-DRAFT-
REMEDIAL INVESTIGATION WORK PLAN

-FOR-

Polychrome R&D Lab Site

137-145 Alexander Street
Yonkers, Westchester County, New York
BCP SITE ID C360099

Submitted by:

Alex II West, LLC

159 Alexander Street
Yonkers, New York 10701

February 6, 2013

Prepared by:

55 Main Street, 3rd Floor
Yonkers, NY 10701

I, John T. Bolan, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Date: _____

Signature: _____

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

PS&S Engineering Inc. (PS&S) has been retained by Alex II West, LLC to prepare this Remedial Investigation Work Plan (RIWP) to present investigation activities to be implemented at the Polychrome Research and Development (R & D) Lab Site, listed as 137-145 Alexander Street located in Yonkers, Westchester County, New York ("Site").

This RIWP includes details from previous investigations and assessments of the Site, a summary of the Site's history, a description of the Site setting, and the proposed methodologies to further delineate the Areas of Concern (AOCs).

This RIWP was developed in accordance with the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Law (Environmental Conservation Law Article 27 Title 14), Part 375 regulations (December 14, 2006), DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) (May 2010) and Commissioner Policy CP-51: Soil Cleanup Guidance (October 21, 2010).

1.1 Purpose of Investigation Activities

The remedial investigation includes the collection of soil, soil vapor and groundwater samples obtained from soil borings, soil vapor probes, and shallow, intermediate and deep groundwater monitoring wells. The collection of these samples is being performed to support the remediation and redevelopment of the Site, supplement the existing soil and groundwater data, assist in the development of a remedial strategy, and to assess two open NYSDEC spills associated with the Site.

1.2 Previous Investigation Activities

PS&S conducted a Phase I Environmental Site Assessment (ESA) for the Sun Chemical Properties, 137-145 Alexander Street (West Site) and 80-94 Alexander Street (East Site), in November 2006. The Polychrome Manufacturing Site is referred to as the East site and the Polychrome R&D Lab Site is referred to as the West site in the Phase I ESA report.

PS&S also conducted a Limited Phase II Environmental Site Investigation (ESI) for SFC Sun, LLC at the Site in November 2006 to address Recognized Environmental Conditions (RECs) identified by the Phase I ESA. The goal of the ESI was to determine if the RECs resulted in soil and/or groundwater impacts that require additional investigation.

The ESI program included the following activities:

- Surface and subsurface soil sampling,
- Catch basin sediment sampling,
- Groundwater sampling, and
- Soil vapor sampling.

PS&S conducted a Supplemental Phase II ESI (SESI) for SFC Sun, LLC at the Site in November and December 2007 to further investigate the impacts documented during the 2006 Phase II ESI. The goal of the SESI was to further delineate the documented soil and groundwater impacts and support remedial decisions for the redevelopment of the property.

The SESI program included the following activities:

- Surface and subsurface soil sampling, and
- Groundwater sampling.

To further supplement the prior work performed, and determine if even deeper contamination has occurred, PS&S conducted a Limited ESI for the BCP Volunteer, Alex II West, LLC, at the Site in January and February of 2012. The Limited ESI program involved the following activities:

- Deep monitoring well installation to determine if deeper contamination had occurred;
- Additional subsurface soil sampling; and
- Additional groundwater sampling;

The findings of the 2006 Phase I ESA, 2006 Phase II ESI, 2007 Supplemental ESI and 2012 Limited ESI are presented in detail in Section 3.0.

1.3 RIWP Organization

This RIWP describes the investigation actions proposed to further characterize/delineate soil and groundwater conditions at the Site in support of the design of remedial actions needed to redevelop the Site and to assess two open NYSDEC spills associated with the Site.

This RIWP is organized as follows:

- **Section 1.0 – INTRODUCTION:** This section provides a brief summary of the investigation activities and purpose.
- **Section 2.0 – SITE DESCRIPTION:** This section provides a brief description of the location of the Site, the historical operations performed on the Site and a summary of the geology and hydrogeology of the site.
- **Section 3.0 – NATURE AND EXTENT OF SITE CONTAMINATION:** This section of the RIWP provides a summary of the results of the investigation activities, previously conducted on the Site.
- **Section 4.0 – REMEDIAL INVESTIGATION PROGRAM:** This section summarizes the objectives of the proposed investigation activities to be implemented on the Site and outlines the specific methods to accomplish these objectives.
- **Section 5.0 – INVESTIGATION PROTOCOLS:** This section discusses laboratory deliverables and data quality. It also presents a description of the health and safety

and air monitoring activities to be conducted during the implementation of the investigation activities.

- **Section 6.0 – APPLICABLE REMEDIAL STANDARDS:** This section describes the remedial standards that will be applied to the analytical results generated from the implementation of the investigation activities described.
- **Section 7.0 – REMEDIAL INVESTIGATION REPORT:** This section presents a summary of the contents of the Remedial Investigation Report to be completed at the conclusion of the investigation program.

2.0 SITE DESCRIPTION

This section provides general information on the setting of the Site. Also included is a description of the land uses, the historical operations performed at the Site, a summary of the regional and local geology, and the hydrogeology of the Site.

2.1 Site Setting

The Site is located at 137-145 Alexander Street in Yonkers, Westchester County, New York. Based on recorded tax information and the City of Yonkers tax maps, the Site area is 3.4 acres and includes Lots 1, 23, and 29 of Block 2615. There is approximately 50 percent building coverage on the Site and associated paved parking areas. The Site structure (45,000 square feet) is a two story concrete block and brick office building that was formerly utilized as a laboratory by the Research and Development (R&D) division of Polychrome Corporation, a subsidiary of Sun Chemical Corporation, and most recently by the Westchester County Department of Social Services (WCDSS). The Site is currently vacant and not utilized for any purpose. Alex II West, LLC acquired the Site in July 2012. The property is bounded by: Alexander Street beyond which is the Greyston Bakery (a former Manufactured Gas Plant (MGP) site) to the east; the Hudson River to the west; Excelsior Packaging to the north; and Ashburton Avenue beyond which is the former ATI BCP Site to the south. The Polychrome Manufacturing BCP Site is located to the southeast.

Based on a Phase I ESA, the former uses of the Site are described as follows:

- *2008 to Present* – Vacant
- *1993 to 2008* – Westchester County Department of Social Services
- *1978 to 1992* – Research and Development division of Polychrome Corporation Lithographic Supplies
- *1968* – Resin Realty Corporation acquired the property located at Block 2615, Lot 23 from Polychrome Corporation
- *1964 to 1969* – Polychrome Corporation owned the property located at Block 2615, Lots 1 and 29
- *1951* – Machine shop with storage buildings and boat construction and repair facility
- *1917* – Gwinzburger & Wiell Fat & Bone Collecting Station and Yerks & Company Lumber and Coal facility
- *1907* – Westchester Lighting Company and Yerks & Company Lumber and Coal Facility
- *1890s* – Single-family dwelling and the Barber Asphalt Company

Examination of the USGS Topographic Map, Yonkers Quadrangle, indicates that the elevation of the Site is approximately 6 feet above mean sea level (msl).

The location of the Site is depicted on **Figure 1**, Site Location Map.

2.2 Land Use

According to the City of Yonkers Zoning Map, the Site is situated within an industrially zoned district. The Site is also zoned-industrial and is currently vacant. The historic and present uses are consistent with the current zoning. However, in May 2009, the City of Yonkers adopted a Master Plan, Urban Renewal Plan and Brownfield Opportunity Area Plan for the entire Alexander Street corridor, which indicates that the City desires this street to be redeveloped into a new residential, transit-oriented development neighborhood.

2.3 Geology and Hydrogeology

According to the United States Department of Agriculture (USDA) Soil Conservation Service (SCS), the dominant soil composition in the general vicinity of the Site consists of Urban Land (Uf), which consists of surface areas that are 70 percent covered with asphalt, concrete or other impervious building material, such as, parking lots, shopping centers, and industrial parks or institutional.

Based on PS&S observations during installation of a soil boring to bedrock during a 2012 Limited ESI, the Site geology is described as follows: fill material from grade to approximately 6 feet below ground surface (bgs) where groundwater is first encountered, beneath which is fine-grained sand silt and clay derived from river sediments from approximately 6 to 100 feet bgs, beneath which is gravel/till from approximately 110 to 115 feet bgs, beneath which is fractured and competent bedrock encountered at approximately 120 feet bgs. The bedrock encountered was characteristic of Manhattan Schist.

There are no surface water bodies located on the property, although the Hudson River is located adjacent to the Site, to the west. During the November 2006 Phase II ESI, groundwater was encountered at approximately 5 feet bgs. Groundwater is expected to flow in a westerly direction across the Site, towards the Hudson River. Groundwater flow beneath the Site is influenced by tidal fluctuations in the Hudson River.

According to Environmental Data Resources, Inc. (EDR), which reviewed wetlands maps and flood zone maps for the subject property and surrounding areas, the National Wetland Inventory and National Priority List identify assets along the western boundary of the Site which coincides with the Hudson River. In addition, the Site is located within the 100-year flood zone of the Hudson River.

3.0 NATURE AND EXTENT OF SITE CONTAMINATION

Soil, sediment, groundwater and soil vapor samples were collected during previous investigations conducted by PS&S. The findings of these investigations are presented in detail below. Based on the historical uses of the Site, it is apparent that the site-wide environmental impacts observed and documented during the environmental site investigations to date are a result of the Site's history.

3.1 Phase I ESA, January 2007

PS&S performed a Phase I Environmental Site Assessment (ESA) in general conformance with the scope and limitations of ASTM E-1527-05. The Phase I ESA report for the Sun Chemical Properties, 137-145 Alexander Street (West Site) and 80-94 Alexander Street (East Site), conducted November 2006, was completed in January 2007. The Phase I ESA reported the following Recognized Environmental Conditions (RECs) related to the West Site and provided associated recommendations for addressing each REC.

1. Historic document research revealed evidence of spills on this Site. Based on the past use of chemicals and petroleum-related materials, it was recommended that further investigation be conducted to determine the condition of the surrounding soil and groundwater. If evidence of impacts to the subsurface environment is identified, then a sampling program should be conducted in accordance with all applicable regulations.

2. Subsurface testing was also recommended to be performed on this Site in accordance with all applicable regulations to address the following soil and groundwater contamination issues:

    - Significant fines were levied by the United States Environmental Protection Agency (USEPA) against the former operations at the Site related to Polychrome's storage and handling of hazardous material. As such, an increased potential exists for impacts to underlying soils and groundwater from prior site activities.

    - Due to the proximity of documented and suspected contaminated facilities that are located upgradient and cross-gradient of the Site in respect to groundwater flow, the migration of off-site contamination via groundwater to beneath the Site is possible. A subsurface investigation at the property boundary is recommended to determine the condition of the underlying soil and to evaluate the potential presence of contamination from off-site sources. If evidence of impacts to the subsurface environment is identified at the property boundaries, then a supplemental sampling program is recommended to include the installation of groundwater monitoring wells.

3. Because the Site building was constructed prior to 1978, it is suspected the building may contain lead based paint. A Lead Based Paint (LBP) Survey should be conducted prior to any demolition/construction activity to determine the presence or absence of LBP.

4. It is likely that asbestos containing building materials (ACBM) are located within the building since the structure was constructed prior to 1978. An ACBM Survey should be conducted to determine the presence or absence of ACBM. If there is a finding of ACBM, then abatement (repair, enclosure, encapsulation, or removal and disposal) should be supervised by a licensed asbestos contractor in compliance with state and federal regulations.

5. Fluorescent light ballasts were observed at the time of the site reconnaissance of the Site building. Based upon the fact that the building was constructed prior to 1979, it is likely that some fluorescent light ballasts that are currently in place were manufactured with PCBs. It is recommended that in accordance with NYSDEC and appropriate state and federal regulations, replacement and proper disposal of these ballasts be conducted in order to minimize potential concert with their contents.

3.2 Limited Phase II ESI, November 2006

The 2006 Limited Phase II ESI program included the following activities:

- Surface and subsurface soil sampling,
- Catch basin sediment sampling,
- Groundwater sampling, and
- Soil vapor sampling.

3.2.1 Soil Investigation

PS&S installed 7 soil borings and collected a total of 13 soil samples from across the Site in November 2006. Boring locations were biased toward former production and storage areas identified in the Phase I ESA. Laboratory analysis of the soil samples indicated that semi volatile organic compounds (SVOCs) and metals were detected at concentrations greater than their respective NYSDEC Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs).

3.2.2 Sediment Investigation

PS&S collected a total of 2 sediment samples from catch basins at the Site in November 2006. Laboratory analysis of the sediment samples indicated that metals were detected at concentrations greater than their respective NYSDEC Track 1 Unrestricted Use SCOs.

3.2.3 Groundwater Investigation

PS&S installed 3 temporary well points in select borings to characterize groundwater at the Site. Laboratory analysis of the groundwater samples collected from the temporary well points in November 2006 indicated that volatile organic compounds (VOCs), SVOCs, and metals were detected at concentrations greater than their respective NYSDEC Ambient Water Quality Standards and Guidance Values (AWQS).

3.2.4 Soil Vapor Investigation

PS&S collected a total of 3 soil vapor samples from across the Site in November 2006. Soil vapor samples were collected via rods driven by direct push (GeoProbe®) methods in accordance with New York State Department of Health (NYSDOH) Guidance. Results of the soil vapor samples indicated that two VOCs were detected above the NYSDOH Air Guideline Values (AGVs). Methylene chloride was detected at location SCSV-1, located near the southwest corner of the building, at a concentration of 1,500 ug/m^3, exceeding the AGV of 60 ug/m^3. Trichloroethene was detected at location SCSV-2, located in the northern driveway of the Site, at a concentration of 5.4 ug/m^3, exceeding the AGV of 5 ug/m^3.

3.2.5 Soil, Sediment and Groundwater Recommendations

Based on the comparison of the analytical results to the NYSDEC criteria, site-wide impacts were documented. A supplemental investigation was subsequently designed to provide for further delineation of the identified impacts and to assist in determining future remedial option decisions to eliminate potential risk for future use of the Site.

3.2.6 Soil Vapor Recommendations

A review of the NYSDOH Vapor Intrusion Guidance suggests that the soil vapor samples results warrant further study for potential vapor intrusion mitigation. Based upon proposed redevelopment activities, a soil vapor assessment should be performed following the completion of the SESI activities, Site demolition and Site remediation activities although prior to new construction activities in accordance with the NYS Vapor Intrusion Guidance to determine the need for soil vapor remedial option decisions.

3.2.7 Findings

The 2006 Limited Phase II ESI documented site-wide impacts that required further investigation and delineation to develop appropriate remedial strategies.

3.3 Supplemental Phase II ESI, November and December 2007

The Supplemental Phase II ESI (SESI) program included the following activities:

- Surface and subsurface soil sampling, and
- Groundwater sampling.

3.3.1 Soil Investigation

Target Compound List (TCL) VOCs were detected in 58 of the 66 soil samples, and at least one VOC concentration exceeded NYSDEC Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs) in 27 of the soil samples. Individual VOCs detected in the soil samples above NYSDEC Track 1 Unrestricted Use SCOs included the following: acetone, benzene, ethyl benzene, methylene chloride, n-propylbenzene, m,p-xylene and o-xylene. Benzene, toluene, ethylbenzene and xylenes (BTEX) concentrations were detected in 27 soil samples. BTEX concentrations were detected above NYSDEC Track 1 Unrestricted Use SCOs in three soil samples. Two of these soil samples were collected in the southwestern portion of the property and one was collected in the northeastern portion of the property. Four soil samples exceeded the NYSDEC TAGM 4046 standard of 10 mg/kg for total VOCs. Three of these soil samples were collected in the southwestern portion of the property. The individual VOCs detected in these three soil samples include the following: benzene, 1,2,4-trimethylbenzene, n-butylbenzene, tert-butylbenzene, sec-butylbenzene, cumene, ethyl benzene, n-propylbenzene, toluene, m,p-xylene and o-xylene. The other soil sample was collected in the northeastern portion of the property. The individual VOCs detected in this soil sample include the following: 1,2,4-trimethylbenzene, 1,2,5-trimethylbenzene, n-butylbenzene, sec-butylbenzene, chloromethane, trans-1-dichloropropene, ethyl benzene, n-propylbenzene, m,p-xylene and o-xylene.

TCL SVOCs were detected in 65 of the 66 soil samples. At least one SVOC was detected at concentrations above NYSDEC Track 1 Unrestricted Use SCOs in 37 soil samples. The general locations of these borings were under the southern, western and northern sub-slabs of the site building; north of the site building; south of the site building; west of the site building; and in the northern and eastern portions of the parking lot. Three soil samples exceeded the NYSDEC TAGM 4046 standard of 500 mg/kg for total SVOCs. These samples were collected from the northern portion of the property adjacent to or west of the site building. Individual SVOCs detected above NYSDEC Track 1 Unrestricted Use SCOs include the following: acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, carbazole, chrysene, dibenzo[a,h]anthracene, dibenzofuran, fluoranthene, fluorine, indeno[1,2,3-cd]pyrene, 2-methylnaphthalene, naphthalene, phenanthrene and pyrene.

Target Analyte List (TAL) Metals were detected in all 66 soil samples at concentrations above NYSDEC Track 1 Unrestricted Use SCOs. The following

metals were detected at concentrations exceeding their respective NYSDEC Track 1 Unrestricted Use SCOs in one or more of the samples: arsenic, barium, cobalt, chromium, cadmium, copper, iron, lead, mercury, nickel, selenium, silver, vanadium, and zinc.

Pesticides were detected in 31 of the 66 samples, and at least one pesticide concentration exceeded NYSDEC Track 1 Unrestricted Use SCOs in 27 of the 66 soil samples. The pesticides exceeding NYSDEC Track 1 Unrestricted Use SCOs include 4,4-DDT; 4,4-DDE; and 4,4-DDD.

Polychlorinated Biphenyls (PCBs) were also detected in 22 of the 66 soil samples. No soil samples exceeded NYSDEC Track 1 Unrestricted Use SCOs for PCBs.

3.3.2 Groundwater Investigation

An LNAPL (light non-aqueous phase liquid), floating on the water table with a measured thickness of 0.73 feet was observed in monitoring well location MW-5, located in the southern driveway of the Site, during the groundwater investigation. A fingerprint analysis of the product determined the source material is consistent with No. 4 fuel-oil.

No LNAPL impacts were identified in three soil borings conducted on the interior of the building to the north of MW-5.

In addition, TCL VOCs were detected in three of the eight groundwater samples, in exceedance of their respective NYSDEC AWQS, including benzene, cis-1,3 dichloropropene, trans-1 dichloropropene, 1,2,4-trimethylbenzene, ethyl benzene, m,p-xylene and o-xylene. SVOCs and metals were also detected in exceedance of their respective NYSDEC AWQS.

3.3.3 Soil and Groundwater Recommendations

The Supplemental Phase II ESI documented numerous VOCs, SVOCs, pesticides and metals in exceedance of NYSDEC Track 1 Unrestricted Use SCOs in soil. PCBs were also detected in a significant portion of the soil samples. In addition, a LNAPL source was observed impacting the shallow groundwater table. The NYSDEC was notified of the observed floating product and NYSDEC spill number 0709858 was assigned on December 13, 2007.

3.3.4 Findings

The Supplemental Phase II ESI documented site-wide impacts that required further investigation and delineation to develop appropriate remedial strategies.

3.4 Limited Environmental Site Investigation, January and February 2012

The 2012 Limited ESI program involved the following activities:

- Deep monitoring well installation to determine if deeper contamination had occurred;
- Additional subsurface soil sampling; and
- Additional groundwater sampling;

3.4.1 Soil Investigation

The soil boring location SW-MW-10 was installed along the eastern boundary of the Site. Potential contamination from an upgradient former manufactured gas plant site was the focus of this deep soil boring investigation. Cores from the soil boring were recovered continuously from the surface to a depth of approximately 120 feet. Petroleum and chemical odors were noted during the soil boring installation. Dense non-aqueous phase liquid (DNAPL) was observed in a soil core recovered at the depth of 110 to 115 feet (ft.) in the gravel/till directly above the bedrock surface. Based on this field observation a petroleum release of an unknown type and quantity was reported to NYSDEC as occurring on January 19, 2012 at 4:30pm. NYSDEC spill number 1112252 was assigned to the event.

Soil samples were submitted for laboratory analysis from three depth intervals (10 to 15 ft., 15 to 16 ft., and 110 to 115 ft.). VOCs, SVOCs and Metals were detected in the all of the samples. PCBs were not detected. VOCs, SVOCs and Metals were detected in exceedance of NYSDEC Track 1 Unrestricted Use SCOs in two soil samples collected from 15 to 16 ft. and 110 to 115 feet at location SW-MW-10.

3.4.2 Groundwater Investigation

A monitoring well was installed at sample location SW-MW-10. A two-inch diameter PVC well was installed with a well screen interval across the depth of 110 to 120 feet.

The new and existing monitoring wells on the Site were monitoring for light and dense NAPL. At MW-5, located in the southern driveway of the Site, 0.15 feet of LNAPL was measured on February 2, 2012. Although NAPL was observed in the recovered soil boring, no LNAPL or DNAPL was detected in the new monitoring well SW-MW-10.

A groundwater sample was collected from the monitoring well location SW-MW-10. VOCs, SVOCs and Metals were detected; and PCBs were not detected. VOCs and SVOCs were detected in exceedance of their respective NYSDEC AWQS.

3.4.3 Findings

The Sun West Site was developed prior to 1898 as an industrial waterfront property. Historical site uses included an asphalt plant, lumber and coal yard, fat rendering operations, Westchester Lighting Company yard, boat building, machine shop and photochemical R&D facility. These historical uses apparently resulted in the site-wide environmental impacts observed and documented during the environmental site investigations to date.

The soil, soil vapor and groundwater environmental impacts included VOCs, SVOCs, pesticides and metals detected above NYSDEC SCBs. LNAPL and DNAPL source materials have been identified in two portions of the Site. These environmental impacts require a complete nature and extent delineation as part of a Remedial Investigation and then the implementation of Remediation Action Plan prior to Site redevelopment.

4.0 REMEDIAL INVESTIGATION PROGRAM

The remedial investigation includes the collection of soil, soil vapor and groundwater samples obtained from soil borings, soil vapor probes and shallow, intermediate and deep groundwater monitoring wells. The collection of these samples is being performed to 1) support the remediation and redevelopment of the Site, 2) supplement the existing soil, soil vapor and groundwater data with information about the Site's physical characteristics, physical and chemical characteristics of contamination sources, and the nature and extent of contamination, 3) assist in the development of a remedial strategy, and 4) to assess two open NYSDEC spills associated with the Site.

Based on a review of previous investigations, the following four Areas of Concern (AOCs) have been identified:

- AOC-1 – LNAPL Southern driveway Source Area: Investigation of this AOC will include five proposed soil borings (SB-31 through SB-35) to the south, east and west of existing well MW-5. Soil borings in this AOC will be used to delineate the nature of the LNAPL contamination and the extent of the LNAPL migration.

- AOC-2 – Site-Wide Historic Fill Material: Proposed soil samples will characterize the historic fill material throughout the Site.

- AOC-3 – DNAPL Source Area: Investigation of this AOC along the eastern boundary of the Site to the north and south of existing monitoring well MW-10 and in the paved parking area to the west will include four proposed monitoring well clusters to delineate the extent of DNAPL migration.

- AOC-4 – Soil Vapor: Two proposed soil vapor samples will characterize soil vapor beneath the Site.

Figure 2 – Proposed Soil Boring, Soil Vapor Probe and Monitoring Well Location Plan depicts the proposed soil, soil vapor and groundwater sampling locations.

4.1 Geophysical Survey

Prior to the start of the investigation, a private utility locating service contractor would conduct a geophysical survey to mark out subsurface utilities including a pipe located beneath the southern driveway and to clear proposed soil boring, soil vapor probe and monitoring well locations.

