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New York State Electric & Gas

REMEDIAL DESIGN WORK PLAN

Dansville Manufactured Gas Plant Site
Operable Unit 2
Dansville, Livingston County, New York
Site No. 8-26-012

September 2018

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Dansville Manufactured Gas Plant Site
Operable Unit 2

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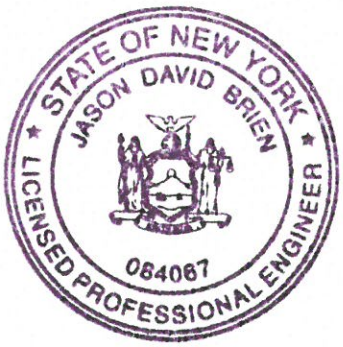
CERTIFICATION STATEMENT

I, Jason Brien, P.E. certify that I am currently a New York State registered Professional Engineer and that to the best of my knowledge and based on my inquiry of the persons involved in preparing this document under my direction, certify that this Remedial Design Work Plan was prepared in substantial conformance with applicable portions of the DER Technical Guidance for Site Investigation and Remediation (DER-10).

_____, P.E.
New York State P.E. No. 084067

9/14/2018
DATE



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ACRONYMS AND ABBREVIATIONS

ASP	Analytical Services Protocol
BDL	below method detection levels
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CRQL	Contract Required Quantitation Limit
DER-10	Department of Environmental Remediation's *Technical Guidance for Site Investigation and Remediation*
DNAPL	Dense non-aqueous phase liquid
DOT	Department of Transportation
DUSR	Data Usability Summary Reports
ft/ft	feet/foot
IDW	investigation-derived waste
IRM	interim remedial measure
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MGP	manufactured gas plant
NAPL	non-aqueous phase liquids
NTU	nephelometric turbidity units
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric and Gas
OU-1	Operable Unit 1
OU-2	Operable Unit 2
PAHs	polycyclic aromatic hydrocarbons
PID	photoionization detector
PVC	polyvinyl chloride
RDWP	Remedial Design Work Plan
SCOs	Soil Cleanup Objectives
SCR	Site Characterization Report
SMP	Site Management Plan

SVOC	semivolatile organic compounds
TAL	Target Analyte List
TCL	Target Compound List
TLM	tar-like material
TPH	Total Petroleum Hydrocarbons
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds

1 INTRODUCTION

This Remedial Design Work Plan (RDWP) has been prepared by Arcadis of New York, Inc. (Arcadis) on behalf of NYSEG to present the activities associated with preparation of a remedial design for the New York State Department of Environmental Conservation- (NYSDEC-) selected remedy for Operable Unit 2 (OU-2) of the New York State Gas and Electric Corporation (NYSEG) Dansville former manufactured gas plant (MGP) site (the "site") located in the Village of Dansville, New York (**Figure 1**).

This RDWP has been prepared in accordance with the following documents:

- *Record of Decision, NYSEG- Dansville MGP, Operable Unit Number 02: Onsite and Offsite Soil and Groundwater* (ROD) dated March 2017.
- *DER-10, Technical Guidance for Site Investigation and Remediation* (NYSDEC 2010) (DER-10).
- The Order on Consent between NYSEG and NYSDEC (Index No. DO-0002-9309) signed on March 30, 1994.

Upon receipt of NYSDEC comments on this draft RDWP, the comments will be incorporated, as appropriate, and the RDWP will be finalized for distribution.

1.1 RDWP Organization

This RDWP has been organized into seven sections as described in the following table.

Table 1.1. RDWP Organization

Section	Description
Section 1 – Introduction	Presents the organization of the RDWP, pertinent site background information, a summary of potentially applicable standards, criteria, and guidance (SCGs) criteria, site characterization summary, remedial action objectives (RAOs), and a description of the NYSDEC-selected remedy.
Section 2 – Pre-Design Investigation	Presents the scope and rationale for PDI activities to be completed in support of the remedial design.
Section 3 – Remedial Design	Presents a description of remedial design activities to be completed in support of implementing the remedial construction activities.
Section 4 – Permits, Access Agreements, and Approvals	Identifies the permits, access agreements, and approvals necessary to conduct the PDI and to implement the NYSDEC-selected remedy.
Section 5 – Remedial Design Documents and Schedule	Identifies the remedial design documents to be prepared in support of the remedial action and presents the anticipated project schedule for implementing the PDI and preparing the remedial design.

Section	Description
Section 6 - Post-Construction Activities	Describes the documents to be prepared following the remedial construction.
Section 7 - References	Presents a list of documents used to support the preparation of this RDWP.

1.2 Site Background

This section presents a summary of relevant background information used to develop the elements described in this RDWP. The background information summarized below was obtained from environmental investigations performed at Operable Unit 1 (OU-1) and OU-2 of the site from 1986 to 2006.

More detailed site background information is provided in the documents listed in Section 7, References.

1.2.1 Location and Physical Description

The Dansville former MGP site is located at 50 Ossian Street in the Village of Dansville, Livingston County, New York (**Figure 1**). During the remedial investigation phase of the project, the NYSDEC and NYSEG agreed to separate the site into two operable units. The ROD indicates that OU-1 consists of soil lying above and below the groundwater table within the portion of the former MGP property that was remediated by excavation from 2014 to 2015. OU-2, the focus of this RDWP, consists of the remainder of soil on the NYSEG-owned property not included in the OU-1 remedy and groundwater both on- and off-site impacted by MGP-related residuals. A site map showing the limits of the OU-1 excavation and the limit of OU-2 based on the most recent sampling event completed at each well is shown on **Figure 2**. OU-2 is comprised of a mixed industrial use (i.e., the NYSEG-owned property) and residential neighborhood, with private residences to the north, south, east, and west. A church and a child care facility are also located to the north of the NYSEG property, across Battle Street. A former dry cleaners facility (Pappas Dry Cleaners site) is located at 46 Ossian Street, and abuts the NYSEG property to the southeast, and is located hydraulically upgradient from OU-2. As indicated in the NYSDEC ROD for the Pappas Dry Cleaners Site, Operable Unit No. 1 (NYSDEC, 2009), OU-1 of the Pappas Dry Cleaners site consists of the soil and groundwater on the former dry cleaner property and OU-2 of the Pappas Cleaners site consists of off-site groundwater and soil vapor. Based on close proximity of the former MGP and Pappas Dry Cleaners sites (i.e., adjacent properties) and the direction of groundwater flow, OU-2 for the NYSEG site is co-located within a portion of the larger Pappas Cleaners impacts.

The NYSEG-owned portion of OU-2 is mostly vacant other than a small non-occupied active gas regulator station. The NYSEG property is flat with no significant topographic features with approximately three-quarters of the site surface covered with stone or paved, with the remaining portion covered with grass.

1.2.2 Site History and Operation

As presented in the OU-2 SRI Report, the gas works operations began in 1861 and continued for approximately 70 years, ceasing in January of 1930. The gas manufacturing process and the feed fuels

were changed several times during the operational life of the MGP. Oil, coal, and coke were used as feed fuels at various times during the plant's operation. Blue gas, and later carburetted water gas, were manufactured at the plant. Gas production generally increased during the operating life of the plant. Little is known about the generation and disposal practices of wastes at the site, except that a tar storage vessel was present in the subsurface and rail cars were likely used to transport wastes from the property for refining or for burning as boiler fuel. Also, purifier wastes were stored in burlap bags along the west side of the gas house for periodic removal. NYSEG acquired the 50 Ossian Street property through its merger with New York Central Electric Company in1937 (seven years after gas manufacturing operations ceased). Photographs from 1930 show that at least two holders were present on the property, but the gas holders were no longer present in a 1938 aerial photograph. Additionally, site maps and photos from circa 1930 show a former canal as a weed-choked ditch paralleling the south side of Battle Street. Historical pictures from circa 1933 show a small substation on the 50 Ossian Street property. In later years, NYSEG used a portion of the property for electrical equipment storage, including transformers. Electricity was also produced on-site from 1895 to 1925. In the years after plant operations had ceased, the gas house was used as a meter department and was later removed in 1958. Also, in later years after gas production ceased, the former electricity generator building was renovated, enlarged, and used as the regional service center for NYSEG. Service center operations ceased in 2010 and the remaining building was demolished in 2012. As indicated in the OU-1 Pappas ROD (NYSDEC, 2009), the dry-cleaning business located at 46 Ossian Street operated from 1952 to 2002.

1.3 Standards, Criteria, and Guidance

Chemical-, action-, and location-specific standards, criteria, and guidance values (SCGs) potentially relevant to the design and implementation of the NYSDEC-selected remedy were developed and presented in the *Feasibility Study Report, Dansville Former Manufactured Gas Plant Site, Operable Unit No. 2* (Arcadis, 2016) (FS Report). The primary SCGs that were considered during the development of this RDWP include the following:

- NYSDEC's DER-10.
- Soil cleanup objectives (SCOs) based on NYSDEC's Title 6 of the New York Code of Rules and Regulations (NYCRR) Part 375-6 (6 NYCRR Part 375-6).
- Groundwater, drinking water, and surface water SCGs based on NYSDEC's *Division of Water, Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (NYSDEC 2004) and Part 5 of the *New York State Sanitary Code*.
- Resource Conservation and Recovery Act (RCRA) and New York State regulations regarding the identification and listing of hazardous wastes outlined in *40 Code of Federal Regulations (CFR) 261 and 6 NYCRR Part 371*, respectively.
- NYSDEC's *Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants (DER-4)* (NYSDEC 2002).

- United State Army Corps of Engineers (USACE) Nationwide Permit (NWP) program promulgated under Section 404 of the Clean Water Act and NYSDEC Freshwater Wetlands Permit regulations (6 NYCRR Part 603).

1.4 Site Characterization Summary

This section presents summaries of the site characterization and the nature and extent of impacted media based on the results obtained from several environmental investigations performed between 1986 and 2006. Detailed discussions of the site investigation history and results are documented in the following reports:

- *Final Supplemental Remedial Investigation (SRI) Report for Operable Unit 1 (OU-1) at the Former MGP Site, Dansville* (OU-1 RI Report)
- *Final Supplemental Remedial Investigation (SRI) Report for Operable Unit 2 (OU-2) at the Former MGP Site, Dansville, New York* (OU-2 SRI Report)
- *Draft Synoptic Groundwater Sampling Report for Operable Units 1 (OU1) and 2 (OU2) at the Dansville Former MGP Site, Dansville, New York* (Synoptic Groundwater Sampling Report)

A complete list of environmental investigation reports and regulatory documents associated with OU-1 and OU-2 is provided in Section 7 (References).

1.4.1 Topography

The NYSEG-owned portion of OU-2 is flat with no significant topographic or geologic features. Most of the site's surface was reworked/regraded during the OU-1 remedial action; approximately three quarters of the site surface is covered with stone or paved, with the remaining portion covered with grass. The topography north of the NYSEG-owned property is also generally flat with the ground surface elevation ranging between approximately 682 to 686 feet above mean sea level (AMSL). According to the ecological study performed during the OU-2 SRI, the majority of OU-2 is composed of a residential development (mowed lawn, mowed lawn with trees), commercial/industrial development (urban vacant lot, urban structure exterior), and roadway/transportation (mowed roadside/pathway, herbicide-sprayed roadside/pathway, paved road/path, and unpaved road/path).

1.4.2 Geology

In vertically descending order from ground surface, overburden materials within OU-2 consist of fill (where present), alluvium sediment, and Quaternary glacial lacustrine deposits. Geologic cross-sections presented in the OU-2 SRI Report (Figures A-7 through A-11) are included in **Appendix A**. The fill unit is generally encountered in and immediately north of OU-1 at thicknesses up to 10 feet. The fill material is located above the water table and consists of medium to coarse-grain sands, trace amounts of silt, some gravel, and other debris. The top of the alluvium was encountered at depths near the ground surface to approximately 10 feet below ground surface (bgs), with the bottom of the alluvium extending to depths ranging from approximately 11 to 24 feet bgs. The alluvium at OU-2 consists of three units. The upper unit consists of silt, sand and gravel with angular rock clasts. This upper unit overlies a brown, wet, gravel and medium to coarse-grained sands, cobbles and a trace amount of silt. A vast majority of the visual

MGP-related impacts observed in OU-2 were encountered within this unit. A third, less consistent layer, was present beneath the upper unit in some areas and consisted of interbedded, brown, fine sand and silt. The top of the lacustrine deposit was encountered at depths ranging from approximately 11 to 24 feet bgs. The unit consists of gray, stiff, silty clay with some layers of interbedded fine sand and silt. The top of silty clay unit serves as a continuous confining layer beneath the overlying shallow aquifer. A top of silty clay unit contour map (OU-2 SRI Report, Figure A-12) is included in **Appendix A**. As shown on the figure, the top of the silty clay unit generally slopes to the northwest, with undulations throughout OU-2. The contour is generally consistent with the groundwater flow direction of the shallow unconfined hydrostratigraphic unit.

1.4.3 Hydrogeology

Shallow groundwater in the area of OU-1 and OU-2 flows generally to the northwest. The water table is typically encountered at depths ranging from 8 to 14 feet bgs throughout OU-2, but typically at depths greater than 10 feet bgs in the central portion of OU-1. The saturated zone above the confining silty clay unit water table is typically 5 feet thick (or less).

In the shallow groundwater bearing zone, the average horizontal hydraulic gradient for the aquifer in OU-1 was calculated as 0.011 foot per foot (ft/ft) and the average horizontal hydraulic gradient for the aquifer in OU-2 was calculated as 0.014 ft/ft. As reported in the OU-2 MGP SRI Report, the estimated specific discharge for the off-site groundwater plume was 2.46 feet per year (ft/yr), while the average estimated groundwater seepage velocity was 7 ft/yr. However, as indicated in the OU-1 MGP SRI Report, the hydraulic conductivity values used to calculate groundwater seepage velocity in OU-1 were likely significantly underestimated. Given the distance of observed groundwater impacts from the former MGP and dry cleaners properties, the actual average groundwater seepage velocity within the alluvial unit is likely on the order of 50 to 100 ft/yr, which is consistent with a sand and gravel unit (where the majority of residual MGP-related impacts are located with OU-2).

1.4.4 Groundwater Usage

The *Task 1 Report, Preliminary Site Evaluation* (TRC, 1986) stated that there are no known wells being used for water supply within a one-mile radius of the OU-1 site, and that Dansville's water supply is provided by two surface water reservoirs located approximately two miles southeast (i.e., hydraulically upgradient) of the site.

1.4.5 Nature and Extent of Remaining Impacts

Manufactured gas-production byproducts, typically dense non-aqueous phase liquid (NAPL) (i.e., coal tar), often account for the majority of the environmental impacts at former MGP sites. Principal components of coal tar are benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, which are volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs), which are semi-volatile organic compounds (SVOCs). Because coal tar typically contains elevated levels of these compounds, soil samples and groundwater monitoring wells that contain visual evidence of coal tar are typically assumed to contain BTEX and PAHs at concentrations greater than applicable SCGs.

Soil and groundwater within OU-1 and OU-2 contained BTEX and PAHs related to the MGP operations, as well as impacts associated with the Pappas Dry Cleaners property (NYSDEC Site Number 826018). As stated in the ROD, the chlorinated compounds are not associated with the former MGP operations and are being addressed by the NYSDEC as part of the State Superfund Program. Remediation of the OU-1 portion of the NYSEG-owned property has been completed. Remedial actions have successfully achieved soil cleanup objectives for commercial use in OU-1.

The ROD (page 8) indicates that the contaminants of concern (COC) identified for OU-2 are:

benzene	dibenz(a,h)anthracene
ethylbenzene	naphthalene
toluene	phenanthrene
xylene (mixed)	indeno(1,2,3-cd)pyrene
benzo(a)anthracene	acenaphthene
chrysene	coal tar

The COCs exceed the applicable SCGs for soil and groundwater.

1.4.5.1 Surface Soil

As stated in the ROD, analytical results from five surface soil samples collected during the OU-1 SRI at depths between 0 to 2 inches below bgs did not show evidence of surficial soil impacts related to MGP activities.

1.4.5.2 Subsurface Soil and NAPL

Remediation of the OU-1 portion of the former MGP site was completed from 2014 to 2015 and included the removal of MGP-related source materials. The remedial actions successfully achieved soil cleanup objectives for commercial use in OU-1. Remaining MGP impacts within the NYSEG-owned portion of OU-2 includes small NAPL droplets that were identified at four general locations beneath the northern portion of the property at depths ranging from approximately 5 to 12 feet bgs. Sheens were identified in subsurface soil in the southwest portion of the NYSEG-owned property at two locations (SB-12 at depths of 11 to 12 and 16 to 18 feet bgs, and SB-19 at 7 to 8 feet bgs).

The extent of visual MGP-related impacts in soil at properties not owned by NYSEG (i.e., OU-2) is generally limited to Franklin Street, located approximately 375 feet northwest of the NYSEG-owned property. The sheens and NAPL drops most likely migrated from OU-1. In general, the NAPL globules were reddish-brown in color and were intermixed with water within the pore spaces of the loose, sandy gravel in the shallow aquifer at thicknesses of generally 2 feet or less, at depths ranging from approximately 11 to 17 feet bgs. Soil grossly impacted with NAPL was not encountered in OU-2; the coal tar NAPL observed in OU-2 did not saturate the soil matrix, but rather was present in small globules within the sandy gravel matrix present above the silty clay layer. Visual impacts were not observed within the silty clay unit, which indicates that the unit is acting as a confining layer, with respect to the vertical migration of coal tar NAPL. The horizontal distribution of visual impacts generally follows the northwest

groundwater flow direction. No measurable accumulation of NAPL has been observed within the existing piezometers.

The extent of BTEX and PAH COCs that exceed Unrestricted Use SCOs generally corresponds with the extent of visual impacts and were typically located at depths at or greater than 12 feet bgs. In addition to only being found at depth, exceedances of unrestricted use SCO were typically limited to select BTEX and/or PAH compounds that only slightly exceeded their respective SCOs; total BTEX concentrations were typically less than 1 milligram per kilogram (mg/kg) and total PAH concentrations were typically less than 80 mg/kg.

The extent of subsurface soil impacts with at least one BTEX and/or PAH analyte exceeding its Unrestricted Use SCO is presented on **Figure 3**.

1.4.5.3 Groundwater

The most recent groundwater sampling event of site-wide wells and piezometers to evaluate the extent of MGP-related impacts was completed in 2005; one monitoring well (MW03) was resampled in 2011 and one piezometer (PZ36) was resampled in 2012. The extent of groundwater with a COC present at a concentration above its New York State water quality standard or guidance value corresponds with the extent of visual impacts and/or soil quality impacts discussed above. The extent of groundwater with one or more BTEX and/or PAH analytes detected at a concentration greater than its NYSDEC Class GA drinking water standard or guidance value reported during the most recent sampling events is presented on **Figure 4**.

1.4.5.4 Soil Vapor

Soil vapor samples were collected in March 2006 from OU-2 at locations northwest of the site in the areas of Battle and Franklin Street at depths ranging from 6 to 8 feet bgs. Individual BTEX and chlorinated compounds were detected in soil gas samples. As presented above, chlorinated compounds are not associated with the former MGP operations and appeared to originate from the adjacent former Pappas Dry Cleaners property. As part of the investigation activities related to the Pappas Dry Cleaners property, the NYSDEC collected sub-slab and indoor air samples at residential properties within OU-2. Sub-slab and indoor air samples did not contain BTEX concentrations greater than the 90th Percentile (in fuel heated homes) as presented in Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006). Within OU-2 actions were needed to address soil vapor intrusion at some locations as a result of impacts associated with the adjacent Pappa's Dry Cleaning site. Sub-slab depressurization systems (systems that ventilate/remove the air beneath the building) have been installed and maintained by the NYSDEC at eight properties.

1.5 Remedial Action Objectives

Remedial action objectives (RAOs) established for the site represent media-specific goals that are protective of public health and the environment that have been developed through consideration of the results of the site investigation activities and with reference to potential SCGs, as well as current and foreseeable future anticipated uses of the site. The RAOs were presented in the ROD and are outlined below in **Table 1.2**. The objectives for the remedial program have been established through the remedy

selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

Table 2.2. Remedial Action Objectives

Medium	Protection	RAO
Soil	Public Health	• Prevent ingestion/direct contact with contaminated soil • Prevent inhalation of or exposure from contaminants volatilizing from COCs in soil
	Environmental	• Prevent migration of contaminants that would result in groundwater or surface water contamination
Groundwater	Public Health	• Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards • Prevent contact with, or inhalation of volatiles, from contaminated groundwater
	Environmental	• Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable • Remove the source of ground or surface water contamination
Soil Vapor	Public Health	• Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site

1.6 Description of Selected Remedy

The NYSDEC-selected remedy for the site includes enhanced natural attenuation of MGP-related COCs, NAPL monitoring, and implementation of a Site Management Plan (SMP). The elements of the selected remedy are presented in the ROD. In addition to preparation of this RDWP, the remedial elements include:

1. The site cover that currently exists at the NYSEG-owned portion of OU-2 and will be maintained to allow for commercial use of the site. Any site redevelopment will maintain the site cover. The site cover may include paved surface parking areas, sidewalks or soil where the upper 1 foot of exposed surface soil meets the applicable SCOs for commercial use.
2. Installation and operation of coal tar recovery wells to manually remove mobile coal tar (if present).
3. In-situ enhanced biodegradation to treat BTEX and PAH COCs in groundwater via application wells installed within the roadways and rights-of-way, on private property, and/or at the NYSEG-owned property. The biological breakdown of COCs through aerobic respiration will be enhanced by the placement of an oxygen release compound into the subsurface via application wells. Other groundwater amendments may include nutrients such as a sulfate/nitrate product to enhance the already occurring aerobic degradation processes.

4. The interim site management plan (ISMP) for OU-1 of the site will be revised to incorporate the OU-2 remedy, and a site-wide Site Management Plan (SMP) produced that will include:
    a. an Institutional and Engineering Control Plan that identifies use restrictions and engineering controls for the OU-2 area
    b. descriptions of an Environmental Easement for the NYSEG-owned portion of OU-2
    c. Engineering Controls, including the OU-2 site cover materials, coal tar recovery wells, and enhanced bioremediation wells.
    d. Excavation Plan that details the provisions for management of future excavations in areas of remaining contamination
    e. a provision that should a building foundation or building slab be removed in the future on the NYSEG owned property, an appropriate cover system will be placed in areas where the upper one foot of exposed surface soil exceeds the applicable SCOs
    f. agreements with property owners to implement necessary site management plan sampling activities on the off-site properties
    g. a provision for further investigation and remediation should large scale redevelopment occur within OU-2
    h. descriptions of the provisions of the environmental easement placed on the NYSEG property, including any land use and groundwater use restrictions
    i. provisions for the management and inspection of the identified engineering controls
    j. a provision for evaluation of potential soil vapor intrusion for future buildings developed within the area of site management
    k. a Monitoring Plan to assess the performance and effectiveness of the remedy

2 PRE-DESIGN INVESTIGATION

A PDI will be completed during the remedial design phase to support the design of the NYSDEC-selected remedy. The primary objectives of the PDI are to:

- Evaluate dissolved concentrations of MGP-related impacts to delineate the extent of BTEX and PAHs in groundwater.
- Document that natural attenuation processes are occurring.
- Investigate the presence of recoverable NAPL.

This section describes the proposed PDI activities to be conducted to achieve these objectives, organized by the following tasks:

- PDI Task 1 – Access Agreements
- PDI Task 2 – Evaluation of Piezometers and Monitoring Wells
- PDI Task 3 – Utility Evaluation and Mapping
- PDI Task 4 – Soil Boring/ Well Installation, Decommissioning, and Repairs
- PDI Task 5 – Community Air Monitoring
- PDI Task 6 – Site Survey
- PDI Task 7 – Baseline Gauging and Groundwater Sampling
- PDI Task 8 – IDW Management
- PDI Task 9 – PDI Documentation

Methodologies, protocols, and laboratory analytical procedures and requirements to be followed during completion of the PDI are presented in the *Field Sampling Plan* (FSP) and *Quality Assurance Project Plan* (QAPP) included as **Appendix B** and **Appendix C**, respectively. Health and safety protocols and procedures to be followed by Arcadis field personnel are presented in the *Health and Safety Plan* (HASP) included in **Appendix D**.

Community air monitoring activities consistent with the general requirements provided in DER-10 (Appendix 1A; New York State Department of Health [NYSDOH] Generic Community Air Monitoring Plan) are described in the site-specific Community Air Monitoring Plan (CAMP) included as **Appendix E**. Given the limited soil disturbance activities anticipated for the PDI, real-time air monitoring for VOCs will be conducted with one photoionization detector (PID) located at the up-wind perimeter of the exclusion zone (i.e., designated work area) and one PID located at the down-wind perimeter during drilling activities. Continuous VOC monitoring during installation of soil borings is consistent with the NYSDOH generic CAMP. CAMP monitoring will not be required during the groundwater sampling event.

2.1 PDI Task 1 – Access Agreements

Access agreements for both private and public properties will be required to complete the proposed PDI activities described below. Properties that have been identified for potential access to complete the PDI activities are identified in **Table 1**. Obtaining access for the identified private properties and rights-of-way (ROWs) must be obtained prior to initiating the PDI field activities. Access to the identified properties is required to either:

- Inspect/repair/replace a well or piezometer that was previously sampled and identified in the draft ISMP for future plume delineation or effectiveness monitoring.
- Install a new well to support dissolved plume delineation and/or future effectiveness monitoring.

Property addresses, parcel IDs, and rationale for selecting each property are included in **Table 1**.

In addition to the piezometers/wells identified to be evaluated (Section 2.2) and monitoring wells proposed to be installed during the PDI (Section 2.4), **Table 1** includes several additional properties that were identified to obtain access agreements. These properties were included as contingency locations to obtain sufficient delineation data in the event that access agreements cannot be secured for one or more of the identified properties.

NYSEG will be responsible for obtaining access to private properties.

2.2 PDI Task 2 – Evaluation of Piezometers and Monitoring Wells

Upon successful acquisition of access agreements, an evaluation of the conditions of the existing monitoring wells/piezometers that have been identified for effectiveness monitoring in the draft ISMP and/or baseline gauging and groundwater sampling (Section 2.6) will be conducted as the initial field task. As stated in the draft ISMP, the strategy to evaluate the impact of the OU-1 soil remedy on downgradient (i.e., OU-2) dissolved impacts is to include existing wells and piezometers (or replacement wells, if required based in an initial assessment) in the baseline monitoring, along with new monitoring wells, as required.

A network of monitoring wells and piezometers had historically been installed to monitor groundwater conditions up-gradient and down-gradient from the OU-1 site. Monitoring wells and piezometers within OU-1 were abandoned per NYSDEC protocols during implementation of the excavation remedial action. Piezometers located in Franklin Street (i.e., hydraulically downgradient from OU-1) were abandoned by the Town of Dansville from 2007 to 2008 during a sewer line upgrade project. Additional wells that are known to have been abandoned include PZ-06 (2007), PZ-09 (2008), PZ-20 (2005), MW-04 (2012), MW-06 (2012), MW-09 (2012), and MW-01, MW-03, and MW-05 (2008 to 2010). Additionally, wells located on the adjacent Pappas Cleaners property (MW-1, MW-3, MW-4, MW-6 and MW-9) were abandoned in 2012.

Seven piezometers (PZ-18, PZ-21, PZ-24, PZ-25, PZ-27, PZ-29, and PZ-36) and one monitoring well (MW-04S) were identified in the OU-1 draft ISMP for groundwater monitoring to document the effectiveness of the remedy based on wells that were thought to exist and the most recent groundwater data available. These eight wells were primarily located around the perimeter of the MGP-related dissolved plume. One of the property owners where a piezometer was identified for effectiveness

monitoring in the ISMP (PZ-18) has recently refused future access, and one piezometer (PZ-21) is no longer considered a required location for the PDI. In addition to the six remaining locations identified for effectiveness monitoring, two additional existing piezometers (PZ-13 and PZ-32) and one additional existing monitoring well (MW-02S) will be included in the initial inspection/evaluation to determine if they still exist and to document their conditions.

As shown on **Table 1**, in addition to the properties for the nine wells identified above, NYSEG will attempt to obtain access agreements for two additional properties where piezometers were historically located (PZ-22 and PZ-31). Based on NYSEG's ability to obtain access agreements, inspections/evaluations may also be conducted on these piezometers. In addition, as also shown on the table, NYSEG will attempt to obtain access agreements for three properties where monitoring wells could potentially be installed for future performance monitoring. These piezometers are located on private properties and also require acquisition of access agreements. The rationale for selecting these piezometers are also presented in **Table 1** and locations shown on **Figure 5**.

Arcadis will conduct a visual inspection of the wells proposed for sampling. A water level indicator capable of fitting into a 1-inch diameter well will be used to gauge the depth to bottom of each well. At the completion of the site visit a list of required repairs, or well replacements, if any, will be compiled. Arcadis will prepare a summary table(s), a Site Inspection Form (ISMP, Appendix H) for each well, and photo-documentation summarizing the results of the inspections.

Existing piezometers/wells that are deemed to be useable if minor repairs are made (e.g., replace missing well caps, require re-development or replacement of concrete aprons, etc.), will be repaired, as required, during PDI Task 4 (below). Additionally, existing wells that are non-serviceable due to the extent of damage or required repairs, will be properly abandoned during PDI Task 4 in accordance with NYSDEC Commissioner's Policy 43 (CP-43) and the FSP, and potentially replaced if deemed necessary. If replacement is required (as noted on the Site Inspection Form), NYSEG will notify affected property owners and the NYSDEC.

2.3 PDI Task 3 – Utility Evaluation and Mapping

PDI Task 3 consists of documenting the presence and location of utilities that may impact the location of proposed wells associated with the PDI or construction of the selected remedy. Water, gas, storm sewer and sanitary sewer lines within the NYSEG-owned property were abandoned during the OU-1 remedial action; however, utilities suspected to be present within the OU-2 limits include overhead electrical lines and (at a minimum) subsurface gas and sewer lines.

Underground utility identification/location tasks will be accomplished in the following sequence to obtain information for protection of utilities in the PDI areas:

- Arcadis will review available drawings showing locations of utilities prior to confirming soil boring locations in the field.
- Arcadis will flag and mark with white paint all proposed soil boring locations, including locations of existing piezometers/wells that require replacement.
- Arcadis' drilling subcontractor will contact Dig Safely of New York (800) 272-4480 at least two working days, and not more than 10 working days, before subsurface work is initiated to identify and mark the

locations of all underground utilities at, and in the immediate vicinity of, the proposed investigation/remediation areas.

- Companies with subsurface utilities will locate and mark utility lines.
- An Arcadis private utility survey contractor will complete a geophysical survey consisting of ground-penetrating radar (GPR) and radio frequency (RF) detection in the areas of the proposed soil borings.

Soil boring/sampling locations will be adjusted to maintain safe setback distances from identified utilities. In addition, during the site kick-off meeting prior to initiating intrusive field work, Arcadis will review precautions regarding safe distance from overhead electrical lines and will flag and mark equipment offset distances in accordance with Arcadis and NYSEG guidance, as appropriate.

After the conclusion of the PDI field activities, the identified utilities and soil boring locations will be surveyed and mapped on detailed drawings as described below in Section 2.5.

Arcadis' will complete a Utility Structures Checklist (included as Attachment C in the HASP) prior to initiating soil disturbance work. The checklist will be retained in the project files. Additionally, each location selected for installation of a soil boring will be cleared to 5-feet bgs using mechanical methods as described in the FSP.

2.4 PDI Task 4 – Soil Boring/Well Installation, Decommissioning, and Repairs

As presented in the ROD, the extent of visual impacts (sheens and blebs) to soil and impacts to groundwater have been sufficiently delineated for the purpose of developing the FS Report; however, for the purpose of developing the remedial design, additional investigation is required. As part of the PDI, additional investigation will be conducted to accomplish the following:

- Evaluate if recoverable NAPL exists downgradient from OU-1
- Evaluate the current nature and extent of dissolved COCs

Although the quantity and locations of soil borings and monitoring wells are presented in RDWP, it is the intent of the PDI to incorporate field data into the PDI field program as it is collected. As such, the PDI program is designed to be flexible, with the final quantity and location of soil borings and samples determined based on the ability to obtain access agreements and the results from the well inspections, and real-time decisions based on discussions with the NYSDEC.

2.4.1 Soil Boring Advancement

For the purposes of this work plan it is assumed that nine additional soil borings will be drilled during the PDI and completed as monitoring wells for additional investigation of NAPL and MGP-related dissolved COCs. As stated above, the actual number and locations of the soil borings/wells may vary based on access agreements and field conditions encountered. In addition, existing well MW-02S has been destroyed and will require replacement. Monitoring well MW-02S will be decommissioned as described in Section 2.2.5.

Five of the wells (MW-1801 through MW-1804, and MW-1808) will be located to investigate the presence of recoverable NAPL immediately downgradient from OU-1, and four of the wells (MW-1805, MW-1806, MW-1807, and MW-1809) will be located to evaluate the presence of MGP-related COCs in groundwater. In addition, monitoring well MW-1810 will be installed adjacent to decommissioned well MW-02S to support long-term groundwater monitoring. These monitoring wells would also support long-term periodic effectiveness monitoring. Each of the soil borings will be cleared to 5-feet bgs by mechanical methods or air knife.

The five wells installed to investigate the presence of recoverable NAPL (MW-1801 through MW-1804, and MW-1808) are located based on the observations documented during the site investigation activities completed in 2005 and during the OU-1 remediation completed in 2014 to 2015. Small globules of NAPL and/or NAPL were documented at the following locations immediately downgradient from OU-1:

- TP-17 (small NAPL globules at 5 feet bgs)
- TP-18 (small NAPL globules at 10 to 12 feet bgs)
- TP-101 (small NAPL globules at 11 feet bgs)
- TP-113 (small NAPL globules at 11 feet bgs)
- MW-03S (small NAPL globules at 10 to 12 feet bgs)
- MW-04S (sheens when installing boring at 12 feet bgs; small NAPL globules during well development)
- NAPL at northeast corner of OU-1 Remediation Area B at the surface of the silty clay lacustrine unit

These locations are immediately downgradient from the former MGP operations and areas of highest impact identified during the OU-1 remedial action, and represent the highest probability of identifying recoverable NAPL, if present. Therefore, wells MW-1801 through MW-1804 will be located in these areas to investigate the presence of recoverable NAPL.

The locations of the ten PDI wells are shown on **Figure 5**. The soil borings will be terminated approximately 2-feet below the top of the gray, stiff, silty-clay unit that serves as a continuous confining layer beneath the overlying shallow aquifer. The top of this lacustrine unit is anticipated to be encountered from approximately 11 to 18 feet bgs. Field data will be used to determine the actual depth of each soil boring. The soil borings will be drilled using a conventional drilling rig and standard hollow-stem auger (HSA) and split-spoon sampling techniques in accordance with the procedures described in the FSP. Soil samples will be collected continuously at each boring from grade to their final depth using 2-inch-diameter by 2-foot-long split-spoon samplers. A 3-inch-diameter sampler may be used if recovery with the 2-inch sampler is poor. Soil recovered from each 2-foot interval will be described and logged by field personnel as described in the soil description standard operating procedure (SOP), included in the FSP (**Appendix B**). Soil descriptions will include color, texture, components, moisture content, particle shape (e.g., angular), plasticity, and structure (e.g. layered). Soil samples will be headspace-screened with a PID.

NAPL, if present, will be described as either oil-like material (OLM) or tar-like material (TLM). OLM refers to materials that have a relatively low viscosity (like fuel oil) and TLM refers to materials with higher relative viscosity (such as putty or taffy at ambient temperatures). OLM and TLM are not defined based on the specific gravity of the NAPL or any odor that may be associated with the NAPL.

NAPL, if present, will also be described based on quantity and distribution, using the following descriptions:

- **Sheen** – iridescent petroleum-like (i.e., rainbow) sheen.
- **Blebs** – droplets of OLM or TLM within the soil core; however, the majority of the soil is not observed to contain OLM or TLM.
- **Stringers** – thin, vertically discontinuous, finger-like presence of OLM or TLM within the soil core; the majority of the soil is not visibly impacted.
- **Heavily Impacted** – More than one-third of the available pore space is estimated to contain OLM or TLM.

Soil cuttings that contain visual evidence of NAPL or discoloration shall be considered potentially impacted and directly loaded into an appropriate container (roll-off, drum) pending disposal sampling. Soil cuttings will be field screened for the presence of volatile organic vapors using a photoionization detector.

2.4.2 Monitoring Well Completion

Following the completion of the ten soil borings, each of the borings will be completed as a monitoring well using 2-inch inside diameter (I.D.), Schedule 40, PVC riser and 20-slot well screen. Each monitoring well will be screened from approximately 2 feet above the groundwater table to the top of the clay confining layer. A 2-foot long sump will be installed at the bottom of each well. The annular space around the screens will be backfilled with clean silica sand (Morie No. 1, or equivalent) that will be installed from screen bottom to approximately two feet above the top of the screen. An approximately 1-foot-thick chipped bentonite seal or slurry will be placed above the sand pack. Cement/bentonite grout will be used to fill the remaining annular space to approximately 2 feet below grade. A flush mounted road box will be installed with a 2-foot by 2-foot concrete collar. It is anticipated that monitoring wells will be screened over a 10-foot interval.

Following installation and immediately prior to development, each well will be monitored for fluid levels, total depth of the well and for the presence of NAPL by an electronic oil/water interface probe. Each well will then be development a minimum of 24 hours after installation per the methods included in the FSP.

Additional well construction and development details are provided in the FSP.

2.4.3 Soil Sampling and Analyses

As stated above, five of the soil borings (MW-1801 through MW-1804, and MW-1808) will be located to investigate the presence of recoverable NAPL immediately downgradient from OU-1, and five of the borings (MW-1805, MW-1806, MW-1807, MW-1809, and MW-1810) will be located to evaluate and monitor MGP-related COCs in groundwater.

Soil samples collected during the installation of the five soil borings located on the NYSEG property to investigate the presence of recoverable NAPL immediately downgradient from OU-1 will be field screened only; no samples will be sent for laboratory analyses.

Two soil samples from each of the five soil borings located to evaluate MGP-related COCs in groundwater (MW-1805, MW-1806, MW-1807, MW-1809, and MW-1810) will be containerized and sent via overnight courier for laboratory analysis. Samples selected for laboratory analysis will be based on:

- Their position in relation to the groundwater; one sample will be collected from within the saturated zone and one sample from just above the saturated zone.
- The relative levels of VOCs based on PID field screening measurements.
- The discretion of the onsite geologist.

Soil sampling methods and protocols are provided in the FSP (**Appendix B**). Samples selected for laboratory analysis will be placed in appropriate containers provided by the laboratory. Laboratory analyses will include:

- VOCs by USEPA Method 8260B
- PAHs by USEPA Method 8270C

Quality control samples will be collected at the frequency detailed in the QAPP (**Appendix C**).

A summary of the anticipated quantity of soil samples and associated laboratory analyses is included in **Table 2**.

2.2.4 Well/Piezometer Repair

Monitoring wells and piezometers requiring repairs, and the specific type(s) of repairs required for each well/piezometer, will be identified on the Site Inspection Form during PDI Task 2. The required repairs will be completed during Task 4 by the drilling subcontractor. The dates of the repairs will be documented, and repaired wells photographed for inclusion in the 50% Remedial Design.

2.5 PDI Task 5 – Site Survey

At the conclusion of the PDI drilling program, a NYS Certified surveyor will survey the locations and elevations of the new PDI monitoring wells, repaired/replaced piezometers, identified underground and overhead utilities, and collect topographic measurements (1-foot contours) on the NYSEG owned property to support the remedial design. This information will be merged with the existing base map/American Land Title Association/National Society of Professional Surveyors (ALTA/NSPS) survey.

2.6 PDI Task 6 – Groundwater Gauging and Sampling

One groundwater gauging and sampling event will be conducted to evaluate current dissolved concentrations of BTEX and PAHs in groundwater. In addition, analyses will also be performed to document that natural attenuation processes are still occurring. Analyses of natural attenuation parameters were completed during the synoptic groundwater sampling event conducted in 2005 and indicated that natural attenuation processes were active in the groundwater plume area and characterized by nitrate reduction, iron reduction and sulfate reduction. Natural attenuation parameters were selected to confirm the dominant biotransformation processes and evaluate the potential for continued transformation

of COCs. Gauging and sampling will be conducted per the protocols and procedures presented in the FSP and QAPP.

The baseline gauging and sampling activities are generally consistent with the strategy presented in the draft ISMP prepared for OU-1, and include the following locations:

- 7 piezometers (PZ-13, PZ-24, PZ-25 (if access can be obtained), PZ-27, PZ-29, PZ-32, and PZ-36)
- 11 monitoring wells (MW-04S, MW-1801, MW-1802, MW-1803, MW-1804, MW-1805, MW-1806, MW-1807, MW-1808, MW-1809, and MW-1810)

The gauging event will be conducted to measure static groundwater levels, confirm groundwater flow patterns beneath the site, and determine the presence/absence of NAPL. Gauging measurements and field observations will be recorded in the field notebook.

Prior to sampling, wells will be purged, and field measurements of turbidity, conductivity, dissolved oxygen, oxidation-reduction potential (Eh), specific conductance, pH, and temperature will be recorded.

Wells that do not contain NAPL will be sampled using low-flow purge sampling techniques. All monitoring well sampling activities will be recorded in a field book, and low-flow parameters documented on the groundwater sampling log (or similar) included in the FSP (**Appendix B**). Purging will continue until field parameters stabilize. A Standard Operating Procedure describing Low-Flow Groundwater Sampling methodology, along with gauging and purging requirements, is also included as the FSP.

Purged groundwater will be staged within the NYSEG-owned property in New York State Department of Transportation- (NYSDOT-) approved 55-gallon drums pending waste characterization analytical results and subsequent disposal by RGE.

Collected groundwater samples will be submitted under chain-of-command to a New York State Department of Health ELAP-certified laboratory for analysis of:

- TCL VOCs by USEPA SW-846 Method 8260B
- TCL PAHs by USEPA SW-846 Method 8270C
- Iron (Total and Dissolved)
- Manganese (Total and Dissolved)
- Alkalinity (Bicarbonate, Carbonate, and Total)
- Sulfate
- Nitrogen, Nitrate
- Nitrogen, Nitrite

A summary of the groundwater analytical and QA/QC requirements is included in the Sampling and Analysis Summary table (**Table 2**).

2.7 PDI Task 7 – IDW Management

Investigation-derived waste (IDW) generated during the PDI will be containerized in NYSDOT-approved 55-gallon drums or roll-off container, labeled as IDW, and temporarily staged in a secure area on the NYSDEG-owned property. One composite sample of water and one composite sample of soil will be collected at the completion of the PDI for waste disposal profiling. Upon receipt of laboratory results, NYSEG will arrange for disposal of the wastes. Data validation will not be required for the waste characterization samples.

2.8 PDI Task 8 – PDI Documentation

The results of the PDI will be documented in the Preliminary (50%) Remedial Design Report. The results of the PDI will support the basis of design and will consist of the following:

- Documentation of utility verification.
- Data summary tables (including all site and waste characterization data).
- Analytical data packages and associated QA/QC information will be reviewed to determine if they meet project-specific criteria identified in the QAPP and Data Usability Summary Reports (DUSRs) prepared and included as an attachment to the 50% Remedial Design Report.
- Soil boring/monitoring well construction logs.
- Raw laboratory analytical data in electronic format (i.e. compact disk).
- Descriptions of deviations, if any, from the PDI tasks described in this RDWP, including any correspondence with the NYSDEC.

Survey data will be incorporated into the remedial design figures and drawings.

A separate PDI summary report will not be prepared for submittal.

3 REMEDIAL DESIGN

This section presents a description of the remedial design tasks to be completed to prepare the design for the selected site remedy. Work activities associated with preparing the remedial design will be conducted under the following general tasks:

- RD Task 1 – Passive NAPL Recovery
- RD Task 2 – Oxygen Enhancement of Groundwater
- RD Task 3 – Survey
- RD Task 4 – Site Restoration

A description of each task associated with the preparation of the remedial design is presented below. Note that additional supporting remediation tasks (e.g., site preparation, maintaining site cover on the NYSEG-owned property, waste management, etc.) will be developed as part of the remedial design. The remedial design will also present proposed locations for temporary remediation support structures (e.g., staging areas), requirements for soil erosion control (if required), along with monitoring and mitigation procedures for dust, odor, and vapors. Green remediation principles and techniques will also be evaluated during the remedial design and implementation processes.

3.1 RD Task 1 – Passive NAPL Recovery

The NYSDEC-selected site remedy includes passive NAPL recovery using extraction wells to collect potentially mobile coal tar. This component of the remedy involves the installation of NAPL recovery wells along the northern portion of the NYSEG-owned property and/or within rights-of-way (i.e., downgradient from the OU-1 excavation areas), as appropriate. These NAPL recovery wells will be installed where heavily NAPL-impacted soil is identified in soil borings installed during the PDI (Section 2.4) and/or was identified during the OU-1 excavation activities. Note that available historical investigation and information included in the *Construction Completion Report* (Arcadis 2015) were used to identify the areas with the highest probability of encountering NAPL and locate the four PDI NAPL recovery wells (MW-1801 through MW-1804). Based on observations of recoverable NAPL at these locations, in addition to information collected during installation of the treatment system wells (AWs and PMWs), these four wells may be identified as the passive NAPL recovery wells in the remedial design. If additional NAPL recovery wells are identified in the remedial design, the proposed number, location, construction specifications, materials of construction, well spacing details, and installation method will be provided in the remedial design. Details regarding the periodic monitoring of the recovery wells to evaluate the presence/absence of NAPL recovery, recovery and disposal of any accumulated NAPL, and well maintenance activities will be presented in the revised SMP for the OU-1 and OU-2 sites.

3.2 RD Task 2 – Oxygen Enhancement of Groundwater

This component of the site remedy involves the installation of wells that will be used for the application and monitoring of an oxygen-releasing material (ORM) into the groundwater. The objective of the oxygen-

releasing material is to enhance the natural biodegradation of dissolved COCs by stimulating the indigenous biological population.

Application wells (AWs) will be located along the northern boundary of the NYSEG-owned property, hydraulically downgradient from the OU-1 excavation areas. Several Performance Monitoring Wells (PMWs) will be located on both the hydraulic upgradient and downgradient sides of the AWs to monitor the performance of the oxygen-releasing material. It is anticipated that the screened intervals of the AWs and PMWs will extend from the annual high-water elevation to the top of the stiff silty clay lacustrine unit. The approximate locations of the AWs and PMWs are shown on **Figure 6**; the final number, location, and spacing of the AWs and PMWs, along with materials of construction, installation method, construction details and the type of amendment, will be evaluated and presented in the remedial design. The actual depths of the AWs and PMWs will be determined based on conditions encountered; however, the screened intervals will be above the depth at which the top of the silty clay lacustrine unit is encountered. The remedial design will allow flexibility during implementation of groundwater remedy to incorporate field data as the AWs, PMWs, and NAPL recovery wells are installed.

Areas containing NAPL will not be targeted for injection; these areas will be targeted for NAPL removal via installation of recovery wells. Soil collected from borings during construction of AWs and/or PMWs that contain stains or odors will not preclude installation of the AW. In addition, site monitoring activities will be developed as part of the SMP, which will include an Operation, Maintenance, and Monitoring (OM&M) Plan for the site. The OM&M Plan will provide the procedures necessary to operate and maintain the remedy.

3.3 RD Task 3 – Survey of Treatment System Wells

At the completion of the remedial action, the locations and elevations of all wells associated with the treatment system will be surveyed by a NYS Certified surveyor. Survey information will be incorporated into the site survey (Section 2.5).

3.4 RD Task 4 – Site Restoration

Disturbance to the site associated with the PDI and final remedy is expected to be minimal. A site cover currently exists on the NYSEG-owned portion of OU-1 and OU-2 and will be maintained or restored to its current condition to allow for commercial use of the site. Disturbance to non-NYSEG owned portions of the site is also expected to be minimal (i.e., installation of monitoring wells), and restoration will consist of returning surface covers (e.g., grass, concrete, asphalt, etc.) to their original conditions. The remedial design will specify surface cover and restoration requirements for both the OU-1 and OU-2 portions of the site.

4 PERMITS, ACCESS AGREEMENTS, AND APPROVALS

The remedial design will be developed to meet applicable SCGs, permits and approvals. In addition to NYSDEC approval of the remedial design, permits and approvals will be necessary to implement the NYSDEC-selected remedy.

4.1 PDI Permits and Access Agreements

It is anticipated that the NAPL recovery and enhanced biodegradation AWs and PMWs will be located on NYSEG-owned property; however, soil borings and monitoring wells/piezometers to be evaluated, sampled, and/or installed as part of the PDI are/will be located on private property and/or public rights-of-way. Access agreements to the private properties and rights-of-way identified in Section 2.1 will be required prior to initiating the PDI field activities.

