



NYSEG

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site Geneva, New York

November 2010

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

Prepared for: NYSEG

Prepared by:
ARCADIS of New York, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.449.0017

Our Ref.: B0013099 #11

Date:

November 2010

ARCADIS Table of Contents

1.	1. Introduction						
	1.1	RDWP Organization					
	1.2	Site Ba	ckground	ı	2		
		1.2.1	Site Loc	cation and Physical Setting	2		
		1.2.2	Site His	tory	3		
	1.3	Summary of Remedial Investigations and Interim Remedial Measures					
		1.3.1	Geology	y/Hydrogeology	4		
		1.3.2	Nature a	and Extent of Impacts	5		
			1.3.2.1	Soil Quality	5		
			1.3.2.2	Groundwater Quality	9		
			1.3.2.3	Soil Vapor Quality	g		
	1.4	1.4 Standards, Criteria, and Guidelines					
	1.5	Remedial Objectives					
	1.6	Descrip	otion of S	elected Remedy	12		
2.	. Pre-Design Investigation				16		
	2.1	PDI Task 1 – Utility and Site Coordination					
		2.1.1	PDI Tas	sk 1a – Utility Markout	17		
		2.1.2	PDI Tas	sk 1b – Coordination with NYSEG Gas Department	17		
	2.2 PDI Task 2 – Soil Investigation				17		
	2.3	PDI Task 3 – Groundwater Investigation					
		2.3.1	PDI Tas	sk 3a – Groundwater Monitoring Well Installation	18		
		2.3.2	PDI Tas	sk 3b – Groundwater Sampling	19		
	2.4	PDI Ta	sk 4 – Sit	e Survey	20		
	2.5	PDI Do	cumenta	tion	21		
3.	Remedial Design Activities						
	3.1	3.1 RD Task 1 – Soil Excavation					
	3.2	RD Tas	sk 2 – Ba	ckfill	22		

ARCADIS Table of Contents

	3.3	ΚD	Task 3 – Surface Cover	23
	3.4	RD	Task 4 – Natural Attenuation Evaluation	23
4.	Permit	d Approvals	25	
	4.1	PDI	Permits and Approvals	25
	4.2	Rem	nedial Construction Permits and Approvals	25
5.	Remed	lial D	esign Documents	26
	5.1	Preli	iminary (50%) Remedial Design Report	26
	5.2	Draf	ft (95%) Remedial Design Report	28
	5.3	Fina	al (100%) Remedial Design Report	29
6.	Remed	lial D	esign Schedule	30
7.	Post R	emed	dial Construction Activities	31
	7.1	Site	Management Plan	31
	7.2	Insti	itutional Controls	32
8.	Refere	nces		33
Tal	oles			
	Table	1	Potential Chemical-Specific SCGs	
	Table	2	Potential Action-Specific SCGs	
	Table	: 3	Potential Location-Specific SCGs	
Fig	jures			
	Figure 1 Figure 2		Site Location Map	
			Site Plan with Investigation Locations	
	Figure	e 3	Soil Removal Limits	

ARCADIS Table of Contents

Appendices

- A Field Sampling Plan
- B Quality Assurance Protection Plan
- C Health and Safety Plan
- D Community Air Monitoring Plan

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

1. Introduction

This Remedial Design Work Plan (RDWP) has been prepared by ARCADIS on behalf of NYSEG to present the proposed activities associated with the preparation of the remedial design for the New York State Department of Environmental Conservation-(NYSDEC-) selected remedy for the Wadsworth Street Former Manufactured Gas Plant (MGP) site (the site) located in Geneva, New York. The selected remedy to address environmental impacts identified at the site is presented in the March 2010 Record of Decision (ROD) (NYSDEC 2010a).

NYSEG entered into an Order on Consent (the Order) with the NYSDEC in March 1994 to investigate and, where necessary, remediate 33 former MGP sites in New York State, including the Wadsworth Street Former MGP Site (Site No. 8-35-015). Section VI of the Order on Consent indicates that NYSEG shall submit to the NYSDEC a remedial design to facilitate implementation of the selected remedial alternative for the site. This RDWP describes the pre-design investigation (PDI) activities required to support the remedial design, as well as the anticipated components of the remedial design.

1.1 RDWP Organization

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

Table 1.1 – RDWP Organization

Section	Description
Section 1 – Introduction	Presents site background information, a summary of the site characterization, potentially applicable standards, criteria and guidance (SCGs), remedial action objectives identified for the site, and a summary of the NYSDEC-selected remedy.
Section 2 – Pre-Design Investigation	Presents the scope and rationale for the PDI activities to be completed in support of the remedial design.
Section 3 – Remedial Design	Presents a description of the remedial design activities to be completed in support of the remedial construction.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

Section	Description
Section 4 – Permits and Approvals	Identifies the permits and approvals potentially required to conduct the PDI activities and implement the remedial action.
Section 5 – Remedial Design Documents	Identifies the remedial design documents anticipated to be prepared in support of the remedial construction.
Section 6 – Remedial Design Schedule	Presents the anticipated project schedule for implementing the pre-design investigation and preparing the remedial design.
Section 7 – Post Remedial Construction Activities	Describes the documents/controls that will be prepared/established to govern future site activities following remedial construction
Section 8 – References	Presents a list of documents used to support the preparation of this RDWP.

1.2 Site Background

This section presents a summary of site background information, including a description of the site location and physical setting, as well as a brief site history. Additional details regarding site background are presented in the February 2008 Remedial Investigation Report (RI Report) (ARCADIS 2008) and the February 2010 Feasibility Study Report (FS Report) (ARCADIS 2010) prepared for this site.

1.2.1 Site Location and Physical Setting

The site is located in the City of Geneva, near the northwestern shore of Seneca Lake in eastern Ontario County, New York (Figure 1). The former MGP operated in an area comprised of a rectangular piece of land that is now located in a mixed commercial and residential area in the east-central part of Geneva, New York. Seneca Lake is located approximately 900 feet southeast of the site. The site is bordered by Wadsworth Street to the east, a railroad (Finger Lakes Railway) to the south, a restaurant to the west and residential properties to the north. A dry cleaner is located northeast of the site, on the

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

east side of Wadsworth Street. Railroad Place intersects Wadsworth Street and bisects the site. A gas holder (Gas Holder 1) and coal shed were formerly located in Railroad Place. Several MGP structures formerly existed at the current location of the City of Geneva's Public Safety Building (PSB) south of Railroad Place (see Figure 2).

The portion of the former MGP site located north of Railroad Place is currently owned by NYSEG, while the area south of Railroad Place is owned by the City of Geneva. The area owned by NYSEG includes a grass-covered area in the eastern portion of the property and an asphalt parking lot comprises the western portion of the property. A restaurant on Railroad Place leases the parking area from NYSEG. A gravel parking area is located in the northeast portion of NYSEG's property and is used by residential property owners. A NYSEG gas regulator station is located near the intersection of Railroad Place and Wadsworth Street. The City of Geneva's PSB consists of a courtroom, office space, the local jail, and an attached pole barn structure. A large parking lot used by PSB employees is located west of the PSB. A railroad is located immediately south of the PSB.

Based on utility drawings obtained from the City of Geneva, several utilities are located within the Railroad Place right-of-way, and transect former Gas Holder 1. Utilities present within Railroad Place include, but are not limited to:

- 24-inch sanitary sewer
- 8-inch potable water mains
- 8-inch natural gas lines

Additionally, two natural gas distribution lines are located immediately south of (and enter/exit) the NYSEG gas regulator station.

1.2.2 Site History

The gas plant was constructed in 1853 and included a retort and condenser house, purification building (including lime room, ammonia tank and cistern), coal shed and one gas holder (Gas Holder 1). A second gas holder (Gas Holder 2) was constructed circa 1900 in the northwest portion of the site. The majority of the buildings/structures associated with the gas plant were demolished between 1903 and 1909; the only remaining structures after 1909 were the second gas holder, tool house and meter house. The remaining holder was demolished between 1915 and 1925. Between 1925 and 1943, a 500,000-cubic-foot gas holder (Gas Holder 3) and a regulator house were constructed at the site to serve as a storage/distribution facility. This newer holder may

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

have served as a remote distribution holder for the Border City MGP, which was constructed at approximately the same time that the Wadsworth MGP was decommissioned. Gas Holder 3 was demolished sometime after 1946; however, portions of the holder foundation wall and slab still exist. Railroad Place was constructed through the center of the former MGP site, covering the location of Gas Holder 1. The locations of the historical MGP structures and present-day features are shown on Figure 2.

1.3 Summary of Remedial Investigations and Interim Remedial Measures

A summary of environmental investigations and interim remedial measures (IRMs) that have been conducted at the site was presented in the RI Report (ARCADIS 2008) and FS Report (ARCADIS 2010a). A brief description of the site geology/hydrogeology and nature and extent of impacts is presented in the following subsections.

1.3.1 Geology/Hydrogeology

Three geologic units were observed/investigated beneath the site during the RI. In descending order, these units consist of: fill; silt and clay; and fine sand. These units comprise at least the upper approximately 40 feet of materials that underlie the site. Since the deepest investigation location was terminated at approximately 40 feet below grade, the geologic materials below 40 feet are unknown. In terms of hydrogeology, the fill is the least significant unit because it is generally unsaturated, especially north of Railroad Place. Approximately 1 to 2 feet of fill is saturated in the area south of Railroad Place. The bottom of the fill is typically encountered at approximately 4 to 8 feet below grade. The silt and clay unit is continuous across the site and is generally 12 to 16 feet in thickness, except in the area of former Gas Holder 1 where the silt and clay is artificially thin (approximately 1 foot in thickness), assumed due to excavation activities conducted to install Gas Holder 1. The silt and clay unit primarily consists of silt and clay with interbedded thin (i.e., on the order of a few millimeters thick) fine sand seams. The water table is located in the silt and clay unit in the northern portion of the site. The silt and clay grades into a fine sand unit at approximately 18 to 20 feet below grade. The fine sand unit is at least 22 feet in thickness and contains traces of medium sand and clay.

The horizontal hydraulic conductivity of the silt and clay and fine sand units appear to be similar. The average horizontal hydraulic conductivity for these units is low - approximately 0.09 feet/day. The vertical hydraulic conductivity of the silt and clay is expected to be less because of the horizontal bedding of this unit. As a result,

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

groundwater in this unit likely moves more rapidly laterally along bedding than vertically across the bedding. Because of this anisotropy, the silt and clay unit is significant hydrogeologically because it may limit recharge to the fine sand unit by restricting downward infiltration of precipitation.

Groundwater beneath the site moves north-northeast. Although groundwater appears to flow away from Seneca Lake, a regional groundwater discharge boundary, it is likely that site groundwater eventually finds its way to Seneca Lake. Local variability in groundwater flow direction is common in glacial/glacio-lacustrine depositional settings (such as the site area) due to the heterogeneous nature of glacially-derived overburden materials.

1.3.2 Nature and Extent of Impacts

This subsection describes the nature and extent of the environmental impacts identified at the site. The primary MGP byproduct impacting site media is coal tar, or dense non-aqueous phase liquid (dense NAPL or DNAPL). Principal components of coal tar include benzene, toluene, ethylbenzene, and xylene (BTEX) which are volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) which are semi-volatile organic compounds (SVOCs). A summary of environmental impacts, by media type, is presented below. A detailed account of the environmental site impacts, including analytical summary tables, is presented in the RI Report. Previous investigation locations are shown on Figure 2.

1.3.2.1 Soil Quality

The quality of site soil was evaluated during the RI by characterizing soil samples collected during the various site investigations and submitting select soil samples for laboratory analysis for VOCs, SVOCs, and cyanide. A summary of the surface and subsurface soil quality is presented below.

Surface Soil

During the RI, six surface soil samples (0 to 0.2 feet below grade) were collected and analyzed for SVOCs, VOCs and total cyanide. Surface soil samples SS-1 through SS-6 were all collected from the NYSEG-owned property. All surface soil data were compared to 6NYCRR Part 375-6 unrestricted use soil cleanup objectives (SCOs) (unrestricted use SCOs). A limited number of VOCs (i.e., acetone, benzene, toluene) were detected in the surface soil samples. Acetone was the only VOC that was

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

detected at concentrations greater than unrestricted use SCOs. Acetone is not attributed to MGP-related impacts.

During the RI, fifteen SVOCs including acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluoranthene, fluorine, indeno(1,2,3-cd)pyrene phenanthrene and pyrene were detected in surface soil sample (SS-1) at concentrations greater than unrestricted use SCOs. SVOCs were also detected at concentrations greater than unrestricted use SCOs in surface soil samples SS-2 (benzo[k]fluoranthene), SS-5 and SS-6 (benzo[a]pyrene).

Total cyanide was not detected at concentrations greater than the unrestricted use SCO (27 parts per million [ppm]) in surface soil samples collected during the RI: total cyanide was detected in samples SS-1 and SS-5 at concentrations of 1.4 and 2.9 ppm, respectively.

Subsurface Soil

Indications of NAPL and/or sheen were observed in three areas of the site: former Gas Holder 1, an unknown buried structure at the SB-14 borings and at monitoring well MW-3 (near the former purifier house).

- Gas Holder 1: A trace-to-little viscous, tarlike NAPL was observed at three soil borings (SB-5, SB-7 and SB-13) completed inside the footprint of former Gas Holder 1. The soil boring logs indicate that the NAPL was present in the form of droplets and blebs, pooled potentially mobile NAPL was not observed within the soil borings installed in this holder. The interval that the viscous tar was observed at each location corresponds to immediately above and below the floor of the holder at a depth interval of approximately 16 to 23 feet below grade (the holder floor was encountered at approximately 18 feet below grade). The deepest impact observed in the area of former Gas Holder 1 is a trace sheen observed at approximately 28 to 29 feet below grade at SB-13. No impacts were observed in soils encountered below this interval.
- Buried Structure at SB-14: A potential buried structure, as evidenced by void space encountered during drilling, was observed at the first boring (SB-14A) completed at the SB-14 location. The void was encountered at approximately 4 to 6.5 feet below grade, and contained water and a black oil-like fluid. Drilling at boring SB-14A was not advanced beyond the floor of the buried structure and was

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

discontinued at approximately 6.5 feet below grade. A second boring (SB-14B) was completed approximately 5 feet west in an attempt to miss the apparent structure. Strong odors and relatively minor photoionization detector (PID) readings were observed at SB-14B at depths to 15 feet below grade. Additionally, no visual indications of MGP-related impacts were observed in test pits TP-1, TP-1A and/or TP-1B that were completed immediately north of soil boring SB-14A. Additionally, BTEX was not detected at concentrations greater than laboratory detection limits and PAHs were not detected at concentrations greater than unrestricted use SCOs in soil samples collected from SB-14B (10-12') and TP-1 (7').

Former Lime House or Purifier House: The soil boring for monitoring well MW-3
was drilled through a possible brick foundation, likely associated with the former
lime house or purifier house. MGP-related impacts were observed at monitoring
well MW-3, where a moderate to faint odor, trace sheen, and slightly elevated PID
readings (up to 42 ppm) were noted intermittently between 10 and 22 feet below
grade. The impacts were observed below the foundation.

Note that in addition to the investigation activities completed at the site, a trench was excavated along Railroad Place to facilitate installation of a new waterline by the City of Geneva in May 1999. The trench was approximately 6 feet wide by 6 feet deep by 100 feet in length and ran through the foundation of the southernmost gas holder (Gas Holder No. 1). Three subsurface soil samples were collected during the trenching activities: one from the bottom of the excavation within the gas holder; and one from each of the excavation side walls. BTEX and PAH compounds and total cyanide were detected in each sample. Total BTEX was detected at concentrations ranging from 0.003 ppm to 0.407 ppm; total PAHs were detected at concentrations ranging from 23.8 to 181.9 ppm; and total cyanide was detected at concentrations ranging from 110 to 250 ppm. The material excavated from the trench was managed and disposed of in accordance with applicable rules and regulations. Based on the removal and off-site disposal of soil, the trenching/soil removal activities were considered an IRM.

Analytical results for subsurface soil samples collected during the RI were compared to the unrestricted use SCOs and 6NYCRR Part 375-6 restricted use soil cleanup objectives (SCOs) for commercial use (commercial use SCOs). The commercial use SCOs are the focus of the discussion below because the current and intended use of the site is commercial.

A total of 31 subsurface soil samples were collected and analyzed for VOCs during the RI. All but four of the 31 samples contained detectable concentrations of BTEX

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

compounds. Concentrations of total BTEX ranged from 0.002 ppm (SB-2 [8 to 10 feet]) to 980 ppm (SB-13 [16 to 18 feet]). The highest concentrations of total BTEX were detected in samples collected from the visually impacted material at soil borings SB-5, SB-7, SB-13 and SB-14A. Two soil samples (SB-13 [16 to 18 feet] 240 ppm and SB-14A [4 to 6.5 feet] 64 ppm) contained benzene at concentrations greater than the commercial use SCO of 44 ppm. No samples contained concentrations of toluene, ethylbenzene or xylene at concentrations greater than commercial use SCOs.

A total of 31 subsurface soil samples were collected and analyzed for SVOCs. All but two of the 31 samples contained detectable concentrations of PAH compounds. Concentrations of total PAHs ranged from 0.011 ppm (test pit TP-1 [7 feet]) to 11,000 ppm (soil boring SB-5 [23 to 23.3 feet]). Similar to the concentration trend observed for BTEX, the greatest concentrations of total PAHs were detected in samples collected from the visually impacted material observed at monitoring well MW-3 and soil borings SB-5, SB-7, SB-13 and SB-14A. Samples collected from visually non-impacted intervals contained concentrations of total PAHs at concentrations less than 50 ppm. Ten samples contained one or more PAHs at concentrations greater than the commercial use SCOs. Eight of these samples correspond to the areas where visually impacted material was observed. The remaining two samples were collected from soil borings SB-9 (6 to 6.8 feet) and SB-12 (16 to 18 feet), which contained benzo(a)pyrene and/or dibenz(a,h)anthracene at concentrations slightly greater than the commercial use SCO.

A total of 31 subsurface soil samples were collected and analyzed for total cyanide. Ten of the 31 samples contained detectable concentrations of total cyanide. Concentrations of total cyanide ranged from 0.87 ppm (soil boring SB-8 [14 to 16 feet]) to 2,170 ppm (soil boring SB-14A [4 to 6.5 feet]). The subsurface soil sample collected from soil boring SB-14A was the only sample containing cyanide at a concentration greater than the commercial use SCO for total cyanide (i.e., 27 ppm). The distribution of cyanide detected in soil is likely a reflection of the presence of fill material across the site that contains apparent MGP and other potential industrial-related wastes (e.g., clinkers, ash, cinders, purifier wastes). Because MGP wastes sometimes contain cyanide, and MGP-related wastes (mostly in the former of cinders and ash) were observed in nearly every subsurface investigation location, it is not surprising that cyanide was detected in subsurface soils in many areas of the site. Although cyanide was detected at several locations, the detected concentrations were relatively low (generally less than 20 ppm), with the exception of the sample from SB-14A (which was also saturated with NAPL).

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

1.3.2.2 Groundwater Quality

The quality of groundwater was evaluated by comparing the analytical results of groundwater samples to the NYSDEC *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1). Monitoring wells are generally screened within the silt and clay unit with some wells screens extending into the upper few feet of the fine sand unit. With the exception of the groundwater samples collected from monitoring well MW-3, the groundwater in these units did not contain BTEX and PAHs at concentrations greater than TOGS 1.1.1 criteria. Based on the interpreted groundwater flow direction and location of former MGP structures, the source of these dissolved phase constituents could be associated with the former lime house, purifier house, or other former MGP structures located beneath the PSB. Although no monitoring wells were installed inside/immediately near former Gas Holder 1 or the buried structure at SB-14A, it is reasonable to assume that groundwater in immediate contact with impacted soils at these locations likely exceeds the TOGS 1.1.1 criteria for BTEX and PAHs.

Groundwater in the silt and clay and fine sand unit was found to contain low concentrations of total cyanide over a broader area than that affected by BTEX and PAHs. Low concentrations of cyanide were detected in groundwater samples collected from each of the monitoring wells located near and downgradient of the former lime house/purifier house and former Gas Holder 1. Total cyanide was only detected at concentrations greater than the TOGS 1.1.1 criteria (i.e., 200 parts per billion [ppb]) in groundwater samples collected from monitoring wells MW-2 and MW-3 (ranging from 259 to 600 ppb).

1.3.2.3 Soil Vapor Quality

A soil vapor intrusion investigation was conducted at the City of Geneva's PSB. The investigation included collecting soil vapor samples from below the floor slab of the building, and samples of air inside and outside of the building. The investigation results indicated that several VOCs were present in vapor samples collected beneath the building foundation slab and from indoor air. However, the VOCs could not be attributed to a particular source. Several of the VOCs (most notably BTEX) are potentially related to the former MGP, but these same compounds have other possible non-MGP sources such as gasoline. Other detected VOCs, such as trichloroethene, are not related to the former MGP. The concentrations of VOCs detected in indoor air were below appropriate criteria. Based on the investigation results, subsurface MGP

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

byproducts do not appear to be contributing VOCs to the indoor air at the PSB via soil vapor intrusion.

The NYSDEC and the NYSDOH concluded that the concentrations of BTEX and naphthalene detected below the slab present a potential for future soil vapor intrusion into the PSB. As such, the NYSDEC and the NYSDOH requested that NYSEG either install a sub-slab depressurization system or conduct additional vapor sampling during the 2007/2008 winter season.

Based on the findings of the sub-slab pressure field testing conducted during January 2008 and a heating, ventilation and air conditioning (HVAC) air balance evaluation conducted during April 2008, ARCADIS determined that the installation of a sub-slab depressurization system alone to address vapor intrusion concerns at the PSB is not feasible due to the inability to induce an effective sub-slab negative pressure throughout a majority of the building. NYSEG conducted an IRM during 2008 and 2009, consisting of a combination of constructing a sub-slab depressurization vapor intrusion mitigation system and adjusting the HVAC operational set points in the PSB to minimize or eliminate the negative pressure conditions relative to conditions beneath the slab.

ARCADIS conducted additional soil vapor intrusion sampling in May 2009 following installation of the vapor mitigation system and implementation of modifications to the PSB building HVAC system. The additional sampling activities included collecting subslab vapor, indoor air, and ambient air samples at the PSB. As indicated in the March 2010 Post Sub-Slab Depressurization System Installation Vapor Intrusion Evaluation Summary Report (ARCADIS 2010b), analytical results for collected samples indicated that building modifications reduced BTEX and naphthalene concentrations in the indoor air of the PSB relative to the results of the samples collected in 2007.

Routine maintenance and operational checks of the depressurization and HVAC systems was recommended to be conducted every 18 months to verify proper system operation (ARCADIS 2010b). If new buildings or structures are constructed on the NYSEG-owned property in the future, a soil vapor intrusion evaluation would be conducted prior to construction to evaluate the potential need for soil vapor intrusion mitigation measures to be included in the construction design.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

1.4 Standards, Criteria, and Guidelines

Chemical-, action-, and location-specific SCGs that are potentially applicable to the design and implementation of the NYSDEC-selected remedy are presented in Tables 1, 2, and 3, respectively. Primary SCGs that were considered during the development of this RDWP include the following:

- Groundwater, drinking water, and surface water SCGs based on NYSDEC's
 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent
 Limitations (TOGS 1.1.1) and Part 5 of the New York State Sanitary Code.
- Soil SCGs based on Title 6 of the New York Code of Rules and Regulations (NYCRR) Part 375-6 (6 NYCRR Part 375-6) and Technical and Administrative Guidance Memorandum (TAGM) 4046.
- Resource Conservation and Recovery Act (RCRA) and New York State regulations regarding the identification and listing of hazardous wastes outlined in 40 CFR 261 and 6 NYCRR Part 371, respectively.
- NYSDEC Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants TAGM 4041 (also known as NYSDEC DER-4).

1.5 Remedial Objectives

As presented in the ROD (NYSDEC 2010a), the selected remedy must eliminate or mitigate all significant threats to public health and/or the environment from MGP-related materials and impacted media present at the site. To achieve this goal, the following remedial objectives have been established for the protection of public health and the environment.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

Table 1.2 - Remedial Objectives

Public Health Protection

Soil

- · Prevent ingestion/direct contact with contaminated soil
- Prevent inhalation of contaminants volatilizing from the soil
- · Prevent inhalation of contaminated particles from the soil

Groundwater

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards
- Prevent contact with contaminated groundwater
- · Prevent inhalation of contaminants volatilizing from groundwater

Soil Vapor

 Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the indoor air of buildings at or near the site

Environmental Protection

Soil

 Prevent migration of contaminants that would result in groundwater or surface water contamination

Groundwater

- Restore the groundwater aquifer to meet ambient groundwater quality criteria to the extent practicable
- Prevent discharge of contaminated groundwater to surface water

1.6 Description of Selected Remedy

As presented in the ROD (NYSDEC 2010a), the NYSDEC-selected remedy for the site consists of the following remedial components:

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

- A remedial design program that would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program and also access the viability of enhanced natural attenuation.
- 2) The removal of the subsurface structure and MGP-related impacted soil on the NYSEG property in the area of the tar structure (near soil boring SB-14A).
- 3) A site cover will be required for the properties comprising the site to allow for their continued commercial use. This cover will consist of the existing PSB and the associated pavement, sidewalks and parking lots, as well as Railroad Place for the City-owned properties. For the NYSEG-owned property, a soil cover [or asphalt pavement] will be installed in areas of exposed surface soil. The soil cover will consist of a minimum of one foot of soil meeting the commercial use requirements for cover material set forth in 6NYCRR Part 375-6.7(d), placed over a demarcation layer. The upper 6 inches of the soil will be of sufficient quantity to maintain a vegetative layer.
- 4) The holder foundation slab remaining on the NYSEG property [i.e., Gas Holder 3] will be uncovered, inspected, and if tar is observed, cleaned. After the inspection and any required cleaning, the slab will remain, and the site will be restored consistent with the surrounding conditions.
- 5) Enhanced natural attenuation of the identified groundwater contamination will be evaluated as part of the remedial design, and if a viable approach is identified, it will be implemented. The most likely form for such enhancement would be to increase the amount of oxygen available to the soil bacteria which can naturally degrade the MGP-related COCs present in groundwater.
- 6) Imposition of an institutional control in the form of an environmental easement for the controlled property that:
 - a) requires the remedial party or site owner to complete and submit a periodic certification of institutional and engineering controls to the NYSDEC in accordance with 6NYCRR Part 375-1.8(h)(3)
 - b) land use is subject to local zoning laws, the remedy allows the use and development of the controlled property for commercial use

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDEC, New York State Department of Health (NYSDOH) or County DOH
- d) prohibits agriculture or vegetable gardens on the controlled property
- e) requires compliance with a NYSDEC-approved Site Management Plan
- 7) Development of a Site Management Plan that includes the following:
 - a) An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to assure the following institutional and/or engineering controls remain in place and effective:

<u>Institutional Controls</u> – The environmental easement discussed above will be required for both the NYSEG- and City-owned parcels, as well as the area of Railroad Place.

<u>Engineering Controls</u> – The soil cover, the existing buildings, streets, paved areas, and the sub-slab depressurization system already installed in the PSB. The enhanced natural attenuation system, if implemented, would also require ongoing engineering controls to maintain its effectiveness

This plan includes, but may not be limited to the following:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining impacted soil and disposal soil generated during excavations
- ii. descriptions of the provisions of the environmental easements including any land use and groundwater use restrictions
- iii. provisions for management and inspection of the identified engineering controls
- iv. the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

- v. provisions for the continued operation of the sub-slab depressurization system in the PSB.
- b) a *Monitoring Plan* to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to the following:
 - monitoring of groundwater to assess the performance and effectiveness of the remedy
 - ii. a schedule of monitoring and frequency of submittals to be provided to the NYSDEC
 - iii. provisions to evaluate the potential for soil vapor intrusion any that may be constructed on the site, including provisions for implementing soil vapor mitigation (as necessary)
 - iv. provisions to evaluate the potential for soil vapor intrusion for existing buildings if building use changes significantly
- 8) Green remediation and sustainability efforts are to be considered in the design and implementation of the remedy, to the extent practicable, including:
 - energy efficiency and green building design
 - use of renewable energy sources
 - reducing green house gas emissions
 - encouraging low carbon technologies
 - fostering green and healthy communities
 - increasing recycling and reuse of clean materials
 - preserving open space and working landscapes
 - utilizing native species and discouraging establishment of invasive species during restoration

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

2. Pre-Design Investigation

This section describes the PDI activities to be conducted at the site to address additional data needs to support the remedial design activities described in Section 3. The results of the proposed PDI activities will support the development of the remedial design for the NYSDEC-selected remedy. PDI activities will include the following tasks:

- PDI Task 1 Utility and Site Coordination
- PDI Task 2 Soil Investigation
- PDI Task 3 Groundwater Investigation
- PDI Task 4 Site Survey

Methodologies and protocols to be followed during the completion of the PDI activities are presented in the Field Sampling Plan (FSP) included as Appendix A. Analytical procedures and requirements to be followed for the laboratory analysis of samples collected during PDI activities are presented in the Quality Assurance Project Plan (QAPP) included as Appendix B. Health and safety protocols to be followed by field personnel during PDI activities are presented in the Health and Safety Plan (HASP) included as Appendix C. The air monitoring activities to be conducted during the PDI are presented in the Community Air Monitoring Plan (CAMP) included as Appendix D.

A description of each task associated with the PDI is presented below.

2.1 PDI Task 1 - Utility and Site Coordination

PDI Task 1 consists of coordinating with NYSEG and other parties (as appropriate) to determine the presence and location of utilities that may impact the construction of the selected remedy. As indicated in Section 1, utilities present within Railroad Place include, but are not limited to:

- 24-inch sanitary sewer
- 8-inch potable water mains
- 8-inch natural gas lines

Additionally, two natural gas distribution lines are located south of the gas regulator station.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

2.1.1 PDI Task 1a - Utility Markout

As part of the PDI, both a public and a private utility locator will markout the approximate location of subsurface utilities on the NYSEG property, as well as within Railroad Place and Wadsworth Street. The locations of subsurface utilities will be considered during the evaluation and design of potential support system(s) to be used to facilitate the excavation activities described in Section 3.1.

2.1.2 PDI Task 1b - Coordination with NYSEG Gas Department

As indicated above, two natural gas distribution lines are located on the NYSEG property within the soil removal area. As discussed in the Section 3.1, potential excavation support system(s) will be dependent on whether the natural gas distribution lines need to remain during the excavation activities or can be relocated (and if the lines need to be considered based on the results of PDI Task 2, discussed below). As part of the PDI, NYSEG will assess the potential feasibility of relocating the lines prior to or as part of the remedial construction activities (if needed).

2.2 PDI Task 2 - Soil Investigation

Preliminary soil removal limits established during the Feasibility Study and in the NYSDEC ROD are shown on Figure 3. As indicated in the NYSDEC ROD, the purpose of the soil removal activities is to remove the presumed subsurface structure and MGP-related impacts observed in soil boring SB-14A. As part of the PDI, additional soil borings will be completed in the vicinity of soil boring SB-14A to delineate the extent of soil removal to meet the remedial objectives of the NYSDEC ROD.

Soil borings SB-16 through SB-19 will be completed to confirm the extent of soil containing visual MGP-related impacts in the vicinity of soil boring SB-14A. Approximate soil boring locations are shown on Figure 2. Soil boring locations may be adjusted in the field based on the location of subsurface utilities and accessibility. Soil borings will be completed to a depth of approximately 20 feet below grade. The upper five feet of each boring will be hand-cleared using air knife/vacuum technologies (or other appropriate methods) to confirm that no utilities are present at the proposed soil boring locations. The borings will then be completed to the target depth using hollow-stem auger (HSA) drilling methods. Soil samples will be collected continuously in two foot sample intervals from grade to the total depth of the boring. Soil recovered from each sample interval will be visually characterized for color, texture, and moisture content, as well as the presence of visible staining, sheen, NAPL, and obvious odors. If

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

visual MGP-related impacts are encountered in a particular boring, additional "step-out" borings will be completed, as necessary, to determine the extent of the MGP-related impacts.

Additionally, soil boring SB-14C will be completed in an attempt to relocate and inspect the structure observed in soil boring SB-14A. As indicated in Section 1, a void was encountered in soil boring SB-14A at approximately 4 to 6.5 feet below grade. The soil boring log for this location indicated the presence of perched water, black peat and fine to coarse sand with, trace fine to medium sub-rounded gravel saturated with black NAPL, and a very strong MGP-like odor. Soil boring SB-14C will be completed at the same location as soil boring SB-14A using air knife/vacuum technologies. If the same void is encountered, a down-hole video camera will be used to visually inspect the void and assess the nature, size and construction materials of the potential structure.

Soil cuttings will be staged on-site in an appropriate container (i.e., roll-off, drum). Soil cuttings will be field screened for the presence of volatile organic vapors using a photoionization detector (PID). Composite samples from the investigation-derived waste (IDW) will be submitted for laboratory analysis for waste characterization/disposal purposes. Soil cuttings (and other IDW) will be managed and disposed of in accordance with applicable rules and regulations.

2.3 PDI Task 3 - Groundwater Investigation

PDI Task 3 will consist of installing one new groundwater monitoring well and conducting groundwater sampling in support of RD Task 4 – Natural Attenuation Evaluation.

2.3.1 PDI Task 3a – Groundwater Monitoring Well Installation

As part of PDI Task 3, a new groundwater monitoring well (MW-10) will be installed at the approximate location shown on Figure 2. Monitoring well MW-10 will be installed to facilitate sampling and analysis of groundwater in the general vicinity of the NYSEG gas regulator station. The proposed well would be positioned and screened to provide an additional groundwater monitoring point to support the Natural Attenuation Evaluation to be completed under RD Task 4 and provide an additional monitoring point for dissolved phase impacts downgradient from Gas Holder 1. Groundwater level measurements will be collected from each existing groundwater monitoring well prior to the installation of the new monitoring to confirm groundwater flow direction and reposition the well as necessary.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

Monitoring well installation and development procedures are detailed in the FSP (see Appendix A). Similar to the procedures for completing soil borings, the upper five feet of the boring to be completed to facilitate monitoring well installation will be hand-cleared using air knife/vacuum technologies (or other appropriate methods) to confirm that no utilities are present at the proposed well location. Monitoring well MW-10 will be installed to a depth of 25 feet below grade using HSA drilling methods. Soil samples will be collected continuously from grade to the total depth of the boring. Soil recovered from each sample interval will be visually characterized for color, texture, and moisture content. The presence of visible staining, sheen, NAPL, and obvious odors encountered in the soil will be noted. The well will be installed using 2-inch diameter Schedule 40 PVC riser and a 10-foot long, 20 slot screen (0.020-inch slot screen size) from 15 to 25 feet below grade. The well will be completed at the ground surface with a flush-mount steel curb box secured with a neat cement seal sloping gently away to promote drainage away from the well.

At least 24 hours following installation, the monitoring well will be developed by surging/purging using a Waterra positive displacement pump and dedicated polyethylene tubing or new, disposable polyethylene bailers. The well will be developed by alternately surging and purging the well screen until the water removed from the well is reasonably free of visible sediment (50 nephelometric turbidity units [NTUs]), or until the turbidity levels stabilize following the removal of 10 well volumes.

Following installation and development of monitoring well MW-10, groundwater level measurements will be collected from each existing groundwater monitoring well, as well as the proposed new monitoring well to confirm groundwater flow direction.

2.3.2 PDI Task 3b - Groundwater Sampling

PDI Task 3b consists of collecting and submitting one round of groundwater samples for laboratory analysis in support of a natural attenuation evaluation. Groundwater samples will be collected from each existing and new groundwater monitoring well to document the extent of dissolved phase groundwater impacts and evaluate the microbial community in support of the Natural Attenuation Evaluation (to be completed under RD Task 4).

Groundwater sampling procedures are described in the FSP (see Appendix A). Groundwater samples will be submitted for the following parameters:

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

- electron acceptors oxygen, nitrate, manganese oxides (insoluble manganese), ferric iron, sulfate, carbon dioxide
- electron donors VOCs, SVOCs, organic carbon
- metabolic by-products carbon dioxide, nitrogen gas, nitrite, dissolved iron, dissolved manganese, sulfide, methane
- field parameters pH, Conductivity, oxidation-reduction potential (ORP), temperature
- microbial parameters
 - toluene dioxygenase (qTOD) potential to degrade toluene, benzene, and ethylbenzene and
 - naphthalene dioxygenase (qNAH) potential to degrade naphthalene,
 anthracene, phenanthrene, acenaphthylene, fluorene, acenaphthene, dibenzo 1,4-dioxin, dibenzothiophene, and dibenzofuran
- cyanide
- alkalinity

2.4 PDI Task 4 - Site Survey

PDI Task 4 consists of conducting a site survey to document the following:

- the location of subsurface utilities marked out under PDI Task 1b. Utilities identified during the PDI activities will be surveyed (location only) so that protection of these utilities can be considered during preparation of the remedial design.
- the location of soil boring borings complete as part of PDI Task 2.
- the location and elevation of new monitoring well MW-10 installed as part of PDI Task 3.
- the existing site topography.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

Topographic survey information will be collected to obtain a pre-construction baseline to facilitate restoration of the site to pre-construction conditions following the completion of remedial activities. The topographic survey will be completed to facilitate generation of one-foot site contours.

2.5 PDI Documentation

The results from the PDI will be documented in a basis-of-design to be included as part of the Remedial Design. The PDI results, along with existing site information, will support the basis for the remedial design. The results of the groundwater investigation and natural attenuation evaluation (PDI Task 3 and RD Task 4) will be provided to the NYSDEC under separate cover and also included as an appendix to the Remedial Design.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

3. Remedial Design Activities

This section presents a description of the work activities 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 tasks:

- RD Task 1 Soil Excavation
- RD Task 2 Backfill
- RD Task 3 Surface Cover
- RD Task 4 Natural Attenuation Evaluation

A description of each task associated with the preparation of the remedial design is presented below.

3.1 RD Task 1 - Soil Excavation

RD Task 1 consists of designing the necessary support system(s) to complete the soil removal activities to the limits depicted in the ROD (NYSDEC 2010a). Potential excavation support systems (e.g., engineered slopes, sheet pile walls, trench boxes, slide rail shoring, etc.) will be evaluated during the remedial design. The final excavation support system(s) will allow for the removal of soil containing MGP-related impacts and the subsurface structure. The final excavation limits will be delineated based on the absence/presence of visual MGP-related impacts observed during the completion of the PDI soil borings (as described under PDI Task 2). Depending on the final excavation limits and based on NYSEG's ability to relocate the natural gas distribution lines located within the removal area (if needed), the excavation may be conducted in a phased approach. The excavation support system will be designed in a manner that will protect Railroad Place (and potential utilities located within the street) and the NYSEG gas regulator station and as associated natural gas distribution lines.

As indicated in Section 5, the final type, locations, and design of the excavation support system will be presented in the remedial design documentation.

3.2 RD Task 2 - Backfill

RD Task 2 consists of identifying appropriate materials to be used as backfill following the soil excavation activities to be completed as part of the site remedy. Backfilling will be completed to within one foot of the final surface elevation to facilitate installation of the site cover (discussed in Section 3.3). The remedial design will include

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

specifications (i.e. gradations, material types, and analytical criteria) for imported fill materials to reflect existing site soils, as appropriate. Review of previously collected geotechnical data will be used to specify the fill material. Backfill types may include controlled low-strength material (CLSM, also known as flowable fill) and crushed gravel for select areas of the excavation (such as around subsurface utilities). Backfilling protocols (e.g., lift thickness, compaction requirements, etc.) and grading will also be specified in the remedial design.

3.3 RD Task 3 - Surface Cover

RD Task 3 consists of developing the final surface restorations to be completed at the site. As indicated in the ROD (NYSDEC 2010a), the foundation slab of former Holder 3 will be uncovered, visually inspected, and if visual impacts (i.e., visible free product) are observed on the surface of the foundation slab, the slab will be cleaned. The remedial design will include performance criteria for cleaning visual impacts (if observed). Note that destructive testing or sampling of the slab will not be conducted as part of the remedial action.

Additionally, the top one foot of surface material (i.e., not including surfaces covered with pavement or concrete) will be removed to facilitate installation of a site surface cover. Prior to the installation of the surface cover, a demarcation layer (e.g., geotextile, snow fence) will be installed to denote the surface cover limits. The demarcation layer material will be specified as part of the remedial design.

Following placement of the demarcation layer, the surface cover will be installed to generally match the existing site lines and grades. Surface cover material will be determined as part of the remedial design. Potential surface cover materials include vegetated soil, asphalt pavement, or a combination of the two. The vegetated soil cover would consist of one foot of material that meets the commercial use allowable constituent levels for imported fill or soil provided in Appendix 5 of DER-10 (NYSDEC, 2010b), with the top six inches of soil sufficient to maintain a vegetative layer. If asphalt pavement is selected, the remedial design may include stormwater drainage components (e.g., catch basins, piping) that would be tie into the existing storm sewer located within Railroad Place and Wadsworth Street.

