoring wells are based upon the information collected during the field investigation activities, knowledge of the existing distribution of contaminants, historical data and/or preliminary site assessment (PSA) results. If there are existing monitoring wells at a site, any new monitoring wells will be constructed similar to the construction of the existing monitoring well network.

4.1 TYPES OF MONITORING WELLS

Permanent (shallow, intermediate, or deep) or temporary monitoring wells will be installed depending on site specifics. The actual depth of permanent wells will vary relative to groundwater monitoring objectives and site geology, and may be placed in overburden or bedrock and within confined and/or unconfined aquifers. Temporary monitoring wells are typically installed within an overburden unconfined aquifer and utilized for short-term monitoring events and specific work assignment objectives.

Monitoring well identification will start with “MW-#” notation. Shallow, intermediate, or deep depth wells will be identified with an “S”, “I”, or “D” that is immediately preceded by the well number (e.g., “MW-#I”).

Shallow depth monitoring wells will be used for monitoring water table elevations or collecting analytical data that is not sensitive to significant fluctuations in the water table. Intermediate depth monitoring wells can be used to evaluate the vertical hydraulic gradient and the vertical distribution of contaminants within the geologic formation. Deep monitoring wells have varied use, typically to handle complex site geology or meet more rigorous/long-term monitoring objectives. The drilling and installation of monitoring wells will be supervised and documented by a field geologist according to the procedures described in Sections 4.2 and 4.3. The field geologist shall document relevant information pertaining to drilling, soil and bedrock characterization, and monitoring well construction info into the soil boring log form (Appendix A). A typical groundwater monitoring well construction diagram is included as Figure 1.

4.2 TEMPORARY MONITORING WELL CONSTRUCTION

Any temporary groundwater monitoring wells required will be installed using direct-push/Macro-Core® techniques to the appropriate depth. A temporary 1-in. diameter well will be installed into an open borehole. The temporary monitoring wells will be constructed with an appropriate length of 0.01-in. slot well screen and an appropriate length of Schedule 40 polyvinyl chloride (PVC) riser to the ground surface. The annulus space will be backfilled with sand to approximately 2 ft above the screen interval. A bentonite seal will be placed from the top of the sand to the ground surface to eliminate potential run-off from rain events, or spills into the temporary monitoring well.

4.3 PERMANENT MONITORING WELL CONSTRUCTION

4.3.1 Overburden Wells - Hollow-stem Augers, Mud Rotary

Overburden groundwater monitoring wells will typically be installed using hollow-stem auger techniques. A 4-¼ in. inside-diameter hollow-stem auger will be used to install 2-in. wells, and 6-¼ in. inside-diameter hollow-stem augers will be used to install 4-in. wells. Split spoon or MacroCore® samplers will be used to collect soil samples for classification and sampling. Once groundwater is encountered, the borehole will be extended an additional 5 ft into the groundwater table, or to a depth as directed by the NYSDEC. Once the desired depth is reached, the inner bit will be removed, and the well material will be placed within the augers. Monitoring wells will be constructed with an appropriate length of 0.01-in. slot well screen, and the appropriate length of schedule 40 PVC flush-joint casing to ground surface. Once the well material has been set, the annular space between the augers and the well screen will be backfilled with #0 Morie Sand, or equivalent. Simultaneously with the installation of the sandpack, the augers will be retracted. The sand pack will be brought to 2 ft above the top of the screened interval. A 2-ft layer of bentonite chips will be placed on top of the sand pack and hydrated. The remaining annular space will be backfilled with a cement/bentonite grout mixture. The augers will then be withdrawn and the grout within the borehole will be topped off as necessary. Monitoring wells will be completed as flush mounts with a curb box, or with a steel riser casing depending on well location and/or as directed by the NYSDEC. Each well will have a vented cap and a locking cover. A cement pad will be installed to channel surface water away from the well. A weep hole will be drilled in the protective casing to allow any water between the inner and outer casing to drain.

For deep overburden wells located in geologic formations where hollow-stem augers would not be ideal, mud-rotary drilling will be utilized. Mud-rotary utilizes a circulation fluid (mud) which is pumped through the drill stem, out the bit, and up the annulus between the drill stem and the borehole wall. The mud runs through a de-sander at the ground surface and then re-circulated back down the drill stem. Soil samples can be collected at desired intervals using split-spoon samplers. Once the well is drilled to depth, the well casing will be placed in the open borehole. A trimie pipe will be placed at the bottom of the borehole and clean potable water will be circulated to thin out the mud. Once it is determined that there is no longer a presence of mud in the borehole, the monitoring well will be constructed as described above.

4.3.2 Bedrock Monitoring Wells

The installation of bedrock monitoring wells will utilize combination of hollow-stem augering and rock coring/air rotary drilling. The overburden material will be drilled to bedrock using 6-¼ in. inside-diameter hollow-stem augers. Split spoon, or MacroCore® samplers will be used to collect soil samples for classification and sampling to the top of bedrock. Once bedrock is encountered, the inner bit will be removed and the hollow-stem augers will act as a temporary casing. If rock cores are to be collected, the bedrock will be NX or HQ cored to a site-specific depth below ground surface. If no rock cores are to be collected, a 3-⅝ in. diameter air rotary hammer will be utilized to drill to the desired depths. Monitoring wells will be constructed with an appropriate length of 0.01-in. well screen, and the appropriate length of schedule 40 PVC flush-joint casing to ground surface or be left as open rock boreholes. The annular space around the well screen will be backfilled with #0 Morie Sand, or equivalent. The sand pack will be brought to 2-ft above the top of the screened interval. A 2-ft layer of bentonite chips will be placed on top of the sand pack and hydrated. The remaining annular space will be backfilled with a cement/bentonite grout mixture to ground surface. Monitoring wells will be completed as flush mounts with a curb box, or with a steel riser casing depending on the preference of the NYSDEC. Each well will have a vented cap and there will be a locking cover. A cement pad will be installed to channel surface water away from the well. A weep hole will be drilled in the protective casing to allow any water between the inner and outer casing to drain.

5. MONITORING WELL DEVELOPMENT

Groundwater monitoring wells installed at a site will be developed prior to sampling, in order to purge any drilling fluids or sediment that may have entered the well through the filter pack and well screen during installation. Well development helps to establish good hydraulic connection between the well and the surrounding formation and to remove fine-grained material that may have infiltrated the sand pack and/or well during installation. In general, groundwater monitoring well development will follow *Monitoring Well Development Guidelines for Superfund Project Managers* (USEPA, 1992)[2], unless otherwise specifically directed by the NYSDEC.

Monitoring wells will be developed no sooner than 48-hours following installation and shall generally be developed using surging and pumping techniques. Surging techniques force existing water and sediment back and forth through the screen and filter pack with the repeated raising and lowering of a surge block within the well casing. Following surging, pumping will be used to remove water and sediment from within the well. During pumping, a Horiba U-52 water quality meter (or similar) with a flow-through cell, which includes probes for measurement of pH, Eh, turbidity, dissolved oxygen, temperature, salinity, and conductivity will be utilized to collect groundwater water quality parameters during development. Additionally, water level readings will be collected throughout monitoring well development with an electronic water level measurement unit with accuracy of 0.01 ft. Pump rates during well development will be greater than the highest anticipated pump rate to be utilized during sampling. During monitoring well development, a field record of each monitoring well’s development purging, water quality and water level measurements, and sampling flow rates and other field observations will be recorded on a monitoring well development form provided in Appendix A.

Well development will be considered complete when temperature, conductivity, and pH have stabilized and a turbidity of less than 50 nephelometric turbidity units (NTUs) has been achieved. Development water will be discharged to the ground surface away from the well, unless otherwise directed by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the development water will be containerized, handled, and disposed of as detailed in Section 13.

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[2] United States Environmental Protection Agency, 1992. *Monitoring Well Development Guidelines for Superfund Project Managers.* April.

6. GROUNDWATER MONITORING AND SAMPLING

Groundwater samples will be collected from temporary and permanent monitoring wells in order collect obtain samples that are representative of the aquifer in the monitoring well vicinity. Groundwater sampling techniques will be based upon *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers* (USEPA, 2002)[3], unless otherwise specifically directed by NYSDEC.

6.1 GROUNDWATER MONITORING AND SAMPLING PROCEDURES

Groundwater monitoring well sampling procedures will include water level measurements, well purging, field water quality measurements, and sample collection at each monitoring well location. A copy of the purging and sampling log form used to record well purging, water quality measurements, and sampling flow rates is provided in Appendix A. The objective of the groundwater sampling protocol is to obtain samples that are representative of the aquifer in the well vicinity so that analytical results reflect the composition of the groundwater as accurately as possible. Monitoring wells will be allowed to stabilize at least 14 days after development prior to collecting samples for analysis.

Prior to the start of a groundwater sampling event, water levels will be collected from the entire monitoring well network to identify groundwater equipotential contours and develop a potentiometric map which facilitate an evaluation of groundwater flow patterns. If applicable, an oil/water interface probe will be used to measure non-aqueous phase liquids (NAPL) (if any) in the groundwater monitoring wells.

Rapid and significant changes can occur in groundwater samples upon exposure to sunlight, temperature, and pressure changes at ground surface. Therefore, groundwater sampling will be conducted in a manner that will minimize interaction of the sample and the surface environment. The equipment and protocol for collecting groundwater samples by each method are described in Sections 6.2 through 6.4. During groundwater sampling, a groundwater purge/sample form will be completed for each monitoring well location to be sampled (Appendix A).

Groundwater samples will be analyzed by USEPA methods in accordance with the NYSDEC Analytical Services Protocol (ASP) during sampling events.

6.2 GROUNDWATER SAMPLING FROM TEMPORARY MONITORING WELLS

Groundwater samples will be collected from temporary monitoring wells using a peristaltic pump and section of polyethylene tubing. The groundwater sample will be collected using the procedures outlined Section 6.3.3.

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[3] United States Environmental Protection Agency, 2002. *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers.* May.

Upon completion of sampling, the temporary monitoring wells will be backfilled with bentonite and marked with a stake/flag that will be labeled with the proper location identification, and will be illustrated on the site map so it can be located at a later date. Borings performed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

6.3 GROUNDWATER SAMPLING FROM PERMENANT MONITORING WELLS

6.3.1 Purging and Sampling Equipment

Monitoring well purging and sampling may be performed using the following:

- Submersible or peristaltic pumps to be used for well purging
- Electronic water level measurement unit with accuracy of 0.01 ft
- Flow measurement device (containers graduated in milliliters) and stop watch
- PID instrument (MiniRAE or similar) to monitor vapor concentrations during purging and sampling as required by the site-specific Health and Safety Plan (HASP) Addendum.

6.3.2 Field Analytical Equipment

Field equipment to be used at the site will include a Horiba U-52 water quality meter (or similar) with a flow-through cell, which includes probes for measurement of pH, Eh, turbidity, dissolved oxygen, temperature, salinity, and conductivity. Additionally, a PID will be used to obtain a headspace reading on the well head. Each piece of equipment will be checked by the EA Site Manager to be in proper working order before its use and calibrated as required by the manufacturer. Prior to each use, field analytical equipment probe(s) will be decontaminated. After each use, the instrument will be checked and stored in an area shielded from weather conditions.

Instruments will be calibration-checked at the beginning of each day of groundwater sampling.

6.3.3 Low-Flow Groundwater Sampling Procedures

Groundwater samples will be collected from each well a minimum of 14 days following monitoring well development. During each groundwater sampling event, groundwater samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. The following procedures will be used for monitoring well groundwater sampling:

- Wear appropriate personal protective equipment as specified in the site-specific HASP and the HASP Addendum. In addition, samplers will use new sampling gloves for the collection of each sample.

- Unlock and remove the well cap.

- Obtain PID readings and record them in the field logbook.

- Measure the static water level in the well with an electronic water level indicator. The water level indicator will be washed with Alconox detergent and water, then rinsed with deionized water between individual wells to prevent cross-examination. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the decontamination water will be containerized, handled, and disposed of as detailed in Section 13.

- Calculate the volume of water in the well.

- Place polyethylene sheeting around the well casing to prevent contamination of sampling equipment in the event sampling equipment is dropped.

- Purge water from the well utilizing low flow techniques utilizing one of the methods below. If necessary, purged water will be containerized separately from decontamination fluids.

    - Pump with a peristaltic pump using new polyethylene tubing and silicone flex tubing within the pump housing dedicated to each well. Set intake within the screened interval of the monitoring well, and purge at a rate no higher than 250 mL per minute.

    - Pump with a submersible pump equipped with a check valve to avoid backflush and new polyethylene tubing dedicated to each well. Set intake within the screened interval of the monitoring well, and purge at a rate no higher than 250 mL per minute.

- During purging of the well, monitor the water quality indicator parameters, including pH, temperature, salinity, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity, every 3-5 minutes (or as appropriate). Record purge rate, volume purged, depth to water, water quality indicator parameters values, and clock time at 3- to 5-minute intervals on the purging/sampling form.

- Allow field parameters of pH, Eh, dissolved oxygen, specific conductivity, and turbidity stabilize before sampling. Temperature readings should also be recorded along with the aforementioned water quality indicators. Although it is not critical in determining the stabilization of the discharge water, it is important for data interpretation and should also be measured.

- Purging will be complete if the following conditions are met:

    - Consecutive pH readings are ±0.1 pH units of each other
    - Consecutive measured specific conductance is ±10 percent of each other
    - Consecutive measured redox potential is ± 10 mV of each other

- Consecutive measured dissolved oxygen is ±10 percent of each other
- Consecutive measured turbidity readings are ±10 percent of each other and below 50 NTUs.

- If these parameters are not met after purging a volume equal to 3-5 times the volume of standing water in the well, the EA Project Manager will be contacted to determine the appropriate action(s).

- If the well goes dry before the required volumes are removed, the well may be sampled when it recovers (recovery period up to 24 hours).

- Obtain sample from well with a bailer suspended on new, clean nylon twine. The sampling will be performed with a new bailer dedicated to each individual well.

- Collect the sample aliquot for VOC analysis, first by lowering and raising the bailer slowly to avoid agitation and degassing, and then collect sample aliquots for the semi-volatile organic compounds analysis and carefully pour directly into the appropriate sample bottles. Sample bottles containing appropriate preservative for the parameter to be analyzed will be obtained from the laboratory.

- Obtain field measurement of pH, dissolved oxygen, temperature, redox potential, specific conductivity, and turbidity, and record in on the purging and sampling form. The instruments will be decontaminated between wells to prevent cross-contamination.

- Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the analytical laboratories within 24 hours.

- If a centrifugal or submersible pump is used, it will be decontaminated with an alconox and water flush followed by a potable water rinse, and the polyethylene suction/discharge line will be properly discarded.

- Re-lock well cap.

- Fill out field logbook, sample log sheet, labels, custody seals, and chain-of-custody forms.

Groundwater samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory for analysis. The samples will be labeled, handled, and packaged following the procedures described in Generic Quality Assurance Project Plan (QAPP)[4] and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP and site-specific QAPP Addendum.

Purge water will be discharged to the ground surface away from the well, unless otherwise directed

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[4] EA. 2011. Generic Quality Assurance Project Plan for Work Assignments. April.

by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the purge water must be containerized, handled, and disposed of as detailed in Section 13.

6.4 GROUNDWATER SAMPLING USING AQUEOUS DIFFUSION SAMPLERS

This procedure is designed to permit the collection of representative groundwater samples for analysis of VOCs. Groundwater sampling using aqueous diffusion samplers will be conducted using the procedures described below and in accordance with the *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells* (Vroblesky, 2001)[5].

6.4.1 Construction of Aqueous Diffusion Samplers

Aqueous diffusion samplers are constructed by sealing de-ionized water in a 2-in. diameter × 1-mil thick polyethylene tubing. The de-ionized water is sealed in the polytubing by using a heat seal device. One end of the polytube is rolled over onto itself several times then heat is applied to seal this end. The polytube is then filled with de-ionized water. The top end (unsealed end) of the tube is then rolled over onto itself until there is no headspace in the polytube; heat is then applied to seal this end. Care is taken to ensure that no headspace or air bubbles are present in the tube prior to sealing the top end. Each diffusion sampler is approximately 2 ft in length. The samplers are weighted with stainless steel weights, and a stainless steel line is attached to the top of the sampler for placement and retrieval.

6.4.2 Equipment/Materials

Aqueous Diffusion Sampler Placement

- Well construction data, location map, and field data from the previous sampling event
- Field logbook and Field Record of Well Gauging, Purging, and Sampling form
- Electronic water level measuring device, 0.01-ft accuracy for monitoring water level prior to installation of the diffusion sampler
- Diffusion sampler constructed of 2-ft length × 2-in. width 1-mil polyethylene lay-flat tubing filled with de-ionized water and weight attached to bottom
- Stainless steel cable; the depth of each sampler should be established prior to field placement so enough line is available for installation.

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[5] Vroblesky, D. 2001. User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells.

Aqueous Diffusion Sampler Retrieval

- Volatile organic analyte sample bottles and sample preservation supplies (as required by the analytical methods) needed for diffusion sampler retrieval

- Sample tags or labels

- Cooler with bagged ice for storage of sample bottles during shipment to a laboratory.

6.4.3 Sampling Procedures

The following procedures will be followed to obtain representative groundwater samples.

Field logbooks and sampling forms will be filled out as the procedure is being performed, as noted:

- Enter the following information in the field logbook and field sampling form, as appropriate, prior to installation of the diffusion sampler: date and time of sampler installation, depth of sampler, and total depth of well.

- Prepare the diffusion sampler by attaching weight at the base of the sampler and line to the top of the sampler.

- Install the sampler at the predetermined depth. The depth of the sampler will be determined on a well-by-well basis, based on previous sampling data or previously collected aqueous diffusion samplers.

- Allow the diffusion to equilibrate for approximately 14 days. Return after no less than 14 days to retrieve the sampler. Samplers can remain in the well for longer than 14 days, if necessary.

- Enter the following information in the field logbook and field sampling form, as appropriate, during retrieval of diffusion sampler: date and time of sampler retrieval, analytical method, and quality assurance/quality control as necessary.

- Retrieve the diffusion sampler from the well.

- After retrieval is complete, install an in-well water quality parameter meter. Remove the line and weight, and make a diagonal cut toward the top of the sampler. The diagonal cut allows easier filling of the sample containers.

- Begin filling the sample containers from the diagonal cut, allowing the water to fill the volatile organic analyte sample containers by allowing the water to flow gently down the inside of the container with as little agitation or minimal aeration as possible.

- Label each sampler as it is collected. Samplers will be placed into a cooler with ice for delivery to a laboratory.

- After collection of the samplers, record water quality parameter readings. After readings have been recorded, remove the water quality meter from the well. The well will then be capped and locked.

- Complete remaining portions of the field sampling form after each well is sampled, including sample date and time (time of retrieval from the well), well sampling sequence, types of sample bottles used, sample identification numbers, preservatives used, parameters requested for analysis, and field observations of the sampling event.

7. EXPLORATORY TEST PITS/TRENCHS

When detailed observation of subsurface soil and/or fill material is necessary, exploratory test pits/trenches can be utilized to for the collection of subsurface soil samples. Test pits/trenches utilize a backhoe to removed significant amounts of subsurface soil/fill material for classification.

7.1 PROCEDURES FOR TEST PIT/TRENCHING SAMPLING

When deemed appropriate, a backhoe will be utilized to excavate subsurface soil and fill material for classification and sampling. The following procedures will be utilized during test pit/trench installation and sampling.

- Utilizing the backhoe, remove a 3-ft wide section of soil to a depth of approximately 1 ft below ground surface (bgs). Place excavated soils on plastic sheeting or requirements of the site-specific work plan.

- Screen and classify the excavated material to identify soil types, visualize potential contaminants, assess VOC vapors within the soil, and collect representative soil samples from selected depth intervals. PID or FID, visual, and olfactory observations are used when selecting soil samples for potential laboratory analysis.

- Continue excavation with backhoe removing shallow layers of soil for classification until the desired depth of the test pit/trench is reached.

- The selection of subsurface soils for laboratory analysis will be made in consultation with the NYSDEC field representative, when present on-site, and are based the following parameters:

  - Subsurface soil materials that exhibit visual or olfactory signs of contamination
  - Subsurface soil materials that cause a sustained response above the measured background response on a calibrated PID of FID screening instrument

- Following sample collection, backfill the excavation with the excavated soil/fill material and flag the corners of the test pit for future surveying.

Any soil samples collected will be submitted to an approved NYSDOH ELAP-certified laboratory for analytical analysis using USEPA methods.

Soil samples are collected from the most contaminated interval at each test pit location, i.e. high PID reading, visually stained, or strong odor, and sent for laboratory analysis. If no contamination is detected or observed, a subsurface soil sample is collected from the base of the test pit/trench.

Test pits/trenches will be classified and logged according to the Unified Soil Classification System. A field record of each soil boring's classification, sampling interval, PID reading, and other field observations will be recorded on a test pit/trench log form provided in Appendix A.

Selected subsurface soil samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. Soil samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and site specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, and site-specific QAPP Addendum.

8. SURFACE WATER SAMPLING

Local surface water may or may not be affected by site hydrology or hydrogeology. If surface water sampling is necessary, surface water sampling locations will be flagged after sampling to facilitate locating these sampling locations with a high-precision GPS unit.

The names and addresses of property owners where the off-site surface water sampling is anticipated to occur will be contacted by the NYSDEC prior to sampling. This will be accomplished through a telephone call and then through a 10-day written notice consistent with NYSDEC-Division of Environmental Regulation (DER) DER-10 Technical Guidance for Site Investigation and Remediation. The NYSDEC Project Manager will contact the property owners to discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide EA with a copy of the correspondence and surface water sampling schedule.

Following identification of the surface water sampling locations, field personnel will collect the sample by entering the surface water to reach the desired sample location. If the water is sufficiently deep, surface water samples will be collected using a sample container. Otherwise, surface water samples will be collected with a dipper, beaker, or pond sampler.

The approximate location of the sample will be noted in the field logbook. Field measurement of pH, dissolved oxygen, temperature, and specific conductivity will be obtained and recorded in the field logbook. The field sampling crew will record visual observations (sample color, any unusual characteristics [odor, staining, etc.]) in the field notebook and on the field record of the surface water sampling (Appendix A). Instruments used in sample collection will be decontaminated between locations to prevent cross-contamination.

Surface water samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory analysis. The samples will be labeled, handled, and packaged following the procedures described in the Generic QAPP[4] and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, site-specific QAPP Addendum.

Selected surface water samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. Surface water samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP and site-specific QAPP Addendum.

9. SEDIMENT SAMPLING

Sediment sampling is typically done in conjunction with surface water sampling, and much of the sampling procedure in this section is similar to Section 8 (Surface Water Sampling).

If sediment sampling is necessary, sampling locations will be flagged after sampling to facilitate locating these sampling locations with a high-precision GPS unit.