4.2 Existing Monitoring Well Gauging and Groundwater Flow Evaluation

As an initial RI activity, the existing shallow monitoring wells (MW-1 through MW-8) and deep monitoring well (MW-10) on the Site will be gauged using an oil-water interface probe. Groundwater beneath the Site is influenced by tidal fluctuations of the

Hudson River. To determine the extent of tidal influence at the Site, water level measurements and product thicknesses will be collected during peak high and peak low tides in the monitoring wells closest to the Hudson River. PS&S proposes to conduct two separate measurement events to establish groundwater flow conditions beneath the Site. The well elevations will also be surveyed. The information will be utilized to develop a groundwater contour map to better understand site groundwater flow prior to installation of additional monitoring wells. It will also provide information regarding the extent to which the existing wells are usable for future sampling activities.

4.3 AOC-1: LNAPL Source Area

Due to LNAPL being observed in the southern driveway of the Site during prior investigations, AOC-1 will be investigated to determine the nature of the LNAPL contamination and the extent of the LNAPL migration.

4.3.1 GeoProbe® Soil Borings

Five soil borings (SB-31 through SB-35) are proposed in the southern driveway of the Site. The soil borings will be advanced using a GeoProbe®. Continuous soil sampling will be conducted to groundwater estimated at 6 feet bgs or as required, until a clean interval is observed, to visually assess the vertical and horizontal extent of potential impacts in the soil.

The soil recovered in each sample will be "field-screened" with a photoionization detector (PID) for the presence of organic vapors. Soil samples will be visually classified in the field and this information, along with other pertinent observations (i.e., PID readings, visual/physical observations) will be recorded in boring logs maintained by our field representative. The soils will be classified using the unified soil classification system (USCS). Soil samples will be selected for laboratory analysis from a 2-foot interval based on elevated PID readings and/or observed visual physical evidence of contamination (e.g., staining, sheen, odor).

Up to two analytical soil samples will be collected from each soil boring for laboratory analysis on a standard turnaround time. The analytical soil samples will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory within 48 hours of sampling. Transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis for the presence of Target Compound List (TCL) Volatile Organic Compounds (VOC) plus a 10-peak library search (+10) and TCL Semivolatile Organic Compounds (SVOC) plus a 20-peak library search (+20), Target Analyte Metals (TAL Metals) and Hexavalent Chromium. TAL Metals includes analysis for Total Chromium. Hexavalent Chromium has been added to the suite of analytical parameters because of metal contamination in prior sampling results indicating it should be considered for purposes of exposure and disposal.

4.3.2 Shallow Monitoring Well Installation and Sampling

MW-5 will not be sampled as part of the RI due to the assumption that it contains LNAPL. MW-5 will be gauged as discussed in Section 4.2.

A shallow monitoring well (MW-15) will be installed downgradient of the apparent clean soil boring, in the direction of the Hudson River. MW-15 will be constructed of 2-inch diameter PVC and installed in the overburden to an approximate depth of 13-feet bgs. Well construction will include a screened interval from 3-13-feet bgs and solid PVC riser from 0-3-feet bgs. The sand pack will be placed in the annular space around the well screen extending 2 feet above the top and six inches below the bottom. A six-inch thick bentonite seal will be placed above the sand pack along with a six-inch finer grained sand pack. Upon completion of the monitoring well, a 3-foot thick seal will be formed. Proposed monitoring well location MW-15 is depicted on Figure 2.

Following installation, the well will be developed by pumping and surging until either five well volumes have been removed or well quality parameters collected on the Horiba U-22 instrument have stabilized including achieving turbidity readings of less than 50 nephelometric turbidity units (NTUs).

One analytical groundwater sample will be collected from the monitoring well for laboratory analysis on a standard turnaround time. The analytical groundwater sample will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory. The transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis of the presence of TCL VOC+10, TCL SVOC+20, TAL Metals (total and dissolved) and Hexavalent Chromium. Additionally, during collection of the groundwater samples, each sample will be field analyzed for temperature, pH, conductivity, dissolved oxygen and oxidation-reduction potential.

Table 1 displays the total number of soil and groundwater samples proposed to be submitted to the laboratory and the analytical parameters for AOC-1.

The newly installed monitoring well will also be surveyed and gauged and added to contour maps.

4.4 AOC-2: Fill Material

Due to the presence of historic fill material and the former industrial Site uses identified during previous investigations, AOC-2 will pre-characterize the historic fill material for waste disposal purposes using representative soil samples collected throughout the Site.

4.4.1 Sonic Soil Borings

Four soil borings are proposed to be installed throughout the Site using sonic drilling methods. For convenience these soil borings will be the same as those used for intermediate deep monitoring well installation for AOC-3 as described in Section 4.4.1. Continuous soil sampling will be conducted to the soil-groundwater interface for AOC-2.

The soil recovered in each sample will be "field-screened" with a PID for the presence of organic vapors. Soil samples will be visually classified in the field and this information, along with other pertinent observations (i.e., PID readings, visual/physical observations) will be recorded in boring logs maintained by our field representative. The soils will be classified using the USCS.

One analytical soil sample will be collected from a 2-foot interval in the unsaturated zone from each soil boring for laboratory analysis on a standard turnaround time. The analytical soil samples will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory within 48 hours of sampling. Transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis for the presence of TCL VOC+10, TCL SVOC+20, TCL Pesticides, Herbicides, PCBs, TAL Metals and Hexavalent Chromium.

Table 1 displays the total number of soil samples proposed to be submitted to the laboratory and the analytical parameters for AOC-2.

4.5 AOC-3: DNAPL Source Area

Due to DNAPL being observed on the eastern border of the Site in the gravel/till directly above the bedrock surface during prior investigations, AOC-3 will be investigated to determine where the extent of DNAPL migration.

4.5.1 Sonic Soil Borings

The four soil borings advanced using sonic drilling methods that were discussed in Section 4.3.1 will be extended beyond the soil-groundwater interface. Continuous soil sampling will be conducted to bedrock, the termination depth of the boring as required, to visually assess the vertical and horizontal extent of potential impacts in the soil for AOC-3.

Soil samples for AOC-3 will be selected for laboratory analysis from a 2-foot interval based on elevated PID readings and/or observed visual physical evidence of contamination (e.g., staining, sheen, odor).

Up to one additional analytical soil sample will be collected from each soil boring for laboratory analysis on a standard turnaround time. The analytical soil samples

will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory within 48 hours of sampling. Transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis for the presence of TCL VOC+10, TCL SVOC+20, TAL Metals, Hexavalent Chromium and Total Cyanide. Total Cyanide has been added to the suite of analytical parameters because a former MGP site is adjacent to and upgradient of the Site.

4.5.2 Intermediate/Deep Monitoring Well Installation and Sampling

Four monitoring well clusters (MW-11(I,D) through MW-14(I,D)) screened at intermediate and deep intervals will be installed; two in the eastern boundary of the Site and two in the paved parking area to the west. The locations may be modified based on the results of the groundwater flow evaluation discussed in Section 4.2

MW-11 through MW-14 will be constructed of four-inch diameter PVC and installed in bedrock estimated at 110-feet bgs via sonic drilling methods. Well construction would include up to two 10-foot screened intervals and solid PVC riser to grade as determined by field conditions. The sand pack will be placed in the annular space around the well screen extending 2 feet above the top and six inches below the bottom. A six-inch thick bentonite seal will be placed above the sand pack along with a six-inch finer grained sand pack. Upon completion of the monitoring well, a 3-foot thick seal will be formed. Proposed monitoring well locations MW-11, MW-12, MW-13 and MW-14 are depicted on Figure 2. Monitoring wells MW-11 and MW-12 are located along the eastern boundary of the property to determine if contamination is migrating toward the Site from off-site sources (former MGP site noted adjacent to and upgradient of the Site). Monitoring wells MW-13 and MW-14 are located in the paved parking area to the west to delineate the extent of DNAPL contamination, if any.

Following installation, the wells will be developed by pumping and surging until either five well volumes have been removed or well quality parameters collected on the Horiba U-22 instrument have stabilized including achieving turbidity readings of less than 50 NTUs.

Up to nine analytical groundwater samples will be collected from existing monitoring well MW-10 and the four newly installed monitoring well clusters MW-11 through MW-14 (intermediate and deep intervals) for laboratory analysis on a standard turnaround time. The analytical groundwater samples will be placed into laboratory-provided sample containers, labeled, placed in an iced cooler and relinquished to a NYSDEC-ELAP certified laboratory. The transfer of the samples to the laboratory will be accompanied by standard chain-of-custody documentation for analysis of the presence of TCL VOC+10, TCL SVOC+20, TAL Metals (total and dissolved), Hexavalent Chromium and Total Cyanide. Additionally, during collection of the groundwater samples, each sample will be

field analyzed for temperature, pH, conductivity, dissolved oxygen and oxidation-reduction potential.

Table 1 displays the total number of soil and groundwater samples proposed to be submitted to the laboratory and the analytical parameters for AOC-3.

The newly installed monitoring wells will also be surveyed and gauged and added to contour maps.

4.6 AOC-4: Soil Vapor

Due to soil vapor sample results from prior investigations indicating that VOCs were detected at concentrations greater than their respective New York State (NYS) indoor, outdoor and ambient background standards, AOC-4 will characterize existing VOC concentrations using representative soil vapor samples collected throughout the Site.

4.6.1 GeoProbe® Soil Vapor Probe Points

Two soil vapor probes (SV-1 and SV-2) are proposed in the northern and southern driveways of the Site. The samples will be collected in accordance with NYSDOH Guidance. Sampling will be performed using a GeoProbe® to drive the sampling apparatus (drive point and steel "hollow" rod sections) to the desired depth. The shaft sections will be driven into the ground to a depth of approximately 3.5' to 4.0' bgs, dependent upon the depth to groundwater, to avoid drawing shallow groundwater into the soil vapor probes. Once the target depth is achieved, the rods will be pulled up one foot, to expose the void space, and the sampling apparatus will be set up in the sample hole. Soil vapor sampling will be performed using the following steps: Teflon tubing equipped with a threaded stainless steel fitting will be attached to a disposable soil vapor drive point to prevent infiltration of ambient air directly above the sample hole. A bentonite seal will be created around the GeoProbe® drive rods and the surrounding ground surface. Teflon tape will be used to seal the area surrounding the tubing to the drive rods. The sample tubing will be purged using a vacuum pump set at a rate of approximately 0.2 liters per minute.

A tracer gas (Helium) will be used to enrich the atmosphere in the immediate vicinity of the sampling location. A container will be placed over the area where the sample tubing intersects the ground surface to test the sample hole seal and verify that ambient air was not being drawn into the sample and causing dilution. A sample will be pulled into a Tedlar® bag via an evacuated chamber and tested for Helium gas using a MGD 2002 portable He detector. Continuous or excessive pumping will be avoided in order not to dilute the soil vapor with surface air or distort the actual soil vapor concentration patterns. The chamber above the sample hole will also be tested for helium. Screening results will not be accepted if the helium detected in the sample tubing is greater than 20 percent of the Helium enriched container located directly above the sample hole.

Following the purging and tracer gas verification steps, the sample tubing will be connected to a calibrated flow regulator connected to a 6-liter Summa canister. The canisters will be equipped with flow controllers (regulator) with an integral vacuum gauge adjusted to provide a nominal one-hour integrated sample collection period (approximately 0.1 liters/minute). Summa canisters will be supplied by a certified laboratory and evacuated to a vacuum pressure of approximately 30 inches of mercury (Hg). A vacuum gauge will be used to measure the initial and final vacuum in the canisters to document sample integrity.

Upon completion of the sample collection, the GeoProbe® rods and sampling apparatus will be removed from the sample hole. The sample holes will be will be grouted to the surface utilizing a cement-bentonite grout.

An upwind ambient air sample will be collected concurrent with the sub-slab soil vapor samples using a calibrated flow regulator connected to a 6-liter Summa canister. The canister will be equipped with a flow controller (regulator) with an integral vacuum gauge adjusted to provide a nominal one-hour integrated sample collection period (approximately 0.1 liters/minute). The Summa canister will be supplied by a certified laboratory and evacuated to a vacuum pressure of approximately 30 inches of mercury (Hg). A vacuum gauge will be used to measure the initial and final vacuum in the canister to document sample integrity.

Following collection of the samples the canisters will be transferred to the laboratory accompanied by standard chain-of-custody documentation for analysis of the presence of Modified EPA Compendium Method TO-15 using GC/MS in the full scan mode.

Table 1 displays the total number of soil vapor and ambient air samples proposed to be submitted to the laboratory and the analytical parameters for AOC-4.

4.7 Investigation Derived Waste Management

Investigative derived wastes (IDW), including drill cuttings, monitoring well development water, decontamination waters and PPE will be collected and stored within 55-gallon USDOT drums. The drums will be placed in a plastic lined, bermed waste storage area. The location of the waste storage area will be determined prior to the start of the field investigation. PS&S will collect the appropriate samples to characterize the IDW for off-site disposal. The off-site disposal will be the responsibility of Alex II West, LLC.

5.0 INVESTIGATION PROTOCOLS

This section discusses laboratory deliverables and data quality. It also presents a description of the health and safety and air monitoring activities to be conducted during the implementation of the investigation activities.

5.1 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures consistent with NYSDEC sampling protocols will be observed for the sampling operations. All analytical data will be provided as New York State Category B Data Deliverables package. The data will be submitted to NYSDEC electronically using Equis Data Processor version 5.6.1 or most recent version. All QA/QC protocols are discussed in the Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) included as Appendix A. Upon completion of data validation, a Data Usability Summary Report (DUSR) will be prepared and submitted to NYSDEC.

The QAPP and SAP details the means and methods for collecting soil, soil vapor and groundwater samples through various sampling techniques. This plan also provides the sampling forms to be utilized during soil, soil vapor and groundwater sampling activities in order to document the field activities.

5.2 Health and Safety Program

A Site-specific Health and Safety Plan (HASP) has been prepared for this program for use during the investigation activities described in this work plan. A copy of the plan is included as Appendix B. The HASP includes the following information:

- A listing of potential physical, chemical, and/or biological hazards;
- A description of the engineering and/or administrative measures to control each hazard, if applicable;
- Personal protective equipment (PPE) requirements for each remedial task based on the potential hazards of the contaminants to be encountered and the type of operation to be performed; and
- Air monitoring requirements to address the frequency, type and duration of the monitoring and the type of instruments required.

A project organization has been developed to identify the roles and responsibilities of the various parties involved with this RI. The organizational structure for this RI includes NYSDEC, PS&S, and the required contractors. The proposed contractors are Diversified Geophysics for subsurface utility locating, Aquifer Drilling and Testing, Inc. for drilling, and Chemtech for laboratory services. Although the Quality Assurance/Quality Control (QA/QC) responsibilities are principally the responsibility of the PS&S Project Manager and Project Quality Assurance Manager (PQAM), proper implementation of QA/QC

requirements necessitate that the entire project staff be cognizant of all procedures and goals.

The PS&S team will consist of the following personnel, with a description of their responsibilities:

Hal Newell is the Project Manager. He has primary responsibility and authority for implementing and executing the technical, QA, and administrative aspects of the pre-design investigation, including the overall management of the project team. The Project Manager is accountable for ensuring that the RI Field Program is conducted in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific Health and Safety Plan (HASP). In addition, the Project Manager will communicate all technical, QA and administrative matters to Alex II West, LLC.

Christine Beaver is the Project Geologist. She has primary responsibility for implementing and executing the RI Field Program in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific Health and Safety Plan (HASP). In addition, the Project Geologist will communicate all technical and QA matters to the Project Manager and coordinate all RI activities with the selected contractors.

Engineering support for the investigation will be the responsibility of John Bolan, the Project Engineer and Qualified Environmental Professional. His duties include overseeing the preparation of project deliverables.

John Pastorick is the Project Quality Assurance Manager (PQAM) and will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements of the QAPP/SAP.

Christine Beaver is the Field Operations Lead (FOL). She will be responsible for the management and supervision of the field investigation and for providing consultation and decision-making on day-to-day issues relating to the sampling activities. The FOL will monitor the sampling to determine that operations are consistent with plans and procedures, and that the data acquired meets the geotechnical data quality needs. When necessary, the FOL will document any deviations from the plans and procedures for approval.

Jeff Farrell is the Health and Safety Coordinator (HSC). The HSC reports to the PS&S Project Manager, and is responsible for the implementation of the HASP. The HSC shall advise project staff on health and safety issues, conduct health and safety training sessions, and monitor the effectiveness of the health and safety program conducted in the field.

In addition, other site personnel may provide support to the Project Manager and FOL on an as-needed basis. Adrianna Bosco/Greg McClellan will be on-site Field Representatives.

The services of an analytical laboratory contractor will also be necessary to perform the supplemental investigation activities. The Project Manager, with assistance from the FOL and PQAM, will be the liaison between PS&S and the analytical laboratory contractor.

Any laboratory utilized for the analysis of environmental samples shall be a NYSDEC certified laboratory. The laboratory shall deal directly with the consultant in regards to analytical parameters, sample handling, and analytical results reporting. The laboratory shall be responsible for providing all materials for sample collection, handling, and transportation in accordance with QA/QC requirements.

5.3 Air Monitoring

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions generated from the performance of the investigation activities. The air monitoring procedures to be implemented during the performance of this investigation are as follows:

5.3.1 Work Zone Air Monitoring

Work zone air monitoring will be performed in accordance with the HASP prepared for these investigation activities. A photoionization detector (PID), or equivalent, will be used to monitor the work zone for the presence of VOCs. Further, a dust monitor, will be used to monitor the work zone for the presence of airborne particulates during the performance of the investigation activities. Action levels have been established in the HASP and will be communicated to site workers and visitors.

5.3.2 Community Air Monitoring Plan (CAMP)

During drilling activities, calibrated air monitoring instruments will be used to monitor for potential releases of volatile organic vapors and soil particulates from the site. Upwind and downwind air monitoring stations will be established relative to each drilling location. Each monitoring station will contain a data logging PID and soil particulate meter. The air monitoring instruments will be calibrated on a daily basis prior to the start of field work. The calibration records will be maintained in the project file. The data from the stationary air monitoring stations will be electronically downloaded at the conclusion of each work day. A copy of the generic New York State Department of Health (NYSDOH) CAMP guidelines proposed for this investigation is included as Appendix C.

6.0 APPLICABLE REMEDIATION STANDARDS

This section describes the remedial standards that will be applied to the analytical results generated from the implementation of the investigation activities described.

6.1 Soil

Soil samples are being collected and analyzed to gain a greater understanding of the level of impacts in the Site soils relative to current and historical operations and to assist in the development of an appropriate remedial action. The soil analytical results will be compared to NYSDEC's Unrestricted Use Soil Cleanup Objectives (SCOs) as required by the BCP as well as to Protection of Public Health Restricted Residential Use SCOs in the Remedial Program Soil Cleanup Objectives of the NYSDEC Regulations (6NYCRR Part 375-6.8 (a) and (b)).

6.2 Groundwater

Groundwater samples are being collected and analyzed to gain a greater understanding of the level of impacts in the Site groundwater relative to current and historical operations and to assist in the development of an appropriate remedial action. The groundwater analytical results will be compared to the values listed in the "Ambient Water Quality Standards and Guidance Values (AWQS)" as listed in the Technical and Operational Series (TOGS) 1.1.1. In order to estimate the local groundwater gradient, the depth to the top of groundwater will be measured prior to sampling at each location.

6.3 Soil Vapor

Soil vapor samples are being collected and analyzed to gain a greater understanding of the level of impacts in the Site groundwater relative to current and historical operations and to assist in the development of an appropriate remedial action. The soil vapor analytical results will be compared to Air Guideline Values (AGV) listed in the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York document.

7.0 REMEDIAL INVESTIGATION REPORT

PS&S will compile information obtained during implementation of the RI portion of this Work Plan into a Remedial Investigation Report (RIR). This report will be prepared following completion of the final phase of the RI work. The RIR will discuss the field and analytical data collected during the implementation of the field work. The RIR will also describe the level of detail of the investigation, the selected methods, and analyses used to define the rate of movement, and present the future extent and fate of contaminants to ensure attainment of the applicable remediation standards. The RIR will contain:

- An executive summary,
- A discussion of the Site history and previous investigations
- A discussion describing the observed geologic and hydrogeologic conditions of the Site,
- A sample location map based on GPS coordinates,
- Soil boring logs,
- Monitoring well construction logs,
- Well development records
- Summary tables detailing the results of laboratory analytical data collected from all samples of soil and groundwater in comparison to applicable NYSDEC Soil Cleanup Objectives (SCOs) and Ambient Water Quality Standards and Guidance Values (AWQS),
- Summary tables detailing the results of laboratory analytical data collected from all samples of soil vapor in comparison to applicable NYSDOH Air Guideline Values (AGVs),
- A discussion of source areas and the vertical and horizontal extent of contamination within soil, soil vapor and groundwater,
- Sample concentration maps summarizing exceedances of applicable NYSDEC SCOs and AWQS and NYSDOH AGVs),
- Groundwater contour maps
- Cross section maps
- A qualitative human exposure assessment,
- A fish and wildlife resources impact analysis,
- A qualitative risk assessment
- Laboratory analytical reports including results of quality assurance/quality control (QA/QC) samples and data usability summary reports (DUSR),
- Transport Bills of Lading and/or Manifests generated from Investigation Derived Waste, and
- Conclusions and recommendations.