3.4 RD Task 4 - Natural Attenuation Evaluation

Analytical results obtained for groundwater samples collected under PDI Task 3 will be used to evaluate whether natural attenuation is occurring at the site. The natural

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

attenuation evaluation will include a review the geochemical characteristics of site groundwater to identify the presence of a microbial community and community's effectiveness at attenuating dissolved phase groundwater impacts at the site.

The evaluation will ultimately conclude whether natural attenuation is occurring at the site and if natural attenuation is an effective means for addressing dissolved phase groundwater impacts at the site. Additionally, the evaluation will consider (and ultimately recommend, as appropriate) whether additional sampling is needed to evaluate the natural attenuation process potentially present at the site and if the process present could be enhanced through the addition of a groundwater amendment (i.e., oxygen and/or nutrients).

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

4. Permits 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 conduct the PDI field activities and to implement the NYSDEC-selected remedy.

4.1 PDI Permits and Approvals

No permits are currently anticipated to be required in support of the PDI activities described in Section 2.

Monitoring wells MW-3, MW-4, MW-5, MW-6, and MW-9 are located on property owned by the City of Geneva. Prior to conducting the PDI activities, NYSEG will secure an access agreement with the City of Geneva to gain access to these areas in order to conduct groundwater monitoring at these locations. Additionally, although NYSEG owns the property, NYSEG or its agent will notify the owner of the restaurant located west of the gas regulator station and the owner of the private residence north of the gas regulator station that groundwater sampling will be conducted at monitoring wells MW-2 and MW-8, respectively.

4.2 Remedial Construction Permits and Approvals

Permits and approvals necessary to complete the remedial construction activities include (but are not limited to) approvals for conducting work on property not owned by NYSEG. If during the remedial design, it is determined that additional wells should be installed on the City of Geneva or any other property, NYSEG would obtain access agreements with the property owner prior to installing the wells. Additionally, NYSEG or its agent would coordinate with the City of Geneva to evaluate the needs for permits for temporary lane closures in Railroad Place and Wadsworth Street during remedial construction activities.

Based on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, Community Panel Number 360599-0001-B (effective April 15, 1982), the northeastern portion of the site is located within a 100-year (shallow flooding only) and a 500-year flood plain. The need to obtain construction permits for conducting work within a flood plain will be evaluated during the remedial design through consultation with the NYSDEC and/or United States Army Corp of Engineers (USACE).

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

5. Remedial Design Documents

Consistent with the requirements set forth in DER-10 (NYSDEC 2010b) and the Order, the following remedial design submittals will be prepared:

- Preliminary (50%) Remedial Design Report
- Draft (95%) Remedial Design Report
- Final (100%) Remedial Design Report

The contents of each remedial design document are presented below.

5.1 Preliminary (50%) Remedial Design Report

The *Preliminary (50%) Remedial Design Report* will generally include the following information:

- An introductory section that will provide a brief overview of the remedial design, site background information, design report objectives and report organization.
- A summary of the PDI activities, including the results obtained for the PDI activities.
- 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 during the remedial action, and to maintain the effectiveness of the remedial action.
- The regulatory and permitting requirements associated with implementing the activities described in the Preliminary and Final Design Reports.
- A general description of the various components associated with completing the remedial construction activities.
- A set of engineering design drawings that represent an accurate identification of existing site conditions and an illustration of the work proposed. Each engineering

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

design drawing will include a north arrow (where applicable), scale, legend, definitions of all symbols and abbreviations and sheet number. The engineering design drawings are anticipated to include, at a minimum, the following:

- Title Sheet to include at least the title of the project, key map, date prepared, sheet index and NYSDEC project identification.
- Existing Site Conditions to include pertinent property data including owners of record for all properties adjacent to the site (as necessary); site survey including the distance and bearing of all property lines that identify and define the project site; all easements, right-of-ways and reservations (as necessary); existing buildings and structures, wells, facilities and equipment; a topographic survey of existing contours and spot elevations within the project limits of disturbance, based on United States Geological Survey datum; all known existing underground and aboveground utilities; and location and identification of significant natural features, including, among other things, wooded areas, water courses, wetlands and flood hazard areas.
- Site Remediation Plan to include minimum requirements for temporary erosion and sedimentation controls; site facilities (parking areas, decontamination area, equipment/material lay down area and adjacent properties that will be used for access); limits of excavation; excavation support limits; and relocation of utilities (if any).
- Excavation Support Profile and Details to include a profile of excavation support system, preliminary structural details related to the type of support to be used, and other miscellaneous details related to the excavation support system.
- Restoration Plan to include final topographic survey (proposed contours and spot elevations) of the site, limits of the final surface covers, location of new structures and/or wells, final surface restoration for disturbed adjacent properties and other final restoration features.
- Miscellaneous Details to include details related to the surface cover profiles, temporary erosion and sedimentation controls, and decontamination area.
- Materials and performance specifications (table of contents only).

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

5.2 Draft (95%) Remedial Design Report

In addition to the items identified for the *Preliminary (50%) Design Report*, the *Draft (95%) Remedial Design Report* will include the following information:

- Revisions to the Preliminary (50%) Remedial Design Report based on NYSDEC comments, as appropriate.
- Remedial Action Schedule (Preliminary), which presents the preliminary anticipated schedule for implementation of the remedial activities.
- Final Engineering Design Drawings and Technical Specifications.
- A waste management plan (WMP) that describes the characterization, handling, treatment, and disposal requirements for various waste materials to be generated as a result of the remedial activities.
- A community air monitoring plan (CAMP) that describes the monitoring activities
 that will be conducted to detect potential airborne releases of constituents of
 concern during the implementation of remedial activities.
- A construction quality assurance plan (CQAP) that describes the materials, procedures, and testing necessary for proper construction, evaluation, and documentation during remedial activities.
- A community and environmental response plan (CERP) that describes controls, monitoring, and work practices to address the potential for short-term impacts to the surrounding community and environment during the remedial action.
- A description of operation, maintenance, and monitoring activities to be undertaken
 after the NYSDEC has approved construction of the remedial design, including the
 number of years during which such activities will be performed.
- A HASP for the protection of persons at the site during construction. This plan shall be prepared in accordance with 29 Code of Federal Regulations 1910 by a certified health and safety professional.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

 A Citizen Participation Plan which incorporates appropriate activities outlined in the NYSDEC's, "Draft Citizen Participation Handbook for Remedial Programs", dated August 2008.

The *Draft (95%) Remedial Design Report* will not be stamped and signed by Professional Engineer licensed in the State of New York.

5.3 Final (100%) Remedial Design Report

Following NYSDEC review and approval of the *Draft (95%) Remedial Design Report*, the *Final (100%) Remedial Design Report* will be produced. The *Final (100%) Remedial Design Report* will be stamped and signed by Professional Engineer licensed in the State of New York and will be of biddable quality.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

6. Remedial Design Schedule

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

- November 2010: NYSDEC approval of this RDWP
- December 2010: Implement PDI activities
- February 2011: 50% Remedial Design
- Early Summer 2011: 95% Remedial Design
- Late Summer 2011: 100% Remedial Design

This schedule is dependent upon utility coordination and regulatory review times.

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

7. Post Remedial Construction Activities

Following remedial construction activities, future site activities will be conducted in accordance a *Site Management Plan* (SMP) and institutional controls. The anticipated components of the SMP and institutional controls are presented below.

7.1 Site Management Plan

As indicated in the ROD (NYSDEC 2010a), the primary components of the SMP will consist of an *Institutional and Engineering Control Plan* and *Monitoring Plan*. These plans will consist of the following:

- Institutional and Engineering Control Plan describes the use restrictions and engineering controls that have been established at the site. This plan may include the following:
 - an Excavation Plan that includes procedures and protocols for testing, handling, and disposal of remaining site soil that may be excavated in the future
 - descriptions of the environmental easements and groundwater use restrictions established for the site
 - requirements for inspections and management of engineering controls
 - requirements for periodic reviews and certification of institutional and engineering controls
 - requirements for periodic notifications to the NYSDEC and site access by the NYSDEC
 - requirements for the continued operation of the sub-slab depressurization system in the PSB
- Monitoring Plan used to assess the performance and effectives of the remedial activities. This plan may include the following:
 - requirements for conducting periodic groundwater monitoring

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

- a schedule of the monitoring activities and submittals to be provided to NYSDEC
- requirements to evaluate the potential for vapor intrusion at any new buildings that may be constructed onsite in the future
- requirements to evaluate the potential for vapor intrusion for existing site buildings if building use changes significantly

7.2 Institutional Controls

As indicated in the ROD (NYSDEC 2010a), institutional controls in the form of an environmental easement will be established for the site to:

- Require NYSEG to provide a periodic certification of institutional and engineering controls to the NYSDEC in accordance with 6NYCRR Part 375-1.8(h)(3)
- Limit the land use and development of the site to commercial use
- Restrict the use of site groundwater for potable purposes or as process water, unless proper water quality treatment is conducted, as determined by NYSDOH.
- Prohibit agriculture or vegetable gardens at the site
- Require compliance with an NYSDEC-approved SMP

Remedial Design Work Plan

Wadsworth Street Former Manufactured Gas Plant Site

8. References

ARCADIS 2008. *Remedial Investigation Report*, prepared for the NYSEG Former Manufactured Gas Plant Site, Wadsworth Street, Geneva, New York, February 2008.

ARCADIS 2010a. *Feasibility Study Report*, prepared for the NYSEG Former Manufactured Gas Plant Site, Wadsworth Street, Geneva, New York, February 2010.

ARCADIS 2010b. Post Sub-Slab Depressurization System Installation Vapor Intrusion Evaluation Summary Report, prepared for the NYSEG Former Manufactured Gas Plant Site, Wadsworth Street, Geneva, New York, March 2010.

NYSDEC 2010a. *Record of Decision*. NYSEG, Wadsworth Street, Geneva MGP Site, Site Number 8-35-015, March 2010.

NYSDEC 2010b. DER-10 Technical Guidance for Site Investigation and Remediation, May 3, 2010.

Tables

Table 1 **Potential Chemical-Specific SCGs**

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
Clean Water Act (CWA) - Ambient Water Quality Criteria	40 CFR Part 131; EPA 440/5-86/001 "Quality Criteria for Water - 1986", superceded by EPA-822-R- 02-047 "National Recommended Water Quality Criteria: 2002"	S	Criteria for protection of aquatic life and/or human health depending on designated water use.	Applicable to the evaluation of potential impacts to groundwater from MGP-related constituents.
CWA Section 136	40 CFR 136	G	Identifies guidelines for test procedures for the analysis of pollutants.	Applicable to water monitoring associated with National Pollutant Discharge Elimination System (NPDES) permitted discharges.
CWA Section 404	33 USC 1344	S	Regulates discharges to surface water or ocean, indirect discharges to POTWs, and discharge of dredged or fill material into waters of the U.S. (including wetlands).	Potentially applicable for remedial activities involving indirect discharge to a POTW.
RCRA-Regulated Levels for Toxic Characteristics Leaching Procedure (TCLP) Constituents	40 CFR Part 261	S	These regulations specify the TCLP constituent levels for identification of hazardous wastes that exhibit the characteristic of toxicity.	Excavated material may be sampled and analyzed for TCLP constituents prior to disposal to determine if the materials are hazardous based on the characteristic of toxicity.
Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs)	40 CFR Part 268	S	Identifies hazardous wastes for which land disposal is restricted and provides a set of numerical constituent concentration criteria at which hazardous waste is restricted from land disposal (without treatment).	Applicable if waste is determined to be hazardous and for remedial alternatives involving offsite land disposal.
National Primary Drinking Water Standards	40 CFR Part 141	S	Establishes maximum contaminant levels (MCLs) which are health-based standards for public water supply systems.	These standards are potentially applicable if an action involves future use of ground water as a public supply source.

Table 1 **Potential Chemical-Specific SCGs**

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
New York State				
Environmental Remediation Programs	6 NYCRR Part 375	S	Provides an outline for the development and execution of the soil remedial programs. Includes cleanup objective tables.	Applicable for site remediation.
NYSDEC Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants ("MGPs")	TAGM 4061(2002)	G	Outlines the criteria for conditionally excluding coal tar waste and impacted soil from former MGPs which exhibit the hazardous characteristic of toxicity for benzene (D018) from the hazardous waste requirements of 6 NYCRR Parts 370 - 374 and 376 when destined for thermal treatment.	This guidance will be used as appropriate in the management of MGP-impacted soil and coal tar waste for remedial actions that include MGP-impacted soil generated during the remedial activities.
NYSDEC Ambient Water Quality Standards and Guidance Values	Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 (6/98)	G	Provides a compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in the NYSDEC programs.	These standards and guidance values are to be considered in evaluating groundwater and surface water quality.
Identification and Listing of Hazardous Wastes	6 NYCRR Part 371	S	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371-376.	Applicable for determining if soil generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
New York State Surface Water and Groundwater Quality Standards	6 NYCRR Part 703	S	Establishes quality standards for surface water and groundwater.	Applicable for assessing water quality at the site during remedial activities.

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action
Federal				
Occupational Safety and Health Act (OSHA) - General Industry Standards	29 CFR Part 1910	S	These regulations specify the 8-hour time-weighted average concentration for worker exposure to various compounds. Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120.	Proper respiratory equipment will be worn if it is not possible to maintain airborne concentrations of COC's in the breathing zone below required concentrations. Appropriate training requirements will be met for remedial workers.
OSHA - Safety and Health Standards	29 CFR Part 1926	S	These regulations specify the type of safety equipment and procedures to be followed during site remediation.	Appropriate safety equipment will be utilized on- site and appropriate procedures will be followed during remedial activities.
OSHA - Record- keeping, Reporting and Related Regulations	29 CFR Part 1904	S	These regulations outline record-keeping and reporting requirements for an employer under OSHA.	These regulations apply to the company(s) contracted to install, operate, and maintain remedial actions at hazardous waste sites.
RCRA - Preparedness and Prevention	40 CFR Part 264.30 - 264.31	S	These regulations outline requirements for safety equipment and spill control when treating, handling and/or storing hazardous wastes.	Safety and communication equipment will be utilized at the site as necessary. Local authorities will be familiarized with the site.
RCRA - Contingency Plan and Emergency Procedures	40 CFR Part 264.50 - 264.56	S	Provides requirements for outlining emergency procedures to be used following explosions, fires, etc. when storing hazardous wastes.	Emergency and contingency plans will be developed and implemented during remedial design. Copies of the plan will be kept on-site.
CWA - Discharge to Waters of the U.S., and Section 404	40 CFR Parts 403, and 230 Section 404 (b) (1); 33 USC 1344	S	Establishes site-specific pollutant limitations and performance standards which are designed to protect surface water quality. Types of discharges regulated under CWA include: indirect discharge to a POTW and discharge of dredged or fill material into U.S. waters.	Potentially applicable to remedial activities involving indirect discharge to a POTW
90 Day Accumulation Rule for Hazardous Waste	40 CFR Part 262.34	S	Allows generators of hazardous waste to store and treat hazardous waste at the generation site for up to 90 days in tanks, containers and containment buildings without having to obtain a RCRA hazardous waste permit.	Potentially applicable to remedial alternatives that involve the storing or treating of hazardous materials on-site.

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action	
Land Disposal Facility Notice in Deed	40 CFR Parts 264 and 265 Sections 116-119(b)(1)	S	Establishes provisions for a deed notation for closed hazardous waste disposal units, to prevent land disturbance by future owners.	The regulations are potentially applicable because closed areas may be similar to closed RCRA units.	
RCRA - General Standards	40 CFR Part 264.111	S	General performance standards requiring minimization of need for further maintenance and control; minimization or elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. Also requires decontamination or disposal of contaminated equipment, structures and soils.	Decontamination actions and facilities will be constructed for remedial activities and disassembled after completion.	
Standards Applicable to Transporters of Applicable Hazardous Waste - RCRA Section 3003	40 CFR Parts 170- 179, 262, and 263	S	Establishes the responsibility of offsite transporters of hazardous waste in the handling, transportation and management of the waste. Requires manifesting, recordkeeping and immediate action in the event of a discharge.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.	
United States Department of Transportation (USDOT) Rules for Transportation of Hazardous Materials	49 CFR Parts 107 and 171.1 - 172.558	S	Outlines procedures for the packaging, labeling, manifesting and transporting of hazardous materials.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.	
Clean Air Act-National Ambient Air Quality Standards	40 CFR Part 50	S	Establishes ambient air quality standards for protection of public health.	Remedial operations will be performed in a manner that minimizes the production of benzene and particulate matter.	
USEPA-Administered Permit Program: The Hazardous Waste Permit Program	RCRA Section 3005; 40 CFR Part 270.124	S	Covers the basic permitting, application, monitoring and reporting requirements for offsite hazardous waste management facilities.	Any offsite facility accepting hazardous waste from the site must be properly permitted. Implementation of the site remedy will include consideration of these requirements.	

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action
Land Disposal Restrictions	40 CFR Part 368	S	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes Universal Treatment Standards (UTSs) to which hazardous waste must be treated prior to land disposal.	Applicable for remedial actions that generate soils that display the characteristic of hazardous waste or that are decharacterized after generation must be treated to 90% constituent concentration reduction capped at 10 times the UTS.
RCRA Subtitle C	40 U.S.C. Section 6901 et seq.; 40 CFR Part 268	S	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes UTSs to which hazardous wastes must be treated prior to land disposal.	Potentially applicable to remedial activities that include disposal of generated waste material from the site.

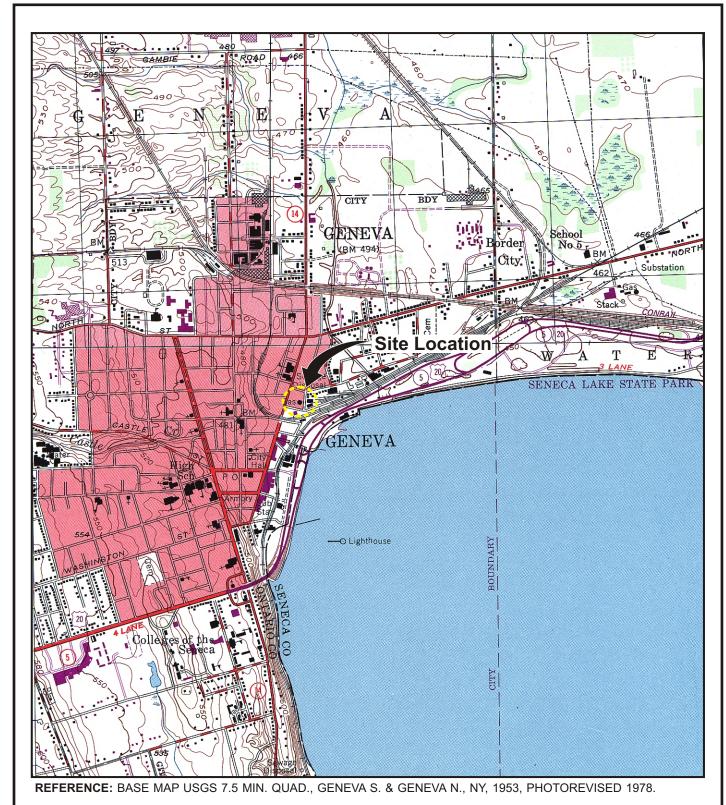
Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action
New York State				
Discharges to Public Waters	New York State Environmental Conservation Law, Section 71-3503	S	Provides that a person who deposits gas tar, or the refuse of a gas house or gas factory, or offal, refuse, or any other noxious, offensive, or poisonous substances into any public waters, or into any sewer or stream running or entering into such public waters, is guilty of a misdemeanor.	During the remedial activities, MGP-impacted materials will not be deposited into public waters or sewers.
NYSDEC's Monitoring Well Decommissioning Guidelines	NPL Site Monitoring Well Decommissioning dated May 1995	G	This guidance presents procedure for abandonment of monitoring wells at remediation sites.	This guidance is applicable for soil or groundwater alternatives that require the decommissioning of monitoring wells onsite.
Guidelines for the Control of Toxic Ambient Air Contaminants	DAR-1 (Air Guide 1)	G	Provides guidance for the control of toxic ambient air contaminants in New York State and outlines the procedures for evaluating sources of air pollution	This guidance may be applicable for soil or groundwater alternatives that result in certain air emissions.
New York Hazardous Waste Management System - General	6 NYCRR Part 370	S	Provides definitions of terms and general instructions for the Part 370 series of hazardous waste management.	Hazardous waste (besides those conditionally exempt per TAGM 4046) is to be managed according to this regulation.
Identification and Listing of Hazardous Wastes	6 NYCRR Part 371	S	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371-376.	Applicable for determining if solid waste generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities	6 NYCRR Part 372	S	Provides guidelines relating to the use of the manifest system and its recordkeeping requirements. It applies to generators, transporters and facilities in New York State.	This regulation will be applicable to any company(s) contracted to do treatment work at the site or to transport or manage hazardous material generated at the site.
New York Regulations for Transportation of Hazardous Waste	6 NYCRR Part 372.3 a-d	S	Outlines procedures for the packaging, labeling, manifesting and transporting of hazardous waste.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.

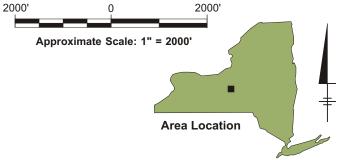
Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action
Waste Transporter Permits	6 NYCRR Part 364	S	Governs the collection, transport and delivery of regulated waste within New York State.	Properly permitted haulers will be used if any waste materials are transported off site.
NYSDEC Technical and Administrative Guidance Memorandums (TAGMs)	NYSDEC TAGMs	G	TAGMs are NYSDEC guidance that are to be considered during the remedial process.	Appropriate TAGMs will be considered during the remedial process.
New York Regulations for Hazardous Waste Management Facilities	6 NYCRR Part 373.1.1 - 373.1.8	S	Provides requirements and procedures for obtaining a permit to operate a hazardous waste treatment, storage and disposal facility. Also lists contents and conditions of permits.	Any offsite facility accepting waste from the site must be properly permitted.
Land Disposal of a Hazardous Waste	6 NYCRR Part 376	S	Restricts land disposal of hazardous wastes that exceed specific criteria.	New York defers to USEPA for UTS/LDR regulations.
NYSDEC Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants	TAGM 4061(2002)	G	Outlines the criteria for conditionally excluding coal tar waste and impacted soils from former MGPs which exhibit the hazardous characteristic of toxicity for benzene (D018) from the hazardous waste requirements of 6 NYCRR Parts 370 - 374 and 376 when destined for thermal treatment.	This guidance will be used as appropriate for remedial activities that require the management of MGP-impacted soil and coal tar waste generated during the implementation of remedial activities.
National Pollutant Discharge Elimination System (NPDES) Program Requirements, Administered Under New York State Pollution Discharge Elimination System (SPDES)	40 CFR Parts 122 Subpart B, 125, 301, 303, and 307 (Administered under 6 NYCRR 750-758)	S	Establishes permitting requirements for point source discharges; regulates discharge of water into navigable waters including the quantity and quality of discharge.	Remedial activities may involve treatment/disposal of water. If so, water generated at the site will be managed in accordance with the disposition facilities NYSDEC SPDES permit requirements.

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action
Federal				
National Environmental Policy Act Executive Orders 11988 and 11990	40 CFR 6.302; 40 CFR Part 6, Appendix A	S	Requires federal agencies, where possible, to avoid or minimize adverse impact of federal actions upon wetlands/floodplains and enhance natural values of such. Establishes the "no-net-loss" of waters/wetland area and/or function policy.	To be considered if remedial activities are conducted within a floodplain or wetlands.
Historical and Archaeological Data Preservation Act	16 USC 469a-1	S	Provides for the preservation of historical and archaeological data that might otherwise be lost as the result of alteration of the terrain.	Not applicable. The National Register of Historic Places website indicated no records present for historical sites at or adjacent to the site.
National Historic and Historical Preservation Act	16 USC 470; 36 CFR Part 65; 36 CFR Part 800	S	Requirements for the preservation of historic properties.	Not applicable. The National Register of Historic Places website indicated no records present for historical sites at or adjacent to the site.
Endangered Species Act	16 USC 1531 et seq.; 50 CFR Part 200; 50 CFR Part 402	S	Requires federal agencies to confirm that the continued existence of any endangered or threatened species and their habitat will not be jeopardized by a site action.	Not applicable as no endangered species were identified during the Fish and Wildlife Resource Impact Analysis.
Floodplains Management and Wetlands Protection	40 CFR 6 Appendix A	S	Activities taking place within floodplains and/or wetlands must be conducted to avoid adverse impacts and preserve beneficial value. Procedures for floodplain management and wetlands protection provided.	Portions of the area to be remediated are located adjacent to the floodplain. Activities located in these areas will be performed in accordance with this regulation, as applicable.
New York State				
New York State Floodplain Management Development Permits	6 NYCRR Part 500	S	Provides conditions necessitating NYSDEC permits and provides definitions and procedures for activities conducted within floodplains.	Potentially applicable to remedial activities at the site.
New York State Freshwater Wetlands Act	ECL Article 24 and 71; 6 NYCRR Parts 662- 665	S	Activities in wetlands areas must be conducted to preserve and protect wetlands.	Not applicable. The closest wetlands are 0.8 and 1.2 miles from the site and do not appear to be hydraulically connected.

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/ Remedial Action
New York State Parks, Recreation, and Historic Preservation Law	New York Executive Law Article 14;	S	Requirements for the preservation of historic properties.	Not applicable. The National Register of Historic Places website indicated no records present for historical sites in the immediate vicinity of the site.
Endangered & Threatened Species of Fish and Wildlife	6 NYCRR Part 182	S	Identifies endangered and threatened species of fish and wildlife in New York.	Not applicable as no threatened or endangered species were identified during the Fish and Wildlife Resource Impact Analysis.
Floodplain Management Criteria for State Projects	6 NYCRR Part 502	S	Establishes floodplain management practices for projects involving stateowned and state-financed facilities.	Portions of the area to be remediated are located adjacent to the floodplain. Activities located in these areas will be performed in accordance with this regulation, as applicable.
Local				
Local Building Permits	N/A	S	Local authorities may require a building permit for any permanent or semi-permanent structure, such as an on-site water treatment system building or a retaining wall.	Substantive provisions are potentially applicable to remedial activities that require construction of permanent or semi-permanent structures.

Figures





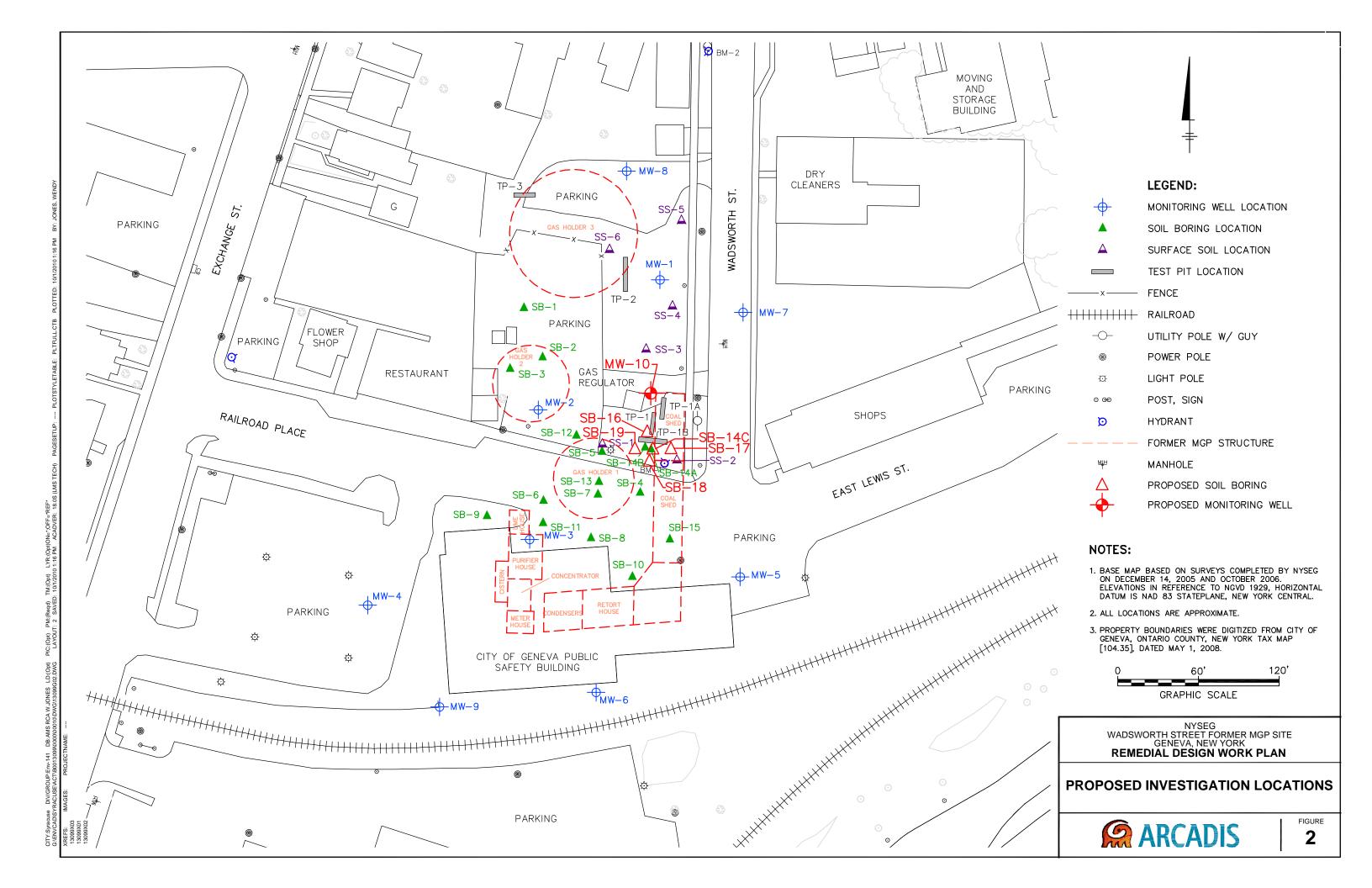
NYSEG
WADSWORTH STREET FORMER MGP SITE
GENEVA, NEW YORK
REMEDIAL DESIGN WORK PLAN

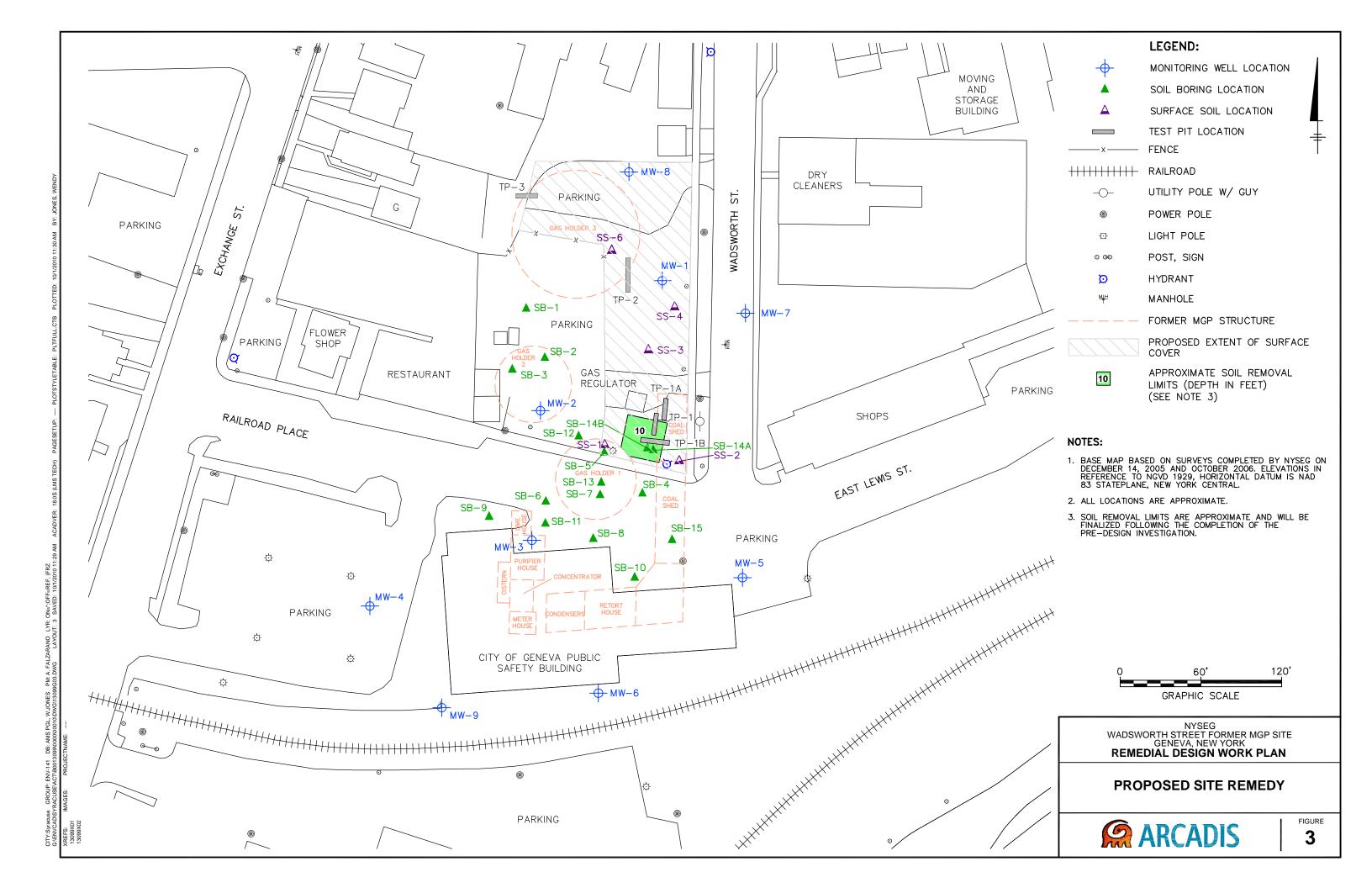
SITE LOCATION MAP



FIGURE

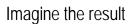
1





Appendix A

Field Sampling Plan





NYSEG

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site Geneva, New York

July 2010

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

Prepared for: NYSEG

Prepared by: ARCADIS 6723 Towpath Road P.O. Box 66 Syracuse New York 13214-0066 Tel 315.446.9120 Fax 315.449.0017

Our Ref.: B0013099

Date: July 2010 ARCADIS Table of Contents

1.	introat	uction	1				
	1.1	General	1				
	1.2	Project Objectives	1				
	1.3	Overview of Field Investigation Activities	1				
2.	PDI Fie	eld Activities	3				
	2.1	General	3				
	2.2	Sample Labeling, Packaging, and Shipping	4				
	2.3	Equipment Decontamination	5				
		2.3.1 Drill Rig Decontamination	5				
		2.3.2 Sampling Equipment Decontamination	6				
	2.4	Monitoring Well Installation	6				
		2.4.1 General Drilling Procedures	7				
		2.4.2 Soil Sampling Procedures	8				
		2.4.3 Well Installation Procedures	9				
	2.5	Water Level Gauging	14				
	2.6	Groundwater Sampling	16				
	2.7	Air Monitoring	20				
3.	Field Ir	nstrumentation	21				
	3.1	Portable Photoionization Detector	21				
	3.2	Dust Monitor	21				
	3.3	pH Meter	21				
	3.4	Specific Conductivity Meter	21				
	3.5	Dissolved Oxygen Meter	22				
	3.6	Water-Level Meter	22				
	3.7	Turbidity Meter	22				
	3.8	Oxidation-Reduction Potential Meter	22				
4.	Refere	References					

ARCADIS Table of Contents

Attachment

A DNAPL Contingency Plan

ARCADIS Field Sa

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

1. Introduction

1.1 General

This Field Sampling Plan (FSP) supports of the Remedial Design Work Plan (RDWP) prepared by ARCADIS for the NYSEG Wadsworth Street Former Manufactured Gas Plant (MGP) site (the site) located in Geneva, New York. The RDWP describes predesign investigation (PDI) activities to be conducted at the site in support of completing the remedial design (RD) activities, as also described in the RDWP.

This FSP describes the field procedures and sample collection methods to be used during implementation of the PDI field activities. The FSP should be used in conjunction with the RDWP, the *Quality Assurance Project Plan* (QAPP), and the *Health and Safety Plan* (HASP) that have been prepared for the site. The RDWP presents the site background and defines the scope of the PDI field activities. The QAPP presents the quality assurance/quality control (QA/QC) procedures to be used during implementation of the RDWP, as well as a description of the general field and laboratory procedures. The QAPP and HASP are provided as appendices of the RDWP.

1.2 Project Objectives

The overall objective of the RDWP is to describe the activities necessary to complete the remedial design for the selected site remedy. The PDI field activities will be conducted to achieve the following objectives:

- Confirm groundwater flow direction
- Evaluate the effectiveness of natural attenuation at addressing the dissolved phase groundwater impacts.

1.3 Overview of Field Investigation Activities

The following PDI field activities will be conducted to achieve the objectives listed above in Section 1.2:

Installing a new groundwater monitoring well

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- Collecting a complete round of groundwater level measurements from existing monitoring wells
- Collecting groundwater samples from existing monitoring wells

The sampling locations and number of samples to be collected are described in the RDWP, and therefore, are not described further in this FSP. A site location map and sampling locations are depicted on the figures included as part of the RDWP.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

2. PDI Field Activities

2.1 General

All 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 underground utilities can be marked at the site.

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)
- Reagent grade preservatives and pH paper (or 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 basins, and scrub brushes for decontaminating equipment
- digital camera
- shipping labels and forms
- knife
- packing/shipping material for sample bottles
- strapping tape
- 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:

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 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 (soil, sediment, groundwater, etc.)
- 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 pH, temperature, conductivity, water-level, etc.

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 accountable 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 accountable document will be corrected by the person who made the entry. All subsequent corrections will be initialed and dated.

2.2 Sample Labeling, Packaging, 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.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

Clear tape will be secured over the sample label and the chain-of-custody will be initiated. 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
- one to two inches of vermiculite or bubble wrap on the bottom of the cooler
- water ice packaged in re-sealable plastic bags
- sufficient vermiculite or 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 "thisend-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, and tremie pipe 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-Solu®) 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. All down-hole drilling 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 opentop drums located on site. All open-top drums will remain closed when not in use.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

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 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.

2.3.2 Sampling Equipment Decontamination

Prior to every entry into each borehole, 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, buckets, etc. 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 Monitoring Well Installation

The following materials will be available during monitoring well installation activities, as required:

- Site Plan with proposed soil boring/well locations
- RDWP, FSP, and HASP
- PPE, as required by the HASP
- traffic cones, delineators, caution tape, and/or fencing as appropriate for securing the work area, if such are not provided by drillers
- drilling equipment required by the American Society for Testing and Materials (ASTM) D 1586, when performing split-spoon sampling
- disposable plastic liners, when drilling with direct-push equipment

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- appropriate soil sampling equipment (e.g., stainless steel spatulas, knife)
- equipment cleaning materials
- appropriate sample containers and labels
- chain-of-custody forms
- insulated coolers with ice, when collecting samples requiring preservation by chilling
- PID or flame ionization detector (FID)
- ziplock style bags
- water level or oil/water interface meter
- locks and keys for securing the well after installation
- field notebook

Prior to mobilizing to the site, ARCADIS personnel will contact the drilling subcontractor or in-house driller (as appropriate) to confirm that appropriate sampling and well installation equipment will be provided. Equipment typically provided by the driller could include:

- drilling equipment required by the American Society of Testing and Materials (ASTM) D 1586, when performing split-spoon sampling
- disposable plastic liners, when drilling with direct-push equipment
- drums for investigation derived waste
- drilling and sampling equipment decontamination materials
- · decontamination pad materials, if required
- well construction materials

2.4.1 General Drilling Procedures

The drilling contractor will be responsible for obtaining accurate and representative samples; informing the supervising geologist of changes in drilling pressure; and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil sampling drive weight [140 pounds] required to drive the split-barrel sampler in 6-inch increments). Records will also be kept of occurrences of premature refusal due to boulders or construction materials that may have been used as fill. Where a boring cannot be advanced to the desired depth, the boring will be abandoned and an additional boring will be advanced at an adjacent location to obtain the required sample. Where it is desirable to avoid leaving vertical connections between depth intervals, the borehole will be sealed using cement and/or bentonite. Multiple refusals may lead to a decision by the supervising geologist to abandon that sampling location.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

If non-aqueous phase liquid (NAPL) is encountered during drilling, the supervising geologist should refer to the procedures detailed in the DNAPL Contingency Plan provided as Attachment A.

2.4.2 Soil Sampling Procedures

Samples of subsurface materials encountered while drilling soil borings will be collected using 2-inch or 3-inch split-barrel (split-spoon) sampler, if using the ASTM D 1586 – Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.

Soil samples are typically field screened with an FID or PID at sites where volatile organic compounds are present in the subsurface. Field screening is performed using one of the following methods:

- Upon opening the sampler, the soil is split open and the PID or FID probe is placed in the opening and covered with a gloved hand. Such readings should be obtained at several locations along the length of the sample
- A portion of the collected sample is placed in a re-sealable plastic bag or jar, which
 is covered with aluminum foil, sealed, and allowed to warm to room temperature.
 After warming, the cover is removed, the foil is pieced with the FID or PID probe,
 and a reading is obtained.