The names and addresses of property owners where the off-site sediment water sampling is anticipated to occur will be contacted prior to sampling. This will be accomplished through a telephone call and then through a 10-day written notice consistent with NYSDEC-DER TAGM 4053. The NYSDEC Project Manager will contact the property owners to discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide EA with a copy of the correspondence and sediment sampling schedule.

The field sampling crew will examine the sediment samples and record visual observations (sample color, texture, any unusual characteristics [odor, staining, etc.]) in the field notebook and on the field record of sediment sampling (Appendix A). The instruments will be decontaminated between locations to prevent cross-contamination.

Surficial (0-6 in.) sediment samples will be collected using a clean, stainless steel coring device, a stainless steel hand auger, Ponar® dredge sampler or a stainless steel scoop as appropriate for the sediment conditions. If sediment depth allows, additional samples will be collected from subsurface depths from 6 to 12 in, 12 to 24 in., and regular intervals beyond 24 in. Dedicated sampling equipment will be used to prevent cross-contamination and to minimize decontamination requirements.

The following procedures will be utilized to collect sediment samples with a Ponar® dredge sampler:

- Identify the proposed sample location in the field notebook along with other appropriate information collected during sediment probing activities.
- Don personal protective equipment (as required by the HASP).
- At each sample location, drop the dredge in the opened position, making sure that the end of the rope is maintained at all times.
- Once the dredge has been allowed to settle into the bottom sediments, a hard pull on the rope will close the sediments inside the dredge.
- Retrieve the dredge.

- Open the dredge to allow the sediments to empty onto a stainless steel tray.
- Describe and record sample descriptions.
- Package sediments in the appropriate containers.

Selected sediment samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. Sediment samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP and site-specific QAPP Addendum.

10. SOIL VAPOR POINT INSTALLATION AND SAMPLING

The primary purpose of a soil vapor investigation is to further characterize and quantify the lateral and longitudinal extents of soil vapor contamination within the vadose zone. The soil vapor data will also be used to evaluate the potential for vapor intrusion in structures located onsite, downgradient of the site, or adjacent to the sampling locations.

Vadose zone monitoring can be used to develop subsequent site characterization activities such as installation of groundwater monitoring points. The vadose zone monitoring will be completed using an acceptable soil gas methodology and will include the collection of quality assurance and quality control samples.

Soil vapor point locations will be pin flagged and labeled with the relevant sample location identification. Each pin flag will include sample identification information that can be used during a subsequent high-precision GPS survey.

10.1 SOIL VAPOR POINT INSTALLATION

Soil vapor points will be installed using Geoprobe® direct-push or Macro-Core technologies to install stainless steel drive points to approximately 8 ft bgs and/or 1 ft above the water table interface or the bedrock interface. Once the sampling depth is reached, the 6-in. stainless steel sampling screen attached to a dedicated section of 0.25-in. diameter Teflon or Teflon-lined tubing that is identified as laboratory or food grade will be installed and used to collect the soil vapor samples. The borehole will then be backfilled with sand/glass beads to a minimum of 6 in. above the screened interval. Granular bentonite pellets will then be placed from approximately 6 in. above the screen to the ground surface hydrating concurrently with placement. Sufficient time will then be provided for the bentonite to set (24 hours minimum). Soil boring spoils will be assumed to be non-hazardous waste and reworked into the surrounding ground surface unless a visible sheen or odor is evident, in which case the spoils will be drummed and disposed of in accordance with Section 13. A typical soil vapor point construction diagram is included as Figure 2.

10.2 SOIL VAPOR POINT SAMPLING

Soil vapor samples will be collected in the same manner at all locations to minimize possible discrepancies. The following procedures will be strictly adhered to when sampling soil vapor:

- At least 24 hours after the installation of the temporary soil vapor points, 2-3 implant volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the samples to ensure that representative samples are collected.

- Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling.

- Samples will be collected using conventional sampling methods and appropriate containers, which meet the objectives of the work assignment (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), and meet the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters, which are certified clean by the laboratory, using an appropriate USEPA Method). The sample duration for these samples will be 2 hours.

- A tracer gas (e.g., helium, butane, or sulfur hexafluoride) will be used at each location before collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring). Once verified, continued use of the tracer gas may be reconsidered.

When soil vapor samples are collected, the following actions will be taken to document local conditions during sampling that may influence interpretation of the results:

- Sample location will be noted, including the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor ambient air sample locations (if applicable), and compass orientation (north).

- Weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed, and direction) will be noted for the past 24-48 hours.

- Any pertinent observations will be recorded, such as odors and readings from field instrumentation.

The field sampling team will maintain a soil vapor sample log sheet (Appendix A) summarizing the following:

- Sample identification
- Date and time of sample collection
- Sampling depth
- Identity of samplers
- Sampling methods and devices
- Purge volumes
- Volume of soil vapor extracted
- Canister and associated regulator identification
- Helium leak test results
- Vacuum before and after samples collected
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone
- Chain-of-custody protocols and records used to track samples.

After the sample collection period, the Summa® canisters will be sent for subsequent laboratory analysis. The soil vapor samples will then be analyzed for target constituents. The soil vapor samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. A minimum reporting limit of 1 microgram per cubic meter (μg/m^3) will be achieved for all analytes, with the exception of trichloroethylene (TCE) and carbon tetrachloride, which will achieve a minimum reporting limit of 0.25 μg/m^3, unless otherwise directed by the NYSDEC or NYSDOH.

Upon completion of the sampling, the sample tubing will be removed and the temporary soil vapor point location will be backfilled with bentonite and marked with a stake/flag that will be labeled with the proper sample identification and illustrated on the site map so it can be located by the site surveyor. Borings performed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

11. VAPOR INTRUSION EVALUATION

Vapor intrusion (VI) evaluations are completed in accordance with the NYSDOH Indoor Air Sampling and Guidance document. *Guidance for Evaluating Soil Vapor Intrusion (SVI) in the State of New York* (NYSDOH, 2006)[6] and NYSDEC Department of Remediation *DER-10 Technical Guidance for Site Investigation and Remediation*[1] protocol will be followed during the planning and implementation of any VI evaluation.

Indoor air sampling and analysis is performed at structure locations identified by the NYSDEC and NYSDOH. The overall goal of a VI evaluation is to determine and evaluate the potential for vapor intrusion into these structures.

Notices of solicitation to participate in the indoor air monitoring program and scheduling appointments will be conducted by the NYSDEC and NYSDOH. Prior to initiating the air sampling, property owners will be contacted through a telephone call and then through a 10-day written notice consistent with NYSDEC TAGM 4053. The NYSDEC Project Manager will contact the property owners, discuss the sampling program, and schedule the sampling. The NYSDEC Project Manager will provide EA with a copy of the correspondence and indoor air sampling schedule.

11.1 INDOOR AIR SAMPLE COLLECTION

An inspection of general site conditions will be performed at each property location as part of the VI evaluation. The inspection will include the following activities:

- Completion of the NYSDOH Indoor Air Quality Questionnaire and Building Inventory included in Indoor Air Sampling and Analysis Guidance. A sample of the questionnaire is included in Appendix A.
- Documentation of weather conditions outside and temperature inside.
- Ambient air (indoor and outdoor) screening using field equipment (i.e., parts per billion photoionization detector).
- Selection of air sampling locations.

Indoor air samples will be collected at structures during the SVI evaluation. In accordance with the NYSDOH SVI Guidance, indoor air samples will be set up to collect a representative air sample from within the breathing zone (i.e., 3-5 ft above the floor). A 6-L Summa® canister with a vacuum gauge and flow controller will be used to collect the indoor air samples. The canisters

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[6] New York State Department of Health. 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. New York State Department of Health, Division of Environmental Health Assessment, Center for Environmental Health. October.

will be batch or individually certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no less than -25 in. of mercury (Hg). Flow controllers will be regulated to collect at 3.8 mL/minute over a 24-hour collection period. The air laboratory will meet the reporting limit of 0.25 $\mu g/m^3$ or less for TCE and carbon tetrachloride and 1.0 $\mu g/m^3$ for other compounds on the TO-15 list.

Prior to initiating the sampling, the serial number of the canisters and associated regulators will be recorded on the field sampling forms. Field sampling forms will include the collection of canister/regulator serial numbers, sample identifications, sample start date/times, vacuum gauge pressures, and required analysis (USEPA Method TO-15).

11.1.1 Sub-Slab Sample Procedures

During the VI evaluation, sub-slab vapor samples will be collected from identified structures that have been constructed with poured concrete foundations. A typical sub-slab vapor point construction diagram is included as Figure 3. The following procedures will be followed for sub-slab vapor point installation and sampling.

11.1.1.1 Sub-Slab Vapor Point Installation

The following procedures will be followed during the selection and installation of all sub-slab vapor points within structures sampled during a VI evaluation.

- A visual assessment of the condition of the basement floor will be completed. The locations of the sub-slab vapor point will be selected to be out of the line of traffic, away from major cracks and other floor penetrations (e.g., sumps, pipes, etc.), and a minimum of 5 ft from an exterior wall.

- Once the location is determined, a ⅜-in. diameter hole will be drilled approximately 2 in. below the concrete floor slab using an electric hammer drill. A 1-in. diameter drill bit will be used to over drill the top ½ in. of the borehole to create an annular space for the surface seal.

- Concrete dust and flooring material will be swept away from the drill hole and wiped with a dampened towel.

- Teflon-lined polyethylene tubing (¼-in. outside diameter × ⅛-in. inside diameter, and approximately 3-ft long) will be inserted into the borehole drilled in the floor, extending no further than 2 in. below the bottom of the floor slab.

- Melted beeswax will be poured around the tubing at the floor penetration and allowed to set tightly around the tubing.

- A dedicated 60-cm^3 syringe will be used to purge approximately 100 ml of air/vapor from the sampling point. The syringe will be capped and the purge air released outside the building as to not interfere with the basement indoor air sample collection. The purge air will be discharged into a ppbRAE and the associated reading will be recorded on the field sampling form. Sub-slab vapor points installed will be leak tested before and after collecting the air sample using helium tracer gas procedures in accordance with the NYSDOH Guidance.

- A 6-L Summa® canister (provided by an independent laboratory) with a vacuum gauge and flow controller will be connected to the sample tubing using a compression fitting and placed on the floor adjacent to the sampling point. The canisters will be batch or individually certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no less than -25 in. of mercury in Hg or a replacement canister will be used. Flow controllers will be regulated to collect at 3.8 mL/minute over a 24-hour collection period.

- The serial number of the canister and associated regulator will be recorded on the field sampling form. Sample identification including sample identification, sample start date/time, vacuum gauge pressure, and required analysis (USEPA Method TO-15) will be recorded on the canister identification tag and the field sampling form.

- A digital photograph will be taken of the canister setup and the surrounding area at each location.

The following procedures will be used for sub-slab vapor sampling:

- Visually assess the condition of the floor. Select an area for sampling that is out of the line of traffic and away from major cracks and other floor penetrations (e.g., sumps, pipes, etc.).

- Drill a ¼-in. diameter hole completely through the concrete floor slab using an electric hammer drill, over drill a ½-in. diameter hole to approximately ½ in. depth.

- Sweep concrete dust away from the drill hole and wipe the floor with a dampened towel. Concrete dust can be cleaned with a vacuum equipped with a high efficiency particulate air filter only after the sample tubing is properly sealed and sample collection has begun.

- Insert the Teflon-lined polyethylene tubing (⅛-in. inside diameter × ¼-in. outside diameter, approximately 3-ft long) into the hole drilled in the floor, extending no further than 1 in. below the bottom of the floor slab.

- Pour the melted beeswax around the tubing at the floor penetration, packing it in tightly around the tubing.

- Attach a syringe to the sample tube and purge approximately 100 ml of air/vapor. The syringe will be capped and the air released outside the building so it does not interfere with the indoor air sample collection.

- Place a canister on the floor adjacent to the sample tube. The canister will be a 6-L canister (provided by an independent laboratory) with a vacuum gauge and flow controller. The canister must be certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no more than -30 in. of mercury in Hg. Flow controllers must be set for a 24-hour collection period.

- Record the serial number of the canister and associated regulator on the chain-of-custody form and field notebook/sample form. Assign sample identification on the canister identification tag and record this on chain-of-custody and field notebook/sample form. For the property owner’s privacy, do not use a sample identifier containing the name of the property owner or the address of the property.

- Record the gauge pressure; the vacuum gauge pressure must read -25 in Hg or less, or the canister cannot be used.

- Record the start time on the chain-of-custody form and on the air sampling form (Appendix A), and take a digital photograph of canister setup and the surrounding area.

11.1.2 Termination of Sample Collection

- Close the canister valve; record the stop time on the chain-of-custody form and in the field notebook/sample form.

- Record the final gauge pressure and disconnect the sample tubing and the pressure gauge/flow controller from the canister, if applicable.

- Install the plug on the canister inlet fitting and place the sample container in the original box.

- Complete the sample collection log with the appropriate information, and log each sample on the chain-of-custody form.

- Remove the temporary subsurface probe and properly seal the hole in the slab with hydraulic cement.

Field quality control samples will include duplicates and trip blanks. Field duplicates will be collected at the rate of 1 duplicate per 20 original samples (20 percent). Field duplicates will be collected by installing an in-line “tee,” which will essentially split the flow coming from the sample tubing penetrating the floor to two canisters set up adjacent to each other and each collecting vapors at identical flow rates.

11.2 OUTDOOR AIR SAMPLE COLLECTION

Outdoor ambient air samples will be collected to determine outdoor air quality during the sampling event. Outdoor ambient air samples will be collected at the same time as the sub-slab vapor, and indoor air sampling. Outdoor air samples will be collected at a rate of one sample per day.

In accordance with the NYSDOH SVI Guidance, outdoor ambient air samples will be collected from the breathing zone (i.e., 3-5 ft above the ground surface) during the same sampling period as indoor air and sub-slab samples. To reach the sampling zone outdoors, dedicated Teflon-lined polyethylene tubing attached to a metal stake will be used to reach the breathing zone. A 6-L Summa® canister with a vacuum gauge and flow controller will be used to collect the outdoor ambient air samples. The canisters will be batch certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no less than -25 in. of mercury (Hg). Flow controllers will be regulated to collect at 3.8 mL/minute over a 24-hour collection period during the SVI investigation. The air laboratory will meet the reporting limit of 0.25 µg/m^3 or less for TCE and carbon tetrachloride and 1.0 µg/m^3 for other compounds on the TO-15 list.

Prior to initiating the sampling, the serial number of the canisters and associated regulators will be recorded on the field sampling forms. Field sampling forms include the collection of canister/regulator serial numbers, sample identifications, sample start date/times, vacuum gauge pressures, and required analysis (USEPA Method TO-15).

11.3 LABORATORY ANALYSIS OF AIR SAMPLES

Air samples will be analyzed by an ELAP-certified laboratory. Detection limits for the analyzed compound list will be defined by the NYSDEC and NYSDOH prior to sample submittal and outlined in the site-specific work plan. For specific parameters identified by NYSDOH, where the selected parameters may have a higher detection limit (e.g., acetone), the higher detection limits will be designated by NYSDOH.

12. COMMUNITY AIR MONITORING PLANS

In accordance with DER-10, A Community Air Monitoring Plan (CAMP) will be developed at sites in which the public using the site, surrounding community, or site workers may be exposed to contamination at the site. A site-specific CAMP will be prepared for sites in which intrusive activities at the site may impact site workers or the surrounding community. The following sections provide generic information regarding CAMPs which may be implemented at a site, based upon the intrusive work completed at the site, and in accordance with the NYSDEC and NYSDOH. The NYSDOH Generic Community Air Monitoring Plan, provided in Appendix 1A of DER-10, shall be the basis for development of site-specific CAMPs for intrusive site work. Additional guidance for fugitive dust and particulate monitoring is provided in Appendix 1B of DER-10.

12.1 MONITORING

Real-time air monitoring for VOCs and/or particulate levels at the perimeter and surrounding community of the work area may be necessary. Monitoring activities will consist of a combination of continuous and periodic monitoring, which will be performed dependent upon the type of activity being conducted at the site, as discussed below.

12.1.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates may be required for all ground intrusive activities associated with the site. Sites known to be contaminated with heavy metals alone may only require particulate monitoring. Ground intrusive activities include soil/waste excavation and handling and installation of test pits and trenches, soil borings, and groundwater monitoring wells.

VOCs should be monitored at the downwind perimeter of the immediate work area on a continuous basis. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a MiniRAE 2000 or equivalent, which is appropriate to measure the types of contaminants known or suspected to be present at the site. The MiniRAE 2000 shall be calibrated at least daily for the COCs or for an appropriate surrogate. The MiniRAE 2000 is capable of calculating 15-minute running average concentrations, which will be compared to the action levels specified in Section 12.2.1.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area at temporary particulate monitoring stations. The particulate monitoring will be performed using a Thermo MIE pDR-4000 DataRam or equivalent. The Thermo MIE pDR-4000 DataRam is a 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 for comparison to the airborne particulate action level. The Thermo MIE pDR is equipped with an audible alarm to indicate exceedance of the action level. In addition to using the Thermo MIE pDR-4000 DataRam, fugitive dust migration will be visually assessed during all work activities. If particulate concentrations are recorded at higher or equivalent concentrations at the upwind station during investigation activities then continuous air monitoring will be discontinued, as approved by NYSDEC representative.

12.1.2 Periodic (As-Needed) Air Monitoring

Periodic or as-needed air monitoring for VOCs may be required during non-intrusive activities associated with the site-specific Work Plan. Non-intrusive activities are anticipated to include the collection of soil and sediment samples, the collection of groundwater samples from existing monitoring wells, and the collection of indoor air and soil vapor samples. Periodic air monitoring during sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

12.2 ACTION LEVELS AND RESPONSE

This subsection identifies the action levels and corresponding responses for concentrations of VOCs and particulates detected during the field activities associated with a site.

12.2.1 Volatile Organic Compounds

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

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 will be stopped, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 ft downwind of the work zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 ft), is below 5 ppm over background for the 15-minute average.

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

Fifteen-minute readings will be recorded and be available for NYSDEC, NYSDOH, and county health department personnel to review. Instantaneous readings (if any) used for decision purposes will also be recorded.

12.2.2 Particulates

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

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

Similar to the VOC readings, all particulate readings will be recorded and be available for NYSDEC, NYSDOH, and county health department personnel to review.

13. STORAGE AND DISPOSAL OF WASTE

EA is responsible for the proper storage, handling, and disposal of investigative-derived waste; including personal protective equipment, solids and liquids generated during the well drilling, well development, and well sampling activities. Drummed materials will be clearly labeled as to their contents and origin. Drill cuttings and spoils will be managed in accordance with NYSDEC-DER TAGM 4032.

Accordingly, handling and disposal will be as follows:

- Liquids generated from contaminated equipment decontamination that exhibit visual staining, sheen, or discernable odors will be collected in drums or other containers at the point of generation. They will be stored in the staging area. A licensed waste subcontractor will then remove the drums and dispose at an offsite location.

- Liquid generated during well purging or a decontamination activity that does not exhibit visible staining, sheen, or discernable odors will be discharged to an unpaved area on the site, where it can percolate into the ground.

- Concrete dust will be collected in shop vacuums and disposed of as non-regulated solid waste, unless photoionization detector readings or visual indications of contamination are noted during field operations.

- Soil and rock cuttings from drilling operations that do not exhibit visible staining, sheen, or discernable odors will be disposed of onsite.

- Soil and rock cuttings from drilling operations that exhibit visible staining, sheen or discernable odors will be staged onsite until an appropriate treatment/disposal procedure has been determined after the completion of the feasibility study.

- Excavated soils from test trenching will be backfilled back into excavations upon test pit completion.

- Used protective clothing and equipment that is suspected to be contaminated with hazardous waste will be placed in plastic bags, packed in 55-gal ring-top drums, and transported to the drum staging area.

- Non-contaminated trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.

- Non-contaminated protective clothing will be packed in plastic bags and placed in a trash dumpster for disposal by a local garbage hauler.

14. SITE SURVEY AND BASE MAP PREPARATION

A site survey will involve the surveying of all soil boring locations, monitoring well locations, test pit locations, soil vapor point locations, and surface water/sediment sampling locations, performing a topographic survey, and preparation of a site map (typically based upon a previous base map or site control markers). To ensure the collection of consistent elevation data, each of the existing monitoring wells or other pertinent locations will be included in the site survey.

A detailed topographic base map of the site and immediate vicinity will be developed. All relevant features of the site and adjacent areas will be plotted. As previously mentioned, the consultant will be responsible for placing either survey flags or survey stakes at each of the pertinent locations. The base map will be used to accurately plot all sampling locations including soil borings, monitoring wells, and all other sample/monitoring locations. These locations will be included in a high-precision GPS survey to be completed by the NYSDEC.

The site map will also include site-specific features associated with the characterization/investigation (i.e., surface water drainage, above and underground storage tanks, buildings, drywells, cesspools). Additionally, engineering controls implemented or to be implemented at the site must be clearly labeled. Contours will be plotted at 1-ft intervals. The location and elevation of each survey point will be surveyed by a New York State licensed surveyor.

The elevations of all monitoring well casings will be established to within 0.01 ft based on the National Geodetic Vertical Datum. A permanent reference point will be placed in all interior polyvinyl chloride casings to provide a point to collect future groundwater elevation measurements.

The site tax map number will also be identified. The tax maps will be reviewed and the property lines of the parcels will be plotted on the base map.

With respect to the site survey and base map preparation, the following assumptions have been made:

- The estimated survey area should include the whole site boundary. All elevations will be referenced to the NAVD 88. All horizontal locations will be referenced to the NAD 83.

- Three blueline copies of the site base maps with topography (1 ft intervals), and three blueline copies of the site basemap, without topography, will be submitted to the NYSDEC.

- The site map must be provided in AutoCAD, version 12 or higher and ArcMap™ 9.1.

15. REFERENCES

EA. 2011. Generic Quality Assurance Project Plan for Work Assignments. April.