4.2 Remedial Action Permits and Approvals

Permits and approvals anticipated to complete the remedial construction activities may include (but are not limited to):

- Underground Injection Control Program (UIC) approval for Class V UIC wells within the United States Environmental Protection Agency (USEPA) Region 2. On behalf of NYSEG, a letter describing the NYSDEC-required application of ORM (or similar) for the site will be prepared. The letter will present the nature of the impacts to groundwater and provide details of the treatment process and descriptions of the construction and location of AWs and the anticipated ORM. The letter will also state that NYSEG believes that the injection, as described in the letter and required by the NYSDEC, is authorized by rule.
- Access agreements for the placement of NAPL recovery wells, if required.

It is anticipated that water collected during well installation, sampling and decontamination activities will be containerized transported by a NYSEG contractor for off-site disposal; therefore, acquisition of treatment/discharge permits is not anticipated.

A final list of permits necessary to implement the remedy will be identified in the remedial design.

5 REMEDIAL DESIGN DOCUMENTS AND SCHEDULE

The scope of work for this task includes preparation of remedial design documents consistent with the requirements of NYSDEC DER-10. The following remedial design submittals will be prepared:

- 50% Remedial Design
- 95% Remedial Design
- Final 100% (Issued-for-Bid) Remedial Design

Specific technical design elements to be developed during the design process include:

- Detailed engineering design to provide quantities, locations, and construction details for the installation of the groundwater treatment system AWs and PMWs, and NRWs.
- Site restoration details.

The general contents of each remedial design document are presented below.

5.1 50% Remedial Design

The 50% Remedial Design Report will generally include the following information:

- Draft design report (including an introductory section that provides a brief overview of the remedial design, site background information, design report objectives, and results of the PDI).
- A summary of the remedy with a basis of design that describes the proposed remedial design and presents information used to develop the design and construction components of the project. Design calculations will also be included, where appropriate, to support the basis of design.
- A description of site controls for protecting the public health, safety, welfare and environment and to maintain the effectiveness of the remedial action.
- Draft technical specifications.
- Draft engineering drawings (anticipated to include a Title Sheet, Existing Site Plan, Site Preparation Plan, draft Support Details, General Restoration Plan, and miscellaneous details).
- Outline of site remediation approach (brief narrative description of remedial activities).

The draft of the 50% design documents will be prepared for NYSEG review. Following revision based on NYSEG's comments, the documents will be submitted to NYSDEC for discussion.

5.2 95% Remedial Design

In addition to the items identified for the 50% Remedial Design report, it is anticipated that the 95% Remedial Design will include the following information:

- Revisions to the 50% Remedial Design based on NYSDEC comments.
- Narrative descriptions of remedial activities and responsibility assignments.

- Revisions to the draft technical specifications.
- Revisions to the 50% Remedial Design drawings based on NYSDEC comments.
- Draft project plans, including:
    - CAMP that describes the monitoring activities that will be conducted during the remedial activities.
    - A Waste/Soil Management Plan that describes the characterization, handling, treatment, and disposal requirements for various waste materials that will be generated.
    - Water Management Plan for handling of waters generated/collected during remedial activities.
    - Sampling and Analysis Plan that outlines requirements for characterization of soil and water generated.
    - Noise Monitoring Plan that describes monitoring requirements and acceptable noise levels during remedial activities.
    - Odor, Vapor, and Dust Control Plan that presents methods to minimize potential impacts to the surrounding community.
- Construction quality assurance language that describes the materials and procedures necessary for proper construction, evaluation, and documentation during remedial activities, along with required transportation routes showing truck routes to minimize disturbances to the community will be included in the remedial design specifications.
- Conceptual Remedial Action Schedule that presents the anticipated schedule for implementation of the remedial activities.
- Engineer's cost estimate (revised) for remedial action.

Project plans will be presented in brief reports that describe the general approach to the design of the component and any required design calculations.

5.3 Final (100%) Remedial Design

The Final (100%) Remedial Design will address comments provided by the NYSDEC on the 95% Remedial Design and will finalize all the design documents for final distribution to the NYSDEC. The Final (100%) Remedial Design will include Issued-for-Bid technical specifications and drawings, final project plans, final construction schedule, and an updated engineer's cost estimate for remedial action (to be submitted to NYSEG only).

5.4 Remedial Design Schedule

The anticipated schedule for completing the PDI activities identified in this RDWP and a preliminary schedule for completion of the remedial design and construction of the selected remedy for the site is presented in **Table 5.1** below.

Table 5.3. Prelimiary Project Schedule

Schedule Component	Date
NYSDEC approval of this RDWP	July 21, 2018
Obtain Access Agreements, Conduct PDI activities	August – September 2018
Submit 50% Remedial Design to NYSDEC	February 1, 2019
Receive NYSDEC comments on 50% Remedial Design	May 1, 2019
Submit Draft 95% Remedial Design to NYSDEC	July 1, 2019
Receive NYSDEC comments on 95% Remedial Design	October 1, 2019
Submit Final (100%) Remedial Design Report to NYSDEC	December 31, 2019

This schedule for conducting PDI activities and preparing remedial design documents is dependent on receipt of NYSDEC comments on project submittals.

6 POST-CONSTRUCTION ACTIVITIES

Following remedial construction activities, future site activities will be conducted in accordance with an SMP to be established for the site. The completed remedial programs for the site will be documented in a certified Final Engineering Report (FER) using the guidance provided in Section 5.8 of DER-10. The anticipated components of the SMP and FER are presented below.

6.1 Site Management Plan

The draft ISMP prepared for OU-1 of the site will be revised to incorporate the OU-2 remedy. The SMP will be revised/prepared consistent with the applicable requirements of DER-10 (Section 6.2) and in a format generally consistent with the NYSDEC's SMP template. As indicated in the ROD, the SMP will consist of the following:

- Institutional and Engineering Controls Plan – describes the use restrictions and engineering controls that will be established.
- Monitoring Plan – used to assess the performance and effectiveness of the remedy.

The SMP will include requirements for post-remedial action groundwater and NAPL monitoring, as well as site inspection schedules, and NYSDEC reporting requirements.

6.1.1 Institutional and Engineering Controls

The Institutional and Engineering Controls Plan will identify use restrictions and engineering controls for the site and detail the steps and media-specific requirements necessary to ensure that institutional and/or engineering controls remain in place and effective.

As indicated in the ROD, institutional controls in the form of an environmental easement (EE) for the NYSEG-owned portion of OU-2 will be established that may include:

- A provision to maintain the cover system above any disturbed areas.
- A provision to obtain agreements with property owners within the OU-2 area to implement SMP activities.
- A provision to implement further investigation and remediation should large-scale redevelopment occur in OU-2.
- Descriptions of the provisions of the environmental easement on the NYSEG-owned property, including any land use (subject to local zoning laws) and groundwater use restrictions.
- A provision for evaluation of potential soil vapor intrusion for future buildings constructed within the management area, including provision for mitigation of any identified impacts.
- Provisions for the continued operation, management and inspection of the engineering controls.
- Provisions for maintaining site access controls.

Supporting plans and provisions will also include an Excavation Plan that details provisions for management of future excavations below the cover's demarcation layer.

6.1.2 Monitoring Plan

The SMP also will require that NYSEG institute a long-term monitoring program to assess the performance and effectiveness of the remedy. The Monitoring Plan will, at a minimum, include details and requirements for the following:

- Periodic monitoring of groundwater.
- Periodic monitoring for vapor intrusion for any buildings developed in the area of site management.
- Annual inspections of the institutional and engineering controls.
- A schedule for performance and effectiveness monitoring.
- A schedule for submittal of Periodic Review Reports (PRRs) to the NYSDEC.

Consistent with DER-10 (Section 6.3), the PRRs will include certification of institutional and engineering controls until the NYSDEC notifies the property owner in writing that this certification is no longer needed. The PRR will contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with NYSDEC-approved modifications and indicate that nothing has occurred that would impair the ability of the control to protect public health or the environment or constitute a violation or failure to comply with the site management plan unless otherwise approved by the NYSDEC.

6.2 Final Engineering Report

A FER that includes both OU-1 and OU-2 will be prepared in accordance with DER-10 guidance to document implementation of the completed remedial program, and will consist of the following:

- Summary of relevant background information, including site location/description, and site history.
- A summary of the final remedial activities, as constructed, including:
  - A description of any problems encountered during construction and their resolutions.
  - A description of changes to the design documents and why the changes were made.
  - Quantities and concentrations of constituents in media (e.g., soil and water) removed.
  - A listing of the waste streams, including quantity of materials treated/disposed and corresponding treatment/disposal locations.
  - The quantity of excavated material re-used as subsurface fill (if applicable).
  - Boundaries of the real property subject to the EE or other institutional controls.
  - A detailed description of site restoration activities.
- A list of the RAOs and remedial goals applied to the remedial activities.
- A description of source and quality of fill.

- A description of the community air monitoring and other remedial action compliance activities performed.
- Tables and figures containing laboratory analytical results.
- “As-built” drawings bearing the stamp and signature of a Professional Engineer licensed to practice in New York State and showing:
    - Surveyed excavation limits, demarcation layer locations and elevations, and any permanent structures (if any).
    - Permanent survey markers for horizontal and vertical control for site management.
- A description of the institutional controls employed at the site and a copy of the EE, when available.
- A certification statement with the signature and seal of a Professional Engineer licensed to practice in New York State.

The following supplemental information will also be provided with the FER:

- Fully executed manifests/certificates of disposal documenting the offsite transportation and treatment/disposal of waste materials generated as part of the remedial activities.
- Copies of weekly field reports and air monitoring logs documenting results of air monitoring performed in accordance with the CAMP.
- Results of all analyses, including laboratory analytical data reports and data validation reports.
- Correspondence with the NYSDEC and others, as deemed relevant to the remedial activities.

7 REFERENCES

Arcadis, 2015. *Construction Completion Report, Dansville Manufactured Gas Plant Site Operable Unit No. 1, Dansville, Livingston County, New York, Site No. 8-26-012*. August 2015.

TRC Environmental Consultants, Inc. *New York State Electric & Gas Corporation, Investigation of the Former Coal Gasification Site In Dansville, New York. Task 1 Report, Preliminary Site Evaluation*, August 20, 1986.

NYSDEC, 1998. *Technical and Operational Guidance Series (TOGS) 1.1.1 – Ambient Water Quality Standards and Guidance Values*, June 1998.

NYSDEC, 2009. *Record of Decision, Pappas Dry Cleaning Operable Unit Number 02: Off-Site Groundwater, State Superfund Project, Dansville, Livingston County, Site No. 826018*. March 2013.

NYSDEC, 2010b. DER-10 Technical Guidance for Site Investigation and Remediation. May 2010.

NYSDEC, 2017. *Record of Decision, NYSEG – Dansville MGP, Operable Unit Number 02: Onsite and Offsite Soil and Groundwater, Wayne County, Site No. 826012*. March 2017.

Ish, 2006. *Final Supplemental Remedial Investigation* (SRI) Report for Operable Unit 1 (OU-1) at the Former MGP Site, Dansville, New York. Ish, January 2006.

Ish, 2006. *Final Supplemental Remedial Investigation* (SRI) Report for Operable Unit 2 (OU-2) at the Former MGP Site, Dansville, New York. Ish, 2006.

Ish, 2006. *Draft Synoptic Groundwater Sampling Report for Operable Units 1 (OU1) and 2 (OU2)* at the Dansville Former MGP Site, Dansville, New York. Ish, 2006.

NYSDOH, 2006. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. NYSDOH 2006

TABLES

Table 1. Wells to Be Evaluated and Potential Properties Requiring Access Agreements

Address	Parcel ID	Well ID	Rationale
58 Ossian Street	203.6-3-17	PZ-18	Included in draft ISMP; however, property owner has refused to sign access agreement
60 Ossian Street	203.6-3-18.1	TBD	No well on property; however, potential location to install MW as 58 Ossian refused access
64-66 Franklin Street	203.6-2-28	PZ-24	Included in draft ISMP; useful to define downgradient extent of plume.
60 Franklin Street	203.6-2-26	PZ-25	Included in draft ISMP; ideal location to evaluate/define downgradient extent of plume
62 Franklin St	203.6-2-27	TBD	No well on property; may be needed as alternate location
57 Franklin Street	203.6-2-53	PZ-22	Useful to evaluate/delineate western extent of plume if cannot get access to 53 Franklin St.
53 Franklin Street	203.6-2-51	PZ-13	Useful to evaluate/define western extent of downgradient dissolved plume
51 Franklin Street	203.6-2-50	TBD	No well currently on property; however, potential alternate location for new effectiveness monitoring location if cannot get access to 49 Franklin St.
49 Franklin Street	203.6-2-49	MW-1807	No well currently on property; ideal location for new proposed effectiveness monitoring well
43 Franklin Street	203.6-2.48.2	TBD	No well currently on property; however, potential alternate location for future effectiveness monitoring if cannot get access to 49 Franklin St.
35 Franklin St.	203.6-2-46.122	PZ-32	Useful to evaluate/delineate eastern extent of dissolved plume
58 Franklin Street	203.6-2-25	TBD	Location would become a priority location if cannot get access to 60 Franklin St
22 Battle St.	203.6-2-48.1	TBD	No well currently on property; however, would be potential alternate location for future effectiveness monitoring if cannot obtain access to 49 Franklin St.
20 Battle St.	203.6-2-46.111	PZ-31	Located east of PZ-32; would be useful to confirm previous results and extent of dissolved plume encounter issues with condition of PZ-32
14 Battle St	Day Care Center	PZ-36	Included in draft ISMP; ideal location for future effectiveness monitoring to evaluate the effect of OU-1 remedy on the eastern extent of the MGP-related dissolved plume
Ossian St.	Right-of-Way	PZ-29	Included in draft ISMP; located in the right-of-way on north side of Ossian St. adjacent to Pappas Cleaners property; useful to document upgradient groundwater quality
Ossian St.	Right-of-Way	PZ-27	Included in draft ISMP; located in the right-of-way on south side of Ossian St. adjacent to 49 Ossian St.; useful to document upgradient groundwater quality
Battle Street	Right-of-Way	MW-1805	Proposed new effectiveness monitoring well located in the right-of-way adjacent to 39 Battle St.; useful to document groundwater quality in center of dissolved plume
Battle Street	Right-of-Way	MW-1806	Proposed new effectiveness monitoring well located in the right-of-way adjacent to 35 Battle St.; useful to document groundwater quality immediately downgradient from OU-1
50 Ossian St.	NYSEG property	MW-02S	Evaluate upgradient groundwater quality within OU-2
50 Ossian St.	NYSEG property	MW-04	Evaluate groundwater quality within OU-2

TBD – To Be Determined; ID to be based on quantity and locations of access agreements obtained and resulting data needs.

Table 2. Sampling and Analysis Summary

PDI Sampling	Media	Laboratory Analysis	Quantity of Samples*	Field QA/QC Samples			Laboratory QA/QC Samples		Total
				Trip Blanks[1]	Field Blind Dups[3]	Equip Rinse Blanks[2]	MS/MSD	MSB/LCS	
MW-1805, MW-1806, MW-1807, MW-1809, MW-1810	Soil	TCL VOCs	10	3	1	0	1 / 1	0	16
		TCL PAHs	10	0	1	0	1 / 1	0	13
MW-04S, MW-1801, MW-1802, MW-1803, MW-1804, MW-1805, MW-1806, MW-1807, MW-1808, MW-1809, MW-1810, PZ-13, PZ-24, PZ-25, PZ-27, PZ-29, PZ-32, PZ-36	Water	TCL VOCs	18	3	1	0	1 / 1	0	24
		TCL SVOCs	18	0	1	0	1 / 1	0	21
		Iron:							
		- Total	18	0	0	0	0 / 0	0	18
		- Dissolved	18	0	0	0	0 / 0	0	18
		Manganese:							
		- Total	18	0	0	0	0 / 0	0	18
		- Dissolved	18	0	0	0	0 / 0	0	18
		Alkalinity:							
		- Bicarbonate	18	0	0	0	0 / 0	0	18
		- Carbonate	18	0	0	0	0 / 0	0	18
		- Total	18	0	0	0	0 / 0	0	18
		Sulfate	18	0	0	0	0 / 0	0	18
		Nitrogen, Nitrate	18	0	0	0	0 / 0	0	18
		Nitrogen, Nitrite	18	0	0	0	0 / 0	0	18

NOTE: QA/QC samples not required for Natural Attenuation parameters

Notes:

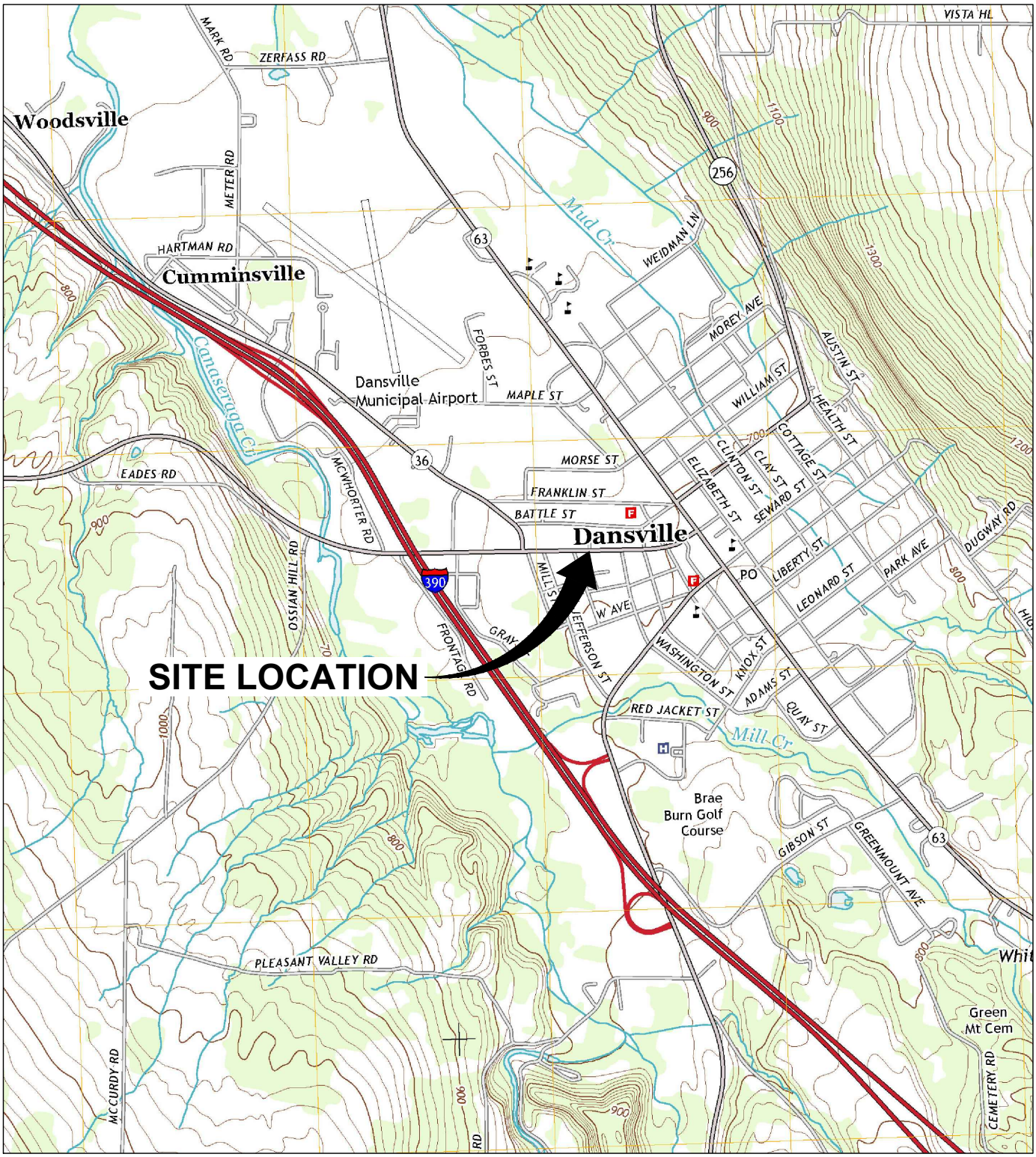
1. One trip blank will be collected per cooler per day of samples for TCL VOC analysis.
2. Equipment rinse blanks will be collected at a frequency of one per 20 if re-use equipment; not required if using disposable equipment (table assumes disposable equipment will be used)
3. Blind duplicate will be collected at a frequency of one per 20 and sent to the laboratory for analysis

* Assumes 2 samples of soil will be collected and sent for laboratory from each soil boring

TCL VOC analysis by USEPA SW-846 Method 8260B

TCL PAH analysis by USEPA SW-846 Method 8270C

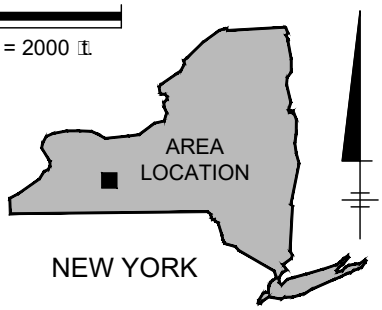
FIGURES



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. □UAD., DANSVILLE, NEW YORK, 2013.

0 2000' 4000'

Appro□□ate Scale: 1 in. = 2000 ft

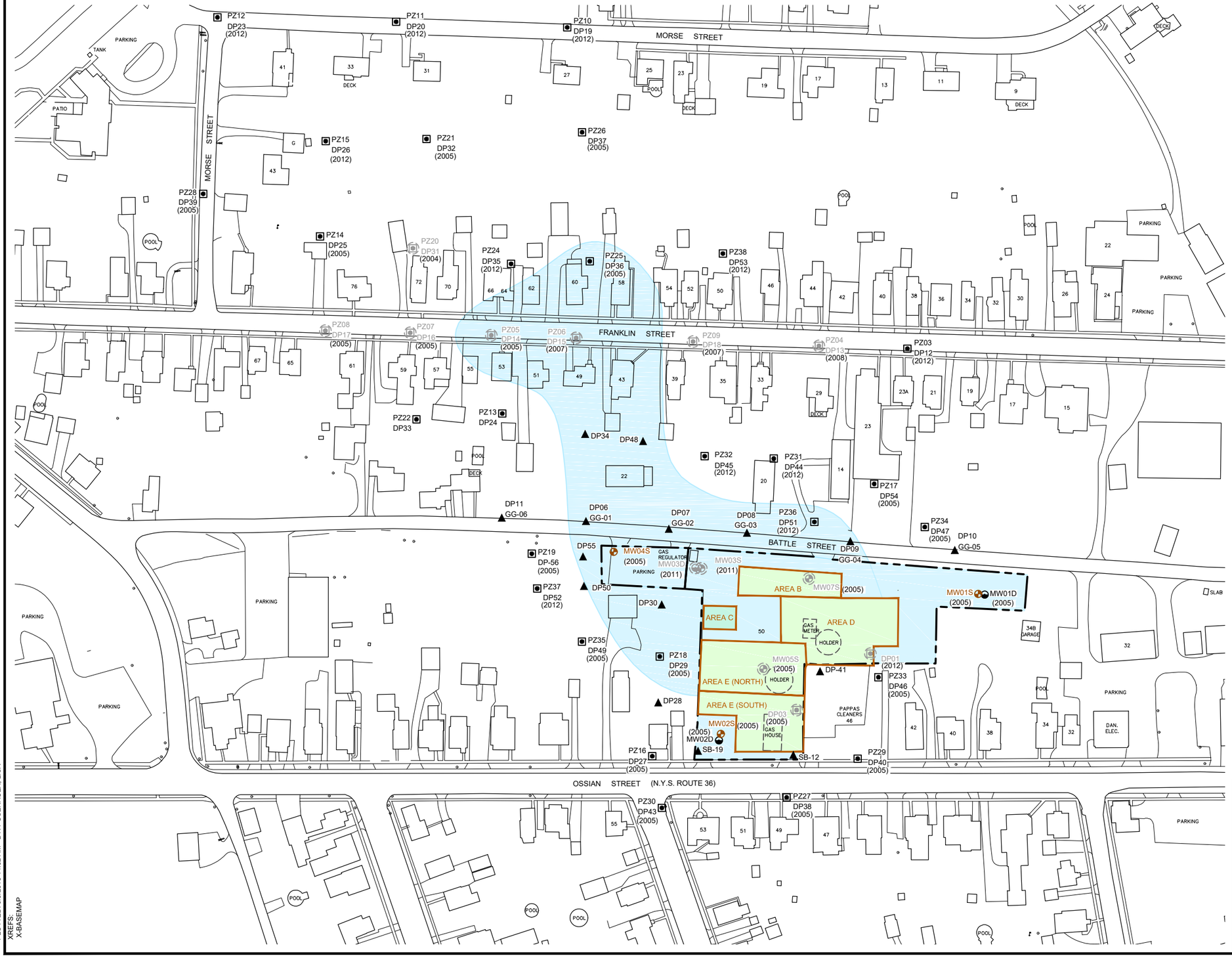


NYSEG
DANSVILLE FORMER MGP SITE
DANSVILLE, NEW YORK
REMEDIAL DESIGN WORK PLAN

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE □



LEGEND:

- SOIL BORING LOCATION
- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- ABANDONED OR DESTROYED WELL OR PIEZOMETER LOCATION
- NYSEG PROPERTY BOUNDARY
- FORMER MGP STRUCTURE
- LIMITS OF PREVIOUSLY COMPLETED EXCAVATIONS
- (2012) YEAR LAST SAMPLE COLLECTED
- OPERABLE UNIT 1
- EXTENT OF OPERABLE UNIT 2 BASED ON MOST RECENT GROUNDWATER SAMPLING EVENT

NOTES:

1. BASE MAP PREPARED FROM DWG FILE PROVIDED BY NYSEG, DATED 10/2/2006, TITLED EXPANDED DANSVILLE MGP SITE, AT A SCALE OF 1"=100'.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ONLY SELECT MONITORING WELL, SOIL BORING, PIEZOMETER, AND TEST PIT LOCATIONS ARE SHOWN ON THE NYSEG PROPERTY AS A MAJORITY OF THE LOCATIONS WERE REMEDIATED IN 2014. SEE PREVIOUS SITE REPORTS FOR ADDITIONAL INVESTIGATION LOCATIONS.
4. ADDITIONAL WELLS OR PIEZOMETERS SHOWN MAY BE ABANDONED OR DESTROYED.

0 150' 300'

GRAPHIC SCALE

NYSEG
DANSVILLE FORMER MGP SITE (OU-2)
DANSIVLLE, NEW YORK
REMEDIAL DESIGN WORK PLAN

SITE MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE

CITY:SYRACUSE_NY DIV/GROUP: EBC-IMD/DV DB: L.POSENAUER PM/TM: B.AHRENS LYR:(Opt)ON=*;OFF=*REF*
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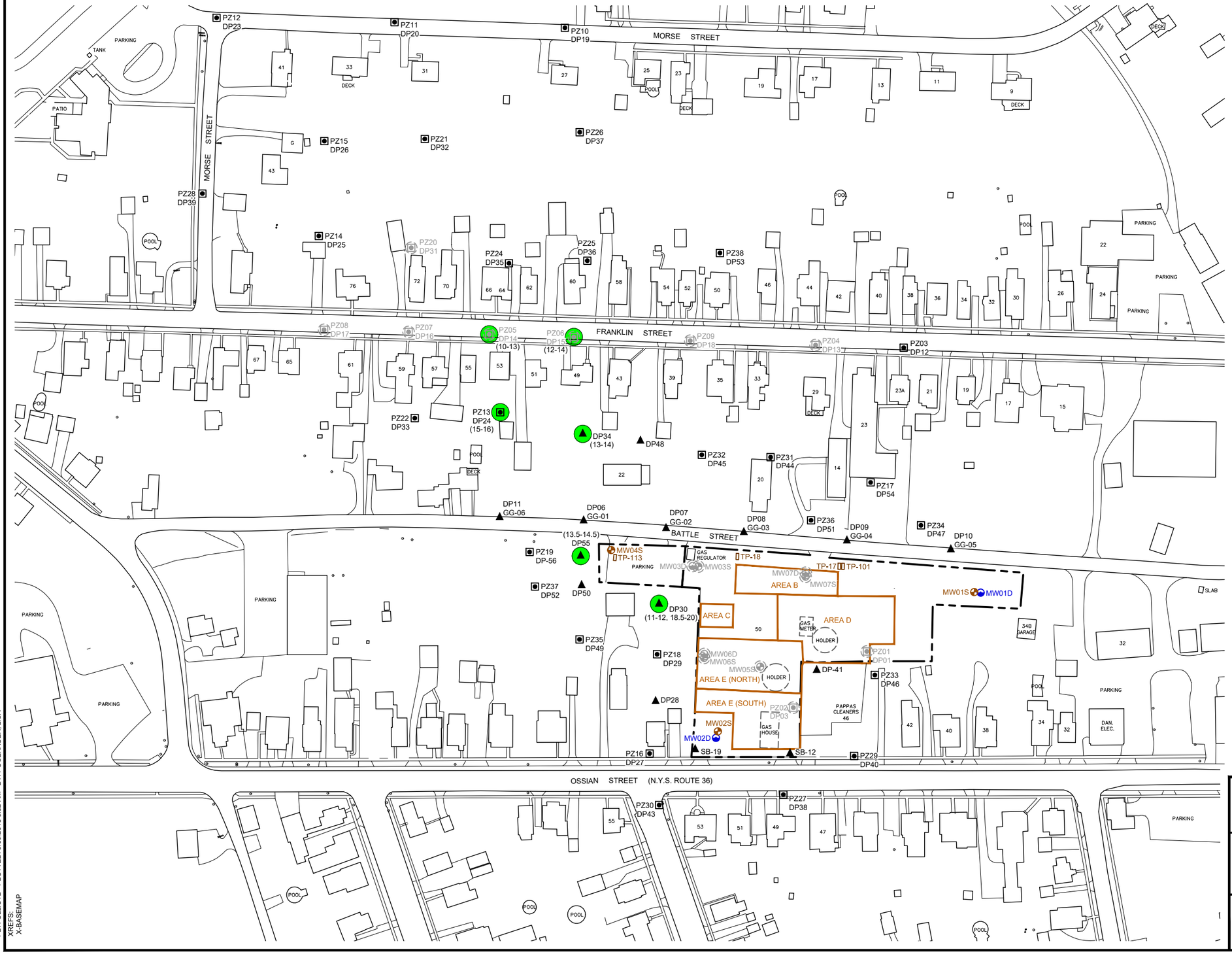


LEGEND:

- ▲ SOIL BORING LOCATION
- TEST PIT LOCATION
- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- ABANDONED OR DESTROYED WELL OR PIEZOMETER LOCATION
- NYSEG PROPERTY BOUNDARY
- FORMER MGP STRUCTURE
- LIMITS OF PREVIOUSLY COMPLETED EXCAVATIONS
- LOCATION CONTAINING ONE OR MORE BTEX/PAH COMPOUND GREATER THAN 6NYCRR PART 375-6 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES
- (10-12) DEPTH OF EXCEEDANCE (FEET BELOW GRADE)

NOTES:

1. BASE MAP PREPARED FROM DWG FILE PROVIDED BY NYSEG, DATED 10/2/2006, TITLED EXPANDED DANSVILLE MGP SITE, AT A SCALE OF 1"=100'.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ONLY SELECT MONITORING WELL, SOIL BORING, PIEZOMETER, AND TEST PIT LOCATIONS ARE SHOWN ON THE NYSEG PROPERTY AS A MAJORITY OF THE LOCATIONS WERE REMEDIATED IN 2014. SEE PREVIOUS SITE REPORTS FOR ADDITIONAL INVESTIGATION LOCATIONS.
4. ADDITIONAL WELLS OR PIEZOMETERS SHOWN MAY BE ABANDONED OR DESTROYED.

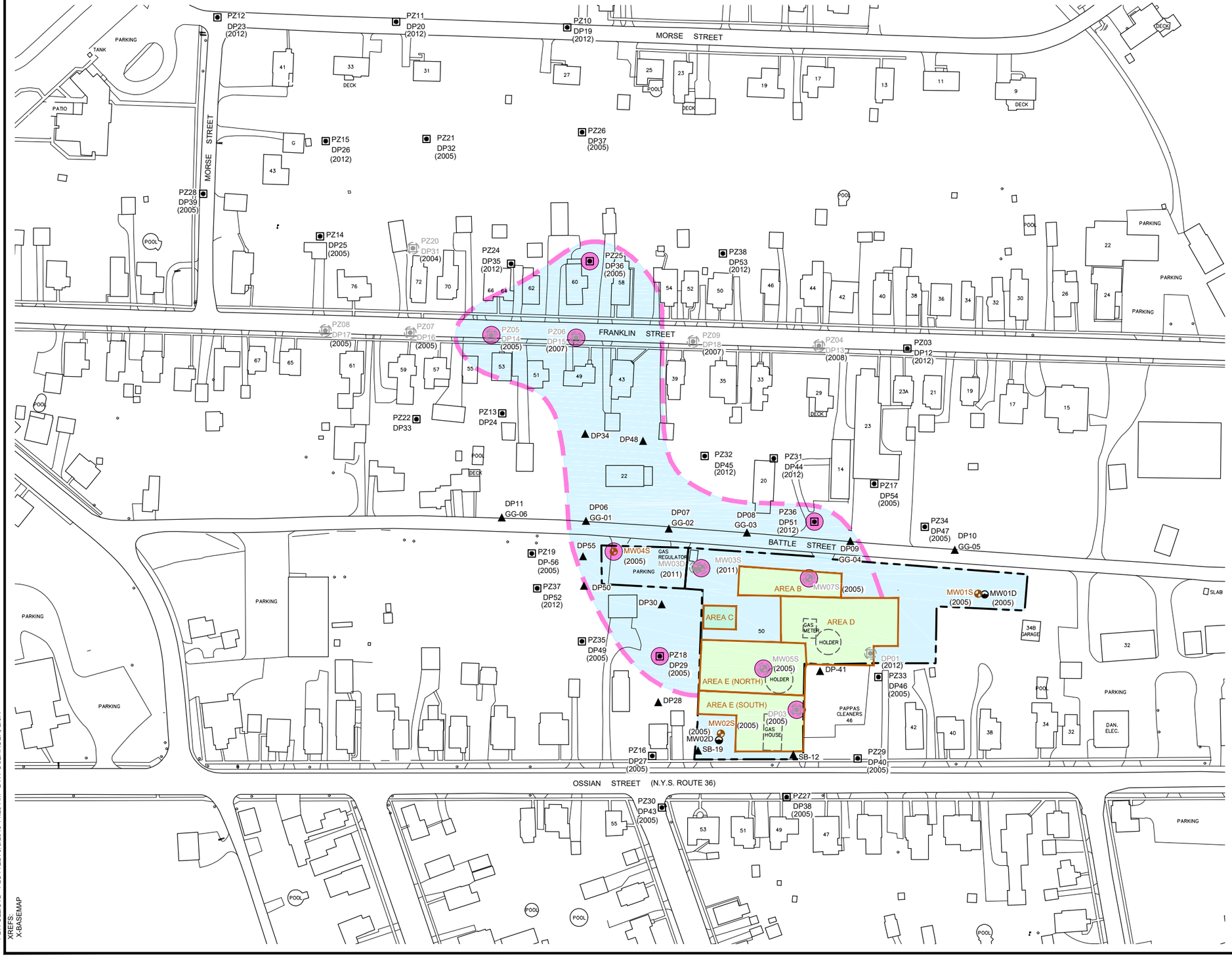
0 150' 300'
GRAPHIC SCALE

NYSEG
DANSVILLE FORMER MGP SITE (OU-2)
DANSIVLLE, NEW YORK
REMEDIAL DESIGN WORK PLAN

E□TENT O□ □TE□ AND PA□□□
UNRESTRICTED USE SCO□

ARCADIS Design & Consultancy for natural and built assets

FIGURE
□



LEGEND:

- SOIL BORING LOCATION
- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- ABANDONED OR DESTROYED WELL OR PIEZOMETER LOCATION
- NYSEG PROPERTY BOUNDARY
- FORMER MGP STRUCTURE
- LIMITS OF PREVIOUSLY COMPLETED EXCAVATIONS
- LOCATION CONTAINING ONE OR MORE BTEX/PAH COMPOUND GREATER THAN NYSDEC CLASS GA STANDARDS OR GUIDANCE VALUE
- APPROXIMATE EXTENT OF GROUNDWATER CONTAINING BTEX/PAH COMPOUNDS GREATER THAN NYSDEC CLASS GA STANDARDS AND GUIDANCE VALUES
- (2012) YEAR LAST SAMPLE COLLECTED
- OPERABLE UNIT 1
- OPERABLE UNIT 2

NOTES:

1. BASE MAP PREPARED FROM DWG FILE PROVIDED BY NYSEG, DATED 10/2/2006, TITLED EXPANDED DANSVILLE MGP SITE, AT A SCALE OF 1"=100'.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ONLY SELECT MONITORING WELL, SOIL BORING, PIEZOMETER, AND TEST PIT LOCATIONS ARE SHOWN ON THE NYSEG PROPERTY AS A MAJORITY OF THE LOCATIONS WERE REMEDIATED IN 2014. SEE PREVIOUS SITE REPORTS FOR ADDITIONAL INVESTIGATION LOCATIONS.
4. ADDITIONAL WELLS OR PIEZOMETERS SHOWN MAY BE ABANDONED OR DESTROYED.

0 150' 300'

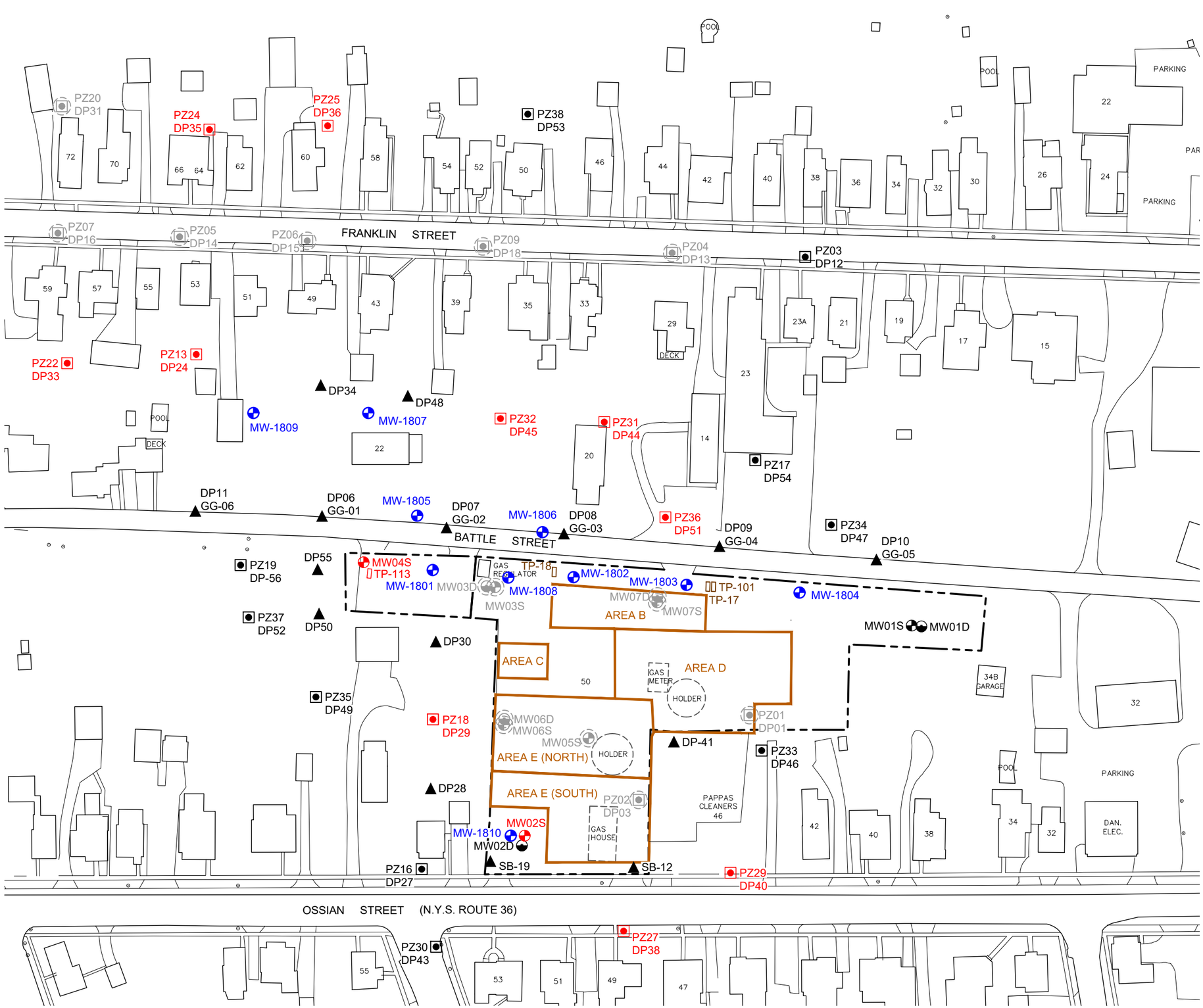
GRAPHIC SCALE

NYSEG
DANSVILLE FORMER MGP SITE (OU-2)
DANSIVLLE, NEW YORK
REMEDIAL DESIGN WORK PLAN

E□CEEDANCES O□ GROUNDWATER STANDARDS OR GUIDANCE VALUES

ARCADIS Design & Consultancy for natural and built assets

FIGURE □



LEGEND:

- HISTORICAL SOIL BORING LOCATION
- HISTORICAL TEST PIT LOCATION
- EXISTING DEEP MONITORING WELL LOCATION
- EXISTING SHALLOW MONITORING WELL LOCATION
- PIEZOMETER LOCATION FOR POTENTIAL SAMPLING/INSPECTION
- ABANDONED OR DESTROYED WELL OR PIEZOMETER LOCATION
- NYSEG PROPERTY BOUNDARY
- FORMER MGP STRUCTURE
- LIMITS OF PREVIOUSLY COMPLETED EXCAVATIONS
- PROPOSED NEW PDI MONITORING WELL

NOTES:

1. BASE MAP PREPARED FROM DWG FILE PROVIDED BY NYSEG, DATED 10/2/2006, TITLED EXPANDED DANSVILLE MGP SITE, AT A SCALE OF 1"=100'.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ONLY SELECT MONITORING WELL, SOIL BORING, PIEZOMETER, AND TEST PIT LOCATIONS ARE SHOWN ON THE NYSEG PROPERTY AS A MAJORITY OF THE LOCATIONS WERE REMEDIATED IN 2014. SEE PREVIOUS SITE REPORTS FOR ADDITIONAL INVESTIGATION LOCATIONS.
4. ADDITIONAL WELLS OR PIEZOMETERS SHOWN MAY BE ABANDONED OR DESTROYED.

0 150' 300'
GRAPHIC SCALE

NYSEG
DANSVILLE FORMER MGP SITE (OU-2)
DANSIVLLE, NEW YORK
REMEDIAL DESIGN WORK PLAN

PROPOSED WELL LOCATIONS

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FIGURE

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C:\Users\lposenauer\OneDrive - ARCADIS\BIM 360 Docs\IBERDROLA USA\NYSEG\DANSVILLE OU-2 REMEDIAL\2018\B0013142.0000\01-DWG\RDWP_FIG 5_PROPOSED WELL LOCS.dwg LAYOUT: 5 SAVED: 9/7/2018 9:20 AM ACADVER: 21.0S (LMS TECH) PAGESETUP: C-LB-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/7/2018 9:20 AM BY: POSENAUER, LISA
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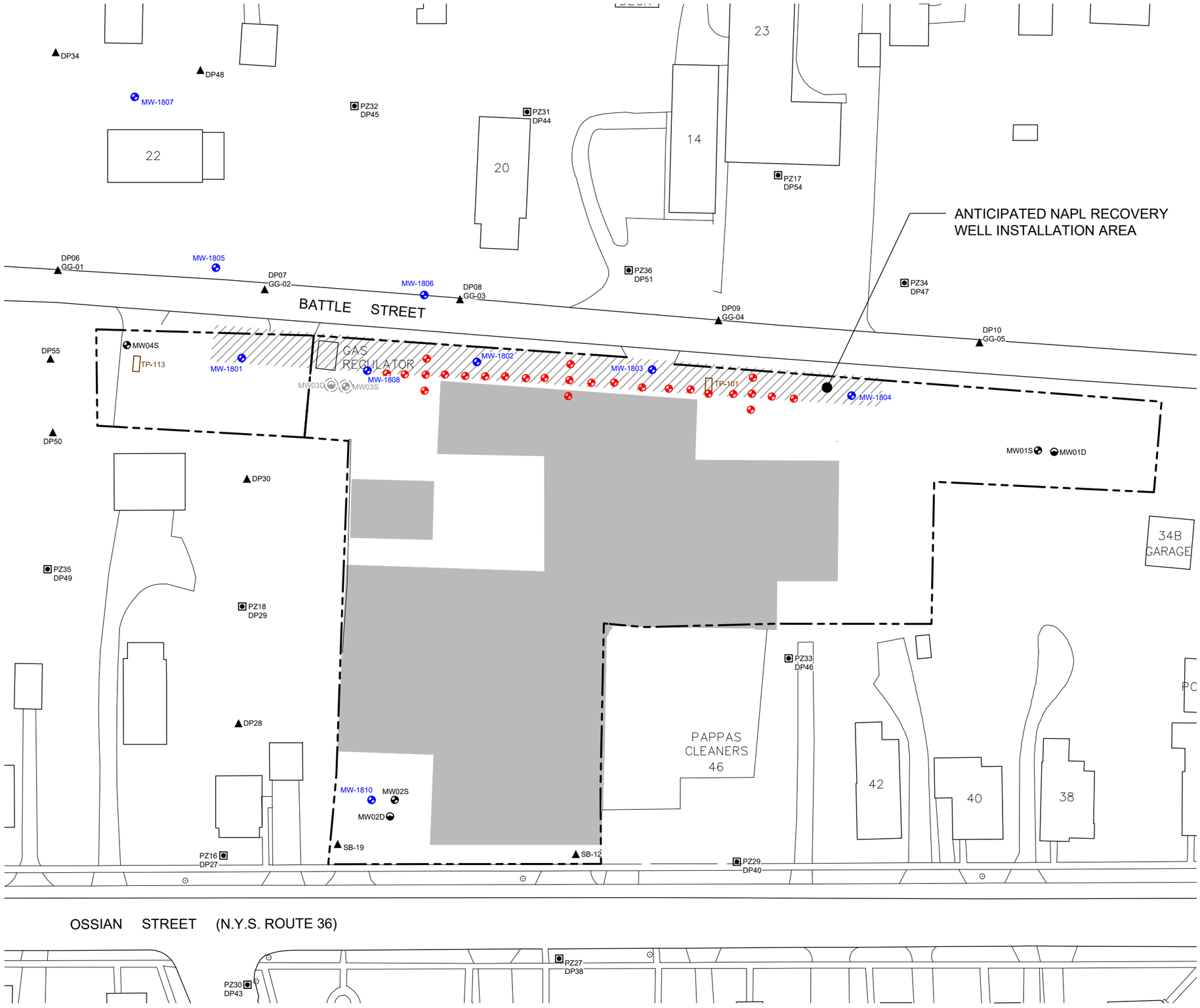

LEGEND:

- SOIL BORING LOCATION
- TEST PIT LOCATION
- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- ABANDONED OR DESTROYED WELL OR PIEZOMETER LOCATION
- NYSEG PROPERTY BOUNDARY
- FORMER MGP STRUCTURE
- LIMITS OF PREVIOUSLY COMPLETED EXCAVATIONS
- NEW PDI MONITORING WELL
- APPROXIMATE LOCATION/EXTENT OF AWs AND PMWs

NOTES:

1. BASE MAP PREPARED FROM DWG FILE PROVIDED BY NYSEG, DATED 10/2/2006, TITLED EXPANDED DANSVILLE MGP SITE, AT A SCALE OF 1"=100'.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ONLY SELECT MONITORING WELL, SOIL BORING, PIEZOMETER, AND TEST PIT LOCATIONS ARE SHOWN ON THE NYSEG PROPERTY AS A MAJORITY OF THE LOCATIONS WERE REMEDIATED IN 2014. SEE PREVIOUS SITE REPORTS FOR ADDITIONAL INVESTIGATION LOCATIONS.
4. ADDITIONAL WELLS OR PIEZOMETERS SHOWN MAY BE ABANDONED OR DESTROYED.