Samples selected for laboratory analysis will be handled, packed, and shipped in accordance with the procedures outlined in the RDWP, FSP, or Chain-of-Custody, Handling, Packing, and Shipping SOP. A geologist will be on-site during drilling and sampling operations to describe each soil sample on the soil boring log, including:

- percent recovery
- soil type
- color
- moisture condition
- density
- grain-size
- consistency
- other observations, particularly relating to the presence of potential impacts

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

The supervising geologist or scientist will be responsible for documenting drilling events using a bound field notebook to record all relevant information in a clear and concise format. The record of drilling events will include:

- · start and finish dates of drilling
- name and location of project
- project number, client, and site location
- sample number and depths
- blow counts and recovery
- depth to water
- type of drilling method
- drilling equipment specifications, including the diameter of drilling tools
- documentation of any elevated organic vapor readings
- names of drillers, inspectors, or other people onsite
- weather conditions

2.4.3 Well Installation Procedures

The procedures for installing groundwater monitoring wells are presented below:

Hollow-Stem Auger, Drive-and-Wash, Spun Casing, Fluid/Mud Rotary, Rotosonic, and Dual-Rotary Drilling Methods

- 1. Locate boring/well location, establish work zone, and set up sampling equipment decontamination area.
- 2. Advance boring to desired depth. Collect soil and/or bedrock samples at appropriate interval as specified in the RDWP. Collect, document, and store samples for laboratory analysis as specified in the RDWP. Decontaminate equipment between samples in accordance within this FSP. A common sampling method that produces high-quality soil samples with relatively little soil disturbance is the ASTM D1586 Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. Split-spoon samples are obtained during drilling using hollow-stem auger, drive-and-wash, spun casing, and fluid/mud rotary. Rotosonic drilling produces large-diameter soil cores that tend to be more disturbed than split-spoon samples due to the vibratory action of the drill casing. Dual-rotary removes cuttings by compressed air and allows only a general assessment of geology. High-quality bedrock samples can be obtained by coring.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 3. Describe each soil or bedrock sample as described in Section 2.2.2. Record descriptions in the field notebook and/or personal digital assistant (PDA). It should be noted that PDA logs must be electronically backed up and transferred to a location accessible to other project team members as soon as feasible to retain and protect the field data. During soil boring advancement, document all drilling events in field notebook, including blow counts (number of blows required to advance split-spoon sampler in 6-inch increments) and work stoppages. Blow counts will not be available if Rotosonic, dual-rotary, or direct push methods are used. When drilling in bedrock, the rate of penetration
- 4. If it is necessary to install a monitor well into a permeable zone below a confining layer, particularly if the deeper zone is believed to have water quality that differs significantly from the zone above the confining layer, then a telescopic well construction should be considered. In this case, the borehole is advanced approximately 3 to 5 feet into the top of the confining layer, and a permanent casing (typically PVC, black steel or stainless steel) is installed into the socket drilled into the top of the confining layer. The casing is then grouted in place. The preferred methods of grouting telescoping casings include: pressure-injection grouting using an inflatable packer installed temporarily into the base of the casing, such that grout is injected out the bottom of the casing until it is observed at ground surface outside the casing; displacement-method grouting (also known as the Halliburton method), which entails filling the casing with grout and displacing the grout out the bottom of the casing by pushing a drillable plug, typically made of wood to the bottom of the casing, following by tremie grouting the remainder of the annulus outside the casing; or tremie grouting the annulus surrounding the casing using a tremie pipe installed to the base of the borehole. In all three cases, the casing is grouted to the ground surface, and the grout is allowed to set prior to drilling deeper through the casing. Site-specific criteria and work plans should be created for the completion of non-standard monitoring wells, including telescopic wells. (minutes per foot) is recorded.
- 5. In consolidated formations such as competent bedrock, a monitoring well may be completed with an open borehole interval without a screen and sandpack. In these cases, the borehole is advanced to the targeted depth of the top of the open interval. A permanent casing is then grouted in place following the procedures described in Step 4 above. After the grout sets, the borehole is advanced by drilling through the permanent casing to the targeted bottom depth of the open interval, which then serves as the monitoring interval for the well. If open-borehole interval stability is found to be questionable or if a specific depth interval is later

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

selected for monitoring, a screened monitoring well may later be installed within the open-borehole interval, depending on the annular space and well diameter requirements.

- 6. Prior to screened well installation or after the completion of an open-bedrock well, the water level or oil/water interface probe should be used to determine the static water level in the borehole in relation to the proposed well screen or open interval location. If necessary, an open-bedrock well may be drilled deeper to intersect the water table or a permeable water-bearing zone.
- 7. Upon completing the borehole to the desired depth, if a screened well construction is desired, install the monitoring well by lowering the screen and casing assembly with sump through the augers or casing. Monitoring wells typically will be constructed of 2-inch-diameter, flush-threaded PVC or stainless steel slotted well screen and blank riser casing. Smaller diameters may be used if wells are installed using direct-push methodology or if multiple wells are to be installed in a single borehole. The screen length will be specified in the RDWP based on regulatory requirements and specific monitoring objectives. Monitoring well screens are usually 5 to 10 feet long, but may be up to 25 feet long in very low permeability, thick geologic formations. The screen length will depend on the purpose for the well and the objectives of the groundwater investigation. Typically, the slot size will be 0.010 inch and the sand pack will be 20-40, Morie No. 0, or equivalent. In very fine-grained formations where sample turbidity needs to be minimized, it may be preferred to use a 0.006-inch slot size and 30-65. Morie No. 00, or equivalent sand pack. Alternatively, where monitoring wells are installed in coarse-grained deposits and higher well yield is required, a 0.020-inch slot size and 10-20, Morie No. 1, or equivalent sand pack may be preferred. To the extent practicable, the slot size and sand pack gradation may be predetermined in the RDWP based on site-specific grain-size analysis or other geologic considerations or monitoring objectives. A blank sump may be attached below the well screen if the well is being installed for DNAPL recovery/monitoring purposes. If so, the annular space around the sump will be backfilled with neat cement grout to the bottom of the well screen prior to placing the sand pack around the screen. A blank riser will extend from the top of the screen to approximately 2.5 feet above grade or, if necessary, just below grade where conditions warrant a flush-mounted monitoring well. For wells greater than 50 feet deep, centralizers may be desired to assist in centralizing the monitoring well in the borehole during construction.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 8. When the monitoring well assembly has been set in place and the grout has been placed around the sump (if any), place a washed silica sand pack in the annular space from the bottom of the boring to a height of 1 to 2 feet above the top of the well screen. The sand pack is placed and drilling equipment extracted in increments until the top of the sand pack is at the appropriate depth. The sand pack will be consistent with the screen slot size and the soil particle size in the screened interval, as specified in the RDWP. A hydrated bentonite seal (a minimum of 2 feet thick) will then be placed in the annular space above the sand pack. If non-hydrated bentonite is used, the bentonite should be permitted to hydrate in place for a minimum of 30 minutes before proceeding. No coated bentonite pellets will be used in monitoring well drilling or construction. Potable water may be added to hydrate the bentonite if the seal is above the water table. Monitor the placement of the sand pack and bentonite with a weighted tape measure. During the extraction of the augers or casing, a cement/bentonite or neat cement grout will be placed in the annular space from the bentonite seal to a depth approximately 2 feet bgs.
- 9. Place a locking, steel protective casing (extended at least 1.5 feet below grade and 2 feet above grade) over the riser casing and secure with a neat cement seal. Alternatively, for flush-mount completions, place a steel curb box with a bolt-down lid over the riser casing and secure with a neat cement seal. In either case, the cement seal will extend approximately 1.5 to 2.0 feet below grade and laterally at least 1 foot in all directions from the protective casing, and should slope gently away to promote drainage away from the well. Monitoring wells will be labeled with the appropriate designation on both the inner and outer well casings or inside of the curb box lid.

When an above-grade completion is used, the PVC riser will be sealed using an expandable locking plug and the top of the well will be vented by drilling a small diameter (1/8 inch) hole near the top of the well casing or through the locking plug, or by cutting a vertical slot in the top of the well casing. When a flush-mount installation is used, the PVC riser will be sealed using an unvented, expandable locking plug.

10. During well installation, record construction details and actual measurements relayed by the drilling contractor and tabulate materials used (e.g., screen and riser footages; bags of bentonite, cement, and sand) in the field notebook.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

11. After completing the well installation, lock the well, clean the area, and dispose of materials in accordance with the procedures outlined in the RDWP.

Direct Push Method

The direct-push drilling method may also be used to complete soil borings and install monitoring wells. Examples of this technique include the Diedrich ESP vibratory probe system, GeoProbe®, or AMS Power Probe® dual-tube system. Environmental probe systems typically use a hydraulically operated percussion hammer. Depending on the equipment used, the hammer delivers 140- to 350-foot pounds of energy with each blow. The hammer provides the force needed to penetrate very stiff/medium dense soil formations. The hammer simultaneously advances an outer steel casing that contains a dual-tube liner for sampling soil. The outside diameter (OD) of the outer casing ranges from 1.75 to 2.4 inches and the OD of the inner sampling tube ranges from 1.1 to 1.8 inches. The outer casing isolates shallow layers and permits the unit to continue to probe at depth. The double-rod system provides a borehole that may be tremiegrouted from the bottom up. Alternatively, the inside diameter (ID) of the steel casing provides clearance for the installation of small-diameter (e.g., 0.75- to 1-inch ID) microwells. The procedures for installing monitoring wells in soil using the direct push method are described below.

- 1. Locate boring/well location, establish work zone, and set up sample equipment decontamination area.
- Advance soil boring to designated depth, collecting samples at intervals specified in the Work Plan. Samples will be collected using dedicated, disposable, plastic liners. Describe samples in accordance with the procedures outlined in Step 3 above. Collect samples for laboratory analysis as specified in the RDWP.
- 3. Upon advancing the borehole to the desired depth, install the micro-well through the inner drill casing. The micro-well will consist of approximately 1-inch ID PVC or stainless steel slotted screen and blank riser. The sand pack, bentonite seal, and cement/bentonite grout will be installed as described, where applicable, in Step 7 and 8 above.
- Install protective steel casing or flush-mount, as appropriate, as described in Step 9 above. During well installation, record construction details and tabulate materials used.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

5. After completing the well installation, lock the well, clean the area, and dispose of materials in accordance with the procedures outlined in the RDWP.

2.5 Water Level Gauging

The following materials, as required, shall be available during fluid level measurements at monitoring wells that do not contain NAPL:

- PID
- appropriate health and safety equipment, as specified in the HASP
- laboratory-type soap (Alconox or equivalent), methanol/hexane rinse, potable water, distilled water, and/or other equipment that may be needed for decontamination purposes
- electronic water-level meter
- 6-foot engineer's rule
- portable containers
- plastic sheeting
- field logbook
- indelible ink pen
- digital camera

If there is any uncertainty regarding the accuracy of the tape or cable associated with the electronic water-level probe, it should be checked versus a standard length prior to use to assess if the tape or cable above the meter has been correctly calibrated by the manufacturer, and to identify evidence of tape or cable stretching, etc.

- Measure the lengths between markers on the cable with a 6-foot engineer's rule or a fiberglass engineer's tape. The tape or cable associated with the electronic water-level probe should be checked for the length corresponding to the deepest total well depth to be monitored during the data collection event.
- If the length designations on the tape or cable associated with the electronic waterlevel probe are found to be incorrect, the probe will not be used until it is repaired by the manufacturer.
- Record verification of this calibration process in field logbook.

The detailed procedure for obtaining fluid level depth measurements is as follows. Field notes on logs will be treated as secured documentation and indelible ink will be used.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

As a general rule, the order of measuring should proceed from the least to most contaminated monitoring wells, based on available data.

- 1. Identify site and well number in field logbook using indelible ink, along with date, time, personnel, and weather conditions.
- Field personnel will avoid activities that may introduce contamination into
 monitoring wells. Activities such as dispensing gasoline into vehicles or generators
 should be accomplished well in advance of obtaining field measurements.
- 3. Don PPE as required by the HASP.
- 4. Clean the water-level probe and cable in accordance with the appropriate cleaning procedures. Down-hole instrumentation should be cleaned prior to obtaining readings at the first monitoring well and upon completion of readings at each well.
- 5. Clean the water-level probe and cable with a soapy (Alconox) water rinse followed by a solvent rinse (if appropriate based on site-specific constituents of concern) an analyte-free water rinse. Contain rinse water in a portable container that will be transferred to an on-site container.
- 6. Put clean plastic sheeting on the ground next to the well.
- 7. Unlock and open the well cover while standing upwind from the well. Place the well cap on the plastic sheeting.
- 8. Locate a measuring reference point on the well casing. If one is not found, initiate a reference point at the highest discernable point on the inner casing (or outer if an inner casing is not present) by notching with a hacksaw, or using an indelible marker. All down-hole measurements will be taken from the reference point established at each well on the inner casing (on the outer only if an inner casing is not present).
- 9. Measure to the nearest hundredth of a foot and record the height of the inner and outer casings (from reference point, as appropriate) to ground level.
- 10. Record the inside diameter of the well casing in the field log.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 11. Lower the probe until it emits a signal (tone and or light) indicating the top of the water surface. Gently raise and lower the instrument through this interface to confirm its depth. Measure and record the depth of the water surface, and the total well depth, to the nearest hundredth of a foot from the reference point at the top of the well. Lower the probe to the bottom of the well to obtain a total depth measurement.
- 12. Clean the water-level probe and cable in accordance with the appropriate cleaning procedures.
- 13. Compare the depth of the well to previous records, and note any discrepancy.
- 14. Lock the well when all activities are completed.

Fluid level measurement data will be recorded legibly on "write-in-the-rain" field notebook in indelible pen. Field situations such as apparent well damage or suspected tampering, or other observations of conditions that may result in compromised data collection will be photographically documented where practicable.

2.6 Groundwater Sampling

This protocol describes the procedures to be used to collect groundwater samples. No wells will be sampled until well development has been performed. During precipitation events, groundwater sampling will be discontinued until precipitation ceases. When one 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

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 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 steps detail the monitoring well sampling procedures:

- Review materials checklist to ensure that the appropriate equipment has been acquired.
- 2. Identify site and well sampled on sampling log sheets, along with date, arrival time, and weather conditions. Identify the personnel and equipment used and other pertinent data requested on the logs (Attachment A-2).
- 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 and if rusted or broken replace with a new brass keyedalike lock.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 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.
- 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 light non-aqueous phase liquid (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 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 200 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 three to five 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 ensure 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.

ARCADIS Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 14. During well purging, monitor the field indicator parameters (turbidity, temperature, specific conductance, pH, dissolved oxygen [DO], and oxidation-reduction potential [ORP]) every three to five 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):
 - <u>+</u>0.1 for pH
 - +3% for specific conductance (conductivity)
 - +10 mV for ORP
 - +10% for turbidity and DO
- 15. 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.
- 16. 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 three to five 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). DO measurements should be measured using a field test kit (e.g., colorimetric).
- 17. Fill in the sample label and cover the label with clear packing tape to secure the label onto the container.
- 18. 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 that the pump intake was set, and then retrieved.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 19. Secure with packing material and store at 4 degrees Celsius on wet ice in an insulated transport container provided by the laboratory.
- 20. After all sampling containers have been filled, remove one additional volume of groundwater. Check the calibration of the meters and then measure and record on the field log the physical appearance, pH, temperature, turbidity, and conductivity.
- 21. Record the time sampling procedures were completed on the field logs.
- 22. 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.
- Complete the procedures for packaging, shipping, and handling with associated COC forms.

2.7 Air Monitoring

Detailed air monitoring procedures are presented in the site-specific CAMP included as part of the RDWMP. Air monitoring will be conducted with a PID and dust monitor during all land based intrusive activities. 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 concentration in the breathing zone for particulates less than 10 microns in diameter. In addition, air monitoring during the PDI activities will be consistent with the New York State Department of Health's (NYSDOH's) community air monitoring plan, as described in the HASP.

The PID and dust monitor readings will be recorded in the field book during land based trenching and drilling activities. The instruments will be calibrated at least once each day and more frequently, if needed.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

3. Field Instrumentation

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 Detector

The PID will be a MiniRae (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.

3.2 Dust Monitor

The dust monitor will be an MIE DataRAM (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.

Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

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.

ARCADIS Field Sampling Plan

Wadsworth Street Former Manufactured Gas Plant Site

4. References

- ARCADIS, 2010a. *Remedial Design Work Plan,* NYSEG Wadsworth Street Former MGP Site, Geneva, New York. July 2010.
- ARCADIS, 2010b. *Quality Assurance Project Plan,* NYSEG Wadsworth Street Former MGP Site, Geneva, New York. July 2010.
- ARCADIS, 2010c. *Health and Safety Plan*, NYSEG Wadsworth Street Former MGP Site, Geneva, New York. July 2010.
- ARCADIS, 2010d. *Community Air Monitoring Plan*, NYSEG Wadsworth Street Former MGP Site, Geneva, New York. July 2010.

Attachment A

DNAPL Contingency Plan



NYSEG

Attachment A DNAPL Contingency Plan

Wadsworth Street Former Manufactured Gas Plant Site Geneva, New York

July 2010

SOP: DNAPL Contingency Plan Rev. #: 1 | Rev Date: April 15, 2005

I. Scope and Application

This document has been prepared to guide drilling activities at sites where dense, non-aqueous phase liquid (DNAPL) may be potentially be present, and provide procedures to be implemented in the event that DNAPL is encountered during subsurface investigations. These procedures are proposed to limit the potential of remobilizing DNAPL, if any, in response to drilling and sampling activities. In addition, the procedures are designed to optimize the recovery of encountered DNAPL (if any) in a safe and efficient manner. This DNAPL Contingency Plan was developed based on a similar document prepared by DNAPL expert Bernard H. Kueper, Ph.D., P.Eng., of Queens University, for an EPA Region 1 Superfund Site (Kueper, May 1995).

Downward DNAPL mobilization from overburden into the bedrock may occur in response to drilling activities (short-circuiting along drill stem and/or completed well screen) and groundwater extraction (creation of downward hydraulic gradient in excess of previously measured downward gradients). This DNAPL Contingency Plan addresses drilling-related issues.

II. Personnel Qualifications

DNAPL contingency field activities will be performed by persons who have been trained in proper drilling and well installation procedures under the guidance of an experienced field geologist, engineer, or technician.

III. Equipment List

The following materials will be available during soil boring and monitoring well installation activities, as required:

- Work Plan, Field Sampling Plan (FSP), and site Health and Safety Plan (HASP)
- personal protective equipment (PPE), as required by the HASP
- equipment specified under drilling and well installation SOPs
- hydrophobic dye (Oil Red O or Sudan IV), pertinent at chlorinated solvent sites

Rev. #: 1 | Rev Date: April 15, 2005

disposable polyethylene pans for performing soil-water pan tests

clean, empty jars for performing soil-water shake tests

IV. Cautions

ARCADIS

The presence or absence of DNAPL at a site can have significant implications in terms of site management, health and safety, and the feasibility of potential remedial alternatives. Therefore, field personnel must be attentive to the potential for DNAPL, recognize when DNAPL is encountered during drilling, and accurately document field observations indicating the presence of DNAPL and interpreted DNAPL depth. In addition, opportunities to characterize DNAPL, when present, may be rare. When practicable, DNAPL samples should be collected and analyzed for physical and chemical characteristics.

V. Health and Safety Considerations

Field activities associated with this DNAPL Contingency Plan will be performed in accordance with the site HASP, a copy of which will be present on site during such activities.

VI. Procedure

DNAPL Screening During Overburden Drilling

To screen for the potential presence of DNAPL in soil, drilling procedures must allow for high-quality porous media samples to be taken. Split-spoon samples or direct-push samplers should be taken continuously in 2-foot intervals ahead of the auger or drill casing. Upon opening each split-spoon sampler or direct-push plastic liner sleeve, the soil will immediately be screened for the presence of organic vapors using a portable photoionization detector (PID) or organic vapor analyzer (OVA). During screening, the soil will be split open using a clean spatula or knife and the PID or OVA probe will be placed in the opening and covered with a gloved hand. Such readings will be obtained along the entire length of the sample.

If the PID or OVA examination reveals the presence of organic vapors above 100 parts per million (ppm), the sample will undergo further detailed evaluation for visible non-aqueous phase liquid (NAPL). The assessment for NAPL will include a combination of the following tests/observations:

Rev. #: 1 | Rev Date: April 15, 2005

3

• Evaluation for Visible NAPL Sheen or Free-Phase NAPL in Soil Sampler – The NAPL sheen will be a colorful iridescent appearance on the soil sample. NAPL may also appear as droplets or continuous accumulations of liquid with a color typically ranging from yellow to brown to black, depending on the type of NAPL. Creosote DNAPL (associated with wood-treating sites) and coal-tar DNAPL (associated with manufactured gas plant [MGP] sites) are typically black and have a characteristic, pungent odor. Pure chlorinated solvents may be colorless in the absence of hydrophobic dye. Solvents mixed with oils may appear brown.

- Soil-Water Pan Test A portion of the selected soil interval with the highest PID or OVA reading > 100 ppm will be placed in a disposable polyethylene dish along with a small volume of potable or distilled water. The dish will be gently tilted back and forth to mix the soil and water, and the surface of the water will be viewed in natural light to observe the development of a sheen, if any. A small quantity of Oil Red O or Sudan IV hydrophobic dye powder will be added and the soil and dye will be manually mixed for approximately 30 to 60 seconds and smeared in the dish to create a paste-like consistency using a new nitrile glove-covered hand. A positive test result will be indicated by a sheen on the surface of the water and/or a bright red color imparted to the soil following mixing with dye.
- Soil-Water Shake Test A small quantity of soil (up to 15 cc) will be placed in a clear, colorless, 40-mL vial containing an equal volume of potable or distilled water. After the soil settles into the water, the surface of the water will be evaluated for a visible sheen. The jar will be closed and gently shaken for approximately 10 to 20 seconds. Again, the surface of the water will be evaluated for a visible sheen or a temporary layer of foam. A small quantity (approximately 0.5 to 1 cc) of Oil Red O or Sudan IV powder will be placed in the jar. The sheen layer will be evaluated for a reaction to the dye (change to bright red color). The jar will be closed and gently shaken for approximately 10 to 20 seconds. The contents in the closed jar will be examined for visible bright red dyed liquid inside the jar. A positive test result will be indicated by the presence of a visible sheen and foam on the surface of water, a reaction between the dye and the sheen layer upon first addition of the dye powder, a bright red coating the inside of the vial (particularly above the water line), or red-dyed droplets within the soil.
- Estimation of Relative Degree of NAPL Saturation When NAPL is interpreted as present in a particular portion of soil, the field geologist will attempt to estimate the relative degree of NAPL saturation in the soil. Specifically, based on the apparent, visible continuity of NAPL within the soil, an interpretation will be made as to whether the observed NAPL is pooled (continuous section of soil across entire diameter of soil sample in which the pore spaces are filled with a mixture of NAPL and water) or residual (isolated droplets or blebs of NAPL, surrounded by pore spaces containing only water).

Rev. #: 1 | Rev Date: April 15, 2005

4

If NAPL is obviously present upon opening the soil sampler or evaluating the soil sample within the split-spoon sampler or direct-push liner sleeve, it is not necessary to perform a soil-water pan test or soil-water shake test. In addition, it is not necessary to perform both a soil-water pan test and a soil-water shake test. Either test method is acceptable. The pan test may be preferred in some circumstances because the presence of a sheen may be easier to see on a wider surface.

The results of each test or observation will be recorded in the field notebook.

DNAPL Screening During Bedrock Drilling

To screen for the potential presence of DNAPL in bedrock, drilling fluids, rock cuttings, and/or core samples are monitored for the presence of sheens. During drilling using rotary methods (coring or roller bit drilling with water or drilling mud), the return fluid will be screened with a PID or OVA and evaluated continuously for the presence of a sheen in the recirculation tub. Where core samples are obtained, they will be carefully evaluated for the presence of a sheen on fracture surfaces. During drilling using air-rotary methods, rock cuttings will be continuously screened using a PID or OVA and evaluated for the presence of a sheen. During drilling with rotary methods, the positive head level at the borehole will reduce the potential for DNAPL short-circuiting via the borehole.

If a sheen is observed with any of these methods, drilling will be temporarily discontinued and an evaluation will be undertaken to determine whether pooled DNAPL is present. The drill stem will be retracted to a few feet above the apparent depth where the sheen was first encountered. Groundwater will be extracted from the borehole to produce a drawdown of 5 to 10 feet below the approximate static, non-pumping water level for a period of 20 minutes to test for the presence of pooled, mobilizable DNAPL in the fractures surrounding the open borehole. The bottom of the borehole will then be evaluated for the presence of DNAPL using an interface probe or bottom-loading bailer. If no DNAPL is observed, the interpretation will be made that the sheen was not produced by pooled DNAPL. In this case, if drilling by the rotary method, the recirculation water will be replaced by clean water and drilling will continue. Replacing the recirculation water reduces the potential for cross-contamination and facilitates observation of a newly created sheen, if any, at a deeper interval. Accumulation of DNAPL in the bottom of the borehole, however, indicates that the boring has encountered pooled DNAPL. If DNAPL has accumulated, it will be removed using a bottom-loading bailer or pump.

Data Collection Below Zone Containing Pooled DNAPL

If pooled DNAPL is encountered in a borehole and deeper drilling is required to collect data below a zone containing pooled DNAPL, one of the following actions will be taken.

SOP: DNAPL Contingency Plan Rev. #: 1 | Rev Date: April 15, 2005

- Adjustment of Drilling Location The boring where pooled DNAPL was encountered will be abandoned by tremie grouting using neat cement grout and a replacement boring will be re-attempted at a nearby location.
- 2. <u>DNAPL Sump Installation</u> A DNAPL collection well will be installed with a blank sump properly grouted in place below the screen and the boring will be re-attempted at a nearby location. In this case, after removing the DNAPL in the borehole, the boring may be advanced an additional 2 to 3 feet to accommodate a blank sump below the interval with apparent pooled DNAPL.
- 3. Casing Off DNAPL Layers If pooled DNAPL is found to be present throughout an area where deeper drilling is essential, a permanent, grouted casing should be installed. The bottom of the pooled DNAPL likely coincides with the top of a relatively fine-grained, low permeability, stratum (capillary barrier). Permanent casing will be installed to the bottom of the borehole and grouted in place using the displacement method prior to advancing the borehole any further. In this case, after removing any DNAPL that may have accumulated in the borehole, the boring may be advanced a few feet into the top of the underlying confining layer or up to 5 feet in bedrock prior to grouting the casing to assist in isolating the zone containing apparently pooled DNAPL. When the casing is grouted in place and the grout has set, the drilling recirculation water will be replaced with clean water to prevent cross-contamination and facilitate observation of a newly created sheen (if any) at a deeper interval, and drilling will continue.

DNAPL Monitoring

New wells installed in borings where DNAPL was encountered during drilling will be monitored for DNAPL accumulation in the DNAPL sump using an oil-water interface probe or bottom-loading bailer within approximately one day following initial installation. If DNAPL is encountered, a bottom-loading bailer or pump will be used to remove the DNAPL, the final DNAPL thickness will be recorded, and the DNAPL thickness will be reassessed after another day of accumulation (if any). This process will be repeated until DNAPL no longer accumulates overnight, at which point the accumulation monitoring and removal period will extend to one-week intervals. If no DNAPL accumulation is observed over a period of one week, further DNAPL monitoring may be continued with a longer period between monitoring events.

Any DNAPL recovered during drilling and monitoring activities should be analyzed for chemical composition, DNAPL-water interfacial tension, density, and viscosity. The physical tests should be performed at the approximate groundwater temperature at the site where the DNAPL sample was obtained, typically between 10°C and 20°C. These parameters will allow for correlation of groundwater chemistry with suspected DNAPL locations and will allow an estimate to be made of the volume and potential mobility of DNAPL, if any, in the formation.

SOP: DNAPL Contingency Plan Rev. #: 1 | Rev Date: April 15, 2005

VII. Waste Management

DNAPL removed from wells will be temporarily stored on-site in metal drums for subsequent appropriate off-site disposal. The locations and volumes of recovered DNAPL will be noted.

VIII. Data Recording and Management

Any occurrence of DNAPL encountered during subsurface investigations will be documented in an appropriate field notebook in terms of the drilling location (boring or well identification), depth below surface, type of geologic material DNAPL was observed within, field screening and testing results, and apparent degree of DNAPL saturation (pooled or residual). DNAPL locations and depths will be recorded on subsurface log forms, as appropriate.

IX. Quality Assurance

DNAPL can be mobilized downward as a result of drilling operations. It is very difficult to drill through DNAPL without bringing about vertical DNAPL mobilization. This opinion is stated by USEPA (1992): "In DNAPL zones, drilling should generally be minimized and should be suspended when a potential trapping layer is first encountered. Drilling through DNAPL zones into deeper stratigraphic units should be avoided." The DNAPL screening procedure outlined in this plan should, therefore, be implemented while drilling at all locations and depths within overburden or bedrock where potential DNAPL presence is suspected. If data collection is required below a zone containing DNAPL, the interval containing DNAPL will be cased off prior to drilling deeper.

X. References

Kueper, B.H., May 11, 1995. DNAPL Contingency Plan. [Prepared at the request of *de maximis, inc.*].

United States Environmental Protection Agency (USEPA), 1992. Memorandum from D. Clay: Considerations in Ground-Water Remediation at Superfund Sites and RCRA Facilities – Update. OSWER Directive No. 9283.1-06.

Appendix B

Quality Assurance Project Plan



NYSEG

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site Geneva, New York

July 2010

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

Prepared for: NYSEG

Prepared by: ARCADIS 6723 Towpath Road PO Box 66 Syracuse New York 13214-0066 Tel 315.446.9120 Fax 315.449.0017

Our Ref.: B0013099

Date: July 2010

Pro	eface			Vi
Ac	ronyms			viii
1.	Projec	t Organ	nization and Responsibilities	1
	1.1	Projec	t Organization	1
		1.1.1	Overall Project Management	1
	1.2	Team	Member Responsibilities	2
		1.2.1	NYSEG	2
		1.2.2	ARCADIS	2
		1.2.3	Laboratory Subcontractor	4
2.	Projec	t Backg	ground	5
	2.1	Site Lo	ocation and Description	5
	2.2	Site Hi	istory	6
	2.3	Projec	t Objectives	6
3.	Quality	/ Objec	tives and Criteria for Measurement Data	7
	3.1	Data C	Categories	8
	3.2	Field A	Activities	9
		3.2.1	Data Quality Objectives for PDI Task 2 – Groundwater Investigation	10
4.	Specia	ıl Traini	ing Requirements/Certification	11
5.	Docun	nentatio	on and Records	12
	5.1	Gener	al	12
	5.2	Sampl	le Designation System	12
	5.3	Field D	Documentation	12
	5.4	Labora	atory Documentation	13
		5.4.1	Laboratory Project Files	13
		5.4.2	Laboratory Logbooks	14
		5.4.3	Computer Tape and Hard Copy Storage	14

	5.5	Data Re	eporting Requirements	14
		5.5.1	Field Data Reporting	14
		5.5.2	Laboratory Data Reporting	15
6.	Sampli	ng Prod	ess Design	17
7.	Sampli	ng Meth	nod Requirements	18
8.	Sample	Handli	ing and Custody Requirements	19
	8.1	Sample	Containers and Preservation	19
	8.2	Packing	g, Handling, and Shipping Requirements	19
	8.3	Field C	ustody Procedures	20
		8.3.1	Field Logbooks	21
		8.3.2	Sample Labeling	22
		8.3.3	Field Chain of Custody Forms	22
	8.4	Manage	ement of Investigation-Derived Materials and Wastes	23
	8.5	Laborat	tory Custody Procedures	23
		8.5.1	General	23
		8.5.2	Sample Receipt and Storage	23
		8.5.3	Sample Chain of Custody and Documentation	23
		8.5.4	Sample Analysis	23
		8.5.5	Sample Storage Following Analysis	24
9.	Analyti	cal Pro	cedures	25
	9.1	Field A	nalytical Procedures	25
	9.2	Laborat	tory Analytical Procedures	25
		9.2.1	General	25
		9.2.2	Sample Metrics	25
10.	Quality	Contro	ol Requirements	27
	10.1	Quality	Assurance Indicators	27
		10.1.1	Representativeness	27

	10.1.2	Comparability	27
	10.1.3	Completeness	28
	10.1.4	Precision	28
	10.1.5	Accuracy	28
10.2	Decisio	on Rule	28
10.3	Field Q	uality Control Checks	29
	10.3.1	Field Measurements	29
	10.3.2	Sample Containers	29
	10.3.3	Field Duplicates	29
	10.3.4	Rinse Blanks	29
	10.3.5	Trip Blanks	29
10.4	Analytic	cal Laboratory Quality Control Checks	30
	10.4.1	Method Blanks	30
	10.4.2	Matrix Spike/Matrix Spike Duplicates	30
	10.4.3	Surrogate Spikes	30
	10.4.4	Laboratory Duplicates	31
	10.4.5	Calibration Standards	31
	10.4.6	Internal Standards	31
	10.4.7	Reference Standards/Control Samples	32
10.5	Data Pi	recision Assessment Procedures	32
10.6	Data A	ccuracy Assessment Procedures	33
10.7	Data C	ompleteness Assessment Procedures	33
		uipment Testing, Inspection, and Maintenance	0.4
-	ements		34
11.1		struments and Equipment	34
11.2		tory Instruments and Equipment	35
	11.2.1	Instrument Maintenance	35
	11.2.2	Equipment Monitoring	36

11.

12.	Instrun	nent Calibration and Frequency	37
	12.1	Field Equipment Calibration Procedures and Frequency	37
	12.2	Laboratory Equipment Calibration Procedures and Frequency	37
13.	Inspect	ion/Acceptance Requirements for Supplies and Consumables	38
14.	Data M	anagement	39
	14.1	Sample Designation System	39
	14.2	Field Activities	39
		14.2.1 Field Documentation	40
		14.2.2 Data Security	41
	14.3	Sample Management and Training	41
	14.4	Data Management System	42
		14.4.1 Computer Hardware	42
		14.4.2 Computer Software	42
		14.4.3 Surveying Information	42
		14.4.4 Field Observations	43
		14.4.5 Analytical Results	44
		14.4.6 Data Analysis and Reporting	44
	14.5	Document Control and Inventory	45
15.	Assess	ment and Response Actions	46
	15.1	Field Audits	46
		15.1.1 Performance Audits	46
		15.1.2 Internal Systems Audits	46
	15.2	Laboratory Audits	46
	15.3	Corrective Action	47
		15.3.1 Field Procedures	47
		15.3.2 Laboratory Procedures	47
16.	Report	s to Management	49

	16.1	Internal Reporting	49
	16.2	Reporting	49
17.	Data Re	eview, Validation, and Verification	50
	17.1	Field Data Reduction, Validation, and Reporting	50
		17.1.1 Field Data Reduction	50
		17.1.2 Field Data Review	50
		17.1.3 Field Data Reporting	51
	17.2	Laboratory Data Reduction, Review, and Reporting	51
		17.2.1 Laboratory Data Reduction	51
		17.2.2 Laboratory Data Review	51
18.	Validat	on and Verification Methods	52
19.	Recond	ciliation with User Requirements	54
20.	Referen	nces	55
Tak	oles		
	1	Parameters, Methods, and Target Reporting Limits	
	2	Sample Quantities and Quality Control Frequencies	
	3	Sample Containers, Preservation Methods, and Holding Time Requirements	
	4	Laboratory Quality Control Limits	
	5	Electronic Data Deliverable (EDD) Format	
Atta	achmen	t	
	Α	Sample Chain of Custody Form	

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

Preface

This *Quality Assurance Project Plan* (QAPP) presents the analytical methods and procedures that will be used during implementation of the select actions at the site.

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)
- The USEPA's guidance document entitled EPA Requirements for Quality
 Assurance Project Plans for Environmental Operations, EPA-QA/R-5 (USEPA,
 2001), which replaces QAMS-005/80 Interim Guidance and Specifications for
 Preparing Quality Assurance Project Plans (USEPA, 1980)
- the National Enforcement Investigations Center Policies and Procedures Manual (USEPA, 1991)

Information contained in this QAPP has been organized into the following sections:

Section	Content			
Project Management				
1	Project Organization and Responsibilities			
2	Project Background			
3	Project Description			
4	Quality Objectives and Criteria for Measurement Data			
5 Special Training Requirements/Certification				
6	Documentation and Records			
Measurement/Data Acquisition				
7	Sampling Process Design			
8	Sampling Method Requirements			
9	Sample Handling and Custody Requirements			
10	Analytical Procedures			
11	Quality Control Requirements			
12	Instrument/Equipment Testing, Inspection, and Maintenance Requirements			
13 Instrument Calibration and Frequency				

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

Section Content				
14	Inspection/Acceptance Requirements for Supplies and Consumables			
15	Data Acquisition Requirements for Nondirect Measurements			
16 Data Management				
Assessment/Oversight				
17	Assessment and Response Actions			
18	Reports to Management			
Data Validation and Usability				
19	Data Review, Validation, and Verification			
20 Validation and Verification Methods				
21	Reconciliation with User Requirements			
22 References				

Details are provided in the subsequent sections. This document also contains pertinent information from the *Remedial Design Work Plan* (RDWP) related to the measurements and evaluation of the analytical data.

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

Acronyms

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

NAPL nonaqueous phase liquid

NYSDEC New York State Department of Environmental Conservation

ORP oxidation-reduction potential

OSHA Occupational Safety and Health Administration

PAH polycyclic aromatic hydrocarbon
QA/QC quality assurance/quality control
QAC Quality Assurance Coordinator
QAPP Quality Assurance Project Plan
RDWP Remedial Design Work Plan

NYSEG New York State Electric and Gas Company

RPD relative percent difference SDG sample delivery ground

SVOC semivolatile organic compound

3-D three-dimensional TOC total organic carbon

USEPA United States Environmental Protection Agency

VOC volatile organic compound

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

1. Project Organization and Responsibilities

1.1 Project Organization

The site will require integration of personnel from the organizations identified below, collectively referred to as the project team. A detailed description of the responsibilities of each member of the project team is presented in Section 1.2.

1.1.1 Overall Project Management

ARCADIS, on behalf of NYSEG (New York State Electric and Gas Company), has overall technical responsibility for site investigation activities. ARCADIS personnel will perform the tasks and subtasks presented in Section 3 and will be responsible for evaluating resultant investigation data and preparing the deliverables specified in the RDWP. Project direction and oversight will be provided by NYSEG personnel. A listing of project management personnel and their responsibilities is provided below.

Company/ Organization	Title	Name	Phone Number
NYSDEC	Project Manager	Douglas MacNeal	518.402.9564
NYSEG	Project Manager	John Ruspantini	607.762.8839
ARCADIS	Project Manager in Charge	Keith White	315.671.9530
	Project Manager	Jason Brien	315.671.9114
	Field Activities Manager	TBD	
	Quality Assurance Coordinator	Dennis Capria	315.671.9299
Lab – PTS Laboratories	Project Manager	Rachel Spitz	562.347.2504
Lab – MicroSeeps	Project Manager	Heather Hauser	412.826.5245
Lab – Microbial Insights	Project Manager	Greg Davis	865.573.8188
Lab – TestAmerica Buffalo	Project Manager	Paul Morrow	716.691.7991
Buildio	Quality Assurance Officer	Peggy Gray-Erdmann	716.691.7991

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

1.2 Team Member Responsibilities

This section of the QAPP discusses the responsibilities and duties of the project team members.

1.2.1 NYSEG

Project Manager In Charge

- 1. oversight of the ARCADIS work products
- 2. provide ARCADIS approval for major project deliverables

Project Manager

- 1. overall direction of the investigation
- 2. review of ARCADIS work products

1.2.2 ARCADIS

Project Manager

- 1. Management and coordination of all aspects of the project as defined in the RDWP with an emphasis on adhering to the project objectives.
- 2. Reviews investigation results reports and all documents prepared by ARCADIS.
- 3. Confirms that corrective actions are taken for deficiencies cited during audits of the field activities.

Field Activities Manager

- Oversight of field hydrogeologic efforts.
- Oversight of field screening and collection of soil samples.
- 3. Review of field hydrogeologic records and boring logs.
- 4. Oversight of groundwater sampling.
- 5. Oversight of field analysis and collection of QA samples.

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

- Reduction of field data calibration and maintenance.
- 7. Review of the field instrumentation, maintenance, and calibration to maintain quality data.
- 8. Preparation of draft reports and other key documents.
- 9. Maintenance of field files of notebooks and logs and calculations.
- 10. Instruction of field staff.
- 11. Coordination of field and laboratory schedules.

Field Personnel

- 1. Perform field procedures associated with the tasks and subtasks presented in Section 3.
- 2. Perform field analyses and collect QA samples.
- 3. Calibrate, operate, and maintain field equipment.
- 4. Reduce field data.
- 5. Maintain sample custody.
- 6. Prepare field records and logs.

Quality Assurance Coordinator

- 1. Review laboratory data packages.
- 2. Oversee and interface with the analytical laboratories.
- 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.

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 6. Prepare a QA/QC report that includes an evaluation of field and laboratory data and data validation reports.
- 1.2.3 Laboratory Subcontractor

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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

2. Project Background

The following summarizes background information for the facility and the off-site areas. Additional information can be found in the RDWP.