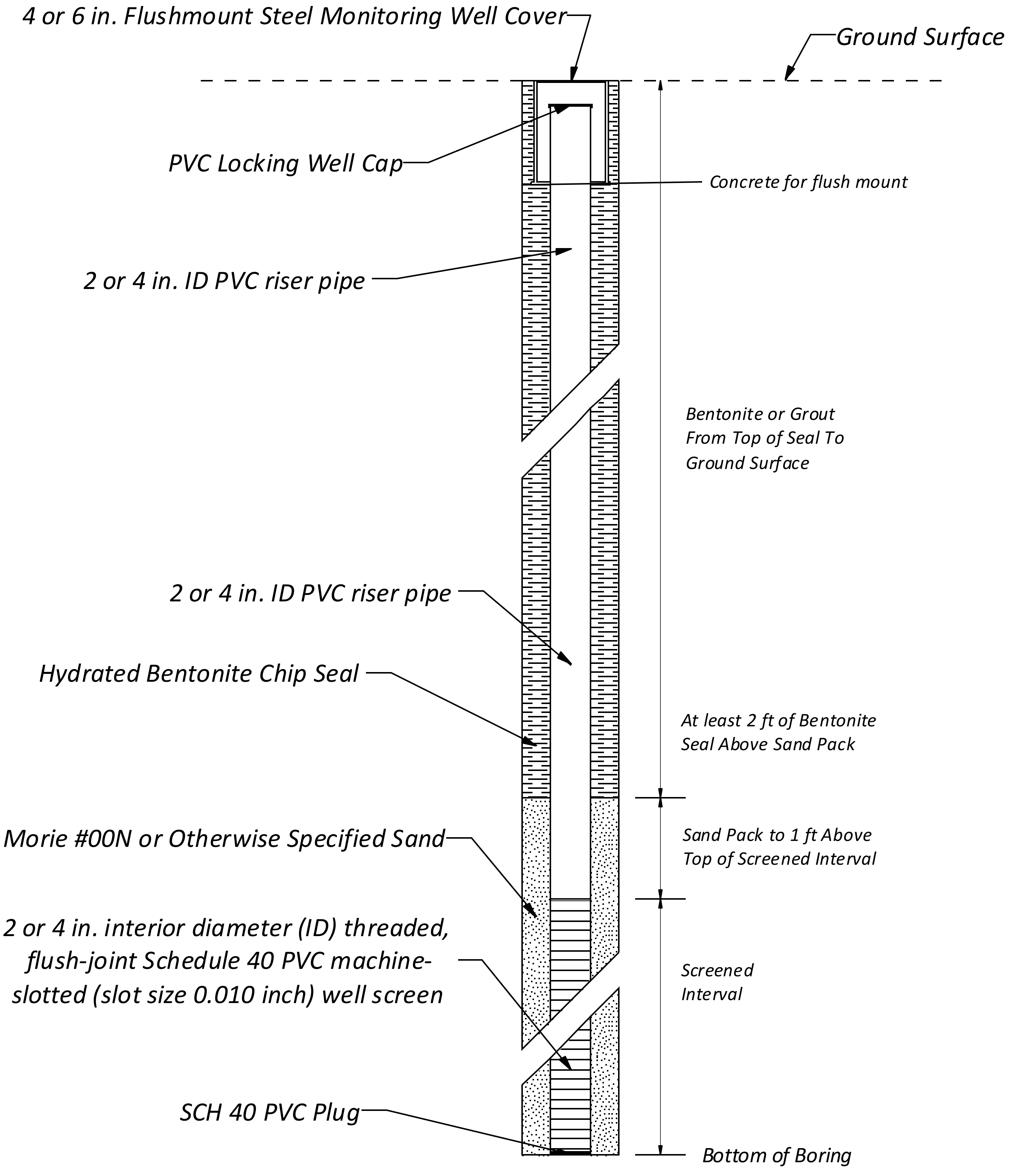
New York State Department of Environmental Conservation. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

New York State Department of Health. 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. New York State Department of Health, Division of Environmental Health Assessment, Center for Environmental Health. October.

United States Environmental Protection Agency. 1992. *Monitoring Well Development Guidelines for Superfund Project Managers.* April.

-----. 2002. *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers.* May.

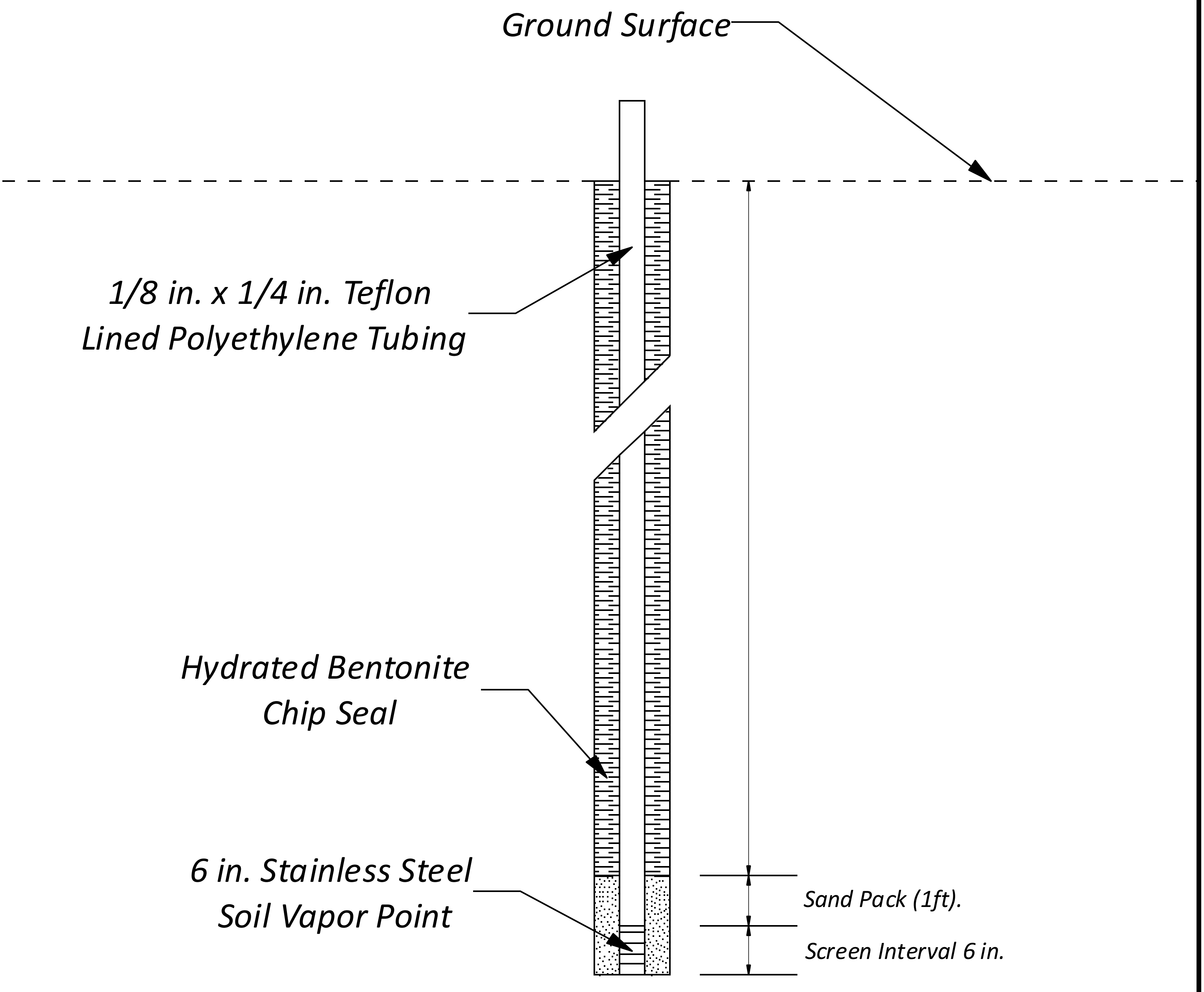
Vroblesky, D. 2001. User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells.



NYSDEC
CONTRACT NO. D007624
GENERIC FIELD ACTIVITIES PLAN

FIGURE 1
Typical Monitoring Well
Construction Diagram

CONTRACT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	NOT TO SCALE	DATE:	PROJECT NO:	FILE NO:
CJC	DCC	DCC	RSC		APRIL 2011	14368.39	GIS/PROJECTS/ FIGURE1.MXD

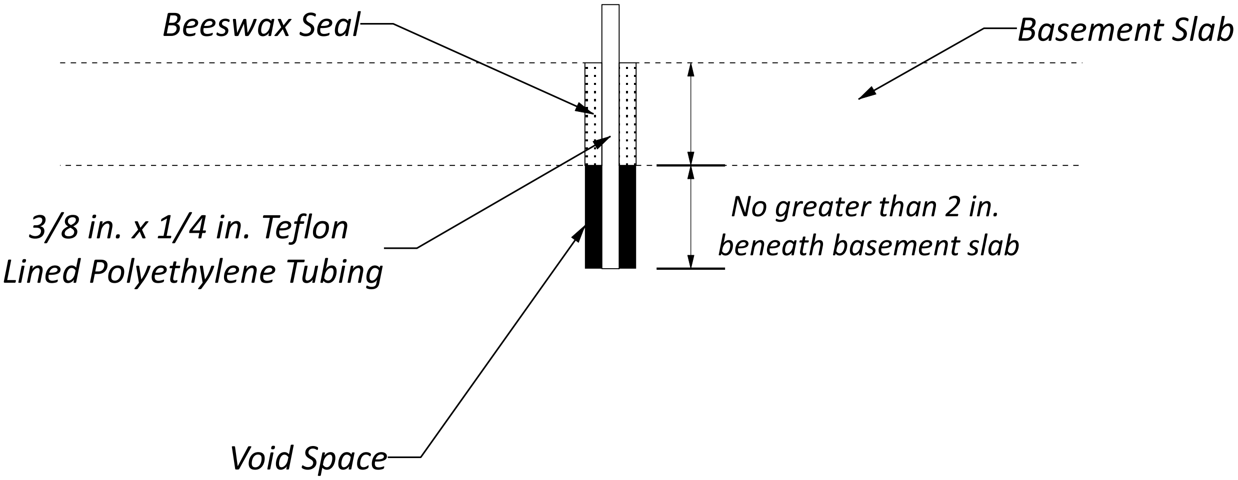


Soil vapor sampler set at 8 ft bgs or 1 ft above water table

NYSDEC
CONTRACT NO. D007624
GENERIC FIELD ACTIVITIES PLAN

FIGURE 2
Typical Temporary
Soil Vapor Point
Construction Diagram

CONTRACT MGR: CJC	DESIGNED BY: DCC	CREATED BY: DCC	CHECKED BY: RSC	NOT TO SCALE	DATE: APRIL 2011	CONTRACT NO: D007624	FILE NO: GIS/PROJECTS/ FIGURE2.MXD



NYSDEC CONTRACT NO. D007624 GENERIC FIELD ACTIVITIES PLAN	FIGURE 3 Typical Sub-Slab Vapor Sample Point Construction Diagram

CONTRACT MGR: CJC	DESIGNED BY: DCC	CREATED BY: DCC	CHECKED BY: RSC	NOT TO SCALE	DATE: APRIL 2011	CONTRACT NO: D007624	FILE NO: GIS/PROJECTS/ FIGURE3.MXD

Appendix A

Field Forms

FIELD AIR SAMPLING FORM

EA Engineering and Its Affiliate
EA Science & Technology

6712 Brooklawn Parkway, Suite 104

Syracuse, NY 13211

Project #:

Project Name:

Location:

Project Manager:

Sample Location Information:

Site ID Number:				Sampler(s):	
PID Meter Used: (Model, Serial #)				Building I.D. No.:	

SUMMA Canister Record:

INDOOR AIR - FIRST FLOOR		INDOOR AIR - BASEMENT		SUBSLAB SOIL GAS		OUTDOOR AIR	
Flow Regulator No.:		Flow Regulator No.:		Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:		Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:		Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)		Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:		Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:		Sample ID:		Sample ID:	

Other Sampling Information:

Story/Level		Story/Level		Basement or Crawl Space?		Direction from Building	
Room		Room		Floor Slab Thickness (inches) *[if present]*		Distance from Building	
Indoor Air Temp (°F)		Indoor Air Temp		Potential Vapor Entry Points Observed?		Intake Height Above Ground Level (ft.)	
Barometric Pressure?		Barometric Pressure?		Ground Surface Condition (Crawl Space Only)		Intake Tubing Used?	
Intake Height Above Floor Level (ft.)		Intake Height Above Floor Level (ft.)		If slab, intake Depth If Crawl Space, intake height		Distance to nearest Roadway	
Noticeable Odor?		Noticeable Odor?		Noticeable Odor?		Noticeable Odor?	
PID Reading (ppb)		PID Reading (ppb)		PID Reading (ppb)		PID Reading (ppb)	
Duplicate Sample?		Duplicate Sample?		Duplicate Sample?		Duplicate Sample?	

Comments:

Sampler Signature:

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER DEVELOPMENT FORM

Well I.D.:	**EA Personnel:**	**Client:** NYSDEC
Location:	**Well Condition:**	**Weather:**
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
	Gauge Time:	
Stick Up/Down (ft):	**PID Headspace Reading:**	**Well Diameter (in):**

Purge Date:	**Purge Time:**
Purge Method:	**Field Technician:**

Well Volume

A. Well Depth (ft):	**D. Well Volume (ft):**	**Depth/Height of Top of PVC:**
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (^{o}C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)

Total Quantity of Water Removed (gal): ____________ **Personnel:** ____________

COMMENTS AND OBSERVATIONS: ____________

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER SAMPLING PURGE FORM

Well I.D.:	**EA Personnel:**	**Client:** NYSDEC
Location:	**Well Condition:**	**Weather:**
Sounding Method:	**Gauge Date:** **Gauge Time:**	**Measurement Ref:**
Stick Up/Down (ft):	**PID Headspace Reading:**	**Well Diameter (in):**

Purge Date:	**Purge Time:**
Purge Method:	**Field Technician:**

Well Volume

A. Well Depth (ft):	**D. Well Volume (ft):**	**Depth/Height of Top of PVC:**
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (°C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)

Total Quantity of Water Removed (gal): ______________ **Sampling Time:** ______________
Samplers: ______________ **Split Sample With:** ______________
Sampling Date: ______________ **Sample Type:** ______________

COMMENTS AND OBSERVATIONS: ______________

NEW YORK STATE DEPARTMENT OF HEALTH INDOOR AIR QUALITY
QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name ___________________________________ Date/Time Prepared ______________

Preparer's Affiliation _Independent Consultant – EA Engineering Phone No._315-431-4610________

Purpose of Investigation ___________________

1. OCCUPANT: Interviewed: Y / N

Last Name: _________________________ First Name: _________________________

Address: ____

County: _________________

Home Phone: ____________________ Office Phone: ____________________

Number of Occupants/persons at this location _______ Age of Occupants ______________________

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _________________________ First Name: _________________________

Address: ____

County: _________________

Home Phone: ____________________ Office Phone: ____________________

3. BUILDING CHARACTERISTICS Type of

Building: (Circle appropriate response)

Residential School Commercial/Multi-use

Industrial Church Other: _________________

If the property is residential, type? (Circle appropriate response)

Ranch
Raised Ranch
Cape Cod
Duplex
Modular

2-Family
Split Level
Contemporary
Apartment House
Log Home

3-Family
Colonial
Mobile Home
Townhouses/Condos
Other:_______________

If multiple units, how many?
________ If the property is
commercial, type?

Business Type(s) ____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? ______

Other characteristics:

Number of floors______ Building age______

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors
Airflow near source
Outdoor air infiltration
Infiltration into air ducts

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other ________
c. Basement floor:	concrete	dirt	stone	other ________
d. Basement floor:	uncovered	covered	covered with _______________	
e. Concrete floor:	unsealed	sealed	sealed with ________________	
f. Foundation walls:	poured	block	stone	other ________
g. Foundation walls:	unsealed	sealed	sealed with ________________	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: ________(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

6. HEATING, VENTING and AIR CONDITIONING

Type of heating system(s) used in this building: (circle all that apply –note primary)

Hot air circulation - Heat pump - Hot water baseboard - Space Heaters -
Stream radiation - Radiant floor - Electric baseboard - Wood stove -
Outdoor wood boiler - Other ___________

The primary type of fuel used is:
Natural Gas - Fuel Oil - Kerosene - Electric - Propane - Solar - Wood - Coal

Domestic hot water tank fueled by: ____________________________
Boiler/furnace located in: Basement - Outdoors - Main Floor - Other___________
Air conditioning: Central Air - Window units - Open Windows - None
Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

7. OCCUPANCY

Is basement/lowest level occupied? Full-time - Occasionally - Seldom - Almost Never

Level General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)

Basement ____
1st Floor ____
2nd Floor ____
3rd Floor ____
4th Floor ____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage?	Y / N	
b. Does the garage have a separate heating unit?	Y / N / NA	
c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car)	Y / N / NA	Please specify________________________
d. Has the building ever had a fire?	Y / N	When?______________________
e. Is a kerosene or unvented gas space heater present?	Y / N	Where? ______________________
f. Is there a workshop or hobby/craft area?	Y / N	Where & Type? _______________
g. Is there smoking in the building?	Y / N	How frequently? _______________
h. Have cleaning products been used recently?	Y / N	When & Type? ________________
i. Have cosmetic products been used recently?	Y / N	When & Type? ________________
j. Has painting/staining been done in the last 6 months?	Y / N	When & Type? ________________
k. Is there new carpet, drapes or other textiles?	Y / N	Where & When? _______________
l. Have air fresheners been used recently?	Y / N	When & Type? _____________
m. Is there a kitchen exhaust fan?	Y / N	If yes, where vented? ___________________________
n. Is there a bathroom exhaust fan?	Y / N	If yes, where vented? ___________________________
o. Is there a clothes dryer?	Y / N	If yes, is it vented outside? Y / N
p. Has there been a pesticide application?	Y / N	When &Type? _____________

Are there odors in the building? Y / N
If yes, please describe:
____

Do any of the building occupants use solvents at work? Y / N

(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist)

If yes, what types of solvents are used? ____
If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)
Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation:
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE
Water Supply: Public Water Drilled Well Driven Well Dug Well Other: _______
Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other: _______

☐.**10. RELOCATION INFORMATION (for oil spill residential emergency)**
☐.**a. Provide reasons why relocation is recommended:** ______________________________________
☐.**b. Residents choose to:** remain in home relocate to friends/family relocate to hotel/motel
☐.**c. Responsibility for costs associated with reimbursement explained?** Y / N
☐.**d. Relocation package provided and explained to residents?** Y / N

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

First Floor:

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: ____

List specific products found in the residences that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.
BTSA\Sections\SIS\Oil Spills\Guidance Docs\Aiproto4.doc

FIELD SOIL VAPOR SAMPLING FORM

EA Engineering and Its Affiliate EA Science & Technology 6712 Brooklawn Parkway, Suite 104 Syracuse, NY 13211	Project #: Project Name: Location: Project Manager:

Sample Location Information:

Site ID Number:				Sampler(s):	
PID Meter Used (Model, Serial #) :☐				Soil Vapor I.D. No.:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test:		Depth to sample point:	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?		Additional info:	
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:			

Comments:

Sampler Signature:

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Job. No.
Client: NYSDEC
Project:
Location:
Drilling Method:
Soil Boring Number:
Sampling Method:
Sheet 1 **of**

Coordinates: Northing ________ Easting: ________
Surface Elevation: ________
Casing Below Surface: ________
Reference Elevation: ________
Reference Description: ________

Water Level:					**Drilling**	
					Start	**Finish**
Time:					DATE	DATE
Date:					TIME	TIME

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	**Ft. Driven/ Ft. Recvrd**	**Boring Diagram**	**PID (ppm)**	**Depth in Feet**	**USCS Log**	
				0		
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				11		
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				27		
				28		
				29		

Monitoring Well Construction Information

Monitoring Well Diameter: ________ in
Bottom of Monitoring Well: ________ ft bgs
Stick Up or Flush Mount: ________
Screen Interval: ________ To ________ ft bgs
Riser Interval: ________ To ________ ft bgs
Sand Pack Interval: ________ To ________ ft bgs
Bentonite Seal: ________ To ________ ft bgs
Grout Interval: ________ To ________ ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point: ________ ft
Bottom of Tubing: ________ ft
Top of Sand Pack: ________ ft
Top of Bentonite Seal: ________ ft

Logged by: ________ Date: ________
Drilling Contractor: ________ Driller: ________

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Job. No.	**Client:** NYSDEC		**Location:**
14368.41	**Project:** Old Upper Mnt. Road		Lockport, New York
Drilling Method:	Geoprobe Direct-Push		**Soil Boring Number:**
			932112-SB-
Sampling Method:			**Sheet 1 of**

Coordinates:
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description:

					Drilling	
Water Level:					**Start**	**Finish**
Time:						
Date:						

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Feet Driven/Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log	
				33		
				34		
				35		
				36		
				37		
				38		
				39		
				40		
				41		
				42		
				43		
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				64		
				65		

Logged by: ______________________ Date: ______________

Drilling Contractor: ______________________ Driller: ______________

EA Engineering, P.C.
EA Science and Technology

LOG OF SURFACE SOIL

Coordinates: Northing: ____________ Easting: ____________
Surface Elevation: ____________________________
Reference Elevation: ____________________________
Reference Description: ____________________________

Job. No.	**Client:** NYSDEC **Project:**	**Location**
Sampling Location Description:		**Sample Location ID:**
		Sheet 1 of 1
		Sampling Date/Time

Sample Method:	**Start**	**Finish**
	DATE TIME	DATE TIME

Sample Interval (in.)	PID (ppm)	TCL VOCs	TCL SVOCs	TCL Metals	TCL PCBs/ Pesticides	USCS Log	**Surface Conditions:** **Weather:** **Temperature:**

Logged by: ____________________ **Date:** ____________

Sample Interval: ____________________ **Time:** ____________

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EA Science and Technology

Job. No.	**Client:** NYSDEC **Project:**	**Location**	
Sampling Location Description:		**Sample Location ID:**	
		Sheet 1 of 1	
Sample Method:			
Depth of Water Body:		**Sampling Date/Time**	
Width of Water Body:		**Start**	**Finish**
Water Body Location		DATE	DATE
		TIME	TIME

Log of Surface Water Sample Collection

Coordinates: Northing: Easting:
Surface Water Elevation:
Reference Elevation:
Reference Description:

	Water Quality Parameters						
	Time (hrs)	**pH (pH units)**	**Cond. (mS/cm)**	**Turb. (ntu)**	**DO (mg/L)**	**Temp (°C)**	**ORP (mV)**

Surface Conditions:
Weather:

Description of Surface Water

Total Quantity of Water Removed (gal):
Samplers:
Sampling Date:

Sampling Time:
Split Sample With:
Sample Type:

EA Engineering, P.C.
EA Science and Technology

LOG OF TEST PIT

Job. No.	**Client:** NYSDEC **Project:**	**Location**	
Sampling Location Description:		**Sample Location ID:**	
		Sheet 1 of	
Sample Method:			
Depth of Test Pit:		**Sampling Date/Time**	
Depth to Bedrock (ft bgs):		**Start**	**Finish**
Groundwater Encountered (ft bgs):		DATE	DATE
Dispostion of Test Pit:		TIME	TIME

Coordinates: Northing: Easting:

Surface Elevation:

Reference Elevation:

Reference Description:

Surface Conditions:

Weather:

Depth Interval (ft bgs)	**PID (ppm)**	**Analysis**						**USCS Log**	**Description of Material**
		TCL VOCs	**TCL SVOCs**	**TCL Metals**	**TCL PCBs/ Pesticides**	**Other**	**Other**		

Logged by: **Date:**

Sample Interval: **Time:**

Attachment B

Health and Safety Plan Addendum

Health and Safety Plan Addendum
Admiral Cleaners (401075)
Watervliet, New York

Prepared for

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

Prepared by

EA Engineering, P.C., and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211
(315) 431-4610

March 2018
Version: FINAL
EA Project No. 14907.38

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Health and Safety Plan Addendum
Admiral Cleaners (401075)
Watervliet, New York

Prepared for

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

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Prepared by

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Donald Ca
12 March 2018
Donald F. Conan, P.E., Contract Manager — Date
EA Engineering, P.C.