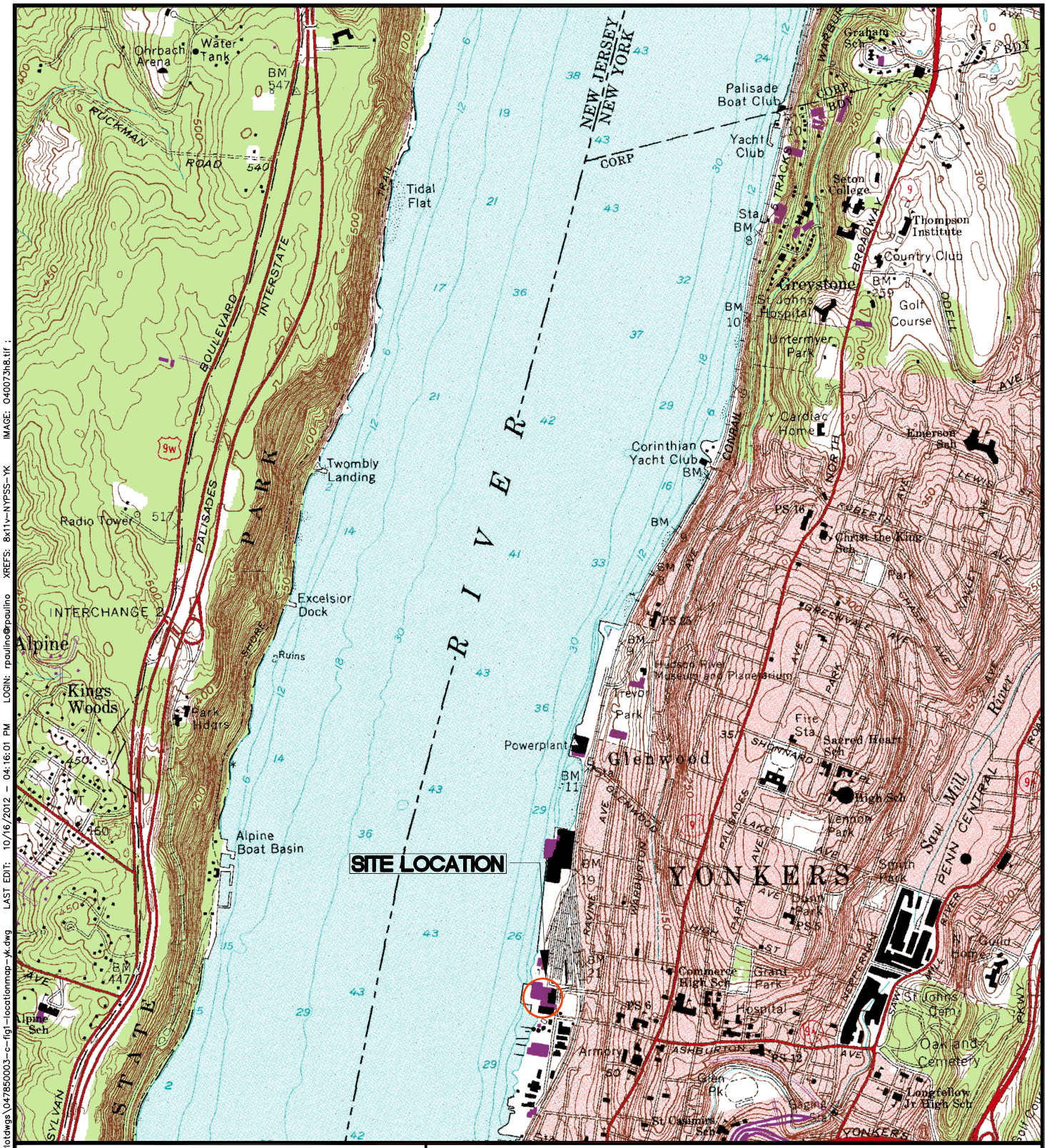
TABLES

DRAFT
Table 1
Proposed Sampling Summary
PolyChrome R&D Lab Site
Yonkers, New York
February 2013

		Sample Type			Analysis							
Sample ID	**Sample Location/ Rationale**	**Soil**	**Groundwater**	**Sub Slab Soil Vapor/ Ambient Air**	**TCL VOC**	**TCL SVOC**	**TAL Metals**	**Hexavalent Chromium**	**PCBs**	**Pesticides/Herbicides**	**Total Cyanide**	**VOC (TO-15)**
AOC1												
SB-31 thru SB-35	Borings to be installed to delineate LNAPL in the southern driveway. Samples will be collected from the interval above the soil-groundwater interface (approximately 4-6 feet bgs).	X			X	X	X	X				
MW-15	Shallow monitoring well to be installed downgradient of the LNAPL investigation area.		X		X	X	X	X				
AOC2												
SSMW-11-A thru SSMW-14-A	Representative samples to characterize fill material above the water table (approximately 0-6'bgs) will be collected from the soil borings drilled to install monitoring wells MW-11 thru MW-14.	X			X	X	X	X	X	X		
AOC3												
SSMW-11-B thru SSMW-14-B	Samples will be collected below the water table if significant visual impacts are noted from the soil borings drilled to install monitoring wells MW-11 thru MW-14.	X			X	X	X	X			X	
MW-10	Existing deep monitoring well		X		X	X	X	X			X	
MW-11I, MW11-D, MW-12I, MW-12D	Proposed intermediate and deep groundwater monitoring wells to be installed on upgradient portion of Site to delineate DNAPL/migration of MGP constituents from off-site sources.		X		X	X	X	X			X	
MW-13I, MW-13D, MW-14I, MW-14D	Proposed intermediate and deep groundwater monitoring wells to be installed on downgradient portion of Site to delineate DNAPL/migration of MGP constituents from off-site sources.		X		X	X	X	X			X	
AOC4												
SV-1 and SV-2	Soil Vapor Probes to be installed and samples collected from 3.5 - 4.0 feet bgs			X								X
PRD-AA	An upwind ambient air sample to be collected concurrent with the sub-slab soil vapor samples.			X								X

Notes:
1. The test methods specified are from EPA SW-846.

FIGURES



PS&S
integrating design & engineering
PAULUS, SOKOLOWSKI AND SARTOR
55 MAIN STREET
3RD FLR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

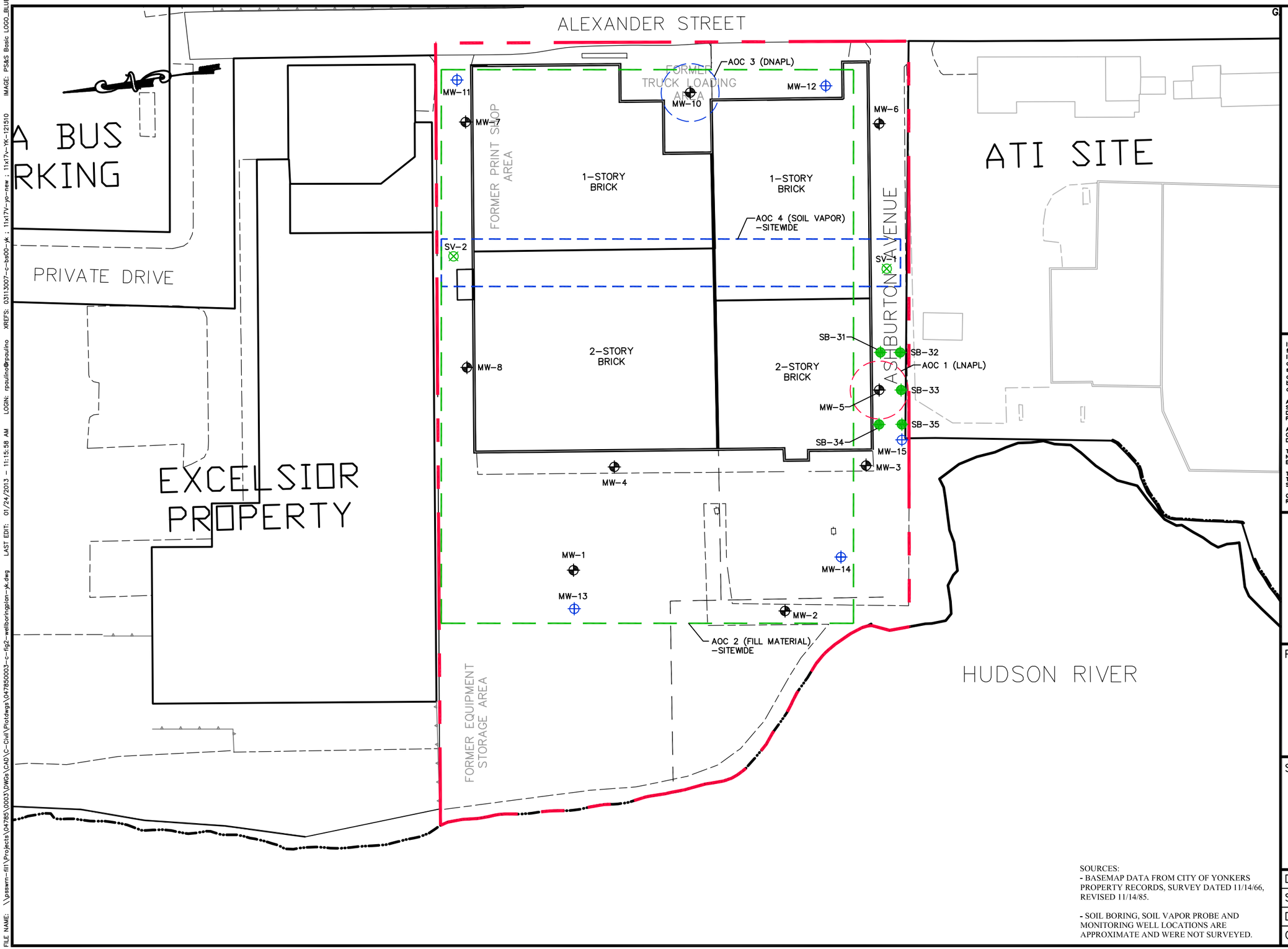
POLYCHROME R&D LAB SITE
137–145 ALEXANDER STREET
YONKERS, WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

FIGURE 1
SITE LOCATION MAP
(USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES)

DATE: 10/16/12	DRN. BY: RP	PROJ. NO.: K47850003
SCALE: NTS	CK'D BY: CB	SHT. NO.: 1

FILE NAME: P:\04785\0003\DWGs\CAD\C-Civil\Plotdwgs\047850003-c-fig1-locationmap-yk.dwg LAST EDIT: 10/16/2012 — 04:16:01 PM LOGIN: rpaulino@rpaulino XREFS: 8x11v-NYPSS-YK IMAGE: 040073h8.tif ;



Legend

- Existing Monitoring Well Location
- Proposed Soil Boring and Monitoring Well Location
- Proposed Soil Boring Location
- Proposed Soil Vapor Probe Location
- Approximate Site Boundary
- DNAPL Observed (limits undefined)
- LNAPL Observed (limits undefined)
- AOC — Area of Concern

DRAFT

PS&S
integrating design & engineering

55 MAIN STREET
3RD FLOOR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

POLYCHROME R&D LAB SITE
137-145 ALEXANDER STREET
CITY OF YONKERS
WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

PROPOSED SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATION PLAN

SOURCES:
- BASEMAP DATA FROM CITY OF YONKERS PROPERTY RECORDS, SURVEY DATED 11/14/66, REVISED 11/14/85.

- SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATIONS ARE APPROXIMATE AND WERE NOT SURVEYED.

DATE	01/22/2013	PROJ. NO.	K47850003
SCALE	1"=60'		
DRN. BY	RP	SHT. NO.	FIG. 2
CHK. BY	CB		

FILE NAME: \\psswrm-fil1\Projects\04785\0003\DWGs\CAD\C-Civil\Plotdwgs\047850003-c-fig2-wellboringplan-yk.dwg LAST EDIT: 01/24/2013 – 11:15:58 AM LOGIN: rpaulino@paulino XREFS: 03113007-c-bs00-yk ; 11x17V-yo-new ; 11x17V-YK-121510 IMAGE: PS&S Basic LOGO_BLUE-300dpi.

APPENDICES

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN (QAPP) & SAMPLING AND ANALYSIS PLAN (SAP)

-DRAFT-
QUALITY ASSURANCE PROJECT PLAN
AND
SAMPLING AND ANALYSIS PLAN

- FOR -

Polychrome R&D Lab Site

137-145 Alexander Street
Yonkers, Westchester County, New York
SITE ID C360099

Submitted by:

Alex II West, LLC

159 Alexander Street
Yonkers, New York 10701

February 6, 2013

Prepared by:

55 Main Street, 3rd floor
Yonkers, NY 10701

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) is to present the organization, objectives, specific quality assurance/quality control (QA/QC) procedures and to outline and detail sample collection and analytical procedures leading to valid data for use during Remedial Investigation (RI) activities at the Polychrome R&D Lab Site ("Site") located at 137-145 Alexander Street in Yonkers, Westchester County, New York.

The plan provides descriptions of protocols to be utilized for field sampling, sample handling and storage, laboratory analysis, record keeping and data evaluation and management. The quantitative and qualitative data generated from the RI will be utilized to identify the nature and extent of contamination, identify impacts and sources of the impacts and aid in preparing remedial options.

2.0 PROJECT ORGANIZATION AND RESPONSIBILTY

A project organization has been developed to identify the roles and responsibilities of the various parties involved with this RI. The organizational structure for this RI includes New York State Department of Environmental Conservation (NYSDEC), PS&S Engineering, Inc. (PS&S), and the required contractors (i.e., analytical testing laboratories, drillers, etc). Although the Quality Assurance/Quality Control (QA/QC) responsibilities are principally the responsibility of the PS&S Project Manager and Project Quality Assurance Manager (PQAM), proper implementation of QA/QC requirements necessitate that the entire project staff be cognizant of all procedures and goals.

The PS&S team will consist of the following personnel, with a description of their responsibilities:

Hal Newell is the Project Manager. He has primary responsibility and authority for implementing and executing the technical, QA, and administrative aspects of the pre-design investigation, including the overall management of the project team. The Project Manager is accountable for ensuring that the RI Field Program is conducted in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific Health and Safety Plan (HASP). In addition, the Project Manager will communicate all technical, QA and administrative matters to Alex II West, LLC.

Christine Beaver is the Project Geologist. She has primary responsibility for implementing and executing the RI Field Program in accordance with applicable plans and guidelines, including the QAPP/SAP, and the Site-Specific Health and Safety Plan (HASP). In addition, the Project Geologist will communicate all technical and QA matters to the Project Manager and coordinate all RI activities with the selected contractors.

Engineering support for the investigation will be the responsibility of John Bolan, the Project Engineer and Qualified Environmental Professional. His duties include overseeing the preparation of project deliverables.

John Pastorick is the Project Quality Assurance Manager (PQAM) and will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements of this QAPP/SAP.

Christine Beaver is the Field Operations Lead (FOL). She will be responsible for the management and supervision of the field investigation and for providing consultation and decision-making on day-to-day issues relating to the sampling activities. The FOL will monitor the sampling to

determine that operations are consistent with plans and procedures, and that the data acquired meets the geotechnical data quality needs. When necessary, the FOL will document any deviations from the plans and procedures for approval.

Jeff Farrell is the Health and Safety Coordinator (HSC). The HSC reports to the PS&S Project Manager, and is responsible for the implementation of the HASP. The HSC shall advise project staff on health and safety issues, conduct health and safety training sessions, and monitor the effectiveness of the health and safety program conducted in the field.

In addition, other site personnel may provide support to the Project Manager and FOL on an as-needed basis. Adrianna Bosco/Greg McClellan will be on-site Field Representatives.

The services of an analytical laboratory contractor will also be necessary to perform the investigation activities. The Project Manager, with assistance from the FOL and PQAM, will be the liaison between PS&S and the analytical laboratory contractor.

Any laboratory utilized for the analysis of environmental samples shall be a NYSDEC certified laboratory. The laboratory shall deal directly with the consultant in regards to analytical parameters, sample handling, and analytical results reporting. The laboratory shall be responsible for providing all materials for sample collection, handling, and transportation in accordance with QA/QC requirements.

3.0 DATA QUALITY REQUIREMENTS

Data quality requirements and assessments will be consistent with the NYSDEC's Division of Environmental Remediation regulations and guidance. Quantification limits, estimated accuracy, accuracy protocol estimate precision and precision protocol will be determined by the laboratory and will be in conformance with NYSDEC requirements.

The methods of analysis will be in accordance with United States Environmental Protection Agency (USEPA) SW846. Specific analytical procedures and laboratory QA/QC descriptions are not included in this QA/QC Plan, but will be available upon request from the laboratory selected to perform the analyses. The laboratory will be a NYSDEC certified laboratory.

3.1 Data Usage

The data generated from the RI will be used to determine the nature, extent and source(s) of contamination at the project site, to aid in preparing plans regarding future remedial options. The data will also be utilized to monitor the health and safety of workers at the site and potential receptors off site.

3.2 Data Comparability

All data will be presented using standard reporting units and reporting formats, including the reporting of QC data. In addition, sample locations, collection procedures and analytical methods from earlier studies will be evaluated for comparability with current procedures/methods.

3.3 Data Completeness

The acceptability of 100% of the data is desired as a goal for this project. The acceptability of less than 100% complete data, meeting all laboratory QA/QC protocols/standards, will be evaluated on a case-by-case basis. The QA officer will provide data validation services to assist in confirming the acceptability of the reported laboratory analytical data. A total of

10% of each laboratory generated data package will be validated to assist in confirming the reliability of the entire laboratory reporting package.

3.4 Laboratory Sample Custody Procedures

A NYSDEC certified laboratory meeting the requirements for sample custody procedures, including cleaning and handling sample containers and analytical equipment, will be used to analyze samples collected during the RI. The selected laboratory's Standard Operating Procedures will be made available upon request.

4.0 SAMPLING PROCEDURES

Environmental sampling may generally include obtaining samples of different media utilizing different techniques. The following summarizes the various environmental media that may be conducted in support of this RI.

- Soil Vapor - Soil vapor samples may be collected as part of a soil vapor survey to identify potential sources of and the potential extent of contamination. The soil vapor survey may also be utilized on a preliminary basis to determine if the presence of subsurface contamination is potentially impacting surface receptors.

- Surface Soil - Surface soil samples may be collected from prescribed on and off-site locations to determine the extent of on-site and/or off-site surface soil contamination.

- Subsurface Soil - Subsurface soil samples will be collected during the advancement of soil borings pits and probe locations. Subsurface soil samples may be collected to delineate the extent of on and off-site contamination.

- Groundwater - Groundwater samples may be obtained from monitoring wells, and/or probe or Hydropunch sampling devices which may be installed as part of the investigation or from monitoring wells which were installed previously at and in the vicinity of the site. Groundwater samples will be collected to define the horizontal and vertical extent of groundwater contamination on and off site.

- Air - Ambient air samples may be collected on and off site, within buildings and outdoors, to identify potential health risks to workers and to determine if contamination has impacted building interiors.

A detailed discussion of the sampling program for the Site and selection of sample matrices and locations will be provided for in the RIWP.

4.1 Analytical Parameters

Surface soil, subsurface soil and groundwater samples collected from the Site will be analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOC) +10, TCL Semivolatile Organic Compounds (SVOC) +20, Target Analyte (TAL) Metals, Hexavalent Chromium, Total Cyanide, Polychlorinated Biphenyls (PCBs), Pesticides and Herbicides.

Soil vapor and ambient air samples collected from the Site will be analyzed for Volatile Organic Compounds on the TO-15 list.

Table 1 presents a summary of the parameters/sample fraction that may be monitored for at the Site, together with the typical sample location, type of sample, sample matrix, type of sample container, method of sample preservation, holding time and analytical method.

Table 1

SUMMARY OF ANALYTICAL PARAMETERS

Sample Matrix	**Sample Type**	**Analytical Parameter**	**EPA Analytical method**	**Sample Preservation**	**Maximum Holding Time**	Sample Container
Soil	Grab	TCL VOCs+10	Method 8260-low	Cool to 4°C, MeOH to pH>12	10 days after VTSR for analysis	Encore transferred to Glass, clear/40 ml/ ICHEM 200 series or equivalent
Soil	Grab	TCL SVOCs+20	Method 8270D	Cool to 4°C	10 days after VTSR for extraction, 40 days after extraction for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Soil	Grab	PCBs	Method 8082A	Cool to 4°C	10 days after VTSR for extraction, 40 days after extraction for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Soil	Grab	Pesticides/Herbicides	Method 8081A/8151A	Cool to 4°C	10 days after VTSR for extraction, 40 days after extraction for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Soil	Grab	TAL Metals	Method 6010B/7471A	Cool to 4°C	26 days after VTSR for Hg analysis, 6 months for all other metals	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Soil	Grab	Hexavalent Chromium	Method 7196A	Cool to 4°C	24 hours after VTSR	Glass, clear/8 oz./1 ICHEM 200 series or equivalent
Soil	Grab	Total Cyanide	Method 9012B	Cool to 4°C	12 days after VTSR for analysis	Glass, clear/8 oz./1 ICHEM 200 series or equivalent

VTSR - Verified time of sample receipt at the laboratory.

Table 1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Matrix	**Sample Type**	**Analytical Parameter**	**EPA Analytical method**	**Sample Preservation**	**Maximum Holding Time**	Sample Container
Groundwater	Grab	TCL VOCs+10	Method 8260B	Cool to 4°C, HCL to pH<2	14 days after VTSR for analysis	Glass, clear/40 ml/3 ICHEM 300 series or equivalent
Groundwater	Grab	TCL SVOCs+20	Method 8270D	Cool to 4°C	7 days after VTSR for extraction, 40 days after extraction for analysis	Glass, amber/1 L/2 ICHEM 300 series or equivalent
Groundwater	Grab	PCBs	Method 8082A	Cool to 4°C	7 days after VTSR for extraction, 40 days after extraction for analysis	Glass, amber/1 L/2 ICHEM 300 series or equivalent
Groundwater	Grab	Pesticides/Herbicides	Method 8081A/8151A	Cool to 4°C	7 days after VTSR for extraction, 40 days after extraction for analysis	Glass, amber/1 L/2 ICHEM 300 series or equivalent
Groundwater	Grab	TAL Metals (Total and Dissolved)	Method 6010B/7470A	HNO_3 to pH <2 or None, Cool to 4°C	26 days after VTSR for Hg analysis, 6 months after VTSR for analysis of all other metals	Plastic/1 L/1 ICHEM 300 series or equivalent
Groundwater	Grab	Hexavalent Chromium	Method 7196A	Cool to 4°C	24 hours after VTSR	Plastic/500 mL/1 ICHEM 300 series or equivalent
Groundwater	Grab	Total Cyanide	Method 335.4	Cool to 4°C, NaOH to pH>12	12 days after VTSR for analysis	Plastic/1L/1 ICHEM 300 series or equivalent

Table 1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Matrix	**Sample Type**	**Analytical Parameter**	**EPA Analytical method**	**Sample Preservation**	**Maximum Holding Time**	Sample Container
Soil Vapor	Grab – 60 minute	VOCs	TO-15	None	7 days after VTSR for analysis	Summa Canister, 6L
Ambient Air	Grab – 60 minute	VOCs	TO-15	None	7 days after VTSR for analysis	Summa Canister, 6L

VTSR - Verified time of sample receipt at the laboratory.

4.2 Detailed Sampling Procedures

Environmental samples to be collected as part of the RI may consist of surface soil, subsurface soil, groundwater, soil vapor and ambient air. Sample locations may consist of monitoring wells, soil probe locations, groundwater probe locations, Hydropunch locations, soil borings, and surface soils. Actual sample media locations are described in the RIWP. General sampling guidelines, including sample media, depths, equipment, rationale and analytical parameters is provided in Table 2.

During soil sample collection, an attempt will be made to maintain sample integrity by preserving its physical form and chemical composition to as great an extent as possible. An appropriate sampling device (i.e., decontaminated or dedicated equipment) will be utilized to transfer the sample into the sample container. The sample will be transferred into the sample bottle as quickly as possible, with no mixing, to make certain that the volatile fraction is not lost. All laboratory containers will be fitted with seals to minimize volatilization.

The materials involved in groundwater sampling are critical to the collection of high quality monitoring information, particularly where the analyses of volatile organic compounds, pH sensitive or reduced chemical constituents are of interest. The materials of construction for bailers and pump parts will be PTFE (e.g., Teflon^{R}) stainless steel and/or polyethylene.

Table 2

SUMMARY OF SAMPLING PROGRAM

Environmental Media	**Sample Location**	**Sample Point**	**Sample Depth**	**Equipment**	**Rationale**	**Sample Analysis**
Soil	On Site	Probe Location	For AOC-1 and AOC-3 will be dependent on visual characteristics and total organic vapor field screening. For AOC -2 will be 0-6'bgs in fill materials.	Decontaminated Macrocore sampler fitted with dedicated acetate liner (during Geoprobe drilling) and Decontaminated core barrel (during sonic drilling).	To determine soil contamination. To pre-characterize fill for waste disposal.	TCL VOC, TCL SVOC, TAL metals, hexavalent chromium, total cyanide, PCBs, pesticides and herbicides
Groundwater	On Site	Monitoring Well	At screened interval	Low-flow sampling pump and dedicated tubing.	To determine groundwater contamination	TCL VOC, TCL SVOC, TAL metals, hexavalent chromium and total cyanide
Soil Vapor	On Site	Probe Location	3.5-4' bgs.	Stainless steel soil vapor probe point with dedicated tubing threaded onto fitting of Summa Canister.	To determine sub-slab soil vapor contamination.	TO-15
Ambient Air	On Site	Upwind portion of the Site as determined by field conditions	In breathing zone	Direct into Summa Canister	To determine if ambient air concentrations are influencing sub-slab soil vapor sample concentrations.	TO-15

There will be several steps taken after the transfer of the soil or water sample into the sample container that are necessary to properly complete collection activities. Once the sample is transferred into the appropriate container, the container will be capped and, if necessary, the outside of the container will be wiped with a clean paper towel to remove excess sampling material. The container will not be submerged in water in an effort to clean it. Rather, if necessary, a clean paper towel moistened with distilled/deionized water will be used.

The sample container will then be properly labeled. Information such as sample number, location, collection time and date, sampler's initials and sample description will be recorded on the field log forms. Associated paper work (e.g., Chain of Custody forms) will then be completed and will accompany the sample. During sample transport to the laboratory the samples will be packaged in a manner that will allow the appropriate storage temperature to be maintained during shipment to the laboratory. Samples will be delivered to the laboratory within 48 hours of collection.