2.1 Site Location and Description

The site is a former manufactured gas plant (MGP) located in the City of Geneva, near the northwestern shore of Seneca Lake in eastern Ontario County, New York. The former MGP operated in an area comprised of a rectangular piece of land that is now located in a mixed commercial and residential area in the east-central part of Geneva, New York. Seneca Lake is located approximately 900 feet southeast of the site. The site is bordered by Wadsworth Street to the east, a railroad (Finger Lakes Railway) to the south, a restaurant to the west and residential properties to the north. A dry cleaner is located northeast of the site, on the east side of Wadsworth Street. Railroad Place intersects Wadsworth Street and bisects the site. A gas holder (Gas Holder 1) and coal shed were formerly located in Railroad Place. Several MGP structures formerly existed at the current location of the City of Geneva's Public Safety Building (PSB) south of Railroad Place.

The portion of the former MGP site located north of Railroad Place is currently owned by NYSEG, while the area south of Railroad Place is owned by the City of Geneva. The area owned by NYSEG includes a grass-covered area in the eastern portion of the property and an asphalt parking lot comprises the western portion of the property. A restaurant on Railroad Place leases the parking area from NYSEG. A gravel parking area is located in the northeast portion of NYSEG's property and is used by residential property owners. A NYSEG gas regulator station is located near the intersection of Railroad Place and Wadsworth Street. The City of Geneva's PSB consists of a courtroom, office space, the local jail, and an attached pole barn structure. A large parking lot used by PSB employees is located west of the PSB. A railroad is located immediately south of the PSB.

Based on utility drawings obtained from the City of Geneva, several utilities are located within the Railroad Place right-of-way, and transect former Gas Holder 1. Utilities present within Railroad Place include, but are not limited to:

- 24-inch sanitary sewer
- 8-inch potable water mains
- 8-inch natural gas lines

Additionally, two natural gas distribution lines are located immediately south of (and enter/exit) the NYSEG gas regulator station.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

2.2 Site History

The gas plant was constructed in 1853 and included a retort and condenser house, purification building (including lime room, ammonia tank and cistern), coal shed and one gas holder (Gas Holder 1). A second gas holder (Gas Holder 2) was constructed circa 1900 in the northwest portion of the site. The majority of the buildings/structures associated with the gas plant were demolished between 1903 and 1909; the only remaining structures after 1909 were the second gas holder, tool house and meter house. The remaining holder was demolished between 1915 and 1925. Between 1925 and 1943, a 500,000-cubic-foot gas holder (Gas Holder 3) and a regulator house were constructed at the site to serve as a storage/distribution facility. This newer holder may have served as a remote distribution holder for the Border City MGP, which was constructed at approximately the same time that the Wadsworth MGP was decommissioned. Gas Holder 3 was demolished sometime after 1946; however, portions of the holder foundation wall and slab still exist. Railroad Place was constructed through the center of the former MGP site, covering the location of Gas Holder 1.

2.3 Project Objectives

The purpose of the field investigation activities is to gather additional data to complete the remedial design of the preferred remedial action alternative. The data collected during the investigation will be used with existing data from previous investigations to achieve the following specific objectives:

 Collecting and submitting groundwater samples for laboratory analysis in support of a monitored natural attenuation evaluation and documentation of dissolved phase groundwater impacts.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

3. Quality Objectives and Criteria for Measurement Data

The DQO process, as described in the USEPA EPA QA/G-4 QAPP instructions document, is intended to provide a "logical framework" for planning field investigations. The following addresses, in turn, each of the seven sequential steps in the EPA QA/G-4 QAPP DQO process.

Step 1: State the Problem

Groundwater sampling will be completed in support of the remedial design for the project site.

Step 2: Identify the Goal of the Study

The goal of the study is to obtain necessary data to evaluate the potential for natural attenuation to be occurring at the site.

Step 3: Identify Information Inputs

Information inputs will consist of analytical results for groundwater samples.

Step 4: Define the Boundaries of the Study

The site is located in the City of Geneva, near the northwestern shore of Seneca Lake in eastern Ontario County, New York. The former MGP operated in an area comprised of a rectangular piece of land that is now located in a mixed commercial and residential area in the east-central part of Geneva, New York. Seneca Lake is located approximately 900 feet southeast of the site. The site is bordered by Wadsworth Street to the east, a railroad (Finger Lakes Railway) to the south, a restaurant to the west and residential properties to the north. A dry cleaner is located northeast of the site, on the east side of Wadsworth Street. Railroad Place intersects Wadsworth Street and bisects the site. A gas holder (Gas Holder 1) and coal shed were formerly located in Railroad Place. Several MGP structures formerly existed at the current location of the City of Geneva's Public Safety Building (PSB) south of Railroad Place.

Step 5: Developing the Analytical Approach

The decision on whether data can be used will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions noted. The sampling plan has been devised so that the loss of any single data point will not hinder description of the distribution of constituents of concern. Given this, a

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

reasonable decision rule would be that 90% of the data points not be rejected and deemed unusable.

Step 6: Specify Performance or Acceptance Criteria

Specifications for this step call for: 1) giving forethought to corrective actions to improve data usability; and 2) understanding the representative nature of the sampling design. This QAPP has been designed to meet both specifications for this step. The sampling and analysis program has been developed based on a review of previous site data and knowledge of present Site conditions. Corrective actions are described elsewhere in the document and in the appended documents. The representative nature of the sampling design has been assured by discussions among professionals familiar with the Site and the appropriate government agencies.

Step 7: Develop the Plan for Obtaining Data

Field sampling procedures are detailed in the *Field Sampling Plan* (FSP) included as Appendix A to the RDWP. Laboratory analysis of samples collected per the RDWP will be conducted in accordance with this QAPP.

3.1 Data Categories

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:

<u>Screening Data:</u> 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.

<u>Screening Data with Definitive Confirmation</u>: 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.

<u>Definitive Data</u>: Definitive data are generated using analytical methods, such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce raw data (e.g., chromatograms,

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

spectra, digital values) in the form of paper printouts or computer-generated electronic files.

It is anticipated that both the screening and definitive data categories will be used during the investigation. Field parameters (i.e., turbidity, conductivity, temperature, and pH) that will be obtained during groundwater sampling for use in qualitatively interpreting other site data will be determined using screening techniques. All remaining parameters will be determined using definitive techniques.

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 investigation activities will be USEPA SW-846, generally accepted microbial polymerase chain reaction methodology, lab-specific AM20GAX method for dissolved gases (a modified, ELAP-approved, version of USEPA method RSK175), USEPA Methods for Chemical Analysis of Water and Waste and Standard Methods for Water and Wastewater methods with New York State Department of Environmental Conservation (NYSDEC) ASP Revision 2005, QA/QC requirements, and Category B reporting deliverables. A summary of the testing methods is provided in Tables 1 and 2.

3.2 Field Activities

To obtain information necessary to meet the objectives stated above in Section 2.3, the following tasks will be performed: (Note: only tasks that require collection and analysis of environmental samples or collecting field measurements are listed below. Refer to the RDWP for a description of the task and subtasks.)

PDI Task 2b – Groundwater Sampling

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

A description of the DQOs is presented below.

3.2.1 Data Quality Objectives for PDI Task 2 – Groundwater Investigation

PDI Task 2b consists of collecting and submitting one round of groundwater samples for laboratory analysis in support of a natural attenuation evaluation. Groundwater samples will be collected from each existing and new groundwater monitoring well to document the extent of dissolved phase groundwater impacts and evaluate the microbial community in support of the Natural Attenuation Evaluation (to be completed under RD Task 4, see the RDWP).

Groundwater sampling procedures are described in the FSP (see Appendix A of the RDWP). Groundwater samples will be submitted for the following parameters:

- electron acceptors oxygen, nitrate, manganese oxides (insoluble manganese),
 ferric iron, sulfate, carbon dioxide
- electron donors VOCs, SVOCs, organic carbon
- metabolic by-products carbon dioxide, nitrogen gas, nitrite, dissolved iron, dissolved manganese, sulfide, methane
- field parameters pH, Conductivity, oxidation-reduction potential (ORP), temperature
- microbial parameters
 - toluene dioxygenase (qTOD) potential to degrade toluene, benzene, and ethylbenzene and
 - naphthalene dioxygenase (qNAH) potential to degrade naphthalene, anthracene, phenanthrene, acenaphthylene, flurorene, acenaphthene, dibenzo-1,4-dioxin, dibenzothiophene, and dibenzofuran
- surface tension
- cyanide

The number of groundwater samples that will be collected (if additional laboratory analyses are required), including 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

4. 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 remedial activities at the site 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

5. Documentation and Records

5.1 General

Groundwater samples will be collected, as described in the PDI Work Plan. Detailed descriptions of the documentation and reporting requirements are presented below.

5.2 Sample Designation System

Samples will be identified with a unique designation system that will facilitate sample tracking. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events and conditions. An alpha-numeric system is considered appropriate and will be used by field personnel to assign each sample with a unique sample identification number. The sample identification number will begin with a two-letter prefix indicating the sample type and two digits indicating the sequential sample number collected from the location.

The samples types (if applicable) will be designated using the following codes:

- Equipment Blank Sample "EB"
- Field Duplicate Sample "DUP"
- Groundwater Sample "MW"
- Matrix Spike and Matrix Spike Duplicate "MS" and MSD"
- Trip Blank Sample "TB"

For groundwater samples, the sample code will correspond to a six-digit number indicating the month, day, and year the sample was obtained. For example a groundwater sample collected from MW-2 on July 30, 2008 will be designated MW-2-20080730.

QA/QC samples will be designated by a three-letter code followed by the six –digit sample collection date. For field and equipment blanks, a two letter sample type code will precede the blank designation to indicate which medium the blank was intended to represent. For example, a field blank collected on July 30, 2008 during groundwater samples collection would be designated GW-FB1-20080730. The sampling point associations for field duplicates must be recorded in the field log.

5.3 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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 the 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 A.

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.

5.4 Laboratory Documentation

5.4.1 Laboratory Project Files

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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

5.4.2 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.

5.4.3 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.

5.5 Data Reporting Requirements

5.5.1 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 RDWP 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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

5.5.2 Laboratory Data Reporting

Analytical results will be provided by the laboratory in a digital format. The data packages will be examined to insure 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 Quality Assurance Coordinator will be notified and will promptly follow up with the laboratory to resolve any issues.

If validation is required, each data package will be validated in accordance with the procedures presented in this QAPP. Data that do 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, the data review will be used to populate the appropriate database tables. This format specifies one data record for each constituent and each sample analyzed. 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 either an ASCII comma-separated value (CSV) format or in a Microsoft Excel worksheet, will be loaded into the appropriate database table via a custom-designed user interface Visual Basic program. The EDD format can be found in Table 5. Analytical data that cannot be provided by the laboratory in electronic format will be entered manually. Hand-keyed data will be reviewed for accuracy. 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 were received.

The laboratory is responsible for preparing the groundwater sample results in Level 2 data packages as described in 3.2.

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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 corrected for dilutions. 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

6. Sampling Process Design

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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

7. Sampling Method Requirements

Groundwater samples will be collected, as described in the RDWP and the FSP. The approximate sample quantities and field quality control samples are shown in Table 3. 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

8. Sample Handling and Custody Requirements

8.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for the samples are shown in Table 4.

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).

8.2 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 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 24 to 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.

8.3 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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.

8.3.1 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

8.3.2 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

8.3.3 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, UPS) 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

8.4 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.

8.5 Laboratory Custody Procedures

8.5.1 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.

8.5.2 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.

8.5.3 Sample Chain of Custody and Documentation

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

8.5.4 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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.

8.5.5 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

9. Analytical Procedures

9.1 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.

9.2 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, USEPA Methods for the Chemical Analysis of Water and Wastes and Standard Methods for Water and Wastewater with NYSDEC, ASP, 2005 Revision, QA/QC and reporting deliverables requirements will be used for all analytes except for geotechnical analyses.

9.2.1 General

The following tables summarize general analytical requirements:

Table	Title
Table 1	Parameters, Methods, and Target Reporting Limits
Table 2	Samples and Quality Control Frequencies
Table 3	Sample Containers, Preservation Methods, and Holding Times Requirements
Table 4	Laboratory Quality Control Limits
Table 5	Electronic Data Deliverable (EDD) Format

9.2.2 Sample Metrics

9.2.2.1 Groundwater

Analyses in this category will relate to groundwater samples. Analyses will be performed following the methods listed in Tables 1 and 2 and quality control frequencies listed in Table 2. Results will be reported in units presented in Tables 1 and 2.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

9.2.4 Analytical Requirements

The primary sources to describe the analytical methods to be used during the investigation are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition, and USEPA Methods for Chemical Analysis of Water and Waste, QA/QC, in addition to method specific (Methods AM20GAX for dissolved gases analyses, DNA q(PRC) methodology for microbial parameters), conventional and generally accepted standard analytical methods, and reporting deliverables requirements.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

10. Quality Control Requirements

10.1 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 Sections 10.3 and 10.4.

QA indicators are generally defined in terms of five parameters:

- 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.

10.1.1 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability. The investigation activities have been designed to assess the presence of the constituents at the time of sampling. The RDWP presents the rationale for sample quantities and location. 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.

10.1.2 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between this investigation, and to the extent possible, with existing data will be maintained through consistent sampling and analytical

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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.

10.1.3 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 17.

10.1.4 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. All work for this investigation will adhere to established protocols presented in the RDWP. 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 Sections 10.4.

10.1.5 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 10.4.

10.2 Decision Rule

The decision on whether data can be used will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions noted. The sampling plan has been devised so that the loss of any single data point will not hinder description of the distribution of potential COCs. Given this, a reasonable decision rule would be that 90% of the data points not be rejected and deemed unusable.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

10.3 Field Quality Control Checks

10.3.1 Field Measurements

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

10.3.2 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.

10.3.3 Field Duplicates

Field duplicates collected for VOC analysis will be collected as discrete samples from the same location. For groundwater, one well will have a field duplicate collected per sampling event. Table 3 provides an estimated number of field duplicates to be prepared for each applicable parameter and matrix.

10.3.4 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 3 provides an estimated number of rinse blanks collected during the investigation activities.

10.3.5 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 3 provides an estimated number of trip blanks collected for each matrix and parameter during the investigation activities.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

10.4 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.

10.4.1 Method Blanks

Sources of contamination in the analytical process, whether specific analyses or interferences, need to be identified, isolated, and corrected. The method blank is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. As such, the method blank would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources which could affect sample analysis. One method blank will be analyzed with each analytical series associated with no more than 20 samples.

10.4.2 Matrix Spike/Matrix Spike Duplicates

MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices and will be site-specific. MS/MSD pairs will be analyzed at a 5% frequency (every 20 samples or once every week, whichever comes first).

When MS/MSD recoveries are outside quality control limits, associated control sample and surrogate spike recoveries will be evaluated, as applicable, to attempt to verify the reason for the deviation and determine the effect on the reported sample results. Table 3 presents an estimated number of MS and MSD analyses for each applicable parameter.

10.4.3 Surrogate Spikes

Surrogates are compounds which are unlikely to occur under natural conditions that have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by gas chromatography/mass spectrometry (GC/MS) and gas chromatography (GC) methods and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to sample matrix.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

If surrogate spike recoveries exceed specified quality control limits, the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data may not be verifiable and reanalysis of the samples with additional control may be necessary.

Surrogate spike compounds will be selected utilizing the guidance provided in the analytical methods.

10.4.4 Laboratory Duplicates

For inorganics, laboratory duplicates will be analyzed to assess laboratory precision. Laboratory duplicates are defined as a separate aliquot of an individual sample that is analyzed as a separate sample. Table 3 presents an estimated number of laboratory duplicates for each applicable parameter.

10.4.5 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.

10.4.6 Internal Standards

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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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

10.4.7 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.

10.5 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 3.

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 =
$$(A-B)$$
 x 100 $(A+B)/2$

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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

10.6 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 through the use of MSs, surrogate spikes, internal standards, and reference standards. Where available and appropriate, quality assurance Performance Standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated in terms of percent recovery as follows:

% Recovery =
$$A-X$$
 x 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.

10.7 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.

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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

11. 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.

11.1 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 Activities Task Manager to follow the maintenance schedule and arrange for prompt service.

Field instrumentation to be used in this study 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 Activities 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.

Non-operational field equipment will be either repaired or replaced. Appropriate spare parts will be made available for field meters. A summary of preventive maintenance requirements for field instruments, and details regarding field equipment maintenance, operation, and calibration, are provided in the FSP.

11.1.1 Equipment Maintenance

All measuring and test equipment to be used in support of the PDI activities that directly affect the quality of the analytical data shall be subject to preventative maintenance measures that minimize equipment downtime. Equipment will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual to ensure that all maintenance requirements are being observed. Field notes from previous sampling events will be reviewed to ensure that any prior equipment problems are not overlooked and that any necessary repairs to equipment have been carried out.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

Field equipment returned from a site will be inspected to confirm that it is in working order. The inspection will be recorded in the field logbook, as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook. Non-operational field equipment will either be repaired or replaced. Appropriate spare parts will be made available for field meters.

Consultant-/subcontractor-owned or leased equipment maintenance shall be in accordance with the manufacturer's instructions.

11.2 Laboratory Instruments and Equipment

Laboratory instrument and equipment documentation procedures include details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

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

11.2.1 Instrument Maintenance

Maintenance schedules for laboratory equipment adhere to the manufacturer's recommendations. Records reflect the complete history of each instrument and specify the time frame for future maintenance. Major repairs or maintenance procedures are performed through service contracts with manufacturer or qualified contractors. Paperwork associated with service calls and preventative maintenance calls will be kept on file by the laboratory.

Laboratory Systems Managers are responsible for the routine maintenance of instruments used in the particular laboratory. Any routine preventative maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the method used, and/or the judgment of the Laboratory Systems Manager.

All major instruments are backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts is also available to minimize equipment/instrument downtime.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

11.2.2 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

12. Instrument Calibration and Frequency

12.1 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.

12.2 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 E, Part III.

Semivolatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit E, Part IV.

Metals and Cyanide

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit E, Part VII.

Supplemental Parameters

Additional parameters (listed as Conventional Chemistry parameters in Table 1) will be calibrated according to their respective methods, following the guidance presented in NYSDEC ASP 2005, Exhibit E, Part VIII.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

13. Inspection/Acceptance Requirements for Supplies and Consumables

All supplies to be used in the field and laboratory will be available when needed. They will be free of target chemicals and interferences. All reagents will be tested prior to use with site samples. All standards will be verified against a second source standard. The laboratory will follow a "first in first out" procedure for the storage and use of all consumables to minimize the risk of contamination and degradation.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

14. 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 data management program established for the project 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

14.1 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 re-sampling 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.

14.2 Field Activities

Field activities designed to gather the information necessary to make decisions regarding the off-site areas 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

14.2.1 Field Documentation

Complete and accurate record keeping is a critical component of the field investigation 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 the remedial investigation. 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. In addition, certain media sampling locations will be surveyed to accurately record their locations. The survey crew will use their own field logs and will supply the sampling location coordinates to the File Custodian.

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. In order 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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. All 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.

14.2.2 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.

14.3 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 8.3.3. On a daily basis, the completed chain of custody forms associated with samples collected that day will be faxed 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

14.4 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. Information that will be used to populate the database will be derived from three primary sources: surveying of sampling locations, field observations, and analytical results. Each of these sources is discussed in the following sections.

14.4.1 Computer Hardware

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

14.4.2 Computer Software

If required, the database will be written in Microsoft Access, running in a Windows operating system.

14.4.3 Surveying Information

In general, the new monitoring well location sampled will be surveyed to confirm that accurate documentation of sample location for mapping and geographic information system purposes (if appropriate) to facilitate the re-sampling of select sample locations during future monitoring programs, if needed, and for any potential remediation activities. The surveying activities that will occur in the field will consist of the collection of information that will be used to compute a northing and easting in state plane coordinates for each sample location and the collection of information to compute elevations relative to the National Geodetic Vertical Datum of 1929 for select sample locations, as appropriate. All field books associated with the surveying activities will be stored as a record of the project activities.

Conventional surveying techniques will be used to gather information, such as the angle and distance between the sample location and the control monument, as well as point attributes. Control monuments will be established using global positioning system techniques. The surveying software allows the rapid computation of a location's state plane coordinates.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

Differential leveling techniques will be used to gather information to be used to compute a sample location's (or top-of-casing for groundwater monitoring wells) elevation. During the differential leveling process, which includes at least one benchmark of known elevation, detailed field notes will be kept in a field book

Surveying data for pre-existing site monitoring wells was previously conducted by NYSEG on December 14, 2005 and October, 2006.

14.4.4 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 status memorandum may be prepared by the field personnel who performed the sampling activities. The purpose of the status memo 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 memorandum 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. For example, for soil samples, the table would present the sampling date and time, soil depth, depth of soil recovered in a given core, the depth increment submitted for analysis, and a description of the lithology.

Status memos 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

14.4.5 Analytical Results

Analytical results provided by the laboratory will generally 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 QAM will be notified and will promptly follow up with the laboratory to resolve any issues.

Where appropriate, the data packages will be validated in accordance with the procedures presented in Section 20. 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 either an ASCII comma separated value format or 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.

14.4.6 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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. Several output functions that have been developed by ARCADIS will be appropriately modified for use in the data management system.

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. This data management system function creates a digital comma-delimited ASCII file of analytical results and qualifiers for a given media. The ASCII file is then processed through a spreadsheet, which transforms the comma-delimited file into a table of rows and columns. Tables of analytical data will be produced as part of data interpretation tasks, the reporting of data, and the preparation of remedial design documents.

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. A function has been created by ARCADIS that creates a digital file consisting of sample location number, state plane coordinates, sampling date, and detected constituents and associated concentrations and analytical qualifiers. The file is then transferred to an AutoCAD work station, where another program has been developed to plot a location's analytical data in a "box" format at the sample location (represented by the state plane coordinates). This routine greatly reduces the redundant keypunching of analytical results and facilitates the efficient production of interpretative and presentation graphics.

The data management system also has the capability of producing a digital file of select parameters that exists in one or more of the databases. This type of custom function is accomplished on an interactive basis and is best used for transferring select information into a number of analysis tools, such as statistical or graphing programs.

14.5 Document Control and Inventory

ARCADIS maintains project files at its Syracuse, New York office as discussed in Section 5.6.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

15. Assessment and Response Actions

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

15.1 Field Audits

The following field performance and systems audits will be completed during this project.

15.1.1 Performance Audits

The appropriate Task Manager will monitor field performance. 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 ARCADIS QAM will review all field reports and communicate concerns to the ARCADIS Project Manager and/or Task Managers, as appropriate. In addition, the ARCADIS QAM will review the rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures.

15.1.2 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, the FSP, and the HASP.

15.2 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

ARCADIS 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.

15.3 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, the FSP, or the RDWP. 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.

15.3.1 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 ARCADIS Project Manager and Task Manager.

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

- Protocols, as defined by this QAPP, the FSP, or the RDWP, 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.

15.3.2 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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

16. Reports to Management

16.1 Internal Reporting

The analytical laboratory will submit analytical reports to ARCADIS for review. If required, ARCADIS will, in turn, submit the reports to the data validator for review. Supporting data (i.e., historic data, related field or laboratory data) will also be reviewed to evaluate data quality, as appropriate. The ARCADIS 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 ARCADIS Project Manager and appropriate Task Managers. If required, this QAPP will be filed in the project file at ARCADIS' office 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.

16.2 Reporting

Upon sample transport to the laboratory, a copy of the chain of custody will be forwarded to NYSEG. Upon receipt of the ASP – Category B Data Package from the laboratory, the ARCADIS QAC 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 the reports.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

17. Data Review, Validation, and Verification

After field and laboratory data are obtained, the data will be subject to the following:

- 1. Reduction, or manipulation mathematically, or otherwise into meaningful and useful forms
- 2. Review
- 3. Organization, interpretation, and reporting
- 4. Data validation

17.1 Field Data Reduction, Validation, and Reporting

17.1.1 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 RDWP 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.

17.1.2 Field Data Review

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
- Usage of appropriate procedures
- 4. Appropriate instrument calibration and maintenance
- 5. Reasonableness in comparison to present and past data collected

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

- 6. Correct sample locations
- 7. Correct calculations and interpretations

17.1.3 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 at the ARCADIS office in Syracuse, New York.

17.2 Laboratory Data Reduction, Review, and Reporting

17.2.1 Laboratory Data Reduction

The calculations used for data reduction will be specified in each of the analytical methods referenced previously. Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data will be entered into permanently bound laboratory notebooks. The data entered are sufficient to document all factors used to arrive at the reported value.

Concentration calculations for chromatographic analyses will be based on response factors. Quantitation will be performed using either internal or external standards.

Total cyanide analyses will be based on regression analysis. Regression analysis is used to fit a curve through the calibration standard data. The sample concentrations will be calculated using the resulting regression equations. Non-aqueous values will be reported on a dry-weight basis. Unless otherwise specified, all values will be reported uncorrected for blank contamination.

17.2.2 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 to ARCADIS.

If discrepancies or deficiencies exist in the analytical results, then corrective action will be taken, as discussed in Section 15. 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 ARCADIS Project Manager.

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

18. 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.

No validation of the analytical data collected during the PDI is proposed at this time. 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 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:

- 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

DRAFT Quality Assurance Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

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 ARCADIS 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

19. 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

DRAFT
Quality Assurance
Project Plan

Wadsworth Street Former Manufactured Gas Plant Site

20. 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).

United States Environmental Protection Agency. *EPA Requirements for Quality Assurance Project Plans for Environmental Operations*. EPA-QA/R-5. Quality Assurance Division. (March 2001).

Tables

Table 1 Parameters, Methods and Target Reporting Limits

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

		oundwater (ug	
	Criteria	Laboratory	
Analyte		MDL	RL
Volatile Organic Compounds SW846 8260 1			
1,1,1,2-Tetrachloroethane	NA	0.35	1.0
1,1,1-Trichloroethane	NA NA	0.26	1.0 40
1,4-Dioxane	NA NA	9.3 0.40	1.0
2,2-Dichloropropane 2-Butanone (MEK)	NA NA	1.3	5.0
2-Chloroethyl vinyl ether	NA NA	0.96	5.0
2-Chlorotoluene	NA NA	0.20	1.0
2-Hexanone	NA	1.2	5.0
2-Methylthiophene	NA	0.44	1.0
3-Chlorotoluene	NA	0.45	1.0
3-Methylthiophene	NA	0.53	1.0
4-Chlorotoluene	NA	0.37	1.0
4-Isopropyltoluene	NA	0.31	1.0
4-Methyl-2-pentanone (MIBK)	NA	0.91	5.0
Acetone	NA	1.3	5.0
Acetonitrile	NA	19	40
Acrolein	NA	5.5	20
Acrylonitrile	NA NA	0.83	5.0
Allyl chloride	NA NA	0.17	1.0
Benzene	NA	0.41	1.0
Bromobenzene	NA	0.17	1.0
Bromochloromethane	NA	0.39	1.0
Bromodichloromethane	NA	0.39	1.0
Methacrylonitrile	NA	0.12	5.0
Methyl Acetate	NA	0.50	1.0
Methyl Methacrylate Methyl tert-Butyl Ether	NA NA	0.14 0.16	1.0
Methylcyclohexane	NA NA	0.16	1.0
Methylene Chloride	NA NA	0.50	1.0
m-Monochlorobenzotrifluoride	NA NA	0.49	1.0
m-Xylene & p-Xylene	NA NA	0.66	2.0
Naphthalene	NA	0.43	1.0
n-Butanol	NA	8.8	40
n-Butylbenzene	NA	0.28	1.0
n-Propylbenzene	NA	0.18	1.0
o-Monochlorobenzotrifluoride	NA	0.50	1.0
o-Xylene	NA	0.36	1.0
Pentachloroethane	NA	0.34	1.0
p-Monochlorobenzotrifluoride	NA	0.21	1.0
Propionitrile	NA	1.9	10
Propylene Oxide	NA	0.60	5.0
sec-Butylbenzene	NA	0.30	1.0
Styrene	NA	0.18	1.0
t-Amyl alcohol	NA	1.0	1.0
t-Butanol	NA	3.6	20
Tert-Amyl Methyl Ether	NA	0.27	1.0
tert-Butylbenzene	NA 1	0.30	1.0
Semivolatile Organic Compounds SW846 8270		0.50	F ^
1,2,4,5-Tetrachlorobenzene	NA NA	0.58	5.0
1,2,4-Trichlorobenzene	NA NA	0.44	10 10
1,2-Dichlorobenzene 1,2-Diphenylhydrazine	NA NA	0.40 0.35	10
1,3,5-Trichlorobenzene	NA NA	NA	NA
1,3,5-Trichlorobenzene	NA NA	2.5	10
1,3-Dichlorobenzene	NA NA	0.48	10
1,3-Dinitrobenzene	NA	0.82	20
1,4-Dichlorobenzene	NA	0.46	10
1,4-Dinitrobenzene	NA	0.71	10
1,4-Dioxane	NA	1.1	10
1,4-Naphthoquinone	NA	0.24	10
1-Naphthylamine	NA	1.3	10
2,3,4,6-Tetrachlorophenol	NA	0.32	5.0
2,4,5-Trichlorophenol	NA	0.48	5.0
2,4,6-Trichlorophenol	NA	0.61	5.0
2,4-Dichlorophenol	NA	0.51	5.0
		•	

Table 1 Parameters, Methods and Target Reporting Limits

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

			ındwater (ug/L)				
	Criteria	Laboratory	Laborator				
Analyte		MDL	RL				
Semivolatile Organic Compounds SW846							
2,4-Dimethylphenol	NA	0.50	5.0				
2,4-Dinitrophenol	NA	2.2	10				
2,4-Dinitrotoluene	NA NA	0.45	5.0				
2,6-Dichlorophenol	NA NA	0.46	10				
2,6-Dichloropyridine	NA NA	1.6	10				
2-Acetylaminofluorene	NA NA	2.3	10				
2-Chloronaphthalene 2-Chlorophenol	NA NA	0.46 0.53	5.0 5.0				
z-Chloropyridine	NA NA	2.2	10				
2-Methylnaphthalene	NA NA	0.60	5.0				
2-Methylphenol	NA NA	0.40	5.0				
2-Naphthylamine	NA NA	2.5	10				
2-Nitroaniline	NA NA	0.42	10				
2-Nitrophenol	NA NA	0.48	5.0				
2-Picoline	NA	1.4	80				
2-Toluidine	NA NA	1.5	10				
3 & 4 Methylphenol	NA NA	0.36	10				
3,3'-Dichlorobenzidine	NA	0.40	5.0				
3,3'-Dimethylbenzidine	NA NA	2.5	40				
3-Chloropyridine	NA	1.4	10				
3-Methylcholanthrene	NA	2.5	10				
3-Methylphenol	NA	0.40	10				
3-Nitroaniline	NA	0.48	10				
4,6-Dinitro-2-methylphenol	NA	2.2	10				
4-Aminobiphenyl	NA	0.81	10				
4-Bromophenyl phenyl ether	NA	0.45	5.0				
4-Chloro-3-methylphenol	NA	0.45	5.0				
1-Chloroaniline	NA	0.59	5.0				
4-Chlorophenyl phenyl ether	NA	0.35	5.0				
4-Chloropyridine	NA	1.2	10				
4-Methylphenol	NA	0.36	10				
4-Nitroaniline	NA	0.25	10				
4-Nitrophenol	NA	1.5	10				
4-Nitroquinoline-1-oxide	NA	2.5	10				
7,12-Dimethylbenz[a]anthracene	NA	0.62	10				
a,a-Dimethylphenethylamine	NA	0.49	100				
Acenaphthene	NA	0.41	5.0				
Acenaphthylene	NA	0.38	5.0				
Acetophenone	NA NA	0.54	5.0				
Alachlor	NA NA	0.63	10				
Alpha-Terpineol	NA NA	1.4	10				
Aniline	NA NA	0.61	10				
Anthracene	NA NA	0.28	5.0				
Aramite	NA NA	1.6	20				
Atrazine	NA NA	0.46	5.0				
Benzaldehyde	NA NA	0.27	5.0				
Benzidine	NA NA	2.2	80				
Benzo[a]anthracene	NA NA	0.36	5.0				
Benzo[a]pyrene	NA NA	0.47	5.0				
Benzo[b]fluoranthene	NA NA	0.34	5.0				
Diphenylamine Disulfoton	NA NA	0.82 0.42	10 10				
Ethyl Methanesulfonate	NA NA	0.42	10				
etnyl Methanesullonate Famphur	NA NA	1.9	40				
Fluoranthene	NA NA	0.40	5.0				
Fluorene	NA NA	0.40	5.0				
Hexachlorobenzene	NA NA	0.50	5.0				
Hexachlorobutadiene	NA NA	0.68	5.0				
Hexachlorocyclopentadiene	NA NA	0.68	5.0				
Hexachloroethane	NA NA	0.59	5.0				
Hexachlorophene	NA NA	130	310				
Hexachloropropene	NA NA	2.5	10				
ndeno[1,2,3-cd]pyrene	NA NA	0.47	5.0				
sodrin	NA NA	0.47	10				
JUILLI	INA	0.10	10				

Table 1 Parameters, Methods and Target Reporting Limits

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

	Groundwater (ug/L)							
	Criteria	Laboratory						
Analyte		MDL	RL					
Semivolatile Organic Compounds SW846 827	0 (continued) 1							
Isosafrole	l NA	0.58	10					
Kepone	NA	1.8	50					
Methapyrilene	NA NA	1.8	50					
Methyl Methanesulfonate	NA NA	2.5	10					
N,N-Dimethyl Formamide	NA NA	1.7	20					
Naphthalene	NA NA	0.76	5.0					
Nitrobenzene	NA NA	0.29	5.0					
N-Nitro-o-toluidine	NA NA	0.66	10					
N-Nitrosodiethylamine	NA NA	0.36	10					
N-Nitrosodimethylamine	NA NA	2.2	10					
N-Nitrosodi-n-butylamine	NA NA	0.60	10					
Simazine	NA NA	1.4	10					
Sulfotepp	NA NA	0.64	10					
Tetraethyl lead	NA NA	2.0	10					
Thionazin	NA NA	0.38	10					
Tributyl phosphate	NA NA	0.34	10					
Tricresylphosphate	NA NA	1.8	10					
USEPA Method 353.2	INA	1.0	10					
Nitrate	NA	0.011	0.05					
Standard Method SM4500-S-2D	IVA	0.011	0.03					
Sulfide	NA	0.052	0.1					
USEPA Method SW-9060								
Total Dissolved Organic Carbon	NA	0.4	1.0					
Total Organic Carbon	NA	0.4	1.0					
USEPA Method 200.7 Rev 4.4	1							
Total Manganese	NA	0.0002	0.003					
Dissolved Manganese	NA	0.0002	0.003					
Total Iron	NA	0.019	0.05					
Dissolved Iron	NA	0.019	0.05					
USEPA Method 9038	- U	1	1					
Sulfate	NA	1.49	5					
USEPA Method 350.1	•	*	•					
Nitrogen as Ammonia	NA	0.015	0.02					
USEPA Method 9012A		•	•					
Cyanide	NA	0.005	0.01					
USEPA Method 300.0	•	•						
Chloride	NA	0.28	0.5					
Conventional Chemistry	•	•	-					
Dissolved Methane (AM20GAX)4	NA	0.023	0.1					
Dissolved Carbon Dioxide (AM20GAX) ⁴	NA	0.125	5					
Dissolved Oxygen (AM20GAX) ⁴	NA NA	0.063	0.5					
Dissolved Oxygen (AM20GAX) ⁴	NA NA	0.126	0.5					
Surface Tension	NA NA	TBD	TBD					
	NA NA	100 ²	1000 ²					
qTOD (DNA q(PRC))		100 ²	1000 ²					
qNAH (DNA q(PRC))	NA	100	1000					

- USEPA. Office of Solid Waste and Emergency Response. Test Methods for Evaluating Solid Waste SW-846 3rd ed. Washington, D.C. 1996.
- 2. Microbial analyses DNA q(PRC) MDL's and RL's are reported in cells/mL.
- 3. NA not applicable. These analyses are being conducted for treatability testing and will not be compared to regulatory criteria.
- Dissolved gases method AM20GAX is lab-specific and is an ELAP-approved modified version of USEPA Method RSK175

Table 2 Sample Quantities and Quality Control Frequencies

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

	Estimated	Field QC Analyses						Laborator	y QC Sampl					
	Environ. Sample	Trip Blank		Rinse Blank		Field Duplicate		Matrix Spike		Matrix Spike Duplicate		Lab Duplicate		Total
	Quantity 1	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Water (Groundwater)														
VOCs (SW846 8260)	10	1/day	1	1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	15
SVOCs (SW846 8270)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Cyanide (USEPA 9012A)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Dissolved Gases (AM20GAX)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Dissolved Metals (USEPA 200.7 Rev 4.4)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Dissolved Organic Carbon (USEPA 9060)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Microbial Parameters (DNA q(PRC))	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Nitrate (SM 4500 NO 3 F)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Nitrite	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Sulfate (USEPA 9038)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Sulfide (SM 4500-S-2D)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Surface Tension (TBD)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Total Metals (USEPA 200.7 Rev 4.4)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14
Total Organic Carbon (USEPA 9060)	10	NA		1/20	1	1/20	1	1/20	1	1/20	1	1/20	1	14

Notes:

1. All sample quantities are an approximation.

1/day - One rinse blank per day or one per 20 samples, whichever is more frequent. Rinse blanks not required when dedicated sampling equipment is used.

Freq - Frequency

No. - Number

TBD - To be determined

Table 3 Sample Containers, Preservation Methods and Holding Time Requirements

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

Parameter	Method	Bottle Type	Preservation	Holding Time
Water (Groundwater)	motriou	Bottle Type	1 10001 Valion	Trotaing Time
VOCs	8260B ²	Three 40-ml glass vial	HCI, Cool to 4°C±2°C	7 days to extraction 40 days to analysis
SVOCs	8270C ²	Two 1-L amber glass bottle with Teflon®-lined lid	Cool to 4°C±2°C	7 days to extraction 40 days to analysis
Carbon Dioxide, dissolved gases	AM20GAX ³	Two 40-mL glass vial with mylar septum	Benzoalkonium CI, Cool to 4°C±2°C	14 days to analysis
Cyanide	9012A ²	One 250ml plastic bottle	NaOH to pH>12, Cool to 4°C+2°C	14 days to analysis
Methane, dissolved gases	AM20GAX ³	Two 40-mL glass vial with mylar septum	Benzoalkonium CI, Cool to 4°C±2°C	14 days to analysis
Naphtalene dioxygenase (qNAH) DNA (qPCR) ⁵		One 1-L plastic bottle	Cool to 4°C±2°C	24 hours to 48 hours to analysis
Nitrate	4500 NO 3 F ¹	One-125mL plastic bottle	Cool to 4°C±2°C	48 hours to analysis
Nitrogen, dissolved gases	AM20GAX ³	Two 40-mL glass vial with mylar septum	Benzoalkonium CI, Cool to 4°C±2°C	14 days to analysis
Oxygen, dissolved gases	AM20GAX ³	Two 40-mL glass vial with mylar septum	Benzoalkonium CI, Cool to 4°C±2°C	14 days to analysis
Sulfate	9038 ¹	One 500-mL plastic bottle	HNO ₃ to pH<2, Cool to 4°C <u>+</u> 2°C	180 days to analysis 28 days to analysis
Sulfide	SM4500-S-2D ⁴	One 250-mL plastic bottle	Zinc Acetate, Cool to 4°C±2°C	7 days to analysis
Surface Tension (air-water interfacial)	TBD	TBD	TBD	TBD
Toluene dioxygenase (qTOD)	DNA (qPCR) ⁵	One 1-L plastic bottle	Cool to 4°C±2°C	24 hours to 48 hours
Total Dissolved Organic Carbon	SW-9060 ²	Two 40-mL glass vial	Cool to 4°C±2°C	28 days to analysis
Total Organic Carbon	SW-9060 ²	Two 40-mL glass vial	HCl, Cool to 4°C±2°C	28 days to analysis
Total and Dissolved Iron	200.7 Rev 4.4 ¹	One 500-mL plastic bottle	HNO ₃ to pH<2, Cool to 4°C±2°C	180 days to analysis 28 days to analysis
Total and Dissolved Manganese 200.7 Rev 4.4 ¹		One 250-mL plastic bottle	HNO ₃ to pH<2, Cool to 4°C <u>+</u> 2°C	180 days to analysis 28 days to analysis

- 1. USEPA. Methods for Chemical Analysis of Water and Wastes. EPA/600/4-79/020. EMSL-Cincinnati. 1983.
- 2. USEPA. Office of Solid Waste and Emergency Response. Test Methods for Evaluating Solid Waste SW-846.3rd ed. Washington, DC. 1996.
- 3. Microseeps' modified version of USEPA Method RSK-175, ELAP-approved
- 4. Standard Methods for the Examination of Water and Wastewater
- 5. Conventional method of analysis
- 6. All holding times are measured from date of collection except where noted.
- 7. °C Degrees Celsius.