12 March 2018
Christopher Schroer, Project Manager — Date
EA Science and Technology

March 2018
Version: FINAL
EA Project No. 14907.38

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LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CSP	Certified Safety Professional
dBA	Decibel(s)
DER	Division of Environmental Remediation
DOW	Department of Water
EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
ft	Foot (feet)
HASP	Health and Safety Plan
IDW	Investigative-derived waste
MOU	Memorandum of Use
No.	Number
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
PCE	Tetrachloroethene
P.E.	Professional Engineer
P.G.	Professional Geologist
PPE	Personal protective equipment
ppm	Parts per million
RI	Remedial investigation
SSHO	Site Health and Safety Officer
SVI	Soil vapor intrusion

1. INTRODUCTION

1.1 GENERAL

A Generic Health and Safety Plan (HASP) (EA Engineering, P.C. and Its Affiliate EA Science and Technology [EA] 2011)[1] was developed for field activities performed under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract Number (No.) D007624. This HASP Addendum is to supplement the Generic HASP with site-specific information to protect the health and safety of personnel while performing field investigation activities to complete implementation of a Soil Vapor Intrusion (SVI) Evaluation and Remedial Investigation (RI) for the Admiral Cleaners Site (Site), Watervliet, Albany County, New York (NYSDEC Site No. 401075).

This HASP Addendum describes the safety organization, procedures, and protective equipment that have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential for accidents or injuries to occur. One copy of the Generic HASP (EA 2011a)[1] and this HASP Addendum will be maintained for use during the scheduled field investigation activities. The copies will be made available for site use and employee review at all times.

This HASP Addendum addresses regulations and guidance practices set forth in the Occupational Safety and Health Administration (OSHA) Standards for Construction Industry, 29 Code of Federal Regulations (CFR) 1926, including 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response and 29 CFR 1926.59, Hazardous Communications.

The following are provided as appendixes:

- **Appendix A:** Worker Training and Physical Examination Record
- **Appendix B:** Health and Safety Plan Addendum Review Record
- **Appendix C:** Site Entry and Exit Log
- **Appendix D:** Accident/Loss Report
- **Appendix E:** Emergency Telephone Numbers and Hospital Directions
- **Appendix F:** Emergency Equipment Available Onsite
- **Appendix G:** Personal Protective Equipment Activity Record
- **Appendix H:** Safety Data Sheets.

Note: This site-specific HASP Addendum should be left open to display Appendix E (Emergency Telephone Numbers and Hospital Directions) and made available to all site personnel in a conspicuous location for the duration of field investigation activities in the event of an emergency.

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[1] EA. 2011a. *Generic HASP for Work Assignments under NYSDEC Contract No. D007624.* April.

1.2 SITE DESCRIPTION

The Site is comprised of a rectangular parcel totaling 0.17 acres located at 617 19th Street, Watervliet, Albany County, New York (Figures 1 and 2), between 6th Avenue and 7th Avenue. The parcel has approximately 45 feet (ft) of frontage on 19th Street and a depth of about 100 ft. The Site consists of a vacant brick/concrete block commercial building that takes up approximately 75 percent of the property and a small grassy yard located behind the building. The yard is enclosed by a wooden fence. The Site is located in an urban area with mixed commercial and residential use. The Site is bordered by an unoccupied residential building to the west, a mixed-use building containing a commercial day care and private residences to the east, and residences to the north.

1.3 SITE HISTORY

The building was constructed in 1950 has been used as a dry cleaning facility from 1950 until 2013. The Site was then operated as a dry cleaning drop shop, where garments are brought in and sent to be dry cleaned at another local facility, until 2017.

During its operation, the facility used tetrachloroethene (PCE) as a cleaning solvent. In 1999, the facility was registered as an air contamination source. A Consent Order was issued in 2007, ordering the facility to obtain required owner/manager and operator dry cleaning certifications. In November 2008, a third-party inspection indicated that PCE concentrations in the facility’s drum was at 845 parts per million (ppm), above the limit of 300 ppm published in 6 New York Codes, Rules and Regulations (NYCRR) 232.6(a)(6). NYSDEC performed an additional inspection in February 2009, resulting in a second Consent Order. During this inspection, NYSDEC discovered that the facility had failed to comply with the 2007 consent order or the 2008 inspection remedy, and found evidence of improper disposal of PCE-contaminated wastes (NYSDEC 2009).[2] Dry cleaning operations ceased in 2013 due to continued violations of environmental regulations.

1.4 POLICY STATEMENT

EA will take every reasonable step to provide a safe and healthy work environment, and to eliminate or control hazards in order to minimize the possibility of injuries, illnesses, or accidents to site personnel. EA and EA subcontractor employees will be familiar with this HASP Addendum for the project activities that they are involved in. Prior to entering the Site, the HASP Addendum will be reviewed and an agreement to comply with the requirements will be signed by EA personnel, subcontractors, and visitors (Appendix B).

Operational changes that could affect the health and safety of site personnel, the community, or the environment will not be made without approval from the Project Manager and the Program Health and Safety Officer. This document will be periodically reviewed to ensure that

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[2] NYSDEC. 2009. *Order on Consent File No. R4-2009-0219-25.* April.

it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification to the HASP Addendum. Such changes will be documented in the form of a revision to this Addendum.

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2. KEY PERSONNEL

The following table contains information on key project personnel:

Title	Name	Telephone No.
NYSDEC Project Manager	Joshua Haugh	518-357-2008
Program Health and Safety Officer	Peter Garger, CIH, CSP	410-527-2425
Program Manager	Donald Conan, P.E.	315- 877-7403
Quality Assurance/Quality Control Officer	Frank Barranco	410-584-7000
Project Manager	Christopher Schroer	315-565-6565
Site Manager/Site Health and Safety Officer	Amanda Kohn, P.G.	315-565-6548
Site Geologist	Stephen Soldner	315-565-6566
Site Geologist	Erica Thieleman	315-565-6562
Note: CIH = Certified Industrial Hygienist CSP = Certified Safety Professional P.E. = Professional Engineer P.G. = Professional Geologist		

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3. SCOPE OF WORK

This HASP Addendum was developed to designate and define site-specific health and safety protocols applicable to project activities to be implemented and followed during field activities and consulting work at the Site. The scope of work covered by this HASP Addendum includes the following:

- Geophysical evaluation
- Evaluation of surface soil
- Evaluation of subsurface soil
- Evaluation of groundwater
- Evaluation of soil vapor
- Waste storage and disposal.

Each of these activities is summarized below and additional detail for each activity is provided in the Letter Work Plan (EA 2018)[3].

3.1 SOIL VAPOR INTRUSION EVALUATION

EA will conduct a SVI evaluation of the Admiral Cleaner building and nearby structures/residences, including the collection of sub-slab soil vapor samples, indoor ambient air samples, and outdoor ambient air samples, as described in the letter Work Plan (EA 2018)[3]. The purpose of the SVI evaluation is to evaluate the migration of vapors into onsite and offsite residential and commercial structures.

3.2 GEOPHYSICAL EVALUATION

EA will conduct a geophysical survey using ground-penetrating radar technology across the entire site (0.17 acre) to identify and/or locate any potential areas of concern (e.g., buried drums and debris) that may be present as a result of historical operations at the Site. The goal of the survey will be to identify areas for intrusive soil boring and soil sampling activities.

3.3 EVALUATION OF SUBSURFACE SOIL

EA will implement an onsite subsurface soil sampling program using direct-push methodologies as described in the Letter Work Plan (EA 2018)[3]. The purpose of the subsurface soil evaluation is to evaluate the potential for the presence of onsite materials and evaluate the nature of potential toxicity of the onsite soil through laboratory analysis. A total of 30 soil borings will be completed and each soil boring location will be based on the geophysical evaluation, which will determine the potential presence of areas of concern. One subsurface soil sample will be collected from each soil boring.

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[3] EA. 2018. *Draft Remedial Investigation/Feasibility Study Letter Work Plan. Admiral Cleaners (401075).* January.

3.4 EVALUATION OF GROUNDWATER

EA will install temporary and permanent overburden monitoring wells using direct-push methodologies and complete 2 groundwater sampling events at the Site as described in the Letter Work Plan (EA 2018)[3]. Each monitoring well will be completed as a flush mount with a curb box. A total of 11 temporary and 5 permanent monitoring wells will be installed and sampled. All monitoring wells will be installed in accordance with the Division of Environmental Remediation (DER-10) Technical Guidance for Site Investigation and Remediation (NYSDEC 2010)[4].

3.5 EVALUATION OF SOIL VAPOR

EA will install a total of 6 soil vapor monitoring points and complete 2 soil vapor sampling events at the Site as described in the Letter Work Plan (EA 2017)[3]. Each soil vapor monitoring point will be installed using direct-push methods to approximately 6 to 8 ft below grade. Soil vapor samples will be collected to characterize soil vapor contamination within the vadose zone. Subsequent to the sampling event, sample tubing will be removed and the soil vapor monitoring point will be backfilled with bentonite. Soil vapor monitoring points installed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

3.6 WASTE STORAGE AND DISPOSAL

EA is responsible for the proper storage, handling, and disposal of investigative-derived waste (IDW) including personal protective equipment (PPE); solids and liquids generated during soil boring, soil sampling, monitoring well installation, well development, well sampling, soil vapor point installation, and soil vapor sampling activities.

IDW; including PPE, solids and liquids generated during the well drilling, well development, and well sampling activities, will be stored, handled, and disposed of in accordance with the EA's Generic Field Activities Plan (EA 2011b) [5], the NYSDEC and Department of Water (DOW) Memorandum of Use (MOU) on short-term discharge limits, and the Letter Work Plan (EA 2017)[3]. Drummed materials will be clearly labeled as to their contents and origin. Drill cuttings and purge water will be will be stored onsite and managed in accordance with NYSDEC DER-10, pending analytical results from the RI.

Accordingly, handling and disposal will be as follows:

- Liquids generated from contaminated equipment decontamination that exhibit visual staining, sheen, or discernable odors will be collected in drums or other containers at the point of generation. They will be stored in the staging area. A licensed waste subcontractor will then remove the drums and dispose at an offsite location.

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[4] NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

[5] EA. 2011b. *Generic Field Activities Plan for Work Assignments under NYSDEC Contract D007624.* April.

- Liquid generated during well purging or a decontamination activity that does not exhibit visible staining, sheen, or discernable odors will be containerized and staged onsite until an appropriate treatment/disposal procedure has been determined based on the short-term discharge limits described in the MOU (NYSDEC/DOW), after the completion of the RI investigation.

- Soil and rock cuttings from drilling operations will be containerized and staged onsite until an appropriate treatment/disposal procedure has been determined after the completion of the RI investigation.

- Used protective clothing and equipment that is suspected to be contaminated with hazardous waste will be placed in plastic bags, packed in 55-gallon ring-top drums, and transported to the drum staging area.

- Non-contaminated trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.

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4. POTENTIAL HAZARD ANALYSIS

Based on the field activities detailed in Section 3, the following potential hazard conditions may be anticipated:

- The use of mechanical and construction equipment such as Geoprobes®, drill rigs, front loaders, dump trucks, backhoes, excavators, and bobcats can create a potential for crushing and pinching hazards due to movement and positioning of the equipment. In addition, the ambient noise levels around heavy equipment machinery can cause disorientation and reduced awareness levels. Hard hats and steel toe boots are required when working around this type of equipment.

- Personnel may be injured during physical lifting and handling of equipment, construction materials, or containers. Additionally, personnel may encounter slip, trip, and fall hazards associated with sampling activities. Precautionary measures should be taken in accordance with the Generic HASP (EA 2011a)[1] and this HASP Addendum.

- Field operations conducted during the winter months can impose excessive heat loss to personnel conducting strenuous activities during unseasonably cold weather days, and can impose cold-related illness symptoms during unseasonably cold weather days or when the wind chill is high. In addition, heavy rains, electrical storms, and high winds may create extremely dangerous situations for employees.

- Field operations conducted during the summer months can impose heat stress on field personnel conducting strenuous activities during unseasonably hot weather days. Because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses and be able to recognize these signs and symptoms in both themselves and their co-workers.

- Work around large equipment often creates excessive noise. Noise can cause workers to be startled, annoyed, or distracted; can cause physical damage to the ear, pain, and temporary and/or permanent hearing loss; and can interfere with communication. If workers are subjected to noise exceeding an 8-hour time-weighted average sound level of 85 decibels (dBA), hearing protection will be selected with an appropriate noise reduction rating to comply with 29 CFR 1910.95 and to reduce noise below levels of concern.

- Entry into a confined space in support of this project is forbidden.

- Field investigation activities intended to define potential sources of environmental contamination often require employees to be in direct proximity or contact with hazardous substances. Employees may be exposed through inhalation of toxic dusts, vapors, or gases. Normal dust particulates from surficial soil may have adsorbed or absorbed toxic solvents, petroleum compounds, or toxic metal salts or metal particulates. Air monitoring equipment will be used to monitor airborne organic vapors and particulates. Toxic materials contained in dusts or particulates can be ingested if eating, smoking, drinking, and gum chewing prior to personnel washing their hands and face or removing contaminated work clothing and PPE. Some chemicals may be absorbed directly through the skin. PPE, properly designed for the chemicals of concern, will always be provided and worn when a potential for skin contact is present.

- Biological Hazards—Potential hazards may be present at the Site due to bites from stray domestic and wild animals (to include rodents), spiders, bees, and other venomous anthropods. Potential hazards may also be present at the Site in the form of poisonous plant life, which can result in skin rashes or abrasions. In the case of an animal or insect bite that can be serious or fatal, workers must seek immediate medical attention and report the incident to the Site Health and Safety Officer (SSHO) prior to leaving the Site. An employee known to be allergic or sensitive to poisonous insects should alert the Site Manager and SSHO.

- The potential chemicals of concern present at the site include, but are not limited to, volatile organic compounds and semi-volatile organic compounds.

- Safety data sheets for chemicals that may be used onsite are provided in Appendix H.

5. PERSONAL PROTECTIVE EQUIPMENT

Based upon currently available information, it is anticipated that Level D PPE will be required for currently anticipated conditions and activities. If, at any time, the sustained level of total organic vapors in the worker breathing zone exceeds 5 ppm above background, site workers will evacuate the area and the condition will be brought to the attention of the Site Safety and Health Officer (SSHO). Efforts will be undertaken to mitigate the source of the vapors. Once the sustained level of total organic vapors decreases to below 5 ppm above background, site workers will be allowed to continue activities at the direction of the SSHO. If dust levels exceed the OSHA (EA 2011a)[1]. Permissible exposure limit; dust masks will be worn by all onsite personnel until dust suppression using water methods reduce the levels.

The PPE components for use during this project are detailed in the Generic HASP (EA 2011a)[1]. The components of Level D PPE are summarized below. Level D will be worn for initial entry onsite and for all activities and will consist of the following:

- Coveralls or appropriate work clothing
- Steel toe, steel shank safety boots/shoes
- Hard hats (when overhead hazards are present or as required by the SSHO
- Chemical resistant gloves (nitrile/neoprene) when contact with potentially contaminated soil or water is expected
- Safety glasses with side shields
- Hearing protectors (during operations producing excessive noise).

Insulated clothing, hats, etc. must be worn when temperatures or wind chill fall below 40 degrees Fahrenheit.

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6. SITE CONTROL AND SECURITY

Only authorized personnel will be permitted to conduct field activities. Authorized personnel include those who have completed hazardous waste operations initial training, as defined under OSHA 29 CFR 1910.120/29 CFR 1926.65, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations.

6.1 SAFE WORK PRACTICES

Safe work practices that will be followed by site workers include, but are not limited to, the following rules:

- Working before or after daylight hours without special permission is prohibited.
- Do not enter restricted or posted areas without permission from the SSHO.
- Smoking onsite is prohibited.
- Possessing, using, purchasing, distributing, or having controlled substances in their system throughout the day or during meal breaks is prohibited.
- Consuming or possessing alcoholic beverages is prohibited.
- Good housekeeping—employees will be instructed about housekeeping throughout field activities.
- Sitting or kneeling in areas of obvious contamination is prohibited.
- Avoid overgrown vegetation and tall grass areas.

6.2 DAILY STARTUP AND SHUTDOWN PROCEDURES

The following protocols will be followed daily prior to start of work activities:

- The SSHO will review site conditions to determine if modification of work and safety plans is needed.
- Personnel will be briefed and updated on new safety procedures as appropriate.

- Safety equipment will be checked for proper function.

- The SSHO will ensure that the first aid kit is adequately stocked and readily available.

- Onsite equipment and supplies will be locked and secure.

6.3 PEDESTRIAN PROTECTION MEASURES

The following protocols will be followed to protect the public while construction activities are occurring.

- Cones and caution tape will be used around the drill rig and work area to prevent pedestrians from entering the work space.

- Drilling activities will avoid blocking pedestrian walkways, if a walkway is partially blocked due to construction activities an alternate pathway will be provided.

- When mobilizing a drill to the Site, an individual that is not operating the drill rig will be directing pedestrians.

Appendix A

Worker Training and
Physical Examination Record

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Worker Training and Physical Examination Record

SITE: Admiral Cleaners, Watervliet, New York

Name	OSHA 40-hour Hazardous Waste Operations Training		OSHA Hazardous Waste Supervisor Training	CPR (date of expiration)	First Aid (date of expiration)	Date of Last Physical Examination
	Initial	Annual				
EA PERSONNEL						
Christopher Schroer	8/25/2005	3/14/2017	7/21/2009	12/20/2018	12/20/2018	4/11/2017
Amanda Kohn, P.G.	6/15/2007	9/7/2016	7/28/2009	4/21/2017	4/21/2017	4/11/2017
Stephen Soldner	11/20/2009	6/23/2017	1/26/2017	4/21/2018	4/21/2018	1/26/2017
Erica Thieleman	6/24/2016	5/19/2017	—	6/24/2018	6/24/2018	1/22/2018
SUBCONTRACTOR OR ADDITIONAL PERSONNEL						
To be determined	—	—	—	—	—	—

Prior to performing work at the site, this Health and Safety Plan Addendum must be reviewed and an agreement to comply with the requirements must be signed by all personnel, including contractors, subcontractors, and visitors. Contractors and subcontractors are ultimately responsible for ensuring that their own personnel are adequately protected. In signing this agreement, the contractors and subcontractors acknowledge their responsibility for the implementation of the Health and Safety Plan Addendum requirements. All personnel onsite shall be informed of the site emergency response procedures and any potential safety or health hazards of the operations.

Note:
CPR = Cardiopulmonary resuscitation
EA = EA Engineering, P.C. and Its Affiliate EA Science and Technology
OSHA = Occupational Safety and Health Administration

Appendix B

Health and Safety Plan Addendum Review Record

HEALTH AND SAFETY PLAN ADDENDUM REVIEW RECORD

I have read the Health and Safety Plan Addendum for this site and have been briefed on the nature, level, and degree of exposure likely as a result of participation in this project. I agree to conform to all the requirements of this Plan.

SITE: Admiral Cleaners, Watervliet, New York

Name	Signature	Affiliation	Date

Appendix C

Site Entry and Exit Log

SITE ENTRY AND EXIT LOG

SITE: Admiral Cleaners, Watervliet, New York

Name	Date	Time of Entry	Time of Exit	Initials

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Appendix D

Accident/Loss Report

ACCIDENT/LOSS REPORT

This report must be completed by the injured employee or supervisor and faxed to EA corporate headquarters within 24 hours of any accident. **Fax number: (410) 771-1780.**

Note: Whenever an employee is sent for medical treatment for a work related injury or illness, **page 4 of this report** must accompany that individual to ensure that all invoices, bills, and correspondence are sent to Human Resources for a timely response.

A. DEMOGRAPHIC INFORMATION		
Name of injured employee:		
Home address:		
Home telephone:		
Date of birth:	Age:	Sex: M F
Marital status:	Name of spouse (if applicable):	
Social security number:		Date of hire:
Number of dependents:		
Employee job title:	Department regularly employed:	
Was employee injured on the job: yes or no		
Primary language of employee:		

B. ACCIDENT/INCIDENT INFORMATION	
Date of accident:	Time of accident:
Reported to whom:	Name of supervisor:
Exact location where accident occurred (include street, city, state, and county):	
Explain what happened (include what the employee was doing at the time of the accident and how it occurred):	
Describe the injury and the specific part of the body affected (i.e., laceration, right hand, third finger):	
Object or substance that directly injured the employee:	
Number of days and hours employee usually works per week:	
Is the employee expected to lose at least one full day of work?	
Does the employee have a previous claim? yes or no	If yes, status? open or closed
Was the employee assigned to restricted duty? yes or no	If yes, describe:

ACCIDENT/LOSS REPORT

C. ACCIDENT INVESTIGATION INFORMATION
Was safety equipment provided? yes or no If yes, was it used? yes or no
Was an unsafe act being formed? yes or no If yes, describe:
Was a machine part involved? yes or no If yes, in what way?
Was the machine part defective? yes or no If yes, in what way?
Was a third party responsible for the accident/incident: yes or no If yes, list name, address, and telephone number.
Was the accident/incident witnessed? yes or no If yes, list name, address, and telephone number.

D. PROVIDER INFORMATION
Was first aid given onsite? yes or no
If yes, what type of medical treatment given?
Physician information (if medical attention was administered): Name: Address (include city, state, and zip): Telephone:
Hospital address (include name, address, city, state, zip code, and telephone number):
Was the employee hospitalized? yes or no If yes, on what date?
Was the employee treated as an outpatient, receive emergency treatment or ambulance service? yes or no
Please attach the physician's written return to work slip.
Note: A physician's return to work slip is required prior to allowing the worker to return to work.

E. AUTOMOBILE ACCIDENT INFORMATION (complete if applicable)	
Authority contacted and report number:	
EA employee's vehicle year, make, and model:	
V.I.N.	Plate/tag number:
Owner's name and address:	
Driver's name and address:	
Relationship to insured?	
Driver's license number?	

ACCIDENT/LOSS REPORT

E. AUTOMOBILE ACCIDENT INFORMATION (continued)

Describe damage to ***your*** property:

Describe damage to ***other*** vehicle or property:

Other driver's name, address, and telephone:

Other driver's insurance company (include name, address and telephone number):

Location of other vehicle?