0 60' 120'

GRAPHIC SCALE

NYSEG
DANSVILLE FORMER MGP SITE (OU-2)
DANSIVLLE, NEW YORK
REMEDIAL DESIGN WORK PLAN

CONCEPTUAL GROUNDWATER AND NAPL RECOVERY REMEDY

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FIGURE 6

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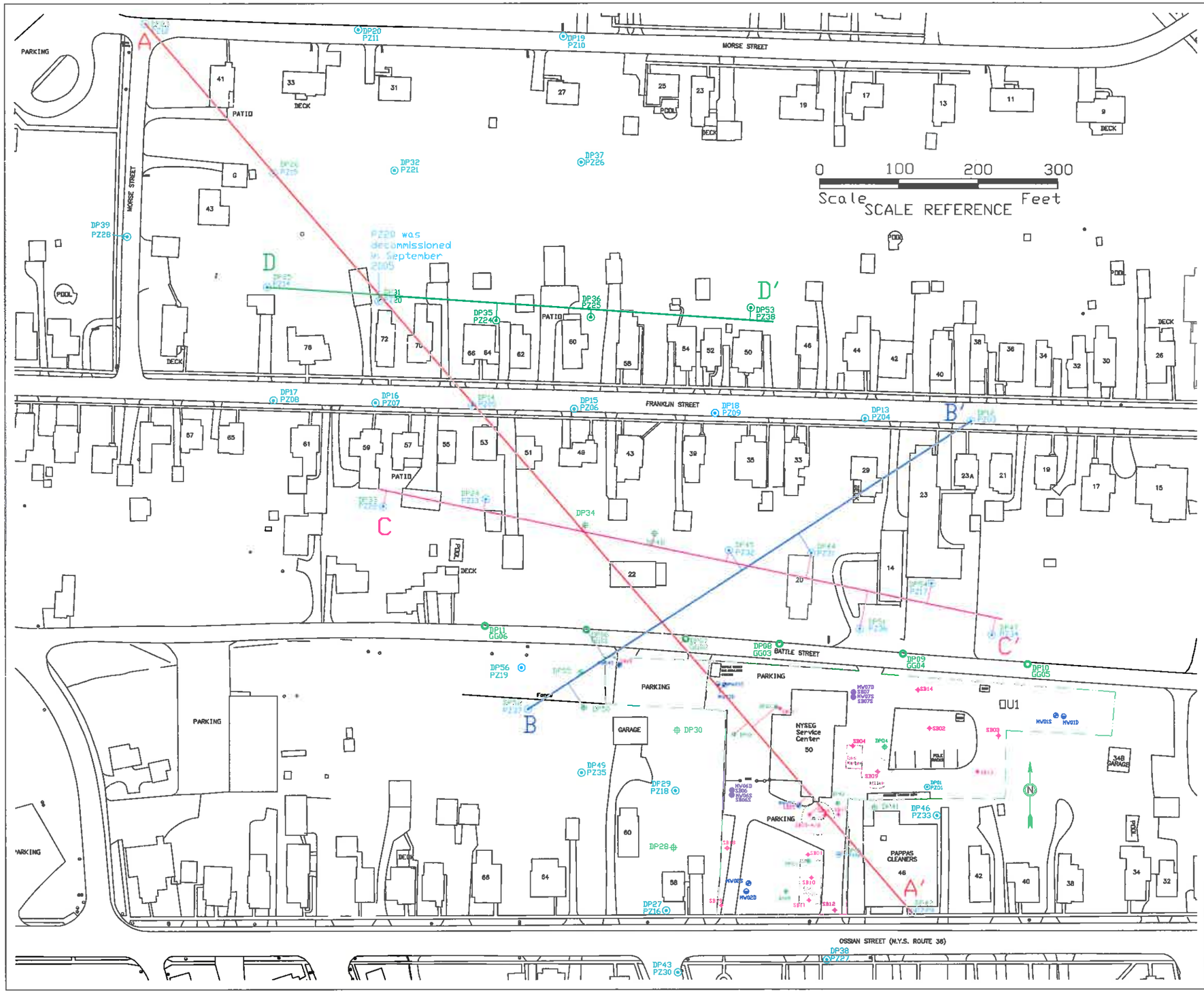
APPENDIX A

Geologic Cross Section Figures



Project: DANSVILLE/103023	Client: NYSEG	Ish Inc./META

Figure A-7
Location of Geologic Cross Sections

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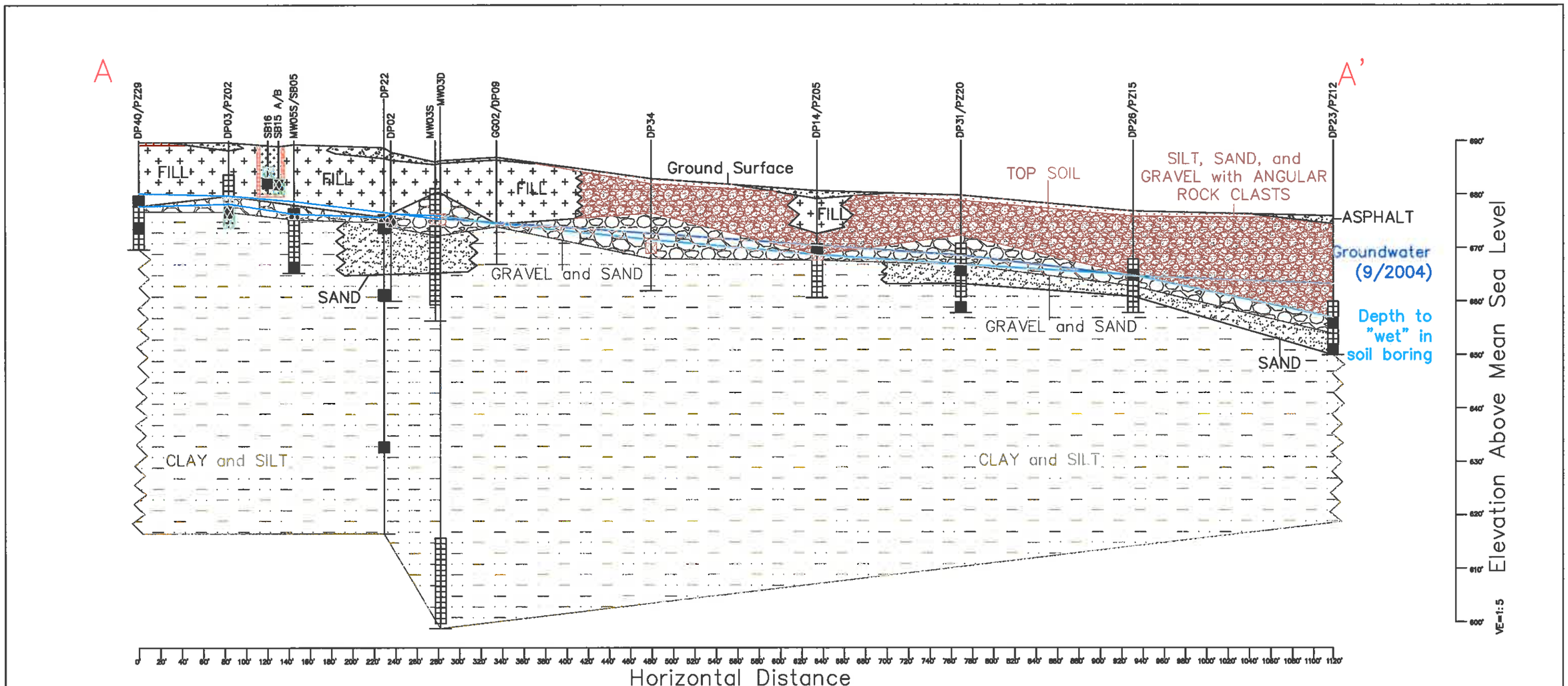
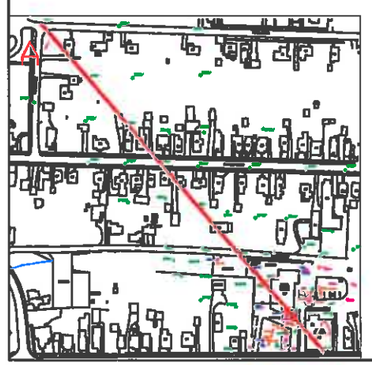
Copy of mgp-exp	LMG	PJD	5/5/2006





Legend

- Well Screen
- Bottom of Boring
- Soil Sample
- Sheens in matrix
- NAPL in matrix
- Holder
- Top Soil
- Asphalt
- Fill
- Holder Fill
- Gravel and Sand
- Sand
- Clay and Silt
- Silt, Sand, and Gravel with Angular Rock Clasts

Note:

Observations of NAPL and sheens are from this SRI except at MW03S and MW03D, where observations were made in 1986 by TRC.

Project: DANSVILLE/103023	Client: NYSEG	Ish Inc./META

Figure A-8
Geologic Cross-Section A-A'

Filename: Cross Section	Drawn by: AJB	Approved by: PJD	Date: 5/5/2006

B

B'

DP52/PZ37 DP50 DP55 GG01/DP06 MW04S/SB20 DP45/PZ32 DP44/PZ31 DP12/PZ03

SILT, SAND, and GRAVEL with ANGULAR ROCK CLASTS

TOP SOIL

FILL

GRAVEL and SAND

SAND

CLAY and SILT

690' 685' 680' 675' 670' 665' 660'

VE=1:7 Elevation Above Mean Sea Level

0' 20' 40' 60' 80' 100' 120' 140' 160' 180' 200' 220' 240' 260' 280' 300' 320' 340' 360' 380' 400' 420' 440' 460' 480' 500' 520' 540' 560'

Horizontal Distance

Groundwater (9/2004)

Depth to "wet" in soil boring

Legend

- Well Screen
- Bottom of Boring
- Soil Sample
- Sheens in matrix
- NAPL in matrix
- Top Soil
- Asphalt
- Fill
- Gravel and Sand
- Sand
- Clay and Silt
- Silt, Sand, and Gravel with Angular Rock Clasts

Note:

Observations of NAPL and sheens are from this SRI.

Project: DANSVILLE/103023	Client: NYSEG	Ish Inc./META

Figure A-9
Geologic Cross-Section B-B'

Filename: Cross Section	Drawn by: AJB	Approved by: PJD	Date: 5/5/2006

C

C'

DP33/PZ22

DP24/PZ13

DP34

DP48

DP45/PZ32

DP44/PZ31

DP51/PZ36*

DP54/PZ17

DP47/PZ34

Ground Surface

FILL

TOP SOIL

SILT, SAND, and GRAVEL with ANGULAR ROCK CLASTS

ASPHALT

FILL

Groundwater (10/2004)

Depth to "wet" in soil boring

GRAVEL and SAND

SAND

CLAY and SILT

GRAVEL and SAND

SAND

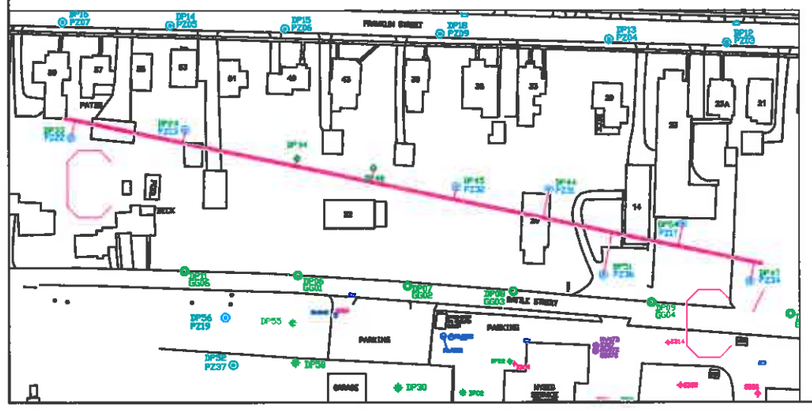
CLAY and SILT

690'
685'
680'
675'
670'
665'
660'

VE=1:7 Elevation Above Mean Sea Level

0' 20' 40' 60' 80' 100' 120' 140' 160' 180' 200' 220' 240' 260' 280' 300' 320' 340' 360' 380' 400' 420' 440' 460' 480' 500' 520' 540' 560' 580' 600' 620' 640' 660' 680' 700' 720' 740' 760'

Horizontal Distance



Legend

- NAPL in matrix
- Well Screen
- Bottom of Boring
- Soil Sample
- Top Soil
- Asphalt
- Fill
- Silt, Sand, and Gravel with Angular Rock Clasts
- Gravel and Sand
- Sand
- Clay and Silt

Note:

Observations of NAPL are from this SRI.

*NAPL observed during groundwater development and sampling.

Project: DANSVILLE/103023	Client: NYSEG	Ish Inc./META

Figure A-10
Geologic Cross-Section C-C'

Filename:	Drawn by:	Approved by:	Date:
Cross Section	AJB	PJD	5/5/2006

D

D'

DP25/PZ14

DP31/PZ20

DP35/PZ24

DP36/PZ25

DP53/PZ38

Ground Surface

FILL

FILL

TOP SOIL

SILT, SAND, and GRAVEL with ANGULAR ROCK CLASTS

GRAVEL and SAND

GRAVEL and SAND

SAND

SAND

CLAY and SILT

CLAY and SILT

SAND

Groundwater (9/2004)

Depth to "wet" in soil boring

685'
680'
675'
670'
665'
660'
655'

VE=1:7 Elevation Above Mean Sea Level

0' 20' 40' 60' 80' 100' 120' 140' 160' 180' 200' 220' 240' 260' 280' 300' 320' 340' 360' 380' 400' 420' 440' 460' 480' 500' 520' 540' 560' 580' 600' 620'

Horizontal Distance

Legend

- Well Screen
- Bottom of Boring
- Soil Sample
- Top Soil
- Asphalt
- Fill
- Silt, Sand, and Gravel with Angular Rock Clasts
- Gravel and Sand
- Sand
- Clay and Silt

Note:

Observations of NAPL are from this SRI.

Project: DANSVILLE/103023	Client: NYSEG	Ish Inc./META	
Figure A-11 Geologic Cross-Section D-D'			
Filename: Cross Section	Drawn by: AJB	Approved by: PJD	Date: 5/5/2006

APPENDIX B

Field Sampling Plan

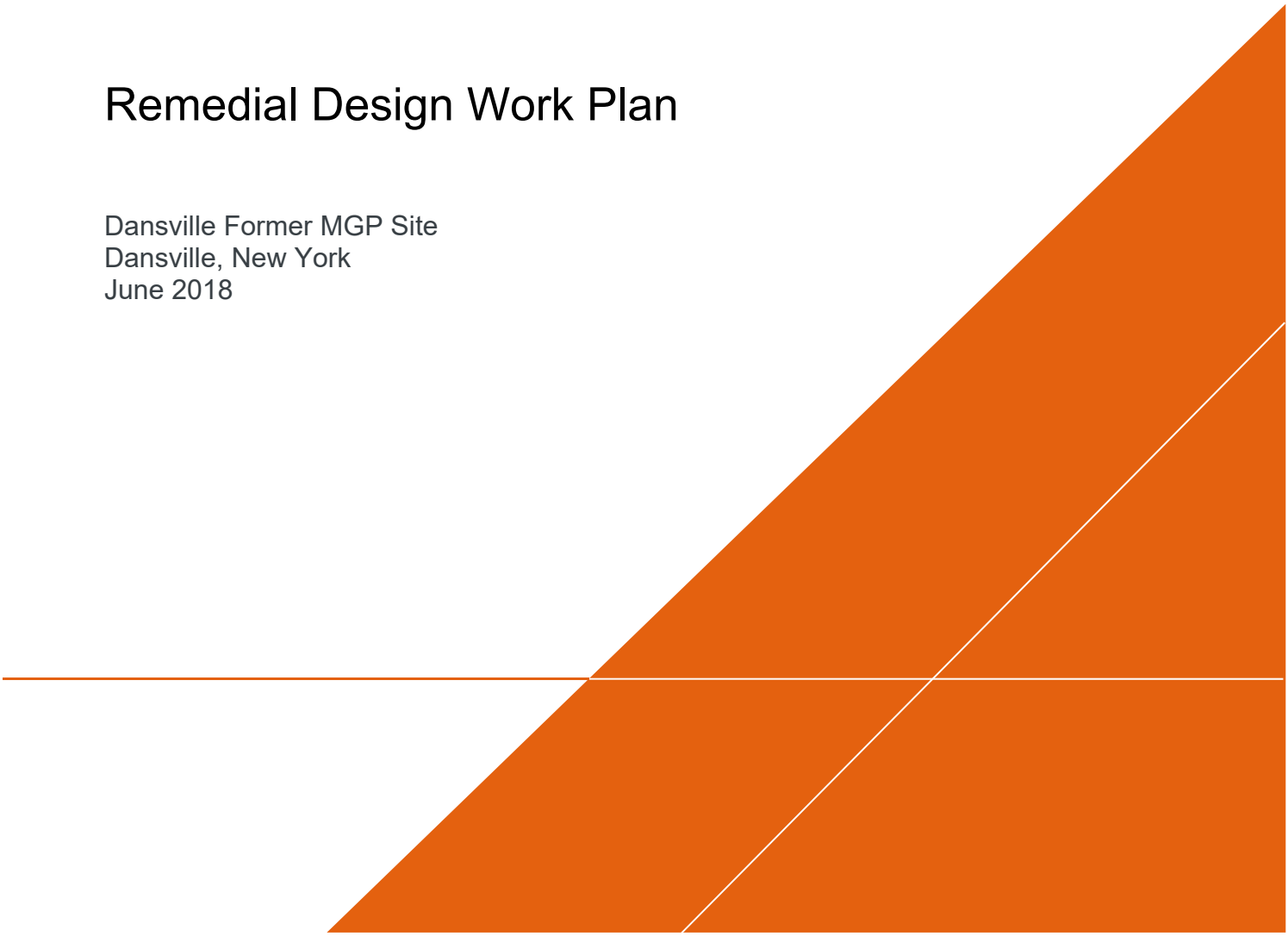
ARCADIS Design & Consultancy for natural and built assets

FIELD SAMPLING PLAN

Appendix B

Remedial Design Work Plan

Dansville Former MGP Site
Dansville, New York
June 2018



FIELD SAMPLING PLAN

Remedial Design Work Plan

Prepared for:

NYSEG

Prepared by:

Arcadis of New York, Inc.

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Third Floor

Suite 301

Fairport

New York 14450

Tel 585 385 0090

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Our Ref.:

B0013135

Date:

June 2018

CONTENTS

FIGURES

ATTACHMENTS

1. INTRODUCTION

1.1 General

This *Field Sampling Plan* (FSP) supports the *Remedial Design Work Plan (RDWP)* prepared by Arcadis of New York, Inc. (Arcadis) for the Dansville Former Manufactured Gas Plant (MGP) Site located in Dansville, New York (site).

This FSP addresses the field procedures and sample collection methods to be used during implementation of the RDWP field activities within potentially MGP-impacted areas of the site. The FSP should be used in conjunction with the RDWP, the *Quality Assurance Project Plan* (QAPP), and an approved *Health and Safety Plan* (HASP). The QAPP (included as **Appendix C** of the RDWP) presents the quality assurance/quality control (QA/QC) procedures to be used during field activities described in the RDWP, as well as a description of the general field and laboratory procedures.

1.2 Project Objectives

The purpose of the FSP is to describe the field procedures and sample collection methods to be used during implementation of the RDWP field activities within potentially MGP-impacted areas.

1.3 Overview of Investigation Field Activities

- The following activities may be conducted at the site:
- Soil boring advancement.
- Monitoring well installation.
- Measurement of fluid levels.
- Collection of soil samples during advancement of soil borings.
- Groundwater sampling.
- Bailing non-aqueous phase liquid (NAPL) from NAPL recovery wells (NRWs).

The sampling locations and rationale for each field sampling activity are described in the RDWP and not further described in this FSP.

A site location map and figure with sampling locations have been prepared for the site; these figures are presented in the RDWP.

2. FIELD ACTIVITIES

2.1 General Field Guidelines

Underground utilities will be identified prior to any drilling or subsurface sampling. Public and privately owned utilities will be located by contacting responsible agencies by phone so that their underground utilities can be marked at the site. Other potential on-site hazards, such as traffic, overhead power lines, and building hazards (residences, businesses), will be identified during a site reconnaissance visit.

The following is a general list of equipment necessary for sample collection:

- Stainless steel spoons and bowls for compositing soil samples.
- Appropriate sample containers provided by the laboratory (kept closed and in laboratory-supplied coolers until the samples are collected).
- Pre-preserved sample containers for aqueous samples.
- Chain of custody record forms.
- Log book, field sampling records, and indelible ink pens and markers.
- Laboratory-grade soap (such as Alconox®), reagent grade solvents, and distilled water to be used for decontaminating equipment between sampling stations.
- Buckets, plastic wash bins, and scrub brushes for decontaminating equipment.
- Camera and film.
- Stakes to identify sampling locations.
- Shipping labels and forms.
- Knife.
- Packing/shipping material for samples bottles.
- Clear plastic tape.
- Duct tape.
- Aluminum foil.
- Re-closable plastic bags.
- Portable field instruments, including a photoionization detector (PID), water quality parameter meter, conductivity meter, and water-level indicator.

Field log books will be maintained by the field team leader and other team members to provide a daily record of significant events, observations, and measurements during the field investigation.

Information pertinent to the field investigation and/or sampling activities will also be recorded in the log books. The books will be bound with consecutively numbered pages. Entries in the log book will include, at a minimum, the following information:

- Name of author, date of entry, and physical/environmental conditions during field activity.
- Purpose of sampling activity.
- Location of sampling activity.
- Name of field crew members.
- Name of any site visitors.
- Sample media (e.g., soil, groundwater).
- Sample collection method.
- Number and volume of sample(s) taken.
- Description of sampling point(s).
- Volume of groundwater removed before sampling (where appropriate).
- Preservatives used.
- Date and time of collection.
- Sample identification number(s).
- Field observations.
- Any field measurements made, such as, but not limited to, pH, temperature, conductivity, water level.

All original data recorded in field log books and chain of custody records will be written with indelible ink. If an error is made on an original document assigned to one individual, that individual will make all corrections simply by crossing a single line through the error and entering the correct information. The erroneous information will not be erased. Any subsequent error discovered on an original document will be corrected by the person who made the entry. All subsequent corrections will be initialed and dated.

2.2 Sample Labeling, Packing, and Shipping

Each sample will be given a unique identification. With this type of identification, no two samples will have the same label.

Samples will be promptly labeled upon collection with the following information:

- Project number and site.
- Unique sample identification.
- Analysis required.
- Date and time sampled.
- Sample type (composite or grab).
- Preservative, if applicable.

Clear tape will be secured over the sample label and the chain of custody will be initiated. A sample chain of custody form is included on **Figure 1**.

Appropriate sample containers, preservation methods, and laboratory holding times for each sample type will be applied as identified in the QAPP.

If samples are to be shipped by commercial carrier (e.g., Federal Express), sample bottles/jars will be packed in coolers containing the following:

- A drain plug (if present) that has been sealed with duct tape.
- 1 to 2 inches of bubble wrap on the bottom of the cooler.
- Water ice packaged in re-sealable plastic bags.
- Sufficient bubble wrap to fill in the remaining area.
- The completed chain of custody in a re-sealable plastic bag, taped in place on the inside cover of the cooler.

The cooler will then be sealed with tape. Appropriate shipping labels, such as "this-end-up" and "fragile" stickers will be affixed to the cooler. Samples will be hand delivered or delivered by an express carrier within 48 hours of sample collection. The express carrier will not be required to sign the chain of custody form; however, the shipping receipt should be retained by the sampler and forwarded to the project files.

2.3 Equipment Decontamination

2.3.1 Drill Rig Decontamination

A decontamination pad will be lined with plastic sheeting on a surface sloped to a sump. The sump must also be lined and of sufficient volume to contain approximately 20 gallons of decontamination water. All drilling equipment, including rear-end of drilling rig, augers, bits, rods, tools, split spoon samplers, tremie pipe, etc., will be cleaned on the decontamination pad with a high-pressure hot water "steam cleaner" unit and scrubbed with a wire brush, as needed, to remove dirt, grease, and oil before beginning work in the project area. If heavy accumulations of tars or oils are present on the downhole tools, a citrus-based cleaner (e.g., Citra-Solv®) may be used to aid in equipment cleaning. Tools, drill rods, and augers will be placed on sawhorses, decontaminated pallets, or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided. The back of the drill rig and augers, rods, and tools will be decontaminated between each drilling location according to the above procedures. Decontamination water will be contained in a dedicated plastic tank or 55-gallon open-top drums located on site. All open-top drums will remain closed when not in use.

Following decontamination of all heavy site equipment, the decontamination pad will be decommissioned. The decommissioning will be completed by:

- Transferring the bulk of the remaining liquids and solids into the drums, tanks, and/or roll-offs to be provided by NYSEG or the drilling subcontractor for these materials.

- Rolling the sheeting used in the decontamination pad onto itself to prevent discharge of the remaining materials to the ground surface. Once rolled up, the polyethylene sheeting will be placed in the roll-off or drums used for disposal of personal protective equipment (PPE) and disposable equipment.

Unless sealed in manufacturer's packaging, polyvinyl chloride (PVC) monitoring well casing screens will be decontaminated by the above procedures before installation.

2.3.2 Sampling Equipment Decontamination

Prior to collecting samples to be submitted for chemical analysis, if any, all non-dedicated bowls, spoons, hand augers, bailers, and filtering equipment will be washed with potable water and a detergent (such as Alconox®). Decontamination may take place at the sampling location as long as all liquids are contained in pails and buckets. The sampling equipment will then be rinsed with potable water, followed by a 10 percent "pesticide-grade" methanol rinse, and finally a distilled water rinse. When sampling for inorganic constituents in an aqueous phase, an additional rinse step will be added prior to the rinse with methanol. The rinse step will entail a rinse with a 10 percent "ultra pure-grade" nitric acid followed by a distilled water rinse. Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time will washed equipment be placed directly on the ground. Equipment will be either be used immediately or wrapped in plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

2.4 Subsurface Soil Sampling Method

Continuous soil sampling will be conducted during drilling in the overburden using. Continuous core samples of overburden materials will be collected. At locations designated for geotechnical data collection, the Standard Penetration Test (American Society for Testing and Materials [ASTM] D 1586 84) and hollow-stem augers or flush-joint casing will be used during drilling to collect split-spoon samples from the unconsolidated fill and soils beneath the site. If required, samples selected for laboratory analysis will be based on:

- Their position in relation to potential source areas.
- The visual presence of source materials.
- The relative levels of volatile organics based on PID field screening measurements.
- The discretion of the on-site geologist.

Samples selected for laboratory analysis will be placed in appropriate containers provided by the laboratory. Sample containers for volatile organic analyses consistent with United States Environmental Protection Agency Method 5035 will be filled. Next, a sufficient amount of the remaining soil will be homogenized by mixing the sample in a decontaminated stainless steel tray/bowl or disposable zip-top bag with a decontaminated stainless steel trowel or disposable scoop. Laboratory-supplied sample containers for other analytes will then be filled. Duplicate samples will be collected at the frequency detailed in the QAPP by alternately filling two sets of sample containers.

Representative portions of each soil sample may be placed in a 1 pint jar or re-closable plastic bag, labeled, and stored on site. This container will be labeled with:

- Site.
- Boring number.
- Interval sampled.
- Date.
- Initials of sampling personnel.

These soil samples will be screened for organic vapors using a PID. In addition, a geologist will be on site during drilling operations to describe each sample. Soil samples will be described using the methods described in the soil description standard operating procedure (SOP), included as **Attachment A**.

For samples that may be submitted for chemical analysis, split-spoons, or any portion of the drilling rig that may contact the sample, will be decontaminated, as specified in Section 2.3.2, after each sample is collected. Sample descriptions, PID readings, and location will be recorded in the field book or on the field drilling log presented on **Figure 2**. Calibration, operation, and maintenance procedures are included as **Attachment B** for one type of PID commonly used in the field. The procedures to be followed will be dependent on the PID acquired for this project, as described in the equipment manual.

2.5 Soil Boring/Monitoring Well Installation and Development

Soil borings and/or monitoring wells will be installed to the depths and at the locations defined in a RDWP. After completion of drilling and well installation, all new wells will be developed to establish hydraulic connection between the well and the formation. The following procedures will be used to drill borings and install and develop monitoring wells.

2.5.1 Drilling and Geological Logging Methods

The drilling and geological logging methods to be completed in connection with monitoring well installation are as follows:

- Boreholes in the overburden will be drilled using rotosonic technology, hollow-stem augers, or other method identified in the RDWP.
- Continuous soil sampling will be conducted during advancement of soil borings and/or monitoring wells.
    - Rotosonic drilling methods provide continuous core samples of overburden materials by advancing casings and corebarrels using harmonic wave energy. Boreholes will be drilled by first advancing a corebarrel to obtain a soil sample, followed by advancing an outer casing using the corebarrel to stabilize the borehole. The inner corebarrel is then retrieved and the soil sample is extruded into polyethylene bags. 6-inch or 4-inch cased boreholes will be drilled to required depths taking continuous soil samples in 5-foot or 10-foot core runs. Soil samples are extruded into polyethylene bags and laid out for characterization.
    - Hollow-stem auger drilling methods provide continuous samples of overburden material by advancing 2-inch or 3-inch diameter split spoons in two-foot intervals with a precisely weighted

auto hammer or by advancing a 4-foot or 5-foot long macrocore sampler lined with a disposable acetate liner.

- If geotechnical data is required, split-spoon sampling will be conducted during the advancement of soil borings. Sampling will be performed in accordance with ASTM Specification D 1586 for standard penetration test and split-spoon sampling, unless otherwise authorized by the field geologist.
- The designated field geologist will log borehole geology and monitoring well specifications in the field book and/or field forms.
- A plywood sheet or tub may be placed around the auger or casing when drilling to contain cuttings.
- Soil cuttings will be placed in a drum or roll-off supplied by NYSEG or the drilling subcontractor. Decontamination water will be placed in plastic tanks/drums supplied by NYSEG or the drilling subcontractor. Soil cuttings and decontamination water will be picked up and containerized at the end of each work day. The roll-offs or open-top drums used to contain the solids will be covered when not in use.

Results from the drilling efforts will be recorded in the field book.

2.5.2 Monitoring Well Specifications

Figure 2 shows details of a typical monitoring well construction for shallow wells installed in unconsolidated sediment that do not penetrate a presumed confining layer, above which dense NAPL (DNAPL) is known or suspected to exist. The overburden monitoring wells will be installed according to the following specifications:

- PVC 2-inch-diameter, threaded, flush joint casing and 10-foot-long, 0.020 inch slot screens will be installed.
- A sump, 2 feet in length and grouted in with cement, may be attached to the bottom of the screen for potential collection of DNAPL, if present.
- The top of the casing will extend approximately 2 feet above ground surface given site-specific considerations; otherwise, flush-mount casings will be used.
- The annulus around the screens will be backfilled with an appropriate size of silica sand, such as Morie #1 sand, to a minimum height of 1 foot above the top of the screen, assuming there is sufficient room to install an appropriate surface seal above the sand.
- An approximately 1-foot-thick chipped bentonite seal or slurry (30 gallons water to 25 to 30 pounds bentonite, or relative proportions) will be placed above the sand pack. The pellet seal must be allowed to partially hydrate before placing grout above the seal.
- The remainder of the annular space will be filled with a cement/bentonite grout to approximately 2 feet below grade. The grout will be placed with a tremie pipe from the bottom up. The grout will consist of a cement mixture of one 94-pound bag of Portland cement, approximately 5 pounds of granular bentonite, and approximately 7 gallons of water. The grout will be allowed to set for a minimum of 24 hours before wells are developed.

- Each monitoring well will have a vented cap and a 4-inch-diameter steel casing with a locking cap placed over the monitoring well. The protective casing will extend approximately 1 to 2 feet below ground surface and be set in concrete. In some areas, it may be necessary to provide flush-mounted casings.
- A concrete seal or pad, approximately 2 feet in diameter and 1.5 feet below grade, will be installed.
- A weep hole will be drilled through the protective standpipe casing just above the top of the concrete seal to allow water between the inner and outer casing to drain.
- The top of the PVC well casing and outer protective casing will be marked and the elevation determined by survey to the nearest 0.01 foot, relative to a fixed benchmark or datum.
- The measuring point on all wells will be on the innermost PVC casing at the highpoint of the casing, if any.

The following characteristics of each newly installed well will be recorded in the field log book:

- Date/time of construction.
- Drilling method and drilling fluid used (if any).
- Approximate well location.
- Borehole diameter and well casing diameter.
- Well depth.
- Drilling and lithologic logs.
- Casing materials.
- Screen materials and design.
- Casing and screen joint type.
- Screen slot size/length.
- Filter pack material/size.
- Filter pack placement method.
- Sealant materials.
- Sealant placement method.
- Surface seal design/construction.
- Well development procedure.
- Type of protective well cap.
- Detailed drawing of well (including dimensions).

2.5.3 Monitoring Well Development

A minimum of 24 hours after installation, the monitoring wells will be developed by surging/bailing using a centrifugal pump and dedicated polyethylene tubing, or by Waterra positive displacement pumps and dedicated polyethylene tubing or other methods at the discretion of the field geologist. Development water will be contained in a tank on site or in drums to be provided by NYSEG or the drilling subcontractor. The wells will be developed until the water removed from the well is reasonably free of visible sediment (50 nephelometric turbidity units [NTUs]), if possible, or until the turbidity levels stabilize, assuming a minimum of 10 well volumes of water have been removed from the monitoring well during development. Following development, wells will be allowed to recover for at least 1 week before groundwater is purged and sampled. All monitoring well development will be overseen by a field geologist and the duration, method of development, and approximate volume of water removed will be recorded in the field book.

2.5.4 Monitoring Well Abandonment

In the event well abandonment is required, it will be conducted in accordance with NYSDEC Commissioner's Policy 43 (CP-43). This document identifies appropriate and acceptable methods of well abandonment considering site specific geology and constituents of concern. At the site, it is assumed that monitoring wells will be installed in overburden material and will not pierce a confining layer and as such can be abandoned in place by filling with grout mixed at the correct ratio as identified in CP-43 (94 pounds [lbs] type I Portland cement to 3.9 pounds powdered bentonite and 7.8 gallons potable water).

2.6 Measurement of Fluid Levels

Fluid levels will be measured using an electronic fluid-level indicator (sounder), steel tape, pressure transducer, or stream gauge at established reference points (e.g., top of casing, stream gauge).

The following materials will be available, as required:

- Appropriate health and safety equipment, as specified in the HASP.
- Laboratory-type soap (Alconox or equivalent).
- Electronic water-level indicator (sounder) or pressure transducer.
- PID.
- Analyte-free water.
- Indelible ink pen.

The measurements will be made in as short a timeframe as practical to minimize temporal fluctuations in hydraulic conditions. The following procedure will be used to measure fluid-level depths at monitoring wells and surface-water gauges:

1. Identify site and well number in field book, as well as with the date, time, personnel, and weather conditions using indelible ink. Use safety equipment, as specified in the HASP. Clean the water-level indicator in accordance with Section 2.3.2. Contain rinse water in a portable container that will be transferred to an onsite container.

2. Unlock and open the well cover while standing upwind from the well. Record PID reading in well headspace.
3. Locate a measuring reference point on the well casing. If one is not found, create a reference point by notching the inner casing (or outer if an inner casing is not present) with a hacksaw. All down-hole measurements will be taken from one reference point. Document the creation of any new reference point or alteration of the existing reference point.
4. Measure to the nearest 0.01-foot and record the height of the inner and outer casing from reference point to ground level.
5. Lower the water-level indicator probe down the well. Take depth measurements of light product (if any), water, dense product (if any), and bottom. Double check all measurements and record depths to the nearest 0.01-foot.
6. Clean the instrument(s), as specified in Section 2.3.2.
7. Compare the depth of the well to previous records.
8. Lock the well when all activities are completed.

2.7 Low-Flow Groundwater Sampling Procedures for Monitoring Wells

This protocol describes the procedures to be used to collect groundwater samples. For newly installed wells, no wells will be sampled until well development has been performed. During precipitation events, groundwater sampling will be discontinued until precipitation ceases. When a round of water levels is taken to generate water-elevation data, the water levels will be taken consecutively at one time prior to sampling or other activities.

The following materials, as required, shall be available during groundwater sampling:

- Sample pump.
- Sample tubing.
- Power source (i.e., generator, battery).
- PID.
- Appropriate health and safety equipment, as specified in the HASP.
- Plastic sheeting (for each sampling location).
- Dedicated or disposable bailers.
- New disposable polypropylene rope.
- Buckets to measure purge water.
- Water-level probe.
- 6-foot rule with gradation in hundredths of a foot.

- Conductivity/temperature meter.
- pH meter.
- Turbidity meter.
- Dissolved oxygen (DO) meter.
- Oxidation-reduction potential (ORP) meter.
- Appropriate water sample containers.
- Appropriate blanks (trip blank supplied by the laboratory).
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials.
- Groundwater sampling logs.
- Chain of custody forms.
- Indelible ink pens.
- Site map with well locations and groundwater contour maps.
- Keys to wells.

The following 21 steps detail the monitoring well sampling procedures:

1. Review materials checklist (Part II) to confirm that the appropriate equipment has been acquired.
2. Identify site and well to be sampled on sampling log sheets, including date, arrival time, and weather conditions. Identify the personnel and equipment used and other pertinent data requested on the Field Sampling Logs (**Attachment C**).
3. Label all sample containers using an appropriate label.
4. Use safety equipment, as required in the HASP.
5. Place plastic sheeting adjacent to the well to use as a clean work area.
6. Establish the background reading with the PID and record the reading on the field log.
7. Remove lock from the well; if rusted or broken, replace with a new brass keyed-alike lock.
8. Unlock and open the well cover while standing upwind of the well. Remove well cap and place on the plastic sheeting. Insert PID probe in the breathing zone above the well casing following instructions in the HASP.
9. Set out on plastic sheeting the dedicated or disposable sampling device and meters.
10. Prior to sampling, groundwater elevations will be measured at each monitoring well and the presence of LNAPL or DNAPL (if any) within the well will be evaluated. Obtain a water-level depth and bottom of well depth using an electric well probe and record on the sampling log sheet. Clean the well probe after each use with a soapy (Alconox®) water wash and a tap water rinse. (Note: water levels will be measured at all wells prior to initiating a sampling event).

11. After groundwater elevations are measured and NAPLs are determined not to be present, groundwater will be purged from the wells. If NAPLs are determined to be present, then a groundwater sample will not be collected; rather, a representative NAPL sample may be collected (if required) using a peristaltic pump or other method determined by the Field Manager/Site Supervisor.
12. Pump, safety cable, electrical lines, and/or tubing (for peristaltic pumps) will be lowered slowly into the well to a depth corresponding to the center of the saturated screen section of the well.
13. Measure the water level again with the pump in the well before starting the pump. Start pumping the well at 100 to 500 milliliters per minute. Ideally, the pump rate should cause little water-level drawdown in the well (less than 0.3 feet and the water level should stabilize). The water level should be monitored every 3 to 5 minutes (or as appropriate) during pumping. Care should be taken not to cause the pump suction to be broken or entrainment of air in the sample. Record pumping rate adjustments and depths to water. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or to confirm stabilization of indicator parameters. If the recharge rate of the well is very low, purging should be interrupted so as not to cause the drawdown within the well to advance below the pump. However, a steady flow rate should be maintained to the extent practicable. Sampling should commence as soon as the volume in the well has recovered sufficiently to permit sample collection.
14. During well purging, monitor the field indicator parameters (e.g., turbidity, temperature, specific conductance, pH, dissolved oxygen [DO], and oxidation-reduction potential [ORP]) every 3 to 5 minutes (or as appropriate). The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):

    $\pm$0.1 for pH

    $\pm$3% for specific conductance (conductivity)

    $\pm$10 mv for ORP

    $\pm$10% for turbidity and DO

    Note that turbidity and DO usually require the longest time to achieve stabilization. As such, sampling may be allowed prior to stabilization of turbidity and/or DO if all other parameters have stabilized. The decision to sample under this scenario must be agreed to by the Project Manager.

    The pump must not be removed from the well between purging and sampling. If the parameters have stabilized, but the turbidity is not in the range of the 50 NTU goal, the pump flow rate should be decreased to no more than 100 millimeters per minute. Measurement of the indicator parameters should continue every 3 to 5 minutes. Measurements for parameters may be taken using a flow-thru cell or in a clean container such as a glass beaker. Measurements of DO should be taken from a sample collected using an in-line tee fitting installed before the tubing outlet, prior to connection to the flow-through cell (if one is being used).
15. Fill in the sample label and cover the label with clear packing tape to secure the label onto the container.

16. After the groundwater quality parameters have stabilized, as discussed above, obtain the groundwater sample needed for analysis directly from the sampling device in the appropriate container and tightly screw on the caps. Note that groundwater samples collected for analysis of VOCs cannot be collected using a peristaltic pump. If purging the well using a peristaltic pump, collect all other types of samples (e.g., SVOCs, inorganics, etc.) prior to collecting the sample for VOC analysis. Once other samples are collected, remove the peristaltic pump tubing and collect the VOC samples using a new disposable polyethylene bailer. The bailer should be gently lowered to the approximate depth at which the pump intake was set, and then retrieved.
17. Secure with packing material and store at 4 degrees Celsius (°C) on wet ice in an insulated transport container provided by the laboratory.
18. After all sampling containers have been filled, purge water for an additional few minutes. Check the calibration of the meters and then measure and record on the field log the physical appearance, pH, ORP, DO, temperature, turbidity, and conductivity.
19. Record the time sampling procedures were completed on the field logs.
20. Place all disposable sampling materials (plastic sheeting, disposable bailers, and health and safety equipment) in appropriately labeled containers. Go to the next well and repeat Step 1 through Step 21 until all wells are sampled.
21. Complete the procedures for packaging, shipping, and handling with associated chain of custody forms (Section 2.2).

2.8 NAPL Bailing

In the event that either LNAPL or DNAPL is discovered during well gauging, it will be removed via appropriately sized disposable bailers. Bailing will continue until there is no longer recoverable product retrieved in the bailer. All material brought up in the bailer (groundwater and product) will be dumped into a bucket immediately adjacent to the well. Upon completion of bailing of NAPL from a well, the bailed material will be transferred to an onsite storage container (e.g. 55-gallon drum) for temporary storage in an area identified by the City of Oneonta, pending disposal.

2.9 Air Monitoring

Air monitoring will be conducted with a PID and dust monitor during all intrusive activities and only a PID during sampling activities. Air monitoring requirements that need to be conducted during intrusive activities are provided in the RDWP. The PID will be used to monitor organic vapors in the breathing zone and borehole and to screen samples for analysis; the dust monitoring will be used to monitor particulate concentrations in the breathing zone for particulates less than 10 microns in diameter.

The PID and dust monitor readings will be recorded in the field book during trenching and drilling activities. The instruments will be calibrated at least once each day and more frequently, if needed. A detailed procedure for the PID calibration is included as **Attachment B**.

3. FIELD INSTRUMENTS

All field-screening equipment will be calibrated immediately prior to each day's use and more frequently, if required. The calibration procedures will conform to the manufacturer's standard instructions. Records of all instrument calibration will be maintained by the field personnel. Copies of all of the instrument manuals will be maintained on site by the field personnel.

3.1 Portable Photoionization Analyzer

The photoionization analyzer (PID) will be a MiniRAE 3000 (or equivalent), equipped with a 10.6 electron volt (eV) lamp. The MiniRAE is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73 percent of the VOCs on the Target Compound List. Calibration will be performed according to the procedures outlined in **Attachment B**.

3.2 Dust Monitor

The dust monitor will be an TSI DUSTRAK (or equivalent) and will be calibrated at the start of each day of use. Calibration and maintenance of the dust monitor will be conducted in accordance with the manufacturer's specifications. The calibration data will be recorded in field notebooks.

3.3 pH Meter

The pH meter will be calibrated at the start of each day of use and after very high or low readings, as required by this FSP. National Institute of Standards and Technology traceable standard buffer solutions that bracket the expected pH range will be used. The standards will most likely be a pH of 7.0 and 10.0 standard units. The pH calibration and slope knobs will be used to set the meter to display the value of the standard being checked. The calibration data will be recorded in field notebooks.

3.4 Specific Conductivity Meter

Calibration checks using the appropriate conductivity standard for the meter will be performed at the start of each day of use and after very high or low readings, as required by this FSP. Readings must be within 5 percent to be acceptable. The thermometer of the meter will be calibrated against the field laboratory thermometer on a weekly basis.

3.5 Dissolved Oxygen Meter

The DO meter will be calibrated and the condition of the DO sensor will checked at the start of each day of use. Calibration and maintenance of the DO meter will be conducted in accordance with the manufacturer's specifications. The calibration data will be recorded in field notebooks.

3.6 Water-Level Meter

The water-level cable will be checked once to a standard to assess if the meter has been correctly calibrated by the manufacturer or vendor. If the markers are incorrect, the meter will be sent back to the manufacturer or vendor.

3.7 Turbidity Meter

The turbidity meter will be calibrated daily prior to use. Calibration and maintenance will be conducted in accordance with the manufacturer's specifications. Calibration and maintenance information will be recorded in the field notebook.

3.8 Oxidation-Reduction Potential Meter

The ORP meter will be calibrated at the start of each day of use. Calibration and maintenance of the ORP meter will be conducted in accordance with the manufacturer's specifications. The calibration data will be recorded in the field notebook.

FIGURES

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ID#:

CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

Page ___ of ___

Lab Work Order #

Send Results to:

Contact & Company Name:	Telephone:
Address:	Fax:
City State Zip	E-mail Address:
Project Name/Location (City, State):	Project #:
Sampler's Printed Name:	Sampler's Signature:

Sample ID	Collection Date	Collection Time	Type (✓) Comp	Type (✓) Grab	Matrix

Preservative								
Filtered (✓)								
# of Containers								
Container Information								

PARAMETER ANALYSIS & METHOD

REMARKS

Keys

Preservation Key:
A. H_2SO_4
B. HCL
C. HNO_3
D. NaOH
E. None
F. Other: _____
G. Other: _____
H. Other: _____

Container Information Key:
1. 40 ml Vial
2. 1 L Amber
3. 250 ml Plastic
4. 500 ml Plastic
5. Encore
6. 2 oz. Glass
7. 4 oz. Glass
8. 8 oz. Glass
9. Other: _____
10. Other: _____

Matrix Key:
SO - Soil | SE - Sediment | NL - NAPL/Oil
W - Water | SL - Sludge | SW - Sample Wipe
T - Tissue | A - Air | Other: _____

Special Instructions/Comments:

☐ **Special QA/QC Instructions(✓):**

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name:	Cooler Custody Seal (✓)	Printed Name:	Printed Name:	Printed Name:	Printed Name:
☐ Cooler packed with ice (✓)	☐ Intact ☐ Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements:	Sample Receipt:	Firm:	Firm/Courier:	Firm/Courier:	Firm:
Shipping Tracking #:	Condition/Cooler Temp: _____	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: WHITE – Laboratory returns with results YELLOW – Lab copy PINK – Retained by BBL

Date Start/Finish: 8/9/2008 - 8/10/2008
Drilling Company: Drillers, Inc.
Driller's Name: Joe Smith
Drilling Method: Hollow Stem Auger
Auger Size: 4.25" ID
Rig Type: CME-55
Sampling Method: 2" Split Spoon

Northing: 617984.1848
Easting: 559115.8392
Casing Elevation: NA

Borehole Depth: 26' bgs
Surface Elevation: 682.35' AMSL

Descriptions By: Katherine Murray

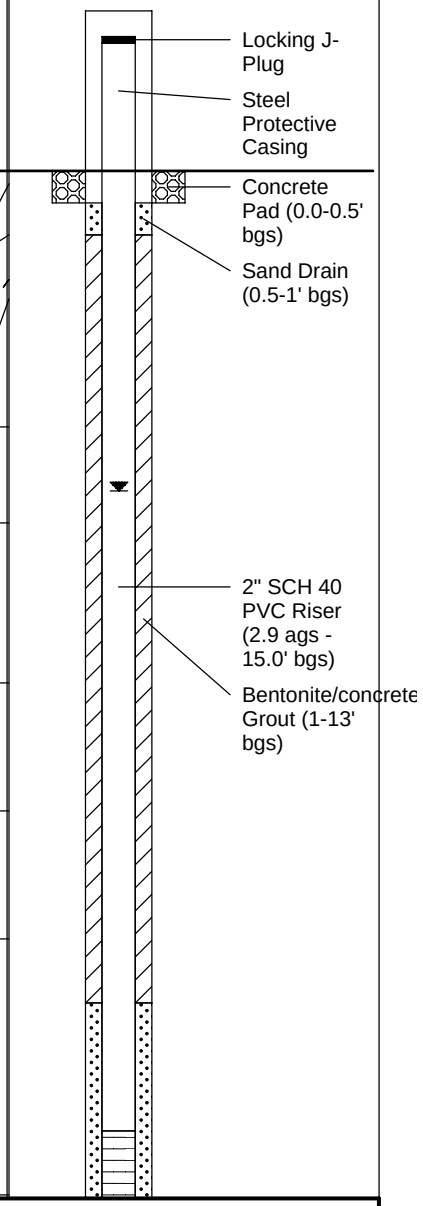
Well/Boring ID: **EXAMPLE BORING**

Client: XYZ Chemical Plant, An ABC Company

Location: Smith Street Site Syracuse, NY

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
	685								
0		1	0-2	2.0	1 1 2 5	3	1.1		Asphalt surface. Black-gray coarse GRAVEL, some fine Sand, moist. Dark brown to brown fine SAND and Coal SLAG, some medium to coarse Sand, moist.
	680	2	2-4	1.2	1 2 3 5	5	0.0		Light gray to white ASH, little rust colored mottles, moist to wet. Dark gray fine SAND and SILT, trace Clay, slightly plastic, some rust colored layers, wet.
5		3	4-6	1.1	1 2 1 5	3	0.0		Dark gray SILT and CLAY, little fine Gravel, little coarse Sand, medium plasticity, soft, wet. Gravel content increasing to some below 4.7' bgs.
	675	4	6-8	1.3	7 8 1 8	9	0.0		Red to yellow-brown fine to medium GRAVEL and coarse SAND, little Silt, trace Clay, wet.
		5	8-10	0.3	1 2 5 4	7	0.0		Brown fine to coarse SAND, some fine Gravel, little Silt, moist.
10		6	10-12	0.0	6 18 50/0.3	NA	NA		No Recovery.
	670	7	12-14	1.4	6 5 4 6	9	3.5		Red to yellow-brown fine to medium GRAVEL and coarse SAND, little Silt, saturated.
15		8	14-16	1.5	2 9 1 2	10	4.5		Color change to brown below 14' bgs.