Table 4
Laboratory Quality Control Limits¹

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

	Acc	uracy - % Reco	overy	Precision - RPD					
Parameter	Surrogate	MS/MSD	LCS	MS/MSD	Lab Duplicate	Field Duplicate			
Groundwater									
VOCs (SW846 8260)	75-115	60-145	70-140	20		50			
SVOCs (SW846 8270)	20-140	20-130	40-120	40		50			
Cyanide (USEPA 9012A)		75-125	80-120	30		50			
Dissolved Gases (AM20GAX)		70-130	75-125	20		20			
Dissolved Metals (USEPA 200.7 Rev 4.4)		75-125	80-120		30	50			
Dissolved Organic Carbon (USEPA 9060)	TBD	TBD	TBD	TBD	TBD	TBD			
Microbial Parameters (DNA q(PRC))									
Nitrate (SM 4500 NO 3 F)		70-130	70-130		30	50			
Nitrite		70-130	70-130		30	50			
Sulfate (USEPA 9038)		70-130	70-130		30	50			
Sulfide (SM 4500-S-2D)	TBD	TBD	TBD	TBD	TBD	TBD			
Surface Tension (TBD)	TBD	TBD	TBD	TBD	TBD	TBD			
Total Metals (USEPA 200.7 Rev 4.4)		75-125	80-120	30		50			
Total Organic Carbon (USEPA 9060)	TBD	TBD	TBD	TBD	TBD	TBD			

- 2. TBD To be determined
- 3. -- Not Applicable

¹ The listed QC limits are based on SW-846 guidance and are advisory. The actual limits are determined based on laboratory performance. Frequent failure to meet the QC limits; however, warrant investigation of the laboratory.

Table 5 Electronic Data Deliverable (EDD) Format

Quality Assurance Project Plan NYSEG – Wadsworth Street Former MGP Site – Geneva, New York

Field Name (1)	Data Type (2)	Notes
Sample Name	Text-50	Sample ID as it appears on Laboratory Form 1 for analysis (e.g., MW-1 reported as MW-1RE for re-analysis).
COC Sample Name	Text-50	Sample ID as it appears on the chain of custody.
SDG	Text-50	Sample Delivery Group
Lab Sample ID	Text-50	
Matrix	Text-25	e.g., Soil, Water, Sediment
Sample Type	Text-10	e.g., FB, RB, FD, FS, TB, MS, MSD for Field Blank, Rinse Blank, Field Duplicate, Field Sample, Trip Blank, Matrix spike, Matrix Spike Duplicate respectively. MS and MSD sample results are optional.
Date Collected	Date/Time	
Time Collected	Date/Time	
Depth Start	Number	
Depth End	Number	
Depth Units	Text-25	
Method	Text-50	Analytical method used by laboratory. Include "-TCLP" or "-Filtered" as appropriate (e.g., Soil-1 reported as Soil-1-TCLP for TCLP samples).
CAS Number	Text-25	Chemical Abstracts Service Registry Number
Analyte	Text-100	
Result Value	Number	For non-detected results a "U" must be present in Lab Qualifiers field.
Lab Qualifiers	Text-10	"U" for not detected, others as defined by the lab.
Reporting Limit	Number	PQL
Result Units	Text-25	
Dilution Factor	Number	
Reportable Result	Yes/No	If the field is not included, default on import will be "Yes". If the field is included it must be populated. Used where reanalyses or dilutions are present to determine proper result to report.
Filtered	Yes/No	
MDL	Number	Method Detection Limit
Date Analyzed	Date/Time	
Time Analyzed	Date/Time	
Date Received	Date/Time	Date Received by Lab
Laboratory	Text-50	
Lab Certification Number	Text-50	
Result Type	Text-10	e.g., IS, SC, SUR, TIC or TRG for Internal Standard, Spiked Compound, Surrogate, Tentatively Identified Compound, Target (regular) result, respectively. IS, SC and SUR results are optional.
Basis	Text-10	e.g., Wet, Dry or NA for wet weight, dry weight, not applicable, respectively.
Test Type	Text-10	e.g., Initial, DL, DL1DLn, RE, RE1Ren, REX, REX1REXn; where Initial = Initial Analysis, DL = Dilution, RE = Reanalysis, REX = Re-extraction, n = the nth analysis of the test type.
Time Received	Date/Time	Time Received by Lab
Natas	-	

- 1. Fields highlighted in pink are not required. They may be left empty or the field can be eliminated from the EDD if the lab is not providing that data.
- 2. Number after "Text-" indicates the maximum number of characters allowed.
- 3. If lab is providing Matrix or Sample Types, they can use codes different from the examples above but will need to provide definitions for them.
- 4. Depth related fields can be left blank for samples where they are not applicable.

Attachment A

Sample Chain-of-Custody Form

ARCADIS
Infrastructure, environment, facilities

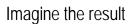
D#:		

CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

	Contact & Company Name:	Telephone:					Preservative				T					Keys		
ţ	Address: City State Zip					Filtered (✓)		+						Preservation I		ner Information Key:		
ults	Address:	Fax:					# of Container	s							A. H ₂ SO ₄ B. HCL	2. 1 L	Amber	
Res						Container								C. HNO ₃ D. NaOH	4. 500	ml Plastic ml Plastic		
pue	City State Zip	E-mail Addres				Information	PAF	RAMETE	FR ANA	I YSIS 8	METH	OD		E. None 5. Encore F. Other: 6. 2 oz. Glass				
ű						/	/	/	<u> </u>	/	<u>/ </u>	/		G. Other:	7. 4 oz 8. 8 oz	. Glass		
Proje	ct Name/Location (City, State):	Project #:													H. Other:	9. Othe	er:	
Sam	oler's Printed Name:	Sampler's Sig	gnature:												Matrix Key: SO - Soil W - Water	SE - Sediment SL - Sludge		
	Sample ID	Colle	ection	Туре	(√)	Matrix									T - Tissue	A - Air	Other:	
		Date	Time	Time Comp	Grab		V /	/	/						REMARK	S		
Spe	cial Instructions/Comments:		•							☐ Special Q	A/QC Instruc	ctions(√):	•					
	Laboratory Information							uished By			Received By	1		elinquished	-		Received By	
Lab	Name:	Cooler C	ustody Sea	al (√)		Printed	I Name:			Printed Name:			Printed Name:		P	rinted Name:		
	Cooler packed with ice (✓)	□ Inta	ıct	□ No	ot Intact	Signati	ure:			Signature:			Signature:		Signature:			
Spec	ify Turnaround Requirements:	Sample F	Receipt:			Firm:				Firm/Courier:			Firm/Courier:			irm:		
Ship	oing Tracking #:	Condition	n/Cooler Te	emp:		Date/T	ime:			Date/Time:			Date/Time:			Date/Time:		

Appendix C

Health and Safety Plan





NYSEG

Environmental Health and Safety Plan (E-HASP)

Wadsworth Street Former Manufactured Gas Plant Site

Geneva, New York

July 2010

Jason Golubski, P.E.
Designated H&S Plan Writer

Cll. P. What

Charles Webster
Designated H&S Plan Reviewer

Jason Brien, P.E. Project Manager

Environmental Health and Safety Plan (E-HASP)

Wadsworth Street Former Manufactured Gas Plant Site

Prepared for: NYSEG

Prepared by:
ARCADIS of New York, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.449.0017

Our Ref.: B0013099

Date: July 2010 ARCADIS Table of Contents

1.	Introdu	ction	1				
2.	Project	Site History and Requirements	2				
	2.1	Site Background	2				
	2.2	Site Description	2				
	2.3	List of Project Tasks and Scope of Work	2				
3.	ARCAE	DIS Organization and Responsibilities	5				
	3.1	Project Manager/Task Manager	5				
	3.2	Other Project Team Responsibilities	5				
4.	Hazard	Control	8				
	4.1	Job Loss Analyses (JLAs), H&S Procedures and PPE	8				
	4.2	Field Health & Safety Handbook	9				
5.	Tailgate	e Meetings	11				
6.	Medica	l Surveillance	12				
7.	Air and Work Space Monitoring						
	7.1	Air Monitoring	13				
	7.2	Noise Monitoring	13				
	7.3	Monitoring Equipment Maintenance and Calibration	13				
	7.4	Action Levels	14				
	7.5	Onsite Monitoring Plan and Response Activities	14				
	7.6	Odor Control	16				
8.	Genera	I Site Access and Control	18				
9.	Decont	amination Control Zones and Procedures	19				
10.	Emerge	ency Action Plan (EAP)	20				
11.	Loss P (LPOs)	revention System [™] (LPS [™]) and Loss Prevention Observations	21				
12.	Subcor	ntractors	22				
13.	Project	Personnel HASP Certification	23				

ARCADIS Table of Contents

14. C	Departi	ment of Transportation (DOT) Dangerous Goods Shipping				
Requirements						
	14.1	Materials of Trade (MOT)	24			
	14.2	Department of Transportation	24			
Appe	endice	s				
	Α	HASP Addendum Pages and Log Table				
	В	Project Hazard Analysis Worksheet				
	С	JLAs				
	D	PPE Equipment List				
	E	Forms and MSDSs				
	F	Emergency Action Plan and Route to Hospital				

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

1. Introduction

All work on this project will be carried out in compliance with ARCADIS' Health and Safety policies and procedures, and the Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response regulation 29 CFR 1910.120. The design of this health and safety plan (HASP) conforms to the requirements of the ARC HSFS010 (HASP H&S Procedure). Specific health and safety information for the project is contained in this HASP. All personnel working on hazardous operations or in the area of hazardous operations shall read and be familiar with this HASP before doing any work. All project personnel shall sign the certification page acknowledging that they have read and understand this HASP.

Changes in the scope of the project or introduction of new hazards to the project shall require revision of the HASP by the HASP writer and reviewer, and approval by the Project Manager. The HASP Addendum Form and log table are included as Appendix A.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

2. Project Site History and Requirements

2.1 Site Background

The gas plant was constructed in 1853 and included a retort and condenser house, purification building (including lime room, ammonia tank and cistern), coal shed and one gas holder (Gas Holder 1). A second gas holder (Gas Holder 2) was constructed in approximately 1900 in the northwest portion of the site. The majority of the buildings/structures associated with the gas plant were demolished between 1903 and 1909; the only remaining structures after 1909 were the second gas holder, tool house and meter house. The remaining holder was demolished between 1915 and 1925. Between 1925 and 1943, a 500,000-cubic-foot gas holder (Gas Holder 3) and a regulator house were constructed at the site to serve as a storage/distribution facility. This newer holder may have served as a remote distribution holder for the Border City MGP, which was constructed at approximately the same time that the Wadsworth MGP was decommissioned. Gas Holder 3 was demolished sometime after 1946; however, portions of the holder foundation wall and slab still exist. Railroad Place was constructed through the center of the former MGP site, covering the location of Gas Holder 1.

2.2 Site Description

Site Type: (Check as many as applicable)

Χ	Active		Secure	Х	Industrial		Landfill		Service station
	Inactive	Х	Unsecured	Χ	Commercial		Well field		Water work
			Uncontrolled	Χ	Residential		Railroad	Х	Undeveloped
Other specify: Gas regulator shed									

The site is located in the City of Geneva, near the northwestern shore of Seneca Lake in eastern Ontario County, New York. The former MGP operated in an area comprised of a rectangular piece of land that is now located in a mixed commercial and residential area in the east-central part of Geneva, New York. Seneca Lake is located approximately 900 feet southeast of the site. The site is bordered by Wadsworth Street to the east, a railroad (Finger Lakes Railway) to the south, a restaurant to the west and residential properties to the north. A dry cleaner is located northeast of the site, on the east side of Wadsworth Street. Railroad Place intersects Wadsworth Street and bisects the site. A gas holder (Gas Holder 1) and coal shed were formerly located in Railroad

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

Place. Several MGP structures formerly existed at the current location of the City of Geneva's Public Safety Building (PSB) south of Railroad Place.

The portion of the former MGP site located north of Railroad Place is currently owned by NYSEG, while the area south of Railroad Place is owned by the City of Geneva. The area owned by NYSEG includes a grass-covered area in the eastern portion of the property and an asphalt parking lot comprises the western portion of the property. A restaurant on Railroad Place leases the parking area from NYSEG. A gravel parking area is located in the northeast portion of NYSEG's property and is used by residential property owners. A NYSEG gas regulator shed is located near the intersection of Railroad Place and Wadsworth Street. The City of Geneva's PSB consists of office space, including the local jail, and an attached pole barn structure. A large parking lot used by PSB employees is located west of the PSB. A railroad is located immediately south of the PSB.

Based on utility drawings obtained from the City of Geneva, several utilities are located within the Railroad Place right-of-way, and transect former Gas Holder 1. Utilities present within Railroad Place include, but are not limited to:

- 24-inch sanitary sewer
- 8-inch potable water mains
- 8-inch natural gas lines

Additionally, two natural gas distribution lines are located immediately south of (and enter/exit) the NYSEG gas regulator shed.

The primary Chemicals of Concern (COCs) on this project are:

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

Table 2.1 - Chemicals of Concern

Known Compounds	Source (soil/water/drum, etc.)	Known Concentration Range (ppm, mg/kg, mg/l)	
		Lowest	Highest
BTEX	Soil	ND	1,000 mg/kg
PAHs	Soil	ND	11,800 mg/kg
BTEX	Groundwater	ND	21,000 ug/L
PAHs	Groundwater	ND	4,700 ug/L

2.3 List of Project Tasks and Scope of Work

- Task 1 Utility and Site Coordination Consists of coordinating with NYSEG and other parties (as appropriate) to determine the presence and location of utilities that may impact the construction of the selected remedy.
- Task 2 Groundwater Investigation Consists of groundwater investigation activities in support of completing a natural attenuation evaluation. Groundwater investigation activities consists of installing a new groundwater monitoring well using hollow-stem auger (HSA) drilling methods and collecting and submitting one round of groundwater samples from existing and the new monitoring wells for laboratory analysis in support of a natural attenuation evaluation
- Task 3 Site Survey Consists of conducting a site survey to document the location of subsurface utilities marked out, the location and elevation of the new monitoring well, and to facilitate preparation of the remedial design.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

3. ARCADIS Organization and Responsibilities

3.1 Project Manager/Task Manager

In planning and preparation of this project, the project manager and/or task manager has completed the project-specific H&S Stewardship Checklist & Project Hazard Analysis Worksheet. The project Hazard Analysis Worksheet was completed using the Hazard Analysis Risk Control (HARC) ranking process (ARCADIS H&S Procedure ARC HSMS002) (see Section 4 of this HASP). Additional responsibilities of the project manager and task manager are as follows:

- Review all applicable H&S Procedures, and ensure that project activities conform to all requirements.
- Obtain client-specific health and safety information and communicate with the client on health and safety issues.
- Communicate with the Site Safety Officer (SSO) on health and safety issues.
- Allocate resources for correction of identified unsafe work conditions.
- Ensure ARCADIS site workers have all training necessary for the project.
- Report all injuries, illnesses and near-misses to the Client H&S Resource or Project H&S Manager (PHSM), lead incident investigations, and ensure that any recommendations made are implemented.

3.2 Other Project Team Responsibilities

Additional personnel designated to carry out H&S job functions for the project, and their responsibilities are listed below. The same person may fill more than one role:

Environmental Health and Safety Plan

ARCADIS

Wadsworth Street Former Manufactured Gas Plant Site

Table 3.1 – Project Team Responsibilities

ARCADIS Project Team	Responsibility and Tasks					
To Be Determined	sso					
	Reviews and works in accordance with the components of this HASP.					
	 Ensures that this HASP is available to and reviewed by all site personnel including subcontractors. 					
	 Ensures that necessary site-specific training is performed (both initial and "tailgate" safety briefings. 					
	 Ensures site visitors have been informed of the hazards related to ARCADIS work, and have signed the Site Visitors Log. 					
	 Ensures that work is performed in a safe manner and has authority to stop work when necessary to protect workers and/or the public. 					
	 Coordinates activities during emergency situations. 					
	 Ensures that all necessary permits and safety information provided by the client is disseminated to other site personnel and is maintained in an organized manner. 					
	 Communicates with the PM, Client H&S Resource and/or the PHSM on health and safety issues. 					
	 Reports all injuries, illnesses and near-misses to the PM, Client H&S Resource and PHSM. 					
	 Ensures that necessary safety equipment is maintained and used at the site. 					
	 Contacts a health and safety professional for assistance in establishing the respiratory cartridge change schedule as required. 					
To Be Determined	Site Workers					
	Reads and works in accordance with the components of this HASP.					
	Reports all unsafe working conditions to the SSO.					
	 Reports all injuries, no matter how minor, to the SSO. 					
	Works in a safe manner.					
	Signs the HASP acceptance log in Appendix E.					

Environmental Health and Safety Plan

ARCADIS

Wadsworth Street Former Manufactured Gas Plant Site

ARCADIS Project Team	Responsibility and Tasks				
Charles Webster	Project Health and Safety Manager (PHSM)				
	The PHSM oversees all aspects of the site safety program, and prepares site-specific health and safety guidance documents or addenda to this plan. The PHSM does not report to the Project Manager, and is separately accountable to the ARCADIS project team for site health and safety. The PHSM acts as the sole contact to regulatory agencies on matters of safety and health. Other responsibilities include:				
	Overall authority for health and safety compliance and HASP conformance for the project.				
	General health and safety program administration.				
	Conducts project health and safety audits as warranted.				
	Determines the level of personal protection required.				
	Updates equipment or procedures based on information obtained during site operations.				
	Establishes air-monitoring parameters based on expected contaminants.				
	Assists in injury, illness and near-miss investigations and follow-up.				
Charles Webster	Client Health and Safety Resource				
	The designated Client H&S Resource is responsible for :				
	Assisting the SSO in issues as they arise.				
	Performing site audits and assessments.				
	Assisting with near-miss/incident investigations.				
	 Serves as the liaison with corporate during H&S regulatory issues as they may arise. 				

Environmental Health and Safety Plan

ARCADIS

Wadsworth Street Former Manufactured Gas Plant Site

4. Hazard Control

Effective hazard control begins with appropriate planning. ARCADIS has established several tools to help develop and implement hazard controls and avoid incidents at various risk levels. One of these tools, the Risk Assessment Matrix, is illustrated in Figure 1 below. H&S planners use the Risk Assessment Matrix (in conjunction with the Hazard Analysis Worksheet – Appendix B) to rate hazards that could potentially be encountered on the job site. The results drive H&S planning for the entire project.

Figure 4.1 - HARC - Risk Assessment Matrix (H&S Procedure ARC HSMS002)

Risk Assess	ment Matrix	Likelihood Ratings**						
Consequence	ces Ratings*	Α	В	С	D	Е		
People	Property	Never heard of in the world	Heard of incident in industry	Incident has occurred in ARCADIS Group	Happens several times a year in ARCADIS OpCo	Happens several times a year at ARCADIS Worksite		
0 - No health effect	0 - No damage	Low	Low	Low	Low	Low		
1 - Slight health effect	1 - Slight damage	Low	Low	Low	Low	Low		
2 - Minor health effect	2 - Minor damage	Low	Low	Low	Medium	Medium		
3 - Major health effect	3 - Local damage	Low	Low	Medium	Medium	High		
4 - PTD or 1 fatality	4 - Major damage	Low	Medium	Medium	High	High		
5 - Multiple fatalities	5 - Extensive damage	Medium	Medium	High	High	High		

The Risk Assessment Matrix can also be used in the field to evaluate and control risks as they arise. When practiced in the context of H&S Procedure ARC HSMS002, hazard control becomes an ongoing exercise that supports a safer working environment through continuous planning and preparation.

4.1 Job Loss Analyses (JLAs), H&S Procedures and PPE

A JLA has been completed for each safety critical task, and are included in Appendix C. Hazards identified on the Project Hazard Analysis Worksheet are addressed in the JLAs as well as control methods to protect employees and property from hazards. The JLA also lists the type of personal protective equipment (PPE) required for the completion of the project. JLAs will be updated on site to reflect actual site conditions prior to starting work. A detailed list of PPE for the project is located in Appendix D.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

ARCADIS H&S Procedures applicable to this project are listed below. These procedures should be reviewed by the project manager, task manager and site personnel. The Client H&S Resource should be contacted with any questions concerning the procedures.

- ARC HSFS019 Utility Location
- ARC HSCS005 Excavation and Trenching
- ARC HSGE007 Hazard Communication
- ARC HSGE024 Motor Vehicle
- ARC HSIH003 Benzene
- ARC HSIS008 Hearing Conservation
- ARC HSGE004 First Aid / CPR
- ARC HSMS010 Incident Reporting and Investigation
- ARC HSGE015 Personal Protective Equipment (PPE)

4.2 Field Health & Safety Handbook

The Field H&S Handbook is an ARCADIS document containing information about topic-specific health and safety requirements for the field. This handbook contains relevant general topics and is used as part of the overall HASP process. To aid in the consistency of the HASP process the handbook will be used as an informational source in conjunction with this HASP. The following four (4) handbook sections are minimally required reading for this project:

- Section III-F. General Housekeeping, Personal Hygiene and Field Sanitation
- Section III-G. Site Security, Work Zone and Decontamination for HAZWOPER Sites
- Section III-GG. HAZWOPER and HAZMAT Response

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

• Section III-II. Drums and other Material Handling

The following handbook sections are additional required reading for this project:

- Section III A. Daily Safety Meetings/Tailgates
- Section III-C. First-aid/CPR
- Section III-I. Severe Weather
- Section III-K. Hazard Communication
- Section III-L. Noise
- Section III-M. Heat and Cold Stress
- Section III-N. Biological Hazards
- Section III-P. Medical Surveillance (ARCHSGE010)
- Section III-R. Personal Protective Equipment (ARCHSGE015)
- Section III-T. Vehicle Safety Inspection
- Section III-U. Driving
- Section III-CC. Hand and Power Tools
- Section III-EE. Ergonomics
- Section III-MM. Utility Location (ARCHSF019)
- Section IV-E. Heavy Equipment (ARCHSCS006)
- Section III-O. Rollover and Overhead Protection
- Section V-I. Industrial Hygiene and Monitoring Equipment

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

5. Tailgate Meetings

Tailgate safety briefings will be conducted at least twice daily, once at the beginning of the work day, again after lunch, or as tasks/hazards change. Each tailgate safety briefing will be documented on the form included in Appendix E.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

6. Medical Surveillance

Medical surveillance requirements for the project are provided on the Project Manager/Task Manager H&S Stewardship Checklist & Project Hazard Analysis Worksheet (Appendix B). All medical surveillance requirements as indicated on the worksheet must be completed and site personnel medically cleared before being permitted on the project site.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

7. Air and Work Space Monitoring

7.1 Air Monitoring

Air monitoring will be conducted continuously at the site during any land-based intrusive work to determine employee exposure to airborne constituents. The monitoring devices to be used are an MIE Mini RAM particulate monitor (or equivalent) and a Rae Systems MultiRAE detector (PID with a **10.6 eV** lamp/ oxygen/ LEL/ Hydrogen Sulfide Sensors). All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10% of the LEL at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level. In areas where petroleum hydrocarbons are suspected, benzene detector tube readings may be taken if PID readings exceed 0.5 part per million (ppm), and are sustained for 15 minutes in the breathing zone.

In addition to the monitoring discussed above, additional VOC and particulate monitoring will be conducted to be compliant with the New York State Department of Health's (NYSDOH's) Generic Community Air Monitoring Plan (CAMP) (NYSDOH, 2000). The additional monitoring to be performed in accordance with the NYSDEC's CAMP are provided in the Community Air Monitoring Plan (CAMP) provided as Appendix D to the RDWP (ARCADIS, 2010). The CAMP also contains information on the instrumentation to be used during implementation of the CAMP.

The ARCADIS HSS will be responsible for utilizing the air monitoring results to determine appropriate health and safety precautions for ARCADIS personnel and subcontractors. Air monitoring results will be recorded in the field notebook or on an air monitoring log (see Appendix E).

7.2 Noise Monitoring

Noise monitoring may be conducted as required. Hearing protection is mandatory for all employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection.

7.3 Monitoring Equipment Maintenance and Calibration

All direct-reading instrumentation calibrations should be conducted under the approximate environmental conditions the instrument will be used. Instruments must

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibrations, including the standard used for calibration, must be documented on a calibration log or in the field notebook. All completed documentation/forms must be reviewed by the HSS and maintained by the SS.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturer's procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

If an instrument is found to be inoperative or suspected of giving erroneous readings, the HSS must be responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The HSS will be responsible for ensuring a replacement unit is obtained and/or repairs are initiated on the defective equipment.

7.4 Action Levels

The table at the end of this section presents airborne constituent action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the site.

7.5 Onsite Monitoring Plan and Response Activities

Soil borings will be completed at locations as part of the field investigation activities. These activities have the potential to generate organic vapors and particulates. As mentioned above, air monitoring will be conducted in the worker breathing zone to determine the level of protection required for personnel observing completion of monitoring wells, soil vapor points, or soil borings. If action levels in the worker breathing zone are exceeded for organic vapors or particulates, air monitoring will be required at various onsite/perimeter locations to determine appropriate response activities that are protective of personnel onsite who are not directly involved with the investigation, personnel at adjacent commercial sites, and the surrounding community. If action levels for the remaining monitoring parameters listed in the table at the end of this section are exceeded, work will stop, the HSO/HSM will be contacted, and perimeter monitoring will be performed. The procedures given below will be used

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

during all ground intrusive activities. As mentioned above, additional monitoring will be implemented in accordance with the NYSDOH's Generic CAMP. Procedures for CAMP monitoring are provided in the CAMP include as Appendix D to the RDWP.

Total Organic Vapors

If the sustained level of total organic vapors in the worker breathing zone exceeds 1 ppm above background, then the level of total organic vapors will be manually recorded at the downwind perimeter of the work area (i.e., exclusion zone) at 15 minute intervals. If the sustained level of total organic vapors at the downwind perimeter of the work area exceeds 1 ppm above background, then work activities will be halted and additional downwind monitoring will be performed. Efforts will be undertaken to mitigate the source of organic vapors. The work area will be enlarged, if necessary, to mitigate the potential for people who are not involved with the investigation from being exposed to organic vapor levels exceeding 1 ppm above background.

During the investigation, it is possible that the downwind perimeter of the work area will coincide with the site perimeter. If, at any time, the sustained level of total organic vapors adjacent to the downwind site perimeter reaches 5 ppm above background, then the level of total organic vapors adjacent to the nearest downwind occupied building or property from the work zone will be monitored. If after 30 minutes, the total organic vapor level adjacent to the nearest occupied building or property has not subsided below 1 ppm above background, then the HSS will inform the local emergency response contacts [in addition to project managers from NYSEG, the NYSDEC, the NYSDOH, and ARCADIS] and persons who may be exposed will be notified to evacuate occupied buildings or properties. These persons will not be permitted to return to the properties until after the level of total organic vapors on the properties subsides to below 1 ppm above background.

Particulates

If the level of particulates in the worker breathing zone exceeds 100 micrograms per cubic meter ($\mu g/m^3$) above background, then the level of particulates will be manually recorded at the downwind perimeter of the work area at 15 minute intervals. If the level of particulates at the downwind perimeter of the work area is 150 $\mu g/m^3$ or greater, then work activities will cease and dust suppression techniques must be employed to maintain particulate levels below 150 $\mu g/m^3$. In addition, the work area will be enlarged

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

if necessary to keep the public from being exposed to particulate levels greater than $150 \ \mu g/m^3$.

7.6 Odor Control

If any odor complaints are received from members of the surrounding community and are related to the field investigation activities described herein, then the potentially odor-causing activity will be suspended, subsurface openings will be covered, and onsite personnel (in consultation with NYSEG and ARCADIS PM) will evaluate an alternative course of action.

Table 7.1 – Airborne Constituent Action Levels

	Deading in Breath!	
Parameter	Reading in Breathing Zone (BZ)	Action
Total Organic Vapors	0 ppm to < 0.5 ppm	Normal operations; record breathing zone monitoring measurements every hour
	> 0.5 ppm to 5 ppm	Increase recording frequency to at least every 15 minutes and use benzene Drager tube to screen for the presence of benzene
	> 5 ppm to 50 ppm	Upgrade to level C PPE, continue screening for benzene
	> 50 ppm	Stop work; evacuate work area, investigate cause of reading, reduce through engineering controls, contact HSO
Benzene (as determined by	> 0.5 ppm to 5 ppm	Upgrade to Level C PPE
colorimetric tube)	>5 ppm	Stop work; evacuate confined spaces/work area, investigate cause of reading; contact HSO
Total Particulate	0 to 0.100 mg/m ³ above background	Normal operations
	> 0.100 mg/m ³ above background	Initiate wetting of work area to control dust; upgrade to Level C if dust control measures do not control dust within 15 minutes, monitor downwind impacts.
	> 0.15 mg/m ³ in breathing zone or at downwind perimeter of work area	Stop work; investigate cause of reading; contact PM and HSO



Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

Parameter	Reading in Breathing Zone (BZ)	Action
Oxygen	< 19.5 %	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
	> 19.5% to < 23.5 %	Normal operations
	> 23.5 %	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
Carbon Monoxide	0 ppm to ≤ 20 ppm	Normal operations
	> 20 ppm	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
Hydrogen Sulfide	0 ppm to ≤ 5 ppm	Normal operations
	> 5 ppm	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
Flammable Vapors (LEL)	< 10% LEL	Normal operations
(LLL)	> 10% LEL	Stop work; ventilate area; investigate source of vapors

Notes:

If action levels in the worker breathing zone are exceeded for organic vapors or particulates, air monitoring will be required at various onsite/perimeter locations to determine appropriate response activities that are protective of personnel onsite who are not directly involved with the investigation, personnel at adjacent commercial sites, and the surrounding community. ppm= parts per million.

mg/m3= milligrams per cubic meter.

LEL= Lower explosive limit.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

8. General Site Access and Control

The SSO will coordinate access and control security at the work site. As the work dictates, the SSO will establish a work area perimeter. The size of the perimeter will be based on the daily task activities and will be discussed with all project personnel during the tailgate meeting and then documented on the tailgate meeting form. Control zones for Level C or above will be demarcated by either visual or physical devices and will be monitored for effectiveness by the SSO.

Only authorized personnel will be allowed beyond the perimeter. Other site workers and visitors to the site should be kept out of the work site. If visitors need access to the site, the SSO will escort the visitor at all times. All visitors will log in and out with the SSO. The visitor log sheet is included in Appendix E.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

9. Decontamination Control Zones and Procedures

Part of required reading for this HASP includes reviewing the Field H&S Handbook, Section III-G Site Security, Work Zones and Decontamination for HAZWOPER site zones. The decontamination procedures outlined in the Field H&S Handbook are provided for typical Level D and Level C ensembles.

The zones for Level C and above will be designated by traffic cones, barricades, signs, caution tape, or other means effective in identifying the different areas. The SSO will establish control boundaries for the exclusion zone, contamination reduction zone, and the support zone. The zones will be identified by the SSO during tailgate meetings and documented on the meeting form. Entrance and exit to the exclusion zone will only be through controlled access points established for each work area.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

10. Emergency Action Plan (EAP)

In the event that an injury, over-exposure or spill has occurred, an EAP will be implemented. Appendix F provides the EAP and notifications for the project. All employees working on this project must be shown the location and proper use of all emergency equipment prior to beginning work on the project.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

11. Loss Prevention System[™] (LPS[™]) and Loss Prevention Observations (LPOs)

As part of any project, no matter how simple or complex, LPOs should be conducted when practical and when able to integrate into normal business activities. LPOs should be scheduled based on the risk of the tasks being performed, and should be conducted for different tasks and at different times. Completion of LPOs should be documented on the tailgate meeting form.

The following table outlines the LPO plan for the project:

Table 11.1 - LPOs

Identified Task for LPO	Schedule Date	Observer Name	Observee Name	Feedback Supervisor Name
Monitoring Well Installation	TBD	TBD	TBD	TBD
Groundwater Sampling	TBD	TBD	TBD	TBD
Water Level Measurement	TBD	TBD	TBD	TBD

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

12. Subcontractors

A copy of this HASP is to be provided to all subcontractors prior to the start of work so that the subcontractor is informed of the hazards at the site. While the ARCADIS HASP will be the minimum health and safety requirements for the work completed by ARCADIS and its subcontractors, each subcontractor, in coordination with ARCADIS health and safety personnel, is expected to perform its operations in accordance with its own HASP, policies and procedures unique to the subcontractor's work to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to ARCADIS for review prior to the start of on-site activities.

In the event that the subcontractor's procedures/requirements conflict with requirements specified in this HASP, the more stringent guidance will be adopted after discussion and agreement between the subcontractor and ARCADIS project health and safety personnel. Hazards not listed in this HASP, but known to the subcontractor or known to be associated with the subcontractor's services, must be identified and addressed to the ARCADIS project or task manager and SSO prior to beginning work operations.

If the subcontractor prefers to adopt this HASP, the <u>"Subcontractor"</u>

Acknowledgement Memo" must be signed and dated by the subcontractor's management and placed in the project file. Once the signed memo is received by the project manager, an electronic version of our HASP can be submitted to the subcontractor to use as their own. Subcontractors working at the site will need to have this plan with them, and will also need to sign the Subcontractor HASP receipt signature page of the ARCADIS HASP (Appendix E). Subcontractors are responsible for the H&S of their employees at all times, and have the authority to halt work if unsafe conditions arise.

The Project/Task Manager and SSO (or authorized representative) has the authority to halt the subcontractor's operations and to remove the subcontractor or subcontractor's employee(s) from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

13. Project Personnel HASP Certification

All site project personnel will sign the certification signature page provided in Appendix E of this HASP.

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

14. Department of Transportation (DOT) Dangerous Goods Shipping Requirements

ARCADIS has policies in place for transporting small quantities of hazardous materials and for offering for shipping via ground or air. These policies are designed to meet the applicable requirements. As such, only ARCADIS staff that have been trained in the proper methods to prepare and ship hazardous materials are authorized to do so. Tasks associated with the packaging, labeling, marking, and preparation of hazardous materials for shipping or transport must have all appropriate and applicable training.

14.1 Materials of Trade (MOT)

DOT allows for a small amount of hazardous materials that are used in or an inherent part of our work to be transported in company vehicles. This includes things like gasoline, paint, small compressed gas cylinders, calibration gas, etc. To transport these:

- Staff will complete Materials of Trade training.
- Vehicles used in transportation to and from off-site work locations will be in conformance with ARCADIS vehicle safety procedures.

Hazardous materials will be transported as described above as a result of the activities covered in this HASP. Site personnel who transport materials mentioned above will complete the Hazardous Materials Transportation Form included in Appendix E.

14.2 Department of Transportation

Staff who collect, prepare, package, mark, label, complete shipping declarations, offer shipments to a transporter, directly transport or are engaged in other activities associated with the transportation of Hazardous Materials (referred to as Dangerous Goods in Canada and by the International Air Transport Association [IATA]) will have appropriate and applicable training. DOT requires all individuals who participate in hazmat shipping including activities such as completing the paperwork (but not signing it), filling a container with a hazardous material (including filling a drum with drill cuttings or purge water), marking, labeling, and packaging the hazardous material, etc., have awareness level training on the DOT requirements. DOT

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant Site

requires additional job function training for those who conduct specific activities including:

- Staff who have to sign shipping papers or manifests, are listed as the 24-hour emergency contacts on shipping and have the responsibility for identifying, classifying, packaging, marking, and labeling HazMat packages, and/or are directing or overseeing others who do these tasks will become certified through the completion of additional training.
- The above training allows the offering employee to ship only by ground. If the shipment is to be offered for air transport, additional training is required.

Shipments as described above will be made as a result of the activities covered in this HASP. Site personnel shipping hazardous materials will complete the Hazardous Materials Shipment Form included in Appendix E.

Appendix A

HASP Addendum Pages and Log Table

Addendum Page

This form should be completed for new tasks associated with the project. The project manager and/or task manager should revise the Project Hazard Analysis Worksheet with the new task information and attach to this addendum sheet. JLAs should be developed for any new tasks and attached as well.

Review the addendum with all site staff, including subcontractors, during the daily tailgate briefing, and complete the tailgate briefing form as required. Attach a copy of the addendum to all copies of the HASP including the site copy, and log in the Addendum Log Table A-1 on the next page.

Addendum Number:	Project Number:
Date of Changed Conditions:	Date of Addendum:
Description of Change that Results in Modificati	ions to HASP:
Signed: Project Manager	Signed:Site Safety Officer
Signed: H&S Plan Writer	Signed:H&S Plan Reviewer

Addendum Log Table

Addendums are to be added to every copy of the HASP, and logged on Table A-1 to verify that all copies of the HASP are current:

Table A-1 Addendum Log Table

Addendum Number	Date of Addendum	Reason for Addendum	Person Completing Addendum
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Appendix B

Project Hazard Analysis Worksheet

ARCADIS US Project Manager and Task Manager/Principal-In-Charge H&S Stewardship Checklist

Project Hazard Analysis Page

	· · · · · · · · · · · · · · · · · · ·						
Project Name:	Wadsworth Street Former Manufactured Gas Plant site		Project Number:	B0013099			
Client:	NYSEG		Principal-In Charge:	Kieth White, PG			
		Completed					
Project / Task Manager:	Jason Brien, PE	By:	Jason Golubski, PE	Date:	1-Jul-10		

ARCADIS Project Hazard Analysis Worksheet

TRACK

Recognize and Assess the Hazards for the Project

For each potential hazard, determine the worst case conditions for the entire project and all of the tasks and assess them using High (H), Medium (M), Low (L). Use the drop down list in each "Assess" cell. If a hazard is not expected on the site, leave the "Assess" box blank.

	Recognize the Hazards	Assess	Recognize the Hazards	Assess	List Types of other Physical Hazards Below
	Heat	Medium	Holes/Pits	Low	
	Cold	Medium	Ionizing Radiation		
	Noise	Medium	Non-ionizing Radiation		
Physical Hazards:	Walking/Working surfaces (includes slip/trip/fall & floor/wall openings)	High	Electricity	Low	
	Visible Dust	Low	Poor lighting		
	LASER		Severe Weather	Medium	
	Other:		Overhead Hazards		
	Other:		None: Mark with an "X"		

Control the Hazard: (Briefly describe how the identified hazards will be controlled)

Site workers should exercise proper work/rest cycles for hot and cold weather. Site workers should be aware of their surroundings to aviod slip/trip/fall type accidents as well as overhead obstructions and utilities lines.

	Flammable/ Combustible	Corrosive		List the Names of the Major Chemicals Below
	Compressed gas	Toxic	Medium	BTEX
	Explosive	Highly toxic		
Chemical Hazards:	Organic peroxide	Irritant	Medium	BTEX
Chemical Hazarus.	Oxidizer	Sensitizer		
	Water reactive	Carcinogen		
	Unstable reactive	Mutagen		
	Dust/Fumes/	None: Mark with an "X		
	Particulates			

Control the Hazard: (Briefly describe how the identified hazards will be controlled)

Site workers should limit exporsure to and contact with impacted site media (i.e., soil and groundwater) through the use of proper PPE

	Heavy machinery	Medium	Cranes/Hoists/Rigging		List Types of Other Environmental / Equipment Hazards Below
	Trenching/excavation		Ladders		
	Docks – marine operations		Scaffolding		
	Construction activities		Manlifts		
	Diving operations		Welding		
Environmental/	Drilling	High	Gas cylinders		
Equipment Hazards:	Forklifts		Roadway work		
	Water operations work		Railroad work		
	Heights (fall protection)		Mining work		
	Overhead/ Underground utilities	High	Energized / Pressurized equip (LO/TO)		
	Confined spaces		Drums and containers	Low	
	Power tools		Other		
	Other		None: Mark with an "X"		

Control the Hazard: (Briefly describe how the identified hazards will be controlled)

All site workers should be familiar with drilling equipment operational procedures and safte work practicies. Site workers should take care while other storage containers.