Name, address, and telephone of other injured parties:

Witness (include name, address, and telephone number):

Witness's statement:

Witness (include name, address, and telephone number):

Witness's statement:

F. ACKNOWLEDGEMENT

Name of supervisor:

Date of this report:

Report prepared by:

I have read this report and the contents as to how the accident/loss occurred are accurate to the best of my knowledge.

Signature (injured employee):   Date:

ACCIDENT/LOSS REPORT

I am seeking medical treatment for a work related injury/illness.
Please forward all bills/invoices/correspondence to:

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle
Suite 400
Hunt Valley, Maryland 21031

Attention: Michele Bailey

Human Resources

(410) 584-7000

Appendix E

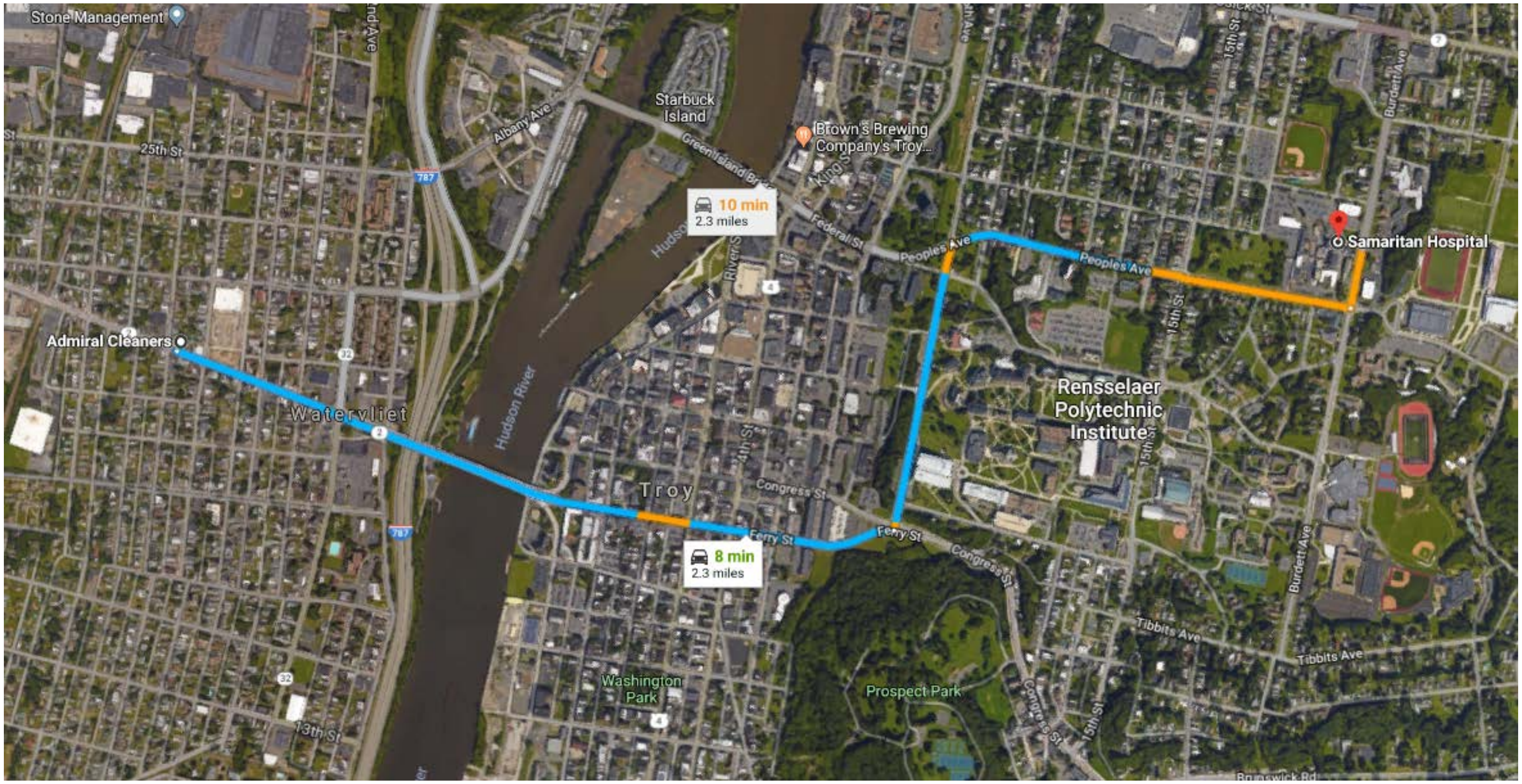
Emergency Telephone Numbers and Hospital Directions

EMERGENCY TELEPHONE NUMBERS AND HOSPITAL DIRECTIONS

Emergency Telephone Numbers

SITE: Admiral Cleaners, Watervliet, New York	
Police	9-1-1
Fire	9-1-1
Ambulance	9-1-1
Hospital: Samaritan Hospital	(518) 271-3300
Poison Control	(800) 222-1222
Program Safety and Health Officer: ***Peter Garger, CIH, CSP***	(410) 527-2425
Contract Manager: ***Donald Conan, P.E.***	(315) 877-7403
EA Project Manager ***Christopher Schroer***	(315) 565-6565 Office (315) 569-8308 Cell
In case of spill, contact ***James Hayward, P.E.***	(315) 565-6555
EA Medical Services (Physician) ***All One Health Services***	(800) 229-3674
Site Manager/Site Health and Safety Officer: ***Amanda Kohn, P.G.***	(315) 565-6548 Office (315) 506-2556 Cell
Site Geologist: ***Stephen Soldner***	(315) 565-6566 Office (315) 412-2684 Cell
Site Geologist ***Erica Thieleman***	(315) 565-6562 (732) 779-0405
In case of accident or exposure incident, contact Corporate Health and Safety Officer ***Peter Garger, CIH, CSP***	(410) 527-2425

Hospital Directions



1. Head East on NY-2 (Ferry St). Continue for 1.1 miles, crossing over the bridge into Troy, NY.
2. Turn Left onto 8th St., continue for 0.4 miles.
3. Turn right onto Peoples Ave., continue for 0.6 miles.
4. Turn left onto Burdett Ave, continue for 0.1 miles.
5. Samaritan Hospital will be on the left.

Appendix F

Emergency Equipment Available Onsite

EMERGENCY EQUIPMENT AVAILABLE ONSITE

Type of Equipment	Location
Communications Equipment	
Mobile Telephone	In EA vehicle
Medical Support Equipment	
First Aid Kits	In EA vehicle
Eye Wash Station	In EA vehicle
Firefighting Equipment	
Fire Extinguishers	In EA vehicle

Appendix G

Personal Protective Equipment Activity Record

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PERSONAL PROTECTIVE EQUIPMENT ACTIVITY RECORD

SITE: Admiral Cleaners, Watervliet, New York

Weather Condition:	Onsite Hours: From To

Changes in Personal Protective Equipment Levels[a]	Work Operations	Reasons for Change

Site Health and Safety Plan Violations	Corrective Action Specified	Corrective Action Taken (yes/no)

Observations and Comments:

Completed by:

____

Site Health and Safety Officer Date

(a) Only the Site Health and Safety Officer may change personal protective equipment levels, using only criteria specified in the Health and Safety Plan Addendum.

Appendix H

Safety Data Sheets

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SAFETY DATA SHEET
BENTONITE

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

PRODUCT NAME	BENTONITE
APPLICATION	Viscosifier.
SUPPLIER	M-I Drilling Fluids UK Ltd, Pocra Quay, Footdee, Aberdeen. AB11 5DQ T -44 (0)1224-584336 F -44 (0)1224-576119
EMERGENCY TELEPHONE	+44(0)208 762 8322

2 COMPOSITION/INFORMATION ON INGREDIENTS

Name	EC No.	CAS-No.	Content	Classification
BENTONITE	215-108-5	1302-78-9	80 - 95%	-
QUARTZ, CRYSTALLINE SILICA	238-878-4	14808-60-7	2 -15%	Xn;R20.

The Full Text for all R-Phrases are Displayed in Section 16

COMPOSITION COMMENTS

This material is a naturally occurring mineral. The Data Shown is in accordance with the latest EC Directives. This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the maximum exposure limit may lead to chronic lung disease such as silicosis.

3 HAZARDS IDENTIFICATION

Not regarded as a health or environmental hazard under current legislation.

HUMAN HEALTH

This product contains a small quantity of quartz. IARC Monographs, Vol.68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or crystobalite from occupational sources causes cancer in humans. IARC classification Group 1.

4 FIRST-AID MEASURES

INHALATION

Move the exposed person to fresh air at once. Get medical attention if any discomfort continues.

INGESTION

First aid is not normally required. Rinse mouth thoroughly. Drink plenty of water.

SKIN CONTACT

Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.

EYE CONTACT

Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

UNUSUAL FIRE & EXPLOSION HAZARDS

No unusual fire or explosion hazards noted.

PROTECTIVE MEASURES IN FIRE

Self contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

Wear protective clothing as described in Section 8 of this safety data sheet.

ENVIRONMENTAL PRECAUTIONS

Do not allow to enter drains, sewers or watercourses.

SPILL CLEAN UP METHODS

Shovel into dry containers. Cover and move the containers. Flush the area with water. May be slippery when wet.

7 HANDLING AND STORAGE

USAGE PRECAUTIONS

Avoid handling which leads to dust formation. Provide good ventilation. Mechanical ventilation or local exhaust ventilation may be required
.

STORAGE PRECAUTIONS

Store at moderate temperatures in dry, well ventilated area.

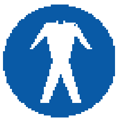
8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	Std	LT - ppm	LT - mg/m3	ST - ppm	ST - mg/m3
QUARTZ, CRYSTALLINE SILICA	WEL		0.3 mg/m3 resp. dust		
BENTONITE			4 mg/m3 resp. dust		

INGREDIENT COMMENTS

WEL = Workplace Exposure Limits * OSHA PELs for Mineral Dusts containing crystalline silica are 10 mg/m3 / (%SiO2+2) for quartz and 1/2 the calculated quartz value for cristobalite and tridymite. NUI = Nuisance Dust. WEL TWA 4mg/m3 respirable dust, 10mg/m3 total dust.

PROTECTIVE EQUIPMENT



ENGINEERING MEASURES

Provide adequate general and local exhaust ventilation.

RESPIRATORY EQUIPMENT

Respiratory protection must be used if air contamination exceeds acceptable level. Dust filter P3 (for especially fine dust/powder).

HAND PROTECTION

No specific hand protection noted, but gloves may still be advisable. For prolonged or repeated skin contact use suitable protective gloves
. Rubber or plastic.

EYE PROTECTION

Wear dust resistant safety goggles where there is danger of eye contact.

OTHER PROTECTION

Wear appropriate clothing to prevent repeated or prolonged skin contact. Provide eyewash station.

9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Powder, dust		
COLOUR	Cream to Grey		
ODOUR	Odourless		
SOLUBILITY	Insoluble in water		
RELATIVE DENSITY	2.3 - 2.6 20	BULK DENSITY	769 - 833 kg/m3
pH-VALUE, CONC. SOLUTION	9 - 10		

10 STABILITY AND REACTIVITY

STABILITY

Stable under normal temperature conditions.

CONDITIONS TO AVOID

Avoid wet and humid conditions.

MATERIALS TO AVOID

No incompatible materials noted.

HAZARDOUS DECOMPOSITION PRODUCTS

No specific hazardous decomposition products noted.

11 TOXICOLOGICAL INFORMATION

INHALATION

Dust may irritate respiratory system or lungs. Harmful: danger of serious damage to health by prolonged exposure through inhalation.

INGESTION

May cause discomfort if swallowed.

SKIN CONTACT

Powder may irritate skin.

EYE CONTACT

Particles in the eyes may cause irritation and smarting.

HEALTH WARNINGS

This product contains small quantities of quartz. Prolonged inhalation of high concentrations may damage respiratory system. Because of quantity and composition, the health hazard is small.

12 ECOLOGICAL INFORMATION

ECOTOXICITY

Not regarded as dangerous for the environment. Contact M-I Swaco's QHSE Department for ecological information.

13 DISPOSAL CONSIDERATIONS

DISPOSAL METHODS

Recover and reclaim or recycle, if practical. Dispose of waste and residues in accordance with local authority requirements.

14 TRANSPORT INFORMATION

GENERAL	The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

15 REGULATORY INFORMATION

RISK PHRASES

NC	Not classified.

SAFETY PHRASES

NC	Not classified.

UK REGULATORY REFERENCES

The Control of Substances Hazardous to Health Regulations 1988. Chemicals (Hazard Information & Packaging) Regulations. IARC Monographs, Vol.68, 1997.

EU DIRECTIVES

Dangerous Substance Directive 67/548/EEC. Dangerous Preparations Directive 1999/45/EEC.

GUIDANCE NOTES

Workplace Exposure Limits EH40.

16 OTHER INFORMATION

GENERAL INFORMATION

HMIS Health - 1 HMIS Flammability - 1 HMIS Physical Hazard - 0 E - Safety glasses, Gloves, Dust Respirator

INFORMATION SOURCES

Material Safety Data Sheet, Misc. manufacturers. Transport of Dangerous Goods, Model Regulations, Tenth Revised Edition, United Nations.

REVISION COMMENTS

The following sections have been revised: 5, 6, 7, 8, 13, 14, 15 and 16. Revised by Bill Cameron

ISSUED BY

Sam Hoskin

REVISION DATE	23-09-05
REV. NO./REPL. SDS GENERATED	2
SDS NO.	10609

RISK PHRASES IN FULL

R20	Harmful by inhalation.

DISCLAIMER

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all apprlicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

SAFETY DATA SHEET

SDS ID NO.: 0290MAR019
Revision Date: 06/01/2016

1. IDENTIFICATION

Product Name: Marathon Petroleum No. 2 Ultra Low Sulfur Diesel

Synonym: #2 Diesel; No. 2 Ultra Low Sulfur Diesel 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 15 ppm Sulfur Max with Polar Plus; No. 2 Diesel, Motor Vehicle Use, Undyed; No. 2 Diesel, Motor Vehicle Use, Undyed, with Polar Plus; ULSD No. 2 Diesel 15 ppm Sulfur Max; ULSD No. 2 Diesel 15 ppm Sulfur Max with Polar Plus; No. 2 MV 15 Diesel; No. 2 MV 15 Diesel with Polar Plus; No. 2 Ultra Low Sulfur Diesel Dyed 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 Dyed 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 Dyed 15 ppm Sulfur Max with Polar Plus; No. 2 Diesel, Tax Exempt-Motor Vehicle Use, Dyed; No. 2 Diesel, Tax Exempt-Motor Vehicle Use, Dyed, with Polar Plus; ULSD No. 2 Diesel Dyed 15 ppm Sulfur Max; ULSD No. 2 Diesel Dyed 15 ppm Sulfur Max, with Polar Plus; No. 2 MV 15 Diesel Dyed; #2 MV 15 CFI Diesel; #2 MV 15 CFI Diesel Dyed; No. 2 Low Sulfur Diesel (TxLED); No. 2 MV 15 Diesel Dyed, with Polar Plus; No. 2 NRLM 15 Diesel Dyed; No.2 NRLM Diesel Dyed; No. 2 MV 500 ppm TxLED; No.2 Low Emission Low Sulfur Diesel; No. 2 Low Sulfur Diesel (TxLED) 500 ppm Sulfur Max; No. 2 Heating Oil 5000 NMA Unmarked; NEMA No. 2 Heating Oil; Heating Oil, No. 2 Low Sulfur 5000 ppm; No. 2 Ultra Low Sulfur Diesel Dyed with <6% Renewable Diesel Fuel; Ultra Low Sulfur No. 2 Diesel Dyed with <6% Renewable Diesel Fuel; No. 2 Diesel Dyed with <6% Renewable Diesel Fuel 15 ppm Sulfur Max; No. 2 Ultra Low Sulfur Diesel with <6% Renewable Diesel Fuel; Ultra Low Sulfur No. 2 Diesel with <6% Renewable Diesel Fuel; No. 2 Diesel with <6% Renewable Diesel Fuel 15 ppm Sulfur Max; Garyville Export Diesel; Export Diesel, Garyville; Diesel Fuel, Export Garyville; #2 Motor Vehicle ULSD 15 ppm with 0-5% Renewable Diesel; Marathon No. 2 ULSD with 0-5% Renewable Fuel with R100; Marathon No. 2 ULSD with 0-5% Renewable Fuel with R99; No. 2 Heating Oil 2000 ppm Sulfur Max, Clear (Undyed) Unmarked;Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Clear (Undyed) Unmarked; ULS Heating Oil 15 ppm Clear (Undyed) Unmarked; ULS HO 15 ppm CLR; Ultra-Low Sulfur Heating Oil (<= 15ppm, Undyed); No. 2 Heating Oil 2000 ppm Sulfur Max, Dyed Unmarked; No. 2 Heating Oil 2000 ppm Sulfur Max, Dyed Marked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Dyed Unmarked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Dyed Marked;15 ppm Sulfur Heating Oil Grade 67; 15 PPM Heating Oil; 15 PPM Dyed Heating Oil; 0291MAR019; 0306MAR019; 0308MAR019; 0334MAR019; 0335MAR019; 0336MAR019; 0337MAR019; 0340MAR019;

Chemical Family: Complex Hydrocarbon Substance

Recommended Use: Fuel.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:
MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 2
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Specific target organ toxicity (repeated exposure)	Category 2
Aspiration toxicity	Category 1
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)
Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
May be fatal if swallowed and enters airways
Harmful if inhaled
Causes skin irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
May cause damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure
Toxic to aquatic life with long lasting effects

Appearance Yellow to Red Liquid **Physical State** Liquid **Odor** Hydrocarbon

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use only non-sparking tools.
Use explosion-proof electrical/ventilating/lighting/equipment
Take precautionary measures against static discharge
Do not breathe mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

No. 2 Ultra Low Sulfur Diesel is a complex mixture of paraffins, cycloparaffins, olefins and aromatic hydrocarbon chain lengths predominantly in the range of eleven to twenty carbons. May contain up to 5% Renewable Diesel. May contain small amounts of dye and other additives (<0.15%) which are not considered hazardous at the concentration(s) used. May contain a trace amount of benzene (<0.01%). Contains a trace amount of sulfur (<0.0015%)

Composition Information:

Name	CAS Number	% Concentration
No. 2 Diesel Fuel	68476-34-6	50-100
Kerosine, Petroleum	8008-20-6	0-50
Alkanes, C10-C20 branched and linear	928771-01-1	0-5
Naphthalene	91-20-3	0.3-2.6

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

4. FIRST AID MEASURES

First Aid Measures

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause adverse effects to the thymus, liver, and bone marrow.

Indication of any immediate medical attention and special treatment needed

Notes To Physician: INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical

This product has been determined to be a flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products

Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to Mechanical Impact No.

Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters
Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material. Keep run-off water out of sewers and water sources.

Additional firefighting tactics
FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 2	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. All contaminated surfaces will be slippery.
Protective equipment:	Use personal protection measures as recommended in Section 8.
Emergency procedures:	Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.
Environmental precautions:	Avoid release to the environment. Avoid subsoil penetration.
Methods and materials for containment:	Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
Methods and materials for cleaning up:	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions:	NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements. Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists

from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers.

A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling.

Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions: Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible Materials Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
No. 2 Diesel Fuel 68476-34-6	100 mg/m³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route	-	-	-
Kerosine, Petroleum 8008-20-6	200 mg/m³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route	-	-	-
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	-	-
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	10 ppm TWA 50 mg/m³ TWA 15 ppm STEL 75 mg/m³ STEL	250 ppm

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required in an enclosed area or with inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection:	Use goggles or face-shield if the potential for splashing exists.
Skin and body protection:	Wear neoprene, nitrile or PVA gloves to prevent skin contact. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.
Respiratory protection:	Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.
Hygiene measures:	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Yellow to Red Liquid
Color	Yellow to Red
Odor	Hydrocarbon
Odor Threshold	No data available.

Property	**Values (Method)**
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	154-366 °C / 310-691 °F (ASTM D86)
Flash Point	58-76 °C / 136-168 °F (ASTM D93)
Evaporation Rate	No data available.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	No data available.
Lower Flammability Limit:	No data available.
Explosion limits:	No data available.
Vapor Pressure	No data available.
Vapor Density	No data available.
Specific Gravity / Relative Density	0.82-0.86 (ASTM D4052)
Water Solubility	No data available.
Solubility in other solvents	No data available.
Partition Coefficient	No data available.
Decomposition temperature	No data available.
pH:	Not applicable
Autoignition Temperature	No data available.
Kinematic Viscosity	1.90-3.32 cSt @ 40°C (ASTM D445)
Dynamic Viscosity	No data available.
Explosive Properties	No data available.
VOC Content (%)	No data available.
Density	No data available.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity	The product is non-reactive under normal conditions.
Chemical stability	The material is stable at 70°F, 760 mmHg pressure.

Possibility of hazardous reactions	None under normal processing.
Hazardous polymerization	Will not occur.
Conditions to avoid	Excessive heat, sources of ignition, open flame.
Incompatible Materials	Strong oxidizing agents.
Hazardous decomposition products	None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation	Harmful if inhaled. May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.
Eye contact	Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness.
Skin contact	Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.
Ingestion	May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
No. 2 Diesel Fuel 68476-34-6	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	>1 - <5 mg/L (Rat) 4 h
Kerosine, Petroleum 8008-20-6	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.28 mg/L (Rat) 4 h
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	>1 - <5 mg/l (Rat) 4 h
Naphthalene 91-20-3	490 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 340 mg/m³ (Rat) 1 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

MIDDLE DISTILLATES, PETROLEUM: Long-term repeated (lifetime) skin exposure to similar materials has been reported to result in an increase in skin tumors in laboratory rodents. The relevance of these findings to humans is not clear at this time. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

MIDDLE DISTILLATES WITH CRACKED STOCKS: Light cracked distillates have been shown to be carcinogenic in animal tests and have tested positive with in vitro genotoxicity tests. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

DIESEL EXHAUST: The combustion of diesel fuels produces gases including carbon monoxide, carbon dioxide, oxides of nitrogen and/or sulfur, and hydrocarbons that can be irritating and hazardous with overexposure. Long-term occupational overexposure to diesel exhaust and diesel exhaust particulate matter has been associated with an increased risk of respiratory disease, including lung cancer, and is characterized as a “known human carcinogen” by the International Agency for Research on Cancer (IARC), as “a reasonably anticipated human carcinogen” by the National Toxicology Program, and as “likely to be carcinogenic to humans” by the EPA, based upon animal and occupational exposure studies. However, uncertainty exists with these classifications because of deficiencies in the supporting occupational exposure/epidemiology studies, including reliable exposure estimates. Lifetime animal inhalation studies with pulmonary overloading exposure concentrations of diesel exhaust emissions have produced tumors and other adverse health effects. However, in more recent long-term animal inhalation studies of diesel exhaust emissions, no increase in tumor incidence and in fact a substantial reduction in adverse health effects along with significant reductions in the levels of hazardous material emissions were observed and are associated with fuel composition alterations coupled with new technology diesel engines.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and Symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause damage to organs.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects None known.