4.3 Sample Identification

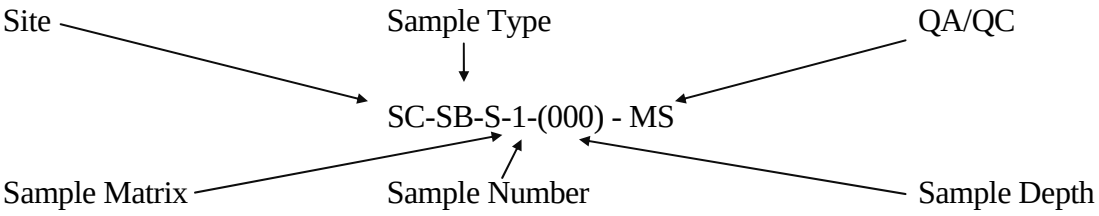
All samples collected will be labeled with a sample identification code. The code will identify the site, sample location, sample matrix and series numbers for sample locations with more than one sample. Samples will be labeled according to the following system:

- Site: – Site name (i.e., Polychrome R&D Lab Site (PRD))
- Sample Type:
  - Soil Boring or Probe "SB"
  - Monitoring Well "MW"
  - Soil Vapor Probe "SV"
- Sample Matrix:
  - Soil "S"
  - Groundwater "GW"
  - Ambient Air "AA"
  - Soil Vapor "SV"
- Sample Number: – For circumstances where more than one sample of the same type and/or from the same location will be

collected, a consecutive sample number will be assigned. When more than one sample is collected from a borehole in a sampling round at different depths, the depth will be indicated on the sample container and in the field log book.

- Quality Assurance/ Quality Control (QA/QC):
  - Matrix Spike "MS"
  - Matrix Spike Duplicate "MSD"
  - Field Blank "FB"
  - Trip Blank "TB"

Based upon the above sample identification procedures, an example of a sample label may be:



4.4 Sample Handling, Packaging and Shipping

All samples will be placed in the appropriate containers in accordance with NYSDEC requirements. The holding time criteria identified in the ASP will be followed as specified in Table 1.

Prior to packaging any samples for shipment, the sample containers will be checked for proper identification and compared to the field log forms for accuracy. The samples will then be wrapped with a cushioning material and placed in a cooler (or laboratory shuttle) with a sufficient amount of bagged ice or "blue ice" packs in order to keep the samples at 4°C until arrival at the laboratory. If an office trailer is located on-site and equipped with a sample refrigerator, the samples may be maintained in the sample refrigerator prior to placement in the laboratory shuttle container.

All necessary documentation required to accompany the sample during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler will then be sealed with fiber (duct) or clear packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

All samples will be shipped to the laboratory receipt within 48 hours of sample collection in accordance with NYSDEC requirements. The laboratory will be notified prior to the shipment of the samples.

4.5 Sampling Methodologies

4.5.1 Soil Vapor

1. Be certain that the sample location is noted on Location Sketch.
2. Drive the decontaminated stainless steel probe with removable inner rod into the ground to the desired depth, above the zone of saturation, leaving approximately one-foot of the probe exposed above the ground surface.
3. Connect new silicon/teflon tubing to the probe and the personal sampling pump. Turn on pump. Allow the pump to run until the soil vapor within the probe has reached equilibrium.*
4. Perform Helium test.
5. Collect a vapor sample using a gas tight syringe, sorbent tube or SUMMA canister.
6. Shut off pump and disconnect tubing.
7. Extract probe from the ground and decontaminate according to the procedures in Section 5.

*In order to establish the amount of time required for the soil vapor to reach equilibrium in the probe, two approaches can be utilized:

a. Once the personal sampling pump is turned on, collect a sample every 1 to 2 minutes and analyze on the portable GC. Continue to collect samples until two consecutive samples yield comparable results. Do this at two or three locations in order to establish a pumping time.

b. Instead of using a personal sampling pump, attach the silicon tubing from the probe directly to a PID or FID. Once a steady reading is obtained, the system is considered to be in equilibrium. (Not recommended if low levels of volatile organic vapors are present [i.e., <1 ppm].)

4.5.2 Soil (Surface)

1. Be certain that the sample location is noted on Location Sketch.

2. If a dedicated sampling device is not used, be certain that the sampling equipment has been decontaminated utilizing the procedures outlined in Section 5.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form 5.

4. At the sample location, clear surface debris (e.g., vegetation, rocks, twigs, etc.). First, collect the sample for VOC analysis. Collect an adequate amount of soil from a selected depth interval (i.e. 0 to 6 inches) using a dedicated Terracore sampler. Terracore samplers should be filled completely. Confirm that the Terracore sampler contains 5 grams of soil using a portable field scale. Transfer the sample directly the sample container preserved with Methanol.

5. For remaining analysis, collect an adequate amount of soil from a depth of 0 to 6 inches using a decontaminated or disposable scoop and/or sterile wooden tongue depressor. Transfer the sample directly into the precleaned sample container from sample cooler and label the sample container.

6. Return the sample container to the cooler or refrigerator. If the sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler or refrigerator.

7. If reusable, decontaminate the sampling equipment according to the procedures described in Section 5.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.3 Soil (Probe)

1. Be certain that the sample location is noted on Location Sketch.

2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

3. Drive the probe to the desired sampling depth.

4. Retrieve the soil probe and immediately after opening it, obtain an organic vapor measurement with a FID or PID and complete boring log form.

5. First, collect the sample for VOC analysis. Collect an adequate amount of soil from a selected depth interval using a dedicated Terracore sampler. Terracore samplers should be filled completely. Confirm that the Terracore sampler contains 5 grams of soil using a portable field scale. Transfer the sample directly the sample container preserved with Methanol.

6. For remaining analysis, remove a sample aliquot from the soil probe using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.

7. Return the sample container to the cooler or refrigerator. If the sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler or refrigerator

8. If reusable, decontaminate the sampling equipment according to the procedures described in Section 5.

9. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.4 Soil (Borehole, Split Spoon or Core Barrel)

1. Be certain that the sample location is noted on Location Sketch.

2. Be certain that the sampling equipment (split spoon) has been decontaminated utilizing the procedures outlined in Section 5.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

4. Drill into the soil to the desired depth and drive the split spoon sampler.

5. Retrieve the split spoon and immediately after opening the split spoon, obtain an organic vapor measurement with a PID or FID and fill out Boring Log Form.

6. First, collect the sample for VOC analysis. Collect an adequate amount of soil from a selected depth interval using a dedicated Terracore sampler. Terracore samplers should be filled completely. Confirm that the Terracore sampler contains 5 grams of soil using a portable field scale. Transfer the sample directly the sample container preserved with Methanol.

7. For remaining analysis, remove a sample aliquot from the split spoon using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.

8. Return the sample container to the cooler or refrigerator. If the sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler or refrigerator.

9. If reusable, decontaminate the sampling equipment according to the procedures described in Section 5.

10. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.5 Groundwater (Probe)

1. Be certain sample location is noted on Location Sketch.

2. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

3. Obtain a sample by using a dedicated polyethylene tubing equipped with a bottom check valve.

4. After sample collection, obtain field measurements including pH, conductivity, temperature and turbidity.

5. Gently pour the sample into the sample container taking care not to spill on the outside of the container, spill any of the preservative or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a

meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

6. If a sample is to be collected for metals analysis, the turbidity must be less than 50 NTUs. If the turbidity cannot be reduced to less than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

7. Return sample containers to sample cooler or refrigerator.

8. Place all disposable personal protective equipment and disposal sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.6 Groundwater (Hydropunch)

1. Be certain sample location is noted on Location Sketch.

2. Using Hydropunch equipment drive/punch screen to desired depth.

3. Remove inner sleeve and lower down decontaminated Hydropunch bailer.

4. Remove the laboratory precleaned sample container from the sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

5. Obtain a sample and analyze for field parameters (pH, conductivity, temperature and turbidity).

6. Obtain a volatile organic sample by using a Hydropunch bailer. Gently pour the sample into the sample container taking care not to spill on the outside of the container, spill any of the preservative or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace

the septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Turbidity must be less than 50 NTUs prior to collection of a sample for metals analysis. If the turbidity of the sample is greater than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

8. Collect remaining samples. Gently pour the sample into the sample container, taking care not to spill water on the outside of the container or overfill the container. Replace cover on the sample container.

9. Return sample container to sample cooler or refrigerator.

10. Punch down to next depth and repeat items 3 through 9.

11. Decontaminate Hydropunch equipment as described in Section 5.

12. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.7 Groundwater (Monitoring Well)

1. Measure the depth of water using a decontaminated water level indicator and compute the volume of standing water in the well.

2. Remove three to five times the volume of standing water from the well until field measurements (pH, conductivity, temperature and turbidity) stabilize, or until the well is dry, whichever occurs first. Turbidity should be less than 50 NTUs prior to collection of a sample for metals analysis. If utilizing "Low-Flow" purging continuously monitor field measurements (pH, conductivity, turbidity, temperature, dissolved oxygen and redox potential) until stabilization.

3. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Summary Form and Chain of Custody Form.

4. Obtain a sample by using a disposable polyethylene bailer or from the discharge point when utilizing "Low Flow" purging.

5. If the turbidity of the sample is greater than 50 NTUs, the metals portion of the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

6. Gently pour the sample into the sample container taking care not to spill on the outside of the container, spill any of the preservative or overfill container and replace the cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Return sample container to sample cooler or refrigerator.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.6 Grab Sampling and Composite Sampling

Grab sampling consists of collecting a sample from a discrete interval, utilizing the appropriate sampling tool, and submitting that sample for analysis. The discrete intervals for Grab Samples should be outlined in the Site-specific Work Plan for the subject site. Composite sampling consists of homogenizing different grab samples, of the same material, into one sample for analysis. Composite sampling should be performed by collecting the individual grab samples and combining them in a decontaminated stainless steel pan or bowl where the soils can be combined prior to being placed in the sample container. The number of composite samples collected would depend on the amount of material being sampled and the respective sample analysis. Composite samples for volatile organics will be collected from each discrete grab samples and placed in the sample container prior to the remainder of the soils being mixed.

4.7 Monitoring Well Installation

To provide for the collection of representative groundwater samples permanent two-inch or four-inch diameter monitoring wells will be installed. Groundwater monitoring wells will be constructed of threaded two-inch-diameter or four-inch-diameter Schedule 40 PVC well casing equipped with 20-slot well screen. Well construction will include a 10-foot screened interval and solid PVC riser to grade as determined by field conditions. The length of well screen extending above the top of the water table will be determined based on field conditions. The appropriate clean silica sand size should be used for the screen being utilized (i.e., No. 2 sand for 20-slot screen) shall be placed in the annular space around the well from one foot below the screened interval extending to a minimum of two feet above the top of the well screen. A six-inch bentonite seal shall then be placed above the sand pack and wetted with potable water for a minimum of 15 minutes before backfilling the remaining space with a cement-bentonite grout. Upon completion of the monitoring well, a 3-foot thick seal will be formed. If warranted by depth, backfilling will be completed using a tremie pipe placed below the surface of the grout. Solid PVC riser, attached to the well screen, will extend approximately to grade for flush-mount installations or approximately two feet above grade for above-ground mount installations. A flush-mount or above-grade mount protective casing with a locking water-tight well cap will then be installed and a measuring point marked on each PVC well riser. Well construction diagrams will be prepared for each well. Modifications to the well installation/construction procedures may be warranted if subsurface conditions (presence of finer grained materials or DNAPL) indicate that they may be necessary. Any modifications must be approved by the Project Manager and Alex II West.

4.8 Well Development

Following their installation, the groundwater monitoring wells will be developed, using a two-inch diameter Grundfos submersible pump(s) (or equivalent) until the water is reasonably free of turbidity and field readings (pH, conductivity, temperature, and dissolved oxygen) sufficiently stabilize. Fifty nephelometric turbidity units (NTUs) or less will be the turbidity goal but not an absolute value. To minimize suspended material, the wells will be

developed very carefully using low-flow submersible pump techniques. The wells will be developed at low pumping rates, on the order of 0.5 to one gallons per minute (gpm). Bailers will not be used for developing these wells (nor will bailers be used for sampling except for VOC compounds). The wells will be allowed to equilibrate for 14 days prior to sampling. The volume of water removed, the well development time, and field instrument readings will be recorded on the field forms.

5.0 DECONTAMINATION PROCEDURES

Whenever possible, all field sampling equipment should be sterile/disposable and dedicated to a particular sampling point. In instances where this is not possible, a field cleaning/decontamination procedure will be used to mitigate cross contamination between sample locations. A decontamination station/pad will be established for all field sampling activities. This will be an area located away from the source of contamination so as not to adversely impact the decontamination procedure, but close enough to the sampling locations to keep equipment transport handling to a minimum after decontamination.

5.1 Field Decontamination Procedures

All nondisposable equipment will be decontaminated at appropriate intervals (e.g., prior to initial use, prior to moving to a new sampling location and prior to leaving the site). Different decontamination procedures are used for various types of equipment that are used to collect samples. When using field decontamination, sampling should commence in the area of the site with the lowest contamination, if known or probable, and proceed through to the areas of highest contamination. It may be necessary to repeat a decontamination procedure if the sampler is used to obtain a Non Aqueous Phase Liquid (NAPL) sample.

5.2 Decontamination Procedure for Drilling/Probing Equipment

All equipment such as drill rigs and other mobile equipment will receive an initial cleaning prior to use at the site. The frequency of decontamination while on site will depend on how the equipment is actually used in relation to collecting environmental samples. All wash/rinse solutions will be collected and containerized on site until testing results provide for an appropriate disposal option.

After the initial decontamination, cleaning may be reduced to those areas that are in close proximity to materials being sampled. Drill rig/probe items such as augers, drill/probe rods and drill bits will be cleaned in between sample locations.

Drilling/probing equipment will be decontaminated in the following manner:

- Wash thoroughly with nonresidual detergent (alconox) and tap water using a brush to remove particulate matter or surface film. Pressure washing will be utilized, if necessary, to remove any oil and/or tar accumulations on the back of the rig, auger flights, drill rods, drill head, etc. Any loose paint chips, paint flakes and rust must also be removed.
- Steam clean (212°F).
- Once decontaminated, remove all items from the decontamination area.

Also, following the general cleaning procedures described above, all downhole/drilling sampling items, such as split spoon samplers, core barrels, rock corers, or any other item of equipment which will come in direct contact with a sample during drilling, will be decontaminated by the methods outlined in this section.

5.3 Decontamination Procedure for Sampling Equipment

Teflon, PVC, polyethylene, stainless steel and downhole sampling equipment decontamination procedures will be the following:

- Wash thoroughly with nonresidual detergent (alconox) and clean potable tap water using a brush to remove particulate matter or surface film. Pressure washing will be utilized, if necessary, to remove oil and/or tar.
- Steam clean (if necessary to remove oil and/or tar).
- Rinse thoroughly with tap water.
- Rinse thoroughly with distilled water.
- Rinse with Nitric Acid (10% solution), in a well-ventilated area, if sampling for metals.
- Rinse thoroughly with distilled water.
- Rinse with methanol (pesticide grade), in a well-ventilated area and air dry.

- Rinse thoroughly with distilled water and air dry.
- Wrap completely in clean aluminum foil with dull side against the equipment. For small sampling items, such as scoops, decontamination will take place over a drum specifically used for this purpose.

Methanol has been chosen because it is not an analyte of concern on the Target Compound List. The solvent will be allowed to evaporate and then a final distilled/deionized water rinse will be performed.

5.4 Decontamination Procedure for Well Casing and Development Equipment

Field cleaning of PVC, steel, stainless steel well casings will consist of a manual scrubbing to remove foreign material and steam cleaning, inside and out, until all traces of oil, grease and tar are removed. This material will then be stored in such a manner so as to preserve it in this condition. Special attention to threaded joints will be necessary to remove cutting oil or weld burn residues of steel and stainless steel material, if necessary.

Materials and equipment that will be used for the purposes of well development will also be decontaminated by steam cleaning. An additional step will involve flushing the interior of any hose, pump, etc. with a nonphosphate detergent solution and potable water rinse prior to the development of the next well. This liquid waste will be containerized on site, until testing results provide for an appropriate disposal option.

6.0 DOCUMENTATION

Proper management and documentation of field activities is essential to provide that all necessary work is conducted in accordance with the sampling plan and QA/QC Plan in an efficient and high quality manner. Field management procedures will include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required); preparing a Location Sketch; completing Sample Summary Forms, Chain of Custody Forms, Boring, Drilling and Well Construction Logs; maintaining a daily Field Forms; completing Daily Equipment Calibration Logs; preparing Daily Field Activity Reports; completing Field Change Forms; filling out a Daily Air Monitoring Form and maintenance of Photographic documentation. Copies of each of these forms are included in the Attachments Section. Proper completion of these forms and the field forms are necessary to support the consequent actions that may result from the sample analysis. This documentation will support that the samples were collected and handled properly.

6.1 Location Sketch

The location of Site activities will be based on the Sample Location Plan in Attachment A. For each sampling point, a Location Sketch will be completed using permanent references and distances to the sampling point noted, if possible.

6.2 Sample Summary Form

At each sampling location, a Sample Summary Form is filled out including, but not limited to, the following information:

- Site Name
- Client Name
- Sample identification number
- Date

- Time of sample collection
- Sample Matrix
- Sample Depth
- Analysis to be performed
- PID readings

6.3 Chain of Custody

The Chain of Custody (COC) form is initiated at the laboratory with container preparation and shipment to the site. The form remains with the sample(s) at all times and bears the name of the person assuming responsibility for the samples. This person is tasked with providing secure and appropriate handling of the containers and samples. When the COC form is complete, it will indicate that there was no lapse in sample accountability.

A sample is considered to be in an individual's custody if any of the following conditions are met:

- It is in the individual's physical possession, or
- It is in the individual's view after being in his or her physical possession, or
- It is secured by the individual so that no one can tamper with it, or
- The individual puts it in a designated and identified secure area.

In general, the Chain of Custody form is provided by the laboratory selected to perform the analytical services. At a minimum, the following information will be provided on these forms:

- Project name and address
- Project number

- Sample identification number
- Date
- Time
- Sample location
- Sample type/description
- Sample matrix
- Analysis requested
- Number of containers and volume taken
- Remarks
- Type of waste
- Sampler(s) name(s) and signature(s)
- Spaces for relinquished by/received by signature and date/time.
- Required laboratory deliverables/format

Chain of Custody forms to be utilized at a site will be those provided by the chosen analytical laboratory.

The Chain of Custody form will be filled out and signed by the person performing the sampling. The original of the form will travel with the sample and will be signed and dated each time the sample is relinquished to another party, until it reaches the laboratory or analysis is completed. The field sampler will keep one copy and a copy will be retained for the project file. The sample bottle will also be labeled with an indelible marker with a minimum of the following information:

- Project identification/number/site name
- Sample number
- Analysis to be performed

- Date and time of collection

A copy of the completed form will be returned by the laboratory with the analytical results.

6.4 Split Samples

Whenever samples are being split with another party, a record of this activity should be maintained in the field log book. A copy of the Chain of Custody form shall indicate the split sample.

6.5 Field Logs

All pertinent information regarding the Site, Site activities and sampling procedures will be documented in the field logs. Notations will be made in logs, noting the time and date of all entries. Information recorded in the logs will include, but not be limited to, the following:

The first page of the log will contain the following information:

- Project name and address
- Name, address and phone number of field contact
- Client and address, if different from above
- Site personnel
- Arrival and departure of all on-site personnel
- Weather
- Activity to be performed

Daily entries will be made for the following information:

- Purpose of sampling
- Location of sampling point

- Number(s) and volume(s) of sample(s) taken
- Description of sampling point and sampling methodology
- Date and time of sample collection
- Collector's sample identification number(s)
- Sample distribution and method of storage and transportation
- References, such as sketches of the sampling site or photographs of sample collection
- Field observations, including results of field analyses (e.g., pH, temperature, specific conductance), water levels, drilling logs, and organic vapor and dust readings
- Signature of personnel responsible for completing log entries.

6.6 Daily Field Activity Report

At the end of each day of field work, the Field Operations Lead, or designee, will complete this form noting personnel on site and summarizing the work performed that day, equipment, materials and supplies used, results of field analyses, problems and resolutions. This form will be signed and subject to review.

6.7 Field Changes and Corrective Actions

Whenever there is a required or recommended change or correction in the investigation/sampling procedures. This field change will be completed by the Field Operations Lead and approved by an Alex II West representative and the NYSDEC Project Manager, if required.

7.0 CALIBRATION PROCEDURES

With regard to field equipment, the following will be maintained at the project site:

1. Equipment calibration records and operating procedures which will include provisions for documentation of frequency of calibration, conditions, calibration standards and records reflecting the calibration procedures, methods of usage and repair history of the measurement system. Calibration of field equipment will be performed daily at the sampling site prior to commencement of work activities so that any background contamination can be taken into consideration and the instrument calibrated accordingly. The equipment operation manuals shall also be maintained on site.

2. A schedule of preventive maintenance tasks, consistent with the instrument manufacturer's specific operation manuals, which will be carried out to minimize down time of the equipment.

3. Spare bulbs, filters and manufacturer manuals will be on hand to facilitate equipment maintenance and simple repair.

Analytical instrumentation calibration procedures and preventive maintenance, in accordance with NYSDEC requirements, for laboratory equipment, will be contained in the laboratory's standard operating procedures (SOP) which will be available upon request.

7.1 Performance of Field Audits

During field activities, the QA/QC officer will accompany sampling personnel into the field, in particular during the initial phase of the field program, to verify that the site sampling program is being properly conducted, and to detect and define problems so that corrective action can be taken early in the field program. All findings will be documented and provided to the Field Operations Lead.

7.2 Control and Disposal of Contaminated Material

During construction and sampling of the monitoring wells and soil borings, contaminated waste, soil and water may be generated from drill cuttings, drilling fluids, decontamination

water, development water and purge water. All soil cuttings generated during the investigation will be handled in a manner consistent with NYSDEC requirements.

All water generated during the investigation, including decontamination water, drill water and well development/purge water, will be containerized on site. The RIWP will provide detailed information on the disposal of water generated during the investigation.

Department of Transportation approved 55-gallon drums, roll off and/or water holding tank will be used for the containment of soil cuttings and water, and for disposal of personal protective clothing and disposable sampling equipment (i.e., bailers, scoops, tongue depressors, etc.). The drums will be sealed, marked and labeled with a description of the contents and from what location they were collected. All waste containers will be stored on Site in a secure area.

8.0 DATA REDUCTION, VALIDATION AND REPORTING

A NYSDEC certified laboratory meeting the New York State requirements for documentation, data reduction and reporting will be used. All data will be cataloged according to sampling locations and sample identification nomenclature.

8.1 Data Validation

A summary document regarding data validation will be completed by the laboratory, using the appropriate NYSDEC required forms and submitted with the data package. Data validation will be performed in order to define and document analytical data quality. The data validation process will assist in confirming that all analytical requirements specific to this work plan, including the QA/QC Plan are followed.

The data validation process will provide an assessment of the laboratory's performance based upon contractual requirements and applicable analytical criteria. The report generated as a result of the data validation process will provide an interpretation of the usefulness of the data that can be evaluated by the end user of the analytical results. The overall level of effort and specific data validation procedure to be used will be for a "10% validation."

During the review process, it will be determined whether the contractually required laboratory submittals for sample results are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of data. Each data package will be checked for completeness and technical adequacy of the data. Upon completion of the review, the reviewers will develop a QA/QC data validation report for each analytical data package.