Biological Hazards Discontinuo Disconti						
Biological Hazards Personal Suffering I Low Beactering Cultures Personal Suffering Succession				Contaminated Needles		List Types of Other Biological Hazards Below
Personal Safety/Security Personal Safety/Secur	Biological Hazards					
Control the Hazard: (Brainty describe how the identified hazards will be controlled) Avoid polision by. Repetitive motion Assivant position Forcethi exertions Hazards Below Medium Forcethi exertions Hazards Below Forcethi exertions Forcethi exertions Hazards Below Forcethi exertions Forcethi exertion Forcet	•	Poisonous/irritating	Low			
Repetitive motion						
Repetitive motion	Control the Hazard: (Brie	fly describe how the ident	ified hazards wi	ll be controlled)		
Ergonomic Hazards Awkward position Heavy lifting Program lifting Chort Control the Hazard: (Briefly describe how the identified hazards will be controlled) Personal Safety/Security Personal Safety/Security Personal safety Beautify issue Program is insolated gently issue Program is insolated gently issue Recommendation Beautify issue Program is insolated gently issue Recommendation Beautify issue Program is insolated gently issue Recommendation Beautify is						
Ergonomic Hazards Awkward position Heavy lifting Program lifting Chort Control the Hazard: (Briefly describe how the identified hazards will be controlled) Personal Safety/Security Personal Safety/Security Personal safety Beautify issue Program is insolated gently issue Program is insolated gently issue Recommendation Beautify issue Program is insolated gently issue Recommendation Beautify issue Program is insolated gently issue Recommendation Beautify is						
Ergonomic Hazards		Repetitive motion		Limited movement		
Personal safety Medium Personal safety P		Awkward position		Forceful exertions		Hazards Below
Control the Hazard: (Briefly describe how the identified hazards will be controlled) Personal safety Project site in isolated Security issue Security issue Security issue Project site in isolated Security issue Security issue Security issue Security issue Project site in isolated Security issue Sec	Ergonomic Hazards	Heavy lifting		Vibration		
Personal safety Security issue Medium Employees working Employees working Safety Security issue Potentially dangerous Italy issue Potentially dangerous Italy issue Potentially dangerous Italy Security issue Potentially dangerous Italy issue Potentially dangerous Italy Security issue Italy Security Security issue Italy Security issue Italy Security Security issue Italy Security Security issue Italy Security Security issue Italy Security issue Italy Security Security issue Italy Security Security issue Italy Security Securit					X	
Personal safety/Security Security issue Security is	Control the Hazard: (Billio		ified hereads			I
Medium Safety / Security Hazards Below Security issue Potentially dangerous Low Weldlife Security Hazards Below Potentially dangerous Low Weldlife Security Hazards Se	Ontroi trie nazara: (Brie	iry describe now the ident	meu nazards wi	n be controlled)		
Medium Safety / Security Hazards Below Security issue Potentially dangerous Low Weldlife Security Hazards Below Potentially dangerous Low Weldlife Security Hazards Se						
Medium Safety / Security Hazards Below Security issue Potentially dangerous Low Weldlife Security Hazards Below Potentially dangerous Low Weldlife Security Hazards Se		Personal safety		Employees working		List Types of Other Personal
Personal Safety/Security Project size in isolated wildlife Project state in isolated along season with the project season with the project season will be controlled.		. S.Soriai Salety	Medium		Medium	Safety / Security Hazards
Personal Safety/Security Project site in isolated area area area area area area area ar		Security issue			Low	
Employees working alone Notificited cell phone Service Patigue Medium Other Othe	Personal Safety/Security					
Service Falgue Service Service Other				No/limited cell phone		
Control the Hazard: (Briefly describe how the identified hazards will be controlled) All site workers should keep personal safety in mind while conducting site work. Long days may potentially cause fatique, use proper Be aware of potential wildlife surrounding the site. Driving Garly/late Driving early/late Driving (Indigo and Indigo and		alone	Madisus	service		
All site workers should keep personal safety in mind while conducting site work. Long days may potentially cause fatique, use proper Be aware of potential wildlife surrounding the site.			wedium			
All site workers should keep personal safety in mind while conducting site work. Long days may potentially cause fatique, use proper Be aware of potential wildlife surrounding the site.	Control the Hazard: (Brie	fly describe how the ident	ified hazards wi	ll be controlled)		
Driving Safety Driving early/late Driving born pins Driving of the Driving born pins Driving of the Driving born pins Driving of the Driving born pins Driving off-road Bad weather driving Other None: Mark with an "X" Control the Hazard: (Briefly describe how the identified hazards will be controlled) Follow Smith System Driving Keys while operating motor vehicles 40 hour HAZWOPER Bloodborne pathogens List Types of Other Training Required Here 24 hour HAZWOPER Confined space HAZWOPER HAZWOPER Lockout/tagout Supervisor Solar 30 hour Construction Golden pins File Extinguishers Construction OSHA 10 hour File Extinguishers Construction Construction PPE Apart HAZWOPER File Extinguishers Construction PPE File Extinguishers Construction PPE File Extinguishers Construction PPE File Extinguishers Construction Chemical hygiene Forklifts Hazardous waste Lead File Extinguishers Forklifts Hazardous waste Lead File Extinguishers Forklifts File Extinguishers Forklifts					potentially	cause fatique, use proper
Driving Safety Driving log earlylate Driving is Pulling a trailer Driving long types Driving long types Driving off-road ATV driving: Bad weather driving Other None: Mark with an "X" Control the Hazard: (Briefly describe how the identified hazards will be controlled) Follow Smith System Driving Keys while operating motor vehicles 40 hour HAZWOPER Substite Supervisor OSHA 30 hour Construction OSHA 10 hour Electrical Safety Construction OSHA 10 hour Construction OSHA 10 hour Construction OSHA 10 hour Construction OSHA 10 hour Electrical Safety Construction OSHA 10 hour Construction OSHA 10 hour Fire Extinguishers Construction OSHA 10 hour Construction PPE 1988 Fall Protection Respiratory protection Noise exposure Chemical hygiene Forklitts Hazard communication Asbestos Hazard communication Asbestos Hazards waste Lead First-aid/CPR Cadmium DOT/IATA hazmat transportation MSHA Driving Client specific FRA None: Mark with an "X" Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Client required drug andor alcohol testing Hepatitis B Immunization (or declination on file) None: Mark with an "X" Island with an "X" Audiomatic and on phoyee not part of HAZWOPER Client required drug andor alcohol testing Hepatitis B Immunization (or declination on file) None: Mark with an "X" Island with an "X" Island with an "X" Audiomatic and and employee not part of HAZWOPER Client required drug and and and or urine screening Hepatitis B Immunization (or declination on file) None: Mark with an "X" Indicate Streening None: Mark with an "X" Island with an "X" Indicate Streening None: Mark with an "X" Indicate Streenin	Be aware of potential wildlife s	surrounding the site.	-	_	-	
Driving Safety Driving log earlylate Driving is Pulling a trailer Driving long types Driving long types Driving off-road ATV driving: Bad weather driving Other None: Mark with an "X" Control the Hazard: (Briefly describe how the identified hazards will be controlled) Follow Smith System Driving Keys while operating motor vehicles 40 hour HAZWOPER Substite Supervisor OSHA 30 hour Construction OSHA 10 hour Electrical Safety Construction OSHA 10 hour Construction OSHA 10 hour Construction OSHA 10 hour Construction OSHA 10 hour Electrical Safety Construction OSHA 10 hour Construction OSHA 10 hour Fire Extinguishers Construction OSHA 10 hour Construction PPE 1988 Fall Protection Respiratory protection Noise exposure Chemical hygiene Forklitts Hazard communication Asbestos Hazard communication Asbestos Hazards waste Lead First-aid/CPR Cadmium DOT/IATA hazmat transportation MSHA Driving Client specific FRA None: Mark with an "X" Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Client required drug andor alcohol testing Hepatitis B Immunization (or declination on file) None: Mark with an "X" Island with an "X" Audiomatic and on phoyee not part of HAZWOPER Client required drug andor alcohol testing Hepatitis B Immunization (or declination on file) None: Mark with an "X" Island with an "X" Island with an "X" Audiomatic and and employee not part of HAZWOPER Client required drug and and and or urine screening Hepatitis B Immunization (or declination on file) None: Mark with an "X" Indicate Streening None: Mark with an "X" Island with an "X" Indicate Streening None: Mark with an "X" Indicate Streenin			Mar di		Lau	List Types of Other Driving
Driving Grif-road Bad weather driving Other Other Other None: Mark with an "X" Control the Hazard: (Briefly describe how the identified hazards will be controlled) Follow Smith System Driving Keys while operating motor vehicles 40 hour HAZWOPER 24 hour HAZWOPER 24 hour HAZWOPER Confined space Required Here HAZWOPER site supervisor OSHA 30 hour Construction OSHA 30 hour Construction OSHA 10 hour Construction OSHA 10 hour Construction PPE You Fall Protection Respiratory protection Noise exposure Chemical hygiene Forklifts Hazard communication Asbestos Hazard communication Asbestos Hazard communication Asbestos Hazard communication MSHA DoTriATA hazmat transportation MSHA Radiation safety Diving Cilent specific FRA None: Mark with an "X" Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER None: Mark with an "X" Institute of the protection Institute of the part o			Medium		Low	
Bad weather driving Other None: Mark with an "X"	Driving Safety					
Control the Hazard: (Briefly describe how the identified hazards will be controlled)				Other		
A0 hour HAZWOPER Yes Bloodborne pathogens List Types of Other Training Required Here	Cantania					<u> </u>
All hour HAZWOPER Yes				ii be controlled)		
Training Required Act Confined space Confined space Confined space Confined space Confined space Confined space Construction Construction	i onow omitti oyatem briving i	Coys write operating Inc	ACI VEHICIES			
Training Required Act Confined space Confined space Confined space Confined space Confined space Confined space Construction Construction		40 hour HAZWODER		Bloodhorne nathogens		List Types of Other Training
HAZWOPER site supervisor OSHA 30 hour Construction OSHA 10 hour Construction PPE Respiratory protection Chemical hygiene Hazardous waste First-aid/CPR DOT/IATA hazmat transportation MSHA Diving FRA Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Medical Screening Medical Screening HAZWOPER site supervisor Lectoconstruction Nose exposure Forklits Fall Protection Noise exposure Forklits Lead First-aid/CPR Cadmium DOT/IATA hazmat transportation MSHA Diving Client specific FRA None: Mark with an "X" List Types of other Medical Screening Here Medical Screening Medical Screening Medical Screening Required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) List Types of other Medical screening None: Mark with an "X"			Yes	Dioduborne patriogens		
Supervisor OSHA 30 hour Construction OSHA 10 hour Construction PPE Yes Fall Protection Respiratory protection Chemical hygiene Hazard communication Hazardous waste First-aid/CPR DOT/IATA hazmat transportation MSHA Diving FRA None: Mark with an "X" Medical Screening Mosha Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) Electrical Safety Fire Extinguishers Fall Protection Noise exposure Forklifts Hepatitis Forklifts Asbestos Asbestos Cadmium SPCC Cadmium SPCC Cadmium SPCC Tcadmium S				· · · · · · · · · · · · · · · · · · ·		
Training Required Construction		supervisor		Ţ.		
Training Required Construction				Electrical Safety		
Training Required Respiratory protection Respiratory protection Noise exposure Chemical hygiene Hazard communication Hazarduous waste First-aid/CPR DOT/IATA hazmat transportation MSHA Diving FRA None: Mark with an "X" Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Medical Screening PPE Fall Protection Noise exposure Cadmium SPCC Cadmium SPCC Cadmium SPCC Usent specific None: Mark with an "X" Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) None: Mark with an "X" Blood and/or urine soreening None: Mark with an "X"		OSHA 10 hour		Fire Extinguishers		
Respiratory protection Noise exposure			Yes	Fall Protection		
Hazardous waste Hazardous waste First-aid/CPR DOT/IATA hazmat transportation MSHA Diving FRA None: Mark with an "X" Medical Screening Medical Screening Medical Screening Medical Screening Hazardous waste Lead SPCC Tadmium Cadmium Ca	Training Required					
First-aid/CPR DOT/IATA hazmat transportation MSHA Diving FRA Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER None: Mark with an "X" List Types of other Medical Screening Here List Types of other Medical Screening Here List Types of other Medical Screening Here None: Mark with an "X" Blood and/or urine screening None: Mark with an "X" Immunization (or declination on file)						
First-aid/CPR DOT/IATA hazmat transportation MSHA Diving FRA Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER None: Mark with an "X" List Types of other Medical Screening Here List Types of other Medical Screening Here List Types of other Medical Screening Here None: Mark with an "X" Blood and/or urine screening None: Mark with an "X" Immunization (or declination on file)		Hazardous waste		Lead		
transportation Radiation safety Diving Client specific		First-aid/CPR	Yes			
MSHA Diving Client specific FRA None: Mark with an "X" Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Medical Screening Medical Screening Medical Screening Audiometric test if noise is a hazard and employee not part of HAZWOPER Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) Mone: Mark with an "X"				SPCC		
FRA Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) None: Mark with an "X" Other hazardous substance List Types of other Medical Screening Here List Types of other Medical Screening Here Audiometric test if noise is a hazard and employee not part of HAZWOPER Display to the Audiometric test if noise is a hazard and employee not part of HAZWOPER Audiometric test if noise is a hazard and employee not part of HAZWOPER Display to the Audiometric test if noise is a hazard and employee not part of HAZWOPER Display to the Audiometric test if noise is a hazard and employee not part of HAZWOPER None: Mark with an "X" None: Mark with an "X"		MSHA				
Medical Surveillance Exam (HAZWOPER) Pulmonary Function Test if wearing respirator and employee not part of HAZWOPER Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) Medical Surveillance Exam (HAZWOPER) Audiometric test if noise is a hazard and employee not part of HAZWOPER Blood and/or urine screening None: Mark with an "X"				· · · · · · · · · · · · · · · · · · ·		
Medical Screening Exam (HAZWOPER) 165		Medical Surveillance				List Types of other Medical
Test if wearing respirator and employee not part of HAZWOPER Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) Test if wearing a hazard and employee not part of HAZWOPER Blood and/or urine screening None: Mark with an "X"			res			
respirator and employee not part of HAZWOPER Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) respirator and employee not part of HAZWOPER Dart of HAZWOPER Part of HAZWOPER Blood and/or urine screening None: Mark with an "X"						
Client required drug and/or alcohol testing Hepatitis B Immunization (or declination on file) Client required drug and/or alcohol testing No Blood and/or urine screening None: Mark with an "X"		respirator and employee				
and/or alcohol testing NO screening Hepatitis B Immunization (or declination on file)	Medical Screening	INOL PAIL OF HAZWOPER				
Hepatitis B None: Mark with an "X" Immunization (or declination on file)			No			
declination on file)		Hepatitis B				
Keep Safety First In All Things						
	Keep Safety	First In Al	l Thin	gs		

Appendix C

JLAs

Job Loss Analysis

General

Client Name	NYSEG
JSA ID	2880
Job Name	Environmental-Drum sampling/handling
Task Description	Drum Handling
Project Number	B00130990000
Project Name	NYSEG - WADSWORTH STREET
PIC Name	WHITE, KEITH
Project Manager	BRIEN, JASON
Status Name	(1) Initial
Cretaion Date	6/24/2010 10:14:23 AM

User Roles

Role	Employee	Due Date	Completed	Approve	Supervisor	Active Employee
Created By	Golubski, Jason	7/15/2010			Brien, Jason	True
Developer	Golubski, Jason	7/15/2010			Brien, Jason	True
HASP Reviewer	Webster, Charles				Insco, Ashly	True
Reviewer	Brien, Jason				Brussel, John	True

Job Steps

Job Job Step Description Step		Potential Hazard	Critical Action	HSP Reference	
1	(0)•]^&c/(Ö)¦`{•Á(;¦Á) a*}•Á(~ Ó`[*ā]*É(Šố>æ);ā]*Ê Ô¦`•c憕É(V^{]^¦æeč¦^É(Sæ);å Uå[¦	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.	None
		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.	None
2	Remove lids or bungs from Drums	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	Wear appropriate work gloves. When removing ring from drum, fingers can get pinched between ring and drum. Keep fingers clear of this space. Select proper tool for task. 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.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.

2	Remove lids or bungs from Drums	3	Use of mechanical tools to remove bolts from drum lids causes excessive noise.	Wear hearing protection.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.
		4	Splashing can occur if filling drum, or collecting samples.	Wear eye and face protection. Pour liquids into drum slowly to minimize splashing.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.
		5	When working with COCs that have fire/explosive properties, sparking or heat could cause fire/explosion.	fire/explosive properties, if such a hazard exists or is suspected. cplosion.	
3	Sample Contents from Drums	1	Exposure to COCs can occur by contacting impacted contents.	sure to COCs can occur ntacting impacted Select proper dermal protection for task, at a minimum nitrile gloves	
		2	Staff can be exposed to chemical vapors/fumes when sampling.	emical vapors/fumes when the HASP, and if required, select	
		3	Sharp edges and broken sample containers can cause lacerations.	narp edges and broken Imple containers can cause Discard any broken sample ware or glass properly. Do not over tighten	
		4	hemical burns or skin irritation occur from contact with ample 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.	p edges, pinch points, and	
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.		
		3	Body parts can be pinched between lift device, or drum and the ground.	veen lift device, or drum placement during drum staging. Do	
		4	When moving, the drum can tip or the dolly could become unstable from uneven ground surface.	Y @ } Á; [çā * Éác@ Áā; { Á8æ Áā Á; cœ Áā [[^ Á } • cæ Áī Á; * cæ Áā Á; * cæ Áā [[^ Á } • cæ Áī] æ dæ [^ Á; * æ Áā [[~ Á] • cæ Ái] æ dæ [[~ Á] • áā [] * É @æ [^ Á; * Å] * Áā [] * É @æ [^ Á; * Å] * Áā [] * É @æ [^ Á; * Å] * Áā [] * [^ ^ Á] [] * [^ ^ Á] [] * [^ A] * Áā [] * É æ Æ Å Å] & Áā [] * É æ Æ Å Å [] * É æ Æ Å Å [] * É æ Æ Å Æ [] * É æ Æ Å Æ [] * Á Ø Å Æ Å Æ Å Æ] * Áā Ø Å Æ Å Æ Å Æ Å Æ Å Æ Å Æ Å Æ Å Æ Æ Æ Æ	

Personal Protective Equipment

Туре	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Required
Eye Protection	faceshield		Required
Eye Protection	safety goggles		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
Hand Protection	work gloves (specify type)		Required
Hearing Protection	ear plugs		Required

Supplies

Туре	Supply	Description	Required
Miscellaneous	Other	dolly	Required

Job Loss Analysis

General

Client Name	NYSEG
JSA ID	2879
Job Name	Environmental-Groundwater Sampling and free product recovery
Task Description	Groundwater Sampling
Project Number	B00130990000
Project Name	NYSEG - WADSWORTH STREET
PIC Name	WHITE, KEITH
Project Manager	BRIEN, JASON
Status Name	(3) Completed
Cretaion Date	6/24/2010 9:49:49 AM

User Roles

Role	Employee	Due Date	Completed	Approve	Supervisor	Active Employee
Created By	Golubski, Jason	7/15/2010	6/24/2010		Brien, Jason	True

Job Steps

Job Step	Job Step Description		Potential Hazard	Critical Action	HSP Reference
1	Ùcæt^ÁsænÁ,¦^Ëà^c^¦{ā},^å •æṭ] ā]*Á[&æeā[} æ)åAn^cń[Á][¦\Á[}^Áse)å •æṭ] ā]*Án~~ä]{^}c	1	personnel could be hit by vehicluar 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.	
		2	Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess and changes	
2	Open wells to equilibrate and gauge wells	1	When squatting down, 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 guaging. 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	Ó^*ājÁÚ`¦*āj*Áv^ Áæjå Ô[^&cāj* Úæjæ{^c^¦ÁT^æ*¦^{^}o*	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.	

3	Ó^* ā ÁÚ* * ā * ÁY ^ Ásē) å Ô[^&cā * Úælæ{ ^c^ ÁT ^æ* ^{ ^} o*	2	purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with sorbent 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 JLA for movement of drums.	Drum handling JLA

Personal Protective Equipment

Туре	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required

Supplies

Туре	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	traffic cones		Required

Job Loss Analysis

General

Client Name	NYSEG
JSA ID	2877
Job Name	Environmental-Drilling, soil sampling, well installation
Task Description	Monitoring Well Installation
Project Number	B00130990000
Project Name	NYSEG - WADSWORTH STREET
PIC Name	WHITE, KEITH
Project Manager	BRIEN, JASON
Status Name	(3) Completed
Cretaion Date	6/24/2010 9:37:06 AM

User Roles

Role	Employee	Due Date	Completed	Approve	Supervisor	Active Employee
Created By	Golubski, Jason	7/15/2010	6/24/2010		Brien, Jason	True

Job Steps

ob ep	Job Step Description		Potential Hazard	Critical Action	HSP 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	
2	Utility Clearance	1	Potential to encounter underground or aboveground utilities while drilling	Complete utility clearance in accordance with the ARCADIS H&S procedure	ARCADIS H&S Procedure ARCHSFS019
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.	
		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	
			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. W operation as practicable. Wear appropriate gloves to protect from COCs.	

3	General drill rig operation	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.	
		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 Location H&S policy and procedure 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.	
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 debris 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 debris damage to paint or winshields.	
		2	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.	
		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 creation and/or dust masks 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	

7	Reverse rotary drilling	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 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.	
		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 hydrualic 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 uaually 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.	

9	Direct push drilling	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.	Preferably let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If we cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	
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 equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty 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.	Sample cooler handling JLA
		2	lifting heavy coolers can cause back injuries	Use two people to move heavy coolers. Use proper lifting techniques.	Sample cooler handling JLA
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 dollys, 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.	Drum handling JLA

Personal Protective Equipment

Туре	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)		Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vestClass II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Туре	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	traffic cones		Required

Appendix D

PPE Equipment List

PPE CHECKLIST

 $\mathbf{R}=$ Equipment required to be present on the site. $\mathbf{O}=$ Optional equipment. Subcontractors must have the same equipment listed here as a minimum.

Description	ı	Level Of Protection	
(Put Specific Material or Type in Box)	D	С	В
Body			
Coveralls	0	0	
Chemical Protective Suit		R	
Splash Apron		0	
Rain Suit	0		
Traffic Safety Vest (reflective)	R		
Head			
Hard Hat (if does not create other hazard)	R	R	R
Head Warmer (depends on temperature and	0		
Eyes & Face			
Safety Glasses (incorporate sun protection as	R		
Goggles (based on hazard)	R		
Splash Guard (based on hazard)			
Ears			
Ear Plugs	R	R	
Ear Muffs	0	0	
Hands and Arms			
Outer Chemical Resistant Gloves	R	R	R
Inner Chemical Resistant Gloves		R	R
Insulated Gloves	0	0	
Work Gloves*	R	R	
Foot			
Safety Boots (steel toe and shank)	R	R	R
Rubber, Chemical Resistant Boots		R	R
Rubber Boots			
Disposable Boot Covers	0	0	
Respiratory Protection			
1/2 Mask APR			
Full Face APR		R	
Dust Protection			
Powered APR			
SCBA			
Air Line			

Appendix E

Forms and MSDSs



OUTE A OTIVITIES TA	U OATE LIEAL TIL O	OAFETY DRIFFING FORM						
SITE ACTIVITIES TAILGATE HEALTH & SAFETY BRIEFING FORM								
This briefing form documents the tailgate briefing conducted in accordance with the HASP. Personnel who perform work operations on								
site are required to attend each briefing and to acknowledge receipt of each briefing, at least daily. Project Number: Project Name:								
Date:	Time:	Driefing Constructed by						
	Time:	Briefing Conducted by:						
Company:		Signature/Title:						
TRACKing the Tailgate Briefin	ng							
Think through the Tasks (list the tasks for the da	ay):							
1	3	5						
2	4	6						
Recognize the hazards (check all those that are	discussed) and Assess the F	Diake / Low Madium High airele rick love	1)					
[_ ·	_		1)					
Confined Space (L M H)	Buried/Overhead Utilities	(L M H) Excavation	(L M H)					
Walking/Working surfaces (L M H)	Chemical Exposure	(L M H) Noise	(L M H)					
Thermal Stress (Hot/Cold) (L M H) Severe Weather (L M H)	Overhead Hazards	(L M H) Traffic/Roadway/Railw	ay (LMH) (LMH)					
	Chemical Usage	, –	, ,					
Hazardous Energy (L M H)	Heavy Machinery Personal Safety/Security	(L M H) Biological/Animals	(L M H)					
Ergonomic (L M H) Client/Other Site Activities List	_ · · · · ·	(L M H) Mining	(L M H)					
Client/Other Site Activities <u>List</u> (L M H)	Chemical Exposure	List Other (L M H)	<u>Specify</u> (L M H)					
(L M H)	-	(L M H)	(L M H)					
		(L M H)	(L M H)					
(L M H)			(L IVI H)					
Control the hazards (Check all those methods t	o control the hazards that apply	r):						
STOP WORK AUTHORITY (Must be addres	sed in every Tailgate meeting.	See H&S Handbook for definition)						
General PPE Usage	Hearing Conservation	Respiratory Protection						
Personal Hygiene	Exposure Guidelines	Decon Procedures						
Emergency Action Plan	Fall Protection	Work Zones/Site Contr	ol					
JSA to be developed/used (specify)	LPO conducted (specify job)		-					
Deinte d Name	Personnel Sign-in Lis							
Printed Name		Signature						
<u>K</u> eep H&S 1 st in all things								
<u>nceprido i ili ali tilligs</u>								

SITE ACTIVITIES TAILGATE HEALTH & SAFETY BRIEFING FORM **Additional Comments:** Discussion of recent results of LPOs conducted on the project: Discussion of recent Near-miss, injuries, and/or property damage on the project: **List Visitors to Site Today:**

Real Time Exposure Monitoring Data Collection Form

	9	ducted on the Site below. Ke	•	, ,	
Site Name:				Date:	
nstrument:		Model:		Serial #:	
Calibration Method:					
Material used settings, etc.)					
Calibration Results:					
Calibrated By:					
Activity Being Mo	nitored	Compounds/Hazards Monitored	Time	Reading	Action Required? Y/N
					_
					_
					1
Describe Any Actio	ons Taken a	s a Result of this Air Mon	itoring and	Why (does it	match Table

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):					

ARCADIS Infrastructure, environment, facilities			C	Daily / Periodic Excavation Inspection Checklist
Project Name:	Date / Time	e:		
Project Number:	Location:			
Prepared By:	Project Ma	nager:		
This checklist must be completed for all excavations. inspections are conducted.	It docume	nts that	daily	and post-event / periodic
Soil Classified As: Stable Rock Type	A	Ту	ре В	Type C
Soil Classified On:	Ву:			
Type of Protective System in Use: Sloping	Shoring		Ot	her
Description:				
Inspection Item		YES	NO	Comments
Is the underground / overhead utilities checklist completed?				
Are underground installations protected from damage?				
Are adequate means of entry / exit available in the excavation?				
If exposed to traffic, are personnel wearing reflective vests?				
Do barriers exist to prevent equipment from rolling into the excar	vation?			
Was air monitoring conducted prior to and during excavation ent	try?			
Was the stability of adjacent structures reviewed by a registered	P.E.?			
Are spoil piles at least 2 feet from the excavation edge?				
Is fall protection in use near excavations deeper than 6 feet?				
Are work tasks completed remotely if feasible?				
Is a protective system in place and in good repair?				
Is emergency rescue (lifeline / body harness) equipment used depotential atmospheric hazard?	ue to			
Is excavation exposed to vibration?				
Are employees protected from falling / elevated material?				
Is soil classification adequate for current environmental / weather conditions?	er			
Do portable ladders extend at least 4 feet above the excavation?				
Are portable ladders or ramps secured in place?				
Have all personnel attended safety meeting on excavation hazards?				
Are support systems for adjacent structures in place?				
Is the excavation free from standing water?				
Is water control and diversion of surface runoff adequate?				
Are employees wearing required protective equipment?				
BBL Excavation Competent Person:				Date/Time:

ARCADIS Infrastructure, environment, facilities	Underground / Overhead Utility Checklist
Project Name:	Date:
Project Number:	Location:
Prepared By:	Project Manager:

This checklist must be completed for any intrusive subsurface work such as excavation or drilling. It documents that overhead and underground utilities in the work area are identified and located. The Project Manager shall request utility markouts before the start of field operations to allow the client and utility companies sufficient time to provide them. If complete information is not available, a magnetometer or other survey shall be performed to locate obstacles prior to intrusive subsurface activities.

Procedure: A diagram of the work area depicting the proposed location of intrusive subsurface work sites (i.e., boring locations, excavation locations) must be attached to this form. The diagram must clearly indicate the areas checked for underground structures / utilities, and overhead power lines. This form and the diagram must be signed by the BBL Project Manager (if present), the BBL Site Supervisor, and the client representative.

Type of Structure	Present	Not Present	Method of Markout
Electric Power Line			
Natural Gas Line			
Telephone Line			
Water Line			
Product Line			
Sewer Line			
Steam Line			
Drain Line			
Underground Tank			
Underground Cable			
Overhead Power Line			
Overhead Product Line			
Other (Specify)			
Reviewed By			
Name		Job Title	Date
		Client Representative	
		BBL Project Manager	
		BBL Site Supervisor	



SEDIMENT/SURFACE WATER SAMPLING CHECKLIST

Project Name/Number				Date	
ocation repared By		Project Man	nager		
nis checklist must be completed for any sediment of equipment are in place prior to commencing mpling permits, clearance or right-of-way accordedure rocedure rior to any work on a navigable waterway or an	ng sampling less from the	activities. The appropriate enti	Project Manag ty during projec	er shall identify the ct planning.	e need for and arrange to obt
Activity:	Require	d for project:	Com	pleted:	Comments:
Access rights to property	YES	NO	YES	NO	
Activity planned that impedes traffic on navigable waterway	YES	NO	YES	NO	
Notification and approval obtained from United States Coast Guard and/or other regulating authority (County, US Parks Service, EPA)	YES	NO	YES	NO	
Buoys, signs markings or other forms of notification present	YES	NO	YES	NO	
Other (Specify)					
oating/Water Safety Checklist: Activity:	Required	l for project:	Requi	rement:	Comments:
Working on over or near water (within 6 feet)	YES	NO	PFD Availab personnel		
Boat has been current registration, has been inspected and loaded safely	YES	NO	PFDs and thr floatation dev	ad distribution owable vice available sher on board	
Boat operator has appropriate training (USCG Boating Safety Course or equivalent)	YES	NO			
Sampling on or near water below 50 degrees Fahrenheit	YES	NO	Cold water in for affected p	nmersion suit personnel	
Method of communication available	YES	NO	Radio, cell pl scheduled ch		
lient Representative				Date	
BL Project Manager				Date	
				Date	

(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 54/60

Material Name: Benzene CAS Number: 71-43-2

Chemical Formula: C₆H₆

Structural Chemical Formula: C₆H₆ EINECS Number: 200-753-7 ACX Number: X1001488-9

Synonyms: Benzene; BENZENE; (6)ANNULENE; BENZEEN; BENZEN; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL;

PYROBENZOLE

General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.

May also be a minor component of gasoline, petrol.

Exposure should be minimized by use in closed systems.

Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

Section 2 - Composition / Information on Ingredients

 Name
 CAS
 %

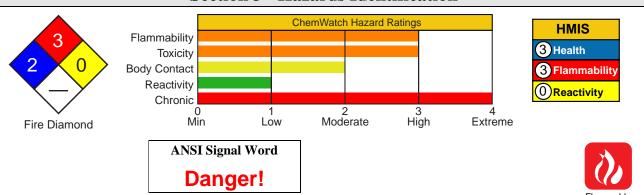
 benzene
 71-43-2
 99.9

OSHA PEL NIOSH REL DFG (Germany) MAK

TWA: 1 ppm; STEL: 5 ppm. TWA: 0.1 ppm; STEL: 1 ppm. Skin.

ACGIH TLV
TWA: 0.5 ppm; STEL: 2.5 ppm; 500 ppm. skin.

Section 3 - Hazards Identification



፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟ Emergency Overview ፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Other Acute Effects: headache, dizziness, drowsiness. Absorbed through skin. Chronic Effects: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin **Primary Entry Routes:** inhalation, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Acute effects from inhalation of high concentrations of 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.

Inhalation hazard is increased at higher temperatures.

The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.

Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual dicoloration of the skin may be evident for up to four weeks. Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal

Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.

Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is moderately discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.

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.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.

Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.

Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thromocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

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.

See

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

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 (pO₂ <50 mm Hg or pCO₂ >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. Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures

Flash Point: -11 °C Closed Cup **Autoignition Temperature:** 562 °C

LEL: 1.3% v/v **UEL:** 7.1% v/v

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

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.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

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.

Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

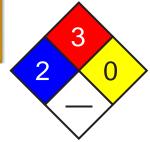
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.



Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.





Fire Diamond

See

DOT

ERG

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

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.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Storage Requirements: Store in original containers in approved flame-proof area.

No smoking, bare lights, heat or ignition sources.

DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.

Store away from incompatible materials in a cool, dry well ventilated area.

Protect containers against physical damage and check regularly for leaks.

Observe manufacturer's storing and handling recommendations.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Nitrile gloves; Neoprene gloves.

Safety footwear.

Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face

Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

Note: must change cartridge at beginning of each shift

Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:

PE/EVAL/PE	Best selection
PVA	Best selection
TEFLON	Best selection
VITON	Best selection
VITON/NEOPRENE	Best selection

NITRILE+PVC	. Poor to dangerous choice for other than short-term immersion
BUTYL	. Poor to dangerous choice for other than short-term immersion
NITRILE	. Poor to dangerous choice for other than short-term immersion
	. Poor to dangerous choice for other than short-term immersion
	. Poor to dangerous choice for other than short-term immersion
	. Poor to dangerous choice for other than short-term immersion
	. Poor to dangerous choice for other than short-term immersion
	6

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid pH: Not applicable

Vapor Pressure (kPa): 9.95 at 20 °CpH (1% Solution): Not applicable.Vapor Density (Air=1): 2.77Boiling Point: 80.1 °C (176 °F)

Formula Weight: 78.12 Freezing/Melting Point: 5.5 °C (41.9 °F) Specific Gravity (H₂O=1, at 4 °C): 0.879 at 20 °C Volatile Component (% Vol): 100

Evaporation Rate: Fast Water Solubility: 0.18 g/100 g of water at 25 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur. **Storage Incompatibilities:** Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity

Oral (man) LD_{Lo}: 50 mg/kg Oral (rat) LD₅₀: 930 mg/kg

Inhalation (rat) LC_{so} : 10000 ppm/7h Inhalation (human) LC_{Lo} : 2000 ppm/5m Inhalation (man) TC_{Lo} : 150 ppm/1y - I Inhalation (human) TC_{Lo} : 100 ppm Reproductive effector in rats

Irritation

Skin (rabbit): 20 mg/24 hr - mod Eye (rabbit): 2 mg/24 hr - SEVERE See *RTECS* CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conductive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

Ecotoxicity: LC₅₀ Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC₅₀ Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD₅₀ Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC₁₀₀ Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC₅₀ Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.3 x10⁻³

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days **Octanol/Water Partition Coefficient:** $log K_{ow} = 2.13$

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Benzene

ID: UN1114

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: 40

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U019 Toxic Waste, Ignitable Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a), per

CAA Section 112 10 lb (4.535 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.





Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 50/60

Material Name: Coal Tar Creosote CAS Number: 8001-58-9

Chemical Formula: No data found. EINECS Number: 232-287-5 ACX Number: X1002891-0

Synonyms: AWPA #1; BRICK OIL; COAL TAR CREOSOTE; COAL TAR CRESOTE; COAL TAR OIL; CREOSOTE; CREOSOTE OIL; CREOSOTE P1; CREOSOTE, FROM COAL TAR; CREOSOTUM; CRESYLIC CREOSOTE; DEAD OIL; EPA PESTICIDE CHEMICAL CODE 025004; HEAVY OIL; HODGSONS CREOSOTE; LIQUID PITCH OIL; NAPHTHALENE OIL; PRESERV-O-SOTE; SAKRESOTE 100; TAR OIL; WASH OIL

Derivation: By distillation of coal tar produced by high-temperature carbonization of bituminous coal; by mixing strained naphthalene oil, wash oil, and strained or light anthracene oil; as a by-product of conventional coal coking. **General Use:** Used mainly as a wood preservative for railroad ties, poles, fence posts, marine pilings, and other lumber

for outdoor use; as a water-proofing agent, fuel oil constituent, frothing agent for mineral separation, tap hole refractory cement, and lubricant for die molds. Used only in limited quantities as an animal and bird repellent, animal dip, and insecticide (ovicide).

Section 2 - Composition / Information on Ingredients

Name CAS %

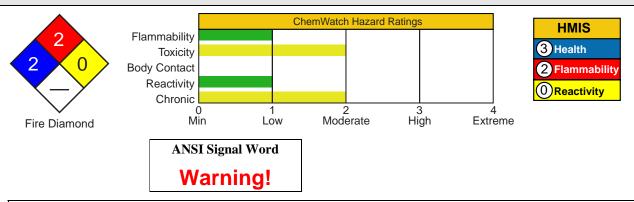
Coal tar creosote 8001-58-9 Consists of aromatic hydrocarbons, anthracene, naphthalene, and phenanthrene derivatives; some tar acids; and tar bases. Polycylic aromatic

hydrocarbons make up at least 75%. * Creosote contains several carcinogenic polycyclic aromatic hydrocarbons including benz[a]anthracene, benzo[a]pyrene, and dibenz[a,h]anthracene.

OSHA PEL NIOSH REL

ACGIH TLV

Section 3 - Hazards Identification



አልአል Emergency Overview ልልልልል

Colorless (pure) or yellow to black (industrial) liquid; aromatic smoky smell. Severely irritating to eyes/skin/respiratory tract. Probable human carcinogen. Combustible.

Potential Health Effects

Target Organs: Eyes, skin, bladder, kidneys, and respiratory system

Primary Entry Routes: Inhalation, skin absorption, and skin and/or eye contact

Acute Effects Note! Phenol and phenolic derivatives of various aromatic hydrocarbons (tar acids), present in low concentrations, are the constituents most likely to be responsible for acute toxicity.

Inhalation: Inhalation of vapors causes moderate irritation to the nose, throat, and upper respiratory tract.

Eye: Contact with liquid causes conjunctivitis (inflammation of the eye's lining), keratitis (corneal inflammation), or corneal burns with scarring. May cause loss of vision.

Skin: Contact causes irritation, burning, itching, redness, pigment changes, dermatitis (a rash of redness and bumps), or burns. Photosensitization (worsening of rash with exposure to sunlight) may occur.

Ingestion: Causes salivation, nausea; vomiting; gastrointestinal tract irritation or bleeding; abdominal pain; rapid, thready pulse; vertigo; headaches; loss of pupillary reflexes; hypothermia; cyanosis; respiratory distress; shock and mild convulsions. Large doses may be fatal.

Carcinogenicity: NTP - Not listed; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B1, Probable human carcinogen based on epidemiologic studies; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: Skin disorders.

Chronic Effects: Include dermatitis and, possibly, skin cancer or other forms of cancer. An increased risk of scrotal cancer for creosote-exposed brick makers was indicated in a worker mortality analysis. Epidemiological studies of coke oven workers reveal increased incidences of lung, bladder, prostate, pancreas, and intestinal cancer.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air, monitor for respiratory distress, 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 or ophthalmologist immediately.



Skin Contact: *Quickly* remove contaminated clothing. Prior to washing and if readily available, use undiluted polyethylene glycol 300 to 400. Wash affected area with soap and flooding amounts of water for at least 15 min. *Do not* rub or apply pressure to the affected skin, apply any oily substance or use hot water to rinse. 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. Rinse the mouth several times with cold water. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water. *Do not induce vomiting!* Keep victim warm and at rest.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Creosote may be detected in urine.

Special Precautions/Procedures: An exposed person should examine their skin periodically for growths, changes in warts or moles, and sores that do not heal.

Section 5 - Fire-Fighting Measures

Flash Point: 165.2 °F (74 °C), Closed Cup **Autoignition Temperature:** 637 °F (336 °C)

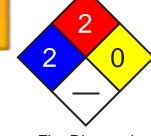
LEL: None reported. **UEL:** None reported.

Flammability Classification: OSHA IIIA combustible liquid

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or regular foam. For large fires, use water spray, fog or regular foam.

General Fire Hazards/Hazardous Combustion Products: Include carbon oxides. Coal tar creosote may present a vapor explosion hazard indoors, outdoors, and in sewers. Vapors may travel to an ignition source and flash back.

Fire-Fighting Instructions: If feasible and without undue risk, remove containers from



See

DOT

ERG

Fire Diamond

fire hazard area. Otherwise use water spray to cool fire-exposed containers until well after they are extinguished. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Immediately leave area if you hear a rising sound from venting safety device or notice any fire-caused tank discoloration as a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Isolate area for 1/2 mile in all directions if fire involves tank, rail car or tank truck. Fully decontaminate or properly dispose of personal protective clothing.

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel. Isolate hazard area, deny entry, and stay upwind of spills. Shut off all ignition sources. Cleanup personnel should protect against vapor inhalation and skin and eye contact.

See DOT ERG

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal.

Large Spills: Consider initial downwind evacuation for at least 300 meters (1000 feet). For large spills, dike far ahead of liquid spill for later disposal. Water spray may reduce vapor. *Do not* release into sewers or waterways. Use nonsparking tools during clean-up.

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 ventilation sufficient to reduce airborne exposures to nonhazardous levels (Sec. 2). Wear protective gloves, goggles, and clothing to avoid contact. Wear respiratory protection when necessary (Sec. 8). Consult your industrial hygienist. Practice good personal hygiene procedures to avoid inadvertently ingesting this material. Keep away from ignition sources.

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 a cool, dry, well-ventilated area away from heat and ignition sources. Store coal tar creosote as close to area of use as possible to minimize transporting distance. Avoid physical damage to containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Enclose all operations and/or ventilate at the site of release to avoid vapor dispersion into the work area. To prevent static sparks, electrically ground and bond all containers and equipment. Provide general or local exhaust ventilation systems equipped with high-efficiency particulate filters to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Preplacement and periodic medical examinations of exposed workers emphasizing respiratory, skin, liver, and kidney disorders, including comprehensive work and medical history, physical examination, CXR, PFTs, urinalysis, LFT, and sputum cytology as the attending physician considers appropriate. Educate workers about the health and safety hazards associated with coal tar creosote.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent any skin contact. With breakthrough times of >8 hr, butyl rubber, Teflon, and Viton are recommended materials. Frequent change of protective garments is an additional protective measure. Wear protective eyeglasses or 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 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. (The following respirator recommendations are for coal tar pitch volatiles.) For concentrations above the NIOSH REL or at any detectable concentrations, wear a SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode; or any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. 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 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 (pure) or yellow to black (industrial); aromatic smoky smell.