Remarks: bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

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Client: XYZ Chemical Plant,
An ABC Company

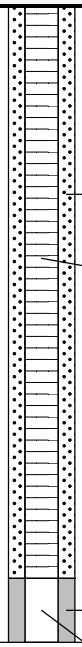
Site Location:
Smith Street Site
Syracuse, NY

Well/Boring ID: **EXAMPLE BORING**

Borehole Depth: 26' bgs

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blows / 6 Inches	N - Value	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
		9	16-18	2.0	3 2 1 1	3	0.0		Brown fine to medium GRAVEL and coarse SAND, little Silt, saturated.	
	665	10	18-20	2.0	1 1 2 2	3	0.0			
20		11	20-22	2.0	5 4 1 2	5	0.0			
	660	12	22-24	1.6	4 13 12 9	15	87			
25		13	24-26	1.7	3 12 9 15	21	112			
	655									
30										
	650									
35										



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Remarks: bgs = below ground surface; NA = Not Applicable/Available; AMSL = Above Mean Sea Level.

ATTACHMENT A

Soil Description Standard Operating Procedure

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Imagine the result

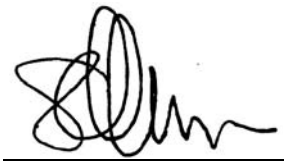
Soil Description

Rev. #: 0

Rev Date: May 20, 2008

Approval Signatures

Prepared by:  Date: 5/22/08

Reviewed by:  Date: 5/22/08
(Technical Expert)

Reviewed by  Date: 5/22/08
(Technical Expert)

I. Scope and Application

This ARCADIS standard operating procedure (SOP) describes proper soil description procedures. This SOP should be followed for all unconsolidated material unless there is an established client-required specific SOP or regulatory-required specific SOP. In cases where there is a required specific SOP, it should be followed and should be referenced and/or provided as an appendix to reports that include soil classifications and/or boring logs. When following a required non-ARCADIS SOP, additional information required by this SOP should be included in field notes with client approval.

This SOP has been developed to emphasize field observation and documentation of details required to:

- make hydrostratigraphic interpretations guided by depositional environment/geologic settings;
- provide information needed to understand the distribution of constituents of concern; properly design wells, piezometers, and/or additional field investigations; and develop appropriate remedial strategies.

This SOP incorporates elements from various standard systems such as ASTM D2488-06, Unified Soil Classification System, Burmister and Wentworth. However, none of these standard systems focus specifically on contaminant hydrogeology and remedial design. Therefore, although each of these systems contain valuable guidance and information related to correct descriptions, strict application of these systems can omit information critical to our clients and the projects that we perform.

This SOP does not address details of health and safety; drilling method selection; boring log preparation; sample collection; or laboratory analysis. Refer to other ARCADIS SOPS, the project work plans including the quality assurance project plan, sampling plan, and health and safety plan (HASP), as appropriate.

II. Personnel Qualifications

Soil descriptions will be completed only by persons who have been trained in ARCADIS soil description procedures. Field personnel will complete training on the ARCADIS soil description SOP in the office and/or in the field under the guidance of an experienced field geologist. For sites where soil descriptions have not previously been well documented, soil descriptions should be performed only by trained persons with a degree in geology or a geology-related discipline.

III. Equipment List

The following equipment should be taken to the field to facilitate soil descriptions:

- field book, field forms or PDA to record soil descriptions;
- field book for supplemental notes;
- this SOP for Soil Descriptions and any project-specific SOP (if required);
- field card showing Wentworth scale;
- Munsell® soil color chart;
- tape measure divided into tenths of a foot;
- stainless steel knife or spatula;
- hand lens;
- water squirt bottle;
- jar with lid;
- personal protective equipment (PPE), as required by the HASP; and
- digital camera.

IV. Cautions

Drilling and drilling-related hazards including subsurface utilities are discussed in other SOPs and site-specific HASPs and are not discussed herein.

Soil samples may contain hazardous substances that can result in exposure to persons describing soils. Routes for exposure may include dermal contact, inhalation and ingestion. Refer to the project specific HASP for guidance in these situations.

V. Health and Safety Considerations

Field activities associated with soil sampling and description will be performed in accordance with a site-specific HASP, a copy of which will be present on site during such activities. Know what hazardous substances may be present in the soil and understand their hazards. Always avoid the temptation to touch soils with bare hands, detect odors by placing soils close to your nose, or tasting soils.

VI. Procedure

1. Select the appropriate sampling method to obtain representative samples in accordance with the selected sub-surface exploration method, e.g. split-spoon or Shelby sample for hollow-stem drilling, Lexan or acetate sleeves for dual-tube direct push, etc.

2. Proceed with field activities in required sequence. Although completion of soil descriptions is often not the first activity after opening sampler, identification of stratigraphic changes is often necessary to select appropriate intervals for field screening and/or selection of laboratory samples.

3. Examine all of each individual soil sample (this is different than examining each sample selected for laboratory analysis), and record the following for each stratum:

- depth interval;
- principal component with descriptors, as appropriate;
- amount and identification of minor component(s) with descriptors as appropriate;
- moisture;
- consistency/density;
- color; and
- additional description or comments (recorded as notes).

The above is described more fully below.

DEPTH

To measure and record the depth below ground level (bgl) of top and bottom of each stratum, the following information should be recorded.

1. Measured depth to the top and bottom of sampled interval. Use starting depth of sample based upon measured tool length information and the length of sample interval.

2. Length of sample recovered, not including slough (material that has fallen into hole from previous interval), expressed as fraction with length of recovered sample as numerator over length of sampled interval as denominator (e.g. 14/24 for 14 inches recovered from 24-inch sampling interval that had 2 inches of slough discarded).

3. Thickness of each stratum measured sequentially from the top of recovery to the bottom of recovery.

4. Any observations of sample condition or drilling activity that would help identify whether there was loss from the top of the sampling interval, loss from the bottom of the sampling interval, or compression of the sampling interval. Examples: 14/24, gravel in nose of spoon; or 10/18 bottom 6 inches of spoon empty.

DETERMINATION OF COMPONENTS

Obtain a representative sample of soil from a single stratum. If multiple strata are present in a single sample interval, each stratum should be described separately. More specifically, if the sample is from a 2-foot long split-spoon where strata of coarse sand, fine sand and clay are present, then the resultant description should be of the three individual strata unless a combined description can clearly describe the interbedded nature of the three strata. Example: Fine Sand with interbedded lenses of Silt and Clay, ranging between 1 and 3 inches thick.

Identify principal component and express volume estimates for minor components on logs using the following standard modifiers.

Modifier	Percent of Total Sample (by volume)
and	36 - 50
some	21 - 35
little	10 - 20
trace	<10

Determination of components is based on using the Udden-Wentworth particle size classification (see below) and measurement of the average grain size diameter. Each size grade or class differs from the next larger grade or class by a constant ratio of ½. Due to visual limitations, the finer classifications of Wentworth's scale cannot be distinguished in the field and the subgroups are not included. Visual determinations in the field should be made carefully by comparing the sample to the field gauge card that shows Udden-Wentworth scale or by measuring with a ruler. Use of field sieves s

recommended to assist in estimating percentage of coarse grain sizes. Settling test or wash method (Appendix X4 of ASTM D2488) is recommended for determining presence and estimating percentage of clay and silt.

Udden-Wenworth Scale Modified ARCADIS, 2008			
Size Class	Millimeters	Inches	Standard Sieve #
Boulder	256 – 4096	10.08+	
Large cobble	128 - 256	5.04 -10.08	
Small cobble	64 - 128	2.52 – 5.04	
Very large pebble	32 – 64	0.16 - 2.52	
Large pebble	16 – 32	0.63 – 1.26	
Medium pebble	8 – 16	0.31 – 0.63	
Small pebble	4 – 8	0.16 – 0.31	No. 5 +
Granule	2 – 4	0.08 – 0.16	No.5 – No.10
Very coarse sand	1 -2	0.04 – 0.08	No.10 – No.18
Coarse sand	½ - 1	0.02 – 0.04	No.18 - No.35
Medium sand	¼ - ½	0.01 – 0.02	No.35 - No.60
Fine sand	1/8 -¼	0.005 – 0.1	No.60 - No.120
Very fine sand	1/16 – 1/8	0.002 – 0.005	No. 120 – No. 230
Silt (subgroups not included)	1/256 – 1/16	0.0002 – 0.002	Not applicable (analyze by pipette or hydrometer)
Clay (subgroups not included	1/2048 – 1/256	.00002 – 0.0002	

Identify components as follows. Remove particles greater than very large pebbles (64-mm diameter) from the soil sample. Record the volume estimate of the greater than very large pebbles. Examine the sample fraction of very large pebbles and smaller particles and estimate the volume percentage of the pebbles, granules, sand, silt and clay. Use the jar method, visual method, and/or wash method (Appendix X4 of ASTM D2488) to estimate the volume percentages of each category.

Determination of actual dry weight of each Udden-Wentworth fraction requires laboratory grain-size analysis using sieve sizes corresponding to Udden-Wentworth fractions and is highly recommended to determine grain-size distributions for each hydrostratigraphic unit.

Lab or field sieve analysis is advisable to characterize the variability and facies trends within each hydrostratigraphic unit. Field sieve-analysis can be performed on selected samples to estimate dry weight fraction of each category using ASTM D2488 Standard Practice for Classification of Soils for Engineering Purposes as guidance, but replace required sieve sizes with the following Udden-Wentworth set: U.S. Standard sieve mesh sizes 6; 12; 20; 40; 70; 140; and 270 to retain pebbles; granules; very coarse sand; coarse sand; medium sand; fine sand; and very fine sand, respectively.

PRINCIPAL COMPONENT

The principal component is the size fraction or range of size fractions containing the majority of the volume. Examples: the principal component in a sample that contained 55% pebbles would be “Pebbles”; or the principal component in a sample that was 20% fine sand, 30% medium sand and 25% coarse sand would be “Fine to coarse Sand” or for a sample that was 40% silt and 45% clay the principal component would be “Clay and Silt”.

Include appropriate descriptors with the principal component. These descriptors vary for different particle sizes as follows.

Angularity – Describe the angularity for very coarse sand and larger particles in accordance with the table below (ASTM D-2488-06). Figures showing examples of angularity are available in ASTM D-2488-06 and the ARCADIS Soil Description Field Guide.

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

Plasticity – Describe the plasticity for silt and clay based on observations made during the following test method (ASTM D-2488-06).

- As in the dilatancy test below, select enough material to mold into a ball about ½ inch (12 mm) in diameter. Mold the material, adding water if necessary, until it has a soft, but not sticky, consistency.

- Shape the test specimen into an elongated pat and roll by hand on a smooth surface or between the palms into a thread about 1/8 inch (3 mm) in diameter. (If the sample is too wet to roll easily, it should be spread into a thin layer and allowed to lose some water by evaporation.) Fold the sample threads and reroll repeatedly until the thread crumbles at a diameter of about 1/8 inch. The thread will crumble when the soil is near the plastic limit.

Description	Criteria
Nonplastic	A $^{1}/_{8}$ inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit

Dilatancy – Describe the dilatancy for silt and silt-sand mixtures using the following field test method (ASTM D-2488-06).

- From the specimen select enough material to mold into a ball about ½ inch (12 mm) in diameter. Mold the material adding water if necessary, until it has a soft, but not sticky, consistency.
- Smooth the ball in the palm of one hand with a small spatula.
- Shake horizontally, striking the side of the hand vigorously with the other hand several times.
- Note the reaction of water appearing on the surface of the soil.
- Squeeze the sample by closing the hand or pinching the soil between the fingers, and not the reaction as none, slow, or rapid in accordance with the table below. The reaction is the speed with which water appears while shaking and disappears while squeezing.

Description	Criteria
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

MINOR COMPONENT(S)

The minor component(s) are the size fraction(s) containing less than 50% volume. Example: the identified components are estimated to be 60% medium sand to granules, 25 % silt and clay; 15 % pebbles – there are two identified minor components: silt and clay; and pebbles.

Include a standard modifier to indicate percentage of minor components (see Table on Page 5) and the same descriptors that would be used for a principal component. Plasticity should be provided as a descriptor for the silt and clay. Dilatancy should be provided for silt and silt-sand mixtures. Angularity should be provided as a descriptor for pebbles and coarse sand. For the example above, the minor constituents with

modifiers could be: some silt and clay, low plasticity; little medium to large pebbles, sub-round.

SORTING

Sorting is the opposite of grading, which is a commonly used term in the USCS or ASTM methods to describe the uniformity of the particle size distribution in a sample. Well-sorted samples are poorly graded and poorly sorted samples are well graded. ARCADIS prefers the use of sorting for particle size distributions and grading to describe particle size distribution trends in the vertical profile of a sample or hydrostratigraphic unit because of the relationship between sorting and the energy of the depositional process. For soils with sand-sized or larger particles, sorting should be determined as follows:

- Well sorted – the range of particle sizes is limited (e.g. the sample is comprised of predominantly one or two grain sizes)
- Poorly sorted – a wide range of particle sizes are present

You can also use sieve analysis to estimate sorting from a sedimentological perspective; sorting is the statistical equivalent of standard deviation. Smaller standard deviations correspond to higher degree of sorting (see Remediation Hydraulics, 2008).

MOISTURE

Moisture content should be described for every sample since increases or decreases in water content is critical information. Moisture should be described in accordance with the table below (percentages should not be used unless determined in the laboratory).

Description	Criteria
Dry	Absence of moisture, dry to touch, dusty.
Moist	Damp but no visible water.
Wet (Saturated)	Visible free water, soil is usually below the water table.

CONSISTENCY or DENSITY

This can be determined by standard penetration test (SPT) blow counts (ASTM D-1586) or field tests in accordance with the tables below. For SPT blow counts the N-value is used. The N-value is the blows per foot for the 6" to 18" interval. Example: for 24-inch spoon, recorded blows per 6-inch interval are: 4/6/9/22. Since the second interval is 6" to12", the third interval is 12" to 18", the N value is 6+9, or 15. Fifty blow counts for less than 6 inches is considered refusal.

Fine-grained soil – Consistency

Description	Criteria
Very soft	N-value < 2 or easily penetrated several inches by thumb.
Soft	N-value 2-4 or easily penetrated one inch by thumb.
Medium stiff	N-value 9-15 or indented about ¼ inch by thumb with great effort.
Very stiff	N-value 16-30 or readily indented by thumb nail.
Hard	N-value > than 30 or indented by thumbnail with difficulty

Coarse-grained soil – Density

Description	Criteria
Very loose	N-value 1- 4
Loose	N-value 5-10
Medium dense	N-value 11-30
Dense	N-value 31- 50
Very dense	N-value >50

COLOR

Color should be described using simple basic terminology and modifiers based on the Munsell system. Munsell alpha-numeric codes are required for all samples. If the sample contains layers or patches of varying colors this should be noted and all representative colors should be described. The colors should be described for moist

samples. If the sample is dry it should be wetted prior to comparing the sample to the Munsell chart.

ADDITIONAL COMMENTS (NOTES)

Additional comments should be made where observed and should be presented as notes with reference to a specific depth interval(s) to which they apply. Some of the significant information that may be observed includes the following.

- **Odor** - You should not make an effort to smell samples by placing near your nose since this can result in unnecessary exposure to hazardous materials. However, odors should be noted if they are detected during the normal sampling procedures. Odors should be based upon descriptors such as those used in NIOSH "Pocket Guide to Chemical Hazards", e.g. "pungent" or "sweet" and should not indicate specific chemicals such as "phenol-like" odor or "BTEX" odor.
- Structure
- Bedding planes (laminated, banded, geologic contacts)
- Presence of roots, root holes, organic material, man-made materials, minerals, etc.
- Mineralogy
- Cementation
- NAPL presence/characteristics, including sheen (based on client-specific guidance)
- Reaction with HCl (typically used only for special soil conditions)
- Origin, if known (capital letters: LACUSTRINE; FILL; etc.)

EXAMPLE DESCRIPTIONS

51.4 to 54.0' Clay, some silt, medium to high plasticity; trace small to large pebbles, subround to subangular up to 2" diameter; moist; stiff; dark grayish brown (10YR 4/2) NOTE: Lacustrine; laminated 0.01 to 0.02 feet thick, laminations brownish yellow (10 YR 4/3).

32.5 to 38.0' Sand, medium to Pebbles, coarse; sub-round to sub-angular; trace silt; poorly sorted; wet; grayish brown (10YR5/2). NOTE: sedimentary, igneous and metamorphic particles.

Unlike the first example where a density of cohesive soils could be estimated, this rotosonic sand and pebble sample was disturbed during drilling (due to vibrations in a loose Sand and Pebble matrix) so no density description could be provided. Neither sample had noticeable odor so odor comments were not included.

The standard generic description order is presented below.

- Depth

- Principal Components
    - Angularity for very coarse sand and larger particles
    - Plasticity for silt and clay
    - Dilatancy for silt and silt-sand mixtures
- Minor Components
- Sorting
- Moisture
- Consistency or Density
- Color
- Additional Comments

VII. Waste Management

Project-specific requirements should be identified and followed. The following procedures, or similar waste management procedures are generally required.

Water generated during cleaning procedures will be collected and contained onsite in appropriate containers for future analysis and appropriate disposal. PPE (such as gloves, disposable clothing, and other disposable equipment) resulting from personnel cleaning procedures and soil sampling/handling activities will be placed in plastic bags. These bags will be transferred into appropriately labeled 55-gallon drums or a covered roll-off box for appropriate disposal.

Soil materials will be placed in sealed 55-gallon steel drums or covered roll-off boxes and stored in a secured area. Once full, the material will be analyzed to determine the appropriate disposal method.

VIII. Data Recording and Management

Upon collection of soil samples, the soil sample should be logged on a standard boring log and/or in the field log book depending on Data Quality Objectives (DQOs) for the task/project. Two examples of standard boring logs are presented below.

The general scheme for soil logging entries is presented above; however, depending on task/project DQOs, specific logging entries that are not applicable to task/project goals may be omitted at the project manager's discretion. In any case, use of a consistent logging procedure is required.

Completed logs and/or logbook will be maintained in the task/project field records file. Digital photographs of typical soil types observed at the site and any unusual features should be obtained whenever possible. All photographs should include a ruler or common object for scale. Photo location, depth and orientation must be recorded in the daily log or log book and a label showing this information in the photo is useful.

ARCADIS Page ____ of ____

Sample Log

Well/Boring _____ Project Name and No. _____

Site Location _____ Drilling Started _____ Drilling Completed _____

Total Depth Drilled _____ feet Hole Diameter _____ inches Sampling Interval _____ feet

Length and Diameter of Sampling Device _____ Type of Sampling Device _____

Drilling Method _____ Drilling Fluid Used _____

Drilling Contractor _____ Driller _____ Helper _____

Prepared By _____ Hammer Weight _____ Hammer Drop _____ Inches

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample Description	PID (ppm)

http://team/Sites/Offices/North/Northeast Area/Northeast Area Geoscience Forms/Sample Core Log XLS - Sheet1

IX. Quality Assurance

Soil descriptions should be completed only by appropriately trained personnel. Descriptions should be reviewed by an experienced field geologist for content, format and consistency. Edited boring logs should be reviewed by the original author to assure that content has not changed.

X. References

ARCADIS Soil Description Field Guide, 2008 (in progress)

Munsell® Color Chart – available from Forestry Suppliers, Inc.- Item 77341 "Munsell® Color Soil Color Charts

Field Gauge Card that Shows Udden-Wentworth scale – available from Forestry Suppliers, Inc. – Item 77332 "Sand Grain Sizing Folder"

ASTM D-1586, Test Method for Penetration Test and Split-Barrel Sampling of Soils

ASTM D-2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

United States Bureau of Reclamation. Engineering Geology Field Manual. United States Department of Interior, Bureau of Reclamation. http://www.usbr.gov/pmts/geology/fieldmap.htm

Petrology of Sedimentary Rocks, Robert L. Folk, 1980, p. 1-48

NIOSH Pocket Guide to Chemical Hazards

Remediation Hydraulics, Fred C. Payne, Joseph A. Quinnan, and Scott T. Potter, 2008, p 59-63

ATTACHMENT B

Calibration, Operation, and Maintenance Procedures

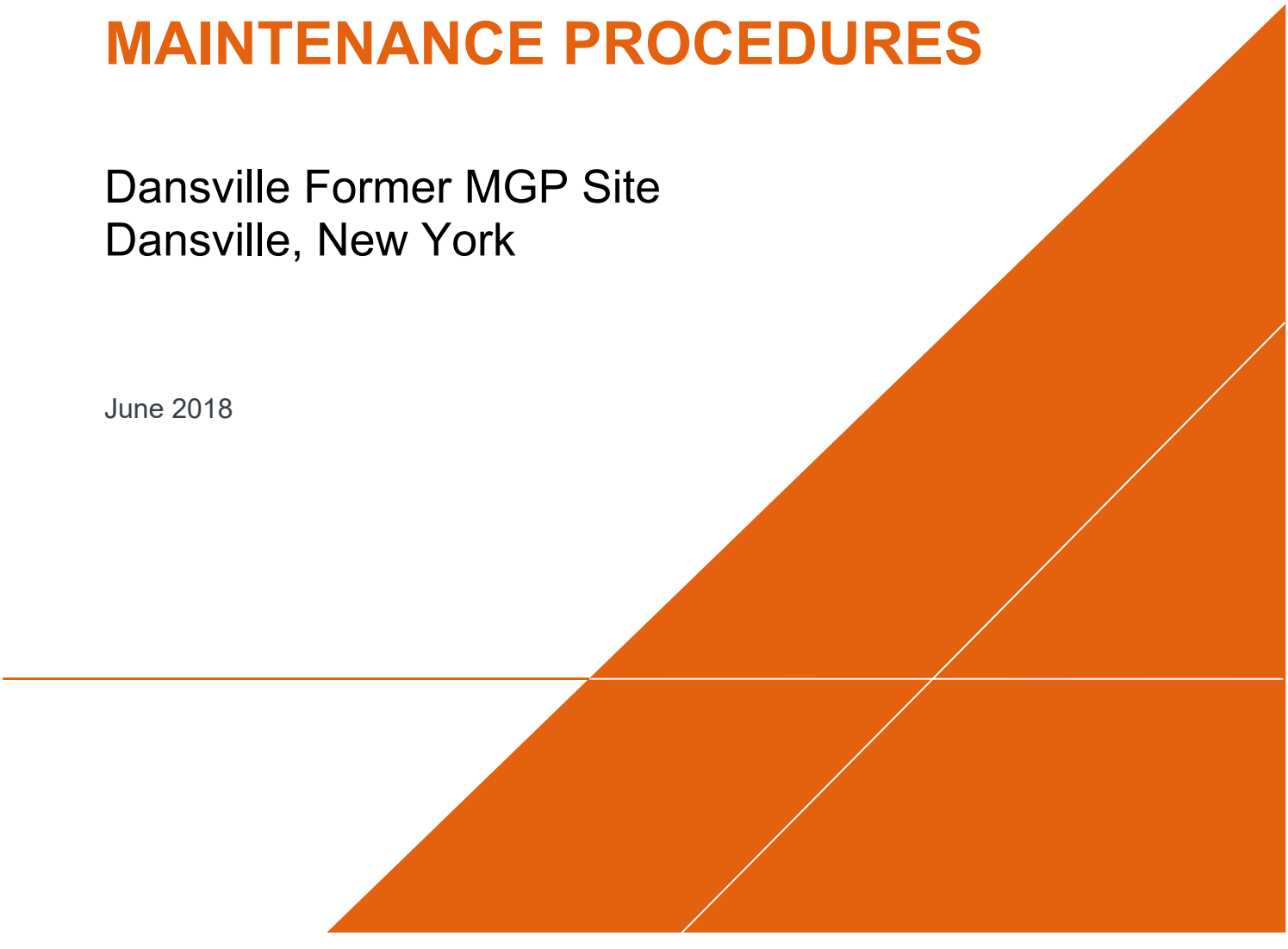
ARCADIS Design & Consultancy for natural and built assets

NYSEG

CALIBRATION, OPERATION, AND MAINTENANCE PROCEDURES

Dansville Former MGP Site
Dansville, New York

June 2018



CALIBRATION, OPERATION, AND MAINTENANCE PROCEDURES

Dansville Former MGP Site

Prepared for:

NYSEG

Prepared by:
Arcadis of New York, Inc.
295 Woodcliff Drive
Third Floor
Suite 301
Fairport
New York 14450
Tel 585 385 0090
Fax 585 385 4198

Our Ref.:

B0013135

Date:

June 2018

CONTENTS

APPENDIX A

1 INTRODUCTION

The MiniRAE 3000 measures relative total concentrations of organic and inorganic vapors in the field and will be calibrated daily prior to use. The MiniRAE 3000 does not carry an Intrinsic Safety Rating and will be used in a controlled environment only. The MiniRAE 3000 will be used to screen soil samples, the head space of soil/water samples, and to monitor the breathing and work zones.

APPENDIX B

2 MATERIALS

- MiniRAE 3000 (PID)
- isobutylene calibration gas tank with pressure regulator and up to four other selected span gases
- zero span gas (clean outdoor air or zero grade gas)
- gas sampling bag with plastic tubing to connect PID probe to calibration gas
- flow regulator
- PID calibration and maintenance log

APPENDIX C

3 CALIBRATION PROCEDURES

1. Turn on the MiniRAE 3000 and monitor the ambient air. If there is any doubt of the air quality, then zero grade gas will be obtained.

2. Connect the regulator to the span gas cylinder. Hand-tighten the fittings.

3. Open the valve on the gas bag by turning the valve stem fully counterclockwise.

4. Attach the gas bag to the regulator. Hand-tighten the fittings.

5. Turn the regulator knob counterclockwise half a turn to start the gas flow.

6. Fill the gas bag half full and then close the regulator fully clockwise to turn off the flow of gas.

7. Fill the gas bag and then turn the valve clockwise.

8. Press “MODE” and “N” at the same time to enter the set-up screens. To cycle through the screens press “MODE.” Press “Y” for span cal and “Y” again for zero point. Press “Y” to set the zero point.

9. When screen displays “CAL GAS” press “Y” and calibrate the unit with isobutylene calibration gas.

10. Press and hold “MODE” for a few seconds and the display will return to normal screening mode.

11. After 7 hours of use, recharge the battery pack. Record the time the battery pack was charged on the MiniRAE 3000 Calibration and Maintenance Log (Attachment 1).

12. Record the date, time, your initials, calibration gas, and concentration on the MiniRAE 3000 Calibration and Maintenance Log (Attachment 1).

APPENDIX D

4 OPERATION PROCEDURES

1. Use the health and safety equipment, as required by the HASP.

2. Calibrate the instrument, as described in Section 3.

3. Measure and record the background PID reading.

4. If the PID will be used for more than 7 hours during optimal weather conditions (50 degrees or greater) or during extreme cold or precipitation, have a fully charged battery available for use.

5. In the event of precipitation, fully cover the instrument, leaving the probe accessible for measurements.

6. Measure and record PID reading.

APPENDIX E

5 MAINTENANCE PROCEDURE

1. At the end of each day or when the battery is fully discharged, recharge batteries overnight.
2. Store the instrument in the protective case when not in use.
3. Keep records of operation, maintenance, calibration problems and repairs.
4. A replacement instrument will be available on site or ready for overnight shipment, if necessary.
5. The MiniRAE 3000 will be sent back to the manufacturer for service if needed.

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ARCADIS

INSTRUMENT CALIBRATION FORM

Project _____

Project No. _____

Site Location _____

Date _____

Time _____

Prepared by _____

☐ Ph Cond Tempmeter Model Oakton 300 Services Serial 121686	☐ Turbidity Meter Model 2020 Lamotte Serial 3597-3502	☐ D.O. Meter Model #55/25 FT Serial 00H0611	☐ ORP Meter Model 00702-70 Serial 55386
☐ Multiprobe Model YSI 600 XL Serial 02J0183A1	☐ Turbidity Meter Model 2020 Lamotte Serial	☐ D.O. Meter Model Serial	☐ ORP Meter Model Serial
☐ PID Model Photovac 2020 Serial ED HF 358	☐ PID Model Photovac 2020 Serial	☐ pH Cond Temp Model Oakton 300 Series Serial 197765	☐ Rental Model Serial

Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful

Parameter PID (ppmv)	**Value**	**Calibration Successful**
Zero		
Span		

ph (si Units)	**Value**	**Calibration Successful**
4.00		
7.00		
10.00		

Conductivity (umhos)	**Value**	**Calibration Successful**
84 umhos		
1413 uhmos		
Other		

Turbidity (NTU)	**Value**	**Calibration Successful**
1.0 NTU		
10 NTU		
40 NTU		
Other		

Parameter D.O.	**Calibration Successful**
100% Saturated Air	
Barometer Adjustment	
Elevation Adjustment	

*** ORP (Mv)**	**Calibration Successful**
Hydroquinone (240) (Black)	
Zobel Solution (237) (yellow)	
Temperature Based Chart Calibration	
* Adjusted	

*** No adjustment on some meters just a probe check, others are adjustable**

ATTACHMENT C

Field Sampling Logs

ARCADIS
Infrastructure, environment, facilities

Water Sampling Log

Project _____ Project No. _____

Site Location _____ Date _____

Well No. _____ Replicate No. _____ Weather _____

Sampling Personnel _____ Sampling Time: Begin _____ End _____

Purge Data

Measuring Point (describe) _____

Sounded Well Depth (ft bmp) _____

Depth to Water (ft bmp) _____

Depth to Packer (ft bmp) _____

Water Column in Well (ft) _____

Casing Diameter _____

Gallons in Well _____

Gallons Purged

Prior to Sampling _____

Pump Intake

Setting (ft bmp) _____

Packer Pressure (psi) _____

Pumping Rate (gpm) _____

Evacuation Method _____

Sampling Method _____

Purge Time Begin _____ End _____

Field Parameters

Color _____

Odor _____

Appearance _____

	I	1V	2V	3V
pH (s.u.)				
Conductivity (mS/cm) or (µmhos/cm) [1)]				
Temperature (°C)				
DO (mg/L)				
ORP (mV)				
Turbidity (NTU)				
Time				
DTW (ft bmp)				

Remarks: _____

Parameter	Container	No.	Preservative

PID Reading _____

Well Casing Volumes

Gal./Ft.				
	$1^{1/4}$" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	$1^{1/2}$" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

1) Circle one unit type

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APPENDIX C

Quality Assurance Project Plan

ARCADIS Design & Consultancy for natural and built assets

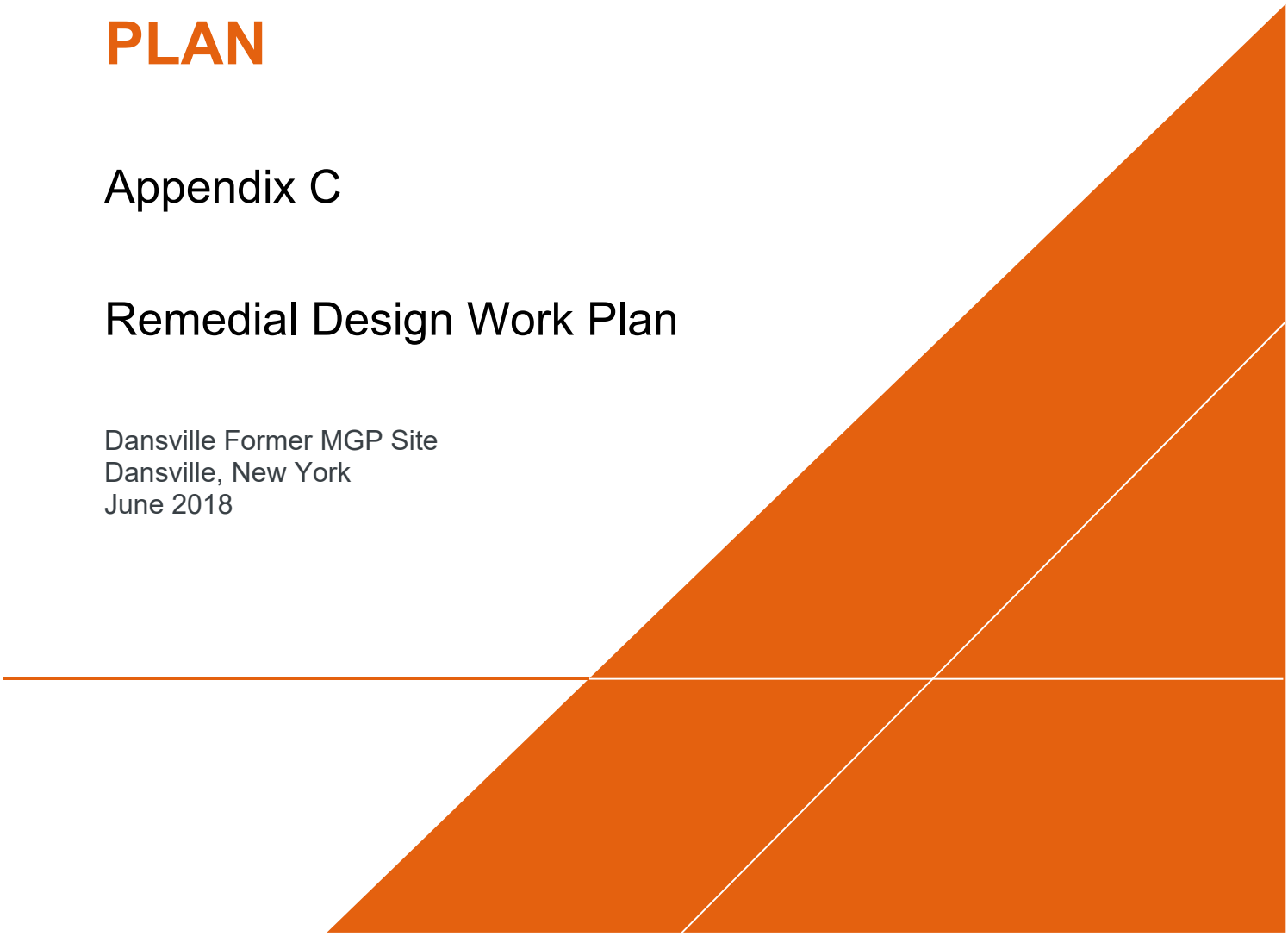
NYSEG

QUALITY ASSURANCE PROJECT PLAN

Appendix C

Remedial Design Work Plan

Dansville Former MGP Site
Dansville, New York
June 2018



QUALITY ASSURANCE PROJECT PLAN

Remedial Design Work Plan

Prepared for:

NYSEG

Prepared by:

Arcadis of New York, Inc.

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Our Ref.:

B0013135

Date:

June 2018

CONTENTS

TABLES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ASP	Analytical Services Protocol
CLP	Contract Laboratory Program
DQO	data quality objective
EDD	electronic data deliverable
FS	feasibility study
FSP	*Field Sampling Plan*
HASP	*Health and Safety Plan*
MGP	manufactured gas plant
MS/MSD	matrix spike/matrix spike duplicate
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric & Gas Corporation
OM&M	operation, monitoring, and maintenance
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
QA/QC	quality assurance/quality control
QAM	Quality Assurance Manager
QAPP	*Quality Assurance Project Plan*
RPD	relative percent difference
SDG	sample delivery ground
RDWP	Interim Site Management Plan
SVOC	semivolatile organic compound
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1. INTRODUCTION

This *Quality Assurance Project Plan* (QAPP) was prepared to support the Remedial Design Work Plan (RDWP). This QAPP presents guidelines for sampling and analytical methods and procedures that will be used during implementation of the operation, monitoring, and maintenance (OM&M) actions at the Dansville Former MGP Site (site) located in Dansville, New York.

This QAPP was prepared in a manner consistent with the following reference and guidance documents:

- United States Environmental Protection Agency's (USEPA's) *Test Methods for Evaluating Solid Waste, SW-846* (USEPA, 1996, and subsequent method revisions).
- USEPA. 2001. *EPA Requirements for QA Project Plans for Environmental Operations*. EPA-QA/R-5. Office of Environmental Information. March 2001.
- USEPA. 2002. *Guidance for QA Project Plans*. EPA-QA/G-5. Office of Environmental Information. December 2002.
- National Enforcement Investigations Center *Policies and Procedures Manual* (USEPA, 1991).

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Project Organization

Operation, monitoring and maintenance (OM&M) and/or intrusive work conducted within potentially impacted areas of the Dansville Former Manufactured Gas Plant (MGP) Site (site), as identified in the *Site Management Plan* (Arcadis, 2015) (RDWP) will require integration of personnel from the organizations identified below, collectively referred to as the project team. A description of the responsibilities of each member of the project team is presented in Section 1.2.

Title	Company/ Organization	Name	Phone Number
NYSEG Project Manager	NYSEG	John J. Ruspantini, CHMM	607.762.8787
Property Owners	NYSEG	John J. Ruspantini, CHMM	607.762.8787
NYSDEC Project Manager	NYSDEC	Amen Omorogbe, PE	518.402.9662

2.1.1 Analytical Laboratory Services and Subcontractors

The analytical services and contractor performing intrusive activities will be determined prior to initiation of field work.

2.1.2 Quality Assurance Staff

Individuals conducting intrusive work within potentially MGP-impacted areas identified in the RDWP will identify quality assurance (QA) personnel. In addition to the contractor's personnel, the following personnel have been assigned to this project component:

Title	Company/Organization	Name	Phone Number
NYSEG QA Manager	NYSEG	John J. Ruspantini, CHMM	607.762.8787
NYSDEC QC Manager	NYSDEC	Amen Omorogbe, PE	518.402.9662

2.2 Team Member Responsibilities

This section of the *Quality Assurance Project Plan* (QAPP) presents the responsibilities and duties of the project team members.

2.2.1 New York State Electric & Gas Corporation (NYSEG)

NYSEG Project Manager

1. Overall understanding of the nature and extent of MGP-related impacts remaining at the site.
2. Understands proposed intrusive activities within potentially MGP impacted areas.

3. Understand the RDWP, QAPP, and *Field Sampling Plan* (FSP) requirements.
4. Ensure RDWP requirements are implemented.
5. Review results, reports, and all documents prepared by contractors conducting work within potentially impacted areas.
6. Confirm that corrective actions are taken for deficiencies cited during audits of the field activities.

2.2.2 Property Owners

1. Ensure that all the requirements of the RDWP, QAPP, and FSP are implemented for proposed intrusive work conducted within potentially MGP-impacted areas.
2. Communicate/notify the project team regarding proposed intrusive work to be conducted within potentially MGP-impacted areas.

2.2.3 New York State Department of Environmental Protection

New York State Department of Environmental Conservation (NYSDEC) Project Manager

1. Ensure that all the requirements of the RDWP, QAPP, and FSP are followed for all OM&M and/or proposed intrusive work conducted within potentially MGP-impacted areas.
2. Review results, reports, and all documents prepared by Contractors conducting work within potentially impacted areas.
3. Overall understanding of the nature and extent of MGP-related impacts remaining at the site.
4. Provide review and approval of Contractor's work plans for work proposed within potentially MGP-impacted areas.

2.2.4 Contractors/Consultants

Contractor Project Manager/Field Personnel

1. Management and coordination of all aspects of the project with an attention on adhering to the requirements of the RDWP, QAPP, and FSP.
2. Oversight of required media sampling.
3. Oversight of field analysis and collection of QA samples.
4. Reduction of field data calibration and maintenance.
5. Review of the field instrumentation, maintenance, and calibration to maintain quality data.
6. Preparation of draft reports and other key documents.
7. Maintenance of field files of notebooks and logs and calculations.
8. Coordination of field and laboratory schedules.
9. Perform field procedures associated with the tasks and subtasks presented in Section 3.
10. Perform field analyses and collect QA samples Maintain sample custody.

11. Prepare field records and logs.
12. Calibrate, operate, and maintain field equipment.
13. Reduce field data.

Quality Assurance Manager

1. Review laboratory data packages.
2. Oversee and interface with the analytical laboratories.
3. Coordinate field quality assurance/quality control (QA/QC) activities with task managers, including audits of field activities, concentrating on field analytical measurements and practices to meet data quality objectives (DQOs).
4. Review field reports.
5. Review audit reports.
6. Prepare a QA/QC report that includes an evaluation of field and laboratory data and data validation reports.

2.2.5 Laboratory Subcontractor (To Be Determined)

General responsibilities and duties include:

1. Perform sample analyses.
2. Supply sample containers and shipping cartons.
3. Maintain laboratory custody of samples.
4. Strictly adhere to laboratory protocols.

Laboratory Project Manager

1. Serve as primary communication link between Arcadis and laboratory staff.
2. Monitor workloads and confirm availability of resources.
3. Oversee preparation of analytical reports.
4. Supervise in-house chain of custody.

Quality Assurance Officer

1. Supervise technical staff in QA/QC procedures.
2. Conduct audits of all laboratory activities.

2.2.6 Data Validator

- Provide independent data review and validation of analytical data; provide documentation of results.

3. PROJECT BACKGROUND

The following briefly summarizes background information for the site. Additional information can be found in the RDWP.

3.1 Site Location and Description

The Dansville former MGP property is located in the Village of Dansville, Livingston County, New York. The former MGP parcel is an approximately 2.25-acre area bounded by Battle Street to the north, Ossian Street to the south, a former commercial dry cleaning business and residential properties to the east, and a residential property to the west. NYSEG currently owns the property that was occupied by the former MGP operations. The former MGP property is primarily level/flat with no significant topographic or geologic features. The surface of the property is approximately 75% covered with 12-inches of crusher run gravel or asphalt; approximately 25% is covered with at least 12-inches of imported clean soil beneath a minimum of 4-inches of clean topsoil. The property is enclosed with a combination of galvanized chain-link fence and/or wooden stockade fence along the perimeter to deter trespassers. The fence and entrance gates are maintained by NYSEG. Land use in the surrounding area is mixed with both commercial (former dry cleaners, learning center facility, and tax service) and residential properties. The former dry cleaning property is adjacent to the southeast side of the NYSEG property and is listed as a Class 2 inactive hazardous waste disposal site.

In 1861 the MGP was constructed at 50 Ossian Street and began supplying manufactured gas to the local community for a period of approximately 70 years, ceasing in 1930. The Dansville Gas Light Company operated the MGP from 1861 until 1895. The property was then owned and operated by the Dansville Gas and Electric Company from 1895 through 1924, during which time a small electric generating station was constructed. Production of manufactured gas was discontinued in January 1930. The New York Central Electric Company owned the property from 1924 through 1937. In 1937 NYSEG acquired this property during a merger with New York Central Electric Company (i.e., 7 years after gas manufacturing operations ceased). Few details are known about the plant closure activities.

3.2 Objectives

This QAPP was prepared to support the RDWP. This document presents QA/QC requirements for investigation and OM&M activities to be conducted associated with the NYSDEC-selected remedy for the Dansville Avenue Former MGP site.

A RDWP has been prepared as required in the Record of Decision (ROD) for the site (NYSDEC, 2008) and in accordance with the *Technical Guidance for Site Investigation and Remediation*, DER-10 (NYSDEC, 2010) (DER-10). A RDWP is required for all sites that the NYSDEC has oversight responsibility, including the New York State Inactive Hazardous Waste Disposal Site Remedial Program, as defined by Environmental Conservation Law, Article 27, Title 13. NYSEG's Dansville site falls under this jurisdiction.

4. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data required to support decisions made during site-related activities and are based on the end uses of the data to be collected. Preliminary DQOs were identified to confirm that the data generated during field activities will be of adequate quality and sufficient quantity to form a sound basis for decision making relative to the above objectives. DQOs have been specified for each data collection activity or investigation. The DQOs presented herein address OM&M and investigation efforts only and do not cover health and safety issues, which will be addressed in detail in a task-specific HASP.

A DQO summary for the OM&M and field sampling efforts is presented below. The summary consists of stated DQOs relative to data uses, data types, data quantity, sampling and analytical methods, and data measurement performance criteria.

Three data categories have been defined to address various analytical data uses and the associated QA/QC effort and methods required to achieve the desired levels of quality. These categories are:

Screening Data: Screening data affords a quick assessment of site characteristics or conditions. This objective for data quality is applicable to data collection activities that involve rapid, non-rigorous methods of analysis and QA. This objective is generally applied to physical and/or chemical properties of samples, degree of contamination relative to concentration differences, and preliminary health and safety assessment.

Screening Data with Definitive Confirmation: Screening data allows rapid identification and quantitation, although the quantitation can be relatively imprecise. This objective for data quality is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings (10 percent or more). This objective can also be used to verify less rigorous laboratory-based methods.

Definitive Data: Definitive data are generated using analytical methods, such as approved United States Environmental Protection Agency (USEPA) reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files.

For this project, three levels of data reporting have been defined. They are as follows:

Level 1 – Minimal Reporting: Minimal or “results only” reporting is used for analyses that, either due to their nature (i.e., field monitoring) or the intended data use (i.e., preliminary screening), do not generate or require extensive supporting documentation.

Level 2 – Modified Reporting: Modified reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols and that, based on the intended data use, require some supporting documentation but not, however, full “Contract Laboratory Program-type” (CLP-type) reporting.

Level 3 – Full Reporting: Full “CLP-type” reporting is used for those analyses that, based on intended data use, require full documentation. This reporting level would include Analytical Services Protocol (ASP) Superfund and Category B reporting.

The analytical methods to be used during the OM&M activities will include Level 1, Level 2, and Level 3, depending on the sampling conducted; the level should be specified in the task-specific work plan.

The analytical methods to be used during intrusive soil and/or groundwater sampling activities will be USEPA SW-846 methods with NYSDEC ASP Revision 2000, QA/QC requirements, and Category B reporting deliverables.

4.1 Data Quality Objectives for Intrusive Soil and Staged Soil Sampling

When required, it is anticipated that excavation will be advanced to varying depths. Subsurface soil samples will be visually characterized and may not require laboratory analyses. However, in the event laboratory analyses are required, soil samples may be collected from the excavation or staged sources. In this instance, the required analyses should be confirmed with NYSEG and the NYSDEC; however, for the purposes of this QAPP, it is anticipated that samples may be collected for analysis of:

- Volatile organic compounds (VOCs) by USEPA SW-846 Method 8260.
- Polycyclic Aromatic Hydrocarbons by USEPA SW-846 Method 8270.

Table 1 presents the parameters to be analyzed under each of the methods described above with the laboratory quantitation limits. Additional analyses may be required by NYSEG or the NYSDEC. The number of required QA/QC samples is summarized in **Table 2**.

4.2 Data Quality Objectives for Groundwater

The number of groundwater QA/QC samples is summarized in **Table 2**. **Table 1** presents the parameters to be analyzed under each of the methods described above with the laboratory quantitation limits. For the purposes of this QAPP, it is assumed that samples will be analyzed for:

- Volatile organic compounds (VOCs) by USEPA SW-846 Method 8260.
- Semivolatile organic compounds by USEPA SW-846 Method 8270.
- Iron, Total/Dissolved by USEPA SW-846 Method 6010
- Manganese, Total/Dissolved by USEPA SW-846 Method 6010
- Alkalinity, Total/Bicarbonate/Carbonate by USEPA Method SM2320B
- Sulfate by USEPA Method 300.0
- Nitrate, Nitrogen by USEPA Method 353.2
- Nitrite, Nitrogen by USEPA Method 353.2

As described in the RDWP, both hydrogeologic and water quality data are required to meet the objective of this task. Hydrogeologic data may include water-level information and hydraulic conductivity values that will be used to calculate other hydrogeologic parameters. Groundwater quality data may include field parameters, including pH, oxidation-reduction potential (ORP), turbidity, temperature, conductivity, and dissolved oxygen, as well as the laboratory parameters described below.

The groundwater level measurement procedures, the field parameter measurement procedures, and the groundwater sampling methods are provided in the FSP.

4.3 Data Quality Objectives for Waste Characterization

In the event that activities create either liquid or soil waste requiring off-site disposal, NYSEG will be consulted to determine the required analyses. However, for the purposes of this QAPP, it is assumed that samples may be collected and analyzed for:

- VOCs by USEPA SW-846 Method 8260.
- SVOCs by USEPA SW-846 Method 8270.
- Inorganics by USEPA SW-846 Method 6010.
- Pesticides/Herbicides by USEPA SW-846 Method 8081.
- Polychlorinated Biphenyl PCB by USEPA SW-846 8082.
- Ignitability, Reactivity, Corrosivity.

5. SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Compliant with the Occupational Safety and Health Administration's (OSHA's) final rule, *Hazardous Waste Operations and Emergency Response*, 29 Code of Federal Regulations Part 1910.120(e), all personnel performing work in potentially MGP-impacted areas will have completed the requirements for OSHA 40-hour Hazardous Waste Operations and Emergency Response training. Persons in field supervisory positions will have also completed the additional OSHA 8-hour Supervisory Training.