"Qualified" analytical results for any one field sample will be established and presented based on the results of specific QC samples and procedures associated with its sample analysis group or batch. Precision and accuracy criteria (i.e., QC acceptance limits) will be used in determining the need for qualifying data. Where test data have been reduced by the

laboratory, the method of reduction will be described in the report. Reduction of laboratory measurements and laboratory reporting of analytical parameters will be verified in accordance with the procedures specified in the NYSDEC program documents for each analytical method (i.e., recreate laboratory calculations and data reporting in accordance with the method specific procedure). The standard operating guideline manuals and any special analytical methodology required will specify documentation needs and technical criteria and will be taken into consideration in the validation process. Copies of the complete data package and the validation report, including the laboratory results data report sheets, with any qualifiers deemed appropriate by the data reviewer, and a supplementary field QC sample result summary statement, will be submitted to the NYSDEC.

The following is a description of the two-phased approach to data validation which will be used in the investigation. The first phase is called checklisting and the second phase is the analytical quality review, with the former being a subset of the latter.

- Checklisting - The data package will be checked for correct submission of the contract required deliverables, correct transcription from the raw data to the required deliverable summary forms and proper calculation of a number of parameters.
- Analytical Quality Review - The data package will be closely examined to recreate the analytical process and verify that proper and acceptable analytical techniques have been performed. Additionally, overall data quality and laboratory performance will be evaluated by applying the appropriate data quality criteria to the data to reflect conformance with the specified, accepted QA/QC standards and contractual requirements.

At the completion of the data validation, a Summary Data Validation/Usability Report will be prepared and submitted to NYSDEC.

8.2 Performance and System Audits

A NYSDEC certified laboratory which has satisfactorily completed performance audits and performance evaluation samples will be used to perform sample analyses for the investigation.

8.3 Corrective Action

A NYSDEC certified laboratory will meet the requirements for corrective action protocols, including sample "clean up" to attempt to eliminate/mitigate matrix interference. High levels of matrix interference may be present in waste, soil and sediment samples. This interference may prevent the achievement of detection limits if no target compounds are found. In order to avoid unnecessary dilutions, the cleanup methods may be required to be performed by the laboratory as necessary.

8.4 Trip Blanks

The primary purpose of a trip blank is to detect other sources of contamination that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

- Laboratory reagent water;
- Sample containers;
- Cross contamination in shipment;
- Ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory; and
- Laboratory reagents used in analytical procedures.

A trip blank will consist of a set of 40 ml sample vials filled at the laboratory with laboratory demonstrated analyte free water. Trip blanks will be handled, transported and analyzed in the same manner as the samples acquired that day, except that the sample containers themselves

are not opened in the field. Rather, these sample containers only travel with the sample cooler. The temperature of the trip blanks will be maintained at 4°C while on site and during shipment. Trip blanks will return to the laboratory with the same set of bottles they accompanied in the field.

The purpose of a trip blank is to control sample bottle preparation and blank water quality as well as sample handling. Thus, the trip blank will travel to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions. Contaminated trip blanks may indicate inadequate bottle cleaning or blank water of questionable quality. Trip blanks will be implemented only when collecting water samples and analyzed for volatile organic compounds only at a frequency of one per day.

8.5 Method Blanks/Holding Blanks

A method blank is an aliquot of laboratory water or soil which is spiked with the same internal and surrogate compounds as the samples. The purpose of the method blank is to define and determine the level of laboratory background contamination. Frequency, procedure and maximum laboratory containment concentration limits should be in accordance with NYSDEC requirements. A holding blank is an aliquot of analyte-free water that is stored with the environmental samples in order to demonstrate that the samples have not been contaminated during laboratory storage. This blank will be analyzed using the same analytical procedure as the samples.

8.6 Matrix Spikes/Matrix Spike Duplicates and Spiked Blanks

Matrix spike samples are quality control procedures used by the laboratory as part of its internal Quality Assurance/Quality Control program. The matrix spikes (MS) and matrix spike duplicates (MSD) will be aliquots of a designated sample (water or soil) which are spiked with known quantities of specified compounds. These QA/QC samples will be used to evaluate the matrix effect of the sample upon the analytical methodology, as well as to

determine the precision of the analytical method used. A matrix spike blank will be an aliquot of analyte-free water, prepared in the laboratory, and spiked with the same solution used to spike the MS and MSD. The matrix spike blank (MSB) will be subjected to the same analytical procedure as the MS/MSD and used to indicate the appropriateness of the spiking solution by calculating the spike compound recoveries. The frequency regarding the MSB will be as per NYSDEC certified laboratory requirements. The MS/MSD will be collected at a frequency of 1 for every 20 collected samples for all sample media.

8.7 Field Blanks

The primary purpose of a field blank is to detect other sources of contamination that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

- Sample containers;
- Cross contamination; and
- Improper decontamination procedures.

A field blank will be generated by pouring laboratory supplied analyte free water over decontaminated sampling equipment and placed into laboratory supplied containers. Field blanks will be handled, transported and analyzed in the same manner as the collected environmental samples. The temperature of the field blanks will be maintained at 4°C while on site and during shipment.

The purpose of a field blank is to identify whether improper decontamination procedures were employed or cross contamination has occurred. Field blanks will be implemented at a frequency of one per twenty (20) samples collected or once per week whichever is greater and will be analyzed for the most comprehensive suite of parameters within the field blank set of 20 environmental samples.

8.8 Blind Duplicates

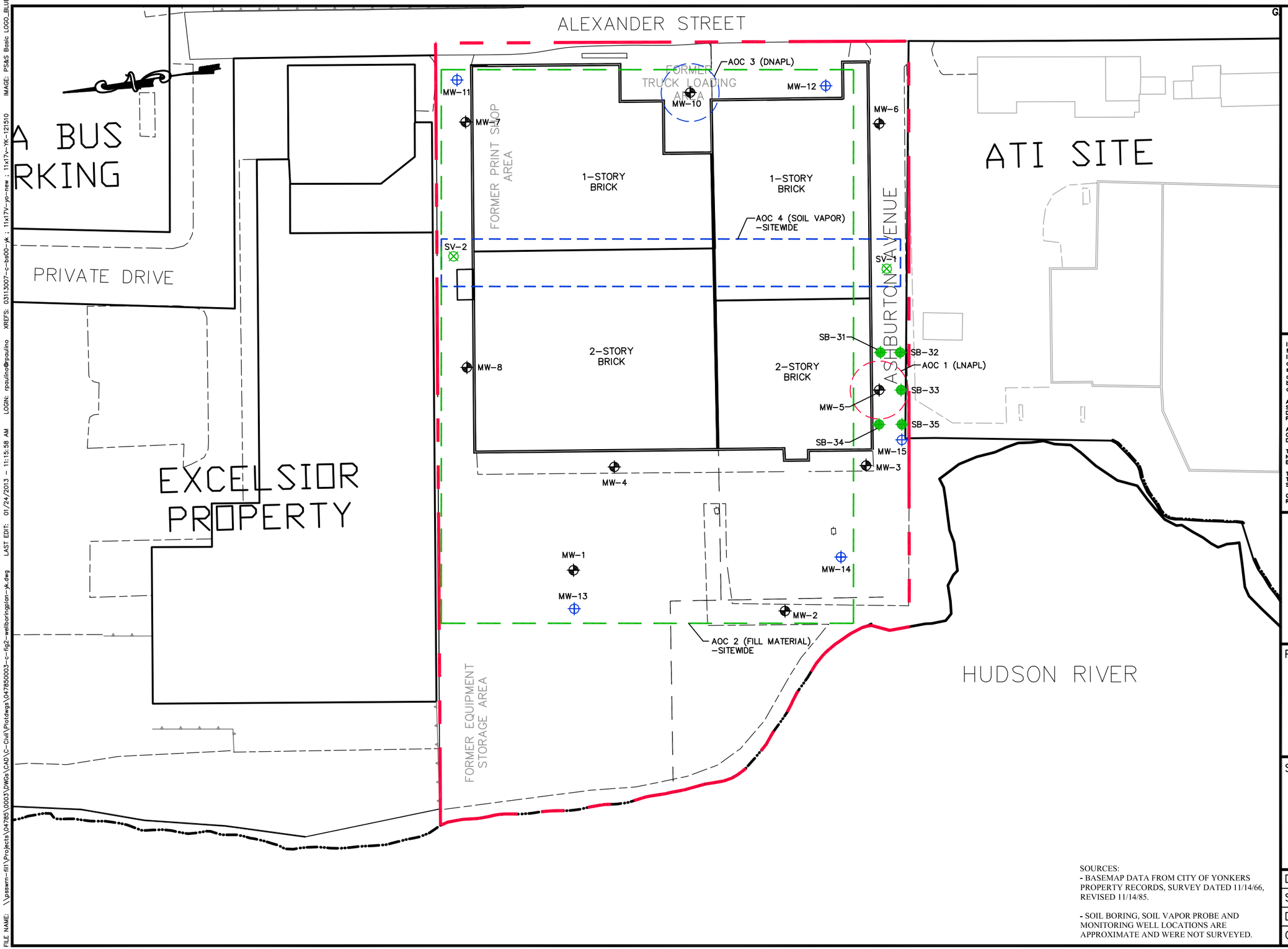
The purpose of a blind duplicate is to confirm the accuracy of the analytical laboratory. Blind duplicates will be implemented at a frequency of one per twenty (20) samples collected or once per week, whichever is greater. The blind duplicate will be collected at the same interval as one of the collected environmental samples and will be identified and labeled with a similar identification scheme as previously noted. The sampler will identify in the field log forms the sample number indicating that it was collected as a blind duplicate. The blind duplicate and will be analyzed for the same parameters as the sample it mimics.

8.9 Field Management Forms

Field management forms are included in Attachments B through P.

ATTACHMENT A

SAMPLE LOCATION PLAN



Legend

- Existing Monitoring Well Location
- Proposed Soil Boring and Monitoring Well Location
- Proposed Soil Boring Location
- Proposed Soil Vapor Probe Location
- Approximate Site Boundary
- DNAPL Observed (limits undefined)
- LNAPL Observed (limits undefined)
- AOC — Area of Concern

DRAFT

PS&S
integrating design & engineering

55 MAIN STREET
3RD FLOOR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

POLYCHROME R&D LAB SITE
137-145 ALEXANDER STREET
CITY OF YONKERS
WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

PROPOSED SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATION PLAN

SOURCES:
- BASEMAP DATA FROM CITY OF YONKERS PROPERTY RECORDS, SURVEY DATED 11/14/66, REVISED 11/14/85.

- SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATIONS ARE APPROXIMATE AND WERE NOT SURVEYED.

DATE	01/22/2013	PROJ. NO.	K47850003
SCALE	1"=60'		
DRN. BY	RP	SHT. NO.	FIG. 2
CHK. BY	CB		

FILE NAME: \\psswrm-fil1\Projects\04785\0003\DWGs\CAD\C-Civil\Plotdwgs\047850003-c-fig2-wellboringplan-yk.dwg LAST EDIT: 01/24/2013 – 11:15:58 AM LOGIN: rpaulino@paulino XREFS: 03113007-c-bs00-yk ; 11x17V-yo-new ; 11x17V-YK-121510 IMAGE: PS&S Basic LOGO_BLUE-300dpi.

ATTACHMENT B

ANALYTICAL SAMPLE SUMMARY FORMS

TABLE
CLIENT NAME
SITE NAME
ANALYTICAL SOIL SAMPLE SUMMARY TABLE

SAMPLE NO.	LABORATORY SAMPLE ID NUMBER	LABORATORY DATA PACKAGE NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH	SAMPLE MATRIX	COLLECTED BY	ANALYTICAL PARAMETERS

NOTES:

ATTACHMENT C

CHAIN OF CUSTODY FORM

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

Chemtech Project Number

COC Number

CLIENT INFORMATION

Report to be sent to

COMPANY:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME:

PROJECT #: LOCATION:

PROJECT MANAGER:

E-MAIL:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO#

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE:

DATA TURNAROUND INFORMATION

FAX:_____ DAYS*
HARD COPY:_____DAYS*
EDD_____DAYS*
* TO BE APPROVED BY CHEMTECH
STANDARD TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ❑ RESEULTS ONLY
- ❑ RESULTS * QC
- ❑ New Jersey REDUCED
- ✈ New Jersey CLP
- ❑ USEPA CLP
- ❑ New York State ASP "B"
- ❑ New York State ASP "A"
- ❑ Other_____
- ❑ EDD FORMAT_____

ANALYSIS

PRESERVATIVES: 1 2 3 4 5 6 7 8 9

COMMENTS

<-- Specify Preservatives
A-HCl B-HNO4
C-H2SO13 D-NaOH
E-ICE F-OTHER

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# of Bottles	1	2	3	4	5	6	7	8	9	COMMENTS
1.																	
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE PROSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER	DATE/TIME	RECEIVED BY
1.		1.
RELINQUISHED BY 2.	DATE/TIME	RECEIVED BY 2.
RELINQUISHED BY 3.	DATE/TIME	RECEIVED FOR LAB BY 3.

Conditions of bottles or collers at receipt: ✈ COMPLIANT ✈ NON COMPLIANT ✈ COOLER TEMP_____

MeOH extraction requires an additional 4oz. Jar for percent solid

Comments:

Page_____of_____

CLIENT: ✈ Hand Delivered ✈ Overnight

CHEMTECH: ✈ Picked Up ✈

Shipment Complete
❑ YES ✈ NO

10/18/2004

WHITE - CHEMTECH COPYFOR RETURN TO CLIENT **YELLOW** - CHEMTECH COPY **PINK** - SAMPLER COPY

#

ATTACHMENT D

FIELD INVESTIGATION SUMMARY FORM

Daily Field Investigation Summary

Project:	
Field Personnel:	
Location:	
Date:	
Weather:	
Job No.:	
Purpose:	
Contacts:	

FIELD OBSERVATIONS:

ATTACHMENT E

FIELD DRILLING LOG FORM

Paulus, Sokolowski, & Sartor
Field Drilling Log

Job Name: _____
Job Name: _____

Boring Log Number:_____
Date:_____
Weather:_____

Drilling Company: _____
Driller/Helper: _____

Depth	Recovery	PID ppm	HCN ppm	Description	Environmental Description

ATTACHMENT F

TEST PIT LOG FORM

Paulus, Sokolowski & Sartor	**TEST PIT LOG**	TEST PIT NUMBER

PROJECT NUMBER:
PROJECT NAME:
LOCATION:
EXCAVATION CO:
EXCAVATION METHOD:
OPERATOR:
ENVIRONMENTAL SCIENTIST:

WEATHER:
TOTAL DEPTH:
GROUND SURFACE ELEVATION:
DATE BEGUN:
DATE COMPLETED:

DEPTH	SAMPLE NUMBER	PID (ppm)	HCN (ppm)	WATER LEVEL	SOIL DESCRIPTION	USCS SYMBOL	LITHOLOGY	ENVIRONMENTAL DESCRIPTIONS	VISUAL OBSERVATIONS
0									
2									
4									
6									
8									
10									

ATTACHMENT G

SOIL BORING LOG FORM

Paulus, Sokolowski & Sartor	BORING LOG	BOREHOLE NUMBER -

PROJECT NUMBER:
PROJECT NAME:
LOCATION:
DRILLING CO:
DRILLING METHOD:
DRILLER / HELPER:
ENVIRONMENTAL SCIENTIST:

WEATHER:
TOTAL DEPTH:
GROUND SURFACE ELEVATION:
DATE BEGUN:
DATE COMPLETED:

DEPTH	SAMPLE NUMBER	RECOVERY (in)	PID (ppm)	HCN (ppm)	WATER LEVEL	SOIL DESCRIPTION	USCS SYMBOL	LITHOLOGY	ENVIRONMENTAL DESCRIPTIONS	VISUAL OBSERVATIONS
0 2 4 6 8 10 12 14 16 18 20										

ATTACHMENT H

WELL CONSTRUCTION LOG FORM

Paulus, Sokolowski, & Sartor	WELL CONSTRUCTION LOG	WELL NUMBER -

PROJECT NUMBER:
PROJECT NAME:
LOCATION:
DRILLING CO:
DRILLING METHOD:
DRILLER/HELPER :
ENVIRONMENTAL SCIENTIST:

WEATHER :
TOTAL DEPTH:
GROUND SURFACE ELEVATION:
DATE BEGUN:
DATE COMPLETED:

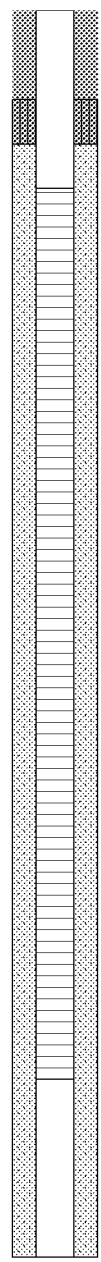
PVC CASING (DIA.) -
SCREEN (DIA.) -
PVC CASING (DIA.):

MATERIAL 1 -
MATERIAL 2 -
MATERIAL 3 -

LENGTH 1 -
LENGTH 2 -
LENGTH 3 -

DEPTH

WELL CONSTRUCTION



WELL SCHEMATICS

CEMENT SEAL 0 - 0.5'

BENTONITE SEAL 0.5' - 1.5'

SOLID PVC CASING 0 - 2'

SAND PACK 1.5' - 14'

PVC 20 SLOT SCREEN 2' - 12'

SOLID PVC CASING 12' - 14'

ATTACHMENT I

EQUIPMENT CALIBRATION LOGS

PS&S DUST TRAK INSTRUMENT CALIBRATION FORM

Job Name: _____ **Personnel:** _____

Job No: _____ **Weather:** _____

Location: _____ **Page :** _____

Date: _____

Date	Serial No.	Time	Zero Calibration No. mg/m^3

NOTES:

PS&S AIR MONITORING INSTRUMENT CALIBRATION LOG

Job Name: ____________________ **Personel:** ____________________

Job Number: ____________________ **Weather** ____________________

Location: ____________________ **Instrument No.:** ____________________

Date: ____________________

Instument Type: ____________________

Date	Calibration Gac Conc.	Calibration Y/N	Reading	Maintenance Notes
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		
	100 ppm	Y		

INSTRUMENT CALIBRATION FORM

Job Name: ____________________
Job No: ____________________
Location: ____________________
Date: ____________________

Personnel: ____________________
Weather: ____________________
Boring Location: ____________________

Instrument: ____________________
Serial No. : ____________________

Sensor	Cal. Gas Concentration	Instrument Reading	Adjusted		Adjusted Reading	Calibration Gas Maker	Calibration Gas Lot #
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________
Serial No. : ____________________

Sensor	Cal. Gas Concentration	Instrument Reading	Adjusted		Adjusted Reading	Calibration Gas Maker	Calibration Gas Lot #
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________
Serial No. : ____________________

Sensor	Cal. Gas Concentration	Instrument Reading	Adjusted		Adjusted Reading	Calibration Gas Maker	Calibration Gas Lot #
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________
Serial No. : ____________________

Sensor	Cal. Gas Concentration	Instrument Reading	Adjusted		Adjusted Reading	Calibration Gas Maker	Calibration Gas Lot #
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Instrument: ____________________
Serial No. : ____________________

Sensor	Cal. Gas Concentration	Instrument Reading	Adjusted		Adjusted Reading	Calibration Gas Maker	Calibration Gas Lot #
H_2S	25		Yes	No			
CO	50		Yes	No			
LEL	50		Yes	No			
HCN	10		Yes	No			
O_2	20.9		Yes	No			

Paulus, Sokolowski & Sartor
Soil Gas Screening
Air Sampling Equipment Calibration Data Sheet

Project Name:_____ By: _____

Project Location:_____ Sampling Date: _____

Calibration Gases:

Screening Instrument To Be Calibrated	Pollutant To Be Measured	Calibration Gas Concentration	Calibration Gas Lot/Serial Number	Calibration Gas Manufacturer

Calibration Record:

Screening Instrument With Serial No.	Calibrated Pollutants	Instrument Response	Calibration Time	Reason for Calibration: (scheduled, unexpected response, etc.)

Comments: _____

WATER METER CALIBRATION RECORD

Job Name:_____ Job Number._____

Instrument and Serial Number: _____

Name:_____Date:_____Time: _____

A) **Temperature** Check (^{o}) Read_____Thermometer _____
(Single Point Check)

B) **pH Calibration (Standard Units)**

Solution Standard	ADC Value	Check Value	NOTES:
4.00	_____	_____	_____
7.00	_____	_____	_____
10.00	_____	_____	_____

C) **Conductivity Calibration (US/cm, MS/CM)**

Solution Standard	ADC Value	Check Value	NOTES:
73.9 US/CM	_____	_____	_____
7.17 US/CM	_____	_____	_____
6.67 MS/CM	_____	_____	_____
58.64 MS/CM	_____	_____	_____

D) **Dissolved Oxygen Calibration**

		NOTES
Dissolved Oxygen (%)	_____	
ADC Value:	_____	_____
Dissolved Oxygen (ppm):	_____	_____
Temperature (C):	_____	_____
Winkler Calibration Date:	_____	_____

5) Comments

_____

_____

ATTACHMENT J

MONITORING WELL SAMPLING RECORD FORM

MONITORING WELL SAMPLING RECORD

Client:

Project Number:

Location:

Personnel:

Date:

Weather:

Conversion Data	
Well dia. (In)	Gallon/ft
2.0"	0.16
2.5"	0.255
4.0"	0.65
5.0"	1.02
5.5"	1.23
6.0"	1.47
8.0"	2.61

1. MONITORING WELL DATA: **VOLUME FACTOR USED:**

Well Permit No: _____

Well No:_____Well Dia. (in):_____ Gallons/Foot: _____

Ground Surface Elevation (Ft):_____ One Well Volume:_____

Top of Well Casing Elevation (Ft):_____ Three Well Volumes:_____

Stand-up/Flush Mount (Ft):_____ Start of Purge: _____

Well Depth-Top of Casing (Ft):_____ Finish of Purge :_____

Depth to Water-Top of Casing (Ft):_____ Flow Rate (GPM):_____

Depth to Water-Ground Surface (Ft):_____ Gallons Purged:_____

Water Level Elevation (Ft):_____ Method of Purge:_____

Static Head of Water (Ft):_____

2. MONITORING WELL SAMPLING AND FIELD MEASUREMENTS

Initial Headspace Reading _____ Instrument _____

Parameter	**Pre-Purge**	**Post Purge**	**Sample**
Time:	_____	_____	_____
HDSPC (ppm):	_____	_____	_____
Depth to Water (Ft):	_____	_____	_____
Product Thickness:	_____	_____	_____
Visual:	_____	_____	_____
Temperature ( ):	_____	_____	_____
pH (SU):	_____	_____	_____
Conductivity ( ):	_____	_____	_____
Dissolved Oxygen (mg/L):	_____	_____	_____

Time, Start Sampling: _____ Time, End Sampling: _____

Sampling Method:_____

Sample Filtering Required:_____Method:_____

Field Preservation Required: _____ Analysis:_____

Sample Analysis Required: _____

3. COMMENTS AND NOTES:

_____

_____

_____

_____

ATTACHMENT K

“LOW-FLOW” WELL SAMPLING FORM

PS&S "LOW-FLOW" SAMPLING TECHNIQUE
GROUNDWATER QUALITY PARAMETER READINGS

Project Name.: _____ Personnel: _____

_____ Weather: _____

Project Number: _____ Location: _____

Date: _____

WELL INFORMATION

Well Number: _____ Screened Interval: _____ Pump Start Time: _____ Total Purged: _____

Well Depth: _____ Pump Intake Depth: _____ Pump Stop Time: _____ Purge Method: _____

PID (ppm): _____ Pumping Rate: _____ Sample Time: _____ Initial Depth to Water: _____

TIME	TEMPERATURE (^{o}C)	pH (SU)	CONDUCTIVITY (mS/cm)	DISSOLVED OXYGEN (ppm)	TURBIDITY (ntu)	REDUCTION POTENTIAL (mv)	WATER LEVEL (ft.)	Flow Rate (ml/min.)
Criteria	*3%*	*0.1*	*0.030*	*10%*	*10%*	*+/- 10mv*	*0.3 ft*	*200 - 500*

Comments: _____

_____

_____

_____

ATTACHMENT L

MONITORING WELL WATER AND PRODUCT LEVEL MEASUREMENTS FORM

Monitoring Well Water and Product Level Measurements

Monitoring Well	Date of Measurement	Depth to Water	Depth to Product	Depth to Bottom	Product in Well Y/N

P:\02400\116\N\004\Compliance\DraftReports\Sun East RIWP\QAPP\Water Level Measurement Log.xls

ATTACHMENT M

SLUG TEST DATA FORM

SLUG TEST DATA							
Test Well:				Length of Gravel Pack:			
Test Date:				Gravel Pack Radius:			
Depth to Water - GS:				Well Casing Radius:			
Depth of Well - GS:				Slug Volume Added:			
Depth to Well Screen - GS:				Slug Volume Removed:			
Length of Well Screen/Open Hole:				One Well Volume:			
Job Name:				Job Number:			
	TIME	**TIME INTERVAL**	**DEPTH**		**TIME**	**TIME INTERVAL**	**DEPTH**
1				**51**			
2				**52**			
3				**53**			
4				**54**			
5				**55**			
6				**56**			
7				**57**			
8				**58**			
9				**59**			
10				**60**			
11				**61**			
12				**62**			
13				**63**			
14				**64**			
15				**65**			
16				**66**			
17				**67**			
18				**68**			
19				**69**			
20				**70**			
21				**71**			
22				**72**			
23				**73**			
24				**74**			
25				**75**			
26				**76**			
27				**77**			
28				**78**			
29				**79**			
30				**80**			
31				**81**			
32				**82**			
33				**83**			
34				**84**			
35				**85**			
36				**86**			
37				**87**			
38				**88**			
39				**89**			
40				**90**			
41				**91**			
42				**92**			
43				**93**			
44				**94**			
45				**95**			
46				**96**			
47				**97**			
48				**98**			
49				**99**			
50				**100**			

NOTES:

ATTACHMENT N

SOIL VAPOR SAMPLING FORM

Paulus, Sokolowski & Sartor Date: _____

Summa Canister Record By: _____

Project Name:_____

Project Location:_____

Canister ID No. _____

Flow Control ID No. _____

Flow Setting: _____

	Canister Vacuum (in Hg)	Barometric Pressure (in Hg)	Ambient Temperature (degrees Farenheit)
Pre-Test (a)			
Post-Test			
Notes: (a) Compare Pre-test canister vacuum with laboratory setting as shipped. Do not use canister if vacuum readings do not agree within 1.0 inch Hg.			