Carcinogenicity Suspected of causing cancer.

Cancer designations are listed in the table below

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
No. 2 Diesel Fuel 68476-34-6	Confirmed animal carcinogen (A3)	Not Classifiable (3)	Not Listed	Not Listed
Kerosine, Petroleum 8008-20-6	Confirmed animal carcinogen (A3)	Not Classifiable (3)	Not Listed	Not Listed
Alkanes, C10-C20 branched and linear 928771-01-1	Not Listed	Not Listed	Not Listed	Not Listed
Naphthalene	Confirmed animal	Possible human carcinogen	Reasonably anticipated to	Not Listed

91-20-3	carcinogen (A3)	(2B)	be a human carcinogen	

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Thymus. Liver. Bone marrow.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
No. 2 Diesel Fuel 68476-34-6	-	96-hr LC50 = 35 mg/l Fathead minnow (flow-through)	-	48-hr EL50 = 6.4 mg/l Daphnia magna
Kerosine, Petroleum 8008-20-6	72-hr EL50 = 5.0-11 mg/l Algae	96-hr LL50 = 18-25 mg/l Fish	-	48-hr EL50 = 1.4-21 mg/l Invertebrates
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	-	-
Naphthalene 91-20-3	-	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	-	48-hr LC50 = 1.6 mg/l Daphnia magna

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
This material may be a flammable liquid waste.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper Shipping Name:	Fuel Oil, No. 2
UN/Identification No:	NA 1993
Transport Hazard Class(es):	3
Packing Group:	III

TDG (Canada):

UN Proper Shipping Name:	Diesel Fuel
UN/Identification No:	UN 1202
Transport Hazard Class(es):	3
Packing Group:	III

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b):	This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
No. 2 Diesel Fuel	NA
Kerosine, Petroleum	NA
Alkanes, C10-C20 branched and linear	NA
Naphthalene	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
No. 2 Diesel Fuel	NA
Kerosine, Petroleum	NA
Alkanes, C10-C20 branched and linear	NA
Naphthalene	100 lb final RQ 45.4 kg final RQ

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard
Fire Hazard
Chronic Health Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
No. 2 Diesel Fuel	None
Kerosine, Petroleum	None
Alkanes, C10-C20 branched and linear	None
Naphthalene	0.1 % de minimis concentration

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

No. 2 Diesel Fuel

Louisiana Right-To-Know: Not Listed
California Proposition 65: Not Listed
New Jersey Right-To-Know: SN 2444
Pennsylvania Right-To-Know: Not Listed
Massachusetts Right-To Know: Not Listed
Florida Substance List: Not Listed
Rhode Island Right-To-Know: Not Listed
Michigan Critical Materials Register List: Not Listed
Massachusetts Extraordinarily Hazardous Substances: Not Listed
California - Regulated Carcinogens: Not Listed
Pennsylvania RTK - Special Hazardous Substances: Not Listed
New Jersey - Special Hazardous Substances: Not Listed
New Jersey - Environmental Hazardous Substances List: SN 2444 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants: Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances: Not Listed

Kerosine, Petroleum
Louisiana Right-To-Know: Not Listed
California Proposition 65: Not Listed
New Jersey Right-To-Know: SN 1091
Pennsylvania Right-To-Know: Present
Massachusetts Right-To Know: Present
Florida Substance List: Not Listed
Rhode Island Right-To-Know: Not Listed
Michigan Critical Materials Register List: Not Listed
Massachusetts Extraordinarily Hazardous Substances: Not Listed
California - Regulated Carcinogens: Not Listed
Pennsylvania RTK - Special Hazardous Substances: Not Listed
New Jersey - Special Hazardous Substances: Not Listed
New Jersey - Environmental Hazardous Substances List: SN 1091 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants: Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances: Not Listed

Alkanes, C10-C20 branched and linear
Louisiana Right-To-Know: Not Listed
California Proposition 65: Not Listed
New Jersey Right-To-Know: Not Listed
Pennsylvania Right-To-Know: Not Listed
Massachusetts Right-To Know: Not Listed
Florida Substance List: Not Listed
Rhode Island Right-To-Know: Not Listed
Michigan Critical Materials Register List: Not Listed
Massachusetts Extraordinarily Hazardous Substances: Not Listed
California - Regulated Carcinogens: Not Listed
Pennsylvania RTK - Special Hazardous Substances: Not Listed
New Jersey - Special Hazardous Substances: Not Listed
New Jersey - Environmental Hazardous Substances List: Not Listed
Illinois - Toxic Air Contaminants: Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances: Not Listed

Naphthalene
Louisiana Right-To-Know: Not Listed
California Proposition 65: Carcinogen, initial date 4/19/02

New Jersey Right-To-Know:	SN 1322 SN 3758
Pennsylvania Right-To-Know:	Environmental hazard Present (particulate)
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen
New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	100 lb RQ (air); 1 lb RQ (land/water)

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
No. 2 Diesel Fuel	B3,D2A,D2B	0.1%
Kerosine, Petroleum	B3,D2B	1%
Alkanes, C10-C20 branched and linear	B3,D2A,D2B	0.1%
Naphthalene	B4,D2A	0.1%

Note: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety

Revision Date: 06/01/2016

Revision Note:

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

SDS ID NO.: 0130MAR019
Revision Date: 05/14/2015

1. IDENTIFICATION

Product Name:	Marathon Petroleum Regular Unleaded Gasoline With Ethanol
Synonym:	Regular Unleaded Gasoline With Alcohol
Chemical Family:	Complex Hydrocarbon Substance
Recommended Use:	Fuel.
Use Restrictions:	All others.

Supplier Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous according to the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 1
Skin corrosion/irritation	Category 2
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Aspiration toxicity	Category 1
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)
Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

EXTREMELY FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode

May be fatal if swallowed and enters airways
Causes skin irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause genetic defects
May cause cancer
Suspected of damaging fertility or the unborn child
Toxic to aquatic life with long lasting effects

Appearance Clear or Colored Liquid **Physical State** Liquid **Odor** Strong Hydrocarbon

Precautionary Statements - Prevention
Keep away from heat/sparks/open flames/hot surfaces. — No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Wear protective gloves/protective clothing/eye protection/face protection
Do not eat, drink or smoke when using this product
Do not breathe mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wash hands thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Gasoline is a complex combination of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons having molecular chains ranging in length from four to ten carbons. May contain small amounts of dye and other additives (>0.02%) which are not considered hazardous at the concentrations used.

Composition Information:

Name	CAS Number	Weight %
Gasoline	86290-81-5	100
Toluene	108-88-3	0.9-13.5
Ethyl Alcohol	64-17-5	5.7-10
Xylene (mixed isomers)	1330-20-7	1.8-9
1,2,4 Trimethylbenzene	95-63-6	0.9-4.5
Benzene	71-43-2	0.45-3.2
n-Hexane	110-54-3	0-2.7
Ethylbenzene	100-41-4	0.45-1.8
Naphthalene	91-20-3	0.1-0.5

4. FIRST AID MEASURES

First Aid Measures

General advice In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.
Delayed: Dry skin and possible irritation with repeated or prolonged exposure.

Indication of any immediate medical attention and special treatment needed

NOTES TO PHYSICIAN:	INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided. SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES. INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical
This product has been determined to be an extremely flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the North American Emergency Response Guide 128.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to Mechanical Impact	No.
Sensitivity to Static Discharge	Yes.

Special protective equipment and precautions for firefighters
Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water may be ineffective in extinguishing low flash point fires, but can be used to cool exposed surfaces. Avoid excessive water spray application. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Keep run-off water out of sewers and water sources.

NFPA:	Health 1	Flammability 3	Instability 0	Special Hazards -

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources.
Protective Equipment:	Use personal protection measures as recommended in Section 8.
Emergency Procedures:	Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions:	Ethanol in gasoline phase seperates in contact with water. Monitor downstream for dissolved ethanol or other appropriate indicators. Avoid release to the environment. Avoid subsoil penetration.
Methods and materials for containment:	Contain liquid with sand or soil.
Methods and materials for cleaning up:	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions:	NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Use only non-sparking tools. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements. Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation. Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers. A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling. Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling. High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).
Storage Conditions:	Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area.
Incompatible materials	Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
Gasoline 86290-81-5	300 ppm TWA 500 ppm STEL	-	300 ppm TWA 900 mg/m³ TWA 500 ppm STEL 1500 mg/m³ STEL	-
Toluene 108-88-3	20 ppm TWA	TWA: 200 ppm Ceiling: 300 ppm	100 ppm TWA 375 mg/m³ TWA 150 ppm STEL 560 mg/m³ STEL	500 ppm
Ethyl Alcohol 64-17-5	1000 ppm STEL	TWA: 1000 ppm TWA: 1900 mg/m³	1000 ppm TWA 1900 mg/m³ TWA	3300 ppm
Xylene (mixed isomers) 1330-20-7	100 ppm TWA 150 ppm STEL	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 150 ppm STEL 655 mg/m³ STEL	900 ppm
1,2,4 Trimethylbenzene 95-63-6	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Benzene 71-43-2	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm (applies to industry segments exempt from the benzene standard at 29 CFR 1910.1028) TWA: 1 ppm STEL: 5 ppm (see 29 CFR 1910.1028)	25 ppm Ceiling 1 ppm TWA 5 ppm STEL	500 ppm
n-Hexane 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m³	50 ppm TWA 180 mg/m³ TWA	1100 ppm
Ethylbenzene 100-41-4	20 ppm TWA	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 125 ppm STEL 545 mg/m³ STEL	800 ppm
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	10 ppm TWA 50 mg/m³ TWA 15 ppm STEL 75 mg/m³ STEL	250 ppm

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection: Use goggles or face-shield if the potential for splashing exists.

Skin and body protection: Use nitrile rubber, viton or PVA gloves for repeated or prolonged skin exposure. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection: Approved organic vapor chemical cartridge or supplied air respirators should be worn for exposures to any components exceeding the established exposure limits. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Hygiene measures:	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Clear or Colored Liquid
Color	Clear or Colored
Odor	Strong Hydrocarbon
Odor Threshold	No available data.

Property	**Values (Method)**
Melting Point / Freezing Point	No available data.
Initial Boiling Point / Boiling Range	32-225 °C / 90-437 °F
Flash Point	-45.5 °C / -50 °F
Evaporation Rate	No available data.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%)	
Upper Flammability Limit:	7.6
Lower Flammability Limit:	1.4
Vapor Pressure	403-776 mm Hg@ 100°F
Vapor Density	3-4
Specific Gravity / Relative Density	0.70-0.77
Water Solubility	Negligible
Solubility in other solvents	No available data.
Partition Coefficient	2.13-4.5
Decomposition temperature:	No available data.
pH:	Not applicable
Autoignition Temperature	C.A. 257 °C / 495 °F
Kinematic Viscosity	No available data.
Dynamic Viscosity	No available data.
Explosive Properties	No available data.
Softening Point	No available data.
VOC Content (%)	100%
Density	5.9-6.3 lbs/gal
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity	The product is non-reactive under normal conditions.
Chemical stability	The material is stable at 70°F, 760 mmHg pressure.
Possibility of hazardous reactions	None under normal processing.
Hazardous polymerization	Will not occur.
Conditions to avoid	Excessive heat, sources of ignition, open flame.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation	Irritating to the respiratory system. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.
Eye contact	Causes mild eye irritation.
Skin contact	Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.
Ingestion	May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute Toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Gasoline 86290-81-5	14000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Toluene 108-88-3	> 2000 mg/kg (Rat)	8390 mg/kg (Rabbit)	12.5 mg/L (Rat) 4 h
Ethyl Alcohol 64-17-5	> 5000 mg/kg (Rat)	-	124.7 mg/L (Rat) 4 h
Xylene (mixed isomers) 1330-20-7	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.04 mg/L (Rat) 4 h
1,2,4 Trimethylbenzene 95-63-6	3280 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	18,000 mg/m^3 (Rat) 4 h
Benzene 71-43-2	> 2000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	> 20 mg/l (Rat) 4 h
n-Hexane 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h
Ethylbenzene 100-41-4	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h
Naphthalene 91-20-3	490 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 340 mg/m^3 (Rat) 1 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

BENZENE: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer and other diseases of the blood forming organs including Acute Myelogenous Leukemia (AML), and Aplastic Anemia (AA), an often fatal disease. Some studies suggest overexposure to benzene may also be associated with Myelodysplastic Syndrome (MDS). Findings from a case control study of workers exposed to benzene was reported during the 2009 Benzene Symposium in Munich included an increase in Acute Myeloid Leukemias and Non-Hodgkins Lymphoid Neoplasms (NHLN) of the subtype follicular lymphoma (FL) in some occupational categories. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of AA have been reported in the offspring of persons severely overexposed to benzene. Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and minor skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC. The current proposed IARC classification for benzene is summarized as follows: Sufficient evidence for Acute Myeloid Leukemia; limited evidence for Acute Lymphatic Leukemia, Chronic Lymphatic Leukemia, Non-Hodgkin Lymphoma, and Multiple Myeloma.

NAPHTHAS: In a large epidemiological study on over 15,000 employees at several petroleum refineries and amongst residents located near these refineries, no increased risk of kidney cancer was observed in association with gasoline exposures (a similar material). In a similar study, no increased risk of kidney cancer was observed among petroleum refinery workers, but there was a slight trend in the incidence of kidney cancers among service station employees, especially after a 30-year latency period. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure with evidence of maternal toxicity. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, nervous system damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure with evidence of maternal toxicity. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

C9 AROMATIC HYDROCARBONS: A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Testicular atrophy and partial to full loss of the germ cell line were observed in sub-chronic high-dose inhalation studies of laboratory rodents. These effects appeared irreversible. Rodent reproduction studies have shown evidence of reduced fetal weight but no frank malformations.

PENTANES: Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

ETHANOL: Repeated ingestion of ethanol can result in alcohol abuse, causing behavioral changes, memory loss, impaired judgement, decreased appetite, irregular heartbeats, and decreased fertility. Prolonged and repeated ingestion of ethanol has also been associated with cancers of the mouth, pharynx, esophagus and liver. Ethanol ingestion by pregnant women can cause miscarriage, low birth weight, premature birth and fetal alcohol syndrome. In males, acute and chronic alcohol ingestion may affect gonadal hormone levels. It may also affect the liver, kidney, brain, blood and cardiovascular system.

CARBON MONOXIDE: is a chemical asphyxiant with no warning properties (such as odor). At 400-500 ppm for 1 hour headache and dyspnea may occur. If activity is increased, symptoms of overexposure may include nausea, irritability, increased respiration, tinnitus, sweating, chest pain, confusion, impaired judgement, dizziness, weakness, drowsiness, ataxia, irregular heart beat, cyanosis and pallor. Levels in excess of 1000 ppm can result in collapse, loss of conciousness, respiratory failure and death. Extremely high concentrations (12,800 ppm) can cause immediate unconsciousness and death in 1-3 minutes. Repeated anoxia can lead to central nervous system damage and peripheral neuropathy, with loss of sensation in the fingers, amnesia, and mental deterioration and possible congestive heart failure. Damage may also occur to the fetus, lung, liver, kidney, spleen, cardiovascular system and other organs.

COMBUSTION ENGINE EXHAUST: Chronic inhalation studies of gasoline engine exhaust in mice, rats and hamsters did not produce any carcinogenic effects. Condensates/extracts of gasoline engine exhaust produced an increase in tumors compared to controls when testing by skin painting, subcutaneous injection, intratracheal instillation or implantation into the lungs.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs & Symptoms Nausea, vomiting, signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects May cause genetic defects.

Carcinogenicity Cancer designations are listed in the table below.

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Gasoline 86290-81-5	Confirmed animal carcinogen (A3)	Possibly Carcinogenic (2B)	Not Listed	Not Listed
Toluene 108-88-3	Not Classifiable (A4)	Not Classifiable (3)	Not Listed	Not Listed
Ethyl Alcohol 64-17-5	Confirmed animal carcinogen (A3)	Carcinogenic (1) Alcoholic Beverages	Known to be human carcinogen - Alcoholic Beverage Consumption	Not Listed
Xylene (mixed isomers) 1330-20-7	Not Classifiable (A4)	Not Classifiable (3)	Not Listed	Not Listed
1,2,4 Trimethylbenzene 95-63-6	Not Listed	Not Listed	Not Listed	Not Listed

Benzene 71-43-2	Confirmed human carcinogen (A1)	Carcinogenic to humans (1)	Known to be human carcinogen	Known carcinogen
n-Hexane 110-54-3	Not Listed	Not Listed	Not Listed	Not Listed
Ethylbenzene 100-41-4	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Gasoline 86290-81-5	72-hr EC50 = 56 mg/l Algae	96-hr LC50 = 11 mg/l Rainbow trout (static)	-	48-hr LC50 = 7.6 mg/l Daphnia magna
Toluene 108-88-3	72-hr EC50 = 12.5 mg/l Algae	96-hr LC50 <= 10 mg/l Rainbow trout	-	48-hr EC50 = 5.46-9.83 mg/l Daphnia magna 48-hr EC50 = 11.5 mg/l Daphnia magna (Static)
Ethyl Alcohol 64-17-5	-	96-hr LC50 >1,000 mg/l Rainbow Trout (static) 96-hr LC50 >100 mg/l Fathead minnow (static)	-	48-hr LC50 >1,000 mg/l Daphnia magna
Xylene (mixed isomers) 1330-20-7	72-hr EC50 = 11 mg/l Algae	96-hr LC50 = 8 mg/l Rainbow trout	-	48-hr LC50 = 3.82 mg/l Daphnia magna
1,2,4 Trimethylbenzene 95-63-6	-	96-hr LC50 = 7.19-8.28 mg/l Fathead minnow (flow-through)	-	48-hr EC50 = 6.14 mg/L Daphnia magna
Benzene 71-43-2	72-hr EC50 = 29 mg/l Algae	96-hr LC50 = 5.3 mg/l Rainbow trout (flow-through)	-	48-hr EC50 = 8.76-15.6 mg/l Daphnia magna (Static)
n-Hexane 110-54-3	-	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-
Ethylbenzene 100-41-4	72-hr EC50 = 1.7-7.6 mg/l Algae	96-hr LC50 = 4 mg/L Rainbow trout	-	48-hr EC50 = 1-4 mg/L Daphnia magna
Naphthalene 91-20-3	-	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	-	48-hr LC50 = 1.6 mg/l Daphnia magna

Persistence and degradability Expected to be inherently biodegradable. The presence of ethanol in this product may impede the biodegradation of benzene, toluene, ethylbenzene and xylene in groundwater, resulting in elongated plumes of these constituents.

Bioaccummulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
This material may be a flammable liquid waste.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper shipping name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing group:	II

TDG (Canada):

UN Proper shipping name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing group:	II

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b):	This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Gasoline	NA
Toluene	NA
Ethyl Alcohol	NA
Xylene (mixed isomers)	NA
1,2,4 Trimethylbenzene	NA
Benzene	NA
n-Hexane	NA
Ethylbenzene	NA
Naphthalene	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	CERCLA/SARA - Hazardous Substances and their Reportable Quantities
Gasoline	NA
Toluene	1000 lb final RQ 454 kg final RQ
Ethyl Alcohol	NA
Xylene (mixed isomers)	100 lb final RQ 45.4 kg final RQ
1,2,4 Trimethylbenzene	NA
Benzene	10 lb final RQ 4.54 kg final RQ
n-Hexane	5000 lb final RQ 2270 kg final RQ
Ethylbenzene	1000 lb final RQ 454 kg final RQ
Naphthalene	100 lb final RQ 45.4 kg final RQ

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
Gasoline	None
Toluene	1.0 % de minimis concentration
Ethyl Alcohol	None
Xylene (mixed isomers)	1.0 % de minimis concentration
1,2,4 Trimethylbenzene	None
Benzene	0.1 % de minimis concentration
n-Hexane	1.0 % de minimis concentration
Ethylbenzene	0.1 % de minimis concentration
Naphthalene	0.1 % de minimis concentration

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Gasoline

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	SN 0957
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0957 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants	Present

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Toluene

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Developmental toxicity, initial date 1/1/91 Female reproductive toxicity, initial date 8/7/09
New Jersey Right-To-Know:	SN 1866
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Flammable - third degree; Teratogen
New Jersey - Environmental Hazardous Substances List:	SN 1866 TPQ: 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

Ethyl Alcohol

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Carcinogen, initial date 4/29/11 (in alcoholic beverages) Carcinogen, initial date 7/1/88 (when associated with alcohol abuse) Developmental toxicity, initial date 10/1/87 (in alcoholic beverages)
New Jersey Right-To-Know:	SN 0844
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Teratogen
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree; Mutagen; Teratogen
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Xylene (mixed isomers)

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	SN 2014
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold all isomers
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 2014 TPQ: 500 lb

Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)
1,2,4 Trimethylbenzene	
Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Not Listed.
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.
Benzene	
Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Carcinogen, initial date 2/27/87 Developmental toxicity, initial date 12/26/97 Male reproductive toxicity, initial date 12/26/97
New Jersey Right-To-Know:	SN 0197
Pennsylvania Right-To-Know:	Environmental hazard; Special hazardous substance
Massachusetts Right-To Know:	Carcinogen; Extraordinarily hazardous
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin); Carcinogen (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Carcinogen; Extraordinarily hazardous
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Present
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree; Mutagen
New Jersey - Environmental Hazardous Substances List:	SN 0197 TPQ: 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	10 lb RQ (air); 1 lb RQ (land/water)
n-Hexane	
Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	SN 1340
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 1340 TPQ: 500 lb
Illinois - Toxic Air Contaminants	Present

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1 lb RQ (air); 1 lb RQ (land/water)
Ethylbenzene	
Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Carcinogen, initial date 6/11/04
New Jersey Right-To-Know:	SN 0851
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Carcinogen; flammable - Third degree
New Jersey - Environmental Hazardous Substances List:	SN 0851 TPQ: 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)
Naphthalene	
Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	SN 1322 SN 3758
Pennsylvania Right-To-Know:	Environmental hazard Present (particulate)
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Carcinogen
New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%)
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	100 lb RQ (air); 1 lb RQ (land/water)

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: "This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations."