6. DOCUMENTATION AND RECORDS

6.1 General

Samples of the various media may be collected, as described in the RDWP or other task-specific work plans. Detailed descriptions of the documentation and reporting requirements are presented below.

6.2 Field Documentation

Field personnel will provide comprehensive documentation covering all aspects of field sampling, field analysis, and sample chain of custody. This documentation constitutes a record that allows reconstruction of all field events to aid in the data review and interpretation process. All documents, records, and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the action include:

- *Daily Production Documentation* – A field notebook consisting of a waterproof, bound notebook that will contain a record of all activities performed at the site.
- *Sampling Information* – Detailed notes will be made as to the exact site of sampling, physical observations, and weather conditions (as appropriate).
- *Sample Chain of Custody* – Chain of custody forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. Chain of custody forms will be filled out at each sampling site, at a group of sampling sites, or at the end of each day of sampling by ARCADIS field personnel designated to be responsible for sample custody. In the event that samples are relinquished by the designated sampling person to other sampling or field personnel, the chain of custody form will be signed and dated by the appropriate personnel to document the sample transfer. The original chain of custody form will accompany the samples to the laboratory, and copies will be forwarded to the project files. A sample chain of custody form is included in **Attachment 1**.

  Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.
- *Field Equipment, Calibration, and Maintenance Logs* – To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory calibrated.

6.3 Laboratory Documentation

6.3.1 Laboratory Project Files

The laboratory will establish a file for all pertinent data. The file will include all correspondence, emailed information, phone logs, and chain of custody forms. The laboratory will retain all project files and data packages for a period of 5 years.

6.3.2 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and document and relate important aspects of the work, including the associated QCs. As such, all logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of whiteout or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, the instrument used, and the instrument conditions.

Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance to this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, then the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

6.3.3 Computer Tape and Hard Copy Storage

All electronic files will be maintained on CD-ROM for 5 years; hard copy data packages will be maintained in files for 5 years.

6.4 Field Data Reporting

6.4.1 Field Data Reporting

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the work plan and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

Where appropriate, field data forms and calculations will be processed and included in appendices to a Site Report (when generated). The original field logs, documents, and data reductions will be kept in the project file.

6.4.2 Laboratory Data Reporting

The laboratory is responsible for preparing ASP Category B data packages for VOC and SVOC data, reduced data packages and case narratives may be acceptable for all other analyses; theRDWP should specify laboratory reporting requirements.

All data reports for all parameters will include, at a minimum, the following items:

Narrative – Summary of activities that took place during the course of sample analysis, including the following information:

- Laboratory name and address.
- Date of sample receipt.
- Cross reference of laboratory identification number to contractor sample identification.
- Analytical methods used.
- Deviations from specified protocol.
- Corrective actions taken.

Included with the narrative will be any sample handling documents, including field and internal chain of custody forms, air bills, and shipping tags.

Analytical Results – Reported according to analysis type, including the following information, as acceptable:

- Sample ID.
- Laboratory ID.
- Date of collection.
- Date of receipt.
- Date of extraction.
- Date of analysis.
- Detection limits.

Sample results on the report forms will be collected for dilutions. Soil samples will be reported on a dry weight basis. Unless otherwise specified, results will be reported uncorrected for blank contamination.

The data for volatile and semi-volatile analyses will be expanded to include all supporting documentation necessary to provide a Category B package. This additional documentation will include, but is not limited to, all raw data required to recalculate any result, including printouts, chromatograms, and quantitation reports. The report also will include standards used in calibration and calculation of analytical results; sample extraction, digestion, and other preparation logs; standard preparation logs; instrument run logs; and moisture content calculations.

6.5 Project File

Project documentation will be placed in project files for document management. Project files typically consist of the following components:

1. Agreements/Proposals (filed chronologically).
2. Change Orders/Purchase Orders (filed chronologically).
3. Invoices (filed chronologically).

4. Project Management (filed by topic).
5. Correspondence (filed chronologically).
6. Notes and Data (filed by topic).
7. Public Relations Information (filed by topic).
8. Regulatory Documents (filed chronologically).
9. Marketing Documents (filed chronologically).
10. Final Reports/Presentations (filed chronologically).
11. Draft Reports/Presentations (filed chronologically).
12. Documents Prepared by Others (filed chronologically).

Final reports (including QA Reports) are filed in a designated folder within the project file. Analytical laboratory documentation (when received) and field data will also be filed in a designated folder within the project file. Filed materials may be removed and signed out by authorized personnel on a temporary basis only. Electronic storage of reports in a client folder is also acceptable.

7. SAMPLING PROCESS DESIGN

Information regarding the sampling design and rationale and associated sampling locations can be found in the RDWP.

8. SAMPLING METHOD REQUIREMENTS

Soil and/or groundwater samples will be collected, as necessary, as described in the RDWP. Sampling procedures are included in the FSP. The FSP also contains the procedures that will be followed to install monitoring wells; measure water levels; perform field measurements; and handle, package, and ship collected samples.

9. SAMPLE HANDLING AND CUSTODY REQUIREMENTS

9.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for the samples are shown in **Table 3**.

The analytical laboratory will supply appropriate sample containers and preservatives, as necessary. The bottles will be purchased pre-cleaned to USEPA Office of Solid Waste and Emergency Response Directive 9240.05A requirements. The field personnel will be responsible for properly labeling containers and preserving samples (as appropriate).

9.2 Packing, Handling, and Shipping Requirements

Sample packaging and shipment procedures are designed to confirm that the samples will arrive at the laboratory, with the chain of custody intact.

Samples will be packaged for shipment as outlined below:

- Confirm that all sample containers have the sample labels securely affixed to the container with clear packing tape.
- Check the caps on the sample containers to confirm that they are properly sealed.
- Wrap the sample container cap with clear packing tape to prevent it from becoming loose.
- Complete the chain of custody form with the required sampling information and confirm that the recorded information matches the sample labels. (Note: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the chain of custody prior to this transfer. The appropriate personnel will sign and date the chain of custody form to document the sample custody transfer.)
- Using duct tape, secure the outside drain plug at the bottom of the cooler.
- Wrap sample containers in bubble wrap or other cushioning material.
- Place 1 to 2 inches of cushioning material at the bottom of the cooler.
- Ice layer.
- Place the sealed sample containers into the cooler.
- Place ice in plastic bags and seal. Place loosely in the cooler.
- Fill the remaining space in the cooler with cushioning material.
- Place chain of custody forms in a plastic bag and seal. Tape the forms to the inside of the cooler lid.
- Close the lid of the cooler, lock, and secure with duct tape.
- Wrap strapping tape around both ends of the cooler at least twice.

- Mark the cooler on the outside with the following information: shipping address, return address, “Fragile” labels, and arrows indicating “this side up.” Cover the labels with clear plastic tape. Place a signed custody seal over the cooler lid.

All samples will be packaged by field personnel and transported as low-concentration environmental samples. The samples will be hand-delivered or delivered by an express carrier within 48 hours of the time of collection. All shipments will be accompanied by the chain of custody form identifying the contents. The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading should be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the chain of custody form, as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage. Trip blank(s) of analyte-free water will be provided by the laboratory and included in each cooler containing aqueous samples to be analyzed for VOCs.

Procedures for packing, handling, and shipping environmental samples are included in the FSP.

9.3 Field Custody Procedures

The objective of field sample custody is to confirm that samples are not tampered with from the time of sample collection through the time of transport to the analytical laboratory. Persons will have “custody of samples” when the samples are in their physical possession, in their view after being in their possession, or in physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field chain of custody forms.

9.3.1 Field Logbooks

Field logbooks will provide the means of recording data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a secure location when not in use. Each logbook will be identified by the project-specific document number. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned.
- Logbook number.
- Project name.
- Project start date.

- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, as well as with the date of calibration.

Samples will be collected following the sampling procedures documented in the FSP. The equipment used to collect samples will be noted, as well as with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

9.3.2 Sample Labeling

Preprinted sample labels will be affixed to sample bottles prior to delivery at the sampling site. The following information is required in each sample label.

- Project.
- Date collected.
- Time collected.
- Location.
- Sampler.
- Analysis to be performed.
- Preservative.
- Sample number.

9.3.3 Field Chain of Custody Forms

Completed chain of custody forms will be required for all samples to be analyzed. Chain of custody forms will be initiated by the sampling crew in the field. The chain of custody forms will contain the sample's unique identification number, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original chain of custody form will accompany the samples to the laboratory. Copies of the chain of custody will be made prior to shipment (or multiple copy forms used) for field documentation. The chain of custody forms will remain with the samples at all times. The samples

and signed chain of custody forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., FedEx) or hand delivered to a mobile or permanent laboratory, or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink, unless prohibited by weather conditions. The labels will include sample information, such as sample number and location, type of sample, date and time of sampling, sampler's name or initials, preservation, and analyses to be performed. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

Whenever samples are collocated with a source or government agency, a separate Sample Receipt will be prepared for those samples and marked to indicate with whom the samples are being collocated. The person relinquishing the samples to the facility or agency should request the representative's signature, acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.

9.4 Management of Investigation-Derived Materials and Wastes

Disposable equipment, debris, and decontamination rinsate (e.g., tap and distilled water containing small amounts of solvent) will be containerized during the sampling events and labeled for appropriate disposal.

9.5 Laboratory Procedures

9.5.1 General

Upon sample receipt, laboratory personnel will be responsible for sample custody. A field chain of custody form will accompany all samples requiring laboratory analysis. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for maintaining sample integrity.

9.5.2 Sample Receipt and Storage

Upon sample receipt, the laboratory sample custodian will verify the package seal, open the package, verify the sample integrity, and compare the contents against the field chain of custody. If a sample container is broken, the sample is in an inappropriate container, has not been preserved by appropriate means, or if there is a discrepancy between the chain of custody and the sample shipment, Arcadis will be notified. The laboratory sample custodian will then log the samples in, assign a unique laboratory identification number to each, and label the sample bottle with the laboratory identification number. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory information management system. If the sample container is broken, the sample is in an inappropriate container, or has not been preserved by appropriate means, Arcadis will be notified.

9.5.3 Sample Chain of Custody and Documentation

Laboratory chain of custody and documentation will follow procedures consistent with Exhibit F of the NYSDEC ASP 2005.

9.5.4 Sample Analysis

Analysis of an acceptable sample will be initiated by worksheets that contain all pertinent information for analysis. The analyst will sign and date the laboratory chain of custody form when removing the samples from storage.

Samples will be organized into sample delivery groups (SDGs) by the laboratory. An SDG may contain up to 20 field samples (field duplicates, trip blanks, and rinse blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG shall be received by the laboratory over a maximum of 7 calendar days, and must be processed through the laboratory (preparation, analysis, and reporting) as a group. Every SDG must include a minimum of one site-specific matrix/matrix spike duplicate (MS/MSD) pair, which shall be received by the laboratory at the start of the SDG assignment.

Each SDG will be self-contained for all of the required QC samples. All parameters within an SDG will be extracted and analyzed together in the laboratory. At no time will the laboratory be allowed to run any sample (including QC samples) at an earlier or later time than the rest of the SDG. These rules for analysis will confirm that the QC samples for an SDG are applicable to the field samples of the same SDG and that the best possible comparisons can be made.

9.5.5 Sample Storage Following Analysis

The remaining samples will be maintained by the laboratory for 1 month after the final report is delivered to Arcadis. After this period, the samples will be disposed of in accordance with applicable rules and regulations.

10. ANALYTICAL PROCEDURES

10.1 Field Analytical Procedures

Field analytical procedures may include the measurement of pH, ORP, turbidity, temperature, conductivity, dissolved oxygen, and groundwater levels. Specific field measurement protocols are provided in the FSP.

10.2 Laboratory Analytical Procedures

Laboratory analytical requirements presented in the subsections below include a general summary of requirements, specifics related to each sample medium that may be analyzed, and details of the methods to be used for this project. SW-846 methods with NYSDEC, ASP, 2005 Revision, QA/QC and reporting deliverables requirements will be used for all analytes.

10.2.1 General

The following tables summarize general analytical requirements:

Table	Title
Table 1	Parameters, Methods, and Quantitation Limits
Table 2	Environmental and Quality Control Sample Analyses
Table 3	Sample Containers, Preservation Methods, and Holding Times Requirements

10.2.2 Sample Metrics

10.2.2.1 Soil

Analyses in this category will relate to soil samples. Analyses will be performed following the methods listed in **Table 2**. Results will be reported as dry weight, in units presented in **Table 1**. Moisture content will be reported separately.

10.2.3 Analytical Requirements

The primary sources to describe the analytical methods to be used during OM&M or field sampling are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition and USEPA Methods for Chemical Analysis of Water and Waste with NYSDEC ASP 2005 Revision, QA/QC and reporting deliverables requirements. Detailed information regarding QC procedures, including MS/MSDs, MS blanks, and surrogate recoveries is provided in NYSDEC, ASP 2005 Revision, Exhibit E.

11. QUALITY CONTROL REQUIREMENTS

11.1 Quality Assurance Indicators

The overall QA objective for this QAPP is to develop and implement procedures for sampling, chain of custody, laboratory analysis, instrument calibration, data reduction and reporting, internal QC, audits, preventive maintenance, and corrective action such that valid data will be generated. These procedures are presented or referenced in the following sections of the QAPP. Specific QC checks are discussed in Section 11.3.

QA indicators are generally defined in terms of five parameters:

1. Representativeness.
2. Comparability.
3. Completeness.
4. Precision.
5. Accuracy.

Each parameter is defined below. Specific objectives for the site actions are set forth in other sections of this QAPP, as referenced below.

11.1.1 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability. The OM&M and/or field sampling activities have been designed to assess the presence of the constituents at the time of sampling. The FSP and this QAPP present field sampling methodologies and laboratory analytical methodologies. The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.

11.1.2 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between OM&M and any required field investigation data, to the extent possible, with existing data will be maintained through consistent sampling and analytical methodology set forth in the FSP and this QAPP, SW-846 analytical methods with NYSDEC ASP Revision 2005 QA/QC requirements and Category B reporting deliverables, and through use of QA/QC procedures and appropriately trained personnel.

11.1.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the amount that was expected to be obtained under normal conditions. This will be determined upon assessment of the analytical results, as discussed in Section 11.6.

11.1.4 Precision

Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the project objectives. To maximize precision, sampling and analytical procedures will be followed. Checks for analytical precision will include the analysis of MSDs, laboratory duplicates, and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Section 11.4.

11.1.5 Accuracy

Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, MS, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data. Further discussion of these QC samples is provided in Section 11.5.

11.2 Field Quality Control Checks

11.2.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for all field analytical measurements.

11.2.2 Sample Containers

Certified, clean sample containers in accordance with Exhibit I of the NYSDEC ASP Revision 2005 (Eagle Picher pre-cleaned containers or equivalent) will be supplied by the laboratory.

11.2.3 Field Duplicates

Field duplicates will be collected for groundwater and soil samples to check reproducibility of the sampling methods. Field duplicates will be prepared as discussed in the FSP. In general, soil and groundwater sample field duplicates will be analyzed at a 5 percent frequency (every 20 samples). **Table 2** provides an estimated number of field duplicates for each applicable parameter and matrix.

11.2.4 Rinse Blanks

Rinse blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. Rinse blanks will be prepared and submitted for analysis at a frequency of 1 per day (when sample equipment cleaning occurs) or once for every 20 samples collected, whichever is less. Rinse blanks will be prepared by filling sample containers with analyte-free water (supplied by the laboratory), which has been routed through a cleaned sampling device. When dedicated sampling devices are used or sample containers are used to collect the samples, rinse blanks will not be necessary. **Table 2** provides an estimated number of rinse blanks collected during the investigation activities.

11.2.5 Trip Blanks

Trip blanks will be used to assess whether site samples have been exposed to non-site-related volatile constituents during storage and transport. Trip blanks will be analyzed at a frequency of once per day, per cooler containing groundwater samples to be analyzed for VOCs. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory), which remains unopened with field samples throughout the sampling event. Trip blanks will only be analyzed for aqueous VOCs. **Table 2** provides an estimated number of trip blanks collected for each matrix and parameter during the investigation activities.

11.3 Analytical Laboratory Quality Control Checks

Internal QC procedures are specified in the analytical methods. These specifications include the types of QC checks required (method blanks, reagent/preparation blanks, MS/MSDs, calibration standards, internal standards, surrogate standards, the specific calibration check standards, laboratory duplicate/replicate analysis), compounds and concentrations to be used, and the QC acceptance criteria.

11.3.1 Method Blanks

Method blanks will serve as a measure of contamination attributable to a variety of sources, including glassware, reagents, and instrumentation. The method blank will be initiated at the beginning of an analytical procedure and is carried through the entire process.

11.3.2 Matrix Spike/Matrix Spike Duplicates

The MS will serve as a measure of method accuracy in a given matrix. The MS and the MSDs together will serve as a measure of method precision.

11.3.3 Surrogate Spikes

Surrogate spikes are organic compounds that have similar properties to those being tested. They will serve as indicators of method performance and accuracy in organic analyses.

11.3.4 Laboratory Duplicates

Laboratory duplicates will serve to measure method precision in inorganic and supplemental analyses.

11.3.5 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding the instruments' stability. A calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours or more frequently, as specified in the applicable analytical method. In analyses where internal standards are used, a calibration check standard will only be analyzed in the beginning of an analytical series. If results of the calibration

check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard will be reanalyzed.

Laboratory instrument calibration standards will be selected utilizing the guidance provided in the analytical methods, as summarized in Section 12.

11.3.6 Internal Standards

Internal standard areas and retention times will be monitored for organic analyses performed by gas chromatograph/mass spectrometer methods. Method-specified internal standard compounds will be spiked into all field samples, calibration standards, and QC samples after preparation and prior to analysis. If internal standard areas in one or more samples exceed the specified tolerances, then cause will be investigated, the instrument will be recalibrated, if necessary, and all affected samples will be reanalyzed.

The acceptability of internal standard performance will be determined using the guidance provided within the analytical methods.

11.3.7 Reference Standards/Control Samples

Reference standards are standards of known concentration and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes the preparation of calibration standards, the validity of calibration, sample preparation, instrument set up, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

11.4 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system, including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for organic analyses will be monitored through the use of MSDs, laboratory duplicate, and field duplicates as identified in **Table 2**.

The precision of data will be measured by calculation of the relative percent differences (RPDs) of duplicate sample sets.

The RPD can be calculated by the following equation:

$$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

Where:

A = analytical result from one of two duplicate measurements

B = analytical result from the second measurement

Precision objectives for MSD and laboratory duplicate analyses are identified in the NYSDEC ASP Revision 2005.

11.5 Data Accuracy Assessment Procedures

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of MS, surrogate spikes, and internal standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated as a percent recovery as follows:

$$\text{Accuracy} = \frac{A-X}{B} \times 100$$

Where:

A = value measured in spiked sample or standard

X = value measured in original sample

B = true value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for MS recoveries and surrogate recovery objectives are identified in the NYSDEC ASP, 2005 Revision.

11.6 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of samples collected or analyzed to the proposed number.

$$\text{Completeness} = \frac{\text{No. Valid Samples Collected or Analyzed}}{\text{No. Proposed Samples Collected or Analyzed}} \times 100$$

As general guidelines, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgment to determine data usability for intended purposes.

12. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of the maintenance activities to be performed is presented below.

12.1 Field Instruments and Equipment

Prior to any field sampling, each piece of field equipment will be inspected to confirm that it is operational. If the equipment is not operational, it must be serviced prior to use. All meters that require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the field Task Manager to follow the maintenance schedule and arrange for prompt service.

Field instrumentation that may be used during OM&M and/or field activities includes meters to measure pH, ORP, turbidity, temperature, conductivity, dissolved oxygen, and groundwater levels. Field equipment also includes sampling devices for groundwater. A logbook will be kept for each field instrument. Each logbook contains records of operation, maintenance, calibration, and any problems and repairs. The field Task Manager will review calibration and maintenance logs.

Field equipment returned from a site will be inspected to confirm it is in working order. This inspection will be recorded in the logbook or field notebooks as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook.

12.2 Laboratory Instruments and Equipment

12.2.1 General

Only qualified personnel will service instruments and equipment. Repairs, adjustments, and calibrations are documented in the appropriate logbook or data sheet.

12.2.2 Instrument Maintenance

Preventive maintenance of laboratory equipment will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired by in-house staff or through a service call by the manufacturer, as appropriate.

The laboratory will maintain a sufficient supply of spare parts for its instruments to minimize downtime. Whenever possible, backup instrumentation will be retained.

Whenever practical, analytical equipment will be maintained under a service contract. The contract allows for preventative system maintenance and repair on an “as-needed” basis. The laboratory has sufficiently trained staff to allow for the day-to-day maintenance of equipment.

12.2.3 Equipment Monitoring

On a daily basis, the operation of balances, incubators, ovens, refrigerators, and water purification systems will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

13. INSTRUMENT CALIBRATION AND FREQUENCY

13.1 Field Equipment Calibration Procedures and Frequency

Specific procedures for performing and documenting calibration and maintenance for the equipment measuring conductivity, temperature, pH, groundwater levels, and surface-water levels are provided in the FSP. Calibration checks will be performed daily when measuring pH, ORP, turbidity, temperature, conductivity, and dissolved oxygen. Field equipment operation, calibration, and maintenance procedures are provided in the FSP.

13.2 Laboratory Equipment Calibration Procedures and Frequency

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for target constituents are identified separately below.

Volatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit D, specific methodology.

Semivolatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit D, specific methodology.

Supplemental Parameters

If required, additional parameters will be calibrated according to their respective methods, following the guidance presented in NYSDEC ASP 2005, Exhibit D.

14. INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

The laboratory shall inspect/test all supplies and consumables prior to use with samples. Documentation shall be maintained for all associated testing and analyses.

15. DATA MANAGEMENT

The purpose of the data management is to confirm that all of the necessary data are accurate and readily accessible to meet the analytical and reporting objectives of the project. The field activities will generate a large number of samples and analytes. From the large amount of resulting data, the need arises for a structured, comprehensive, and efficient program for management of data.

The data management program established for the site includes field documentation and sample QA/QC procedures, methods for tracking and managing the data, and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process the information collected such that the data are readily accessible and accurate. These procedures are described in detail in the following section.

The data management plan has five elements:

1. Sample Designation System.
2. Field Activities.
3. Sample Tracking and Management.
4. Data Management System.
5. Document Control and Inventory.

15.1 Sample Designation System

A concise and easily understandable sample designation system is an important part of the project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy resampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sample collected.

15.2 Field Activities

Field activities designed to gather the information necessary to make decisions require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documentation of field activities, data security, and QA. These procedures are described in further detail in the following subsections.

15.2.1 Field Documentation

Complete and accurate record keeping is a critical component of the field activities. When interpreting analytical results and identifying data trends, investigators realize that field notes are an important part of the review and validation process. To confirm that all aspects of the field investigation are thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including:

- Field logs.
- Instrument calibration records.
- Chain-of-custody forms.

A description of each of these types of field documentation is provided below.

Field Logs

The personnel performing the field activities will keep field logs that detail all observations and measurements made during field activities. Data will be recorded directly into site-dedicated, bound notebooks, with each entry dated and signed. To confirm at any future date that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it, and then documenting the proper information.

Instrument Calibration Records

As part of data quality assurance procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration confirms that equipment used is of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Section 13.1. To demonstrate that established calibration procedures have been followed, calibration records will be prepared and maintained to include, as appropriate, the following:

- Calibration date and time.
- Type and identification number of equipment.
- Calibration frequency and acceptable tolerances.
- Identification of individual(s) performing calibration.
- Reference standards used.
- Calibration data.
- Information on calibration success or failure.

The calibration record will serve as a written account of monitoring or detection equipment QA. All erratic behavior or failures of field equipment will be subsequently recorded in the calibration log.

Chain of Custody Forms

Chain of custody forms are used as a means of documenting and tracking sample possession from time of collection to the time of disposal. A chain of custody form will accompany each field sample collected, and one copy of the form will be filed in the field office. Field personnel will be briefed on the proper use of the chain of custody procedure. A more thorough description of the chain of custody forms is located in the Standard Operating Procedures.

15.2.2 Data Security

Measures will be taken during the field investigation to confirm that samples and records are not lost, damaged, or altered. When not in use, all field notebooks will be stored at the field office in a locked, fireproof cabinet. Access to these files will be limited to the field personnel who utilize them.

15.3 Sample Management and Training

A record of all field documentation, as well as analytical and QA/QC results, will be maintained to confirm the validity of data used in the site analysis. To effectively execute such documentation, carefully constructed sample tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of chain of custody forms, as described in Section 9.5.3. On a daily basis, the completed chain of custody forms associated with samples collected that day will be scanned and emailed from the project office to the QA Manager (QAM). Copies of all completed chain of custody forms will be maintained in the field office. On the following day, the QAM will telephone the laboratory to verify receipt of samples.

When analytical data are received from the laboratory, the QAM will review the incoming analytical data packages against the information on the chains of custody to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed-up by the QAM.

15.4 Data Management System

In addition to the sample tracking system, a data management system may be implemented. The central focus of the data management system will be the development of a personal computer-based project database. The project database, to be maintained by the Database Administrator, will combine pertinent geographical, field, and analytical data.

15.4.1 Computer Hardware

If required, the database will be constructed on Pentium®-based personal computer work stations connected through a network server (or similar). The network will provide access to various hardware peripherals, such as, but not limited to, printers, backup storage devices, image scanners, and modems. Computer hardware will be maintained to industrial and corporate standards.

15.4.2 Field Observations

An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field.

Following each sampling event, a data entry may be prepared by the field personnel who performed the sampling activities. The purpose of the data entry is to present a summary and a record of the sampling event. Topics to be discussed include the locations sampled, the sampling methodologies used, QA/QC

procedures, blind duplicate and MS/MSD sample identification numbers, equipment decontamination procedures, personnel involved in the activity, and any other noteworthy events that occurred.

Tables are typically attached to the data entry, as required, and are used to summarize measurements that were recorded in the field books. It is anticipated that these tables will be developed using a personal computer spreadsheet program to reduce possible transcription error and to facilitate the transfer of information to the data management system.

Status memos, if required, are valuable tools to keep project personnel informed on the details of the field activities and are also invaluable during the development of the final report. Each status memo will be reviewed for accuracy and completeness by the respective sampling activity manager. Following the approval and finalization of each memo, the status memo will be used to transfer field observations into the data management system.

All pertinent field data will be manually entered into the appropriate database tables from the chain of custody forms and field notebooks.

15.4.3 Analytical Results

Analytical results provided by the laboratory will be available in both a digital and a hard copy format. Upon receipt of each analytical package, the original chain of custody form will be placed in the project files. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the chain of custody form were performed. If discrepancies are noted, the laboratory will be notified and will promptly resolve any issues.

Where appropriate, the data packages will be validated in accordance with the procedures presented in Section 18. Any data that does not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of that data may not necessarily be restricted.

Following completion of the data validation (if necessary), the digital files of analytical data will be processed to populate the appropriate database tables. Specific fields include:

- Sample identification number.
- Date sampled.
- Date analyzed.
- Parameter name.
- Analytical result.
- Units.
- Detection limit.
- Qualifier(s).

The individual electronic data deliverables (EDDs) supplied by the laboratory in a Microsoft Excel worksheet, will be loaded into the appropriate database table. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually.

After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.

15.4.4 Data Analysis and Reporting

The database management system will have several functions to facilitate the review and analysis of the data. Data entry screens will be developed to assist in the keypunching of field observations. Routines will also be developed to permit the user to scan analytical data from a given site for a given media.

A valuable function of the data management system will be the generation of tables of analytical results from the project databases. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. Tables of analytical data will be produced as part of data interpretation tasks and the reporting of data.

Another function of the data management system will be to create digital files of analytical results and qualifiers suitable for transfer to mapping/presentation software. This routine greatly reduces the redundant keypunching of analytical results and facilitates the efficient production of interpretative and presentation graphics.

15.5 Document Control and Inventory

Each contractor performing intrusive work within potentially MGP-impacted areas is required to maintain project files. Copies of appropriate portions of the project files will be sent to:

- NYSDEC Project Manager.
- NYSEG Project manager.
- City of Dansville.

ARCADIS maintains project files in its Rochester, New York office. Each client project is assigned a file/job number (e.g., for the remedial activities, 130.42). Each file is then broken down into the following subfiles:

1. Agreements/Proposals (filed chronologically).
2. Change Orders/Purchase Orders (filed chronologically).
3. Invoices (filed chronologically).
4. Project Management (filed by topic).
5. Correspondence (filed chronologically).
6. Notes and Data (filed by topic).
7. Public Relations Information (filed by topic).

8. Regulatory Documents (filed chronologically).
9. Marketing Documents (filed chronologically).
10. Final Reports/Presentations (filed chronologically).
11. Draft Reports/Presentations (filed chronologically).
12. Documents Prepared by Others (filed chronologically).

Originals, when possible, are placed in the files. These are the central files and will serve as the site-specific files for the off-site investigations.

16. ASSESSMENT AND RESPONSE ACTIONS

Performance and systems audits will be completed in the field and the laboratory, as described below.

16.1 Field Audits

The following field performance and systems audits will be completed.

16.1.1 Performance Audits

The Task Manager will monitor field performance, as appropriate. Field performance audit summaries will contain an evaluation of field measurements and field meter calibrations to verify that measurements are taken according to established protocols. The project QAM will review all field reports and communicate concerns to the Project Manager and/or Task Managers, as appropriate. In addition, the QAM will review the rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures.

16.1.2 Internal Systems Audits

A field internal systems audit is a qualitative evaluation of all components of field QA/QC. The systems audit compares scheduled QA/QC activities from this document with actual QA/QC activities completed. The appropriate Task Manager will periodically confirm that work is being performed consistent with the RDWP, FSP, and HASP.

16.2 Laboratory Audits

The laboratory will perform internal audits consistent with NYSDEC ASP, 2005 Revision, Exhibit E.

In addition to the laboratory's internal audits and participation in state and federal certification programs, the laboratory sections at the laboratory are audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

NYSEG reserves the right to conduct an on-site audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the course of the project, as deemed necessary.

16.3 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP or the FSP. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures are described below.

16.3.1 Field Procedures

When conducting the field work, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented will be documented on a Corrective Action Report Form and reported to the appropriate Project Manager and Task Manager.

Examples of situations that would require corrective actions are provided below:

1. Protocols, as defined by this QAPP or the FSP have not been followed.
2. Equipment is not in proper working order or properly calibrated.
3. QC requirements have not been met.
4. Issues resulting from performance or systems audits.

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

16.3.2 Laboratory Procedures

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action to be taken will be documented and reported to the appropriate Project Manager and Task Manager.

Corrective action may be initiated, at a minimum, under the following conditions:

1. Specific laboratory analytical protocols have not been followed.
2. Predetermined data acceptance standards are not obtained.
3. Equipment is not in proper working order or calibrated.
4. Sample and test results are not completely traceable.
5. QC requirements have not been met.
6. Issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

17. REPORTS TO MANAGEMENT

17.1 Internal Reporting

The analytical laboratory will submit analytical reports to the Contractor for review. If required, the Contractor, or Arcadis will, in turn, submit the reports to the data validator for review. The QAM will incorporate results of the data validation reports (if required) and assessments of data usability into a summary report (if required) that will be submitted to the Project Manager. If required, this summary report will be filed in the project file and will include the following:

1. Assessment of data accuracy, precision, and completeness for both field and laboratory data.
2. Results of the performance and systems audits.
3. Significant QA/QC problems, solutions, corrections, and potential consequences.
4. Analytical data validation report.

17.2 Reporting

Upon sample transport to the laboratory, a copy of the chain of custody will be forwarded to NYSEG. Upon receipt of the data package from the laboratory, the QAM will determine if the data package has met the required DQOs. The analytical data package will be submitted to NYSEG's Project Manager and will also be incorporated into required reports.

18. DATA REVIEW, VALIDATION, AND VERIFICATION

After field and laboratory data are obtained, these data may be subject to:

1. Validation of the data.
2. Reduction or manipulation of the data mathematically or otherwise into meaningful and useful forms.
3. Organization, interpretation, and reporting of the data.

18.1 Field Data Reduction, Validation, and Reporting

18.1.1 Field Data Reduction

Information that is collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks, log sheets, and/or other appropriate forms. Such data will be reviewed by the appropriate Task Manager for adherence to the work plan and consistency of data. Any concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

18.1.2 Field Data Validation

Field data calculations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the appropriate Task Manager and the QAM. Task Managers will recalculate at least 5 percent of all data reductions. Field documentation and data reduction prepared by field personnel will be reviewed by the appropriate Task Manager and QAM. All logs and documents will be checked for:

1. General completeness.
2. Readability.
3. Usage of appropriate procedures.
4. Appropriate instrument calibration and maintenance.
5. Reasonableness in comparison to present and past data collected.
6. Correct sample locations.
7. Correct calculations and interpretations.

18.1.3 Field Data Reporting

Where appropriate, field data forms and calculations will be processed and included in appendices to the reports. The original field logs, documents, and data reductions will be kept in the project file.

18.2 Laboratory Data Reduction, Review, and Reporting

18.2.1 Laboratory Data Reduction

Laboratory analytical data will be directly transferred from the instrument to the computer or the data reporting form (as applicable). Calculation of sample concentrations will be performed using the appropriate regression analysis program, response factors, and dilution factors (where applicable).

18.2.2 Laboratory Data Review

All data will be subject to multi-level review by the laboratory. The group leader will review all data reports prior to release for final data report generation, and the laboratory director will review a cross section of the final data reports. All final data reports are reviewed by the laboratory QAM prior to shipment.

If discrepancies or deficiencies exist in the analytical results, then corrective action will be taken, as discussed in Section 16. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form. This form will be submitted to the Project Manager.

19. VALIDATION AND VERIFICATION METHODS

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits, the analytical results are correctly transcribed from the instrument, and which, if any, environmental samples are related to any out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

If required, data validation will consist of data screening, checking, reviewing, editing, and interpreting to document analytical data quality and determine if the quality is sufficient to meet the DQOs. The data validation will also include a review of completeness and compliance, including the elements provided in **Table 4**.

The data validator will use the most recent versions of the USEPA functional guidelines for data validation with NYSDEC ASP 2005 Revision, QA/QC and reporting deliverables requirements available at the time of project initiation and for the entire duration of the project, as guidance, where appropriate.

The data validator will verify reduction of laboratory measurements and laboratory reporting of analytical parameters are in accordance with the procedures specified for each analytical method (i.e., perform laboratory calculations in accordance with the method-specific procedure).

If required, upon receipt of the laboratory data, the following reduction, validation, and reporting scheme will be executed by the data validator:

1. Laboratory data will be screened to confirm that the necessary QC procedures (e.g., detection limit verification, initial calibration, continuing calibration, duplicates, spikes, blanks) have been performed. QC information not included or of insufficient frequency will be identified in the validation report, including a discussion of the implications.
2. QC supporting information will subsequently be screened to identify QC data outside established control limits. If out-of-control data are discovered, documentation of appropriate corrective action will be reviewed. Out-of-control data without appropriate corrective action shall result in designation of the affected data as qualified or rejected, as appropriate.

   It should be noted that the existence of qualified results does not automatically invalidate data. This point is repeatedly emphasized in the USEPA functional guidelines for data validation and is inherently acknowledged by the very existence of the data validation/flagging guidelines. The goal to produce the best possible data does not necessarily mean producing data without QC qualifiers. Qualified data can provide useful information.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the data validator, laboratory Project Manager, and the Contractor's Project Manager.

Upon completion of the data validation (if required), a data usability summary report addressing the following topics will be prepared.

1. Assessment of the data package.
2. Description of any protocol deviations.
3. Failures to reconcile reported and/or raw data.

4. Assessment of any compromised data.
5. Laboratory case narrative.
6. Overall appraisal of the analytical data.
7. Table of site name, sample quantities, data submitted to the laboratory, year of protocol used, matrix, and fractions analyzed.

20. RECONCILIATION WITH USER REQUIREMENTS

The data results will be examined to determine the performance that was achieved for each data usability criteria. The performance will then be compared with the project objectives. Of particular note will be samples at or near action levels. All deviations from objectives will be noted. Additional action may be warranted when performance does not meet performance objectives for critical data. Action options may include any or all of the following:

- Retrieval of missing information.
- Request for additional explanation or clarification.
- Reanalysis of sample from extract (when appropriate).
- Recalculation or reinterpretation of results by the laboratory.

These actions may improve the data quality, reduce uncertainty, and may eliminate the need to qualify or reject data.

If these actions do not improve the data quality to an acceptable level, the following actions may be taken:

- Extrapolation of missing data from existing data points.
- Use of historical data.
- Evaluation of the critical/noncritical nature of the sample.

If the data gap cannot be resolved by these actions, an evaluation of the data bias and potential for false negatives and positives can be performed. If the resultant uncertainty level is unacceptable, then the following action must be taken:

- Additional sample collection and analysis.

21. REFERENCES

American Society for Testing and Materials. Annual Book of ASTM Standards. American Society for Testing and Materials. West Conshohochkton, PA. (1996).

United States Environmental Protection Agency. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. EPA-540/R-94-013. (February 1994a).

United States Environmental Protection Agency. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*. EPA-540/R-94-012. (February 1994b).

United States Environmental Protection Agency. *NEIC Policies and Procedures Manual*. EPA-330/9-78-001R. National Enforcement Investigations Center. (May 1978, Revised August 1991).

United States Environmental Protection Agency. *Interim Guidance and Specifications for Preparing Quality Assurance Project Plans*. QAMS-005/80. Office of Research and Development. (December 1980).

United States Environmental Protection Agency. *Methods for Chemical Analysis of Water and Waste*. EPA-600/4-79-020, Revised. EMSL-Cincinnati. (March, 1983).

United States Environmental Protection Agency. *Test Methods for Evaluating Solid Waste*. SW-846 3rd Edition, Update 3. Office of Solid Waste (December 1996).

USEPA. 2001. *EPA Requirements for QA Project Plans for Environmental Operations*. EPA-QA/R-5. Office of Environmental Information. March 2001.

USEPA. 2002. *Guidance for QA Project Plans*. EPA-QA/G-5. Office of Environmental Information. December 2002.

TABLES

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

Parameter	Quantitation Limit[1]	
Volatile Organics Method 8260	**Water (µg/L)**	**Soil (µg/kg)[2]**
Chloromethane	5	5
Bromomethane	5	5
Vinyl Chloride	5	5
Chloroethane	5	5
Methylene Chloride	3	3
Acetone	5	5
Carbon Disulfide	5	5
1,1-Dichloroethylene	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethylene (total)	5	5
Chloroform	5	5
1,2-Dichloroethane	2	2
2-Butanone	5	5
1,1,1-Trichloroethane	5	5
Carbon Tetrachloride	2	2
Bromodichloromethane	1	1
1,2-Dichloropropane	1	1
cis-1,3-Dichloropropene	5	5
Trichloroethane	5	5
Dibromochloromethane	5	5
1,1,2-Trichloroethane	3	3
Benzene	1	1
trans-1,3-Dichloropropene	5	5
Bromoform	4	4
4-Methyl-2-pentanone	5	5
2-Hexanone	5	5
Tetrachloroethene	1	1
Toluene	5	5
1,1,2,2-Tetrachloroethane	1	1
Chlorobenzene	5	5
Ethylbenzene	4	4
Styrene	5	5
2-Chloroethyl Vinyl Ether	5	5
1,2-Dichlorobenzene	5	5
1,3-Dichlorobenzene	5	5
1,4-Dichlorobenzene	5	5
Vinyl Acetate	5	5
Total Xylenes	5	5
Semivolatile Organics Method 8270	**Water (µg/L)**	**Soil (µg/kg)**
1,2,4-Trichlorobenzene	5	--
1,2-Dichlorobenzene	10	--
1,2-Diphenylhydrazine	10	--
1,3-Dichlorobenzene	10	--
1,4-Dichlorobenzene	10	--
1,4-Dioxane	10	--
2,4,5-Trichlorophenol	10	--
2,4,6-Trichlorophenol	10	--
2,4-Dichlorophenol	10	--

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

Parameter	Quantitation Limit[1]	
Semivolatile Organics Method 8270 (Cont'd.)	**Water (µg/L)**	**Soil (µg/kg)**
2,4-Dimethylphenol	10	--
2,4-Dinitrophenol	40	--
2,4-Dinitrotoluene	2	--
2,6-Dinitrotoluene	2	--
2-Chloronaphthalene	10	--
2-Chlorophenol	10	--
2-Methylnaphthalene	10	--
2-Methylphenol	10	--
2-Nitroaniline	20	--
2-Nitrophenol	10	--
3,3'-Dichlorobenzidene	20	--
3-Nitroaniline	20	--
4,6-Dinitro-2-methylphenol	40	--
4-Bromophenyl-phenylether	10	--
4-Chloro-3-methylphenol	10	--
4-Chloroaniline	10	--
4-Chlorophenyl-phenylether	10	--
4-Methylphenol	10	--
4-Nitroaniline	20	--
4-Nitrophenol	40	--
Acenaphthene	10	330
Acenaphthylene	10	330
Acetophenone	10	--
Aniline	10	--
Anthracene	10	330
Atrazine	10	--
Benzaldehyde	10	--
Benzidine	40	--
Benzo(a)anthracene	5	33
Benzo(a)pyrene	5	33
Benzo(b)fluoranthene	5	33
Benzo(g,h,i)perylene	10	330
Benzo(k)fluoranthene	5	33
Benzoic Acid	10	--
Benzyl Alcohol	10	--
bis(2-chloroethoxy)methane	10	--
bis(2-chloroethyl)ether	5	--
bis(2-chloroisopropyl)ether	10	--
bis(2-ethylhexyl)phthalate	10	--
Butylbenzylphthalate	10	--
Caprolactam	10	--
Carbazole	10	--
Chrysene	10	330
Dibenzo(a,h)anthracene	5	33
Dibenzofuran	10	--
Diethylphthalate	10	--
Dimethylphthalate	10	--
Di-n-butyl phthalate	10	--
Di-n-octyl phthalate	10	--

Table 1
Parameter, Methods, and Quantitation Limits

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

Parameter	Quantitation Limit[1]	
Semivolatiles Method 8270 (Cont'd.)	**Water (µg/L)**	**Soil (µg/kg)**
Diphenyl	10	--
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	5	--
Hexachlorobutadiene	2	--
Hexachlorocyclopentadiene	10	--
Hexachloroethane	5	--
Indeno(1,2,3-cd)pyrene	5	33
Isophorone	10	--
N,N-Dimethylaniline	5	--
Naphthalene	10	330
Nitrobenzene	5	--
N-Nitrosodimethylamine	10	--
N-Nitroso-di-n-propylamine	5	--
N-Nitrosodiphenylamine	10	--
Pentachlorophenol	40	--
Phenanthrene	10	330
Phenol	10	--
Pyrene	10	330
Pyridine	10	--
Supplemental Parameters	**Water (µg/L)**	**Soil (mg/kg)**
Iron (Total/Dissolved) Method 6010	0.05	--
Manganeese (Total/Dissolved) Method 6010	0.003	--
Alkalinity, Bicarbonate Method SM2320B	5	--
Alkalinity, Carbonate Method SM2320B	5	--
Alkalinity, Total Method SM2320B	5	--
Sulfate Method 300.0	2	--
Nitrogen, Nitrate Method 353.2	0.05	--
Nitrogen, Nitrite Method 353.2	0.05	--

Notes:
[1] Specific quantitation limits are highly matrix dependent. The quantitation limits listed are for guidance and may not always be achievable due to matrix interference.
[2] Quantitation limits for source materials/soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for source materials/soil/sediment (calculated on a dry weight basis) will be higher.
* To be determined with lab prior to analysis.
µg/L = micrograms per liter
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram

Table 2
Environmental and Quality Control Analyses

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

Environmental Sample Matrix/ Laboratory Parameters	Field QC Analyses					Laboratory QC Analyses[1,2]	
	Trip Blank	Field Duplicate	Rinse Blank[3]	MS	MSD	MSB	Lab Duplicate
Soil							
Volatile Organics Method 8260	1/cooler	1/20	1/20	1/20	1/20	1/20	--
Polycyclic Aromatic Hydrocarbons Method 8270	--	1/20	1/20	1/20	1/20	1/20	--
Groundwater							
Volatile Organics Method 8260	1/cooler	1/20	--	1/20	1/20	1/20	--
Semivolatile Organics Method 8270	--	1/20	--	1/20	1/20	1/20	--
Iron, Total Method 6020	--	--	--	--	--	--	--
Iron, Dissolved (0.45 micron filter) Method 6020	--	--	--	--	--	--	--
Manganese, Total Method 6020	--	--	--	--	--	--	--
Manganese, Dissolved (0.45 micron filter) Method 6020	--	--	--	--	--	--	--
Alkalinity, Total Method SM2320B	--	--	--	--	--	--	--
Alkalinity, Bicarbonate Method SM2320B	--	--	--	--	--	--	--
Alkalinity, Carbonate Method SM2320B	--	--	--	--	--	--	--
Sulfate Method 300.0	--	--	--	--	--	--	--

Table 2
Environmental and Quality Control Analyses

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

Environmental Sample Matrix/ Laboratory Parameters	Field QC Analyses					Laboratory QC Analyses[1,2]	
	Trip Blank	Field Duplicate	Rinse Blank[3]	MS	MSD	MSB	Lab Duplicate
Nitrate, Nitrogen Method 353.2	--	--	--	--	--	--	--
Nitrite, Nitrogen Method 353.2	--	--	--	--	--	--	--

Notes:
[1] The number of laboratory QC analyses is based on the frequencies given for the number of environmental samples estimated, not including field QC analyses (i.e., rinse and trip blanks).
[2] Laboratory QC analyses are listed only for those parameters that must be performed on site samples. The laboratory is required to analyze QC samples for the remaining parameters at the frequency listed in the associated analytical method.
[3] Rinse blank samples will be collected only when nondedicated sampling devices are used. Rinse blanks will be collected at a frequency of one per day of use or one per 20 samples, whichever is less.
QC = quality control
MS = matrix spike
MSB = matrix spike blank
MSD = matrix spike duplicate

Table 3
Sample Containers, Preservation, and Holding Times Requirements

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

Parameter	Container	Preservation	Maximum Holding Time from VTSR
Groundwater Samples			
Volatile Organics	(2) 40-mL Teflon®-lined septa (glass)	Cool 4ºC HCl to pH <2	7 days (unpreserved) 10 days (preserved)
Semivolatile Organics	(2) 250-mL containers (glass)	Cool 4ºC	5 days extraction; 40 days analysis
Iron, Total/Dissolved	(1) 250-mL container (plastic)	HNO_3 Cool 4ºC	6 months
Manganese, Total/Dissolved	(1) 250-mL container (glass)	HNO_3 Cool 4ºC	6 months
Alkalinity, Total/Bicarbonate/ Carbonate	(1) 250-mL container (plastic)	Cool 4ºC	12 days
Nitrate/Nitrite Nitrogen	(1) 250-mL container (plastic)	H_2SO_4 Cool 4 ºC	48 hours (from collection)
Soil Samples			
Volatile Organics	(1) 2-oz container (glass) (2) 40-mL Teflon®-lined septa (glass) (1) 40-mL Teflon®-lined septa (glass)	Cool 4ºC Deionized water Methanol	10 days
Polycyclic Aromatic Hydrocarbons	(1) 4-oz container (glass)	Cool 4ºC	5 days extraction; 40 days analysis

Notes:
VTSR = Verifiable time of sample receipt. Samples must be delivered to laboratory within 48 hours from day of collection.
mL = milliliters
oz = ounce
ºC = degrees Celsius
TOC = total organic carbon
TCLP = toxicity characteristic leaching procedure
H_2SO_4 = sulfuric acid
HNO_3 = nitric acid
NaOH = sodium hydroxide

Table 4
Data Validation Checklist – Laboratory Analytical Data

Quality Assurance Project Plan
NYSEG
Dansville Former MGP Site

REVIEW FOR COMPLETENESS	
1.	Chain of custody forms included.
2.	Sample preparation and analysis summary tables included.
3.	Quality assurance/quality control (QA/QC) summaries of analytical data included.
4.	Relevant calibration data included with analytical data.
5.	Instrument and method performance data included.
6.	Method detection limits documented.
7.	Data report forms of examples for calculations of concentrations.
8.	Raw data used in identification and quantification of the analysis required.
REVIEW OF COMPLIANCE	
1.	Data package completed.
2.	Quality Assurance Project Plan requirements for data met.
3.	QA/QC criteria met.
4.	Instrument type and calibration procedures met.
5.	Initial and continuing calibration met.
6.	Data reporting forms completed.
7.	Problems and corrective actions documented.