Sample Start Time	Sample End Time	Sample Period	Comments

Field Screening _____ ppm H_2S

_____ % CH_4

Chain-of-Custody Sheet No._____

Air Bill Tracking No._____

ATTACHMENT O

SOIL VAPOR MONITORING DATA FORM

Paulus, Sokolowski & Sartor
SOIL GAS MONITORING DATA SHEET

Page: _____ of _____

By:

Project Name:
Project Location:

Ambient Temperature:_____
Barometric Pressure:_____
Weather Conditions:_____
Ground Conditions (wet/dry):_____

Bar Hole or Well Pt. ID	Time (military)	Percent LEL	Percent Oxygen	Percent Methane	VOC (ppm)	Slam Count	Remarks

Additional Comments:

ATTACHMENT P

DATA USABILITY SUMMARY REPORT FORM

Data Usability Summary Report

Site:		Case Number:
SDG Number(s):	Date Rec'd by Lab :	Lab Report Date:
Reviewed by:		Date Reviewed:

Number of samples of each matrix in data package: ___ water ___ soil
Analyses requested: Volatile organics Semivolatile organics Metals/cyanide

1.	Is the data package complete as defined under the requirements for NYSDEC ASP Category B deliverables?	**Yes**	No
	Exceptions:		Details attached
	Actions:		Details attached
2.	Have all holding times been met (see QA/QC Plan)?	**Yes**	No
	Exceptions:		
	Actions/effect on results:		Details attached
3.	Do all the QC data fall within the protocol required limits and specifications? (blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls, sample data)	**Yes**	No
	Reported exceptions:		Details attached
	Actions/effect on results:		Details attached
4.	Have all of the data been generated using established and agreed upon analytical protocols? Test method(s):	**Yes**	No
	Reported exceptions:		Details attached
	Actions/effect on results:		Details attached
5.	Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?	**Yes**	No NA
	Exceptions:		Details attached
	Actions/effect on results:		Details attached
6.	Have the correct data qualifiers been used by the laboratory?	**Yes**	No
	Exceptions:		Details attached

Specific issues reported by laboratory (check all that apply):	
Sample(s) reanalyzed at dilution	Details attached
Blank contamination	Details attached
Matrix effects	Details attached
Other:	Details attached
Changes by reviewer (attach markup of data form):	
Data qualifiers added/changed	Details attached
Some data rejected (R)	Details attached

APPENDIX B

HEALTH AND SAFETY PLAN

-DRAFT-
HEALTH AND SAFETY PLAN

- FOR -

Polychrome R&D Lab Site

137-145 Alexander Street
Yonkers, Westchester County, New York
SITE ID C360099

Submitted by:

Alex II West, LLC

159 Alexander Street
Yonkers, New York 10701

February 6, 2013

Prepared by:

55 Main Street, 3rd Floor
Yonkers, New York 10701

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Purpose and Requirements

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by the personnel of the selected contractor and Paulus Sokolowski and Sartor (PS&S) for the work at the Polychrome R & D Lab Site (the Site). The work includes the following: Sonic and GeoProbe® soil borings with soil samples collected at each location; GeoProbe® soil vapor probe points with sub slab soil vapor samples collected at each location; installation, surveying, gauging and groundwater sampling of shallow, intermediate and deep monitoring wells. A geophysical survey and utility locating firm will attempt to identify subsurface utilities prior to drilling activities.

The HASP considers hazards generally inherent to the Site and presents requirements to be followed by contractor personnel in order to avoid and, if necessary, protect against health and/or safety hazards. Activities performed under this HASP will comply with applicable parts of the Occupational Safety and Health Association (OSHA) Regulations, primarily 29 CFR parts 1910 and 1926. Modifications to the HASP may be made with the approval of the PS&S Project Manager.

This plan assigns responsibilities, establishes standard operations procedures, and provides for contingencies that may arise while operations are being conducted at contaminated sites. All project personnel will abide to the HASP. Personnel who engage in project activities will be familiar with this plan and comply with its requirements. All project personnel must sign off on the Plan Acceptance Form (see appended) before beginning work on the Site. The contractor will comply with all applicable provisions of OSHA.

1.2 Site Description

The Site is located at 137-145 Alexander Street in Yonkers, Westchester County, New York. Based on recorded tax information and the City of Yonkers tax maps, the Site area is 3.4 acres and includes Lots 1, 23, and 29 of Block 2615. There is approximately 50 percent building coverage on the Site and associated paved parking areas. The Site structure (45,000 square feet) is a two story concrete block and brick office building that was formerly utilized as a laboratory by the Research and Development (R&D) division of Polychrome Corporation, a subsidiary of Sun Chemical Corporation, and most recently by the Westchester County Department of Social Services (WCDSS). The Site is currently vacant and not utilized for any purpose. Alex II West, LLC acquired the Site in July 2012. The property is bounded by: Alexander Street beyond which is the Greyston Bakery (a former MGP site) to the east; the Hudson River to the west; Excelsior Packaging to the north; and Ashburton Avenue beyond which is the former ATI

BCP Site to the south. The Polychrome Manufacturing BCP Site is located to the southeast.

1.3 Scope of Work

The Remedial Investigation (RI) activities are proposed to include the advancement of five shallow soil borings and two shallow soil vapor probe points using Geoprobe® drilling, four deep soil borings using sonic drilling, installation of shallow/intermediate/deep monitoring wells, soil sampling to characterize fill material, and soil, soil vapor and groundwater sampling to delineate the extent of soil, soil vapor and groundwater impacts identified during prior investigation activities.

Project Team organization will include the following positions: PS&S Project Manager, Field Operations Lead, Health and Safety Coordinator, Head Driller/Site Foreman, Second Man and/or Field Technician.

1.3.1 PS&S Project Managers

Hal Newell	Project Manager (PM)
Christine Beaver	Field Operations Lead (FOL)

1.3.2 PS&S Health and Safety Coordinators

Jeff Farrell	Health and Safety Coordinator (HSC)
Adrianna Bosco/ Greg McClellan	On-Site Field Representative

The Health and Safety Coordinator responsibilities will include:

- Monitors and ensures that all Site personnel comply with the HASP and Site safety rules.
- Ensuring that work is scheduled with properly trained personnel, and appropriate equipment and resources to complete the job safely.
- Identifying operational changes that require modification of the HASP.
- Ensuring that plan modifications are documented and approved by the PS&S PM.
- Ensure that workers utilize proper personnel safety equipment.
- Determines upgrade or downgrade of personnel protection equipment (PPE) based on site conditions or results of real-time monitoring results.
- Ensures that monitoring equipment is properly calibrated.
- Maintains health and safety field log book.
- Notifies PM of all accidents or incidents.

1.3.3 Site Personnel

Site personnel will report any unsafe or potentially hazardous conditions to the HSC and to the PS&S FOL. The PS&S FOL will also discuss such conditions with the Property Owner Representative/BCP Volunteer, Alex II West, LLC. Site personnel will also comply with requirements set forth in the HASP, including any revisions.

2.0 RISK ANALYSIS

2.1 Chemical Analysis

The anticipated chemical compounds for the Site are discussed below for information purposes. Samples taken from the Site will be tested for target compound list (TCL) volatile organic compounds, TCL semi-volatile organic compounds, PCBs, pesticides, herbicides, target analyte list (TAL) metals, hexavalent chromium and total cyanide. According to the information for the Site identified in previous reports, aboveground storage tanks (ASTs) and underground storage tanks (USTs) were historically present on the Site and several spills were reported as occurring on the Site. A former Manufactured Gas Plant (MGP) Site was also identified upgradient of the Site. The contaminants of concern that have been identified for the Site include: naphtha (coal tar), acetone, benzene, chromium, gasoline, kerosene, lead, mercury, and xylenes.

Prior approval is required by PS&S if the contractor wants to bring any chemicals to the Site, such as acids/organic compounds, and decontamination fluids. Before working with these materials on-site, Material Safety Data Sheets (MSDS) should be reviewed by all potentially affected personnel. Laboratory sample bottles will be preserved with hydrochloric acid, methanol, sodium hydroxide and nitric acid. Methanol and nitric acid will be used as part of equipment decontamination procedures. Helium will be used as a tracer gas during soil vapor sampling.

Task Specific Hazard Assessment

To simplify the hazard assessment two categories of tasks will be established:

Category 1 - Operations with little or no Soil, Groundwater, Soil Vapor Contact

Category 2 - Operations with medium to high potential Soil, Groundwater, Soil Vapor Contact

It is anticipated each job task will fit in one of the two categories as detailed below. The site HSC will make determinations in the field as necessary.

Category 1 – Little or No Soil, Groundwater, or Soil Vapor Contact

It is anticipated that the following activities require minimal soil, groundwater, or soil vapor contact, and should not result in contact with potentially contaminated soil, groundwater, or soil vapor. These activities should not require additional considerations beyond good Health and Safety (H&S) practices for physical hazards for this type of project. These tasks may include:

- Site Mobilization
- Demobilization

Potential exposure to contaminated soil is not anticipated; however these operations will be conducted within the investigation work zone and will be evaluated by the HSC. Access to the investigation work zone is limited to Project Personnel, Project Support Personnel, and Authorized Visitors. Initially, exclusion zones will not be established until intrusive activities are ready to begin. However, exclusion zones may be established during site mobilization and demobilization if visual evidence of contamination is seen and/or instrument readings exceeding the action levels are detected during site mobilization or demobilization.

Personnel must meet the training requirements as defined in this HASP. Personal protective equipment above Level D will not be required unless exclusion zones are established or as determined by the HSC.

Site Mobilization and Demobilization
This includes such activities as marking out utilities, identifying sampling points, moving drilling rigs, and other equipment into place, and subsequently removing any such equipment. This activity should have a low potential for coming into contact with contaminated soil, water, or soil vapor. No exclusion zones are anticipated to be required during site mobilization and demobilization.

Category 2 – Medium to High Contact with Soil, Groundwater or Soil Vapor

It is anticipated that personnel working in the following activities have some reasonable potential to come into contact with potentially contaminated soil, groundwater, or soil vapor. These activities may include:

- Drilling Activities
- Obtaining Soil/Groundwater/Soil Vapor Samples
- Exclusion Zone Air Monitoring
- Equipment Decontamination
- Personnel Decontamination

These activities may result in potential exposures to contaminated soil, groundwater, or soil vapor. These activities will be evaluated and monitored by the HSC and exclusion zones may be established if necessary. All Project Personnel required to work in designated exclusion zones must meet the training requirements for working in an exclusion zone as outlined in Section 4.2 of this HASP. Personal protective clothing will be worn as defined in Section 4.1 of this HASP, or as determined by the HSC.

Drilling Activities
Persons involved with drilling activities will have a moderate potential for coming into contact with contaminated materials. Exposure may occur by direct contact with soil, groundwater, or soil vapor. An exclusion zone will be established around all drilling sites while the drilling operation is being conducted. The exclusion zone will be removed following completion of the drilling activities.

Obtaining Soil, Groundwater and Soil Vapor Samples
Persons involved with obtaining samples will have a moderate to high potential for coming into contact with contaminated materials. Exposure may occur by direct contact with contaminated soil, groundwater, or soil vapor. This sampling will be done within an established exclusion zone.

Exclusion Zone Air Monitoring
A person conducting air monitoring within the exclusion zone will have a low to moderate potential for coming into contact with contaminated materials. Exposure may occur by direct contact with contaminated soil, groundwater, or soil vapor.

Equipment Decontamination
Persons involved with cleaning the machinery, tools and other field equipment that have been used in designated exclusion zones will have a high potential for coming into contact with contaminated materials. Exposure may occur by direct contact with contaminated materials.

Personnel Decontamination
Persons involved with assisting personnel in removal of protective clothing and cleaning will have a high potential of coming into contact with contaminated materials. The levels of protection may be varied by the HSC depending upon the hazards encountered by site personnel.

2.2 Physical Hazards

Physical hazards will be addressed as necessary, primarily through site-specific training. PS&S safety procedures are provided when applicable. Site physical hazards can include overhead hazards, uneven working and walking surfaces, vehicle traffic, etc.

2.2.1 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, poor judgment and unauthorized procedural changes. Measures such as the use of appropriate clothing, training, work/rest schedules with access to heated areas and/or vehicles and modification of work tasks (if possible) will be utilized.

2.2.2 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70 degrees F for personnel wearing impermeable clothing. Measures such as the use of appropriate clothing, training, work/rest schedules with access to cooled areas and/or vehicles and modification of work tasks (if possible) will be utilized.

2.2.3 Confined Space

Entry into Confined Spaces is not anticipated, and is not permitted under any circumstances without the prior approval of the Health and Safety Coordinator (HSC). Atmospheric testing will be conducted by the HSC prior to entry of a confined space. If a confined space is determined to be Permit-Required, entry may only be performed by qualified, trained personnel. The entry will be conducted in accordance with 29 CFR 1910.146. A confined space is a space that:

- "Is large enough and so configured that an employee can bodily enter and perform assigned work;
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry);
- Is not designed for continuous employee occupancy."

A *permit-required* confined space is a confined space that:

- "Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped

or asphyxiated by inwardly converging walls, or by a floor which slopes downward and tapers to a smaller cross-section;
- Contains any other recognized serious safety or health hazard."

A permit-required confined space may be downgraded to an *alternate* space under the following conditions:
- The only hazard present is an atmospheric hazard
- The atmospheric hazard can be controlled by means of continuous forced-air ventilation
- The condition of the atmosphere can be continuously monitored with direct-reading instruments

2.2.4 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Site workers who will perform suspected high noise tasks and operations for short durations (less than one hour) will be provided with earplugs. If deemed necessary by the FOL, the PM and HSC will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities.

2.2.5 Hand and Power Tools

In order to complete the various tasks for the project, personnel may utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools and GFI-equipped circuits will be used for all electric power tools.

2.2.6 Slips, Trips and Falls

Working in and around the Site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice.

2.2.7 Manual Lifting

Manual lifting of heavy objects may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques, 1) make

sure footing is solid, 2) make back straight with no curve or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) left with legs, and 6) turn with your feet, don't twist, will be stressed. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

2.2.8 Steam, Heat and Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds. Proper PPE will be worn during all steam cleaning activities including rain gear or Tyvek, hardhat equipped with splashguard, and water resistant gloves and boots.

2.2.9 Flammable/Explosive

The potential exists for flammable atmospheres to form as a result of ground contamination. The HSC will monitor drilling activities with a Combustible Gas Indicator (CGI). Any reading above 10% of the Lower Explosive Limit (LEL) will be considered hazardous, and will require work to stop until the condition can be resolved. Any electronic equipment used within a designated exclusion zone must be rated as intrinsically safe for use in Class 1, Div 1, groups A, B, C, and D.

2.2.10 General Construction/Heavy Equipment

The greatest potential hazard at work sites is related to the operation of heavy equipment, especially in the case of malfunction, misuse or improper operation. Only qualified personnel should operate heavy equipment. Personnel not directly involved with equipment operation should stand a safe distance away from the machinery. All personnel should wear hard-hats, safety glasses, and safety boots when working near heavy equipment and any time there is a potential hazard from overhead or falling or flying objects.

2.2.11 Utility Lines

At least 3 and no more than 10 working days prior to intrusive activities, the drilling contractor shall call the Westchester "One-Call Network"

NY one call: 1-800-962-7962

Underground utility lines shall be marked out prior to the start of any digging or drilling.

2.2.12 Electrical Safety

The location of any overhead lines shall be noted, and all project equipment (drill rigs) will be kept at least 15 feet away from overhead lines. If it is not possible to maintain this clearance, the utility will be contacted to de-energize lines. All drilling work is to utilize proper grounding procedures. Always look for overhead utilities when climbing ladders, etc. or when raising drill rig masts, crane booms, etc.

All appropriate 120/240 volt electrical equipment will be equipped with ground fault circuit interrupters (GFCI).

3.0 MEDICAL EMERGENCY

Medical emergencies can be described as situations which present a significant threat to the health of personnel involved in the implementation of the subsurface assessment activities. These can result from chemical exposure, heat stress, cold stress, and poisonous insect bites. Medical emergencies must be dealt with immediately and proper care should be administered. This may be in the form of first aid and emergency hospitalization. All Site workers that have First Aid training will need to be identified prior to the start of work. In addition, a first aid kit will be brought and maintained on Site at all times during the work.

In case of a medical emergency, assess whether or not the victim can be safely transported to medical facilities. If the victim can not be moved without the risk of aggravating their condition, refer to Section 3.2 “Emergency Notification” and summon an ambulance and appropriate emergency response personnel.

3.1 Transporting Victims

If the victim can be safely transported without risk of additional injury, the nearest hospital is St. John’s Hospital (967 North Broadway, Yonkers NY - **Telephone 914-964-4516).**

The hospital is located at the intersection of Ashburton Ave and North Broadway (see Hospital Location Plan). The most direct or emergency route from the Site to the hospital is as follows (see Emergency Route to Hospital):

1). Start out going east on Ashburton Ave
2). Turn left onto North Broadway
3). Travel about 2 miles north.
4). Arrive at the hospital on left side of road.

Total travel time is estimated to be Eight minutes.

3.2 Emergency Notification

In case of any situation or unplanned occurrence requiring assistance, a contact list is provided below. For emergencies, contact will first be made by the PS&S FOL with the Property Owner Representative/BCP Volunteer (Alex II West, LLC) who will notify emergency personnel who will in turn contact the appropriate response teams. The emergency contact list outlined below will be posted in an easily accessible location of the Site. The following is the list of telephone numbers for emergency response personnel/contacts. Information pertaining to the nearest hospital is provided in Section 3.1.

Property Owner Representative Ron Shemesh	914-309-3544
PS&S Project Manager Hal Newell (cell phone)	516-428-5599
PS&S, Field Operations Lead Christine Beaver (cell phone)	732-595-6840
PS&S, Health and Safety Coordinator Jeff Farrell (cell phone)	732-754-4083
PS&S, On-Site Field Representatives (as needed): Adrianna Bosco (cell phone) Greg McClellan (cell phone)	 848-702-4083 516-318-7249
St. John's Hospital	**914-964-4516**
Fire Emergency	911
Ambulance/Rescue Squad	911
Yonkers City Police	911
NYSDEC Spill Hotline	1-800-457-7362
Westchester County Department of Health	914-813-5000
Poison Control Center	1-800-222-1222
NYSDEC Region III Headquarters	845-256-3000

4.0 PERSONAL PROTECTION ON-SITE

Based on currently available information, Level D protection should be adequate for most of the work to be performed on-site. For the purpose of this Health and Safety Plan, Level D areas are defined as areas where gross ambient organic vapor levels (monitoring in real time) range from site background to 5 parts per million (ppm) over background. Background readings will be obtained each day within the work area before commencement of work and along the perimeter of the work site.

For the purpose of this Health and Safety Plan, during implementation of remedial investigation activities, Level D personnel protection will be required. Level D protection includes: coveralls or similar work clothes, leather work gloves, ANSI-approved safety glasses, safety boots, and a hard hat. No shorts will be allowed on site during any of the work.

If concentrations of organic vapors, as monitored in real time, exceed 5 ppm over site background on a non-transitory basis, work will temporarily stop to make work adjustments to alleviate the condition. Personal protection will be upgraded to Level C if the conditions can not be alleviated and similar conditions persist.

Level C protection adds a full-face air-purifying respirator to the Level D protection described above and requires Tyvek coveralls, chemical resistant gloves, and boots. The full-face air-purifying respirator will be fitted with the appropriate cartridge according to on site conditions as determined by the HSC. The cartridges will follow a changing schedule and described by the cartridge user directions.

4.1 Basic Equipment

Basic safety equipment will be provided by the drilling contractor to monitor site conditions and respond to emergencies. This equipment includes, but is not limited to, the following:

1.) First Aid Kits

2.) Portable eyewash

3.) Type ABC fire extinguisher

4.2 Personnel Training

All personnel working on-site who have the potential for coming into contact with site soils during implementation of investigative efforts will be required to show documentation of meeting the Health and Safety HAZWOPER training medical requirements outlined in 29 CFR 1910.120(f) and 29 CFR 1910.134. Copies of certificates and medical surveillance will be provided to the Health and Safety Coordinator two (2) weeks before the commencement of field efforts. This documentation will be maintained on site.

5.0 FIELD PROCEDURES

Exclusion zones that require applicable Level 'C' or 'D' PPE will be clearly defined. Each exclusion zone will be cordoned off while work is taking place. Access to these zones will be provided only to those persons directly involved in the field operations and with the appropriate level of training and personal protection equipment. All equipment and personnel will be subjected to decontamination procedures before leaving an area of restricted access. Separate work zones and decontamination zones will be pre-designated in areas requiring Level C protection.

5.1 Air Monitoring

During the performance of the work, air monitoring will be performed by the PS&S FOL within the breathing zone and immediately downwind of the exclusion zone. This air monitoring will consist of monitoring organic vapors using a photo ionization detector (PID); monitoring LEL and oxygen using a combustible gas meter, and monitoring air particulates using a dust meter.

On a daily basis, the following readings will be recorded upwind of the exclusion zone to establish background levels:

- A PID will be used to monitor for organic vapors prior to the start of work and at least once during the morning and afternoon of each work day;
- A combustible gas meter will be used to monitor for LEL and oxygen prior to the start of work and during all site operations which have the potential for coming into contact with contaminated materials, and
- A dust meter will be used to monitor for particulates prior to the start of work and during site operations which have the potential to create a dust hazard.