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Gasoline	B2,D2A,D2B	0.1%
Toluene	B2,D2A,D2B	0.1%
Ethyl Alcohol	B2,D2B	0.1%
Xylene (mixed isomers)	B2,D2A,D2B	m-, o-isomers 1.0%; p-isomer 0.1%
1,2,4 Trimethylbenzene	B3	1
Benzene	B2,D2A,D2B	0.1%
n-Hexane	B2,D2A,D2B	1%
Ethylbenzene	B2,D2A,D2B	0.1%
Naphthalene	B4,D2A	0.1%

NOTE: Not Applicable.

16. OTHER INFORMATION

Prepared By	Toxicology and Product Safety
Revision Date:	05/14/2015

Revision Note:

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

Airgas

Helium

Section 1. Identification

GHS product identifier	:	Helium
Chemical name	:	Helium
Other means of identification	:	helium (dot); Helium-4; He; o-Helium; UN 1046,Helium USP
Product use	:	Synthetic/Analytical chemistry.
Synonym	:	helium (dot); Helium-4; He; o-Helium; UN 1046,Helium USP
SDS #	:	001025
Supplier's details	:	Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	:	1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	:	GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms	:	
Signal word	:	Warning
Hazard statements	:	Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.

Precautionary statements

General	:	Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.
Prevention	:	Not applicable.
Response	:	Not applicable.
Storage	:	Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.
Disposal	:	Not applicable.
Hazards not otherwise classified	:	In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Helium

Other means of identification : helium (dot); Helium-4; He; o-Helium; UN 1046,Helium USP

CAS number/other identifiers

CAS number : 7440-59-7

Product code : 001025

Ingredient name	%	CAS number
Helium	100	7440-59-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : No specific data.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Section 7. Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Helium	Oxygen Depletion [Asphyxiant]

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Molecular weight : 4 g/mole

Molecular formula : He

Boiling/condensation point : -268.9°C (-452°F)

Melting/freezing point : -272.2°C (-458°F)

Critical temperature : -267.9°C (-450.2°F)

Odor : Odorless.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : 0.14 (Air = 1) Liquid Density@BP: 7.8 lb/ft3 (125 kg/m3)

Specific Volume (ft ^{3}/lb) : 96.1538

Gas Density (lb/ft ^{3}) : 0.0104

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.28

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 10. Stability and reactivity

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP$_{ow}$	BCF	Potential
Helium	0.28	-	low

Mobility in soil

Soil/water partition coefficient (K$_{OC}$) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1046	UN1046	UN1046	UN1046	UN1046
UN proper shipping name	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED	HELIUM, COMPRESSED
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 

Section 14. Transport information

Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 75 kg **Cargo Aircraft Only** Quantity limitation: 150 kg

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Special precautions for user : **Transport within user’s premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Helium	100	No.	Yes.	No.	No.	No.

Section 15. Regulatory information

State regulations

Massachusetts : This material is listed.
New York : This material is not listed.
New Jersey : This material is listed.
Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.
Canada : This material is listed or exempted.
China : This material is listed or exempted.
Europe : This material is listed or exempted.
Japan : Not determined.
Malaysia : Not determined.
New Zealand : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.
Taiwan : This material is listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

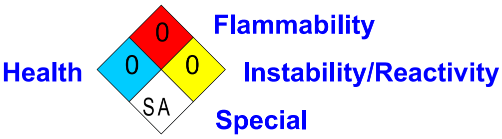
Hazardous Material Information System (U.S.A.)

Health	0
Flammability	0
Physical hazards	3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)



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Section 16. Other information

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	Expert judgment

History

Date of printing : 2/12/2016

Date of issue/Date of revision : 2/12/2016

Date of previous issue : No previous validation

Version : 0.01

Key to abbreviations :
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

◸ **Indicates information that has changed from previously issued version.**

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 24-Aug-2009 **Revision Date** 10-Jan-2017 **Revision Number** 3

1. Identification

Product Name **Hydrochloric Acid**

Cat No. : **A144-212; A144-212LC; A144-500; A144-500LB; A144-500LC; A144-612GAL; A144C-212; A144C-212EA; A144P-19; A144P-20; A144S-212; A144S-212EA; A144S-500; A144SI-212**

Synonyms Muriatic acid

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Supplier
Fisher Scientific UK
Bishop Meadow Rd
Loughborough, Leicestershire, LE11
5RG Great Britain
Tel: 01509 231166

Emergency Telephone Number
CHEMTREC®, Inside the USA:
800-424-9300
CHEMTREC®, Outside the USA:
001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Water	7732-18-5	62-65
Hydrochloric acid	7647-01-0	35-38

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms/effects	Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Corrosive Material. Causes burns by all exposure routes. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Hydrogen chloride gas

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Hydrochloric acid	Ceiling: 2 ppm	Ceiling: 5 ppm Ceiling: 7 mg/m³ (Vacated) Ceiling: 5 ppm (Vacated) Ceiling: 7 mg/m³	IDLH: 50 ppm Ceiling: 5 ppm Ceiling: 7 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Hydrochloric acid	Ceiling: 5 ppm Ceiling: 7.5 mg/m³	Ceiling: 5 ppm Ceiling: 7 mg/m³	CEV: 2 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	pungent
Odor Threshold	No information available
pH	< 1
Melting Point/Range	-35 °C / -31 °F
Boiling Point/Range	57 °C / 135 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	125 mbar @ 20 °C
Vapor Density	1.27
Specific Gravity	1.18
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	1.8 mPa.s @ 15°C
Molecular Formula	$HCl.H_2O$
Molecular Weight	36.46

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat.
Incompatible Materials	Metals, Strong oxidizing agents, Bases, sodium hypochlorite, Amines, Fluorine, Cyanides, Alkaline
Hazardous Decomposition Products	Hydrogen chloride gas
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	Contact with metals may evolve flammable hydrogen gas.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	Not listed	Not listed
Hydrochloric acid	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	1.68 mg/L (Rat) 1 h

Toxicologically Synergistic Products	No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Causes burns by all exposure routes
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Hydrochloric acid	7647-01-0	Not listed	Not listed	Not listed	Not listed	Not listed

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

Mutagenic Effects	No information available
Reproductive Effects	No information available.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	Respiratory system
STOT - repeated exposure	None known
Aspiration hazard	No information available
Symptoms / effects,both acute and delayed	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Hydrochloric acid	-	282 mg/L LC50 96 h Gambusia affinis mg/L LC50 48 h Leucscus idus	-	56mg/L EC50 72h Daphnia

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1789
Proper Shipping Name	HYDROCHLORIC ACID
Hazard Class	8
Packing Group	II

TDG

UN-No	UN1789
Proper Shipping Name	HYDROCHLORIC ACID
Hazard Class	8
Packing Group	II

IATA

UN-No	UN1789
Proper Shipping Name	Hydrochloric acid
Hazard Class	8
Packing Group	II

IMDG/IMO

UN-No	UN1789
Proper Shipping Name	Hydrochloric acid
Hazard Class	8
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Water	X	X	-	231-791-2	-		X	-	X	X	X
Hydrochloric acid	X	X	-	231-595-7	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)	Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Hydrochloric acid	7647-01-0	35-38	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Hydrochloric acid	X	5000 lb	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Hydrochloric acid	X		-

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Hydrochloric acid	-	TQ: 5000 lb

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Hydrochloric acid	5000 lb	5000 lb

California Proposition 65	This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Hydrochloric acid	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security

This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Hydrochloric acid	0 lb STQ (anhydrous); 11250 lb STQ (37% concentration or greater)

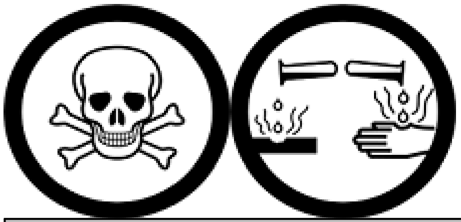
Other International Regulations

Mexico - Grade No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class	D1A Very toxic materials E Corrosive material



16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	24-Aug-2009
Revision Date	10-Jan-2017
Print Date	10-Jan-2017
Revision Summary	SDS sections updated; 2; 3; 11

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Airgas

Isopropyl Alcohol (Isopropanol)

Section 1. Identification

GHS product identifier : Isopropyl Alcohol (Isopropanol)

Chemical name : Isopropyl alcohol

Other means of identification : propan-2-ol; 2-Propanol; isopropanol; isopropyl alcohol

Product use : Synthetic/Analytical chemistry.

Synonym : propan-2-ol; 2-Propanol; isopropanol; isopropyl alcohol

SDS # : 001105

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Emergency telephone number (with hours of operation) : 1-866-734-3438

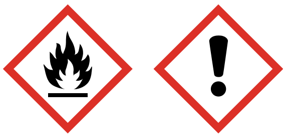
Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3

GHS label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : Highly flammable liquid and vapor.
May form explosive mixtures with air.
Causes serious eye irritation.
May cause drowsiness and dizziness.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling. Use and store only outdoors or in a well ventilated place.

Section 2. Hazards identification

Response : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Isopropyl alcohol

Other means of identification : propan-2-ol; 2-Propanol; isopropanol; isopropyl alcohol

CAS number/other identifiers

CAS number : 67-63-0

Product code : 001105

Ingredient name	%	CAS number
propan-2-ol	100	67-63-0

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention

Section 4. First aid measures

immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	Causes serious eye irritation.
Inhalation	Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.
Skin contact	No known significant effects or critical hazards.
Frostbite	Try to warm up the frozen tissues and seek medical attention.
Ingestion	Can cause central nervous system (CNS) depression. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact	Adverse symptoms may include the following: pain or irritation watering redness
Inhalation	Adverse symptoms may include the following: nausea or vomiting headache drowsiness/fatigue dizziness/vertigo unconsciousness
Skin contact	No specific data.
Ingestion	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	No specific treatment.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	Do not use water jet.

Specific hazards arising from the chemical	Highly flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Section 5. Fire-fighting measures

Hazardous thermal decomposition products	:	Decomposition products may include the following materials: carbon dioxide carbon monoxide
Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	:	If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".
Environmental precautions	:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill	:	Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
Large spill	:	Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures	:	Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Section 7. Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
propan-2-ol	**ACGIH TLV (United States, 3/2012).** TWA: 200 ppm 8 hours. STEL: 400 ppm 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** TWA: 400 ppm 8 hours. TWA: 980 mg/m³ 8 hours. STEL: 500 ppm 15 minutes. STEL: 1225 mg/m³ 15 minutes. **NIOSH REL (United States, 1/2013).** TWA: 400 ppm 10 hours. TWA: 980 mg/m³ 10 hours. STEL: 500 ppm 15 minutes. STEL: 1225 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2010).** TWA: 400 ppm 8 hours. TWA: 980 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 8. Exposure controls/personal protection

Eye/face protection	: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.
Skin protection	
Hand protection	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Body protection	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Other skin protection	: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory protection	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance	
Physical state	: Liquid. [COLORLESS LIQUID WITH THE ODOR OF RUBBING ALCOHOL]
Color	: Colorless.
Molecular weight	: 60.11 g/mole
Molecular formula	: C3-H8-O
Boiling/condensation point	: 83°C (181.4°F)
Melting/freezing point	: -90°C (-130°F)
Critical temperature	: Not available.
Odor	: Alcohol-like.
Odor threshold	: Not available.
pH	: Not available.
Flash point	: Closed cup: 11.7°C (53.1°F)
Burning time	: Not applicable.
Burning rate	: Not applicable.
Evaporation rate	: 1.7 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 2% Upper: 12%
Vapor pressure	: 4.4 kPa (33.002681467 mm Hg) [room temperature]
Vapor density	: 2.1 (Air = 1)
Specific Volume (ft ^{3}/lb)	: 1.2739
Gas Density (lb/ft ^{3})	: 0.785
Relative density	: 0.79

Section 9. Physical and chemical properties

Solubility : Not available.
Solubility in water : Not available.
Partition coefficient: n-octanol/water : 0.05
Auto-ignition temperature : 456°C (852.8°F)
Decomposition temperature : Not available.
SADT : Not available.
Viscosity : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatibility with various substances : Highly reactive or incompatible with the following materials: acids and moisture.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
propan-2-ol	LC50 Inhalation Gas.	Rat	45248 ppm	1 hours
	LD50 Dermal	Rabbit	12800 mg/kg	-
	LD50 Oral	Rat	5000 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
propan-2-ol	Eyes - Moderate irritant	Rabbit	-	24 hours 100 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	10 milligrams	-
	Eyes - Severe irritant	Rabbit	-	100 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-

Sensitization

Not available.

Section 11. Toxicological information

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
propan-2-ol	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
propan-2-ol	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.

Skin contact : No known significant effects or critical hazards.

Ingestion : Can cause central nervous system (CNS) depression. Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Section 11. Toxicological information

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
propan-2-ol	Acute LC50 1400000 to 1950000 µg/l Marine water	Crustaceans - Crangon crangon	48 hours
	Acute LC50 4200 mg/l Fresh water	Fish - Rasbora heteromorpha	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP$_{ow}$	BCF	Potential
propan-2-ol	0.05	-	low

Mobility in soil

Soil/water partition coefficient (K$_{OC}$) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	**TDG**	**Mexico**	**IMDG**	**IATA**
UN number	UN1219	UN1219	UN1219	UN1219	UN1219
UN proper shipping name	ISOPROPANOL OR ISOPROPYL ALCOHOL	ISOPROPANOL; OR ISOPROPYL ALCOHOL	ISOPROPANOL OR ISOPROPYL ALCOHOL	ISOPROPANOL (ISOPROPYL ALCOHOL)	ISOPROPANOL
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 L **Cargo aircraft** Quantity limitation: 60 L **Special provisions** IB2, T4, TP1	**Explosive Limit and Limited Quantity Index** 1 **Passenger Carrying Road or Rail Index** 5	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 5 L **Cargo Aircraft Only** Quantity limitation: 60 L **Limited Quantities - Passenger Aircraft** Quantity limitation: 1 L

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Special precautions for user : **Transport within user’s premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
propan-2-ol	100	Yes.	No.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Isopropyl alcohol	67-63-0	100
Supplier notification	Isopropyl alcohol	67-63-0	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

Canada inventory : This material is listed or exempted.

International regulations

Section 15. Regulatory information

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2B: Material causing other toxic effects (Toxic).

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class B-2: Flammable liquid
Class D-2B: Material causing other toxic effects (Toxic).

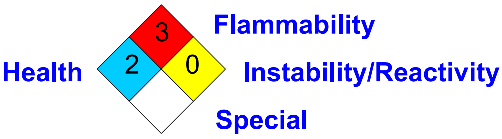
Hazardous Material Information System (U.S.A.)

Health	*	2
Flammability		3
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)



Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 5/20/2015.
Date of issue/Date of revision : 5/20/2015.
Date of previous issue : 10/28/2014.
Version : 0.02

Key to abbreviations :
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health
TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

◤ **Indicates information that has changed from previously issued version.**

Notice to reader

Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Effective date: 05/12/2015 **Revision:** 05/12/2015

LIQUINOX

1 Identification of the Substance/mixture and of the Company/Undertaking

1.1 Product identifier

Trade name: **LIQUINOX**

Application of the substance / the preparation: Hand detergent.

1.2 Relevant identified uses of the substance or mixture and uses advised against:

No additional information available.

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer/Supplier:

Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

Further information obtainable from: Product Safety Department.

1.4 Emergency telephone number:

ChemTel Inc.: (800)255-3924, +1 (813)248-0585

2 Hazards Identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008:

Classification according to Directive 67/548/EEC or Directive 1999/45/EC:

GHS07

Skin Irrit. 2, H315: Causes skin irritation.

Information concerning particular hazards for human and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to the latest editions of the EU-lists, and extended by company and literature data

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:

The product is classified and labelled according to the CLP regulation.

Hazard pictograms:

GHS07

Signal word: Warning

Hazard-determining components of labelling:

Alkyl benzene sulfonic acid, sodium salt.

Hazard statements:

H315: Causes skin irritation.

Precautionary statements:

P332+P313: If skin irritation occurs: Get medical advice/attention.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

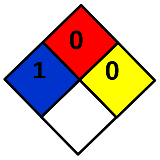
P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

Other Hazard description:

WHMIS-classification and symbols:

D2B - Toxic material causing other toxic effects

NFPA ratings (scale 0 - 4)



Health = 1
Fire = 0
Reactivity = 0

HMIS-ratings (scale 0 - 4)

HEALTH	1	🟦	Health = 1
FIRE	0	🟥	Fire = 0
REACTIVITY	0	🟨	Reactivity = 0

2.3 Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.
vPvB: Not applicable.

3 Composition/Information on Ingredients

3.2 Chemical characterization: Mixture

Description: Hazardous ingredients of mixture listed below.

Identifying Nos.	Description	Wt. %
CAS: 68081-81-2	Alkyl benzene sulfonic acid, sodium salt	10 - 25%
CAS: 1300-72-7 EINECS: 215-090-9	Sodium xylene sulphonate	2.5 - 10%
CAS: 84133-50-6	Alcohol Ethoxylate	2.5 - 10%
CAS: 68603-42-9 EINECS: 271-657-0	Coconut diethanolamide	2.5 - 10%
CAS: 17572-97-3 EINECS: 241-543-5	Ethylenediaminetetraacetic acid, tripotassium salt	2.5 - 10%

Additional information: For the wording of the listed risk phrases refer to section 16.

4 First Aid Measures

4.1 Description of first aid measures

General information:

Take affected persons out into the fresh air.

After inhalation:

Supply fresh air; consult doctor in case of complaints.

After skin contact:

Immediately wash with water and soap and rinse thoroughly for 30 minutes. If skin irritation continues, consult a doctor.

After eye contact:

Remove contact lenses if worn.

Rinse opened eye for at least 30 minutes under running water, lifting upper and lower lids occasionally. Immediately consult a doctor.

After swallowing:

Do not induce vomiting; call for medical help immediately. Rinse out mouth and then drink plenty of water.

A person vomiting while laying on their back should be turned onto their side.

4.2 Most important symptoms and effects, both acute and delayed:

Irritating, all routes of exposure.

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information available.

5 Firefighting Measures

5.1 Extinguishing media:

Suitable extinguishing agents:

CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

5.2 Special hazards arising from the substance or mixture:

No additional information available.

5.3 Advice for firefighters:

Protective equipment:

Wear self-contained respiratory protective device.

Wear fully protective suit.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.

Particular danger of slipping on leaked/spilled product.

6.2 Environmental precautions:

Dilute with plenty of water.

Do not allow to enter sewers/ surface or ground water.

6.3 Methods and material for containment and cleaning up:

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Clean the affected area carefully; suitable cleaners are: Warm water

Dispose contaminated material as waste according to item 13. Ensure adequate ventilation.

6.4 Reference to other sections:

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information

7 Handling and Storage

7.1 Precautions for safe handling:

No special precautions are necessary if used correctly.

Information about fire - and explosion protection:

No special measures required.

7.2 Conditions for safe storage, including any incompatibilities:

Storage:

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: No special requirements.

Further information about storage conditions: None

7.3 Specific end use(s): No additional information available.

8 Exposure Controls/Personal Protection

8.1 Control parameters

Ingredients with limit values that require monitoring at the workplace:

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: The lists valid during the making were used as basis.

8.2 Exposure controls:

Personal protective equipment:

General protective and hygienic measures:

Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.

Respiratory protection:

Not required under normal conditions of use.

Protection of hands:

Protective gloves

The glove material has to be impermeable and resistant to the product. Selection of the glove material should be based on the penetration time, rates of diffusion and the degradation of the glove material.

Material of gloves:

The selection of a suitable gloves does not only depend on the material, but also on the quality, and varies from manufacturer to manufacturer.

Penetration time of glove material:

The exact break through time has to be determined by the manufacturer of the protective gloves. DO NOT exceed the breakthrough time set by the Manufacturer.

For long term contact, gloves made of the following materials are considered suitable:

Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber (NR)
Neoprene gloves

Eye protection:

Safety glasses
Goggles recommended during refilling.

Body protection: Protective work clothing

9 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

General Information:	
Appearance:	
Form:	Liquid
Color:	Light Yellow
Odor:	Odorless
Odor threshold:	Not determined.
pH-value:	8.5
Change in condition:	
Melting point/Melting range:	Not determined.
Boiling point/Boiling range:	100°C
Flash point:	Not applicable.
Flammability (solid, gaseous):	Not applicable.
Ignition temperature:	Not applicable.
Decomposition temperature:	Not determined.
Self-igniting:	Product is not selfigniting.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined.
Upper:	Not determined.
Vapor pressure at 20°C:	23 hPa
Density:	1.08 g/cm³
Relative density:	Not determined.
Vapor density:	Not determined.
Evaporation rate:	Not determined.
Solubility in / Miscibility with water:	Fully miscible.
Segregation coefficient (n-octanol/water):	Not determined.
Viscosity:	
Dynamic:	Not determined.
Kinematic:	Not determined.
Solvent content:	
Organic solvents:	Not determined.
Solids content:	Not determined.
9.2 Other information:	No additional information available.

10 Stability and Reactivity

10.1 Reactivity:

10.2 Chemical stability:

Thermal decomposition / conditions to be avoided:

No decomposition if used according to specifications.

10.3 Possibility of hazardous reactions:

Reacts with strong oxidizing agents. Reacts with strong acids.

10.4 Conditions to avoid:

No additional information available.

10.5 Incompatible materials:

No additional information available.

10.6 Hazardous decomposition products:

Carbon monoxide and carbon dioxide
Sulphur oxides (SOx)
Nitrogen oxides

11 Toxicological Information

11.1 Information on toxicological effects:

Toxicity data: Toxicity data is available for mixture:

Primary irritant effect:

On the skin: Irritating to skin and mucous membranes.

On the eye: Strong irritant with the danger of severe eye injury.

Sensitization: No sensitizing effects known.

Additional toxicological information:

The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version: Irritant

12 Ecological Information

12.1 Toxicity:

Aquatic toxicity: No additional information available.

12.2 Persistence and degradability: Biodegradable.

12.3 Bioaccumulative potential: Does not accumulate in organisms.

12.4 Mobility in soil: No additional information available.

Additional ecological information:

General notes:

Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water.
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Must not reach sewage water or drainage ditch undiluted or un-neutralized.

12.5 Results of PBT and vPvB assessment:

PBT: Not applicable.

vPvB: Not applicable.

12.6 Other adverse effects: No additional information available.

13 Disposal Considerations

13.1 Waste treatment methods:

Recommendation:

Smaller quantities can be disposed of with household waste.

Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.

The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

Uncleaned packaging:

Recommendation: Disposal must be made according to official regulations.

Recommended cleansing agents: Water, together with cleansing agents, if necessary.

14 Transport Information

14.1 UN-Number:

DOT, ADR, ADN, IMDG, IATA:	Not Regulated

14.2 UN proper shipping name:

DOT, ADR, IMDG, IATA:	Not Regulated

14.3 Transport hazard class(es):
DOT, ADR, IMDG, IATA:

Class:	Not Regulated
Label:	-

14.4 Packing group:

DOT, ADR, IMDG, IATA:	Not Regulated

14.5 Environmental hazards:

Marine pollutant:	No

14.6 Special precautions for user:	Not applicable.

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

UN "Model Regulation":	Not Regulated

15 Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:
United States (USA):
SARA:
Section 355 (extremely hazardous substances): None of the ingredient is listed.
Section 313 (Specific toxic chemical listings): None of the ingredient is listed.
TSCA (Toxic Substances Control Act): All ingredients are listed.