ATTACHMENT 1

Sample Chain of Custody Form

ARCADIS
Infrastructure, environment, facilities

ID#:

CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

Page ___ of ___

Lab Work Order #

Send Results to:

Contact & Company Name:	Telephone:
Address:	Fax:
City State Zip	E-mail Address:
Project Name/Location (City, State):	Project #:
Sampler's Printed Name:	Sampler's Signature:

Sample ID	Collection Date	Collection Time	Type (✓) Comp	Type (✓) Grab	Matrix

Preservative								
Filtered (✓)								
# of Containers								
Container Information								

PARAMETER ANALYSIS & METHOD

REMARKS

Keys

Preservation Key:
A. H_2SO_4
B. HCL
C. HNO_3
D. NaOH
E. None
F. Other: _____
G. Other: _____
H. Other: _____

Container Information Key:
1. 40 ml Vial
2. 1 L Amber
3. 250 ml Plastic
4. 500 ml Plastic
5. Encore
6. 2 oz. Glass
7. 4 oz. Glass
8. 8 oz. Glass
9. Other: _____
10. Other: _____

Matrix Key:
SO - Soil | SE - Sediment | NL - NAPL/Oil
W - Water | SL - Sludge | SW - Sample Wipe
T - Tissue | A - Air | Other: _____

Special Instructions/Comments:

☐ **Special QA/QC Instructions(✓):**

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name:	Cooler Custody Seal (✓)	Printed Name:	Printed Name:	Printed Name:	Printed Name:
☐ Cooler packed with ice (✓)	☐ Intact ☐ Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements:	Sample Receipt:	Firm:	Firm/Courier:	Firm/Courier:	Firm:
Shipping Tracking #:	Condition/Cooler Temp: _____	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: WHITE – Laboratory returns with results YELLOW – Lab copy PINK – Retained by BBL

Arcadis of New York, Inc.

295 Woodcliff Drive

Third Floor

Suite 301

Fairport, New York 14450

Tel 585 385 0090

Fax 585 385 4198

www.arcadis.com

APPENDIX D

Health and Safety Plan

Site Specific Health and Safety Plan

Revision 14f

Project Name:	Dansville Former MGP Site
Project Number:	B0013135
Client Name:	NYSEG
Date:	5/30/2018
HASP Expires	5/30/2019
Revision:	

Approvals:

HASP Developer:	Nicholas Beyrle
Project Manager:	Bruce Ahrens
HASP Reviewer:	

Arcadis Culture of Caring

Arcadis is committed to a Culture of Caring that insures each Arcadis employee and contractor goes home at the end of the day free from injury or illness. I certify the following has been performed with all Arcadis field staff on this project either in person or by Skype:

- ☐ Reviewed the HASP including a discussion of hazard identification and controls
  - ☐ If conducting activities deemed by Arcadis to be "High Risk", frontline management has reviewed applicable H&S standards (JSA when authorized by H&S) for these activities with field staff
  - ☐ If permit to work is required, frontline management has reviewed the permit(s) with field staff
- ☐ Reviewed proactive H&S engagement expectations/injury prevention actions
- ☐ Reviewed Stop Work Authority
- ☐ Reviewed the incident reporting process and expectations including when WorkCare should be contacted by staff (WorkCare incident intervention for all minor, non-emergency injuries) and that the WorkCare phone number is programmed into field team cell phone.

For short service employees (SSE) (0-1 years with Arcadis):

- ☐ Coaching and mentoring on Arcadis H&S expectations during project work. Reviewed in detail specific hazards and controls and provided a resource that can be contacted if SSE has questions regarding planned or unplanned work tasks

Resource # _____ _____

Name Phone Number

Signed:

_____ Associate Project Manager

Emergency Information

Site Address: 50 Ossian Street

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
NYSDEC Spill Hotline		1-800-457-7362
Emergency Other (specify)	Poison Control Center	1-800-222-1222
Client Contact	John Ruspantini	1-607-762-8787
WorkCare (non-life-threatening injury/illness)		1-888-449-7787
Project H&S	Nicholas Beyrle	585-662-4044
Task Manager	Nicholas Beyrle	585-662-4044
Project Manager	Bruce Ahrens	585-662-4044
Corporate H&S Specialist	Julie Santaniello	978-551-0033
Corporate H&S Director	Denis Balcer	614-778-9171

Hospital Name and Address: Noyes Health
111 Clara Barton Street
Dansiville, New York

Hospital Phone Number: 585-335-6001

Incident Notification Process

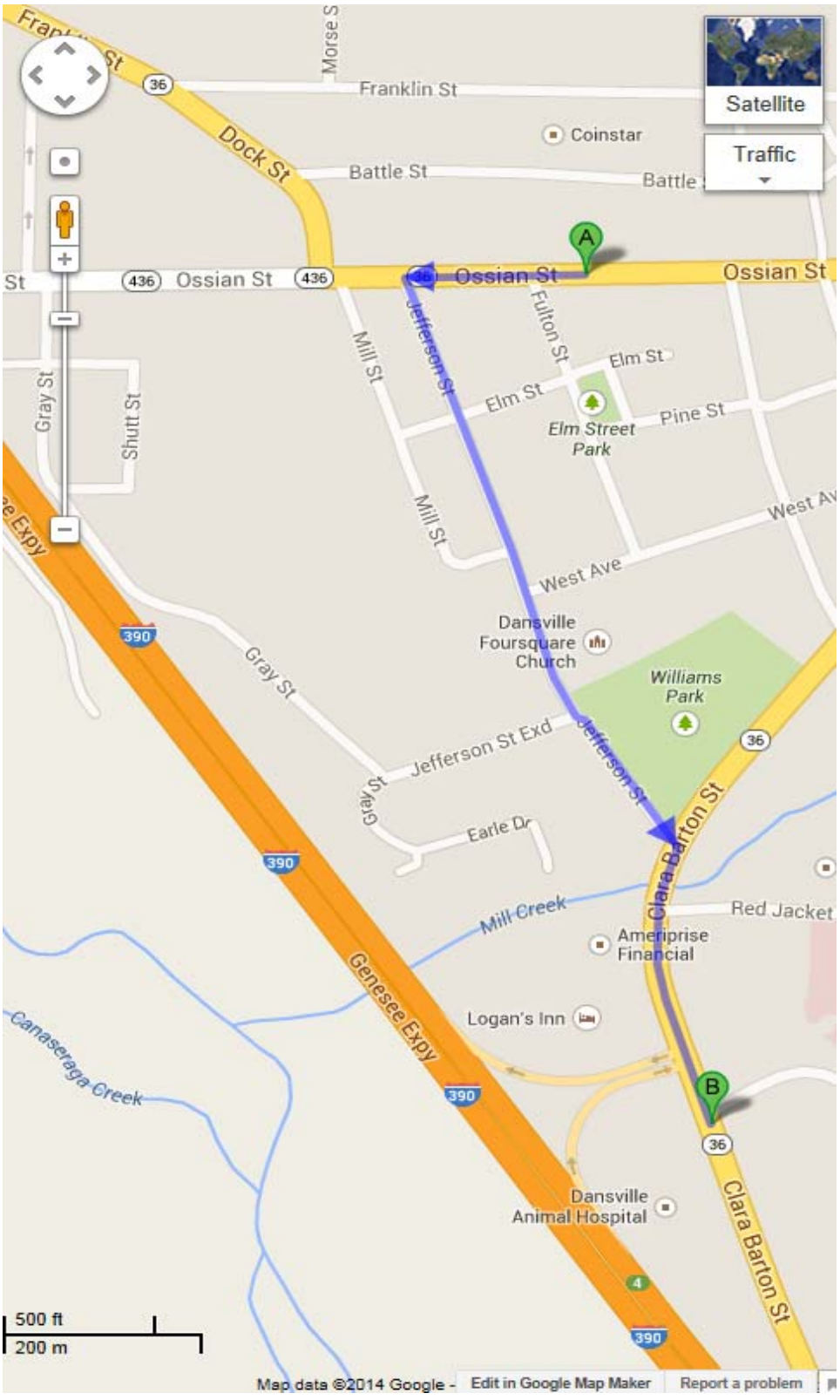
1 Dial 911/Facility Emergency Number/WorkCare as applicable
2 Contact PM/Supervisor — Bruce Ahrens
3 Contact Corporate H&S — Denis Balcer
4 Contact Client — John Ruspantini

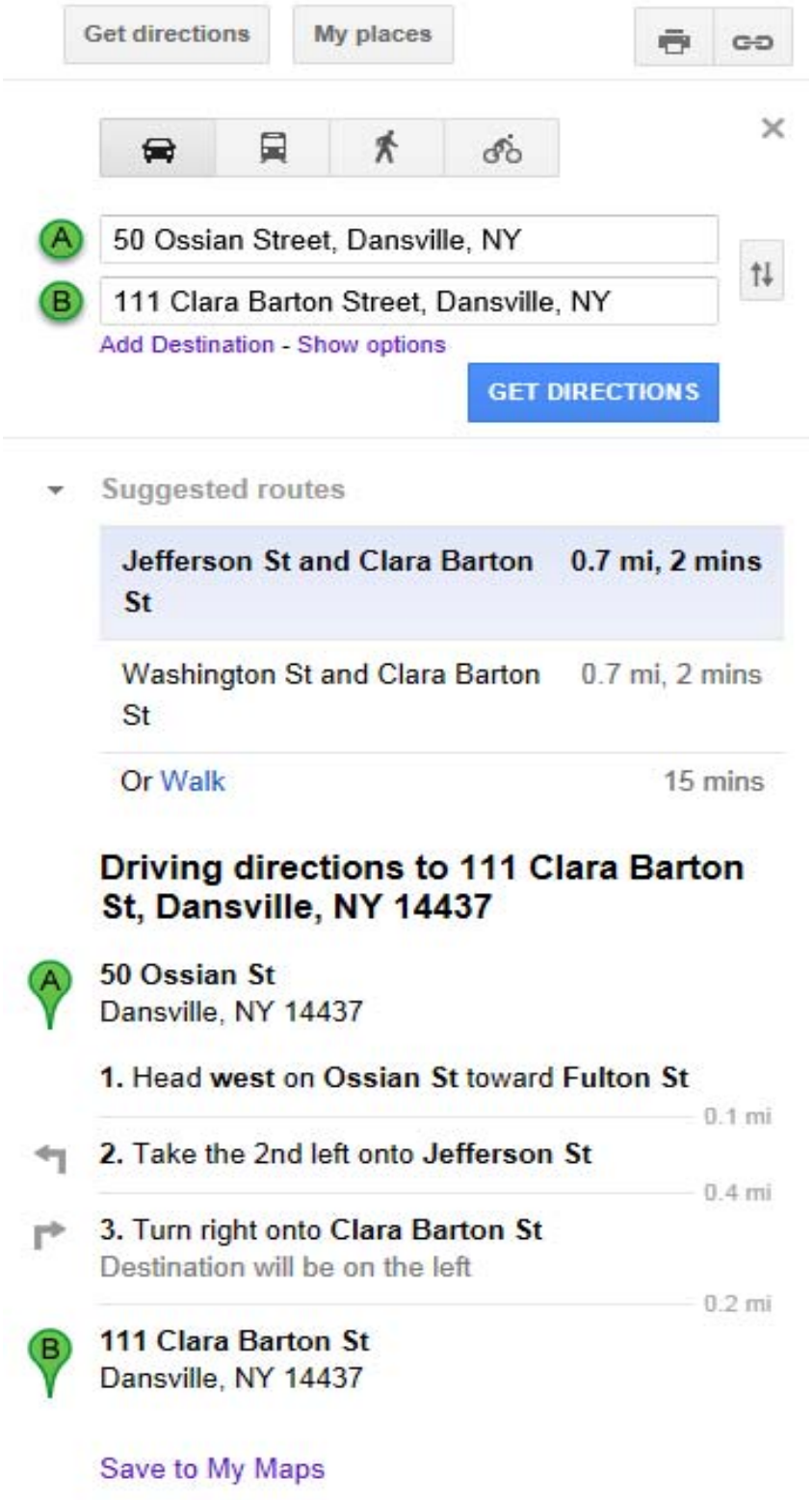
Complete below, as applicable, or clear cell contents:

Location of Assembly Area(s): Sidewalk along Ossian St

Nearest AED location: None
Nearest Storm Shelter: Noyes Heath (Hospital)

Route to the Hospital




Get directions
My places
A
50 Ossian Street, Dansville, NY
B
111 Clara Barton Street, Dansville, NY
Add Destination - Show options
GET DIRECTIONS
Suggested routes
Jefferson St and Clara Barton St
0.7 mi, 2 mins
Washington St and Clara Barton St
0.7 mi, 2 mins
Or Walk
15 mins
Driving directions to 111 Clara Barton St, Dansville, NY 14437
A
50 Ossian St
Dansville, NY 14437
1. Head west on Ossian St toward Fulton St
0.1 mi
2. Take the 2nd left onto Jefferson St
0.4 mi
3. Turn right onto Clara Barton St
Destination will be on the left
0.2 mi
B
111 Clara Barton St
Dansville, NY 14437
Save to My Maps

General Information

Site Type (select all applicable where work will be conducted):

- ☐ Active
- ☐ Bridge
- ☐ Buildings
- ☐ Commercial
- ☐ Construction
- ☐ Military Installation
- ☐ Inactive Industrial
- ☐ Active Industrial
- ☐ Landfill
- ☐ Marine
- ☐ Mining
- ☑ Parking Lot/Private Roadway
- ☐ Railroad
- ☐ Remote Area
- ☐ Residential
- ☐ Retail
- ☐ Roadway (public, including right-of-way)
- ☐ Water Treatment Plant
- ☐ Unknown
- ☐ Security Risk Site/Location
- ☐ Utility
- ☐ Other (specify): _____

Work with exposure to vehicular traffic on private property (Non-ROW) requires preparation of a Non-ROW Traffic Safety Plan.

Surrounding Area and Topography (select one):

- ☐ Surrounding area and topography are presented in the project work plan
- ☐ Surrounding area and topography (*briefly describe*):

The Site (OU-2) is comprised of a mixed industrial use (i.e., the NYSEG-owned property) and residential neighborhood, with private residences to the north, south, east, and west. The site is generally flat.

Simultaneous Operations (SimOps)

- ☑ Not applicable
- ☐ SimOps will exist on this project

Site Background (select one):

- ☑ Site background is presented in the project work plan
- ☐ Site background (*briefly describe)* :

The gas works operations began in 1861 and continued for approximately 70 years, ceasing in January of 1930. Oil, coal, and coke were used as feed fuels at various times during the plant's operation.In later years, NYSEG used a portion of the property for electrical equipment storage, including transformers. Electricity was also produced on-site from 1895 to 1925. In the years after plant operations had ceased, the gas house was used as a meter department and was later removed in 1958. Service center operations ceased in 2010 and the remaining building was demolished in 2012.

Project Tasks

The following tasks are identified for this project: Select: Environment Top 25

Select applicable tasks from the drop down menu

1	Drilling - Contractor oversight
2	Monitor well - Well installation, development, or purging contractor oversight
3	Sampling - Soil sampling using split spoons or continuous sampling tool
4	Decontamination - Small or hand-held objects using manual methods
5	Mobilization - Site set up and take down
6	Select
7	Select
8	Select
9	Select
10	Select

☐ Subcontractor H&S information is attached

☑ Utility clearance required.

☐ Journey Management Plan attached

☐ State specific H&S required:

☐ The following H&S Standards are attached:

Not applicable

☑ Required Checklists/Work Forms

Tailgate Safety Briefing Form

Vehicle Inspection Checklist

☐ Required Permits

Not Applicable

Roles and Responsibilities

	Name	*Role*
1	Bruce Ahrens	Project Manager
2	Nicholas Beyrle	Task Manager
3	Ryan Clare	Field Technical Lead
4	Ryan Clare	Site Safety Officer
5		
6		
7		
8		
9		
10		

Training

All Arcadis employees are required to have the following training to be on site:

H&S Program Orientation
HAZCOM GHS/EAP
Defensive Driving - Smith On-Line
Hazwoper 40 Hour
PPE
Hazwoper 8-Hour Annual Refresher
None
None
None
None
None
None
None
Client specific:
Other:

Selected Arcadis employees are required to have the following additional training:

	Names or Numbers from above
BBP (Bloodborne Pathogens)	3,4
First Aid/CPR	3,4
DOT HazMat #1	3
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
None	
Other:	

Hazard Analysis

The task hazard analysis uses a hazard ranking process utilizing the chart below. The ranking will automatically populate. However, the ranking may be adjusted manually, if required.

Risk Assessment Matrix		Likelihood Ratings			
Consequences Ratings		A	B	C	D
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	4 Almost Certain to Happen
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High

Hazard Analysis

Task 1:	Drilling - Contractor oversight

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low) — Suggested FHSHB Ref: II M

Biological	L	Chemical	L	Driving	-	Electrical	L
Environmental	L	Gravity	M	Mechanical	H	Motion	H
Personal Safety	-	Pressure	L	Radiation	-	Sound	M

Hazard #1

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref: III AC, IV A

Overall Unmitigated Risk: HIGH — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Fall Protection Awareness Training Scaffold Awareness Training Competent Person Required (designated person) PPE (see HASP "PPE" section) Secondary: Job Briefing/Site Awareness 10 hr. Construction Training Specialized Equipment (specify below)

Enter Required Controls: **PPE (Hard Hat), Exclusion zone**

Hazard #2

Mechanical - Crushing - Injury by crushing body part in mechanical process

Suggested FHSHB Ref: III S IV, E, F, G, O,

Overall Unmitigated Risk: MEDIUM — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK Machine Guarding Inspections Site Awareness Operator Competency per Standard PPE (see HASP "PPE" section) Secondary: Field H&S Handbook (see ref. above) Work Plan WorkCare First Aid/CPR Training (designed person)

Enter Required Controls: **Exclusion zone**

Hazard #3

Motion - Struck by - Bodily injury from impact with moving object

Suggested FHSHB Ref: III S

Overall Unmitigated Risk: HIGH — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Site Awareness Engineering Controls (specify below) Secondary: Field H&S Handbook (see ref. above) Job Briefing/Site Awareness H&S Standards

Enter Required Controls: **PPE (Hard Hat), Exclusion zone**

Hazard #4

Sound - Noise - Injury or illness due to noise exposure

Suggested FHSHB Ref: III L

Overall Unmitigated Risk: MEDIUM — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Admin. Controls (specify below) PPE (see HASP "PPE" section) Medical Surveillance Secondary: H&S Standards Field H&S Handbook (see ref. above) WorkCare

Enter Required Controls: **Hearing protection**

Hazard #5

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #6

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

If you need to list more hazards for this task, unhide "Extended Hazard Analsyis".

Hazard Analysis

Task 2:	Monitor well - Well installation, development, or purging contractor oversight

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low) — Suggested FHSHB Ref: III F

Biological	L	Chemical	L	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	L	Motion	L
Personal Safety	-	Pressure	L	Radiation	-	Sound	M

Hazard #1

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref: III AC, IV A

Overall Unmitigated Risk: HIGH — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Fall Protection Awareness Training Scaffold Awareness Training Competent Person Required (designated person) PPE (see HASP "PPE" section) Secondary: Job Briefing/Site Awareness 10 hr. Construction Training Specialized Equipment (specify below)

Enter Required Controls: **PPE (Hard Hat), Exclusion zone**

Hazard #2

Sound - Noise - Injury or illness due to noise exposure

Suggested FHSHB Ref: III L

Overall Unmitigated Risk: MEDIUM — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Admin. Controls (specify below) PPE (see HASP "PPE" section) Medical Surveillance Secondary: H&S Standards Field H&S Handbook (see ref. above) WorkCare

Enter Required Controls: **Hearing protection**

Hazard #3

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #4

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #5

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #6

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

If you need to list more hazards for this task, unhide "Extended Hazard Analsyis".

Hazard Analysis

Task 3:	Sampling - Soil sampling using split spoons or continuous sampling tool

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low) — Suggested FHSHB Ref: III F

Biological	L	Chemical	L	Driving	-	Electrical	L
Environmental	L	Gravity	M	Mechanical	H	Motion	H
Personal Safety	L	Pressure	L	Radiation	-	Sound	H

Hazard #1

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref: III AC, IV A

Overall Unmitigated Risk: HIGH — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Fall Protection Awareness Training Scaffold Awareness Training Competent Person Required (designated person) PPE (see HASP "PPE" section) Secondary: Job Briefing/Site Awareness 10 hr. Construction Training Specialized Equipment (specify below)

Enter Required Controls: **PPE (Hard Hat), Exclusion zone**

Hazard #2

Mechanical - Crushing - Injury by crushing body part in mechanical process

Suggested FHSHB Ref: III S IV, E, F, G, O,

Overall Unmitigated Risk: MEDIUM — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK Machine Guarding Inspections Site Awareness Operator Competency per Standard PPE (see HASP "PPE" section) Secondary: Field H&S Handbook (see ref. above) Work Plan WorkCare First Aid/CPR Training (designed person)

Enter Required Controls: **Exclusion zone**

Hazard #3

Motion - Struck by - Bodily injury from impact with moving object

Suggested FHSHB Ref: III S

Overall Unmitigated Risk: HIGH — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Site Awareness Engineering Controls (specify below) Secondary: Field H&S Handbook (see ref. above) Job Briefing/Site Awareness H&S Standards

Enter Required Controls: **PPE (Hard Hat), Exclusion zone**

Hazard #4

Sound - Noise - Injury or illness due to noise exposure

Suggested FHSHB Ref: III L

Overall Unmitigated Risk: MEDIUM — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Admin. Controls (specify below) PPE (see HASP "PPE" section) Medical Surveillance Secondary: H&S Standards Field H&S Handbook (see ref. above) WorkCare

Enter Required Controls: **Hearing protection**

Hazard #5

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #6

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

If you need to list more hazards for this task, unhide "Extended Hazard Analysis".

Hazard Analysis

Task 4:	Decontamination - Small or hand-held objects using manual methods

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low) — Suggested FHSHB Ref: III G

Biological	L	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	L	Mechanical	-	Motion	L
Personal Safety	L	Pressure	L	Radiation	-	Sound	L

Hazard #1

Chemical - liquids, skin or eye irritation/damage/allergy

Suggested FHSHB Ref: III C, F, G, K, S, AG

Overall Unmitigated Risk: MEDIUM — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK HASP JSAs PPE (see HASP "PPE" section) See HASP "Monitoring" section Secondary: Job Briefing/Site Awareness Hazcom Training SDS (see also HASP Hazcom/GHS section) Client Training/Briefing Specialized Equipment (specify below) WorkCare

Enter Required Controls: **PPE (Nitrile gloves, safety glasses)**

Hazard #2

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #3

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #4

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #5

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #6

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

If you need to list more hazards for this task, unhide "Extended Hazard Analysis".

Hazard Analysis

Task 5:	Mobilization - Site set up and take down

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low) — Suggested FHSHB Ref: III F

Biological	-	Chemical	L	Driving	-	Electrical	L
Environmental	L	Gravity	M	Mechanical	L	Motion	I
Personal Safety	L	Pressure	L	Radiation	L	Sound	L

Hazard #1

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref: III AC, IV A

Overall Unmitigated Risk: HIGH — Mitigated Risk: LOW if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Fall Protection Awareness Training Scaffold Awareness Training Competent Person Required (designated person) PPE (see HASP "PPE" section) Secondary: Job Briefing/Site Awareness 10 hr. Construction Training Specialized Equipment (specify below)

Enter Required Controls: **PPE (Hard Hat), Exclusion zone**

Hazard #2

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #3

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #4

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #5

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

Hazard #6

None

Suggested FHSHB Ref: None

Overall Unmitigated Risk: Not Ranked — Mitigated Risk: Not Ranked if utilizing:

Controls that should be Considered: Primary: Secondary:

Enter Required Controls:

If you need to list more hazards for this task, unhide "Extended Hazard Analysis".

Hazard Communication (HazCom)/Global Harmonization System (GHS)

☐ HAZCOM/GHS for this project is managed by the client or general contractor

List the chemicals anticipated to be used by Arcadis on this project per HazCom/GHS requirements.
(Modify quantities as needed)

	Preservatives	Qty
☐	Not applicable	
☑	Hydrochloric acid	<500 ml
☐	Nitric acid	<500 ml
☐	Sulfuric acid	<500 ml
☐	Sodium hydroxide	<500 ml
☐	Zinc acetate	<500 ml
☐	Ascorbic acid	<500 ml
☐	Acetic acid	<500 ml
☐	Isopropyl alcohol	< 4 gal.
☐	Formalin (<10%)	< 4 gal.
☑	Methanol	<500 ml
☐	Sodium bisulfate	<500 ml

	Decontamination	Qty
☐	Not applicable	
☑	Alconox	≤ 5 lbs
☐	Liquinox	≤ 1 gal
☐	Acetone	≤ 1 gal
☐	Methanol	≤ 1 gal
☐	Hexane	≤ 1 gal
☑	Isopropyl alcohol	≤ 4 gal
☐	Nitric acid	≤ 1 L
☐	Other:	

	Calibration	Qty.
☐	Not applicable	
☑	Isobutylene/air	1 cyl
☐	Methane/air	1 cyl
☐	Pentane/air	1 cyl
☐	Hydrogen/air	1 cyl
☐	Propane/air	1 cyl
☐	Hydrogen sulfide/air	1 cyl
☐	Carbon monoxide/air	1 cyl
☑	pH standards (4,7,10)	≤ 1 gal
☑	Conductivity standards	≤ 1 gal
☐	Other:	

	Fuels	Qty.
☑	Not applicable	
☐	Gasoline	≤ 5 gal
☐	Diesel	≤ 5 gal
☐	Kerosene	≤ 5 gal
☐	Propane	1 cyl
☐	Other:	

	Kits	Qty.
☑	Not applicable	
☐	Hach (specify):	1 kit
☐	DTECH (specify):	1 kit
☐	Other:	1 kit

	Remediation	Qty.
☑	Not applicable	
☐		
☐		
☐		
☐		
☐		

	Other:	Qty.
☐	Not applicable	
☑	Spray paint	≤ 6 cans
☐	WD-40	≤ 1 can
☐	Pipe cement	≤ 1 can
☐	Pipe primer	≤ 1 can
☐	Mineral spirits	≤ 1 gal
☐		

DOT(1):	Qty.
MOT eligible soils	
MOT eligible water	
MOT eligible solids	
MOT eligible liquids	

(1) Attach applicable Materials of Trade (MOT) generic shipping determination. SDS not generally applicable to this category.

Safety Data Sheets (SDSs) must be available to field staff. Indicate below how SDS information will be provided:

- ☐ Not applicable
- ☐ Printed copy in company vehicle
- ☐ Printed copy in the project trailer/office
- ☑ Printed copy attached
- ☐ Electronic copy on field computer

- ☐ Contractor SDSs are not applicable
- ☐ Contractor SDSs are attached
- ☐ Contractor SDSs will be on site and located:

☐ Bulk quantities of the following materials will be stored:

Contact the project H&S contact for information in determining code and regulatory requirements associated with bulk storage of materials.

Monitoring

☐ Chemical air monitoring is not required for this project or is the responsibility of contractor.

For projects requiring air monitoring, list the relevant constituents representing a hazard to site workers.

Constituent	Max. Conc.	Units	TWA	Units	STEL	Units	IDLH	Units	LEL/UEL (%)	RGD Air=1	IP (eV)
Benzene	10	ppm	0.5	p	2.5	p	500	p,N	1.2/7.8	NA	9.24
Ethylbenzene	10	ppm	20	p	125	p	800	p,N	0.8/6.7	NA	8.76
Toluene	10	ppm	20	p	150	p,N	500	p,N	1.1/7.1	NA	8.82
Xylenes	10	ppm	100	p	150	p	900	p,N	1.1/7.0	NA	8.44
None			9999	-	0	-	0	-	0	0	0
None			9999	-	0	-	0	-	0	0	0

Notes: TWAs are ACGIH 8 hr.-TLVs unless noted.

p-ppm m-mg/m3
s- skin c-ceiling
r- respirable i-inhalable
c2- ceiling (2 hr.) se-sensitizer
"9999" - NA O-OSHA PEL
N-NIOSH 10 hr. REL
A - Arcadis specific TWA*
"#N/A"-Manually enter

Monitoring Equipment and General Protocols

Air monitoring is required for any task or activity where employees have potential exposure to vapors or particulates above the TWA. Action levels below are appropriate for most situations. Contact the project H&S contact for all stop work situations. Select monitoring frequency and instruments to be used.

Monitoring Frequency: 15 Minute intervals
Indicator Tube/Chip Frequency: Indicator tube/chip monitoring not required

	Instrument	Action Levels			Actions
☑	Photoionization Detector		<	1.892	Continue work
		1.892	-	3.784	Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
	Lamp (eV): 10.6		>	3.784	Sustained >5 min. stop work, contact SSO
☐	Flame Ionization Detector (FID)		<	0.0	Continue work
		0.0	-	0.0	Sustained >5 min. continuous monitor, review eng. controls and PPE, use caution
			>	0.0	Sustained >5 min. stop work, contact SSO
☐	LEL/O2 Meter	0-5% LEL			Continue work
		>5-10% LEL			Continuous monitor, review eng. controls, proceed with caution
		>10% LEL			Stop work, evacuate, contact SSO
		19.5%-23.5% O2			Normal, continue work
		<19.5% O2			O2 deficient, stop work, evacuate, cont. SSO
		>23.5% O2			O2 enriched, stop work, evacuate, contact
☐	Indicator: ☐ tube ☐ chip	≤PEL/TLV			Continue work
		>PEL/TLV			Stop work, review eng. controls and PPE, contact SSO
	Compound(s):				
☑	Particulate Monitor		<	1.5	Continue work
	(mists, aerosols, dusts in mg/m^3)	1.5	-	3.000	Use engineering controls, monitor continuous
			>	3.000	Stop work, review controls, contact SSO
☐	Other:	Specify:			Specify:

* Arcadis administrative TWAs ensure mixture component TWAs are not exceeded that would require additional monitoring or medical surveillance.

Personal Protective Equipment (PPE)

See JSA or Permit for the task being performed for required PPE. *If work is not conducted under a JSA or Permit, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for all tasks during field work (outside of field office trailers and vehicles) not covered by a JSA or Permit on this project:*

Minimum PPE required to be worn by all staff on project:

							Specify Type:
☑	Hard hat	☐	Snake chaps/guards	☐	Coveralls:		
☑	Safety glasses	☐	Briar chaps	☐	Apron:		
☐	Safety goggles	☐	Chainsaw chaps	☑	Chem. resistant gloves:		Nitrile
☐	Face shield	☐	Sturdy boot	☑	Gloves other:		Leather
☑	Hearing protection	☑	Steel or comp. toe boot	☐	Chemical boot:		
☐	Rain suit	☐	Metatarsal boot	☐	Boot other:		
☐	Other:			☑	Traffic vest, shirt or coat:		Class II
				☐	Life vest:		

Task specific PPE: Nitrile gloves will be used during soil and water sampling and hearing protection will be used during the installation of soil borings, or as needed.

Comments:

Medical Surveillance (*check all that apply*)

- ☐ Medical Surveillance is not required for this project.
- ☑ HAZWOPER medical surveillance applies to all Arcadis site workers on the project.
- ☐ HAZWOPER medical surveillance applies to all subcontractors on the project.
- ☐ HAZWOPER medical surveillance applies to all site workers on the project except:
- ☐ Other medical surveillance required (describe type and who is required to participate):
- ☐ Client drug and/or alcohol testing required.
- ☐ DOT drug and/or alcohol testing required.

Hazardous Materials Shipping and Transportation (*check all that apply*)

- ☐ Not applicable, no materials requiring a Shipping Determination (SD) will be transported or shipped
- ☐ A SD has been reviewed and provided to field staff
- ☑ A SD is attached
- ☐ All HazMat will be transported under Materials of Trade by Arcadis (see generic MOT SD Form)
- ☐ Other (specify):

Traffic Safety Plan (TSP) (*check all that apply*)

- ☐ Not applicable for this project
- ☐ All or portions of the work conducted under a Right-of-Way (ROW) TSP
- ☑ All or portions of the work conducted under a Non-ROW TSP
- ☐ TSP provided to field staff
- ☐ TSP attached
- ☐ Other (specify):

Arcadis Commercial Motor Vehicles (CMVs)

This section is applicable to Arcadis operated vehicles only *(select one)*

- ☑ This project will **not** utilize CMV drivers
- ☐ This project will utilize CMV drivers

This project will NOT utilize vehicles (alone or in combination with a trailer) with a gross vehicle weight rating (GVWR) of 10,001 pounds or more. GVWR Truck + GVWR Trailer = <10,001 pounds

Site Control (*check all that apply*)

- ☐ Not applicable for this project.
- ☐ Site control protocols are addressed in JSA or other supporting document (attach)
- ☑ Maintain an exclusion zone of 50 ft. around the active work area
- ☐ Site control is integrated into the TSP for the project
- ☐ Level C site control - refer to Level C Supplement attached
- ☐ Other (specify):

Decontamination (*check all that apply*)

- ☐ Not applicable for this project.
- ☐ Decontamination protocols are addressed in JSA or other governing document (attach)
- ☑ Wash hands and face prior to consuming food, drink or tobacco.
- ☑ Remove gloves and coveralls and contain, wash hands and face prior to consuming food, drink or tobacco. Ensure footwear is clean of site contaminants
- ☐ Respiratory protection- refer to the Level C supplement attached.
- ☐ Other (specify):

Sanitation *(check all that apply)*

- ☑ Mobile operation with access to off-site restrooms and potable water
- ☐ Restroom facilities on site provided by client or other contractor
- ☐ Project to provide portable toilets (1 per 20 workers)
- ☐ Potable water available on site
- ☐ Project to provide potable water (assume 1 gal./person/day)
- ☐ Project requires running water (hot and cold, or tepid) with soap and paper towels

Safety Briefings (*check all that apply*)

- ☑ Safety briefing required daily
- ☐ Safety briefing required twice a day
- ☐ Safety briefings required at the following frequency:
- ☑ Subcontractors to participate in Arcadis safety briefings
- ☐ Arcadis to participate in client/contractor safety briefings
- ☐ Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA or Permit for the task being performed. *If work is not performed under a JSA or Permit, the following safety equipment is required to be present on site in good condition (Check all that apply):*

- ☑ First aid kit
- ☐ Bloodborne pathogens kit
- ☑ Fire extinguisher
- ☐ Eyewash (ANSI compliant)
- ☑ Eyewash (bottle)
- ☑ Drinking water
- ☐ Other:
- ☐ Insect repellent
- ☑ Sunscreen
- ☐ Air horn
- ☑ Traffic cones
- ☐ 2-way radios
- ☐ Heat stress monitor

International Travel

☑ This project does not involve international travel
☐ This project involves international travel

Behavior Based Safety Program (*check all that apply*)

☑ TIP required at the following frequency on this project:
Select One: _____ mhrs 2 time(s) _____ Define: _____
☐ H&S Field Assessment required at the following frequency on this project:
Select One: _____ mhrs _____ time(s) _____ Define: _____
☐ Other (specify):

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

Printed Name	Signature	Date

Add additional sheets if necessary

You have an absolute right to STOP WORK if unsafe conditions exist!

Attachment A
Traffic Safety Plan

Traffic Safety Plan (TSP)

Notes: ROW - Right of Way (Public) formly known as "TCP"
Non-ROW - Not in the ROW (parking lots, etc) formerly known as "STAR"

1.0 General

Plan type	Non-Right of Way (Non-ROW)
Project Name:	Dansville Former MGP Site
Project Number:	B0013135
Developer Name:	Nicholas Beyrle
Duration of Project (in hours or days):	8 hrs
Time Restrictions (Y/N, if Y descibe below):	No
Not Applicable	
Not Applicable	
Not Applicable	NA
Not Applicable	
Not Applicable	NA

☐ Working on multiple roads?

Comments:

2.0 Work Description

Provide a brief description of scope of work:

Installation of soil borings and monitoring wells and groundwater sampling

3.0 Type and Duration

Work locations on this project will be: Intermediate work (1-8 hours per location)

Non-ROW work will be performed in: Closed parking lot

Special traffic conditions may include (select most prevalent): Not applicable

4.0 Traffic Control Layout, Number of Devices Required and Phasing

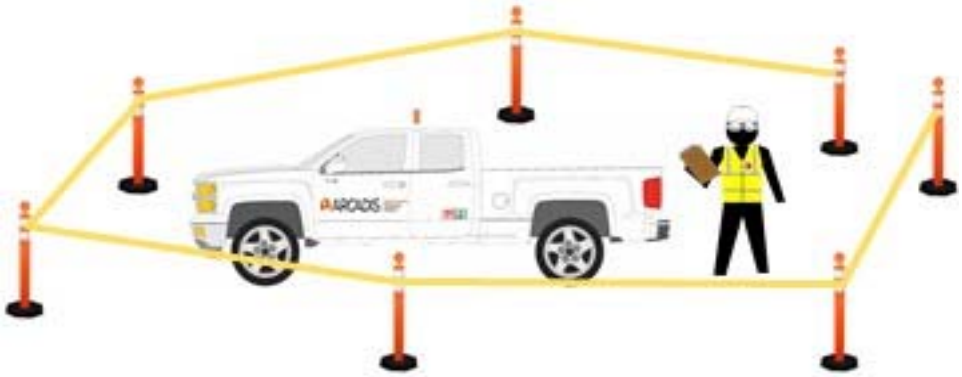
The following Non-ROW requirements in the Traffic Safety Handbook applies:

Section 7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

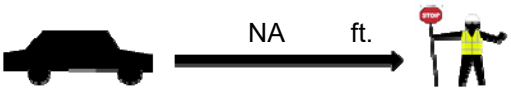
The menu below will be blank and is not applicable.

The menu below will be blank and is not applicable.

Non-ROW configuration:
An example non-ROW traffic control configuration for this project is illustrated below. The actual type and number of devices required are specified below. Don't leave vehicle doors open. Don't establish controls within 25 ft of the front or rear of parked large vehicles/rolling equipment without coordinating with the vehicle/equipment operator.



Intermediate Term (1-8 Hours)
Channelizing Cones with Caution Tape

ROW minumum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts.	ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop.
A NA ft. B NA ft. C NA ft.	 NA ft.

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

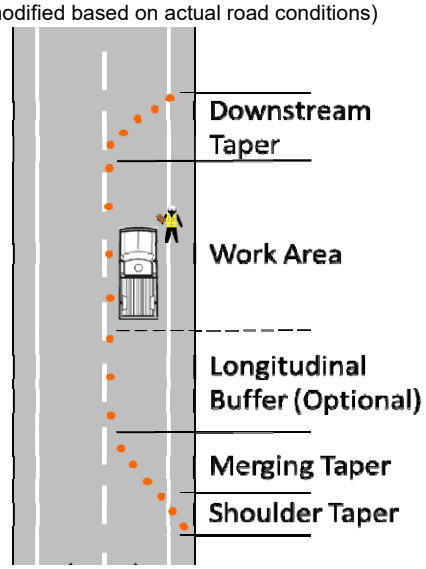
Active work area length (feet)	20
☐ Apply Optional Longitudinal Buffer (ft)?	0
Lane width of offset (feet)	12
Shoulder width of offset (feet)	8
Posted speed limit	NA

☐ **Shoulder Taper**

Taper Length (feet)	NA
Cones Required	NA
Cones Spacing (max., ft)	NA

☐ **Merging Taper**

Taper Length (feet)	NA
Cones Required	NA
Cones Spacing (max., ft)	NA



☐ **Work Area**

Cone Spacing (max., ft)	NA
Cones Required	NA

☐ **Downstream Taper**

Taper Length (feet)	NA
Cones Required	NA
Cone Spacing (max., ft)	NA

Cones Required (minimum) NA

Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.

Select the traffic control devices to be used and enter number each required:

Check all that apply:	*Wording or Pictogram*	*Number:*
☐ Warning signs		
☐ Warning signs		
☐ Warning signs		
☐ Stop/Slow paddle		
☐ Red flag		
☐ Drums		
☐ Channelizer cone (42 inch height, 10 lb base)		
☐ Channelizer cone (42 inch height, 30 lb base)		
☐ Traffic cones (≥ 18 inches tall)		NA
☐ Barricade ☐ Type I ☐ Type II		
☐ Flags for cones		
☐ Lights (for night work)		
☐ Plastic fencing (rolls)		
☐ Caution tape (rolls)		
☐ Other (specify):		

Non-ROW Phasing:

1) Position truck as shield, if practical

2) Deploy traffic control devices

3) Affix flags, caution tape or fencing

4) Unload project equipment

5) Commence work

6) SSO to maintain controls

7) Remove controls in reverse order

Reviewed By:

HASP Reviewer: _____

Attachment B
Safety Data Sheets

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **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**

GHS05 corrosion

Eye Dam. 1; H318: Causes serious eye damage.

GHS07

Skin Irrit. 2; H315: Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

Xi; Irritant

R38-41: Irritating to skin. Risk of serious damage to eyes.

· **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.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

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· **Hazard pictograms**

GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate
· **Hazard statements**
H315: Causes skin irritation.
H318: Causes serious eye damage.
· **Precautionary statements**
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see on this label).
P362: Take off contaminated clothing and wash before reuse.
P332+P313: If skin irritation occurs: Get medical advice/attention.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
· **Hazard description:**
· **WHMIS-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
Fire = 0
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

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3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**

CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	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**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant 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.

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· **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.
· **Additional information:** No further relevant information available.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **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**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **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:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s):** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

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· **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 skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**


Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**


Safety glasses

· **Body protection:** Protective work clothing

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9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20 °C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20 °C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

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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 acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid:** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **On the skin:** Irritant 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
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability:** No further relevant information available.
· **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil:** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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· **vPvB:** Not applicable.
· **12.6 Other adverse effects:** No further relevant 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, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)** · **DOT, ADR, IMDG, IATA, ICAO** · **Class**	Not Regulated
· **14.4 Packing group** · **DOT, ADR, IMDG, IATA, ICAO**	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

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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 ingredients is listed.
· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.
· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients is listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.
· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	Sodium Carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **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**
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.

R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (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)

Material Safety Data Sheet Collection
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Isopropyl Alcohol
ISO5300

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isopropyl Alcohol **CAS Number:** 67-63-0
Chemical Formula: C_3H_8O
Structural Chemical Formula: $(CH_3)_2CHOH$
EINECS Number: 200-661-7
ACX Number: X1001458-1
Synonyms: ALCOJEL; ALCOOL ISOPROPILICO; ALCOOL ISOPROPYLIQUE; ALCOSOLVE; ALCOSOLVE 2; AVANTIN; AVANTINE; CHROMAR; COMBI-SCHUTZ; (COMPONENT OF) HIBISTAT; DIMETHYL CARBINOL; DIMETHYLCARBINOL; EPA PESTICIDE CHEMICAL CODE 047501; HARTOSOL; 2-HYDROXYPROPANE; IMSOL A; IPA; ISOHOL; ISOPROPANOL; ISOPROPYL ALCOHOL; ISO-PROPYLALKOHOL; LUTOSOL; 1-METHYLETHANOL; 1-METHYLETHYL ALCOHOL; PETROHOL; PRO; 2-PROPANOL; I-PROPANOL; N-PROPAN-2-OL; PROPAN-2-OL; PROPOL; 2-PROPYL ALCOHOL; I-PROPYL ALCOHOL; SEC-PROPYL ALCOHOL; I-PROPYLALKOHOL; SECONDARY PROPYL ALCOHOL; SPECTRAR; STERISOL HAND DISINFECTANT; TAKINEOCOL; VISCO 1152
Derivation: Treating propylene with sulfuric acid and then hydrolyzing or direct hydration of propylene using superheated steam. Most commonly available as rubbing alcohol (70% IPA).
General Use: As a solvent for gums, shellac, and essential oils, chemical intermediate, dehydrating agent, vehicle for germicidal compounds, de-icing agent for liquid fuels; for denaturing ethyl alcohol, preserving pathological specimens; in extraction of alkaloids, quick-drying inks and oils, and an ingredient of skin lotions, cosmetics, window cleaner, liquid soaps, and pharmaceuticals.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Isopropyl alcohol	67-63-0	100% vol.

Most commonly sold as 70% isopropyl alcohol (rubbing alcohol).

OSHA PEL
TWA: 400 ppm; 980 mg/m^3.

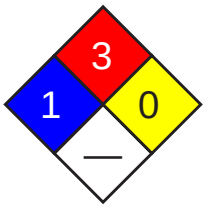
NIOSH REL
TWA: 400 ppm (980 mg/m^3); STEL: 500 ppm (1225 mg/m^3).

DFG (Germany) MAK
TWA: 200 ppm; PEAK: 400 ppm.

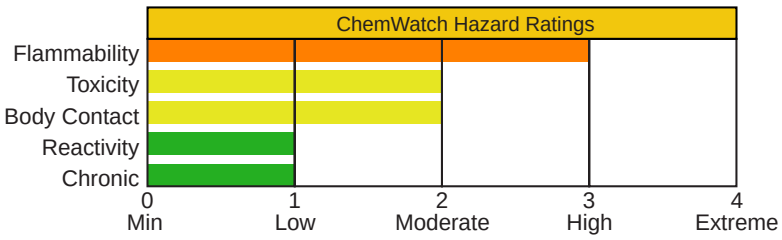
ACGIH TLV
TWA: 200 ppm; STEL: 400 ppm.

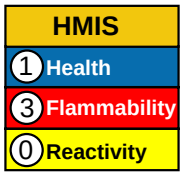
IDLH Level
2000 ppm (10% LEL).

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Volatile liquid. Irritating to eyes/respiratory tract. Other Acute Effects: CNS depression, possible dermatitis, systemic toxicity. Flammable

Potential Health Effects

Target Organs: Eyes, skin, respiratory system.
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption.

Acute Effects

Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations. Volunteers exposed to 400 ppm for 3 to 5 min experienced mild eye and respiratory irritation. At 800 ppm, irritation was not severe, but most people found the air uncomfortable to breathe.

Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.

Skin: Some irritation may occur after prolonged exposure.

Ingestion: Accidental ingestions have provided the most information on isopropyl alcohol toxicity. Symptoms include nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur. One post-mortem examination in a case of heavy ingestion showed extensive hemorrhagic tracheobronchitis, broncho pneumonia, and hemorrhagic pulmonary edema. Death can occur in 24 to 36 h post-ingestion due to respiratory paralysis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.

Chronic Effects: Repeated skin contact can cause drying of skin and delayed hypersensitivity reactions in some individuals.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be contraindicated because of the rapid onset of central nervous system depression. Gastric lavage is preferred.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Diagnostic test: acetone in urine. Isopropyl alcohol is oxidized in the body to acetone where it is excreted by the lungs or kidneys. Some acetone may be further metabolized to acetate, formate, and finally carbon dioxide. Probable oral lethal dose is 240 mL.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: 53 °F (12 °C), Closed Cup

Burning Rate: 2.3 mm/min.

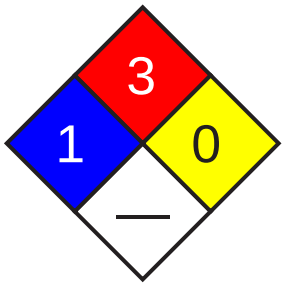
Autoignition Temperature: 750°F (399°C)

LEL: 2 % v/v

UEL: 12.7 % v/v at 200 °F

Flammability Classification: Class 1B Flammable Liquid

Extinguishing Media: Carbon dioxide, dry chemical, water *spray* (solid streams can spread fire), alcohol- resistant foam, or fog.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Carbon oxides and acrid smoke. Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Isopropyl alcohol poses an explosion hazard indoors, outdoors, and in sewers.

Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Water spray may reduce vapor, but may not prevent ignition in closed spaces.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.

Large Spills: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using isopropyl alcohol, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec 10). Install electrical equipment of Class 1, Group D.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around IPA. Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, kidneys, and respiratory system. Be extra cautious when using IPA concurrently with carbon tetrachloride because animal studies have shown it enhances carbon tetrachloride's toxicity.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Nitrile rubber (breakthrough time > 8 hr), Neoprene and Teflon (breakthrough time > 4 hr) are suitable materials for PPE. Do not use PVA, PVC or natural rubber (breakthrough time < 1 hr). Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powered, air purifying respirator with organic vapor cartridges or any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). For < 10,000 ppm, use any supplied-air respirator (SAR) operated in continuous-flow mode. For < 12,000 ppm, use any air- purifying, full facepiece respirator (gas mask) with a chin-style, front-or back-mounted organic vapor canister or any SCBA or SAR with a full facepiece. For emergency or entrance into unknown concentrations, use any SCBA or SAR (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove isopropyl alcohol from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless with a slight odor and bitter taste.

Physical State: Liquid
Odor Threshold: 7.84 to 490 mg/m^3
Vapor Pressure (kPa): 44 mm Hg at 25 °F (77 °C)
Formula Weight: 60.09
Density: 0.78505 at 68°F (20 °C)
Refractive Index: 1.375 at 68 °F (20 °C)
Boiling Point: 180.5 °F (82.5 °C)
Freezing/Melting Point: -129.1 °F (-89.5 °C)
Viscosity: 2.1 cP at 77 °F (25 °C)
Surface Tension: 20.8 dyne/cm at 77 °F (25 °C)
Ionization Potential (eV): 10.10 eV
Critical Temperature: 455 °F (235 °C)
Critical Pressure: 47 atm
Water Solubility: > 10 %
Other Solubilities: Soluble in alcohol, ether, chloroform, and benzene. Insoluble in salt solutions.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Isopropyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.

Storage Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable peroxides), trinitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, aluminum triisopropoxide, and oxidizers. Will attack some forms of plastic, rubber, and coatings.