Throughout the duration of construction activities, air quality will be monitored within the breathing zone and immediately downwind of the exclusion zone using a photo ionization detector (PID) supplemented by benzene colorimetric tubes, a combustible gas meter, and a dust meter. Work will stop should the following conditions apply:

- Organic vapors are identified to exceed 5 ppm;
- Oxygen levels are identified outside the 19.5% to 22% range;
- LEL is identified to be greater than 10%; or if
- Dust is identified to be greater than 150 ug/m^3.

5.2 Record Recording

The onsite PS&S FOL will maintain a record of all individuals present at the work site, levels of worker protection, and general conformance with this HASP. Photo

ionization detector and combustible gas indicator readings will be periodically recorded in addition to noting observed peak readings. In addition, air monitoring equipment will be calibrated on a daily basis and calibration records will be kept.

6.0 DECONTAMINATION

Immediately upon mobilization to the Site, a decontamination area will be designated by the drilling contractor. The decontamination station will consist of a plastic lined, bermed or curbed, and walled area that will contain and allow for the collection of all decontamination fluids. Decontamination activities for hand tools and sampling equipment may be conducted in a portable decontamination container (i.e., 55-gallon United States Department of Transportation (USDOT) specification drum). The location of the decontamination area will be selected in the field. During the investigation, the excavator bucket and all downhole drilling equipment and the rear of the drilling rig will be decontaminated between each monitoring well, boring and test pit.

Personnel and equipment leaving the Exclusion Zone shall be decontaminated as required by the HSC. The standard Level D Decontamination Protocol shall be used unless conditions require an upgrade to Level C PPE and Decontamination Protocols.

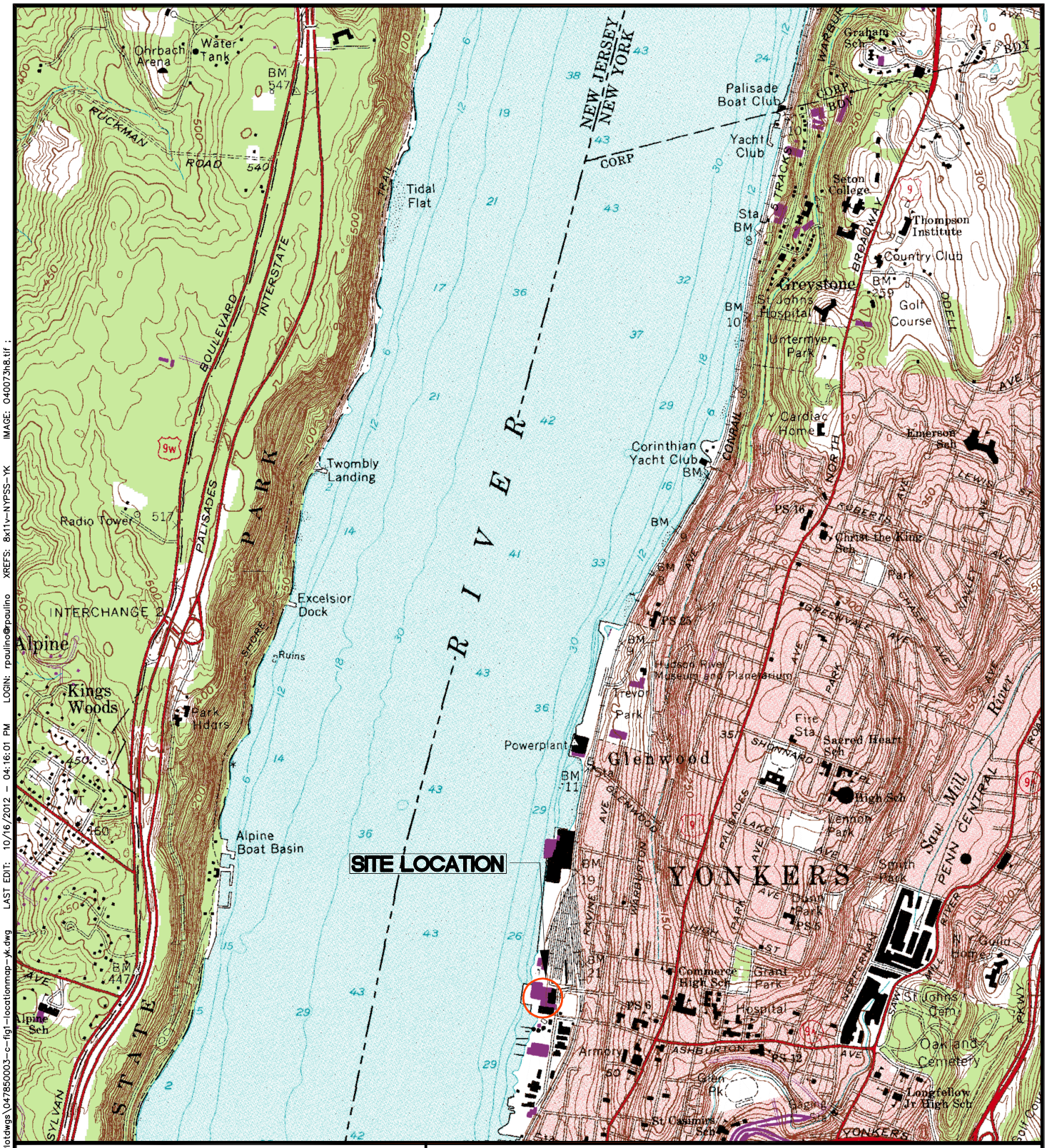
6.1 Level D Areas

Before leaving Level D work areas, loose soil will be brushed from equipment and clothing. Equipment will be rinsed with potable water. Disposable coveralls, gloves, etc. will be placed in plastic bags and disposed as non-hazardous solid waste

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I will comply with the provisions contained therein.

Name (Print and Sign)	Company Name	Date

FIGURES



PS&S
integrating design & engineering
PAULUS, SOKOLOWSKI AND SARTOR
55 MAIN STREET
3RD FLR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

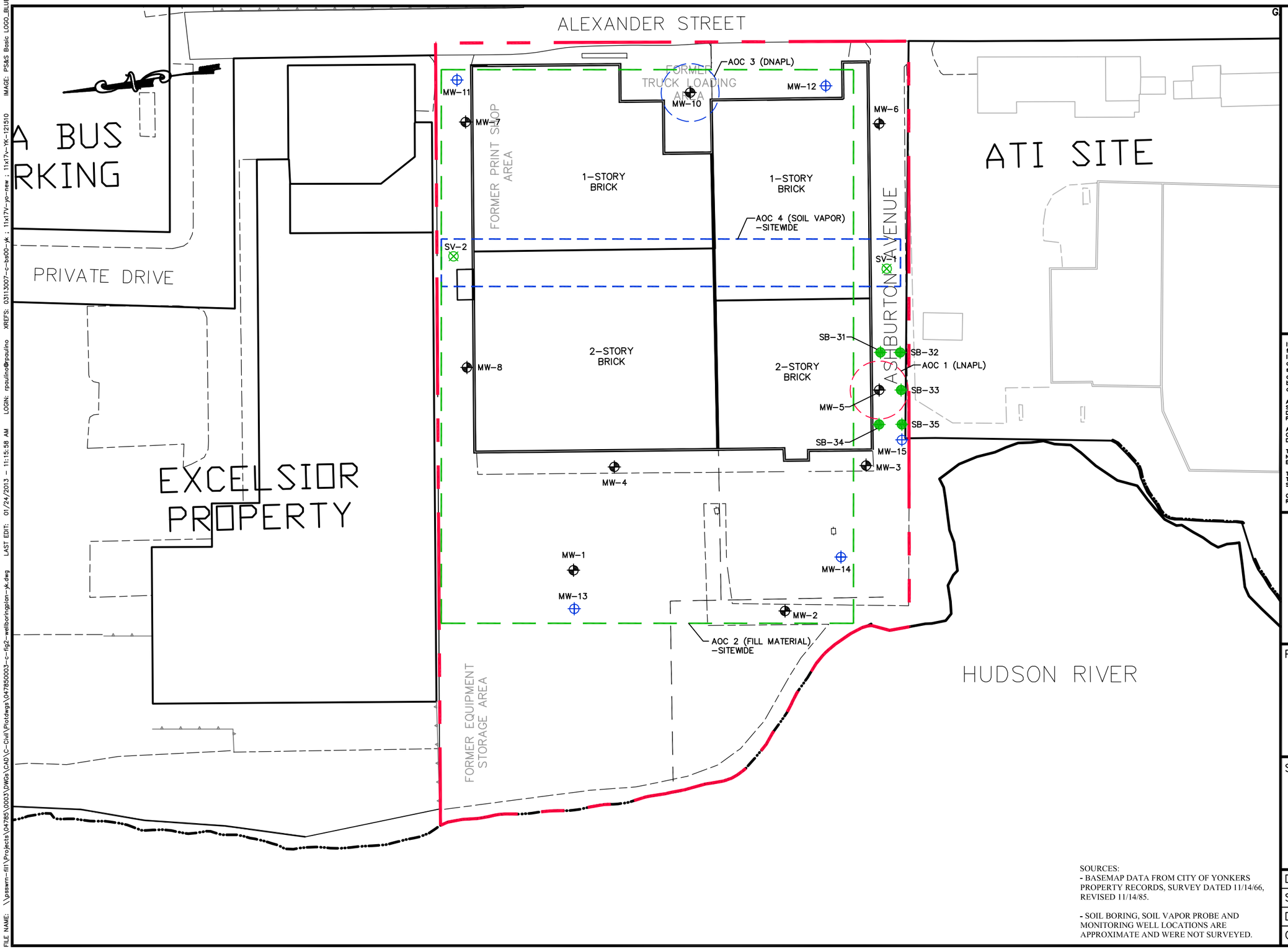
POLYCHROME R&D LAB SITE
137–145 ALEXANDER STREET
YONKERS, WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

FIGURE 1
SITE LOCATION MAP
(USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES)

DATE: 10/16/12	DRN. BY: RP	PROJ. NO.: K47850003
SCALE: NTS	CK'D BY: CB	SHT. NO.: 1

FILE NAME: P:\04785\0003\DWGs\CAD\C-Civil\Plotdwgs\047850003-c-fig1-locationmap-yk.dwg LAST EDIT: 10/16/2012 — 04:16:01 PM LOGIN: rpaulino@rpaulino XREFS: 8x11v-NYPSS-YK IMAGE: 040073h8.tif ;



Legend

- Existing Monitoring Well Location
- Proposed Soil Boring and Monitoring Well Location
- Proposed Soil Boring Location
- Proposed Soil Vapor Probe Location
- Approximate Site Boundary
- DNAPL Observed (limits undefined)
- LNAPL Observed (limits undefined)
- AOC — Area of Concern

DRAFT

PS&S
integrating design & engineering

55 MAIN STREET
3RD FLOOR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE

POLYCHROME R&D LAB SITE
137-145 ALEXANDER STREET
CITY OF YONKERS
WESTCHESTER COUNTY, NEW YORK

SHEET TITLE

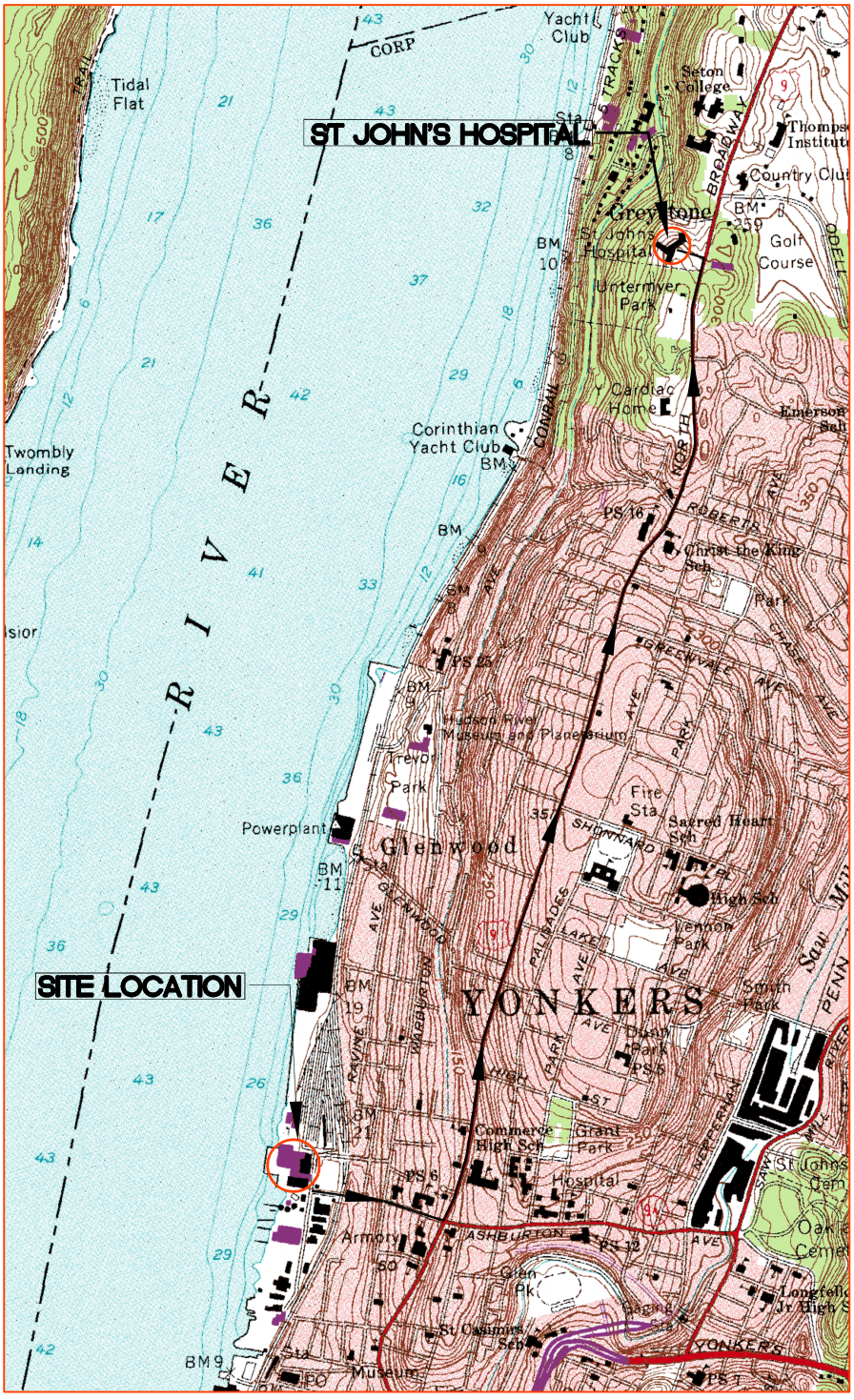
PROPOSED SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATION PLAN

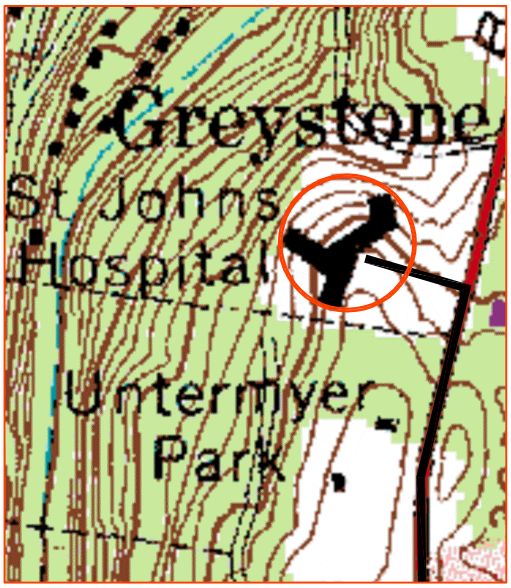
SOURCES:
- BASEMAP DATA FROM CITY OF YONKERS PROPERTY RECORDS, SURVEY DATED 11/14/66, REVISED 11/14/85.

- SOIL BORING, SOIL VAPOR PROBE AND MONITORING WELL LOCATIONS ARE APPROXIMATE AND WERE NOT SURVEYED.

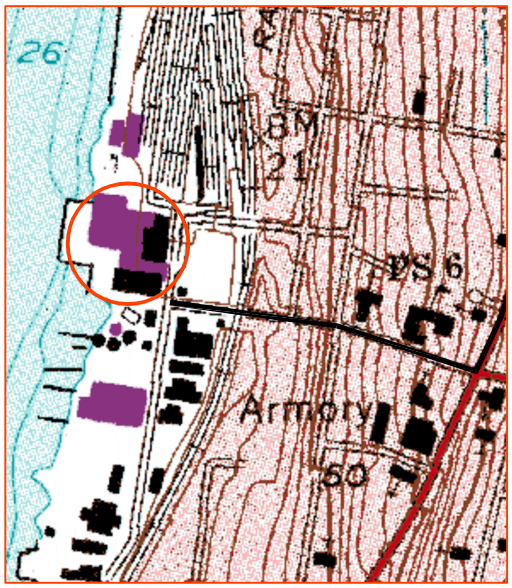
DATE	01/22/2013	PROJ. NO.	K47850003
SCALE	1"=60'		
DRN. BY	RP	SHT. NO.	FIG. 2
CHK. BY	CB		

FILE NAME: \\psswrm-fil1\Projects\04785\0003\DWGs\CAD\C-Civil\Plotdwgs\047850003-c-fig2-wellboringplan-yk.dwg LAST EDIT: 01/24/2013 – 11:15:58 AM LOGIN: rpaulino@paulino XREFS: 03113007-c-bs00-yk ; 11x17V-yo-new ; 11x17V-YK-121510 IMAGE: PS&S Basic LOGO_BLUE-300dpi.





ST. JOHN'S HOSPITAL
EMERGENCY ROOM



POLYCHROME R&D LAB
SITE LOCATION

PS&S
integrating design & engineering
PAULUS, SOKOLOWSKI AND SARTOR
55 MAIN STREET
3RD FLR
YONKERS, NEW YORK 10701
PHONE: (914) 509-8600
FAX: (914) 407-1679

PROJECT TITLE
POLYCHROME R&D LAB SITE
137–145 ALEXANDER STREET
YONKERS, WESTCHESTER COUNTY, NEW YORK

SHEET TITLE
FIGURE 3
HOSPITAL ROUTE MAP

DATE:	10/16/12	DRN. BY:	RP	PROJ. NO.:	K47850003
SCALE:	NTS	CK'D BY:	CB	SHT. NO.:	3

APPENDIX A

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Naphtha (coal tar)

Synonyms & Trade Names Crude solvent coal tar naphtha, High solvent naphtha, Naphtha

CAS No. 8030-30-6	**RTECS No.** DE3030000 (/niosh-rtecs/DE2E3BF0.html)	**DOT ID & Guide**
	Conversion 1 ppm = 4.50 mg/m³ (approx)	**IDLH** 1000 ppm [10% LEL] See: 8030306 (/niosh/idlh/8030306.html)
Exposure Limits **NIOSH REL** : TWA 100 ppm (400 mg/m³) **OSHA PEL** : TWA 100 ppm (400 mg/m³)		**Measurement Methods** **NIOSH** 1550 (/niosh/docs/2003-154/pdfs/1550.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Reddish-brown, mobile liquid with an aromatic odor.

MW: 110 (approx)	**BP:** 320 -428°F	**FRZ:** ?	**Sol:** Insoluble	**VP:** <5 mmHg	**IP:** ?
Sp.Gr: 0.89 -0.97	**Fl.P:** 100 -109°F	**UEL:** ?	**LEL:** ?		

Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose; dizziness, drowsiness; dermatitis; in animals: liver, kidney damage

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly

Eyes: Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated **Change:** No recommendation	**Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode[£]
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge (s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)[£]
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Acetone

Synonyms & Trade Names Dimethyl ketone, Ketone propane, 2-Propanone

CAS No. 67-64-1	**RTECS No.** AL3150000 (/niosh-rtecs/AL3010B0.html)	**DOT ID & Guide** 1090 127 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=127) (http://www.cdc.gov/Other/disclaimer.html)
Formula $(CH_3)_2CO$	**Conversion** 1 ppm = 2.38 mg/m3	**IDLH** 2500 ppm [10%LEL] See: 67641 (/niosh/idlh/67641.html)

Exposure Limits

NIOSH REL : TWA 250 ppm (590 mg/m3)
OSHA PEL † (nengapdxg.html) : TWA 1000 ppm (2400 mg/m3)

Measurement Methods

NIOSH 1300 (/niosh/docs/2003-154/pdfs/1300.pdf) , 2555 (/niosh/docs/2003-154/pdfs/2555.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ;
OSHA 69 (http://www.osha.gov/dts/sltc/methods/organic/org069/org069.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a fragrant, mint-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
58.1	133°F	-140°F	Miscible	180 mmHg	9.69 eV

Sp.Gr:	Fl.P:	UEL:	LEL:		
0.79	0°F	12.8%	2.5%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Oxidizers, acids

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 2500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0087 (/niosh/ipcsneng/neng0087.html) See MEDICAL TESTS: 0002 (/niosh/docs/2005-110/nmed0002.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Benzene

Synonyms & Trade Names Benzol, Phenyl hydride

CAS No.	**RTECS No.**	**DOT ID & Guide**
71-43-2	CY1400000 (/niosh-rtecs/CY155CCo.html)	1114 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula C_6H_6	**Conversion** 1 ppm = 3.19 mg/m3	**IDLH** Ca [500 ppm] See: 71432 (/niosh/idlh/71432.html)

Exposure Limits

NIOSH REL : Ca TWA 0.1 ppm ST 1 ppm See Appendix A (nengapdxa.html)

OSHA PEL : [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F (nengapdxf.html)

Measurement Methods

NIOSH 1500 (/niosh/docs/2003-154/pdfs/1500.pdf) , 1501 (/niosh/docs/2003-154/pdfs/1501.pdf) , 3700 (/niosh/docs/2003-154/pdfs/3700.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ;

OSHA 12 (http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html) (http://www.cdc.gov/Other/disclaimer.html) , 1005 (http://www.osha.gov/dts/sltc/methods/validated/1005/1005.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]

MW:	**BP:**	**FRZ:**	**Sol:**	**VP:**	**IP:**
78.1	176°F	42°F	0.07%	75 mmHg	9.24 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
0.88	12°F	7.8%	1.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, many fluorides & perchlorates, nitric acid

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, blood, central nervous system, bone marrow

Cancer Site [leukemia]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0015 (/niosh/ipcsneng/neng0015.html) See MEDICAL TESTS: 0022 (/niosh/docs/2005-110/nmed0022.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Chromium metal

Synonyms & Trade Names Chrome, Chromium

CAS No. 7440-47-3	**RTECS No.** GB4200000 (/niosh-rtecs/GB401640.html)	**DOT ID & Guide**
Formula Cr	**Conversion**	**IDLH** 250 mg/m³ (as Cr) See: 7440473 (/niosh/idlh/7440473.html)

Exposure Limits

NIOSH REL : TWA 0.5 mg/m³ See Appendix C (nengapdxc.html)

OSHA PEL *: TWA 1 mg/m³ See Appendix C (nengapdxc.html) [*Note: The PEL also applies to insoluble chromium salts.]

Measurement Methods

NIOSH 7024 (/niosh/docs/2003-154/pdfs/7024.pdf) , 7300 (/niosh/docs/2003-154/pdfs/7300.pdf) , 7301 (/niosh/docs/2003-154/pdfs/7301.pdf) , 7303 (/niosh/docs/2003-154/pdfs/7303.pdf) , 9102 (/niosh/docs/2003-154/pdfs/9102.pdf) ;

OSHA ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html) , ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.

MW: 52.0	**BP:** 4788°F	MLT: 3452°F	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 7.14	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame.

Incompatibilities & Reactivities Strong oxidizers (such as hydrogen peroxide), alkalis

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; lung fibrosis (histologic)

Target Organs Eyes, skin, respiratory system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: No recommendation
Eyes: No recommendation
Wash skin: No recommendation
Remove: No recommendation
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 2.5 mg/m3:
(APF = 5) Any quarter-mask respirator.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*

Up to 5 mg/m3:
(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*
(APF = 10) Any supplied-air respirator*

Up to 12.5 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.*

Up to 25 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 250 mg/m3:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0029 (/niosh/ipcsneng/neng0029.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Gasoline

Synonyms & Trade Names Motor fuel, Motor spirits, Natural gasoline, Petrol [Note: A complex mixture of volatile hydrocarbons (paraffins, cycloparaffins, and aromatics).]