Proposition 65 (California):
Chemicals known to cause cancer: None of the ingredient is listed.
Chemicals known to cause reproductive toxicity for females: None of the ingredient is listed.
Chemicals known to cause reproductive toxicity for males: None of the ingredient is listed.
Chemicals known to cause developmental toxicity: None of the ingredient is listed.

Carcinogenic Categories:
EPA (Environmental Protection Agency): None of the ingredient is listed.
TLV (Threshold Limit Value established by ACGIH): None of the ingredient is listed.
NIOSH-Ca (National Institute for Occupational Safety and Health): None of the ingredient is listed.
OSHA-Ca (Occupational Safety & Health Administration): None of the ingredient is listed.
Canadá:
Canadian Domestic Substances List (DSL): All ingredients are listed.
Canadian Ingredient Disclosure list (limit 0.1%): None of the ingredient is listed.
Canadian Ingredient Disclosure list (limit 1%): None of the ingredient is listed.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant phrases:
H315: Causes skin irritation.

Abbreviations and Acronyms:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
IMDG: International Maritime Code for Dangerous Goods.
DOT: US Department of Transportation.
IATA: International Air Transport Association.
GHS: Globally Harmonized System of Classification and Labelling of Chemicals.
ACGIH: American Conference of Governmental Industrial Hygienists.
NFPA: National Fire Protection Association (USA).
HMIS: Hazardous Materials Identification System (USA).
WHMIS: Workplace Hazardous Materials Information System (Canada).
VOC: Volatile Organic Compounds (USA, EU).
LC50: Lethal concentration, 50 percent.
LD50: Lethal dose, 50 percent.

SDS Created by:

Global Safety Management, Inc.
10006 Cross Creek Blvd
Tampa, FL, 33647
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Website: www.GSMSDS.com

SAFETY DATA SHEET

Creation Date 12-Mar-2009 **Revision Date** 28-Nov-2016 **Revision Number** 5

1. Identification

Product Name	**Nitric acid (65 - 70%)**
Cat No. :	**A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721**
Synonyms	Azotic acid; Engraver's acid; Aqua fortis
Recommended Use	Laboratory chemicals.
Uses advised against	No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

General Advice	Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
Inhalation	If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.
Ingestion	Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.
Most important symptoms/effects	Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Oxidizing Properties	Oxidizer
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	**Flammability**	**Instability**	**Physical hazards**
4	0	0	OX

6. Accidental release measures

Personal Precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m^3 (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m^3 TWA: 2 ppm TWA: 5 mg/m^3	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m^3 STEL: 4 ppm STEL: 10 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m^3 STEL: 4 ppm STEL: 10 mg/m^3	TWA: 2 ppm TWA: 5 mg/m^3 STEL: 4 ppm STEL: 10 mg/m^3	TWA: 2 ppm STEL: 4 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F
Boiling Point/Range	Not applicable
Flash Point	Not applicable

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO3
Molecular Weight	63.02

10. Stability and reactivity

Reactive Hazard	Yes
Stability	Oxidizer: Contact with combustible/organic material may cause fire.
Conditions to Avoid	Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.
Incompatible Materials	Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents
Hazardous Decomposition Products	Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products	No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Causes severe burns by all exposure routes
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects	No information available

Reproductive Effects	No information available.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	Respiratory system
STOT - repeated exposure	None known
Aspiration hazard	No information available
Symptoms / effects,both acute and delayed	Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability	Miscible with water Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation	No information available.
Mobility	Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

13. Disposal considerations

Waste Disposal Methods	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

TDG

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IATA

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

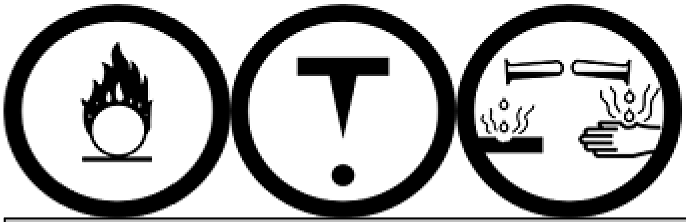
Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class	C Oxidizing materials E Corrosive material D2B Toxic materials



16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	12-Mar-2009
Revision Date	28-Nov-2016
Print Date	28-Nov-2016
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

Attachment C

Quality Assurance Project Plan Addendum

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Quality Assurance Project Plan Addendum
Admiral Cleaners (401075)
Watervliet, New York

Prepared for

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

Prepared by

EA Engineering, P.C., and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211
(315) 431-4610

March 2018
Version: FINAL
EA Project No. 14907.38

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Quality Assurance Project Plan Addendum
Admiral Cleaners (401075)
Watervliet, New York

Prepared for

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

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

Prepared by

EA Engineering, P.C. and Its Affiliate
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(315) 431-4610

Donald

12 March 2018

Donald F. Conan, P.E. Contract Manager | Date
EA Engineering, P.C.

12 March 2018

Christopher Schroer, Project Manager | Date
EA Science and Technology

March 2018
Version: FINAL
EA Project No. 14907.38

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LIST OF ACRONYMS AND ABBREVIATIONS

EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
EPA	U.S. Environmental Protection Agency
No.	Number
NYSDEC	New York State Department of Environmental Conservation
P.E.	Professional Engineer
P.G.	Professional Geologist
QA	Quality assurance
QC	Quality control
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation

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1. PURPOSE AND OBJECTIVES

1.1 PURPOSE

A Generic Quality Assurance Project Plan (QAPP) (EA Engineering, P.C. and Its Affiliate EA Science and Technology [EA] 2011a)[1] was developed for field activities performed under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract Number (No.) D007624. This QAPP Addendum is for the Remedial Investigation (RI) Work Assignment for the Admiral Cleaners Site (Site) (401075) in the City of Watervliet, Albany County, New York. This QAPP Addendum is to supplement the Generic QAPP with site-specific procedures for the collection, analysis, and evaluation of data to ensure that data will be legally and scientifically defensible.

1.2 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

This QAPP Addendum provides site-specific information and standard operating procedures applicable to all work performed at the Site that is not included in the Generic QAPP. The information includes definitions and generic goals for data quality, and required types and quantities of quality assurance (QA)/quality control (QC) samples. The Generic QAPP addresses sampling and decontamination protocols; field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA reporting. The Generic Field Activities Plan (EA 2011b)[2] contains information related to sampling procedures. The Letter Work Plan (EA 2018)[3] contains a site description and information on site field activities, such as sample locations, site-specific sampling procedures, and site-specific analytical methods.

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[1] EA. 2011a. *Generic Quality Assurance Project Plan for Work Assignments under NYSDEC Contract No. D007624.* April.

[2] EA. 2011b. Generic *Field Activities Plan for Work Assignments under NYSDEC Contract No. D007624.* April.

[3] EA. 2018. *FINAL Remedial Investigation/Feasibility Study Letter Work Plan. Admiral Cleaners (401075).* March.

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2. PROJECT ORGANIZATION AND RESPONSIBILITIES

While all personnel involved in the investigation and generation of data are implicitly a part of the overall project management and QA/QC program, certain members of the Project Team have specifically designated responsibilities. Project personnel responsibilities are summarized below.

2.1 EA ENGINEERING, P.C. AND ITS AFFILIATE EA SCIENCE AND TECHNOLOGY

EA will provide oversight, coordination, health and safety, field support, and evaluation of analytical data. EA will also be responsible for the evaluation of analytical test results, which will be submitted to NYSDEC. The EA staff involved in this project are as follows:

- ***Frank Barranco, Professional Engineer (P.E), Professional Geologist (P.G.), Project QA/QC Officer***—The QA/QC Officer will provide guidance on technical matters and review technical documents relating to the project. He will assess the effectiveness of the QA/QC program and recommend modifications when applicable. Additionally, the QA/QC Officer may delegate technical guidance to specially trained individuals under his direction.

- ***Christopher Schroer, EA Project Manager***—The Project Manager provides overall coordination and preparation of the project within EA. This includes coordination with NYSDEC and New York State Department of Health, budget control, subcontractor performance, implementation of the QAPP Addendum, and allocation of resources and staffing to implement both the QA/QC program and the site Health and Safety Plan Addendum.

- ***Amanda Kohn (P.G.), EA Project QA/QC Coordinator***—The Project QA/QC Coordinator is responsible for project-specific supervision and monitoring of the QA/QC program. She will ensure that field personnel are familiar with and adhere to proper sampling procedures, field measurement techniques, sample identification, and chain-of-custody procedures. She will coordinate with the analytical laboratory for the receipt of samples and reporting of analytical results, and will recommend actions to correct deficiencies in the analytical protocol or sampling. Additionally, she will prepare QA/QC reports for management review.

- ***Stephen Soldner, EA Site Manager***—The Site Manager will serve as the onsite contact person for field investigations and tests. He will be responsible for coordinating the field activities, including inspecting and replacing equipment, preparing daily and interim reports, scheduling sampling, and coordinating shipment and receipt of samples and containers.

The Program Health and Safety Officer is also an integral part of the project implementation team.

- ***Peter Garger (CIH, CSP), EA Program Health and Safety Officer***—The Program Health and Safety Officer will be responsible for the development, final technical review, and approval of the Health and Safety Plan Addendum. In addition, he will provide authorization, if warranted, to modify personal protective equipment requirements based on field conditions. He will also provide final review of all safety and health monitoring records and personal protective equipment changes to ensure compliance with the provisions of the Health and Safety Plan Addendum.

2.2 LABORATORY

Laboratory analyses for this project will be performed by Con-Test Analytical Laboratory in East Longmeadow, Massachusetts (soil and groundwater) and Eurofins Air Toxics in Folsom, California (soil vapor and air) under subcontract agreements with EA. Christopher Schroer (EA Project Manager) will have sample analysis and review responsibilities on this project. The laboratories will have their own provisions for conducting an internal QA/QC review of the data before they are released to EA. The laboratories' contract supervisors will contact EA's Project Manager with any sample discrepancies or data concerns.

Hard copy and electronic data deliverable formatted QA/QC reports will be filed by the analytical laboratories when data are submitted to EA. Corrective actions will be reported to the EA Project Manager along with the QA/QC report (Section 9 of the Generic QAPP). The laboratories may be contacted directly by EA or NYSDEC personnel to discuss QA concerns. EA will act as laboratory coordinator on this project and all correspondence from the laboratories will be coordinated with EA's Project Manager.

3. SAMPLING RATIONALE, DESIGNATION, AND CONTAINERS

3.1 SAMPLING RATIONALE

The sampling rationale is presented for each planned field activity in the Letter Work Plan (EA 2018)[3]. The rationale and frequency of the QC samples collected is discussed in the Generic QAPP (EA 2011a)[1]. The site characterization laboratory program includes the number of samples for each sample location, as well as QA/QC samples (Table 1). The frequency of QA/QC samples is expressed as a percentage of the total number of samples collected for that matrix. The Generic QAPP also includes analytical methods and reporting limits.

3.2 SAMPLE DESIGNATION

Field samples collected from the Site will be assigned a unique sample tracking number. Sample/designation will be an alpha-numeric code, which will identify each sample by the site identification, matrix sampled, location number, sequential sample number (or depth of top-of-sample interval for subsurface soil samples), and date of collection. Each sampling location will be identified with a 2-digit number. Sequential sample numbers at each location for samples will begin with 01 and increase accordingly. For soil borings, the top depth of the sample interval will be used as the sample number. The final portion of the sample tracking number will be the sample date.

The following terminology will be used for the sample identification:

- **Structure Air Samples**
  - NYSDEC SITE ID (401075)-IA-XX through 09 (for indoor ambient air)
    - 401075-IA-XXA and 401075-IA-XXB (for multiple basement indoor ambient air samples within the same structure)
    - 401075-IA-XX-B, 401075-IA-F1, and 401075-IA-F2 (for indoor ambient air samples taken on different floors within the same structure)
- **Surface Soil Samples**
  - 401075-SS-XX-SAMPLE DEPTH
- **Subsurface Soil Samples**
  - 401075-SB-XX-SAMPLE DEPTH

- **Groundwater Samples**
  - 401075-MW-XX
- **Soil Vapor Samples**
  - 401075-SV-XX.

3.3 SAMPLE CONTAINERS

Table 2 outlines the types of sample containers and preservatives required for sample collection. Please note that liquid waste samples that exhibit an oily characteristic do not require acid preservation.

4. ANALYTICAL LABORATORY

The data collected during this investigation will be used to determine the presence and concentration of certain analytes in building debris, subsurface soil, groundwater, and soil vapor.

Soil and groundwater samples will be submitted to Con-Test Analytical Laboratory in East Longmeadow, Massachusetts and soil vapor samples will be submitted to Eurofins Air Toxics in Folsom, California. Con-Test Analytical Laboratory and Eurofins Air Toxics are New York State Department of Health Environmental Laboratory Analytical Program-certified laboratories, meeting specifications for documentation, data reduction, and reporting. Preliminary analytical results will be provided within 14 days of sample receipt and full NYSDEC Analytical Services Protocol Category B deliverables and associated electronic data deliverables will be provided to EA within 30 days of sample receipt.

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5. ANALYTICAL TEST PARAMETERS

This QAPP Addendum will require the analysis of non-aqueous and aqueous samples using U.S. Environmental Protection Agency (EPA) Method 8260B for volatile organic compounds, EPA Method 8270C for semi-volatile organic compounds, EPA Method 8082 for polychlorinated biphenyls, EPA Method 6010B for metals, EPA Method 7471A/7470A for mercury, and EPA Method 9010B for cyanide. Groundwater samples will also be analyzed using EPA Method 537 for perfluorinated chemicals and 8270 SIM for 1,4-dioxane. Soil vapor samples will be analyzed using EPA Method TO-15 and TO-15SIM for volatile organic compounds. Additionally, samples of investigation derived waste (IDW) will composited and submitted for analysis using Toxicity Characteristics and Leaching Procedure (TCLP) to determine waste disposal requirements. Compound lists for each analytical method are included in the Generic QAPP (EA 2011a)[1].

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6. ANALYTICAL DATA VALIDATION

The laboratory will review data prior to its release from the laboratory. Objectives for review will be in accordance with the QA/QC objectives stated in the Generic QAPP (EA 2011a)[1]. The laboratories are required to evaluate their ability to meet these objectives. Outlying data will be flagged in accordance with laboratory standard operating procedures and corrective action will be taken to rectify the problem.

In order to ensure the validity of analytical data generated by the laboratories, analytical data validation will be performed by Environmental Data Services, LTD (EDS), who is independent from the laboratory and the project. The resumes of the personnel providing the data validation services will be submitted for approval under a separate cover, if requested. Data usability summary reports will be generated by EDS for analytical data. The Generic QAPP addresses implementation of independent data validation.

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Table 1 SVI Evaluation and Remedial Investigation Analytical Program

SOIL SAMPLING

	Sample Matrix	VOCs by EPA-8260B	SVOCs by EPA-8270C	PCBs by EPA-8082	PEST by EPA-8081	TAL Metals by EPA-6010B	Percent Moisture	
SURFACE SOIL and DEBRIS/FLOOR DRAINS								
No. of Samples	Surface Soil	13	13	13	8	13	13	**Pesticides for surface soil samples only**
Field Duplicate		1	1	1	1	1	0	
Trip Blank/Rinse Blank		1	0	0	0	0	0	
Matrix Spike/Matrix Spike Duplicate		2	2	2	2	2	0	
Total No. of Analyses		**17**	**16**	**16**	**11**	**16**	**13**	
SUBSURFACE SOIL (PHASE I)								
No. of Samples	Subsurface Soil	20	20	20	—	20	20	
Field Duplicate		1	1	1	—	1	0	
Trip Blank/Rinse Blank		1	0	0	—	0	0	
Matrix Spike/Matrix Spike Duplicate		2	2	2	—	2	0	
Total No. of Analyses Phase I		**24**	**23**	**23**	**—**	**23**	**20**	
SUBSURFACE SOIL (PHASE II)								
No. of Samples	Subsurface Soil	10	As Needed Based on Phase I Results				10	
Field Duplicate		1	—	—	—	—	1	
Trip Blank/Rinse Blank		1	—	—	—	—	1	
Matrix Spike/Matrix Spike Duplicate		2	—	—	—	—	2	
Total No. of Analyses Phase II		**14**	**0**	**0**	**—**	**0**	**14**	

GROUNDWATER SAMPLING

	Sample Matrix	VOCs by EPA-8260B	SVOCs by EPA-8270C	PCBs by EPA-8082		TAL Metals by EPA-6010B		PFCs by EPA 537	1, 4-Dioxane by EPA 8270 SIM	Major Anions	TOC	Dissolved Gases
GROUNDWATER GRAB SAMPLES												
No. of Samples	Groundwater	14										
Field Duplicate		1										
Trip Blank/Rinse Blank		1										
Matrix Spike/Matrix Spike Duplicate		2										
Total No. of Analyses Phase I		**18**										
GROUNDWATER (PHASE I)												
No. of Samples	Groundwater	6	6	6		6	—	6	3	3	—	—
Field Duplicate		1	1	1		1	—	1	1	1	—	—
Trip Blank/Rinse Blank		1	0	0		0	—	0	1	1	—	—
Matrix Spike/Matrix Spike Duplicate		2	2	2		2	—	2	2	2	—	—
Total No. of Analyses Phase I		**10**	**9**	**9**		**9**	**—**	**9**	**7**	**7**	**—**	**—**
GROUNDWATER (PHASE II)												
No. of Samples	Groundwater	16	As Needed Based on Phase I Results				—	—	—	3	3	9
Field Duplicate		1	0	0		0	—	—	—	0	0	0
Trip Blank/Rinse Blank		1	0	0		0	—	—	—	0	0	0
Matrix Spike/Matrix Spike Duplicate		2	0	0		0	—	—	—	0	0	0
Total No. of Analyses Phase II		**20**	**0**	**0**		**0**	**—**	**—**	**—**	**3**	**3**	**9**

SOIL VAPOR AND AMBIENT AIR SAMPLING (ROUND I) Nine Structures & Resample as Needed

	Sample Matrix	VOCs by TO-15	VOCs by TO-15SIM
Indoor Air	Soil Vapor	0	14+ 9
Sub-slab Air		5 + 3	0
Outdoor Air		0	2 + 2
Soil Vapor Point		0	0
Subtotal No. of Samples		8	27
Field Duplicate		0	2
Matrix Spike/Matrix Spike Duplicate		0	0
Total No. of Analyses Phase I		**8**	**29**
SOIL VAPOR AND AMBIENT AIR SAMPLING (ROUND II) Up to 18 Structures			
Indoor Air	Soil Vapor	0	18
Subslab Air		18	0
Outdoor Air		0	3
Soil Vapor Point		6	0
Subtotal No. of Samples		24	0
Field Duplicate		1	2
Matrix Spike/Matrix Spike Duplicate		0	0
Total No. of Analyses Phase I		**25**	0
Total No. of Air Analyses		**33**	**23**

NOTE:

VOC = Volatile organic compounds
SVOC = Semi-volatile organic compounds
PCB = Polychlorinated biphenyls
PEST = Pesticides
PFC = Perfluorinated chemicals
TAL Metals = Target Analyte List metals including mercury by EPA Method 7470A/7471A, and cyanide by EPA Method 9010B
TOC = Total Organic Carbon
SIM = Selected Ion Monitoring
Dash (—) indicates no sample taken
Laboratory quality control samples will be collected at a rate of 1 per 20 samples per matrix
Rinse Blanks are collected one per analysis per field sampling day

Table 2 Sample Containers, Preservation, and Holding Times

Parameter	Sample Method	Matrix	Container Type/Size	Sample Volume	Preservation	Maximum Holding Time from Verifiable Time of Sample Receipt
Volatile Organic Compounds	8260B TCL	Soil	One 4-oz wide-mouth glass vial with Teflon-lined cap	4 oz	Minimize headspace, cool 4°C	14 days
		Water	Three 40-mL glass vials with Teflon-lined Septa	120 mL	No headspace, cool 4°C, HCl	14 days
	TO-15SIM	Soil Vapor	One 6-L Summa® canister	6 L	None	30 days
Semi-volatile Organic Compounds	8270 TCL	Soil	One 8-oz wide-mouth glass jar	8 oz	Cool 4°C	14 days
		Water	One 1-L amber glass with Teflon-lined cap	1 L	Cool 4°C	7 days
Polychlorinated Biphenyls	8082	Soil	One 8-oz wide mouth glass jar with Teflon-lined cap	8 oz	Cool 4°C	14 days
		Water	One 1-L glass with Teflon-lined cap	1 L	Cool 4°C	7 days
Pesticides	8081	Soil	One 8-oz wide mouth glass jar with Teflon-lined cap	8 oz	Cool 4°C	14 days
		Water	One 1-L glass with Teflon-lined cap	1 L	Cool 4°C	7 days
Target Analyte List Metals	6010	Soil	One 8-oz wide-mouth glass jar	8 oz	Cool 4°C	6 months for metals, 28 days for mercury, 14 days for cyanide
		Water	One 250-mL plastic bottle	250 mL	Cool 4°C, HNO_3	6 months for metals, 28 days for mercury, 14 days for cyanide
Total Organic Carbon	5310B	Water	One 250-mL amber glass	20 mL	Cool 4°C, H_2SO_4	28 days
Perfluorinated Chemicals	537	Water	One 500-mL HDPE bottle	500 mL	Cool 4°C	14 days

Parameter	Sample Method	Matrix	Container Type/Size	Sample Volume	Preservation	Maximum Holding Time from Verifiable Time of Sample Receipt
1, 4-dioxane	8270 Isotope Dilution	Water	Two 1-L amber jars	2 L	Cool 4°C	7 days
Methane, ethane, ethane	RSK-175	Water	Three 40-mL VOA glass vials with Teflon-lined Septa	120 mL	No headspace, cool 4°C, HCl	14 days
Chloride	SM4500	Water	One 250-mL polyethylene bottle	250 mL	Cool 4°C	28 days
Sulfate	ASTM D516	Water	One 250-mL polyethylene bottle	250 mL	Cool 4°C	28 days
Alkalinity	SM2320B	Water	One 250-mL polyethylene bottle	250 mL	Cool 4°C	15 days
Microbial Community Assay	CENSUS	Water	One Bio-Trap® Sampler	N/A	Cool 4°C	24-48 hours
Toxicity Characteristic Leaching	1311	Soil	One 250-mL	250 mL	Cool 4°C, HNO_3	6 months

Note:
°C = Degrees Celsius
HDPE = High density polyethylene
L = Liter(s)
mL = Milliliter(s)
oz = Ounce

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