Hazardous Decomposition Products: Thermal oxidative decomposition of isopropyl alcohol can produce carbon oxides and acrid smoke.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 5045 mg/kg caused a change in righting reflex, and somnolence (general depressed activity).

Human, oral, TD_{Lo}: 223 mg/kg caused hallucinations, distorted perceptions, lowered blood pressure, and a change in pulse rate.

Human, oral, LD_{Lo}: 3570 mg/kg caused coma, respiratory depression, nausea, and vomiting.

Irritation Effects:

Rabbit, eye: 100 mg caused severe irritation.

Rabbit, skin: 500 mg caused mild irritation.

Other Effects:

Rat, inhalation: 3500 ppm/7 hr given from 1 to 19 days of pregnancy caused fetotoxicity.

See *RTECS* NT8050000, for additional data.

Section 12 - Ecological Information

Environmental Fate: On soil, IPA will volatilize or leach into groundwater. Biodegradation is possible but rates are not found in available literature. It will volatilize (est. half-life = 5.4 days) or biodegrade in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days. Because it is soluble, removal by rain, snow or other precipitation is possible.

Ecotoxicity: Guppies (*Poecilia reticulata*) LC_{50} = 7,060 ppm/7 days; fathead minnow (*Pimephales promelas*) LC_{50} = 11,830 mg/L/1 hr. BOD = 133 %/5 days.

Octanol/Water Partition Coefficient: log K_{ow} = 0.05

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing isopropyl alcohol to acetone by members of the genus *Desulfovibrio*. Spray waste into incinerator (permit-approved facilities only) equipped with an afterburner and scrubber. Isopropyl alcohol can be settled out of water spills by salting with sodium chloride. Note: Salt may harm aquatic life, so weigh the benefits against possible harm before application. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Triple rinse containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Isopropanol *or* Isopropyl alcohol
ID: UN1219
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isobutene **CAS Number:** 115-11-7
Chemical Formula: C_4H_8
Structural Chemical Formula: $(CH_3)_2C=CH_2$
EINECS Number: 204-066-3
ACX Number: X1003822-9
Synonyms: Isobutene; ISOBUTYLENE; ASYM-DIMETHYLETHYLENE; GAMMA-BUTYLENE; 1,1-DIMETHYLETHYLENE; ISO-BUTENE; ISOBUTENE; ISOPROPYLIDENEMETHYLENE; LIQUEFIED PETROLEUM GAS; 2-METHYL-1-PROPENE; 2-METHYLPROPENE; 2-METHYLPROPYLENE; 1-PROPENE,2-METHYL-; PROPENE,2-METHYL-; UNSYM. DIMETHYLETHYLENE
General Use: Production of butene polymers used as adhesives, tackifiers, oil additives.
Butyl rubbers, copolymer resins with butadiene, acrylates and methacrylates.
Also to produce anti-oxidants for foods, food supplements, plastics and in production of isooctane and high-octane aviation gasoline.
Used in closed pressurized systems, fitted with safety relief valve.
Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

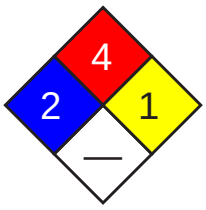
Section 2 - Composition / Information on Ingredients

Name	CAS	%
isobutene	115-11-7	>99

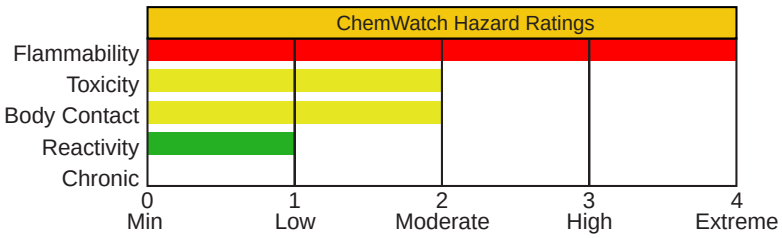
OSHA PEL **NIOSH REL**

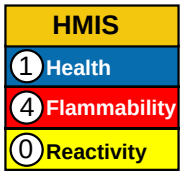
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas. Acute Effects: Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

Potential Health Effects

Target Organs: None reported
Primary Entry Routes: inhalation
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and is harmful if exposure is prolonged and inhalation may cause loss of consciousness.

Acute effects from inhalation of high concentrations of gas / vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated atmosphere of gas is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.
Iso-butene is a simple asphyxiant and may have a narcotic action.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Hydrocarbons may sensitize the heart to adrenalin and other circulatory catecholamines; as a result cardiac arrhythmias and ventricular fibrillation may occur. Abrupt collapse may produce traumatic injury.
Central nervous system (CNS) depression may be evident early. Symptoms of moderate poisoning may include giddiness, headache, dizziness and nausea.
Serious poisonings may result in respiratory depression and may be fatal.
The paraffin gases C1-4 are practically non-toxic below their lower flammability limits (18000-50000 ppm). Above this level, incidental effects include CNS depression and irritation but these are reversible upon cessation of the exposure. The C3 and iso-C5 hydrocarbons show increasing narcotic properties; branching of the chain also enhances the effect.
The C4 hydrocarbons appear to be more highly neurotoxic than the C3 and C5 members. Several fatalities due to voluntary inhalation of butane have been reported, possibly due to central, respiratory and circulatory effects resulting from anesthesia, laryngeal edema, chemical pneumonia or the combined effects of cardiac toxicity and increased sympathomimetic effects.
Inhalation of petroleum gases may produce narcosis, due in part to olefinic impurities. Displacement of oxygen in the air may cyanosis.
If present in sufficient quantity these gases may reduce the oxygen level to below 18% producing asphyxiation.
Symptoms include rapid respiration, mental dullness, lack of coordination, poor judgement, nausea and vomiting.
The onset of cyanosis may lead to unconsciousness and death.

Eye: The liquid is highly discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The gas is regarded as non-irritating to the eyes.

Skin: Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.The liquid is discomforting to the skin and may rapidly cause severe cold burns.
Bare unprotected skin should not be exposed to this material.
There is no evidence of skin absorption but contact may cause frostbite,

Ingestion: Overexposure is unlikely in this form.
Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting if swallowed and may cause severe cold burns.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic overexposure may produce dermatitis.

Section 4 - First Aid Measures

Inhalation: Avoid becoming a casualty and remove to fresh air.
Lay patient down. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.
If available, medical oxygen should be administered by trained personnel.
Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.
Do not apply hot water or radiant heat. Apply a clean, dry dressing.
Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

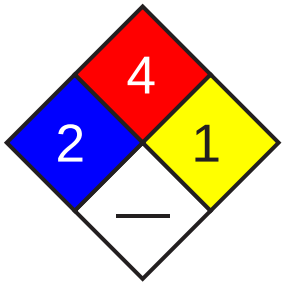
Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -76.111 °C
Autoignition Temperature: 465 °C
LEL: 1.8% v/v
UEL: 9.6% v/v
Extinguishing Media: Water spray or fog; dry chemical powder.
Carbon dioxide.
Foam.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Flammable gas. Liquid and vapor are highly flammable.
Dangerous hazard when exposed to heat, flame and oxidizers.
Gas may form explosive mixtures with air over a wide area.
Decomposes on heating and produces toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Do not extinguish burning gas. If safe to do so, stop flow of gas.
If flow of gas cannot be stopped, leave gas to burn.
Cool fire-exposed containers with water spray from a protected location.
Do not approach cylinders suspected to be hot.
If safe to do so, remove containers from path of fire.
Fight fire from a safe distance, with adequate cover.

Section 6 - Accidental Release Measures

Small Spills: Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut of all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to so do. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.

See DOT ERG

Large Spills: DO NOT touch the spill material. Shut off all possible sources of ignition and increase ventilation. Restrict access to area. Clear area of personnel and move upwind.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Avoid spraying water onto liquid pools.
Use extreme caution to avoid a violent reaction.
Stop leak if safe to do so.
DO NOT enter confined places where gas may have collected. Remove leaking cylinders to a safe place. Fit vent pipes. Release pressure under safe, controlled conditions by opening valve. Burn issuing gas at vent pipes.
Do not exert excessive pressure on valve; do not attempt to operate damaged valve.
Keep area clear of personnel until gas has dispersed
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Use in a well-ventilated area.

Obtain a work permit before attempting any repairs.
Do not attempt repair work on lines, vessels under pressure.
Atmospheres must be tested and O.K. before work resumes after leakage.
Wear protective clothing and gloves when handling containers.
No smoking, bare lights, heat or ignition sources.
Use spark-free tools when handling. Ground all lines and equipment.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Gas may travel a considerable distance to source of ignition.
Vapor may ignite on pumping or pouring due to static electricity.
Avoid physical damage to containers.
DO NOT transfer gas from one cylinder to another.
Natural gases contain a contaminant, radon-222, a naturally occurring radioactive gas. During subsequent processing, radon tends to concentrate in liquified petroleum streams and in product streams having similar boiling points.
Industry experience indicates that the commercial product may contain small amounts of radon-222 and its radioactive decay products (radon daughters). The actual concentration of radon-222 and radioactive daughters in process equipment (IE lines, filters, pumps and reactor units) may reach significant levels and produce potentially damaging levels of gamma radiation. A potential external radiation hazard exists at or near any pipe, valve or vessel containing a radon enriched stream or containing internal deposits of radioactive material. Field studies, however, have not shown that conditions exist that expose the worker to cumulative exposures in excess of general population limits. Equipment containing gamma-emitting decay products should be presumed to be internally contaminated with alpha- emitting decay products which may be hazardous if inhaled or ingested.
During maintenance operations that require the opening of contaminated process equipment, the flow of gas should be stopped and a four hour delay enforced to allow gamma-radiation to drop to background levels. Protective equipment (including high efficiency particulate respirators (P3) suitable for radionucleotides or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination or inhalation of any residue containing alpha-radiation.
Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Cylinder fitted with valve protector cap.
Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Cylinder valve must be closed when not in use or when empty.
Cylinder must be properly secured either in use or in storage.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated areaIf gas concentrations are high: or If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Used in closed pressurized systems; fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Protective gloves eg. leather gloves or gloves with leather facing. Neoprene rubber gloves.
Safety footwear.

Other: Operators should be trained in correct use & maintenance of respirators Ensure that there is ready access to breathing apparatus.
Protective overalls, closely fitted at neck and wrist. Eye-wash unit.
IN CONFINED SPACES:
1. Non-sparking protective boots.
2. Static-free clothing.
3. Ensure availability of lifeline.
Staff should be trained in all aspects of rescue work.
Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Easily liquified flammable gas or colorless highly volatile liquid. Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vaporization with generation of large volume of highly flammable / explosive gas. Strong gasoline odor. Floats and boils on water giving a flammable / explosive, visible cloud. Soluble in alcohol, ether, benzene and sulphuric acid.

Physical State: Liquefied gas
Odor Threshold: 1.3 to 3.0 mg/m^3
Vapor Pressure (kPa): 182 kPa at 10 °C
Vapor Density (Air=1): 2.01
Formula Weight: 56.11
Specific Gravity (H_2O=1, at 4 °C): 0.59
Evaporation Rate: Very rapid
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: -6.9 °C (20 °F)
Freezing/Melting Point: -140.35 °C (-220.63 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid contact with oxidizing agents.

The interaction of alkenes and alkynes with nitrogen oxides and oxygen may produce explosive addition products; these may form at very low temperatures and explode on heating to higher temperatures (the addition products from 1,3-butadiene and cyclopentadiene form rapidly at -150 °C and ignite or explode on warming to -35 to -15 C). These derivatives ("pseudo- nitrosites") were formerly used to characterize terpene hydrocarbons.

Exposure to air must be kept to a minimum so as to limit the build-up of peroxides which will concentrate in bottoms if the product is distilled.

The product must not be distilled to dryness if the peroxide concentration is substantially above 10 ppm (as active oxygen) since explosive decomposition may occur. Distillate must be immediately inhibited to prevent peroxide formation. The effectiveness of the antioxidant is limited once the peroxide levels exceed 10 ppm as active oxygen. Addition of more inhibitor at this point is generally ineffective.

Prior to distillation it is recommended that the product should be washed with aqueous ferrous ammonium sulfate to destroy peroxides; the washed product should be immediately re-inhibited.

A range of exothermic decomposition energies for double bonds is given as 40-90 kJ/mol. The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

Avoid reactions with oxidizing agents, organic acids, inorganic acids halogenated compounds, polymerizable esters, oxygen, cyanohydrins and molten sulphur.

Section 11 - Toxicological Information

Toxicity
Inhalation (rat) LC_{50}: 620000 mg/m^3/4h

Irritation
Nil reported

See *RTECS* UD 0890000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options.
Discharge to burning flare. Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Isobutylene *see also* Petroleum gases, liquefied
ID: UN1055
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: 19, T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:** 40

Shipping Name and Description: Petroleum gases, liquefied *or* Liquefied petroleum gas
ID: UN1075
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: CS7000-A, CS7000-B, CS7000-C, CS7000-D, CS7000-P, CS7000-Q, CS7000-G, CS7000-T
Product Identity: Conductivity Std., 7000 umho/cm

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 01/08/07
Revision Date: 06/05/08, 05/12/10, 02/19/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, colorless liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: Large doses may cause upset stomach.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Potassium Chloride, CAS# 7447-40-7, < 0.5% w/v
Water, purified, CAS# 7732-18-5, >99% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.
Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.

Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions Not relevant considering the small amounts used.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Potassium Chloride, CAS# 7447-40-7, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, colorless liquid
Odor: Odorless
Boiling Point: Approx 100.1C
Melting Point: Approx (-6)-0 C
Vapor Density: No Information Available
Evaporation Rate: No Information Available
pH: Not Available
Flammability: No Information Available
Solubility: Infinite
Relative Density: No Information Available
% Volatility: No Information Available
Specific Gravity: 1-1.01
Vapor Pressure: No Information Available
Flash Point: Not Applicable
Coefficient of water/oil distribution: Not Available
Odor Threshold: Not Available
Decomposition Temperature: No Information Available
Partition Coefficient n-octanol/water: No data available
Molecular Weight: Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials Strong Oxidizing agents, Lithium, Bromine, Trifluoride.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of Sodium and fumes of Chloride.
Hazardous Polymerization: Does not occur
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2
LD50 orl-rat: 3020 mg/kg LC50 inhalation-rat: Not Available
Irritation: No Information Available
Toxicologically Synergistic: No Information Available
Chronic Exposure

Carcinogenicity No Information Available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No Information Available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on the Canada DSL list.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: Not Applicable
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: BU5004-A, BU5004-B, BU5004-C, BU5004-D, BU5004-P, BU5004-Q, BU5004-G, BU5004-T

Product Identity: Buffer Solution, pH 4.00

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 12/28/06
Revision Date: 6/5/08, 02/25/10, 09/14/10, 02/19/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, reddish liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: May cause diarrhea, nausea, vomiting, and cramps.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Potassium Acid Phthalate, CAS# 877-24-7, <1% w/v
Water, purified, CAS# 7732-18-5, >98% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.

Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.
Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions No information available.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Potassium Acid Phthalate, CAS# 877-24-7, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, reddish liquid

Odor: Odorless	**% Volatility:** No Information Available
Boiling Point: Approx 100C	**Specific Gravity:** Approx 1
Melting Point: Approx 0 C	**Vapor Pressure:** No Information Available
Vapor Density: No Information Available	**Flash Point:** Not Applicable
Evaporation Rate: No Information Available	**Coefficient of water/oil distribution:** Not Available
pH: 4.0	**Odor Threshold:** Not Available
Flammability: No Information Available	**Decomposition Temperature:** No Information Available
Solubility: Infinite	**Partition Coefficient n-octanol/water:** No data available
Relative Density: No Information Available	**Molecular Weight:** Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials Nitric Acid.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of potassium and carbon.
Hazardous Polymerization: Does not occur
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2
LD50 orl-rat: 3200 mg/kg (Potassium Acid Phthalate) LC50 inhalation-rat: NA
Irritation: No Information Available
Toxicologically Synergistic: No Information Available

Chronic Exposure
Carcinogenicity No Information Available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No Information Available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on Canada's DSL list.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: Not Applicable
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: BU5010-A, BU5010-B, BU5010-C, BU5010-D, BU5010-P, BU5010-Q, BU5010-G, BU5010-T

Product Identity: Buffer Solution, pH 10.00

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 12/28/06
Revision Date: 6/5/08, 06/03/10, 02/19/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, blue liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: May cause diarrhea, nausea, vomiting, and cramps.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Sodium Bicarbonate, CAS# 144-55-8, <0.5% w/v
Sodium Carbonate, CAS# 497-19-8, <0.5% w/v
Water, purified, CAS# 7732-18-5, >99% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.

Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.
Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions No information available.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Sodium Bicarbonate, CAS# 144-55-8, ACGIH TLV: NA, OSHA PEL: NA
Sodium Carbonate, CAS# 497-19-8, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, blue liquid

Odor: Odorless
Boiling Point: Approx 100C
Melting Point: Approx 0 C
Vapor Density: No Information Available
Evaporation Rate: No Information Available
pH: 10.0
Flammability: No Information Available
Solubility: Infinite
Relative Density: No Information Available

% Volatility: No Information Available
Specific Gravity: Approx 1
Vapor Pressure: No Information Available
Flash Point: Not Applicable
Coefficient of water/oil distribution: Not Available
Odor Threshold: Not Available
Decomposition Temperature: No Information Available
Partition Coefficient n-octanol/water: No data available
Molecular Weight: Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials None identified.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of sodium.
Hazardous Polymerization: Does not occur
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2
LD50 orl-rat: 4090 mg/kg (Sodium Carbonate), 4220 mg/kg (Sodium Bicarbonate) LC50 inhalation-rat: NA
Irritation: No Information Available

Toxicologically Synergistic: No Information Available
Chronic Exposure
Carcinogenicity No Information Available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No Information Available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on Canada's DSL list.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: None Reported
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

Material Safety Data Sheet

Section 1 – Chemical Product and Company Identification

Catalog Numbers: BU5007-A, BU5007-B, BU5007-C, BU5007-D, BU5007-P, BU5007-Q, BU5007-G, BU5007-T

Product Identity: Buffer Solution, pH 7.00

Chemical Family: Not Applicable
Synonyms: Not Applicable
Recommended Use: Laboratory chemicals

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331, (866) 632-1291
Emergency Contact Number (24hr): Chemtel (800) 255-3924

Issue Date: 12/28/06
Revision Date: 06/24/09, 08/26/10, 02/19/12, 08/02/12

Section 2 – Hazard Identification

Emergency Overview: Non-flammable, non-corrosive, non-toxic. Does not present significant health hazards. Wash areas of contact with water.
Appearance: Clear, yellowish liquid **Odor:** Odorless
Target Organs: Eyes, skin
Potential Health Effects/ Routes of Exposure:
Eyes: May cause slight irritation.
Skin: May cause slight irritation.
Ingestion: May cause diarrhea, nausea, vomiting, and cramps.
Inhalation: Not likely to be a hazard.
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)
Aggravated Medical Conditions No information available
These chemicals are not considered hazardous by OSHA.
See section 11 for toxicological information. See section 12 for potential environmental effects.

Section 3 – Composition, Information on Ingredients

Sodium Hydroxide, CAS# 1310-73-2, <1% v/v
Potassium Phosphate, Monobasic, CAS# 7778-77-0, <1% w/v
Sorbic Acid, CAS# 110-44-1, <1% w/v
Water, purified, CAS# 7732-18-5, >99% w/v

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Get medical assistance immediately.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: DO NOT induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
Notes to Physician Treat symptomatically.

Section 5 – Fire Fighting Measures

Flash Point: Not Applicable **Autoignition Temperature:** No information available.
Explosion Limits Upper No data available **Lower** No data available
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Unsuitable Extinguishing Media: No information available

Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.
Fire Fighting Instructions / Equipment: Use normal procedures. Use protective clothing. Use NIOSH-approved breathing equipment.
Hazardous Combustion Products: No information Available
Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.
Specific Hazards Arising from the Chemical: No information available
NFPA Rating: (estimated) Health: 1; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
Environmental Precautions No information available.
Methods for Containment and Clean Up Absorb with suitable material. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage.

Section 8 – Exposure Controls, Personal Protection

Sodium Hydroxide, CAS# 1310-73-2, ACGIH TLV: 2 mg/m3, OSHA PEL: 2mg/m3
Potassium Phosphate, Monobasic, CAS# 7778-77-0, ACGIH TLV: NA, OSHA PEL: NA
Sorbic Acid, CAS# 110-44-1, ACGIH TLV: NA, OSHA PEL: NA
Water, purified, CAS# 7732-18-5, ACGIH TLV: NA, OSHA PEL: NA

Engineering Measures/ General Hygiene: Normal ventilation is adequate. Ensure eyewash and safety showers are available.
Personal Protection Equipment: Skin Protection: Chemical resistant gloves.
Eye/Face Protection: Safety Glasses or goggles. **Respiratory Protection:** Normal ventilation is adequate

Section 9 – Physical and Chemical Properties

Appearance/Physical State: Clear, yellow liquid
Odor: Odorless
Boiling Point: Approx 100C
Melting Point: Approx 0 C
Vapor Density: No Information Available
Evaporation Rate: No Information Available
pH: 7.0
Flammability: No Information Available
Solubility: Infinite
Relative Density: No Information Available
% Volatility: No Information Available
Specific Gravity: Approx 1
Vapor Pressure: No Information Available
Flash Point: Not Applicable
Coefficient of water/oil distribution: Not Available
Odor Threshold: Not Available
Decomposition Temperature: No Information Available
Partition Coefficient n-octanol/water: Not Available
Molecular Weight: Not available

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatible Materials None identified.
Conditions to Avoid: No Information Available.
Hazardous Decomposition Products: Oxides of phosphorus.
Hazardous Polymerization: Does not occur.
Hazardous Reactions: None under normal processing.

Section 11 – Toxicological Information

Routes of Exposure/Symptoms/Corrosiveness – See Section 2

LD50 orl-rat: 1350mg/kg (Sodium Hydroxide) 1700mg/kg (Potassium Phosphate, Monobasic)
LC50 inhalation-rat: NA
Irritation: No Information Available.
Toxicologically Synergistic: No information available.
Chronic Exposure
Carcinogenicity No information available
Sensitization No information available.
Mutagenic Effects No information available.
Reproductive Effects No information available.
Developmental Effects (Immediate/Delayed) No information available.
Teratogenicity No information available.
Other Adverse Effects No information available.
Endocrine Disruptor Information No information available

Section 12 – Ecological Information

Ecotoxicity: Not Available.
Persistence and Degradability: No Information Available **Mobility:** No Information Available
Bioaccumulation/ Accumulation: No Information Available

Section 13 – Disposal Considerations

Waste Disposal/Waste Disposal of Packaging: Dilute with water.
All chemical waste generators must determine whether a discarded chemical is classified as hazardous waste. Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT - Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
Canada DSL: These chemicals are listed on Canada's DSL list.
TSCA: These chemicals are listed on the TSCA Inventory.
SARA Title III Section 313: Not Applicable
RCRA Status: Not Applicable
CERCLA Reportable Quantity: Sodium Hydroxide – 1000lb
WHMIS: Not Applicable.
This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR

Section 16 – Additional Information

Disclaimer: The information on this MSDS applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for his own particular use. No warranty is implied regarding the accuracy of the data or the results to be obtained from the products use.

RUST-OLEUM CORP -- LABOR SAVER MARKING PAINTS, 2533 -- 8010-00N021794

========== Product Identification ==========

Product ID:LABOR SAVER MARKING PAINTS, 2533
MSDS Date:09/29/1987
FSC:8010
NIIN:00N021794
MSDS Number: BLRYV
=== Responsible Party ===
Company Name:RUST-OLEUM CORP
Address:11 HAWTHORN PARKWAY
City:VERNON HILLS
State:IL
ZIP:60061
Country:US
Info Phone Num:312-367-7700
Emergency Phone Num:312-864-8200
Preparer's Name:MJS
CAGE:08882
=== Contractor Identification ===
Company Name:RUST-OLEUM CORP
Address:11 HAWTHORN PARKWAY
Box:City:VERNON HILLS
State:IL
ZIP:60061-1583
Country:US
Phone:847-367-7700
CAGE:08882

========== Composition/Information on Ingredients ==========

Ingred Name:PROPANE
CAS:74-98-6
RTECS #:TX2275000
Fraction by Wt: 16-18%
OSHA PEL:1000 PPM
ACGIH TLV:ASPHYXIANT; 9192

Ingred Name:PROPANE, 2-METHYL-; (ISOBUTANE). VP: 40 PSIA. LEL: 1.9%
CAS:75-28-5
RTECS #:TZ4300000
Fraction by Wt: 10-12%

Ingred Name:TITANIUM DIOXIDE
CAS:13463-67-7
RTECS #:XR2275000
Fraction by Wt: 0-8%
OSHA PEL:15 MG/M3 TDUST
ACGIH TLV:10 MG/M3 TDUST; 9293

Ingred Name:SUPP DATA:CAUSE BLINDNESS IF INGESTED.
RTECS #:9999999ZZ

Ingred Name:METHYL ALCOHOL (METHANOL) (SARA III)
CAS:67-56-1
RTECS #:PC1400000
Fraction by Wt: 0-4%
OSHA PEL:S,200PPM/250STEL
ACGIH TLV:S,200PPM/250STEL; 93
EPA Rpt Qty:5000 LBS
DOT Rpt Qty:5000 LBS

Ingred Name:TOLUENE (SARA III)
CAS:108-88-3
RTECS #:XS5250000
Fraction by Wt: 0-18%
OSHA PEL:200 PPM/150 STEL
ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:HEXANE (N-HEXANE)
CAS:110-54-3
RTECS #:MN9275000
Fraction by Wt: 6-10%
OSHA PEL:500 PPM

ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:XYLENES (O-,M-,P- ISOMERS) (SARA III)
CAS:1330-20-7
RTECS #:ZE2100000
Fraction by Wt: 5-20%
OSHA PEL:100 PPM/150 STEL
ACGIH TLV:100 PPM/150STEL;9192
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:ETHYLENE GLYCOL (SARA III)
CAS:107-21-1
RTECS #:KW2975000
Fraction by Wt: 0-4%
OSHA PEL:C 50 PPM
ACGIH TLV:C 50 PPM,VAPOR; 9192
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:VM&P NAPHTHA. VP: 2 @ 20C. LEL: 0.9%
CAS:64742-89-8
Fraction by Wt: 1-3%
OSHA PEL:300 PPM;400 PPM STEL
ACGIH TLV:300 PPM

========== Hazards Identification ==========

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.
Routes of Entry: Inhalation:YES Skin:NO Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:(ACUTE) INHAL: ANESTHETIC, IRRIT OF RESP TRACT/ACUTE NERV SYS DEPRESS CHARACT BY HDCH, DIZZ, STAG, CONFUSN, UNCON/ COMA. SKIN/EYE: PRIMARY IRRITANT WHICH DEFATS SKIN & CAN LEAD TO DERMAT W/ RPTD OVERE XP. INGEST: GI IRRIT, NAUS, VOMIT & DIARR. (CHRONIC) RPTS HAVE SHOWN RPTD & PRLNGD OCCUP OVEREXP TO (SEE EFTS OF OVEREXP
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:HLTH HAZ: SOLV W/PERM BRAIN & NERV SYS DMG. OVEREXP TO XYLOL & TOLUENE IN LAB ANIMALS HAS SHOWN LIVER, KIDNEY, SPLEEN & EYE DMG AS WELL AS ANEMIA. IN HUMANS, OVEREXP HAS BEEN FOUND TO CAUSE LIVER & CA RDIAC ABNORMALITIES. OVEREXP TO HEXANE IN HIGH VAP CONC (1000-1500 PPM) OVER A PERIOD OF SEV MONTHS HAS BEEN (SUPP DATA)
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:INHAL: REMOVE FROM EXPOS, RESTORE BRTHG & NOTIFY MD. EYE: FLUSH IMMED W/LRG AMTS OF WATER FOR AT LEAST 15 MIN. NOTIFY MD. SKIN: WASH AFFECTED AREA W/SOAP & WATER, REMOVE CONTAM CLTHG & WASH BEFORE REU SE. WASH HANDS BEFORE EATING/SMOKING. INGEST: DO NOT INDUCE VOMIT. KEEP PERSON WARM, QUIET & GET MD. ASPIR OF MATL IN LUNGS CAN CAUSE CHEM PNEUM WHICH CAN BE FATAL.

========== Fire Fighting Measures ==========

Flash Point Method:TCC
Flash Point:<0F,<-18C
Lower Limits:SEE INGRED
Extinguishing Media:NFPA CLASS B EXTINGUISHERS (CO2, DRY CHEMICAL OR FOAM).
Fire Fighting Procedures:WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP . WATER SPRAY MAY BE INEFFECTIVE. WATER MAY BE USED TO COOL CLSD CNTNRS TO PVNT PRESS BUILDUP (SUPP DATA)
Unusual Fire/Explosion Hazard:KEEP CNTNRS TIGHTLY CLSD. ISOLATE FROM HEAT, ELEC EQUIP, SPARKS & OPEN FLAME. CLSD CNTNRS MAY EXPLODE WHEN EXPSD TO EXTREME HEAT. DO NOT APPLY TO HOT SURFACES.

========== Accidental Release Measures ==========

Spill Release Procedures:REMOVE ALL SOURCES OF IGNITION, VENTILATE AREA AND REMOVE WITH INERT ABSORBENT AND NONSPARKING TOOLS.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:DO NOT STORE ABOVE 120F. DO NOT PUNCTURE.
Other Precautions:INTENTIONAL MISUSE BY DELIBERATELY CONCENTRATING AND INHALING CONTENTS CAN BE HARMFUL OR FATAL.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH/MSHA APPROVED CHEMICAL CARTRIDGE RESPIRATOR (TC23C) TO REMOVE SOLID AIRBORNE PARTICLES OF OVERSPRAY AND ORGANIC VAPORS DURING SPRAY APPLICATION. IN CONFINED AREAS: USE NIOSH/MSHA APPROVED SU PPLIED-AIR RESPIRATOR OR HOODS (TC19C).
Ventilation:PROVIDE GENERAL OR LOCAL EXHAUST VENT IN VOLUME & PATTERN TO KEEP TLV OF MOST HAZ INGREDS BELOW ACCEPTABLE LIMIT.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:CHEMICAL WORKERS GOGGLES .
Other Protective Equipment:NONE SPECIFIED BY MANUFACTURER.
Work Hygienic Practices:WASH HANDS BEFORE EATING OR SMOKING.
Supplemental Safety and Health
FIRE FIGHT PROC: AND POSSIBLE AUTOIGNITION OR EXPLOSION. IF WATER IS USED, FOG NOZZLES ARE PREFERRED. EFTS OF OVEREXP: SHOWN TO CAUSE PERIPHERAL POLYNEUROPATHY WHICH HAS THE POTENTIAL OF BECOMING IRRE VERSIBLE. OVEREXP TO METHYL ALCOHOL HASBEEN SHOWN TO AFFECT CNS, ESPECIALLY OPTIC NERVE. MAY BE FATAL OR (SEE ING 10)

========== Physical/Chemical Properties ==========

HCC:F2
Boiling Pt:B.P. Text:<0F,<-18C
Vapor Pres:SEE INGRED
Vapor Density:HVR/AIR
Evaporation Rate & Reference:SLOWER THAN ETHER
Appearance and Odor:NONE SPECIFIED BY MANUFACTURER.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:BY OPEN FLAME - CO AND CO2.

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSE OF ACCORDING TO LOCAL, STATE AND FEDERAL REGULATIONS. DO NOT INCINERATE CLOSED CONTAINERS.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Methanol
MET1440

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Methanol **CAS Number:** 67-56-1
Chemical Formula: CH_4O
Structural Chemical Formula: CH_3OH
EINECS Number: 200-659-6
ACX Number: X1001287-2
Synonyms: ALCOHOL,METHYL; ALCOOL METHYLIQUE; ALCOOL METILICO; CARBINOL; X-CIDE 402 INDUSTRIAL BACTERICIDE; COAT-B1400; COLONIAL SPIRIT; COLONIAL SPIRITS; COLUMBIAN SPIRIT; COLUMBIAN SPIRITS; EPA PESTICIDE CHEMICAL CODE 053801; EUREKA PRODUCTS CRIOSINE DISINFECTANT; EUREKA PRODUCTS,CRIOSINE; FREERS ELM ARRESTER; IDEAL CONCENTRATED WOOD PRESERVATIVE; METANOL; METANOLO; METHANOL; METHYL ALCOHOL; METHYL HYDRATE; METHYL HYDROXIDE; METHYLALKOHOL; METHYLOL; METYLOWY ALKOHOL; MONOHYDROXYMETHANE; PMC REJEX-IT F-40ME; PYROLIGNEOUS SPIRIT; PYROXYLIC SPIRIT; PYROXYLIC SPIRITS; SURFLO-B17; WILBUR-ELLIS SMUT-GUARD; WOOD ALCOHOL; WOOD NAPHTHA; WOOD SPIRIT
Derivation: Prepared by wood pyrolysis; non-catalytic oxidation of hydrocarbons; as a by-product in the fisher-tropsch synthesis; or by reduction of carbon monoxide.
General Use: Used as an industrial solvent; starting material for organic synthesis; antifreeze for windshield washer fluid; in fuel antifreezes; gasoline octane booster; fuel for stoves; extractant for oils; denaturing ethanol; softening agent; food additive; in paint, varnish removers, and embalming fluids; in the manufacture of photographic film, celluloid, textile soap, wood stains, coated fabrics, shatterproof glass, paper coating, waterproofing formulations, artificial leather, dyes.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Methanol	67-56-1	ca 100% vol

Trace Impurities: (Grade A): Acetone and aldehydes < 30 ppm, acetic acid < 30 ppm

OSHA PEL
TWA: 200 ppm; 260 mg/m^3.

ACGIH TLV
TWA: 200 ppm; STEL: 250 ppm; skin.

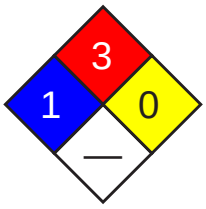
EU OEL
TWA: 260 mg/m^3 (200 ppm).

NIOSH REL
TWA: 200 ppm (260 mg/m^3); STEL: 250 ppm (325 mg/m^3); skin.

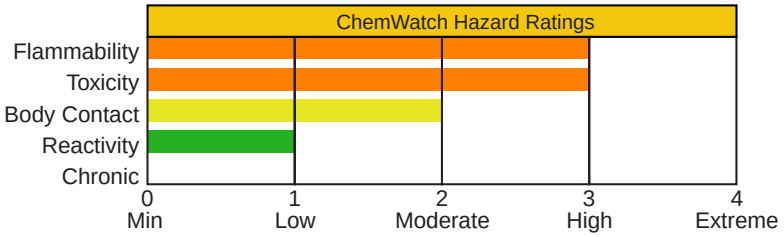
IDLH Level
6000 ppm.

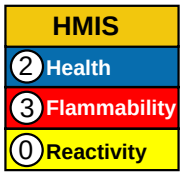
DFG (Germany) MAK
TWA: 200 ppm; PEAK: 800 ppm; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; slight alcohol odor when pure or disagreeably pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: headache, visual disturbance, blindness, respiratory failure. Chronic Effects: reproductive effects reported in animal testing. Flammable; moderate explosion hazard.

Potential Health Effects

Target Organs: Eyes, skin, central nervous system (CNS), gastrointestinal (GI) tract, respiratory system
Primary Entry Routes: Inhalation, ingestion, skin and/or eye contact/absorption
Acute Effects
Inhalation: Irritation, breathing difficulty, headache, drowsiness, vertigo, light-headedness, nausea, vomiting, acidosis (decreased blood alkalinity), visual disturbance, and at high concentrations, CNS damage, convulsions, circulatory collapse, respiratory failure, coma and blindness can result from inhalation of methanol vapor. Concentration >= 200 ppm may cause headache; 50,000 ppm can cause death within 1-2 hrs.
Eye: Contact with liquid may result in irritation, inflamed lids, light sensitization, and superficial lesions.
Skin: Contact may cause irritation, dermatitis, swelling, scaling, and systemic effects.
Ingestion: GI irritation and systemic effects. Symptoms may be delayed 18-48 hours. Fatal dose - 2 to 8 ounces.
Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Chronic Effects: Exposure to methanol vapors has caused conjunctivitis, headache, giddiness, insomnia, GI disturbance, impaired vision. CNS damage is also likely. Methanol is slowly eliminated from the body; exposure is considered cumulative over the short term.

Section 4 - First Aid Measures

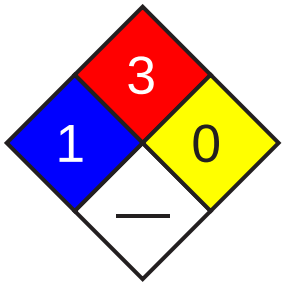
See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develops.
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Follow emesis with rehydration, correction of acidosis, and folate to enhance formate oxidation. Consider IV administration of ethanol (if blood methanol >20 mg/dL) to show metabolic oxidation of methanol. Assay formic acid in urine, blood pH and plasma bicarbonate.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: 54 °F (12 °C), Closed Cup
Burning Rate: 1.7 mm/min
Autoignition Temperature: 867 °F (464 °C)
LEL: 6.0% v/v
UEL: 36% v/v
Flammability Classification: OSHA Class IB Flammable Liquid.
Extinguishing Media: Use dry chemical, carbon dioxide, water spray, fog or alcohol-resistant foam. A water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.
General Fire Hazards/Hazardous Combustion Products: Heating methanol to decomposition can produce carbon oxides (CO_x), formaldehyde, acrid smoke, and irritating fumes. Can form explosive mixtures in the air. The heavier-than-air vapors of methanol may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.



Fire Diamond

Fire-Fighting Instructions: *Do not* scatter material with any more water than needed to extinguish fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Isolate spill area for at least 330-660 feet (100-200 m) in all directions. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors.
Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.

Use clean non-sparking tools to collect absorbed material.

Large Spills: Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves, goggles, and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

Regulatory Requirements: Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class 1B Flammable Liquids.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Enclose operations and/or provide local explosion-proof exhaust ventilation at the site of chemical release. Where possible, transfer methanol from drums or other storage containers to process containers. Minimize sources of ignition in surrounding areas.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets of butyl rubber, Teflon, Viton, Saranex, 4H, Responder, Trellchem HPS, or Tychem 10000 (Breakthrough Time (BT) >8 hr) to prevent skin contact. Natural rubber, neoprene, nitrile rubber, polyethylene, polyvinyl alcohol and CPF 3 may degrade after contact and are not recommended. Wear splash-proof chemical safety goggles, and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/ NIOSH-approved respirator. For concentrations <= 2000 ppm, use a supplied air respirator; <= 5000 ppm, supplied air (SA) respirator in continuous flow mode; <= 6000 ppm, SA respirator with tight-fitting face mask operated in continuous flow mode, or SCBA with full facepiece, or SA respirator with full facepiece; > IDLH/unknown/emergency, SCBA with full facepiece operated in pressure-demand or other positive-pressure mode, or SA respirator with full facepiece operated in pressure-demand or other positive-pressure mode in combination with auxiliary SCBA operated in pressure-demand or other positive-pressure mode. For escape, use an appropriate escape-type SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen- deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless; slight alcohol odor when pure, disagreeably pungent odor when crude.

Physical State: Liquid

Odor Threshold: 13.1150 to 26840 mg/m^3

Vapor Pressure (kPa): 127 mm Hg at 77 °F (25 °C)

Vapor Density (Air=1): 1.11

Bulk Density: 6.59 lbs/gal at 68 F (20 °C)

Formula Weight: 32.04

Density: 0.796 g/mL at 59 °F (15 °C)

Specific Gravity (H_2O=1, at 4 °C): 0.81 at 0 °C/4 °C

Refractive Index: 1.3292 at 68 °F (20 °C)

pH: Slightly acidic

Boiling Point: 148 °F (64.7 °C) at 760 mm Hg

Freezing/Melting Point: -144.04 °F (-97.8 °C)

Viscosity: 0.614 mPa sec

Surface Tension: 22.61 dynes/cm

Ionization Potential (eV): 10.84 eV

Water Solubility: Miscible

Other Solubilities: Ethanol, acetone, benzene, chloroform, DMSO, ether, ketones, most organic solvents.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Methanol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Vapor inhalation, oxidizers.

Storage Incompatibilities: Include beryllium dihydride, metals (potassium, magnesium), oxidants (barium perchlorate, bromine, chlorine, hydrogen peroxide, sodium hypochlorite, phosphorus trioxide), potassium tertbutoxide, carbon tetrachloride and metals, chloroform and heat, diethyl zinc, alkyl aluminum salts, acetyl bromide, chloroform and sodium hydroxide, cyanuric chloride, nitric acid, chromic anhydride, lead perchlorate.

Hazardous Decomposition Products: Thermal oxidative decomposition of methanol can produce carbon oxides (CO_x), formaldehyde, acrid smoke, and irritating fumes.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 5628 mg/kg.

Human, oral, LD_{Lo}: 428 mg/kg produced toxic effects: behavioral - headache; lungs, thorax, or respiration - other changes.

Human, oral, LD_{Lo}: 143 mg/kg produced optic nerve neuropathy, dyspnea, nausea or vomiting.

Acute Inhalation Effects:

Rat, inhalation, LC_{50}: 64000 ppm/4 hr.

Human, inhalation, TC_{Lo}: 300 ppm produced visual field changes, headache; lungs, thorax, or respiration - other changes.

Acute Skin Effects:

Rabbit, skin, LD_{50}: 15800 mg/kg.

Monkey, skin, LD_{Lo}: 393 mg/kg.

Irritation Effects:

Rabbit, standard Draize test: 100 mg/24 hr resulted in moderate irritation.

Rabbit, standard Draize test: 20 mg/24 hr resulted in moderate irritation.

Other Effects:

Rat, oral: 10 µmol/kg resulted in DNA damage.

Rat, inhalation: 50 mg/m^3/12 hr/13 weeks intermittently produced degenerative changes to brain and coverings; muscle contraction or spasticity.

Rat, inhalation: 2610 ppm/6 hr/4 weeks intermittently produced toxic effects: endocrine - changes in spleen weight.

Multiple Dose Toxicity Effects - Rat, oral: 12 g/kg/8 weeks intermittently produced toxic effects: behavioral - ataxia; behavioral - alteration of operant conditioning.

Human, lymphocyte: 300 mmol/L resulted in DNA inhibition.

Rat (female), oral: 7500 mg/kg, administered during gestational days 17-19 produced effects on newborn - behavioral.

Rat (female), oral: 35295 mg/kg administered during gestational days 1-15 produced effects on the fertility index; pre implantation mortality; and post-implantation mortality.

Rat (female), inhalation: 20000 ppm/7 hr, administered during gestational days 1-22 produced specific developmental abnormalities - musculoskeletal system; cardiovascular (circulatory) system; urogenital system.

Rat (male), oral: 200 ppm/20 hr, 78 weeks prior to mating produced paternal effects - testes, epididymis, sperm duct.

See *RTECS* PC1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Bioconcentration (BCF, estimated at 0.2) is not expected to be significant. Physical removal from air can occur via rainfall. Relatively rapid evaporation from dry surfaces is likely to occur. If released to the atmosphere, it degrades via reaction with photochemically produced hydroxyl radicals with an approximate half-life of 17.8 days. If released to water or soil, biodegradation is expected to occur. A low K_{oc} indicates little sorption and high mobility in the soil column.

Ecotoxicity: Trout, LC_{50}: 8,000 mg/L/48 hr; *Pimephales promelas* (fathead minnow) LC_{50}: 29.4 g/L/96 hr.

Henry's Law Constant: 4.55 $x10^{-6}$ atm-m^3/mole at 77 °F (25 °C)

Octanol/Water Partition Coefficient: log K_{ow} = -0.77

Soil Sorption Partition Coefficient: K_{oc} = 0.44

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Methanol
ID: UN1230
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols: + I

Label Codes: 3 - Flammable Liquid, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB2, T7, TP2
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:** 40

Shipping Name and Description: Methanol
ID: UN1230
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols: D - Domestic transportation

Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T7, TP2
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U154 Ignitable Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Nitric Acid **CAS Number:** 7697-37-2
Chemical Formula: HNO_3
Structural Chemical Formula: HNO_3
EINECS Number: 231-714-2
ACX Number: X1002177-5
Synonyms: ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRICACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)
General Use: Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.
Used for etching and cleaning metals.
Operators should be trained in procedures for safe use of this material.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95

OSHA PEL
TWA: 2 ppm; 5 mg/m^3.

ACGIH TLV
TWA: 2 ppm; STEL: 4 ppm.

EU OEL
STEL: 2.6 mg/m^3 (1 ppm).

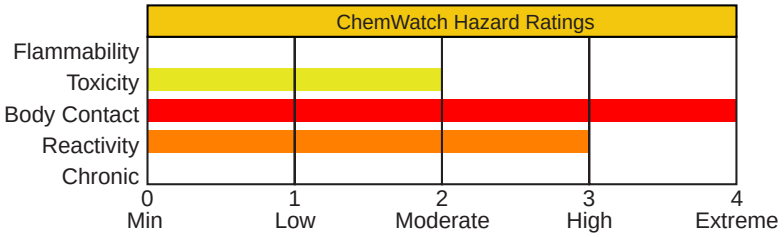
NIOSH REL
TWA: 2 ppm (5 mg/m^3); STEL: 4 ppm (10 mg/m^3).

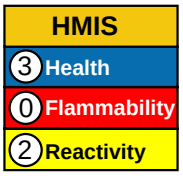
IDLH Level
25 ppm.

DFG (Germany) MAK
TWA: 2 ppm; PEAK: 2 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear to yellow fuming liquid; acrid, suffocating odor. Corrosive. Other Acute Effects: lung damage. Chronic Effects: tooth erosion, bronchitis. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, teeth
Primary Entry Routes: inhalation, ingestion, skin contact, eye contact
Acute Effects
Inhalation: The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods.
Inhalation hazard is increased at higher temperatures.
Reactions may occur following a single acute exposure or may only appear after repeated exposures.

Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.
Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.
Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.
Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

Eye: The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.
The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce moderate eye irritation leading to inflammation.
Repeated or prolonged exposure to irritants may produce conjunctivitis.
Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

Skin: The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.
Bare unprotected skin should not be exposed to this material.
The vapor is highly discomforting to the skin.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.
Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Immediately transport to hospital or doctor. DO NOT delay.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Immediately transport to hospital or doctor. DO NOT delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.
3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

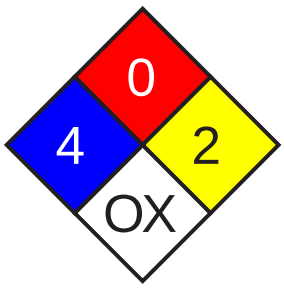
1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.
Heating may cause expansion or decomposition leading to violent rupture of containers.
Heat affected containers remain hazardous.
Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.
May emit irritating, poisonous or corrosive fumes.
Decomposes on heating and produces toxic fumes of nitrogen oxides (NO_x) and nitric acid.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.
Reacts vigorously with water and alkali.
Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H_2S) as ignition may result.
Reacts with metals producing flammable/explosive hydrogen gas.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
Extinguishers should be used only by trained personnel.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
If fire gets out of control withdraw personnel and warn against entry.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Dangerous levels of nitrogen oxides may form during spills of nitric acid.
Wear fully protective PVC clothing and breathing apparatus.
Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.
Use soda ash or slaked lime to neutralize.

See DOT ERG

Large Spills: DO NOT touch the spill material. Restrict access to area.
Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials.
NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.
Use spark-free and explosion-proof equipment.
Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.
Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.
Avoid smoking, bare lights or ignition sources.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Stainless steel drum. Check that containers are clearly labeled.
Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.

Wear safety footwear or safety gumboots, e.g. Rubber.

Respiratory Protection:

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Other: Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

Glove Selection Index:

BUTYL ..... Best selection
HYPALON ..... Best selection
NEOPRENE..... Best selection
NEOPRENE/NATURAL..... Best selection
PE/EVAL/PE ..... Best selection
SARANEX-23 ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
PVC..... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to slightly yellow liquid. Sharp strong odor.
CAUTION: exothermic dilution hazard.
HIGHLY CORROSIVE. Corrosive to most metals. Powerful oxidizing agent.
Darkens to brownish color on aging and exposure to light.