CAS No. 8006-61-9	**RTECS No.** LX3300000 (/niosh-rtecs/LX325AA0.html)	**DOT ID & Guide** 1203 128 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=128) (http://www.cdc.gov/Other/disclaimer.html)
	Conversion 1 ppm = 4.5 mg/m³ (approx)	**IDLH** Ca [N.D.] See: IDLH INDEX (/niosh/idlh/intridl4.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html)
OSHA PEL † (nengapdxg.html) : none

Measurement Methods

OSHA PV2028 (http://www.osha.gov/dts/sltc/methods/partial/pv2028/2028.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Clear liquid with a characteristic odor.

MW: 110 (approx)	**BP:** 102°F	**FRZ:** ?	**Sol:** Insoluble	**VP:** 38-300 mmHg	**IP:** ?
Sp.Gr(60°F): 0.72-0.76	**Fl.P:** -45°F	**UEL:** 7.6%	**LEL:** 1.4%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers such as peroxides, nitric acid & perchlorates

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Cancer Site [in animals: liver & kidney cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Kerosene

Synonyms & Trade Names Fuel Oil No. 1, Range oil [Note: A refined petroleum solvent (predominantly C_9-C_{16}), which typically is 25% normal paraffins, 11% branched paraffins, 30% monocycloparaffins, 12% dicycloparaffins, 1% tricycloparaffins, 16% mononuclear aromatics & 5% dinuclear aromatics.]

CAS No. 8008-20-6	**RTECS No.** OA5500000 (/niosh-rtecs/OA53EC60.html)	**DOT ID & Guide** 1223 128 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=128) (http://www.cdc.gov/Other/disclaimer.html)
	Conversion	**IDLH** N.D. See: IDLH INDEX (/niosh/idlh/intridl4.html)
Exposure Limits **NIOSH REL** : TWA 100 mg/m^3 **OSHA PEL** : none		**Measurement Methods** **NIOSH** 1550 (/niosh/docs/2003-154/pdfs/1550.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to yellowish, oily liquid with a strong, characteristic odor.

MW: 170 (approx)	**BP:** 347-617°F	**FRZ:** -50°F	**Sol:** Insoluble	VP(100°F): 5 mmHg	**IP:** ?
Sp.Gr: 0.81	**Fl.P:** 100-162°F	**UEL:** 5%	**LEL:** 0.7%		

Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 1000 mg/m3:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)
(APF = 10) Any supplied-air respirator

Up to 2500 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)

Up to 5000 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0663 (/niosh/ipcsneng/neng0663.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO


USA.gov
Government Made Easy

Lead

Synonyms & Trade Names Lead metal, Plumbum

CAS No.	RTECS No.	DOT ID & Guide
7439-92-1	OF7525000 (/niosh-rtecs/OF72D288.html)	

Formula	Conversion	IDLH
Pb		100 mg/m³ (as Pb) See: 7439921 (/niosh/idlh/7439921.html)

Exposure Limits

NIOSH REL *: TWA (8-hour) 0.050 mg/m³ See Appendix C (nengapdxc.html) [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

OSHA PEL *: [1910.1025] TWA 0.050 mg/m³ See Appendix C (nengapdxc.html) [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

Measurement Methods

NIOSH 7082 (/niosh/docs/2003-154/pdfs/7082.pdf), 7105 (/niosh/docs/2003-154/pdfs/7105.pdf), 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 7700 (/niosh/docs/2003-154/pdfs/7700.pdf), 7701 (/niosh/docs/2003-154/pdfs/7701.pdf), 7702 (/niosh/docs/2003-154/pdfs/7702.pdf), 9100 (/niosh/docs/2003-154/pdfs/9100.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf), 9105 (/niosh/docs/2003-154/pdfs/9105.pdf);
OSHA ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html), ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html), ID206 (http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description A heavy, ductile, soft, gray solid.

MW:	BP:	MLT:	Sol:	VP:	IP:
207.2	3164°F	621°F	Insoluble	0 mmHg (approx)	NA

Sp.Gr:	Fl.P:	UEL:	LEL:		
11.34	NA	NA	NA		

Noncombustible Solid in bulk form.

Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)
NIOSH/OSHA

Up to 0.5 mg/m3:
(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 2.5 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Up to 100 mg/m3:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0052 (/niosh/ipcsneng/neng0052.html) See MEDICAL TESTS: 0127 (/niosh/docs/2005-110/nmed0127.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Mercury compounds [except (organo) alkyls] (as Hg)

Synonyms & Trade Names Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.

CAS No. 7439-97-6 (metal)	**RTECS No.** OV4550000 (metal) (/niosh-rtecs/OV456D70.html)	**DOT ID & Guide** 2809 172 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=172) (http://www.cdc.gov/Other/disclaimer.html) (metal)
Formula Hg (metal)	**Conversion**	**IDLH** 10 mg/m³ (as Hg) See: 7439976 (/niosh/idlh/7439976.html)
Exposure Limits **NIOSH REL** : Hg Vapor: TWA 0.05 mg/m³ [skin] Other: C 0.1 mg/m³ [skin] **OSHA PEL** † (nengapdxg.html) : TWA 0.1 mg/m³		**Measurement Methods** **NIOSH** 6009 (/niosh/docs/2003-154/pdfs/6009.pdf) ; **OSHA** ID140 (http://www.osha.gov/dts/sltc/methods/inorganic/id140/id140.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

MW: 200.6	**BP:** 674°F	**FRZ:** -38°F	**Sol:** Insoluble	**VP:** 0.0012 mmHg	**IP:** ?
Sp.Gr: 13.6 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Metal: Noncombustible Liquid

Incompatibilities & Reactivities Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

Target Organs Eyes, skin, respiratory system, central nervous system, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

Mercury vapor:

NIOSH

Up to 0.5 mg/m3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†
(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 2.5 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA

Up to 1 mg/m3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†
(APF = 10) Any supplied-air respirator

Up to 2.5 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 5 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0056 (/niosh/ipcsneng/neng0056.html) See MEDICAL TESTS: 0136 (/niosh/docs/2005-110/nmed0136.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010

Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

m-Xylene

Synonyms & Trade Names 1,3-Dimethylbenzene; meta-Xylene; m-Xylol

CAS No. 108-38-3	**RTECS No.** ZE2275000 (/niosh-rtecs/ZE22B6B8.html)	**DOT ID & Guide** 1307 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_4(CH_3)_2$	**Conversion** 1 ppm = 4.34 mg/m3	**IDLH** 900 ppm See: 95476 (/niosh/idlh/95476.html)
Exposure Limits **NIOSH REL** : TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3) **OSHA PEL** † (nengapdxg.html) : TWA 100 ppm (435 mg/m3)		**Measurement Methods** **NIOSH** 1501 (/niosh/docs/2003-154/pdfs/1501.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ; **OSHA** 1002 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an aromatic odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
106.2	282°F	-54°F	Slight	9 mmHg	8.56 eV
Sp.Gr: 0.86	**Fl.P:** 82°F	**UEL:** 7.0%	**LEL:** 1.1%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 900 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0085 (/niosh/ipcsneng/neng0085.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

p-Xylene

Synonyms & Trade Names 1,4-Dimethylbenzene; para-Xylene; p-Xylol

CAS No. 106-42-3	**RTECS No.** ZE2625000 (/niosh-rtecs/ZE280DE8.html)	**DOT ID & Guide** 1307 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_4(CH_3)_2$	**Conversion** 1 ppm = 4.41 mg/m3	**IDLH** 900 ppm See: 95476 (/niosh/idlh/95476.html)
Exposure Limits **NIOSH REL** : TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3) **OSHA PEL** † (nengapdxg.html) : TWA 100 ppm (435 mg/m3)		**Measurement Methods** **NIOSH** 1501 (/niosh/docs/2003-154/pdfs/1501.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ; **OSHA** 1002 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an aromatic odor. [Note: A solid below 56°F.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
106.2	281°F	56°F	0.02%	9 mmHg	8.44 eV
Sp.Gr: 0.86	**Fl.P:** 81°F	**UEL:** 7.0%	**LEL:** 1.1%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 900 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0086 (/niosh/ipcsneng/neng0086.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Hydrogen chloride

Synonyms & Trade Names Anhydrous hydrogen chloride; Aqueous hydrogen chloride (i.e., Hydrochloric acid, Muriatic acid) [Note: Often used in an aqueous solution.]

CAS No. 7647-01-0	**RTECS No.** MW4025000 (/niosh-rtecs/MW3D6AA8.html)	**DOT ID & Guide** 1050 125 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=125) (http://www.cdc.gov/Other/disclaimer.html) (anhydrous) 1789 157 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=157) (http://www.cdc.gov/Other/disclaimer.html) (solution)
Formula HCl	**Conversion** 1 ppm = 1.49 mg/m^3	**IDLH** 50 ppm See: 7647010 (/niosh/idlh/7647010.html)
Exposure Limits **NIOSH REL** : C 5 ppm (7 mg/m^3) **OSHA PEL** : C 5 ppm (7 mg/m^3)		**Measurement Methods** **NIOSH** 7903 (/niosh/docs/2003-154/pdfs/7903.pdf) ; **OSHA** ID174SG (http://www.osha.gov/dts/sltc/methods/partial/t-id174sg-pv-01-8602-m/t-id174sg-pv-01-8602-m.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to slightly yellow gas with a pungent, irritating odor. [Note: Shipped as a liquefied compressed gas.]

MW: 36.5	**BP:** -121°F	**FRZ:** -174° F	Sol(86° F): 67%	**VP:** 40.5 atm	**IP:** 12.74 eV
	Fl.P: NA	**UEL:** NA	**LEL:** NA	**RGasD:** 1.27	

Nonflammable Gas

Incompatibilities & Reactivities Hydroxides, amines, alkalis, copper, brass, zinc [Note: Hydrochloric acid is highly corrosive to most metals.]

Exposure Routes inhalation, ingestion (solution), skin and/or eye contact

Symptoms irritation nose, throat, larynx; cough, choking; dermatitis; solution: eye, skin burns; liquid: frostbite; in animals: laryngeal spasm; pulmonary edema

Target Organs Eyes, skin, respiratory system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact (solution)/Frostbite
Eyes: Prevent eye contact/Frostbite
Wash skin: When contaminated (solution)
Remove: When wet or contaminated (solution)
Change: No recommendation
Provide: Eyewash (solution), Quick drench (solution), Frostbite wash

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately (solution)/Frostbite
Skin: Water flush immediately (solution)/Frostbite
Breathing: Respiratory support
Swallow: Medical attention immediately (solution)

Respirator Recommendations
NIOSH/OSHA

Up to 50 ppm:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0163 (/niosh/ipcsneng/neng0163.html) See MEDICAL TESTS: 0116 (/niosh/docs/2005-110/nmed0116.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Methyl alcohol

Synonyms & Trade Names Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit

CAS No. 67-56-1	**RTECS No.** PC1400000 (/niosh-rtecs/PC155CC0.html)	**DOT ID & Guide** 1230 131 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=131) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3OH	**Conversion** 1 ppm = 1.31 mg/m³	**IDLH** 6000 ppm See: 67561 (/niosh/idlh/67561.html)
Exposure Limits **NIOSH REL** : TWA 200 ppm (260 mg/m³) ST 250 ppm (325 mg/m³) [skin] **OSHA PEL** † (nengapdxg.html) : TWA 200 ppm (260 mg/m³)		**Measurement Methods** **NIOSH** 2000 (/niosh/docs/2003-154/pdfs/2000.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ; **OSHA** 91 (http://www.osha.gov/dts/sltc/methods/organic/org091/org091.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a characteristic pungent odor.

MW: 32.1	**BP:** 147° F	**FRZ:** -144°F	**Sol:** Miscible	**VP:** 96 mmHg	**IP:** 10.84 eV
Sp.Gr: 0.79	**Fl.P:** 52° F	**UEL:** 36%	**LEL:** 6.0%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, upper respiratory system; headache, drowsiness, dizziness, nausea, vomiting; visual disturbance, optic nerve damage (blindness); dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable) **Change:** No recommendation	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Water flush promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 2000 ppm:
(APF = 10) Any supplied-air respirator

Up to 5000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 6000 ppm:
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0057 (/niosh/ipcsneng/neng0057.html)
See MEDICAL TESTS: 0137 (/niosh/docs/2005-110/nmed0137.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Nitric acid

Synonyms & Trade Names Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)

CAS No. 7697-37-2	**RTECS No.** QU5775000 (/niosh-rtecs/QU581E98.html)	**DOT ID & Guide** 2031 157 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=157) (http://www.cdc.gov/Other/disclaimer.html) (other than red fuming) 2032 157 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=157) (http://www.cdc.gov/Other/disclaimer.html) (fuming)
Formula HNO_3	**Conversion** 1 ppm = 2.58 mg/m³	**IDLH** 25 ppm See: 7697372 (/niosh/idlh/7697372.html)
Exposure Limits **NIOSH REL** : TWA 2 ppm (5 mg/m³) ST 4 ppm (10 mg/m³) **OSHA PEL** † (nengapdxg.html) : TWA 2 ppm (5 mg/m³)		**Measurement Methods** **NIOSH** 7903 (/niosh/docs/2003-154/pdfs/7903.pdf) ; **OSHA** ID165SG (http://www.osha.gov/dts/sltc/methods/inorganic/id165sg/id165sg.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless, yellow, or red, fuming liquid with an acrid, suffocating odor. [Note: Often used in an aqueous solution. Fuming nitric acid is concentrated nitric acid that contains dissolved nitrogen dioxide.]

MW: 63.0	**BP:** 181° F	**FRZ:** -44°F	**Sol:** Miscible	**VP:** 48 mmHg	**IP:** 11.95 eV
Sp.Gr (77°F): 1.50	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid, but increases the flammability of combustible materials.

Incompatibilities & Reactivities Combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols [Note: Reacts with water to produce heat. Corrosive to metals.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion

Target Organs Eyes, skin, respiratory system, teeth

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Water flush immediately **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Change: No recommendation
Provide: Eyewash (pH<2.5), Quick drench (pH<2.5)

Respirator Recommendations

NIOSH/OSHA

Up to 25 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern¿
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern¿
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern¿
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0183 (/niosh/ipcsneng/neng0183.html) See MEDICAL TESTS: 0158 (/niosh/docs/2005-110/nmed0158.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Sodium hydroxide

Synonyms & Trade Names Caustic soda, Lye, Soda lye, Sodium hydrate

CAS No. 1310-73-2	**RTECS No.** WB4900000 (/niosh-rtecs/WB4AC4A0.html)	**DOT ID & Guide** 1823 154 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154) (http://www.cdc.gov/Other/disclaimer.html) (dry, solid) 1824 154 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154) (http://www.cdc.gov/Other/disclaimer.html) (solution)
Formula NaOH	**Conversion**	**IDLH** 10 mg/m³ See: 1310732 (/niosh/idlh/1310732.html)
Exposure Limits **NIOSH REL** : C 2 mg/m³ **OSHA PEL** † (nengapdxg.html) : TWA 2 mg/m³		**Measurement Methods** **NIOSH** 7401 (/niosh/docs/2003-154/pdfs/7401.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to white, odorless solid (flakes, beads, granular form).

MW: 40.0	**BP:** 2534° F	MLT: 605°F	**Sol:** 111%	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 2.13	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.

Incompatibilities & Reactivities Water; acids; flammable liquids; organic halogens; metals such as aluminum, tin & zinc; nitromethane [Note: Corrosive to metals.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair

Target Organs Eyes, skin, respiratory system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Water flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 10 mg/m³:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.£
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) 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 self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0360 (/niosh/ipcsneng/neng0360.html) See MEDICAL TESTS: 0210 (/niosh/docs/2005-110/nmed0210.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Helium, compressed (MSDS No. P-4602-G)	**Trade Names:** Helium, LaserStar™ Helium, Medipure® Helium, UltraLift® Helium
Chemical Name: Helium	**Synonyms:** Helium-4, refrigerant gas R-704
Chemical Family: Rare gas	**Product Grades:** Industrial; Ultralift; 6.0 research/chromatographic; 5.5 ECD, trace analytical; 5.0 UHP; 4.7, 5.0, 5.5 LaserStar; 4.6 zero, oxygen-free; 5.0 methanizer FID gas; 4.5; 5.0, 5.5, 6.0 semiconductor process gas

Telephone: **Emergencies:** 1-800-645-4633* **Company Name:** Praxair, Inc.
CHEMTREC: 1-800-424-9300* 39 Old Ridgebury Road
Routine: 1-800-PRAXAIR Danbury, CT 06810-5113

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Hazards Identification

EMERGENCY OVERVIEW

CAUTION! High-pressure gas.
Can cause rapid suffocation.
May cause dizziness and drowsiness.
Self-contained breathing apparatus may be required by rescue workers.
Under ambient conditions, this is a colorless, odorless, tasteless gas.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

Skin Contact. No harm expected.

Swallowing. This product is a gas at normal temperature and pressure.

Eye Contact. No harm expected.

Effects of Repeated (Chronic) Overexposure. No harm expected.

Other Effects of Overexposure. Helium is an asphyxiant. Lack of oxygen can kill.

A vertical line in the left margin indicates revised or new material.

Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of helium suggest that overexposure is unlikely to aggravate existing medical conditions.

CARCINOGENICITY: Helium is not listed by NTP, OSHA, or IARC.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

This section covers materials of manufacture only. See sections 8, 10, 11, and 16 for information on by-products generated during use in welding and cutting. See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Helium	7440-59-7	>99%*

**The symbol > means "greater than."*

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

NOTES TO PHYSICIAN: *There is no specific antidote. This product is inert. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Nonflammable.

SUITABLE EXTINGUISHING MEDIA: Helium cannot catch fire. Use media appropriate for surrounding fire.

PRODUCTS OF COMBUSTION: Not applicable.

PROTECTION OF FIREFIGHTERS: CAUTION! High-pressure gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Helium cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

CAUTION! High-pressure gas.

Personal Precautions. Helium is an asphyxiant. Lack of oxygen can kill. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if without risk. Ventilate area of leak or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry.

Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: ***Protect cylinders from damage.*** Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. ***Never attempt to lift a cylinder by its cap;*** the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. ***Open valve slowly.*** If valve is hard to open, discontinue use and contact your supplier. Close valve after each use; keep closed even when empty. ***Never apply flame or localized heat directly to any part of the cylinder.*** High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents. For other precautions in using helium, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: ***Store and use with adequate ventilation.*** Store only where temperature will not exceed 125°F (52°C). ***Firmly secure cylinders upright to keep them from falling or being knocked over.*** Screw valve protection cap firmly in place by hand. ***Store full and empty cylinders separately.*** Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

See section 16 for important information on by-products generated during use in welding and cutting.

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2007)
Helium	Not Established.	Simple asphyxiant

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Use a local exhaust system, if necessary, to prevent oxygen deficiency, and in welding, to keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Mechanical (General). General exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

Special. None

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves when handling cylinders; welding gloves for welding. Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. For welding, see section 16. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Per input or existing MSDS.

Respiratory Protection. Use air-purifying or air-supplied respirators where local or general exhaust ventilation is inadequate to keep worker exposure below all applicable exposure limits for fumes, gases, and other by-products of welding with helium. See section 16 for details. Air-supplied respirators must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	None
ODOR THRESHOLD:	Not applicable.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
MELTING POINT:	-456.5°F (-271.39°C)
BOILING POINT at 1 atm:	-452.07°F (-268.93°C)
FLASH POINT (test method):	Not applicable.
EVAPORATION RATE (Butyl Acetate = 1):	Not applicable.
FLAMMABILITY:	Nonflammable
FLAMMABLE LIMITS IN AIR, % by volume:	**LOWER:** Not applicable. **UPPER:** Not applicable.
VAPOR PRESSURE at 68°F (20°C):	Not applicable.
VAPOR DENSITY at 70°F (21.1°C) and 1 atm:	0.0104 lb/ft^3 (0.166 kg/m^3)
LIQUID DENSITY at boiling point and 1 atm:	7.802 lb/ft^3 (124.98 kg/m^3)
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	0.138
SOLUBILITY IN WATER 32°F (0°C) and 1 atm:	0.0094
PARTITION COEFFICIENT: n-octanol/water:	Not available.

AUTOIGNITION TEMPERATURE:	Not applicable.
DECOMPOSITION TEMPERATURE:	None
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	4.003
MOLECULAR FORMULA:	He

10. Stability and Reactivity

CHEMICAL STABILITY: ☐ Unstable ☒ Stable

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIALS: None known. Helium is chemically inert.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

POSSIBILITY OF HAZARDOUS REACTIONS: ☐ May Occur ☒ Will Not Occur

11. Toxicological Information

ACUTE DOSE EFFECTS: Helium is a simple asphyxiant.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Helium does not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Helium, compressed

HAZARD CLASS:	2.2	**PACKING GROUP/Zone:**	NA*	**IDENTIFICATION NUMBER:**	UN1046	**PRODUCT RQ:**	None
SHIPPING LABEL(s):	NONFLAMMABLE GAS						
PLACARD (when required):	NONFLAMMABLE GAS						

*NA–Not applicable.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

MARINE POLLUTANTS: Helium is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None
EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: No
DELAYED: No
PRESSURE: Yes
REACTIVITY: No
FIRE: No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Helium is not subject to reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Helium is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Helium is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Helium is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: Helium is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Helium is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: ***High-pressure gas.*** Use piping and equipment adequately designed to withstand pressures to be encountered. Use a backflow prevention device in any piping. ***Never work on a pressurized system.*** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

SPECIAL PRECAUTIONS: ***Use in welding and cutting.*** Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society, www.aws.org—order from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776 and OSHA Publication 2206 (29CFR 1910), US Government Printing Office, Washington, DC 20402, for more information.

Arcs and sparks can ignite combustible materials. Prevent fires. Refer to NFPA 51B, *Standard for Fire Prevention in Welding, Cutting, and Other Hotwork.* ***Do not strike an arc on the cylinder.*** The defect produced by an arc burn could lead to cylinder rupture.

Use in Underwater Breathing. Suitability of this product for use in underwater breathing must be determined by or under supervision of someone experienced in the use of underwater breathing gas mixtures. This person must be familiar with *how* the product is used; the frequency, duration, and effects of use; the hazards and side effects of use, and the precautions to take to avoid or control them.

Mixtures. When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH	= 0	HEALTH	= 0
FLAMMABILITY	= 0	FLAMMABILITY	= 0
INSTABILITY	= 0	PHYSICAL HAZARD	= 3
SPECIAL	= SA (CGA recommends this to designate Simple Asphyxiant.)		

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig	CGA-580
	3001-5500 psig	CGA-680
	5001-7500 psig	CGA-677
PIN-INDEXED YOKE:		CGA-930 (medical use)
ULTRA-HIGH-INTEGRITY CONNECTION:		CGA-718

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, http://www.cganet.com/Publication.asp.

AV-1	*Safe Handling and Storage of Compressed Gases*
G-9.1	*Commodity Specification for Helium*
P-1	*Safe Handling of Compressed Gases in Containers*
P-2	*Characteristics and Safe Handling of Medical Gases*
P-9	*Inert Gases—Argon, Nitrogen, and Helium*
SB-2	*Oxygen-Deficient Atmospheres*
SB-8	*Use of Oxy-Fuel Gas Welding and Cutting Apparatus*
V-1	*Compressed Gas Cylinder Valve Inlet and Outlet Connections*
V-7.1	*Standard Method Of Determining Cylinder Valve Outlet Connections For Medical Gases*
—	*Handbook of Compressed Gases, Fourth Edition*

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

PRAXAIR®

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113

Printed in USA

APPENDIX C

COMMUNITY AIR MONITORING PLAN

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

December 2009