Physical State: Oily liquid

Specific Gravity (H₂O=1, at 4 ^{\circ}C): 1.07 to 1.08 at

68 °F (20 °C)

Boiling Point: 381 to 752 °F (194 to 400 °C)

Water Solubility: Slightly soluble

Other Solubilities: Soluble in alcohol; ether; glycerin; dimethyl sulfate; fixed or volatile oils; in solution of fixed alkali hydroxides.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Coal tar creosote is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Avoid excessive heat and contact with chlorosulfonic acid.

Storage Incompatibilities: Creosote oil mixed with chlorosulfonic acid in a closed container causes an increase in temperature and pressure.

Hazardous Decomposition Products: Thermal oxidative decomposition of coal tar creosote can produce carbon oxides and thick, black, acrid smoke.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50} : 725 mg/kg. Mouse, oral, LD_{50} : 433 mg/kg.

Other Effects:

Tumorgenicity, mouse, oral: 2 g/kg administered on gestational days 5-9 produced maternal effects and fetotoxicity.

Reproductive Effects - Hamster, ovary cell: 10 mg/L induced sister chromatid exchange.

Tumorigenicity: Mouse, skin, 99 g/kg/33 weeks administered intermittently produced tumors on skin and appendages (carcinogenic by RTECS criteria).

S. typhimurium: 20 µg/plate (-S9) produced mutations.

See RTECS GF8615000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: TL50, goldfish (*Carassius auratus*), 3.51 ppm/24 hr (60:40) mixture of creosote and coal tar; TL50, rainbow trout (*Salmo gairdneri*), 3.72 ppm/24 hr (60:40) mixture of creosote and coal tar; LD₅₀, bob white quail (*Colinus virginianus*), 1,260 ppm/8 days (60:40) mixture of creosote and coal tar.

Octanol/Water Partition Coefficient: $log K_{ow} = 1.0$

Section 13 - Disposal Considerations

Disposal: Coal tar creosote is a good candidate for rotary kiln and fluidized bed incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Handle empty containers carefully as hazardous residues may still remain.

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: Corrosive liquids, n.o.s.

ID: UN1760

Hazard Class: 8 - Corrosive material **Packing Group:** I - Great Danger **Symbols:** G - Technical Name Required

Label Codes: 8 - Corrosive

Special Provisions: A7, B10, T14, TP2, TP27

Packaging: Exceptions: None Non-bulk: 201 Bulk: 243

Quantity Limitations: Passenger aircraft/rail: 0.5 L Cargo aircraft only: 2.5 L

Vessel Stowage: Location: B Other: 40

Shipping Name and Description: Corrosive liquids, n.o.s.

ID: UN1760

Hazard Class: 8 - Corrosive material **Packing Group:** II - Medium Danger **Symbols:** G - Technical Name Required

Label Codes: 8 - Corrosive

Special Provisions: B2, IB2, T11, TP2, TP27

Packaging: Exceptions: 154 Non-bulk: 202 Bulk: 242

Quantity Limitations: Passenger aircraft/rail: 1 L Cargo aircraft only: 30 L

Vessel Stowage: Location: B Other:

Shipping Name and Description: Corrosive liquids, n.o.s.

ID: UN1760

Hazard Class: 8 - Corrosive material **Packing Group:** III - Minor Danger **Symbols:** G - Technical Name Required

Label Codes: 8 - Corrosive





Special Provisions: IB3, T7, TP1, TP28

Packaging: Exceptions: 154 Non-bulk: 203 Bulk: 241

Quantity Limitations: Passenger aircraft/rail: 5 L Cargo aircraft only: 60 L

Vessel Stowage: Location: A 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.



Issue Date: 2005-05 1171 RiverFront Center, Amsterdam, NY 12010 (518) 842-4111

Section 1 - Chemical Product and Company Identification

54/60

CAS Number: 100-41-4

Material Name: Ethylbenzene Chemical Formula: C₈H₁₀

Structural Chemical Formula: C₆H₅•C₂H₅

EINECS Number: 202-849-4 ACX Number: X1003016-1

Synonyms: AETHYLBENZOL; BENZENE, ETHYL-; EB; ETHYL BENZENE; ETHYLBENZEEN; ETHYLBENZENE; ETHYLBENZOL; ETILBENZENE; ETYLOBENZEN; PHENYLETHANE

General Use: Used in the manufacture of cellulose acetate, styrene and synthetic rubber; solvent or diluent; component

of automotive and aviation gasoline.

Component of many petroleum hydrocarbon solvents, thinners.

The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

Section 2 - Composition / Information on Ingredients

CAS % Name ethylbenzene 100-41-4 >95

OSHA PEL NIOSH REL

TWA: 100 ppm; 435 mg/m³.

DFG (Germany) MAK TWA: 100 ppm, 435 mg/m³; Skin.

STEL: 125 ppm, 545 mg/m³.

OSHA PEL Vacated 1989 Limits

TWA: 100 ppm; 435 mg/m³;

STEL: 125 ppm; 545 mg/m³.

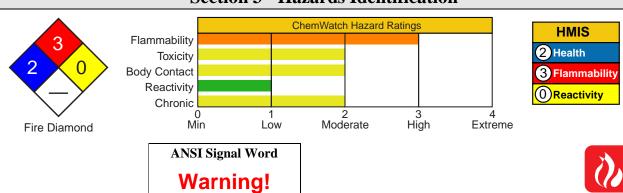
IDLH Level

800 ppm (10% LEL).

ACGIH TLV

TWA: 100 ppm; STEL: 125 ppm.

Section 3 - Hazards Identification



አልልልል Emergency Overview ልልልልል

Colorless liquid; pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: chest constriction, vertigo, narcosis, cramps, respiratory paralysis. Chronic Effects: fatigue, sleepiness, headache, blood disorders, lymphocytosis. Flammable.

Potential Health Effects

Target Organs: eyes, respiratory system, skin, central nervous system (CNS), blood

Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract.

Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high concentrations of 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 solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Inhalation of vapor may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema.

When humans were exposed to the 100 and 200 ppm for 8 hours about 45-65% is retained in the body. Only traces of unchanged ethyl benzene are excreted in expired air following termination of inhalation exposure.

Humans exposed to concentrations of 23-85 ppm excreted most of the retained dose in the urine (mainly as metabolites).

Guinea pigs that died from exposure had intense congestion of the lungs and generalized visceral hyperemia. Rats exposed for three days at 8700 mg/m³ (2000 ppm) showed changes in the levels of dopamine and noradrenaline in various parts of the brain.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration. The vapor is discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Two drops of the material in to the conjunctival sac produced only slight irritation of the conjunctival membrane but no corneal injury.

Skin: The liquid is discomforting to the skin if exposure is prolonged and is capable of causing skin reactions which may lead to dermatitis.

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.

The mean rate of absorption of liquid ethyl benzene applied to 17.3 cm2 area of the forearm of seven volunteers for 10-15 minutes was determined to be 38 mg/cm2/hr. Immersion of the whole hand in aqueous solutions of ethyl benzene (112-156 mg/l) for 1 hour yielded mean absorption rates of 118 and 215.7 ug/cm2/hr. The rate of absorption is thus greater than that of aniline, benzene, nitrobenzene, carbon disulfide and styrene.

Repeated application of the undiluted product to the abdominal area of rabbits (10-20 applications over 2-4 weeks) resulted in erythema, edema and superficial necrosis. The material did not appear to be absorbed through the skin in sufficient quantity to produce outward signs of toxicity.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce considerable gastrointestinal discomfort and may be harmful or toxic if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Industrial workers exposed to a maximum level of ethyl benzene of 0.06 mg/l (14 ppm) reported headaches and irritability and tired quickly. Functional nervous system disturbances were found in some workers employed for over 7 years whilst other workers had enlarged livers.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

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: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water. 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 (pO₂ <50 mm Hg or pCO₂ >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: 12.8 °C Closed Cup **Autoignition Temperature:** 432 °C

LEL: 1.6% v/v **UEL:** 7% v/v

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations

permit), carbon dioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.

Moderate fire hazard when exposed to heat or flame.

Vapor forms an explosive mixture with air.

Moderate explosion hazard when exposed to heat or flame.

Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion or decomposition leading to violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

May emit clouds of acrid smoke.

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 breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If safe, switch off electrical equipment until vapor fire hazard removed.

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.

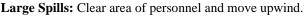
Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.



Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

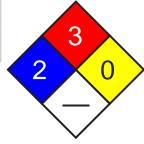
Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.





Fire Diamond



Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

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.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

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: Barrier cream with polyethylene gloves or Nitrile gloves.

Protective footwear.

Respiratory Protection:

Exposure Range >100 to <800 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 800 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

Other: Overalls. Eyewash unit.

Glove Selection Index:

VITON Best selection TEFLON Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid; floats on water. Aromatic solvent odor. Soluble in alcohol,

benzene, carbon tetrachloride and ether.

Physical State: Liquid

Vapor Pressure (kPa): 1.333 at 25.9 °C

Vapor Density (Air=1): 3.66 Formula Weight: 106.17

Specific Gravity (H₂O=1, at $4 \,^{\circ}$ C): 0.8670 at 20 $^{\circ}$ C

Evaporation Rate: Fast

pH: Not applicablepH (1% Solution): Not applicable.

Boiling Point: 136.2 °C (277 °F) at 760 mm Hg

Freezing/Melting Point: -95 °C (-139 °F) Volatile Component (% Vol): 100

Water Solubility: 0.01% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 3500 mg/kg

Inhalation (human) TC_{Lo}: 100 ppm/8h Inhalation (rat) LC_{Lo}: 4000 ppm/4h Intraperitoneal (mouse) LD_{so}: 2642 mg/kg~

Dermal (rabbit) LD₅₀: 17800 mg/kg~

Liver changes, utheral tract, effects on fertility, specific developmental abnormalities (musculoskeletal system)

recorded.

NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

Irritation

Skin (rabbit): 15 mg/24h mild Eye (rabbit): 500 mg - SEVERE See *RTECS* DA 0700000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, it exist predominantly in the vapor phase based on its vapor pressure where it will photochemically degrade by reaction with hydroxyl radicals (half-life 0.5 to 2 days) and partially return to earth in rain. It will not be subject to direct photolysis. Releases into water will decrease in concentration by evaporation and biodegradation. The time for this decrease and the primary loss processes will depend on the season, and the turbulence and microbial populations in the particular body of water. Representative half-lives are several days to 2 weeks. Some may be adsorbed by sediment but significant bioconcentration in fish is not expected to occur based upon its octanol/water partition coefficient. It is only adsorbed moderately by soil. It will not significantly hydrolyze in water or soil.

Ecotoxicity: LC₅₀ Cyprinodon variegatus (sheepshead minnow) 275 mg/l 96 hr in a static unmeasured bioassay; LC₅₀ Pimephales promelas (fathead minnow) 12.1 mg/l/96 hr (confidence limit 11.5 - 12.7 mg/l), flow-through bioassay with measured concentrations, 26.1 °C, dissolved oxygen 7.0 mg/l, hardness 45.6 mg/l calcium carbonate, alkalinity 43.0 mg/l; Toxicity threshold (cell multiplication inhibition test): Pseudomonas putida (bacteria) 12 mg/l; LC₅₀ Palaemonetes pugio (grass shrimp, adult) 14,400 ug/l/24 hr in a static unmeasured bioassay; LC₅₀ Palaemonetes pugio (grass shrimp, larva) 10,200 ug/l/24 hr in a static unmeasured bioassay; Toxicity threshold (cell multiplication inhibition test): Microcystis aeruginosa (algae) 33 mg/l; Scenedesmus quadricauda (green algae) > 160 mg/l

Henry's Law Constant: 8.44 x 10⁻³

BCF: goldfish 1.9

Biochemical Oxygen Demand (BOD): theoretical 2.8%, 5 days

Octanol/Water Partition Coefficient: $log K_{ow} = 3.15$ Soil Sorption Partition Coefficient: $K_{oc} = 164$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Ethylbenzene

ID: UN1175

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: Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1000 lb (453.5 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.			

(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification 54/60

Material Name: n-Hexane CAS Number: 110-54-3

Chemical Formula: C₆H₁₄

Structural Chemical Formula: H₃C(CH₂)₄CH₃

EINECS Number: 203-777-6 **ACX Number:** X1001498-5

Synonyms: DIPROPYL; ESANI; GETTYSOLVE-B; HEKSAN; HEXANE; N-HEXANE; N-HEXANE; HEXANEN; HEXYL HYDRIDE; NORMAL HEXANE; NORMAL-HEXANE; SKELLYSOLVE-B; SKELLYSOLVE B General Use: An incidental component of many aliphatic solvent mixes used as lacquer, paint and enamel thinners,

also in ink reducers and cleaning solvents.

Also used for solvent extraction of oil seeds and in pesticide residue analysis and gas chromatography.

Section 2 - Composition / Information on Ingredients

Name CAS % n-hexane 110-54-3 > 95

OSHA PEL NIOSH REL DFG (Germany) MAK

IDLH Level

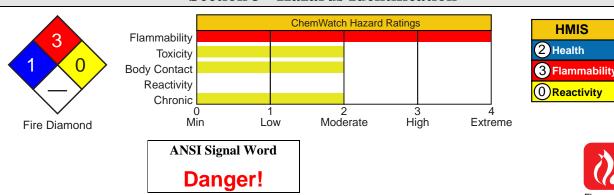
TWA: 500 ppm; 1800 mg/m³. TWA: 50 ppm, 180 mg/m³. TWA: 50 ppm; PEAK: 400 ppm.

OSHA PEL Vacated 1989 Limits

TWA: 50 ppm; 180 mg/m³. 1100 ppm (10% LEL).

ACGIH TLV TWA: 50 ppm; skin.

Section 3 - Hazards Identification



☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, volatile liquid; sweet/gasoline odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, fatigue, muscle weakness, hallucinations. Chronic Effects: muscle weakness, motor loss, sensory disturbances. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS), peripheral nervous system **Primary Entry Routes:** inhalation, skin contact/absorption, eyes, ingestion **Acute Effects**

Inhalation: The vapor is discomforting and harmful to the upper respiratory tract.

Acute effects from inhalation of high concentrations of 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 solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is irritating to the eyes and may cause smarting, painand redness.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis. Toxic effects may result from skin absorption.

Ingestion: The liquid is highly discomforting and harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Considered an unlikely route of entry in commercial/industrial environments.

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 inhalation or skin exposure to n-hexane may cause peripheral neuropathy, which is damage to nerve ends in extremities, e.g. fingers, with loss of sensation and characteristic thickening. Nerve damage has been documented with chronic exposures of greater than 500 ppm.

Improvement in condition does not immediately follow removal from exposure and symptoms may progress for two or three months. Recovery may take a year or more depending on severity of exposure, and may not always be complete. Exposure to n-hexane with methyl ethyl ketone (MEK) will accelerate the appearance of damage, but MEK alone will not cause the nerve damage.

Other isomers of hexane do not cause nerve damage.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

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:** Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Following acute or short-term repeated exposures to n-hexane:

- 1. Large quantities of n-hexane are expired by the lungs after vapor exposure (50-60%). Humans exposed to 100 ppm demonstrate an n-hexane biological half life of 2 hours.
- 2. Initial attention should be directed towards evaluation and support of respiration. Cardiac dysrhythmias are a potential complication.

INGESTION:

1. Ipecac syrup should be considered for ingestion of pure hexane exceeding 2-3 mL/kg. Extreme caution must be taken to avoid aspiration since small amounts of n-hexane intratracheally, produce a severe chemical pneumonitis BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant Index Sampling Time Comments 2.5-hexanedione 5 mg/gm End of shift NS

in urine creatinine

n-Hexane in SQ

end-exhaled air

NS: Non-specific determinant; Metabolite observed following exposure to other materials.

SQ: Semi-quantitative determinant; Interpretation may be ambiguous - should be used as a screening test or confirmatory test.

See

DOT

ERG

Section 5 - Fire-Fighting Measures

Flash Point: -22 °C

Autoignition Temperature: 225 °C

LEL: 1.1% v/v **UEL:** 7.5% v/v

Extinguishing Media: Dry chemical powder. Foam.

Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO). May emit clouds of acrid smoke.

Fire Incompatibility: Avoid reaction with oxidizing agents.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control the 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 protective location.

If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Pollutant - 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 breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so.

Water spray or fog may be used to disperse/absorb vapor.

Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable products into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

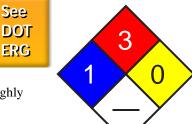
Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.



Fire Diamond



Work clothes should be laundered separately.

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.

Avoid concurrent exposure to materials containing Methyl Ethyl Ketone MEK

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in specific circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

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: Polyethylene gloves. Wear chemical protective gloves, eg. PVC.

Wear safety footwear.

Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >500 to <1100 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 1100 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: poor warning properties

Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:

PE/EVAL/PE	. Best selection
PVA	. Best selection
SARANEX-23 2-PLY	. Best selection
VITON	. Best selection
VITON/CHLOROBUTYL	. Best selection
TEFLON	. Satisfactory; may degrade after 4 hours continuous immersion
NITRILE	. Satisfactory; may degrade after 4 hours continuous immersion
NEOPRENE	. Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	. Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	. Poor to dangerous choice for other than short-term immersion
PVC	. Poor to dangerous choice for other than short-term immersion

BUTYL Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with typical paraffinic odor; floats on water. Mixes with most other organic solvents, chloroform, ether, alcohol. A very volatile liquid, it readily forms explosive vapor /air mixes.

Physical State: Liquid Boiling Point: 68.89 °C (156 °F)

Vapor Pressure (kPa): 13.33 Freezing/Melting Point: -100 °C (-148 °F) to -95 °C (-

Vapor Density (Air=1): 2.97

Formula Weight: 86.17 Volatile Component (% Vol): 100 Specific Gravity (H₂O=1, at 4 °C): 0.6603 at 20 °C Water Solubility: 0.002% by weight

pH: Not applicable

pH (1% Solution): Not applicable

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 28710 mg/kg

Inhalation (human) TC_{Lo}: 190 ppm/8W Inhalation (rat) LD₅₀: 48000 ppm/4h

Irritation

Eye (rabbit): 10 mg - mild

See RTECS MN9275000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Photolysis, hydrolysis or bioconcentration are not expected to be an important environmental fate processes. Biodegradation may occur in soil and water; however, volatilization and adsorption are expected to be far more important fate processes. A K_{∞} range of 1250 to 4100 indicates a low to slight mobility class in soil. In aquatic systems it may partition from the water column to organic matter contained in sediments and suspended materials. A Henry's Law constant of 1.81 atm-cu m/mole at 25 °C suggests rapid volatilization from environmental waters. The volatilization half-lives from a model river and a model pond, the latter considers the effect of adsorption, have been estimated to be 2.7 hr and 6.8 days, respectively. It is expected to exist entirely in the vapor-phase in ambient air. Reactions with photochemically produced hydroxyl radicals in the atmosphere have been shown to be important (average estimated half-life of 2.9 days). Data also suggests that nighttime reactions with nitrate radicals may contribute to atmospheric transformation, especially in urban environments.

Ecotoxicity: No data found.

Henry's Law Constant: calculated at 1.81

BCF: estimated at 2.24 to 2.89

Biochemical Oxygen Demand (BOD): theoretical 0%, 7 days

Octanol/Water Partition Coefficient: $\log K_{ow} = 4.11$

Soil Sorption Partition Coefficient: K_{oc} = estimated at 1250 to 4100

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Hexanes

ID: UN1208

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: E Other:

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

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



2005-05	n-Hexane	HEX6400
	Section 16 - Other Informatio	n
responsibility. Although reasonable car warranties, makes no representations, a	lity of information herein for the purchaser's purpore has been taken in the preparation of such information assumes no responsibility as to the accuracy or purpose or for consequences of its use.	ation, Genium Group, Inc. extends no

54/60

(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification

Material Name: o-Xylene **CAS Number:** 95-47-6

Chemical Formula: C_oH₁₀

Structural Chemical Formula: C₆H₄(CH₂)₂

EINECS Number: 202-422-2 ACX Number: X1001538-4

Synonyms: BENZENE,1,2-DIMETHYL-; 1,2-DIMETHYLBENZENE; O-DIMETHYLBENZENE; O-METHYLTOLUENE; 1,2-XYLENE; O-XYLENE; 2-XYLENE; O-XYLENE; O-XYLENE; O-XYLOL General Use: Used as a general solvent in the manufacture of paints, varnishes, lacquers, thinners, inks, rubber,

TWA: 100 ppm, 435 mg/m^3 ;

STEL: 150 ppm, 655 mg/m³.

pesticides, herbicides and paint strippers.

Section 2 - Composition / Information on Ingredients

Name **CAS** % 95-47-6 >95 o-xylene

OSHA PEL

TWA: 100 ppm; 435 mg/m³.

OSHA PEL Vacated 1989 Limits TWA: 100 ppm; 435 mg/m³; STEL: 150 ppm; 655 mg/m³.

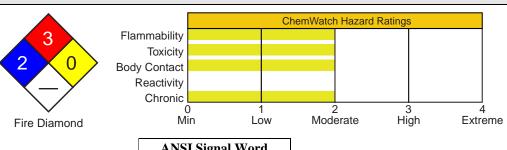
TWA: 100 ppm; STEL: 150 ppm.

ACGIH TLV

IDLH Level 900 ppm.

NIOSH REL

Section 3 - Hazards Identification





DFG (Germany) MAK

TWA: 100 ppm; PEAK: 200 ppm;

ANSI Signal Word Warning!



☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, sweet smelling liquid. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, nausea, drowsiness. Chronic Effects: dermatitis, kidney/liver/peripheral nerve damage. May cause birth defects based on animal data. Flammable.

Potential Health Effects

Target Organs: central nervous system (CNS), eyes, gastrointestinal (GI) tract, liver, kidneys, skin **Primary Entry Routes:** inhalation, skin absorption (slight), eye contact, ingestion Acute Effects

Inhalation: Xylene is a central nervous system depressant. The vapor is discomforting to the upper respiratory tract and may be harmful if inhaled. Inhalation hazard is increased at higher temperatures.

Toxic effects are increased by consumption of alcohol.

Acute effects from inhalation of high concentrations of 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 solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Headache, fatigue, lassitude, irritability and gastrointestinal disturbances (e.g., nausea, anorexia and flatulence) are the most common symptoms of xylene overexposure. Injury to the heart, liver, kidneys and nervous system has also been noted among workers. Transient memory loss, renal impairment, temporary confusion and some evidence of disturbance of liver function was reported in three workers overcome by gross exposure to xylene (10000 ppm). One worker died and autopsy revealed pulmonary congestion, edema, and focal alveolar hemorrhage.

Volunteers inhaling xylene at 100 ppm for 5 to 6 hours showed changes in manual coordination, reaction time and slight ataxia. Tolerance developed during the workweek but was lost over the weekend. Physical exercise may antagonize this effect. Xylene body burden in humans exposed to 100 or 200 ppm xylene in air depends on the amount of body fat with 4% to 8% of total absorbed xylene accumulating in human adipose tissues.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration. The vapor is highly discomforting to the eyes.

Corneal changes have been reported in furniture polishers exposed to xylene.

Skin: The liquid is highly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis and it is absorbed by the skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid is highly discomforting and toxic if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Small excess risks of spontaneous abortion and congenital malformation was reported among women exposed to xylene in the first trimester of pregnancy. In all cases however the women had also been exposed to other substances. Evaluation of workers chronically exposed to xylene has demonstrated a lack of genotoxicity. Exposure to xylene has been associated with increased risks of hemopoietic malignancies but, again simultaneous exposure to other substances (including benzene) complicate the picture. A long-term gavage study of mixed xylenes (containing 17% ethyl benzene) found no evidence of carcinogenic activity in rats and mice of either sex.

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.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to xylene:

1.Gastrointestinal absorption is significant with ingestions.

For ingestions exceeding 1-2 mL (xylene)/kg, intubation and lavage with cuffed endotracheal tube is recommended. The use of charcoal and cathartics is equivocal.

- 2. Pulmonary absorption is rapid with about 60-65% retained at rest.
- 3. Primary threat to life from ingestion and/or inhalation is respiratory failure.
- 4. 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.



- 5. 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.
- 6. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
- 7. 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.

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u> <u>Index</u> <u>Sampling Time</u> <u>Comments</u>

Methylhippuric 1.5 gm/gm End of shift

acids in urine creatinine

2 mg/min Last 4 hrs of shift.

Section 5 - Fire-Fighting Measures

Flash Point: 32 °C Closed Cup **Autoignition Temperature:** 463 °C

LEL: 1.0% v/v **UEL:** 7% v/v

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations

permit), carbon dioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are

flammable.

Moderate fire hazard when exposed to heat or flame.

Vapor forms an explosive mixture with air.

Moderate explosion hazard when exposed to heat or flame.

Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion or decomposition leading to violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

Other combustion products include carbon dioxide (CO₂).

Fire Incompatibility: Avoid contamination with strong oxidizing agents 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 breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If safe, switch off electrical equipment until vapor fire hazard removed.

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.

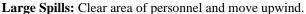
Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.



Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.





Fire Diamond



If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.

Wear protective clothing when risk of overexposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights or ignition sources.

Avoid generation of static electricity. DO NOT use plastic buckets. Ground all lines and equipment. Use spark-free tools when handling.

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.

Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Plastic containers may only be used if approved for flammable liquids.

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.

CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in specific circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage areas.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eves: 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: Barrier cream with polyethylene gloves; Butyl rubber gloves or Neoprene gloves or PVC gloves.

Safety footwear.

Do NOT use this product to clean the skin.

Other: Overalls. Impervious protective clothing.

Eyewash unit.

Ensure there is ready access to an emergency shower.

Glove Selection Index:

PVA Best selection VITON Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless flammable liquid with aromatic odor. Miscible in most organic solvents.

Odor threshold: 0.2 to 2 ppm.

Physical State: Liquid

Vapor Pressure (kPa): 0.5 at 15 °C

Vapor Density (Air=1): 3.66 at 15 °C Formula Weight: 106.18

Specific Gravity (H₂O=1, at 4 $^{\circ}$ C): 0.87 at 15 $^{\circ}$ C

Evaporation Rate: 0.7 Bu Ac=1

pH (1% Solution): Not applicable.

pH: Not applicable

Boiling Point: 144.4 °C (292 °F) at 760 mm Hg

Freezing/Melting Point: -25 °C (-13 °F) Volatile Component (% Vol): 100 Water Solubility: 0.02% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur. **Storage Incompatibilities:** Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity

Inhalation (human) LC_{Lo}: 6125 ppm/12h Intraperitoneal (mouse) LD_{so}: 1364 mg/kg Paternal effects recorded.

Irritation

Nil reported

See RTECS ZE 2450000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Most is released into the atmosphere where it may photochemically degrade by reaction with hydroxyl radicals (half-life 1.5-15 hr). The dominant removal process in water is volatilization. It is moderately mobile in soil and may leach into groundwater where it has been known to be detectable for several years, although there is some evidence that it biodegrades in both soil and groundwater. Bioconcentration is not expected to be significant.

Ecotoxicity: LC₅₀ Poecilia reticulata (guppy) 35 ppm/7 days /Conditions of bioassay not specified; LC₅₀ Morone saxatilis (bass) 11.0 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Cancer magister (crab larvae stage I) 6 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Crangon franciscorum (shrimp) 1.3 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.1 x10⁻³

BCF: eels 1.33

Biochemical Oxygen Demand (BOD): 0 lb/lb, 5 days **Octanol/Water Partition Coefficient:** $\log K_{ow} = 3.12$ **Soil Sorption Partition Coefficient:** $K_{oc} = soils$ 48 to 68

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in 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: Xylenes

ID: UN1307

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:

Shipping Name and Description: Xylenes

ID: UN1307

Hazard Class: 3 - Flammable and combustible liquid

Packing Group: III - Minor Danger

Symbols:

Label Codes: 3 - Flammable Liquid **Special Provisions:** B1, IB3, T2, TP1

Packaging: Exceptions: 150 Non-bulk: 203 Bulk: 242

Quantity Limitations: Passenger aircraft/rail: 60 L Cargo aircraft only: 220 L

Vessel Stowage: Location: A Other:



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001 1000 lb (453.5 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.

54/60



(518) 842-4111

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification

CAS Number: 108-88-3

Material Name: Toluene Chemical Formula: C₇H₆

Structural Chemical Formula: C₆H₅CH₃

EINECS Number: 203-625-9 **ACX Number:** X1001512-0

Synonyms: ANTISAL 1A; BENZENE, METHYL-; CP 25; METHACIDE; METHANE, PHENYL-; METHYL BENZENE; METHYL BENZOL; METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; PHENYLMETHANE; TOLUEN; TOLUEN; TOLUEN; TOLUEN; TOLUENO; TOLUOL; TOLUOLO; TOLU-SOL

General Use: Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners;

in gasoline and aviation fuel. Used in the manufacture of chemicals, dyes, explosives, benzoic acid.

Some grades of toluene may contain traces of xylene and benzene.

Odor threshold: 2 ppm approx. Odor is not a reliable warning property due to olfactory fatigue.

Section 2 - Composition / Information on Ingredients

Name CAS % toluene 108-88-3 > 99.5

OSHA PEL

TWA: 200 ppm; Ceiling: 300 ppm; 500 ppm, 10-minute maximum

peak

OSHA PEL Vacated 1989 Limits

TWA: 100 ppm; 375 mg/m³; STEL: 150 ppm; 560 mg/m³.

ACGIH TLV TWA: 50 ppm; skin.

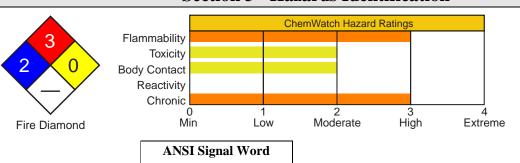
NIOSH REL

TWA: 100 ppm, 375 mg/m³; STEL: 150 ppm, 560 mg/m³.

IDLH Level

500 ppm.

Section 3 - Hazards Identification





DFG (Germany) MAK

skin.

TWA: 50 ppm; PEAK: 200 ppm;

Flammable

Colorless liquid; sickly, sweet odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: weakness, headache, dizziness, confusion, insomnia. Chronic Effects: liver/kidney damage, may cause birth defects. Flammable.

Potential Health Effects

Target Organs: Skin, liver, kidneys, central nervous system. **Primary Entry Routes:** Inhalation, skin contact/absorbtion.

Acute Effects

Inhalation: The vapor is highly discomforting to the upper respiratory tract.

Danger!

Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high concentrations of 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 solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

Eye: The liquid produces a high level of eye discomfort 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 vapor is discomforting to the eyes if exposure is prolonged.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis and it is absorbed by skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

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.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Chronic toluene habituation occurs following intentional abuse (glue-sniffing) or from occupational exposure. Ataxia, incoordination and tremors of the hands and feet (as a consequence of diffuse cerebral atrophy), headache, abnormal speech, transient memory loss, convulsions, coma, drowsiness, reduced color perception, frank blindness, nystagmus (rapid, involuntary eye-movements), decreased hearing leading to deafness and mild dementia have all been associated with chronic abuse.

Peripheral nerve damage, encephalopathy, giant axonopathy, electrolyte disturbances in the cerebrospinal fluid and abnormal computer tomographic (CT) scans are common amongst toluene addicts. Although toluene abuse has been linked with kidney disease, this does not commonly appear in cases of occupational toluene exposures. Cardiac and hematological toxicity are however associated with chronic toluene exposure. Cardiac arrhythmia, multifocal and premature ventricular contractions and supraventricular tachycardia are present in 20% of patients who abused toluene-containing paints.

Previous suggestions that chronic toluene inhalation produced human peripheral neuropathy have largely been discounted. However central nervous system (CNS) depression is well documented where blood toluene levels exceed 2.2 mg%. Toluene abusers can achieve transient circulating concentrations of 6.5 mg%. Amongst workers exposed for a median time of 29 years to toluene no subacute effects on neurasthenic complaints and pyschometric test results could be established.

The prenatal toxicity of very high toluene concentrations has been documented for several animal species and man. Malformations indicative of specific teratogenicity have not generally been found. The toxicity described in the literature takes the form of embryo death or delayed fetal growth and delayed skeletal system development. Permanent damage of children has been seen only when mothers had suffered from chronic intoxication as a result of "sniffing".

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

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: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.



Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Following acute or short-term repeated exposures to toluene:

- 1. Toluene is absorbed across to alveolar barrier, the blood/air mixture being 11.2/15.6 (at 37 °C) The order of toluene, in expired breath, is of the order of 18 ppm following sustained exposure to 100 ppm.
- The tissue/blood proportion is 1/3 except in adipose where the proportion is 8/10.
- 2.Metabolism by microsomal mono-oxygenation, results in the production of hippuric acid. This may be detected in the urine in amounts between 0.5 and 2.5 g/24hr which represents, on average 0.8 gm/gm of creatinine.

The biological half life of hippuric acid is in the order of 1-2 hours.

- 3. Primary threat to life from ingestion and/or inhalation is respiratory failure.
- 4. 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 (pO₂ <50 mm Hg or pCO₃ >50 mm Hg) should be intubated.
- 5.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.
- 6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
- 7. 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.

8.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant Hippuric acid in urine	Index 2.5 gm/gm creatinine	Sampling Time End of shift Last 4 hrs of shift	Comments B,NS
Toluene in venous blood	1 mg/L	End of shift	SQ
Toluene in		End of shift	SQ

NS: Non-specific determinant; also observed after exposure to other material

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: 4 °C Closed Cup **Autoignition Temperature:** 480 °C

LEL: 1.2% v/v **UEL:** 7.1% v/v

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

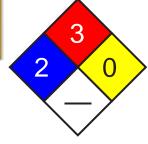
Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO) and carbon dioxide (CO₂).





Fire Diamond

Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.

Nitric acid with toluene, produces nitrated compounds which are explosive.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control the 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 protective location.

If safe to do so, remove containers from path of fire.

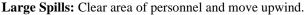
Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.



Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

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.

Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.

Plastic containers may only be used if approved for flammable liquid.

Check that containers are clearly labeled and free from leaks.

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.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in special circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.

Provide adequate ventilation in warehouses and enclosed storage areas.

See

DOT

ERG

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; 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: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:

Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Half Mask

Rest selection

Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

Other: Overalls. Barrier cream. Eyewash unit.

Glove Selection Index:

PF/FVAI /PF

FE/EVAL/FE	. Best selection
VITON/CHLOROBUTYL	. Best selection
VITON	. Best selection
PVA	. Best selection
TEFLON	. Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 2-PLY	. Poor to dangerous choice for other than short-term immersion
CPE	. Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE	. Poor to dangerous choice for other than short-term immersion
SARANEX-23	. Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	. Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	. Poor to dangerous choice for other than short-term immersion
NITRILE	. Poor to dangerous choice for other than short-term immersion
BUTYL	. Poor to dangerous choice for other than short-term immersion
PVC	. Poor to dangerous choice for other than short-term immersion
NEOPRENE	. Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with a strong aromatic odor; floats on water. Mixes with

most organic solvents. **Physical State:** Liquid

Versen December (I-De), 2 02 et 20 0C

Vapor Pressure (kPa): 2.93 at 20 °C Vapor Density (Air=1): 3.2

Formula Weight: 92.14

Specific Gravity (H₂O=1, at $4 \,^{\circ}$ C): 0.87 at 20 $^{\circ}$ C

Evaporation Rate: 2.4 (BuAc=1)

pH: Not applicable

pH (1% Solution): Not applicable.

Boiling Point: 111 °C (232 °F) at 760 mm Hg **Freezing/Melting Point:** -95 °C (-139 °F)

Volatile Component (% Vol): 100

Water Solubility: < 1 mg/mL at 18 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur. **Storage Incompatibilities:** Segregate from strong oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo} : 50 mg/kg Oral (rat) LD_{so} : 636 mg/kg Inhalation (human) TC_{Lo} : 100 ppm Inhalation (man) TC_{Lo} : 200 ppm Inhalation (rat) LC_{so} : > 26700 ppm/1h Dermal (rabbit) LD_{so} : 12124 mg/kg Reproductive effector in rats

Irritation

Skin (rabbit): 20 mg/24h-moderate Skin (rabbit): 500 mg - moderate Eye (rabbit): 0.87 mg - mild Eye (rabbit): 2 mg/24h - SEVERE Eye (rabbit): 100 mg/30sec - mild See RTECS XS 5250000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. It will not significantly hydrolyze in soil or water under normal environmental conditions. If released into water, its concentration will decrease due to evaporation and biodegradation. This removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

Ecotoxicity: LC₅₀ Aedes aegypti-4th instar (mosquito larvae) 22 mg/l /Conditions of bioassay not specified; LC₅₀ Cyprinodon variegatus (sheepshead minnow) 277-485 mg/l 96 hr /Conditions of bioassay not specified; LC₅₀ Calandra granaria (grain weevil) 210 mg/l /in air; LC₅₀ Cancer magister (crab larvae stage I) 28 ppm/96 hr /Conditions of bioassay not specified; LC₅₀ Crangon franciscorum (shrimp) 4.3 ppm 96 hr /Conditions of bioassay not specified; LC₅₀ Artemia salina (brine shrimp) 33 mg/l 24 hr /Conditions of bioassay not specified; LC₅₀ Morone saxatilis (striped bass) 7.3 mg/l 96 hr /Conditions of bioassay not specified; LC₅₀ Pimephales promelas (fathead minnows) 55-72 mg/l (embryos), 25-36 mg/l (1-day posthatch protolarvae), and 26-31 mg/l (30-day-old minnows)/ 96 hour /Conditions of bioassay not specified

Henry's Law Constant: 0.0067

BCF: eels 13.2

Biochemical Oxygen Demand (BOD): 0%, 5 days **Octanol/Water Partition Coefficient:** $\log K_{ow} = 2.69$ **Soil Sorption Partition Coefficient:** $K_{oc} = \text{silty loam } 37$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Toluene

ID: UN1294

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: Listed U220 Toxic Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a)

1000 lb (453.5 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.



54/60

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification

Material Name: Xylene CAS Number: 1330-20-7

Chemical Formula: C_sH₁₀

Structural Chemical Formula: C₆H₄(CH₃)₂

EINECS Number: 215-535-7 **ACX Number:** X1001166-8

Synonyms: BENZENE, DIMETHYL-; COMPONENT 1 (83%): XYLENES; COMPONENT 2 (17%): ETHYL BENZENE; DIMETHYLBENZENE; DIMETHYLBENZENES; EPA PESTICIDE CHEMICAL CODE 086802; KSYLEN; METHYL TOLUENE; METHYLTOLUENE; VIOLET 3; XILOLI; XYLENE; XYLENEN; XYLOL;

XYLOLE

General Use: A strong solvent for general use in the manufacture of paints, varnishes, lacquers, thinners, inks, rubber, pesticides, herbicides and paint strippers.

Section 2 - Composition / Information on Ingredients

Name xylene **CAS** % 1330-20-7 > 95

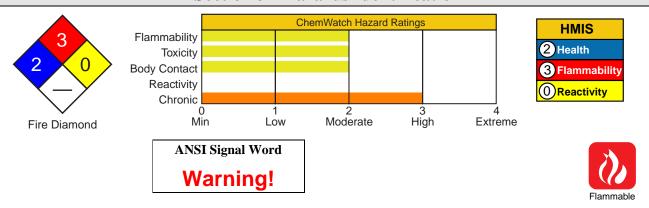
OSHA PEL NIOSH REL DFG (Germany) MAK

TWA: 100 ppm; 435 mg/m³. TWA: 100 ppm, 435 mg/m³; TWA: 100 ppm; PEAK: 200 ppm;

ACGIH TLV STEL: 150 ppm, 655 mg/m³. skin

TWA: 100 ppm; STEL: 150 ppm.

Section 3 - Hazards Identification



፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟ Emergency Overview ፟፟፟፟፟፟፟፟፟፟፟፟፟፟፟

Clear, sweet smelling liquid. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, nausea, drowsiness. Chronic Effects: dermatitis, kidney/liver/peripheral nerve damage. May cause birth defects (animal data). Flammable.

Potential Health Effects

Target Organs: central nervous system (CNS), eyes, gastrointestinal (GI) tract, liver, kidneys, skin **Primary Entry Routes:** inhalation, skin absorption (slight), eye contact, ingestion

Acute Effects

Inhalation: Xylene is a central nervous system depressant. The vapor is discomforting to the upper respiratory tract and may be harmful if inhaled.

Inhalation hazard is increased at higher temperatures.

Toxic effects are increased by consumption of alcohol.

Acute effects from inhalation of high concentrations of 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 solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Headache, fatigue, lassitude, irritability and gastrointestinal disturbances (e.g., nausea, anorexia and flatulence) are the most common symptoms of xylene overexposure. Injury to the heart, liver, kidneys and nervous system has also been noted among workers. Transient memory loss, renal impairment, temporary confusion and some evidence of disturbance of liver function was reported in three workers overcome by gross exposure to xylene (10000 ppm). One worker died and autopsy revealed pulmonary congestion, edema, and focal alveolar hemorrhage.