Physical State: Liquid
Odor Threshold: 0.75 to 2.50 mg/m^3
Vapor Pressure (kPa): 8.26
Vapor Density (Air=1): 1.5
Formula Weight: 63.02
Specific Gravity (H_2O=1, at 4 °C): 1.3-1.42
pH: < 1

pH (1% Solution): 1
Boiling Point: 83 °C (181 °F) at 760 mm Hg
Freezing/Melting Point: -42 °C (-43.6 °F)
Volatile Component (% Vol): 100 (nominal)
Decomposition Temperature (°C): Not applicable
Water Solubility: Soluble in all proportions

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 430 mg/kg
Inhalation (rat) LC_{50}: 2500 ppm/1 hr
Unreported (man) LD_{Lo}: 110 mg/kg

Irritation

Nil reported

See *RTECS* QU 5775000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC_{50} Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC_{50} Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC_{50} Cockle 330-1000 mg/l/48 hr /Aerated water conditions

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Nitric acid *other than red fuming, with more than 70 percent nitric acid*

ID: UN2031
Hazard Class: 8 - Corrosive material
Packing Group: I - Great Danger
Symbols:
Label Codes: 8 - Corrosive, 5.1 - Oxidizer
Special Provisions: B47, B53, T10, TP2, TP12, TP13
Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 2.5 L
Vessel Stowage: **Location:** D **Other:** 44, 66, 89, 90, 110, 111

Shipping Name and Description: Nitric acid *other than red fuming, with not more than 70 percent nitric acid*

ID: UN2031
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: B2, B47, B53, IB2, T8, TP2, TP12
Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** D **Other:**

Shipping Name and Description: Nitric acid, red fuming

ID: UN2032
Hazard Class: 8 - Corrosive material
Packing Group: I - Great Danger
Symbols: + - Override definitions
Label Codes: 8 - Corrosive, 5.1 - Oxidizer, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: 2, B9, B32, B74, T20, TP2, TP12, TP13, TP38, TP45
Packaging: **Exceptions:** None **Non-bulk:** 227 **Bulk:** 244
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

SAFETY DATA SHEET

1. Identification

Product identifier: HYDROCHLORIC ACID

Other means of identification

Synonyms: Muriatic Acid, Hydrogen Chloride, Aqueous

Product No.: 9385, 9538, 9165, V226, V187, V078, V001, 6900, 2624, 2515, H999, H987, H616, 5861, 2062, 5814, 2626, 2612, 5800, 9625, 5587, 9551, 9544, 9539, 9535, 9530, 9529, 5367, H613, 37825, 25496, 20620, 9553

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Details of the supplier of the safety data sheet

Manufacturer

Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034

Telephone: Customer Service: 855-282-6867

Fax: 610-573-2610
Contact Person: Environmental Health & Safety
E-mail: info@avantormaterials.com

Emergency telephone number:
CHEMTREC: 1-800-424-9300 within US and Canada

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metals	Category 1

Health Hazards

Acute toxicity (Oral)	Category 4
Skin Corrosion/Irritation	Category 1
Serious Eye Damage/Eye Irritation	Category 1
Specific Target Organ Toxicity - Single Exposure (Inhalation - vapor)	Category 3

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: May be corrosive to metals.
Harmful if swallowed.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

Precautionary Statements

Prevention: Keep only in original container. Wash thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product.

Response: Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in corrosive resistant container with a resistant inner liner.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
HYDROCHLORIC ACID		7647-01-0	20 - 40%

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

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing If breathing is difficult, give oxygen.

Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
Eye contact:	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms:	Causes severe skin and eye burns. Harmful if swallowed.

Indication of immediate medical attention and special treatment needed

Treatment:	Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards:	No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media:	None known.
Specific hazards arising from the chemical:	Fire or excessive heat may produce hazardous decomposition products.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Ventilate closed spaces before entering them. Keep unauthorized personnel away. Evacuate area. Keep upwind. See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Methods and material for containment and cleaning up:	Neutralize with lime or soda ash. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.
Notification Procedures:	Inform authorities if large amounts are involved.
Environmental Precautions:	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not eat, drink or smoke when using the product. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use caution when adding this material to water.

Conditions for safe storage, including any incompatibilities: Keep container tightly closed. Store in a well-ventilated place. Unsuitable containers: metals.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	type	Exposure Limit Values	Source
HYDROCHLORIC ACID	Ceiling	2 ppm	US. ACGIH Threshold Limit Values (2011)
	Ceil_Time	5 ppm 7 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	Ceiling	5 ppm 7 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	5 ppm 7 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	Ceiling	2 ppm	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (01 2015)
	TWA PEL	0.3 ppm 0.45 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (01 2015)

Appropriate Engineering Controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing and gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin.

9. Physical and chemical properties

Appearance

Physical state:	liquid
Form:	liquid
Color:	Colorless
Odor:	Pungent
Odor threshold:	No data available.
pH:	0.1 (1 N aqueous solution)
Melting point/freezing point:	-35 °C
Initial boiling point and boiling range:	48 °C
Flash Point:	not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	14.1 kPa
Vapor density:	No data available.
Relative density:	1.18 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Avoid contact with strong reducing agents. Strong oxidizing agents. Contact with alkalis.
Incompatible Materials:	Amines. Alkalies. Metals. Reducing agents. Oxidizing agents.
Hazardous Decomposition Products:	Chlorine. hydrogen chloride By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	Causes severe burns.
Skin Contact:	Causes severe skin burns.

Eye contact: Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: ATEmix (Rat): 581 mg/kg

Dermal
Product: No data available.

Specified substance(s):
HYDROCHLORIC ACID — LD 50 (Mouse): 1,449 mg/kg

Inhalation
Product: No data available.

Specified substance(s):
HYDROCHLORIC ACID — LC 50 (Mouse, 1 h): 1108 ppm
LC 50 (Rat, 1 h): 3124 ppm

Repeated dose toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation
Product: Causes serious eye damage.

Respiratory or Skin Sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure
Product: None known.

Aspiration Hazard
Product: Not classified

Other effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
HYDROCHLORIC ACID LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 282 mg/l Mortality

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
HYDROCHLORIC ACID LC 50 (Green or European shore crab (Carcinus maenas), 48 h): 240 mg/l Mortality
LC 50 (Common shrimp, sand shrimp (Crangon crangon), 48 h): 260 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: Expected to be readily biodegradable.

BOD/COD Ratio
Product: No data available.

Bioaccumulative Potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: Large amounts of the product may affect the acidity (pH-factor) in water with possible risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number:	UN 1789
UN Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es)	
Class(es):	8
Label(s):	8
Packing Group:	II
Marine Pollutant:	Not a Marine Pollutant
Special precautions for user:	–

IMDG

UN Number:	UN 1789
UN Proper Shipping Name:	HYDROCHLORIC ACID
Transport Hazard Class(es)	
Class(es):	8
Label(s):	8
EmS No.:	F-A, S-B
Packing Group:	II
Marine Pollutant:	Not a Marine Pollutant
Special precautions for user:	–

IATA

UN Number:	UN 1789
Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es):	
Class(es):	8
Label(s):	8
Marine Pollutant:	Not a Marine Pollutant
Packing Group:	II
Special precautions for user:	–

15. Regulatory information

US Federal Regulations

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

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

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	5000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Acute (Immediate)

SARA 302 Extremely Hazardous Substance

Chemical Identity	Reportable quantity	Threshold Planning Quantity
HYDROCHLORIC ACID	5000 lbs.	500 lbs.

SARA 304 Emergency Release Notification

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	5000 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
HYDROCHLORIC ACID	500lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
HYDROCHLORIC ACID	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	Reportable quantity: 5000 lbs.

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

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	15000 lbs
HYDROCHLORIC ACID	5000 lbs

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

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

Chemical Identity
HYDROCHLORIC ACID

US. Massachusetts RTK - Substance List

Chemical Identity
HYDROCHLORIC ACID

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
HYDROCHLORIC ACID

US. Rhode Island RTK

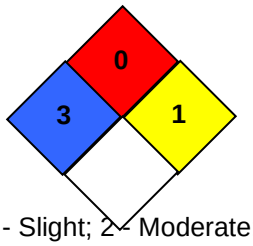
Chemical Identity
HYDROCHLORIC ACID

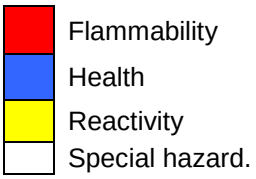
Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	On or in compliance with the inventory
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Switzerland Consolidated Inventory:	Not in compliance with the inventory.
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

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

NFPA Hazard ID





Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible

Issue Date:	12-06-2016
Revision Date:	No data available.
Version #:	4.2
Further Information:	No data available.

Disclaimer:

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Attachment C
Shipping Determination

SHIPPING/TRANSPORTATION DETERMINATION FORM Revision 10

Regulated Material Shipping Determination

Download the HazMat Shipping Handbook

Date:	
Project Name:	Dansville Former MGP
Project Number:	B0013135
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

1a	Select a description category ===>	Select
1b	*Select from this menu a description most accurately representing the material to be shipped/transported*	
1c		

- ☐ This material is mixed with water, soil or other inert material
- ☐ This material will be shipped on wet or blue ice
- ☐ Consignment contains dry ice
- ☐ Consignment contains containers with acid/base preservatives prepared by an analytical laboratory.
- ☐ Leave this box unchecked

2) Classification and Identification

2a This material is: None

Complete for Hazardous Materials ONLY:

2b UN/NA/ID# : NA 2c PG: NA Primary Hazard Class: NA

Subsidiary Hazard Class: NA NA

PSN: NA

☐ See Section 7a

2d This material is a: No additional criteria applies to this material

3) Packaging, Exceptions and Shipping Information

3a Packaging Type: None

3b Inner Container Category: None

3c Number and Quantity:

	Number		Container type			**Net Qty. Each Container**		
Container type #1	0		None	None			None	<= Select units here
Container type #2	0		None	None			None	TIP: Do not place units
Container type #3	0		None	None			None	in the white column.
Container type #4	0		None	None			None	Place the largest
Container type #5	0		None	None			None	container in bottle set in
Container type #6	0		None	None			None	row #1.

3d Intermediate Packaging: None

3e Outer Packaging: None

3f Other: None Type: None

☐ Overnight AIR shipping for next day delivery is required

Your suggested shipping configuration (excluding MOT option): Not available for this shipping configuration.

This material will be shipped (mode of transport and type of shipment):

3g None

If using an exception/exemption, list the exception/exemption below

3h None

Carrier/Transporter information:

3i None

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	NA	NA	Plastic Bag	NA	NA	Outer Package Limit	
Metal	NA	NA	Paper Bag	NA	NA	NA	NA
Plastic	NA	NA	Fibre	NA	NA		
						Total net volume/mass:	0	L/Kg

☐ Arcadis Shipping Guide US-001 attached
☐ Specific package closure instructions are attached
☐ Arcadis Shipping Guide or HSSP is available for this shipment: NA

4) Marks and Labels for Non-Bulk Packages

Orientation arrows, if shown, may be red or black in color.

Place all marks and labels checked in this section on same side of package (excludes orientation arrows, if shown).

5) Documentation

☐ No special documentation required
☐ Requires a Shipper's Declaration (air) prepared using : None
☐ Requires HazMat ground shipping papers prepared using: None
☐ Requires a Bill of Lading or Manifest (>MOT, Freight,Trucking Co., Waste Hauler, etc.)
☐ Requires Special Permit DOT-Special Permit #:
☐ Other:

6) Emergency Response

☐ Use ChemTel 24/7 Emergency Phone and Contract Number
or approved equivalent (authorized client or vendor) for this shipment:
1-800-255-3924 (ChemTel #MIS0007883) Register this shipment with ChemTel:
Have carrier tracking number available. http://Arcadis.chemtel.net/
☐ Ensure current edition of Emergency Response Guidebook in vehicle (this applies to Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in 7a)

7a	

8) References and Rationale for the Determination (add additional sheets, if required).

	NA
DOT Special Provisions:	NA
8a	
0	Rationale must be at least 200 characters (including spaces)

QUICK VIEW SHIPPING DETERMINATION FORM Revision 10

For Use by Field Staff

Date:	1/0/1900
Project Name:	Dansville Former MGP
Project Number:	B0013135

This Determination applies to
The material you will be shipping includes the following:
Select from this menu a description most accurately representing the material to be shipped/transported

If this is not what you are shipping or if you need help, contact 0
at 0 for assistance and guidance.

The material in your shipment has been classified as a: None

This material has been identified as:
PROPER SHIPPING NAME (including applicable modifiers and technical names):
NA

ID NUMBER: **NA** Hazard Class NA (NA) Packing Group NA

☐ The above information in RED is required on the outer package of your shipment as illustrated in the picture
☐ Follow Shipping Guide US-001 to prepare this shipment ☐ Follow Shipping Guide US-015 for dry ice
☐ Refer to the referenced HSSP to right for more information: NA

Package preparation configuration per package shipped (not to exceed):

Inner container sizes and quantity:

# of containers	Size	Type	Net Qty Each
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None

Intermediate packaging:	None
Outer packaging:	None

Place marks and labels on same side of package, except orientation arrows should be placed on each end of package.

If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for assistance.

☐ Your supervisor (PM, TM, or Field supervisor) must register this shipment with ChemTel (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: None

Attachment D
Forms

ARCADIS

Document Control Number:TGM - _____

TGM + *project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year*

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name:			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**
Client:		**Client Contact:**	**Subcontractor companies:**

TRACKing the Tailgate Meeting

Think through the Tasks (list the tasks for the day):

1 _____ 3 _____ 5 _____

2 _____ 4 _____ 6 _____

Other Hazardous Activities - Check the box if there are any other ARCADIS, Client or other party activities that may pose hazards to ARCADIS operations ☐ If there are none, write "None" here: _____

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted that require permit issuance or completion of a checklist or similar before work begins:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working at Height		☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss following questions (for some review previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Any Stop Work Interventions yesterday?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ If deviations, notify PM & client
☐ JLAs or procedures are available?	☐ Field teams to "dirty" JLAs, as needed?	☐ All equipment checked & OK?
☐ Staff has appropriate PPE?	☐ Staff knows Emergency Plan (EAP)?	☐ Staff knows gathering points?

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **A**ssess the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☐ Gravity (i.e., ladder, scaffold, trips) (L M H)	☐ Motion (i.e., traffic, moving water) (L M H)	☐ Mechanical (i.e., augers, motors) (L M H)
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e., gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)
☐ Chemical (i.e., fuel, acid, paint) (L M H)	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☐ Driving (i.e. car, ATV, boat, dozer) (L M H)

Continue TRACK Process on Page 2

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JLAs, and other control processes. Discuss and document any additional control processes.

X	**STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - (*See statements below*)				
	Elimination		Substitution		Isolation
	Engineering controls		Administrative controls		Monitoring
	General PPE Usage		Hearing Conservation		Respiratory Protection
	Personal Hygiene		Exposure Guidelines		Decon Procedures
	Emergency Action Plan (EAP)		Fall Protection		Work Zones/Site Control
	JLA to be developed/used ***(specify)***		LPO conducted ***(specify job/JLA)***		Traffic Control
					Other ***(specify)***

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the HASP

Important Information and Numbers

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call WorkCare at 1.800.455.6155 and then notify the field supervisor who will, in turn, notify Corp H&S at 1.720.344.3844.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify Corp H&S at 1.720.344.3844 and then Corp Legal at 1.720.344.3756.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify Corp Legal at 1.678.373.9556 and Corp H&S at 1.720.344.3500

Visitor Name/Co - not involved in work

	In	Out
	In	Out
	In	Out
	In	Out

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB,** I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- ☐ Lessons learned and best practices learned today: _____
- ☐ Incidents that occurred today: _____
- ☐ Any Stop Work interventions today? _____
- ☐ Corrective/Preventive Actions needed for future work: _____
- ☐ Any other H&S issues: _____

Keep H&S 1st in all things

WorkCare - 1.800.455.6155
Near Loss Hotline - 1.866.242.4304

Real Time Exposure Monitoring Data Collection Form

Document all air monitoring conducted on the Site below. Keep this form with the project file.

Site Name: _____ Date: _____

Instrument: _____ Model: _____ Serial #: _____

Calibration Method: (Material used settings, etc.)	
Calibration Results:	
Calibrated By:	

Activity Being Monitored	Compounds/Hazards Monitored	Time	Reading	Action Required? Y/N

Describe Any Actions Taken as a Result of this Air Monitoring and Why (does it match Table 5-1):

_____

_____

Employee Signature Form

I certify that I have read, understand, and will abide by the safety requirements outlined in this HASP.

Printed Name	Signature	Date

Subcontractor Acknowledgement: Receipt of HASP Signature Form

ARCADIS claims no responsibility for the use of this HASP by others although subcontractors working at the site may use this HASP as a guidance document. In any event, ARCADIS does not guarantee the health and/or safety of any person entering this site. Strict adherence to the health and safety guidelines provided herein will reduce, but not eliminate, the potential for injury at this site. To this end, health and safety becomes the inherent responsibility of personnel working at the site.

Printed Name	Company	Signature	Date

Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release and discharge the owner of the site and ARCADIS and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

Name	Company	Reason for Visit	Date/Time On Site	Date/Time Off Site

Hazardous Materials Transportation Form

	Vehicle (place X in box)	Type (pick-up, car, box truck, etc.)
Personal		
Rental		
ARCADIS owned/leased		
Government owned		
Trailer		

Materials Transported	Quantity	Storage/Transport Container

List Trained Drivers:

_____

_____

Hazardous Materials Shipment Form

Material Description and Proper Shipping Name (per DOT or IATA)	Shipment Quantity	DOT Hazard Classification	Shipment Method (air/ground)

List Shipper (i.e., who we are offering the shipment to):

_____

_____

List Trained Employee(s):

_____

_____

Attachment E
JSAs

Job Safety Analysis

General

JSA ID	10644	**Status**	(3) Completed
Job Name	Construction-Oversight - excavation and construction	**Created Date**	2/17/2014
Task Description	Excavation/trenching oversight	**Completed Date**	02/18/2014
Template	False	**Auto Closed**	False

Client / Project

Client	IBERDROLA USA
Project Number	B00131350000
Project Name	DANSVILLE OU-1 MGP CONST OVERSIGHT
PIC	WHITE, KEITH A
Project Manager	AHRENS, BRUCE

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kiser, Meghan	3/4/2014	2/18/2014	Brien, Jason	☑
HASP Reviewer	Gang, Bob	3/4/2014	2/18/2014	Cullen, Lucas	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Utility Clearance	1	Contact with utilities can cause injury, property damage, and cause releases of hazardous substances to the environment.	Establish a minimum of three lines of evidence. Obtain additional lines of evidence as needed for site specific conditions. Maintain utility markings, perform detailed site inspections, and keep open and constant communication between operators, onsite staff, and project management. Always Use Stop Work Authority if there is a question or concern about the location of a utility.	ARCHSFS019 - Utility Clearance HS Standard
		2	Slips, trips, and falls while performing site clearance activities.	Focus on the task at hand and do not hurry through the task. Avoid reading maps/drawings while walking and stop walking when looking up for overhead utilities.	
2	Excavation/Trenching and Backfilling Oversight	1	Slips, trips, and falls from poor housekeeping around trench or excavation.	Maintain work area and minimize clutter near excavation. Place excavated material at least 2 feet away from the edge of excavation. Remove potential hazards when possible. Mark hazards when it cannot be removed. Create and maintain awareness of hazard. Maintain barriers, fall hazard warning signage, and traffic controls properly. Do not cross over caution tape, safety fencing, etc. Follow Project specific STAR Plan.	FHSHB IV(D); ARCADIS ARC HSFS007 (Excavation Trenching); ARC HSFS 006 (Heavy Equipment)
		2	Excavation or trench collapse trapping workers or creating falls.	Excavation/Trench greater than five (5) feet deep in which subcontractor, employees, or others will be entering must be properly sloped, benched, shored or have a trench box in place. Sloping, benching, shoring or use of trench box is not required IF an excavation is less than five (5) feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in. Ensure a competent person is on site to inspect and oversee excavation/ trenching activities. Where feasible, stay six (6) feet from edge of excavation/trench. A safe means of egress, such as a stairway, ladder, or ramp, shall be located so that no more than twenty-five (25) feet of lateral travel is necessary for site workers conducting activities in trenches exceeding four (4) feet in depth.	

2	Excavation/Trenching and Backfilling Oversight	3	Potential high level of dust, fumes, vapors, or particulates creating visibility or inhalation/contact hazards could result in exposure above occupational exposure limit or create an IDLH atmosphere.	Visually monitor air for dust, and wet excavated soil as needed to control dust. Monitor for chemical vapors if hazard exists. The atmosphere must be tested in excavations greater than four (4) feet in depth where oxygen deficiency or toxic or flammable gases are likely to be present, before workers will be permitted to enter. Ensure downwind and perimeter monitoring also performed, if atmospheric hazards exists.	
		4	Excessive noise from excavating equipment or pumps.	Make sure all authorized personnel, including subcontractors, are wearing hearing protection (ear plugs/muffs) when working around noisy equipment. Increase distance from the noise hazard when practical and conditions permit.	
		5	Potential leaks of petroleum fluids and lubricants from excavating equipment and support equipment.	Make sure all authorized personnel including subcontractors perform equipment inspections looking for leaks, cracked hoses, and loose fittings. Promptly and properly repair all leaks.	
		6	Open Excavation, Unauthorized Entry, or Property Damage.	Make sure all authorized personnel, including subcontractors, mark open excavation with demarcation tape, orange fencing, orange cones, etc. to prevent unauthorized/accidental entry. Ensure that the controls are adequate for traffic protection after dark or when the site is unstaffed. Backfill the excavation area as soon as possible and fence off any excavation not backfilled at the end of the work day.	
		7	Contact with potentially impacted groundwater and soil.	Conduct task in a calm and cautious manner. Wear appropriate PPE. Ensure equipment is in working condition before the start of each work. Stop work immediately and report to the site manager if any life threatening conditions exist.	
		8	Working aound heavy machinery.	Where feasible, maintain distance from excavation equipment in excess of the swing radius. Make eye contact with operator prior to entering zone of influence of equipment. Ensure equipment is in good working condition before work begins. Wear appropriate PPE, including safety vest. Do not wear loose clothing and pull back long hair. Be aware of and avoid standing in red zones (equipment operator "blind-spots"). No personnel are permitted to stand underneath suspended loads.	
3	Stockpile Maintenance and Sampling	1	Falls climbing on the stockpile or during covering of the stockpile.	Avoid climbing on stockpiles when possible, keep hands free, do not hurry through tasks such as pulling plastic sheeting up onto or over piles.	
		2	Overexertion (heart attack, cold and heat stress, fainting) while placing plastic sheeting, weight, and straw bales.	Use proper lifting techniques (keep feet shoulder width apart, lift with legs not back, avoid twisting of body, and forceful pulling/pushing). Do not hurry through tasks.	
		3	Cuts, scrapes, and impalement (hands and feet) from debris in stockpiles.	Have excavation contractor remove/isolate large chunks of concrete, exposed rebar, etc. from stockpile to the extent practical. Inspect areas prior to kneeling or placing hands when sampling on the stockpile.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather when hand hazard exists; nitrile for soil	Required
Head Protection	hard hat		Required
Hearing Protection	ear muffs		Required
	ear plugs	When working near heavy equipment	Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)		Required
	insect repellant		Required
Traffic Control	barricades		Required
	Other	Use tape to delineate trenches prior to backfill	Required
	traffic cones	Delineate trenches prior to backfill	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Revise 2/18/2014	2.8 "maintain eye contact with operator at all times" is not practical. Replace with "make eye contact with operator prior to entering zone of influence of equipment"
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Approve 2/18/2014	

Job Safety Analysis

General

JSA ID	10645	**Status**	(3) Completed
Job Name	Environmental-Air Monitoring	**Created Date**	2/17/2014
Task Description	Air Monitoring	**Completed Date**	02/18/2014
Template	False	**Auto Closed**	False

Client / Project

Client	IBERDROLA USA
Project Number	B00131350000
Project Name	DANSVILLE OU-1 MGP CONST OVERSIGHT
PIC	WHITE, KEITH A
Project Manager	AHRENS, BRUCE

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kiser, Meghan	3/10/2014	2/17/2014	Brien, Jason	☑
HASP Reviewer	Gang, Bob	3/3/2014	2/18/2014	Cullen, Lucas	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Inspect and Claibrate PID Meter.	1	Faulty/uncalibrated equipment leading to over exposure of VOCs.	Calibrate and document the calibration readings to confirm meter meets the manufacturers recommendations. Charge PID Meter to use througout the monitoring task.	
		2	Fire from pressurized calibration gas canister resulting in burns to skin.	Inspect canister and valve for damages, leaks, and pressure. Keep a fire extinguisher within 20 ft of the calibration staging area.	
2	Survey the Area Where Air Monitoring will be Conducted.	1	Head and body injury by getting struck by vehicles and other heavy equipment that may be present in the area.	Delineate the work area with cones and barricades. Communicate with hand signals with heavy equipment operators that may be present in the work area. Wear a high visibility vest during the survey of the area to make yourself more visible to the operators. Wear a hard hat to protect head from overhead hazards around heavy equipment.	
		2	Slips, trips or falls from uneven terrain resulting in broken bones, lacerations or sprains.	Remove all trip hazards from the walking path. Choose a walking path with even surfaces. Wear steel toe safety boots with rubber soles to maintain a non-slip surface with the ground.	
		3	Hearing damage from high noise levels above 85 dBA from remedial construction activities.	Utilize a dosimeter to determine noise levels in the work zone. If a worker cannot hear a normal conversation at 3 feet then the work zone is considered to be a high noise area. Keep all unnecessary personnel outside of the work zone to distance themselves from high noise areas. Wear hearing protection when working in the work zone to protect ears from the noise levels.	
		4	Eye injury from flying debris in wind.	Position body with back facing the wind to avoid the wind blowing debris into the eyes. Wear goggles if visible dust or debris is in the air to protect eyes from debris entering the eye.	
		5	Over exposure to VOCs from excavation operations.	Stay upwind of excavation area. Initiate Stop Work if action levels are exceeded. Refer to the Community Air Monitoring Plan for action levels and mitigation steps.	

PPE	Personal Protective Equipment		
Type	**Personal Protective Equipment**	**Description**	**Required**
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
	safety goggles		Recommended
Foot Protection	steel-toe boots		Required
Hand Protection	work gloves (specify type)	Leather when hand hazard exists	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)		Required
	insect repellant		Required
	water/fluid replacement		Required
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Approve 2/18/2014	

Job Safety Analysis

General

JSA ID	10646	**Status**	(3) Completed
Job Name	Environmental-Drum sampling/handling	**Created Date**	2/17/2014
Task Description	Drum handling	**Completed Date**	02/18/2014
Template	False	**Auto Closed**	False

Client / Project

Client	IBERDROLA USA
Project Number	B00131350000
Project Name	DANSVILLE OU-1 MGP CONST OVERSIGHT
PIC	WHITE, KEITH A
Project Manager	AHRENS, BRUCE

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kiser, Meghan	3/4/2014	2/18/2014	Brien, Jason	☑
HASP Reviewer	Gang, Bob	3/4/2014	2/18/2014	Cullen, Lucas	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Inspect Drums for signs of Bulging, Leaking, Crystals, Temperature, and Odor	1	Exposure to chemicals stored in drum or container.	Read drum labels for information about contents. Review all relevant MSDSs about chemical contents. If labels are not attached, call PM or Local H&S Representative.	
		2	Contents of the drum can cause fire/explosion hazard.	Use air monitoring meters to screen drums. % LEL and VOCs (PPM). If either of the values are above the action levels described in the HASP or MSDS then Stop Work, move away from the area, and reassess the situation. Call PM and H&S staff for support.	
2	Remove lids or bungs from Drums	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	Wear leather work gloves. When removing ring from the drum, fingers can get pinched between ring and drum. Keep fingers clear of this space. Use a ratchet to remove the lid from the drum. If large amount of drums will be encountered, use a speed or drum wrench.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.
		2	Rapid depressurization from empty or partially full drums can cause flying parts or volatile COCs releasing on staff.	Do not handle or open bulging drums (contact Corp H&S for assistance). Bleed any built up pressure by carefully loosening bung prior to removing ring. Keep face and arms away from bung opening when loosening. Slightly lift lid, insert end of air monitoring device to monitor air inside drum.	
		3	Use of mechanical tools to remove bolts from drum lids causes excessive noise.	Wear hearing protection at all times.	
		4	Splashing can occur if filling drum, or collecting samples.	Wear eye and face protection. Pour liquids into drum slowly to minimize splashing.	
		5	When working with COCs that have fire/explosive properties, sparking or heat could cause fire/explosion.	Use brass or non spark hand tools if such a hazard exists or is suspected.	
3	Sample Contents from Drums	1	Exposure to COCs can occur by contacting impacted contents.	At a minimum wear nitrile gloves. Wear appropriate eye, face, and body protection as outlined in the HASP.	
		2	Sharp edges and broken sample containers can cause lacerations.	Discard any broken sample ware or glass properly. Do not over tighten sample containers. Wear cut II resistant gloves.	
		3	Staff can be exposed to chemical vapors/fumes when sampling.	Conduct air monitoring as outlined in the Community Air Monitoring Plan.	

3	Sample Contents from Drums	4	Chemical burns or skin irritation can occur from contact with sample preservatives.	Wear chemical protective gloves when collecting samples or when handling damaged sample containers.	
4	Replace Drum lids	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	See step 2, potential hazard 1.	
5	Moving and Storing Drums	1	Drum storage areas can be accessed by the general public, or may not be secure.	Calculate how many drums will be stored in new location. Ensure that drums are not easily accessed by the general public. Do not store such that drums impede pedestrian or vehicular traffic.	
		2	Muscle strain can occur when lifting/pulling/pushing drums.	Drums that are full can weigh as much as 800 lbs. Use a lift assist device whenever possible, and use a team lift approach. When moving soil drum generated by drilling, have drillers use their equipment to move the drums. Using dolly, slightly lift drum away from dolly to install forks under drum. Slowly let drum come back down and rest on dolly. Using hook on top of dolly, ensure it latches on top of drum bung.	
		3	Body parts can be pinched between lift device, or drum and the ground.	Be aware of hand and foot placement during drum staging. Do not hurry through tasks.	
		4	When moving, the drum can tip or the dolly could become unstable from uneven ground surface.	Plan travel route with drum prior to moving. With drum secure on dolly, have one employee pull back on dolly, and other employee slowly push back on drum toward dolly. Have second worker act as spotter for traffic, pedestrians, and any trip hazards along the way.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Required
	long sleeve shirt/pants		Required
Eye Protection	faceshield		Required
	safety glasses		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather	Required
Hearing Protection	ear plugs		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	Other	Drum dolly	Required
Personal	eye wash (specify type)		Required
	insect repellant		Recommended
	sunscreen		Recommended
	water/fluid replacement		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Revise 2/18/2014	2.1, define proper gloves, and proper tool. Never leave it to the imagination of the reader 3.1 define proper dermal protection 3.2 add "wear Cut II resistant Gloves"
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Approve 2/18/2014	

Job Safety Analysis

General

JSA ID	10647	**Status**	(3) Completed
Job Name	Construction-Site inspection/walkover - construction	**Created Date**	2/17/2014
Task Description	Construction oversight	**Completed Date**	02/18/2014
Template	False	**Auto Closed**	False

Client / Project

Client	IBERDROLA USA
Project Number	B00131350000
Project Name	DANSVILLE OU-1 MGP CONST OVERSIGHT
PIC	WHITE, KEITH A
Project Manager	AHRENS, BRUCE

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kiser, Meghan	3/4/2014	2/18/2014	Brien, Jason	☑
HASP Reviewer	Gang, Bob	3/4/2014	2/18/2014	Cullen, Lucas	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Project specific safety briefing/orientation	1	Lack of compliance to project H&S requirements or putting yourself in a hazardous situation on site.	Prior to entering the site: 1) review and become familiar with project specific safety requirements; 2) attend contractor safety briefings, orientations, or tailgate meetings.	HASP; ARC HSGE001 Tailgate H&S Meetings; ARCADIS Employee Field H&S Handbook
2	PPE verification	1	Lack of adequate PPE on the building site.	Prior to entering the site: verify that all necessary PPE is being worn and that PPE is in good working condition (hard hat, steel toe boots, safety glasses, traffic vest).	ARC HSGE PPE; ARCADIS Employee Field H&S Handbook
3	Exterior site observation/site walk	1	Slips, trips, and falls.	Plan route and do not hurry through the task. Use caution when walking on uneven surfaces. Use proper footwear with good traction (i.e., steel toe boots). Pay attention to where you are walking- including foot placement. Walk in designated areas and pathways. Avoid areas with accumulated materials and debris. Avoid wet, slippery, and icy conditions. Where feasible, stay six (6) feet from open edges, holes, and excavations. Certain construction areas will be fairly "compact" (i.e. people, construction equipment, delivery vehicles, in a small area).	
		2	Struck by overhead work and suspended loads.	Avoid walking in areas with overhead work and suspended loads. Recognize barricades and taped off areas. Maintain awareness and communication with other workers as necessary.	
		3	Working outside of designated responsibilities.	Observe only. Do not assist with onsite tasks. Do not use tools. Do not pickup or touch any materials or building objects.	
		4	Hearing damage.	Wear hearing protection when noise exceeds 85dBA.	
		5	Vehicular traffic.	Where possible, stay on sidewalks and only cross at the designated crosswalks. Wear reflective traffic vest. Make eye contact with driver before entering zone of influence of vehicle.	
4	Construction observation/inspection/walkthrough.	1	Limited access/egress to and from construction areas.	Verify that entry points are free of hazard prior to entry.	

4	Construction observation/inspection/walkthrough.	2	Slips, trips, and falls.	Plan route and do not hurry through the task. Use caution when walking on uneven surfaces. Use proper footwear with good traction (i.e., steel toe boots). Pay attention to where you are walking- including foot placement. Walk in designated areas and pathways. Avoid areas with accumulated materials and debris. Avoid wet, slippery conditions. Maintain a safe distance from open edges. Verify that guardrails and warning devices are installed where fall hazards exist.	
		3	Lacerations on sharp objects and materials.	Avoid walking over or near sharp materials and sharp building corners. Do not pickup or touch construction materials or other sharp objects. Wear protective gloves while in the building (i.e., leather gloves).	
		4	Trip or fall on stairways.	Watch foot placement. Use handrails. Do not hurry up or down stairways.	
		5	Working outside of designated responsibilities.	Observe only. Do not assist with onsite tasks. Do not use tools. Do not pickup or touch any materials or building objects.	
		6	Overhead and suspended work.	Avoid walking in areas near overhead and suspended work. Maintain awareness and communication with overhead workers.	
		7	Entering a marked or designated work area.	Respect all signage and marked or delineated areas. Stay outside of work areas with barricades or caution tape.	
5	Perform documentation of site observations.	1	Distractions during site walk and activities.	Pay attention to your surroundings at all times. Do not walk while writing. Do not use cell phone when near busy work areas.	
		2	Distractions from cell phone, texts, and e-mails.	Seek out a safe location on site before using cell phone. Do not walk while texting and reading emails on cell phone. Maintain attention and awareness to site conditions.	
6	Electrical lockout/tagout (LOTO)	1	Hazard due to energized equipment and panels.	Lockout/Tagout ARCADIS H&S Procedure HSFS0004.	Lockout/Tagout - ARCADIS H&S Procedure No. ARC HSFS004

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	work gloves (specify type)	Leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)		Required
	water/fluid replacement		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Revise 2/18/2014	nice JSA, just a few things 3.1 define "safe distance" 3.5 add "make eye contact with driver before entering zone of influence of vehicle" 5.1 regarding cell phone use - replace "avoid" with "do not use"
Employee: **Role** **Review Type** **Completed Date**	Gang, Bob HASP Reviewer Approve 2/18/2014	

Job Safety Analysis

General

JSA ID	45	**Status**	(3) Completed
Job Name	Environmental-Groundwater Sampling and free product recovery	**Created Date**	2/4/2009
Task Description	Groundwater sampling	**Completed Date**	02/06/2009
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija	6/12/2012	2/4/2009	Mcburney, Lowell	þ
HASP Reviewer	Coppola, Mija	2/6/2009	2/6/2009	Mcburney, Lowell	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Stage at pre-determined sampling location and set up work zone and sampling equipment	1	Personnel could be hit by vehicular traffic	Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	ARC Field H&S Handbook Sec III-G
		2	Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
2	Open wells to equilibrate and gauge wells	1	When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2	Pinchpoints on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		3	Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		4	Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well	
3	Begin Purging Well and Collecting Parameter Measurements	1	Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	ARC Field H&S Handbook Sec III-AA
		2	Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		3	Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	
		4	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	

		5	Purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
4	Collect GW or Free Product Sample	1	Working with bailer rope can cause rope burns on hands.	Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.	
		2	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.	
5	Recovery of Free Product from well	1	Exposure to free product	Additional chemical protection may be necessary based on the type of product. Additionally, safety goggles, a faceshield, or respiratory protection may be required. Verify in the HASP.	
6	Staging of Well Purge water and/or Free Product	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	ARC Field H&S Handbook Sec III-II

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	alconox, DI water, spray bottle	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)	bottle	Required
	insect repellant		Recommended
	sunscreen		Recommended
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Coppola, Mija HASP Reviewer Approve 2/6/2009	

Job Safety Analysis

General

JSA ID	44	**Status**	(3) Completed
Job Name	Environmental-Drilling, soil sampling, well installation	**Created Date**	2/4/2009
Task Description	Drilling, soil sampling, and well installation	**Completed Date**	02/04/2009
Template	True	**Auto Closed**	False

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	NO PROJECT MANAGER

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Coppola, Mija	6/28/2012	2/4/2009	Mcburney, Lowell	þ
HASP Reviewer	Coppola, Mija	2/6/2009	2/2/2009	Mcburney, Lowell	þ

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Set up necessary traffic and public access controls	1	Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	ARC Field H&S Handbook Sec III-G
2	Utility Clearance	1	Potential to encounter underground or above ground utilities while drilling.	Complete utility clearance in accordance with the ARCADIS Utility Clearance H&S Standard.	ARCADIS H&S Standard ARCHSFS019, ARC Field H&S Handbook Sec III-MM
3	General drill rig operation	1	Excessive noise is generated by rig operation.	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	ARC Field H&S Handbook Sec III-L
		2	During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
		3	Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig.	
		4	Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling operation as practicable. Wear appropriate gloves to protect from COCs.	ARC Field H&S Handbook Sec III-R
		5	Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	ARC Field H&S Handbook Sec III-F
		6	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the	

				Utility Clearance H&S Standard for guidance.	
4	Mudd rotary drilling	1	The raised derrick can strike overhead utilities, tree limbs or other elevated items.	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
		2	This technology uses fluid, which collects with sediments in large basin. Fluid can splash out and cause slipping/mud hazard. Liquid mixture can splash into your eyes.	Wear rubber boots if needed, and keep clear of muddy/wet area as much as practicable. If area becomes excessively muddy, consider mud spikes or covering the area with a material that improves traction. Wear safety glasses.	
5	Hollow stem auger drilling	1	All hazards in step 3 apply. Additionally,The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
		2	Hands or fingers can get caught and crushed if trying to clean by hand or with tools while the auger is still turning.	Auger should always be stopped and clutch disengaged prior to cleaning.	
6	Air Rotary Drilling	1	This drilling method works with high air pressure and can generate flying debris that can strike your body or get in your eyes.	When the drill rig is being driven into media, it will produce flying debris. The flaps behind the drill rig should stay closed whenever possible to reduce the risk of flying debris. Safety glasses and hard hat should always be worn when the drill rig is operating. When penetrating asphalt, protect surrounding cars that may be present to avoid damage to pain or windshields.	
		2	The raise derrick can strike overhead utilities, tree limbs or other elevated items.	Never move this rig with the derrick up. Ensure there is proper clearance to raise the derrick and that you are far enough away from overhead power lines. See the Utility clearance H&S Standard for guidance.	
		3	When drilling through bedrock prior to groundwater, dust can be produced from pulverization. Inhalation of dusts/powder can occur.	Supplemental water should be used to manage dust and/or dust masks should be used if necessary.	
7	Reverse rotary drilling	1	This method will use fresh water to pump out drill cuttings through the center of the casing. Water/sediment mixture is generated and could cause contact with impacted soils or groundwater.	Ensure the pit construction can hold the amount of cuttings that are anticipated. Air monitoring should also be used of pit area.	
		2	Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local municipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over to cut by traffic. Any leaks from the hydrant should be reported immediately.	
		3	Settling pit construction can cause tripping hazard from excavated soils, and plastic sheeting can cause slipping.	Cone off the area to keep the general public/visitors away from the settling pit. Ensure proper sloping of excavation.	
		4	The raised derrick can strike overhead utilities, tree limbs or other elevated items.	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	

8	Rotosonic drilling	1	Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local muncipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over to cut by traffic. Any leaks from the hydrant should be reported immediately.	
		2	This method requires a lot of clearance. The drill head can turn 90 degrees to attach to the next drill flight or casing. This usually requires a large support truck to park directly behind the rig. As the drill head raises the new casing flight is angled down at the same time until it can be turned completely vertical.	Ensure sufficient overhead clearance.	
		3	Heavy lifting of cores can cause muscle strain.	Always use 2 people to move core containers. Use caution moving core samples to layout area. Plan layout area to ensure adequate aisle space between core runs for logging. Keep back straight and use job rotation.	
		4	The rotosonic drill head can move very quickly up and down while working on a borehole. Moving parts can strike someone or catch body parts.	The operator and helper must communicate and stay clear of the path of the drill head. The drill utilizes two large hydraulic clamps to continuously hold casings while load/unloading previous casings. Do not wear loose clothing.	
9	Direct push drilling	1	The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts.	Keep a minimum of 5 feet away from drill rig operation and moving parts.	
		2	The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers.	Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next.	
		3	Some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property.	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	
		4	Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations.	It's preferable to let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If you cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	
		5	Soil cores may contain contaminated media.	Wear nitrile gloves and saftey glasses for protection from contaminated media when logging soil borings.	
10	Rock coring	1	Flying debris can hit workers or cause debris to get in eyes.	Rock chips or overburden may become airborne from drilling method. Wear safety glasses and hard hat and remain at a safe distance from back of drill rig.	
		2	Heavy lifting of cores can cause muscle strain.	Always use 2 people to move core containers. Use caution moving core samples to layout area. Plan layout area to ensure adequate aisle space between core runs for logging. Keep back straight and use job rotation.	
11	Sample collection and processing	1	Injuries can result from pinch points on sampling	Care should be taken when opening sampling equipment. Look at empty	Sample Cooler Handling JSA

			equipment, and from breakage of sample containers.	containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break.	
		2	Lifting heavy coolers can cause back injuries.	Use two people to move heavy coolers. Use proper lifting techniques.	
12	Monitoring well installation	1	Same hazards as in Step 3 with general drill rig operation	See step 3	
		2	Monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	
		3	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		4	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	
		5	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	
13	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perfrom TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	ARC Field H&S Handbook Sec III-II

PPE **Personal Protective Equipment**

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required

Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Driller to provide and manage	Recommended
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
	water/fluid replacement		Recommended
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Coppola, Mija HASP Reviewer Approve 2/2/2009	

Attachment F
Utility Checklist

Utilities and Structures Checklist

ARCADIS Design & Consultancy for natural and built assets

THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project: _____

Project Number: _____

Form Completion Date: _____ Form Expiration Date: _____

All utility markings must be refreshed ≤15 days when work is ongoing. (15 business days post form completion date)

Pre-Field Work

Required: One Call or "811" notified 48-72 hours in advance of work? #: _____

Ticket Expiration Date _____ (Review State Requirements)

Utility companies notified during the One Call process ☐ See attached ticket

_____ _____ _____ _____

_____ _____ _____ _____

List any other utilities requiring notification: ☐ None

_____ _____ _____ _____

Private Locator Contacted ☐ Yes ☐ No

Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities. When possible re-clear 811 markings to confirm utility locations.

Client provided utility maps or "as built" drawings showing utilities? ☐ Yes ☐ No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities. Review Check list with PM or designee prior to beginning intrusive work.

Mechanized intrusive work in utility Tolerance Zone (<30-in.) requires pre-approval by Corporate H&S

List Soil Boring / Well IDs or Excavation Locations applicable to this clearance checklist:

3 Reliable Lines of Evidence Required Prior to Starting any Subsurface Intrusive Work

☐ One Call/"811" (Reliable as a line of evidence when working in public right of way or easement)
Utility Markings Present: ☐ Paint ☐ Pin flags/stakes ☐ Other ☐ None

☐ Client Provided Maps/Drawings **OR** ☐ Maps/Drawings requested but not provided

☐ Client Clearance Name(s)/Affiliation(s) _____

☐ Interview(s): Name(s)/Affiliation(s) _____

_____

Did person(s) interviewed indicate depths of any utilities in the subsurface?

☐ Yes, depths provided: ☐ Did not know or refused to answer

Additional Comments:

☐ Site Inspection (**Complete Page 2 & Photo Document Marked Utilities & Utility Structures**)

☐ Public Records / Maps / As-Builts

☐ **Private Locator: (Name and Company)** _____

☐ Ground Penetrating Radar (GPR)

☐ Radiofrequency (RF Loc)

☐ Electromagnetic (EM)

☐ Metal Detector

Soft Dig Methods

☐ Termination Depth _____ft. bgs

☐ Potholing / Vacuum Extraction

☐ Air knife ☐ Hydro knife

☐ Probing

☐ Hand Auguring

Tips for Successful Utility Location (H&S Standard Section 5.6):

1. Don't forget to look up (mark above grade utilities if warranted)
2. Be on-site with Private Utility Locators
3. Ask Private Locators to "confirm" other's markings
4. Select alternate/backup locations during clearance process
5. Mark out all known utilities. Leave nothing to question
6. No hammering - no pickaxes - no digging bars - no shortcutting
7. No excessive turning or downward force of hand augers/shovels
8. Utilities may run in or directly under asphalt/concrete
9. Clearing, grubbing, and heavy equipment may damage shallow utilities.
10. Is Spotter needed for Heavy Equipment near aboveground utilities?

☐ Other: _____

☐ Marine Locator: (Name and Company) _____

Utilities and Structures Checklist

During the site inspection look for the following: **("YES" requires additional investigation and the utility must be marked properly prior to beginning subsurface intrusive work)**:

Site Inspection	Utility Color Codes	Present
A) Natural gas line present (evidence of a gas meter)?	Yellow	☐ Yes ☐ No
i) Feeder Lines to buildings or homes?		☐ Yes ☐ No
B) Evidence of electric lines:	Red	
i) Conduits to ground from electric meter or along wall?		☐ Yes ☐ No
ii) Conduits from power poles running into ground?		☐ Yes ☐ No
iii) Light poles, electric devices with no overhead lines?		☐ Yes ☐ No
iv) Overhead electric lines present? Marked? (See Section L)		☐ Yes ☐ No
C) Evidence of sewer drains:	Green	
i) Restrooms or kitchen on site?		☐ Yes ☐ No
ii) Sewer cleanouts present?		☐ Yes ☐ No
iii) Combined sewer /storm lines or multiple sewer lines?		☐ Yes ☐ No
D) Evidence of water lines:	Blue	
i) Water meter on site or multiple water lines?		☐ Yes ☐ No
ii) Fire hydrants in vicinity of work?		☐ Yes ☐ No
iii) Irrigation systems? (Sprinkler heads, valve boxes, controls in building)		☐ Yes ☐ No
E) Evidence of storm drains:	Green	
i) Open curbside or slotted grate storm drains		☐ Yes ☐ No
ii) Gutter down spouts going into ground		☐ Yes ☐ No
F) Evidence of telecommunication lines:	Orange	
i) Fiber optic warning signs in areas?		☐ Yes ☐ No
ii) Aboveground cable boxes or housings or wires in work area? Marked?		☐ Yes ☐ No
G) Underground storage tanks:		
i) Tank pit present, tank vent present?		☐ Yes ☐ No
ii) Product lines running to dispensers/buildings?		☐ Yes ☐ No
H) Do utilities enter or exit existing structures/buildings?		
If Yes, confirm the utility markings outside of structure/building match up.		☐ Yes ☐ No
I) Proposed excavation marked in white?	White	☐ Yes ☐ No
J) Unclassed utilities / anomalies marked in pink?	Pink	☐ Yes ☐ No
K) **Overhead** Utilities/Communication Lines - **Look Up and MARK**:		
i) Overhead electrical conduit, pipe chases, cable trays, product lines?		☐ Yes ☐ No
ii) Overhead fire sprinkler system?		☐ Yes ☐ No
L) **Overhead** Power lines in or near the work area:		
i) < 50 kV within 10 ft. of work area?		☐ Yes ☐ No
ii) >50 - 200 kV within 15 ft. of work area?		☐ Yes ☐ No
iii) >200-350 kV within 20 ft. of work area?		☐ Yes ☐ No
iv) >350-500 kV within 25 ft. of work area?		☐ Yes ☐ No
v) >500-750 kV within 35 ft. or work area?		☐ Yes ☐ No
vi) >750-1000 kV within 45 ft. of work area?		☐ Yes ☐ No
M) Other:		
i) Evidence of linear asphalt or concrete repair?		☐ Yes ☐ No
ii) Evidence of linear ground subsidence or change in vegetation?		☐ Yes ☐ No
iii) Unmarked manholes or valve covers in work area?		☐ Yes ☐ No
iv) Warning signs (Call Before you Dig, Look Up, etc.) on or adjacent to site?		☐ Yes ☐ No
v) Utility color markings not illustrated in this checklist?	i.e. Purple	☐ Yes ☐ No
vii) Operating heavy equipment on unpaved/unimproved ground; review equipment route for shallow utilities crossing it and modify if necessary.		☐ Yes ☐ No
O) Utilities & Structures Checklist been reviewed by the PM or Designee		Yes No*
PM or Designee Name: _____		* If no, STOP WORK, call PM

Name and Signature of person completing the checklist: _____

Date: _____

Do not perform mechanized intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S.

ALL UTILITY STRIKES REQUIRE CORPORATE H&S NOTIFICATION (EMAIL OR CALL) WITH A CONFIRMED RESPONSE

APPENDIX E

Community Air Monitoring Plan

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