Volunteers inhaling xylene at 100 ppm for 5 to 6 hours showed changes in manual coordination, reaction time and slight ataxia. Tolerance developed during the workweek but was lost over the weekend. Physical exercise may antagonize this effect. Xylene body burden in humans exposed to 100 or 200 ppm xylene in air depends on the amount of body fat with 4% to 8% of total absorbed xylene accumulating in human adipose tissues.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration. The vapor is highly discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Corneal changes have been reported in furniture polishers exposed to xylene.

Skin: The liquid is highly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis and it is absorbed by the skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

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.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Small excess risks of spontaneous abortion and congenital malformation was reported amongst women exposed to xylene in the first trimester of pregnancy. In all cases however the women had also been exposed to other substances. Evaluation of workers chronically exposed to xylene has demonstrated a lack of genotoxicity. Exposure to xylene has been associated with increased risks of hemopoietic malignancies but, again simultaneous exposure to other substances (including benzene) complicate the picture. A long-term gavage study of mixed xylenes (containing 17% ethyl benzene) found no evidence of carcinogenic activity in rats and mice of either sex.

Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

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.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to xylene:

1.Gastrointestinal absorption is significant with ingestions.

For ingestions exceeding 1-2 mL (xylene)/kg, intubation and lavage with cuffed endotracheal tube is recommended. The use of charcoal and cathartics is equivocal.

2. Pulmonary absorption is rapid with about 60-65% retained at rest.



- 3. Primary threat to life from ingestion and/or inhalation is respiratory failure.
- 4.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.
- 5.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.
- 6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
- 7. 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.

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u> <u>Index</u> <u>Sampling Time</u> <u>Comments</u>

Methylhippuric 1.5 gm/gm End of shift

acids in urine creatinine

2 mg/min Last 4 hrs of shift.

Section 5 - Fire-Fighting Measures

Flash Point: 25.6 °C

Autoignition Temperature: 241 °C

LEL: 1.0% v/v **UEL:** 7.0% v/v

Extinguishing Media: Alcohol stable foam; dry chemical powder; carbon

lioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.

Moderate fire hazard when exposed to heat or flame.

Vapor forms an explosive mixture with air.

Moderate explosion hazard when exposed to heat or flame.

Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion or decomposition leading to violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO).

Other combustion products include carbon dioxide (CO₂).

Fire Incompatibility: Avoid contamination with strong oxidizing agents 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 breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If safe, switch off electrical equipment until vapor fire hazard removed.

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.

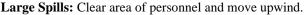
Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.



Contact fire department and tell them location and nature of hazard.

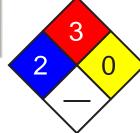
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.





Fire Diamond



Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.

Wear protective clothing when risk of overexposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights or ignition sources.

Avoid generation of static electricity. DO NOT use plastic buckets.

Ground all lines and equipment. Use spark-free tools when handling.

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.

Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Plastic containers may only be used if approved for flammable liquids.

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.

CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in specific circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage areas.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

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: Barrier cream with polyethylene gloves; Butyl rubber gloves or Neoprene gloves or PVC gloves.

Safety footwear.

Do NOT use this product to clean the skin.

Other: Overalls. Impervious protective clothing.

Eyewash unit.

Ensure there is ready access to an emergency shower.

Glove Selection Index:

Giove Selection maca:	
PE/EVAL/PE	. Best selection
PVA	. Best selection
VITON	. Best selection
TEFLON	. Best selection
PVDC/PE/PVDC	. Poor to dangerous choice for other than short-term immersion
NATURAL+NEOPRENE	. Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	. Poor to dangerous choice for other than short-term immersion
HYPALON	. Poor to dangerous choice for other than short-term immersion
NAT+NEOPR+NITRILE	. Poor to dangerous choice for other than short-term immersion
BUTYL	. Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE	. Poor to dangerous choice for other than short-term immersion
NITRILE	. Poor to dangerous choice for other than short-term immersion
NEOPRENE	. Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear colorless flammable liquid with a strong aromatic odor; floats on water. Mixes with

most organic solvents.

Physical State: Liquid pH: Not applicable

Vapor Pressure (kPa): 0.5 at 15 °C **pH (1% Solution):** Not applicable.

Vapor Density (Air=1): 3.66 at 15 °C **Boiling Point:** 137 °C (279 °F) to 140 °C (284 °F) **Freezing/Melting Point:** -47 °C (-53 °F)

Specific Gravity (**H₂O=1**, at 4 °C): 0.87 at 15 °C **Evaporation Rate:** 0.7 Bu Ac=1 **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 storage with oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 50 mg/kg Oral (rat) LD₅₀: 4300 mg/kg Inhalation (human) TC_{Lo}: 200 ppm Inhalation (man) LC_{Lo}: 10000 ppm/6h Inhalation (rat) LC₅₀: 5000 ppm/4h Reproductive effector in rats

Irritation

Skin (rabbit):500 mg/24h moderate Eye (human): 200 ppm irritant Eye (rabbit): 87 mg mild Eye (rabbit): 5 mg/24h SEVERE See RTECS ZE 2100000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Most of the xylenes are released into the atmosphere where they may photochemically degrade by reaction with hydroxyl radicals (half-life 1-18 hr). The dominant removal process in water is volatilization. Xylenes are moderately mobile in soil and may leach into groundwater where they are known to persist for several years, despite some evidence that they biodegrade in both soil and groundwater. Bioconcentration is not expected to be significant.

Ecotoxicity: LC₅₀ Rainbow trout 13.5 mg/l/96 hr /Conditions of bioassay not specified; LD₅₀ Goldfish 13 mg/l/24 hr

/Conditions of bioassay not specified

Henry's Law Constant: 0.22 BCF: estimated at 2.14 to 2.20

Octanol/Water Partition Coefficient: $log K_{ow} = 3.12 to 3.20$

Soil Sorption Partition Coefficient: $K_{oc} = 48 \text{ to } 68$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in 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: Xylenes

ID: UN1307

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:

Shipping Name and Description: Xylenes

ID: UN1307

Hazard Class: 3 - Flammable and combustible liquid

Packing Group: III - Minor Danger

Symbols:

Label Codes: 3 - Flammable Liquid **Special Provisions:** B1, IB3, T2, TP1

Packaging: Exceptions: 150 Non-bulk: 203 Bulk: 242

Quantity Limitations: Passenger aircraft/rail: 60 L Cargo aircraft only: 220 L

Vessel Stowage: Location: A Other:

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U239 Ignitable Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001 100 lb (45.35 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.



Appendix F

Emergency Action Plan and Route to Hospital



Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant

EMERGENCY ACTION PLAN

Emergency Contact List

Emergency Contact	Phone
Local Police – Geneva Police Department	911 (if appropriate) and 315.789.1111
Local Ambulance – Finger Lakes Ambulance EMS	911 (if appropriate) and 585.396.4585
Local Fire Department – Geneva Fire Department	911 (if appropriate) and 315.789.6305
Local Hospital – Geneva General Hospital	315.787.4000
Local Weather Data –	www.weather.com www.wunderground.com
Poison Control	800.332.3073
National Response Center (all spills in reportable quantities)	800.424.8802
U.S. Coast Guard (spills to water)	800.424.8802
Project Manager – Jason Brien	315.671.9114
Site Manager – TBD	
H&S Manager – Charles Webster	315.671.9297
Client Contact – John Ruspantini	607.762.8787

Environmental Health and Safety Plan

Wadsworth Street Former Manufactured Gas Plant

List the Emergency Notification Procedure for the project:

Step 1:Notify appropriate medical personnel Step 2:Notify appropriate ARCADIS personnel Step 3:Notify appropriate RG&E personnel

If emergency attention is not needed but professional medical attention is necessary, the employee will be taken to (see hospital route):

Medical Facility: Geneva General Hospital Address: 196 North Street Geneva, New York

Phone Number: 315.787.4000

Emergency Supplies and Equipment List

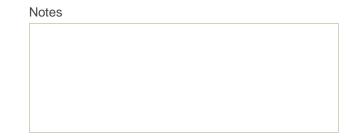
Emergency Supplies and Equipment (check all that apply)	Location on Project Site
☐ First Aid Kit (type):	Field Vehicle
	Field Vehicle
	Field Vehicle
☐ Walkie Talkies	
	Field Vehicle
☐ Eye Wash/Quick Drench Station	
☐ Eye Wash Bottle	
☐ Wash and Dry Towelettes	
Sunscreen (SPF 15 or higher)	Field Vehicle
☐ Insect Repellant	
☐ Chemical Spill Kit	
☐ Other (specify):	





Trip to 196 North St

Geneva, NY 14456-1651 0.81 miles - about 2 minutes





[92-199] Wadsworth St, Geneva, NY 14456

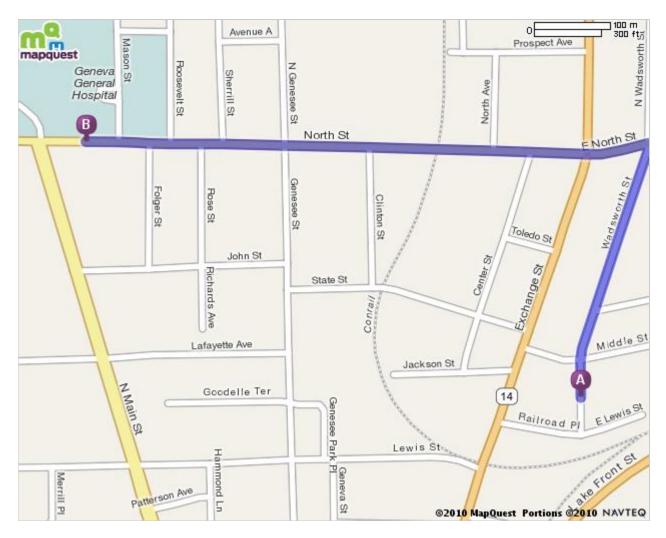
START	1. Start out going NORTH on WADSWORTH ST toward MIDDLE ST .	go 0.3 mi
•	2. Turn LEFT onto E NORTH ST .	go 0.5 mi
END	3. 196 NORTH ST is on the RIGHT.	go 0.0 mi



196 North St, Geneva, NY 14456-1651

Total Travel Estimate: 0.81 miles - about 2 minutes

Route Map Hide



All rights reserved. Use subject to License/Copyright Map Legend

Directions and maps are informational only. We make no warranties on the accuracy of their content, road conditions or route usability or expeditiousness. You assume all risk of use. MapQuest and its suppliers shall not be liable to you for any loss or delay resulting from your use of MapQuest. Your use of MapQuest means you agree to our Terms of Use

Appendix D

Community Air Monitoring Plan



NYSEG

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

Geneva, New York

July 2010

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

Prepared for: NYSEG

Prepared by: ARCADIS 6723 Towpath Road P.O. Box 66 Syracuse New York 13214-0066 Tel 315.446.9120 Fax 315.449.0017

Our Ref.: B0013099

Date: July 2010

Table of Contents

1.	Introdu	uction	1
	1.1	Site Location and Description	1
	1.2	Site History	2
	1.3	Summary of PDI Activities	2
	1.4	Potential Air Emissions Related to PDI Activities	2
	1.5	Air/Odor Emissions and Control Measures	3
2.	Air Mo	nitoring Procedures	4
	2.1	Monitoring Location Selection	4
	2.2	VOC Monitoring	4
	2.3	PM ₁₀ Monitoring	5
	2.4	Action Levels	5
		2.4.1 Action Levels for VOCs	5
		2.4.2 Action Levels for PM ₁₀	6
	2.5	Meteorological Monitoring	7
	2.6	Instrument Calibration	7
3.	Monito	ring Schedule and Data Collection and Reporting	8
	3.1	Monitoring Schedule	8
	3.2	Data Collection and Reporting	8
Ex	hibits		
	1	Generic Community Air Monitoring Plan	
	II	NYSDEC TAGM 4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	
	Ш	Specifications for Community Air Monitoring Equipment	

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

1. Introduction

This Community Air Monitoring Plan (CAMP) has been prepared by ARCADIS on behalf of NYSEG to support the performance of pre-design investigation (PDI) activities to be conducted at the NYSEG Wadsworth Street Former Manufactured Gas Plant (MGP) Site located in Geneva, New York (Site No. 8-35-015). Details related to the proposed PDI activities are presented in the July 2010 Remedial Design Work Plan (RDWP) (ARCADIS, 2010).

This CAMP fulfills the general requirements set forth by the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan* (GCAMP) dated December 2002 (included as Exhibit I), and the New York State Department of Environmental Conservation's (NYSDEC's) *Technical and Administrative Guidance Memorandum* (TAGM) 4031, "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites" (included as Exhibit II). The intent of this CAMP is to provide a measure of protection for downwind communities from potential airborne releases of constituents of concern during subsurface work activities at the site. As such, this CAMP identifies potential air emissions, and describes air monitoring procedures, monitoring schedule, data collection, and reporting requirements for the PDI activities.

1.1 Site Location and Description

The site is located in the city of Geneva, near the northwestern shore of Seneca Lake in eastern Ontario County, New York. The former MGP site is comprised of a rectangular piece of land that is now located in a mixed commercial and residential area in the east-central part of Geneva, New York. Seneca Lake is located approximately 900 feet southeast of the site. The site is bordered by Wadsworth Street to the east, a railroad (Finger Lakes Railway) to the south, a restaurant to the west and residential properties to the north. A dry cleaner is located northeast of the site, on the east side of Wadsworth Street. Railroad Place intersects Wadsworth Street and bisects the site. A gas holder (Gas Holder 1) and coal shed where formerly located in Railroad Place. Several MGP structures formerly existed at the current location of the City of Geneva's Public Safety Building (PSB) south of Railroad Place.

The portion of the former MGP site located north of Railroad Place is currently owned by NYSEG, while the area south of Railroad Place is owned by the City of Geneva. The area owned by NYSEG includes a grass-covered area in the eastern portion of the property and an asphalt parking lot comprises the western portion of the property. A

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

restaurant on Railroad Place leases the parking area from NYSEG. A gravel parking area is located in the northeast portion of NYSEG's property and is used by residential property owners. A NYSEG gas regulator shed is located near the intersection of Railroad Place and Wadsworth Street. The City of Geneva's PSB consists of office space and an attached pole barn structure. A large parking lot used by PSB employees is located west of the PSB. A railroad is located immediately south of the PSB.

1.2 Site History

The gas plant was constructed in 1853 and included a retort and condenser house, purification building (including lime room, ammonia tank and cistern) coal shed and one gas holder (Gas Holder 1). A second gas holder (Gas Holder 2) was constructed in approximately 1900 in the northwest portion of the site. The majority of the buildings/structures associated with the gas plant were demolished between 1903 and 1909; the only remaining structures were the second gas holder, tool house and meter house. The remaining holder was demolished between 1915 and 1925. Between 1925 and 1943, a 500,000-cubic-foot gas holder (Gas Holder 3) and a regulator house were constructed at the site to serve as a storage/distribution facility. This newer holder may have served as a remote distribution holder for the Border City MGP, which was constructed at approximately the same time that the Wadsworth MGP was decommissioned. Gas Holder 3 was demolished sometime after 1946; however, portions of the holder foundation still exist. Railroad Place was constructed through the center of the former MGP site, covering the location of Gas Holder 1.

1.3 Summary of PDI Activities

The proposed PDI activities to be conducted at the site generally include the following:

- installation of a new groundwater monitoring well
- collection of groundwater level measurements
- collection of groundwater samples

Additional details regarding the proposed PDI activities are provided in the RDWP.

1.4 Potential Air Emissions Related to PDI Activities

Certain intrusive PDI activities to be conducted at the site have the potential to generate localized impacts to air quality, including monitoring well installation. Some non-intrusive PDI activities to be conducted may also have the potential to generate

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

impacts to air quality, including collection of groundwater samples and water level measurements.

1.5 Air/Odor Emissions and Control Measures

Air emissions control and fugitive dust suppression techniques will be used during the PDI activities identified above, as necessary, to limit air/odor emissions. Air monitoring for the specific purpose of protecting the community from PDI activity impacts (and verification thereof) will take place during both intrusive and non-intrusive activities.

Odor and dust control measures will be available at the site during the investigation activities and will be used when necessary. Polyethylene sheeting used to control nuisance odors, dust, volatile organic compound (VOC) emissions, as needed. Odor and dust control measures will be implemented based on visual or olfactory observations, and the results of airborne particulate and VOC monitoring (described in Section 2). In event that airborne particulate and VOC monitoring indicates criteria exceedances, all soil cuttings and drummed materials will be covered with polyethylene sheeting and/or drum covers, as appropriate.

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

2. Air Monitoring Procedures

Real-time air monitoring will be implemented during PDI activities for VOCs, and particulate matter less than 10 microns in diameter (PM_{10}). However, particulate monitoring will not be performed, during non-intrusive activities and precipitation events. Upwind and downwind monitoring locations will be determined through visual observation (wind vane, windsock, or similar technique). Monitoring will occur at each sampling location and will include the use of hand-held direct-reading survey instruments.

2.1 Monitoring Location Selection

VOC and PM₁₀ monitoring locations will be determined daily based on visual observation of wind direction. A single upwind location will be selected daily where both VOC and PM₁₀ will be recorded. This upwind location will be established at the start of the workday before PDI activities are initiated. Monitoring activities will continue in a downwind direction throughout the day. If wind direction shifts radically during the workday (i.e., greater than approximately +/- 60 degrees from original upwind direction), new upwind and downwind monitoring locations will be established. Any monitoring location changes will be documented in the field logbook.

2.2 VOC Monitoring

As required by the NYSDOH guidance for community air monitoring, VOCs will be monitored continuously during ground intrusive activities (e.g., monitoring well installation) with instrumentation that is equipped with electronic data-logging capabilities. Because real-time monitors for polycyclic aromatic hydrocarbons (PAHs) are not available, the real-time VOC monitors will also serve as surrogate indicators for emissions (if any) of PAHs during the performance of PDI activities. A real-time VOC monitor equipped with either a photoionization detector (PID) or a flame ionization detector (FID) will be used to conduct the monitoring for VOCs. A MiniRAE 2000 (or equivalent) will be used to conduct the real-time VOC monitoring. Exhibit III provides detailed information on the MiniRAE 2000. All 15-minute readings shall be recorded via the data logging function of the monitoring equipment. All periodic, instantaneous readings, including readings taken to facilitate activity decisions, will be recorded in the field logbook.

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

During non-intrusive PDI activities (e.g., collection of groundwater samples and water level measurements), VOCs will be monitored periodically. Periodic monitoring may include monitoring upon arrival at the sampling location, monitoring while opening a well cap, monitoring during well bailing and/or purging, monitoring at the perimeter of the work area, and/or monitoring prior to leaving a sampling location. However, if a sampling location is near to potentially exposed individuals, VOCs will be monitored continuously during sampling activities at that location. All periodic, instantaneous readings, including readings taken to facilitate activity decisions, will be recorded in the field logbook.

2.3 PM₁₀ Monitoring

As required by the NYSDOH guidance, real-time particulate matter will be monitored continuously during intrusive PDI activities using instrumentation equipped with electronic data-logging capabilities. A MIE DataRAM (or equivalent) will be used to conduct the real-time PM₁₀ monitoring. Exhibit III provides detailed information on the MIE DataRAM. All 15-minute readings shall be recorded via the data logging function of the monitoring equipment. All periodic, instantaneous readings, including readings taken to facilitate activity decisions, will be recorded in the field logbook.

Fugitive dust migration will be visually assessed during all work activities, and reasonable dust suppression techniques will be used during any PDI activities that may generate fugitive dust (see Section 1.5).

2.4 Action Levels

The action levels provided below are to be used to initiate response actions, if necessary, based on real-time monitoring.

2.4.1 Action Levels for VOCs

As outlined in the NYSDOH GCAMP, if the ambient air concentration for total VOCs exceeds 5 parts per million (ppm) above background (upwind location) for the 15-minute average, intrusive PDI activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above background, then intrusive PDI activities can resume with continuous monitoring.

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

If the ambient air concentrations for total VOCs persist at levels in excess of 5 ppm above background but less than 25 ppm above background, intrusive PDI activities will be halted, the source of the elevated VOC concentrations identified, corrective actions to reduce or abate the emissions undertaken, and air monitoring will be continued. Once these actions have been implemented, intrusive PDI activities can resume provided the following two conditions are met:

- The 15-minute average VOC concentrations remain below 5 ppm above background; and
- The VOC level 200 feet downwind of the monitoring location or half the distance to the nearest potential receptor or residential/commercial structure (whichever is less but in no case less than 20 feet) is below 5 ppm over background for the 15-minute average.

If the ambient air concentrations for total VOCs exceed 25 ppm above background, the intrusive PDI activities must cease, and emissions control measures must be implemented.

Periodic monitoring for VOCs is required during non-intrusive activities (e.g., collection of groundwater samples and water level measurements). When these activities are undertaken, ambient direct-reading (instantaneous) VOC data will be collected as described in Section 2.2 above.

2.4.2 Action Levels for PM₁₀

As required by the NYSDOH guidance, if the ambient air concentration for PM_{10} at any one (or more) of the monitoring locations is noted at levels in excess of 100 micrograms per cubic meter ($\mu g/m^3$) above the background (upwind location), or if airborne dust is observed leaving the work area, intrusive PDI activities will be temporarily halted. The source of the elevated PM_{10} concentration is to be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will continue. Work may continue following the implementation of dust suppression techniques provided the PM_{10} levels do not exceed 150 $\mu g/m^3$ above background.

If, after implementation of dust suppression techniques, PM_{10} levels are greater than 150 $\mu g/m^3$ above background, work must be stopped and PDI activities must be reevaluated. Work may only resume provided that the dust suppression measures and

Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

other controls are successful in reducing PM_{10} levels less than 150 $\mu g/m^3$ above background and in preventing visible dust from leaving the work area.

If the ambient air concentration of PM_{10} is 150 $\mu g/m^3$ above background, the intrusive PDI activities must cease and emission control measures must be implemented. The PM_{10} concentrations will be recorded in accordance with Section 2.3 above.

2.5 Meteorological Monitoring

Wind direction is the only meteorological information considered relevant for the PDI activities and CAMP. Meteorological monitoring will be conducted periodically at the site using a windsock, wind vane, or other appropriate equipment. Wind direction will be established at the start of each work day and may be re-established at any time during the work day if a significant shift in wind direction is noted. Wind direction will be recorded in the field activity logbook.

2.6 Instrument Calibration

Calibration of the VOC and PM_{10} instrumentation will occur in accordance with each of the equipment manufacturer's calibration and quality assurance (QA) requirements. The VOC and PM_{10} monitors will be calibrated at least daily, and calibrations will be recorded in the field activity logbook.



Community Air Monitoring Plan

Wadsworth Street Former Manufactured Gas Plant Site

3. Monitoring Schedule and Data Collection and Reporting

The following identifies the monitoring schedule and data collection and reporting requirements.

3.1 Monitoring Schedule

Real-time VOC and PM₁₀ monitoring will be performed continuously throughout the intrusive PDI activities. VOC monitoring will also be performed periodically during non-intrusive PDI activities. Wind direction will be determined at the start of each day and at any other appropriate time during PDI activities.

3.2 Data Collection and Reporting

Air monitoring data will be collected continuously from VOC and PM₁₀ monitors during intrusive PDI activities by an electronic data-logging system. The data management software will be set up so that instantaneous observed readings would be recorded by the electronic data acquisition system and averaged over 15-minute time periods. In addition to the above, VOC readings will be collected periodically during non-intrusive PDI activities. All readings will be recorded and archived for review by NYSDOH and NYSDEC personnel.

Exhibits

Exhibit I

Generic Community Air Monitoring Plan

APPENDIX 1A

New York State Department of Health Generic Community Air Monitoring Plan

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during <u>non-intrusive</u> activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

Exhibit II

NYSDEC TAGM 4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites



То:	Regional Hazardous Waste Remediation Engrs., Bur. Directors & Section Chiefs
From:	Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation (signed)
Subject:	Technical and Administrative Guidance Memorandum Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites
Date:	Oct 27, 1989

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM₁₀); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM ₁₀ is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m³ over a 24-hour averaging time and 50 ug/m³ over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. Guidance

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

- 1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
- Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.
- 3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM₁₀) with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols

Size range: <0.1 to 10 microns

Sensitivity: 0.001 mg/m³ Range: 0.001 to 10 mg/m³

Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or

reference dust

Operating Conditions: Temperature: 0 to 40°C

Humidity: 10 to 99% Relative Humidity

Power: Battery operated with a minimum capacity of eight hours continuous operation

Automatic alarms are suggested.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

- 4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
- 5. The action level will be established at 150 ug/m³ over the integrated period not to exceed 15 minutes. While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of 150 ug/m³ be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.

- 6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential-such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.
- 7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:
 - 1. Applying water on haul roads.
 - 2. Wetting equipment and excavation faces.
 - 3. Spraying water on buckets during excavation and dumping.
 - 4. Hauling materials in properly tarped or watertight containers.
 - 5. Restricting vehicle speeds to 10 mph.
 - 6. Covering excavated areas and material after excavation activity ceases.
 - 7. Reducing the excavation size and/or number of excavations.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet conditions, the chance of exceeding the 150 ug/m³ action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m³ and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require appropriate toxics monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

ARCADIS

Exhibit III

Specifications for Community Air Monitoring Equipment



MiniRAE 2000

Portable Handheld VOC Monitor

The rugged MiniRAE 2000 is the smallest pumped handheld volatile organic compound (VOC) monitor on the market. Its Photoionization Detector's (PID) extended range of 0 to 10,000 ppm makes it an ideal instrument for applications from environmental site surveying to HazMat/ Homeland Security.



Key Features

- Proven PID technology The patented sensor provides a 3-second response up to 10,000 ppm and sets a new standard for resistance to moisture and dirt.
- Wireless communication enabled and certified
- Self-cleaning lamp and sensor The patented self-cleaning lamp and sensor minimize the need for maintenance and calibration.
- The MiniRAE 2000 lamp and sensor can be taken apart in seconds for easy maintenance without tools!
- Measure more chemicals than with any other PID. With over 100 Correction Factors built into the MiniRAE 2000 memory and the largest printed list of Correction Factors in the world (300+), RAE Systems offers the ability to accurately measure more ionizable chemicals than any other PID. When a gas is selected from the MiniRAE 2000's library, the alarm points are automatically loaded into the meter.
- User friendly screens make it easy to use for simple applications and flexible enough for sophisticated operations.
- Drop-in battery When work schedules require putting in more than the 10 hours supplied by the standard NiMH battery, the drop-in alkaline pack supplied with every MiniRAE 2000 lets you finish the job.
- Rugged Rubber Boot The standard rubber boot helps assure that the MiniRAE 2000 survives the bumps and knocks of tough field use.
- Strong, built-in sample pump draws up to 100 feet (30 m) horizontally or vertically.
- · Tough, flexible inlet probe
- Large keys operable with 3 layers of gloves.
- Easy-to-read display with backlight.
- Stores up to 267 hours of data at oneminute intervals for downloading to PC.
- 3-year 10.6 eV lamp warranty

Applications

HazMat/Homeland Security

- Initial PPE (personal protective equipment) assessment
- · Leak detection
- Safety perimeter establishment and maintenance
- Spill delineation
- Decontamination
- Remediation

Industrial Hygiene/Safety

- Confined Space Entry (CSE)
- Indoor Air Quality (IAQ)
- Worker exposure studies

Environmental

- Soil and water headspace analysis
- · Leaking underground storage tanks
- · Perimeter fenceline monitoring
- Fugitive emissions (EPA Method 21)
- Vapor recovery breakthrough
- Landfill monitoring

ver12 04.07









MiniRAE 2000

Specifications*

Detector Specifications

Detector Oper	Silloations		
Size	8.2" L x 3.0" W x 2.0" H (21.8 x 7.62 x 5.0 cm)		
Weight	20 oz with battery pack (553 g) w/o rubber boot		
Sensor	Photoionization sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV UV lamp		
Battery	Rechargeable, external, field-replaceable Nickel-Metal- Hydride (NiMH) battery pack Alkelias better; balder (for 4.5.4.5.4 betteries)		
On anotine Basis d	Alkaline battery holder (for 4 AA batteries)		
Operating Period	10 hours continuous operation		
Display	Large LCD, backlight activated manually, by alarms or by darkness		
Keypad	1 operation and 2 programming keys		
Direct Readout	 VOCs as ppm by volume High and low values STEL and TWA (in hygiene mode) Battery and shut down voltage 		
Alarms	90 dB buzzer and flashing red LED to indicate exceeded preset limits: • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms automatic reset or latching with manual override • Optional plug-in pen size vibration alarm • User adjustable alarm limits		
Calibration	Two-point field calibration of zero and standard reference gas. Calibration memory of 8 calibration gases, alarm limits, span values and calibration date		
Datalogging	267 hours (at one-minute intervals) with date/time. Header information includes monitor serial number, user ID, site ID, date and time		
Sampling Pump	Internal, integrated flow rate of 400 cc/min Sample from 100' (30 m) horizontally or vertically		
Low Flow Alarm	Auto shut-off pump at low flow condition		
Communication	Download data and upload instrument set-up from PC through RS-232 link to serial port. Wireless communication enabled and certified (requires RAELink2 and ProRAE Remote to use)		
Temperature	14° F to 104° F (-10° C to 40° C)		
Humidity	0% to 95% relative humidity (non-condensing)		
EM/RFI	Highly resistant to EMI /RFI. Compliant with EMC Directive 89/336/EEC		
IP-rating	IP-55: protected against dust, protected against low-pressure jets of water from all directions		
Hazardous Area Approval	US and Canada: UL and cUL, Classified for use in Class I, Division 1, Groups A, B, C and D hazardous locations Europe: ATEX II IG EEx ia IIC T4		
Attachment	Durable bright yellow rubber boot w/belt clip & wrist strap		
Warranty	Lifetime on non-consumable components (per RAE Systems Standard Warranty), 3 years for 10.6.V PID lamp, 1 year for pump and battery		

^{*}Specifications are subject to change

ver12_04.07

RAE Systems Inc. 3775 North First Street San Jose, CA 95134 USA raesales@raesystems.com USA/Canada 1-877-723-2878 Europe/Russia +45 8652 5155 Middle East/Australia 971 50 429 1385 China 8610 58858788 Asia +852 2669 0828

Default Sensor Settings**

Gas Monitor (ppm)	Range (ppm)	Resolution Time (T90)	Response
VOCs	0 to 99.9 ppm	0.1 ppm	< 3 sec
	100 to 10,000 ppm	1 ppm	< 3 sec

MiniRAE 2000 and Accessories

Monitor only includes:

- RAE Systems UV lamp: 10.6 eV, 9.8 eV or 11.7 eV as specified
- ProRAE Suite software package for Windows® 98, NT, 2000 and XP
- Computer interface cable
- 5-inch Flex-I-Probe
- · External filter
- Rubber boot with belt clip
- · Alkaline battery adapter
- Tool kit
- · Lamp cleaning kit
- Nickel-Metal-Hydride (NiMH) battery
- 120/230 V AC/DC wall adapter (if specified)
- Operation and maintenance manual

Monitor with accessories kit adds:

- Hard transport case with pre-cut foam padding
- 5 porous metal filters and O-rings
- · Organic vapor zeroing adapter
- · Gas outlet port and tubing

Optional calibration kit adds:

- 10 ppm isobutylene calibration gas, 34L
- · Calibration regulator and flow controller

Optional Guaranteed Cost of Ownership Program:

- 4-year repair and replacement guarantee
- Annual maintenance service

DISTRIBUTED BY:



^{**} Performance based on isobutylene calibration

Product Overview

All these applications in one small unit

- Indoor air quality monitoring
- Walk-through surveys
- Personal exposure monitoring
- Time & motion studies
- Workplace & plant monitoring
- Fixed-point continuous monitoring
- Remediation personal surveillance
- Remote alarming
- Mobile monitoring in vehicles & aircraft
- Toxicology & epidemiology studies
- Emergency response
- Testing air filtration efficiency



personalDataRAM™ Series

Measures airborne particulate concentration in real time

- pDR-1000AN
 For passive air sampling applications
- pDR-1200
 For active air sampling applications



pDR-1000AN Hand-held and fixed-point, real-time aerosol monitor/datalogger

Measure airborne particulate concentration in real-time

The personal DataRAM (pDR-1000AN) measures mass concentrations of dust, smoke, mists, and fumes in real time, and sounds an audible alarm whenever the user-defined level is exceeded. Conventional filter-based monitoring methods cannot indicate dangerous, real-time dust levels. In contrast, the pDR-1000AN alerts you to a problem within seconds, allowing you to take immediate action. With the datalogging enabled, the instrument automatically tags and time stamps the data collected, and stores it for subsequent retrieval, printing, or graphing through a computer.

Highest performance of any realtime personal particulate monitor

With a measurement range from 0.001 to 400 mg/m³ (auto-ranging), and an optical feedback stabilized sensing system, the pDR-1000AN sets the standard for sensitivity, long-term stability and reliability.

The palm-sized pDR-1000AN weighs only 18 oz (0.5 kg) for easy portability and attachment to a belt or a shoulder strap. The absence of any moving parts, such as pumps, motors and valves, and the use of low-power semiconductors housed in a ruggedized case ensures long life and dependable operation.

High correlation with gravimetric measurement

The pDR-1000AN is a lightscattering photometer (i.e., nephelometer) incorporating a pulsed, high output, near-infrared light emitting diode source, a silicon detector/hybrid preamplifier, and collimating optics and a source reference feedback PIN silicon detector. The intensity of the light scattered over the forward angle of 500 to 900 by airborne particles passing through the sensing chamber is linearly proportional to their concentration. This optical configuration produces optimal response to particles in the size range of 0.1-10 µm, achieving high correlation with standard gravimetric measurements of the respirable and thoracic fractions.

Simple zeroing and calibration

The pDR-1000AN arrives practically ready to use after the easy zeroing step. The unit comes gravimetrically calibrated in mg/m³ (NIST traceable) using standard SAE Fine test dust (ISO Fine). Zeroing with particle-free air is accomplished quickly and effectively under field conditions using the zeroing kit included with the instrument. Internal firmware controls an automatic calibration check. To maximize efficiency in the field, gravimetric calibration can be performed by comparison with a filter sampler and programming of the calibration constant.

Standard Accessories

- Universal voltage power supply
- PC communications software
- Zeroing kit
- Belt clip kit
- Instruction manual
- Carrying case
- Signal output cables

Optional Accessories

- Rechargeable battery pack (NiMH)
- Active sampling kit (converts) pDR-1000AN to pDR-1200)
- Portable pump unit
- Shoulder strap
- Remote alarm interface
- Wall mounting bracket



Designed for active particulate monitoring applications

The *personal*DataRam™ (model pDR-1200) performs active sampling applications and aerosol sizing. The pDR-1200 requires a vacuum pump module to perform particle size selective measurements under field conditions. The separate pump (not included) is required for active sampling and aerosol sizing. With optional inlet accessories, the pDR-1200 is excellent for ambient air measurements under variable wind and high humidity conditions. It is ideal for respirable, thoracic, and PM2.5 monitoring, as well as continuous emission and test chamber monitoring. With an isokinetic sampling set, the pDR-1200 can be

used for stack and duct extractive sampling monitoring. Membrane filters can be used to capture particles for particles for subsequent laboratory analysis.

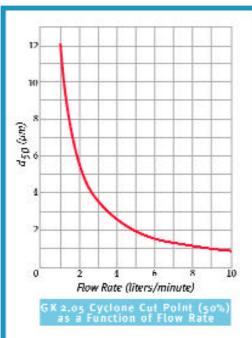
Aerodynamic particle sizing

The pDR-1200 incorporates an optimally designed metal cyclone (BGI Model GK 2.05) or the optional low flow cyclone (BGI Model Triplex SCC1.062-CUST) especially selected for PM2.5 collection at 1.5 LPM.

By operating the pump at specific sampling flow rates, the *p*DR-1200 cyclone preseparator provides precisely defined particle size cuts.

Primary calibration and particle samples by filter collection

An integral filter holder directly downstream of the photometric sensing stage accepts 37 mm filters. The calibration constant of the pDR-1200 is simply adjusted to coincide with the filter-determined concentration. Primary gravimetric calibration of the instrument concentration readout is easily accomplished under actual field conditions by means of this integral filter. Use membrane filters for chemical analysis or concurrent gravimetric measurements.



SCHOOL SECOND SE

pDR-PU Attachable Pump Module

This optional accessory is designed for use with the personal DataRAM Model pDR-1200. It incorporates a dual-chamber diaphragm pump, a volumetric flow sensing, and control unit. The pump module operates from either an optional, rechargeable NiMH battery pack or from AC line current using the power supply/charger supplied with the personal DataRAM. The pDR-PU is designed as a modular unit that can be used in various combinations.

- Flow rate (user adjustable):1 to 4 liters/minute
- Typical Conditions: 2 LPM @ 10 in H₂O (25 mbar) for up to 4 hours
- Maximum Conditions: 2 LPM @ 30 in H₂O
- Precision of constant flow rate control: +2%
- Power: 9 VDC, 200 mA at 4 liters/minute (approximate)
- Dimensions:
 4 in (100 mm) H x
 3.6 in (90 mm) W x
 1.8 in (45 mm) D
- Weight: 1 lb (0.45 kg)

personalDataRAM™ Series

At last, a compact, versatile, real-time aerosol monitor

Specifications

Concentration Measurement Range (auto-ranging)

Referred to gravimetric calibration with SAE Fine test dust (mmd = 2 to 3 mm sg = 2.5, as aerosolized) $0.001 \text{ to } 400 \text{ mg/m}^3$

Scattering Coefficient Range

 1.5×10^{-6} to $0.6 \text{ m}^{-1} \text{(approx)}$ @ lambda = 880 nm

Precision/Repeatability Over 30 Days (2-sigma at constant temperature and full battery voltage)

- ±2% of reading or ±0.005 mg/m3, whichever is larger, for 1 second averaging time
- ±0.5 of reading or ±0.0015 mg/m³, whichever is larger, for 10 second averaging time
- ±0.2% of reading or ±0.0005 mg/m³, whichever is larger, for 60 second averaging time

Accuracy

Referred to gravimetric calibration with SAE Fine test dust (mmd = 2 to 3 mm, sg = 2.5, as aerosolized)

±5% of reading ±precision

Resolution

0.1% of reading or 0.001 mg/m^3 , whichever is larger

Particle Size Range of Maximum Response

0.1 to 10 μm

Flow Rate Range (model pDR-1200)

1-10 liters/min (external pump required)

Aerodynamic Particle Sizing Range

1.0 to 10 µm (pDR-1200 only)

Concentration Display Updating Interval

1 second

About Thermo

Thermo Electron Corporation, the world's leading maker of high-tech instruments, provides instruments, equipment, software, and solutions that help laboratory and industrial customers advance scientific knowledge, enable drug discovery, improve manufacturing

Thermo Electron

27 Forge Parkway
Franklin MA USA 02038
www.thermo.com/ih

1.866.282.0430

+1.508.520.0430 +1.508.520.1460 fax

Concentration Display Averaging Time (user selectable)

1 to 60 seconds

Alarm Level Adjustment Range (user selectable)

Selectable over entire measurement range

Alarm Averaging Time (user selectable)

Real-time (1 to 60 seconds) or STEL (15 minutes)

Datalogging Averaging Periods (user selectable)

1 second to 4 hours

Total Number of Data Points That Can Be Logged in Memory

More than 13,300

Number of Data Tags (data sets)

99 (maximum)

Logged Data

- Each data point: average concentration, time/date, and data point number
- Run summary: overall average and maximum concentrations, time/data of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration, and time/date of occurrence, averaging (logging) period, calibration factor, and tag number

Analog Signal Output

0 to 5 V and 4 to 20 mA, with selectable full scale ranges between 0.1 and 400 mg/m^3

Power

 Internal battery 9 V alkaline, 20 hour run time (typical)

- Internal battery 9 V lithium, 40 hour run time (typical)
- AC source universal voltage adapter (included) 100-250 volts, 50-60 Hz (CE marked)
- Optional battery pack rechargeable
 NiMH, 72 hour run time typical (pDR-BP)

Readout Display

LCD 16 characters (4 mm height) x 2 lines

Serial Interface

RS232, 4800 baud

Computer Requirements

PC compatible, 486 or higher, Windows 95® or higher

Storage Environment

-20°C to 70°C (-4°F to 158°F)

Operating Environment

 -10° C to 50°C (14°F to 122°F), 10 to 95% RH, non-condensing

Dimensions (max external)

153 mm (6.0 in) H x 92 mm (3.6 in) W x 63 mm (2.5 in) D (pDR-1000AN) 160 mm (6.3 in) H x 205 mm (8.1 in) W x 60 mm (2.4in) D (pDR-1200 including cyclone and filter holder)

Weight

0.5 kg (18 oz) (pDR-1000AN) 0.68 kg (24 oz) (pDR-1200)

Approvals

- Intrinsic safety approval by US Mine Safety & Health Administration (MSHA) coal-mining environments containing methane gas (the pDR-PU pump is not approved by MSHA)
- US FCC Rules (Part 15)
- CF certified

processes, and protect people and the environment. With annual revenue exceeding \$2 billion, Thermo is a global leader employing 11,000 people in 30 countries worldwide. The company is based in Waltham, Massachusetts.

LITPERSONALDATARAMSERIES 4.03

