BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Transmitted Via Federal Express

March 3, 2002

Joseph Moloughney, P.E.
Technical Project Manager
MGP Remedial Section
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7017

Re: West 19th Street Development Site
BBL Project #: 2174.27410 #2

Dear Mr. Moloughney:

Enclosed please four copies (one unbound) of the final Site Investigation Work Plan for the West 19th Street Development Site dated March 2003. This work plan was revised based on New York State Department of Environmental Conservation (NYSDEC)'s verbal comments provided on January 21, 2003 as well as the comments provided in your February 24, 2003 letter approving the work plan.

If you have any questions, please contact me at my new phone number (312) 332-4937, Extension 13.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Nancy E. Gensky

Nancy E. Gensky
Associate

NEG/mbg
Enclosures: Site Investigation Work Plan (BBL, March 2003)

cc: Gary Litwin, NYS Department of Health (2 copies)
Denise D'Ambrosio, NYSDEC (1 copies)
Joseph Rose, Georgetown 19th Street Development LLC (2 copies)
Mark Chertok, Sive Paget & Riesel (3 copies)
Greg Albright, BBL (2 copies)

MAR 4 2003
DIVISION OF ENVIRONMENTAL REMEDIATION

6723 Towpath Road • P.O. Box 66 • Syracuse, NY 13214-0066
Tel (315) 446-9120 • Fax (315) 449-0017 • www.bbl-inc.com • offices nationwide

P:\MBG\2003\22230842.doc

Site Investigation Work Plan
West 19th Street Development Site

Revised March 2003

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Site Investigation Work Plan
West 19th Street Development Site

Revised March 2003

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Site Investigation Work Plan - West 19th Street Development Site

Introduction

This document presents a proposed work scope for further site investigation at the West 19th Street Development site located between West 18th and West 19th Streets and 10th and 11th Avenues in the Borough of Manhattan, New York City (Figure 1). The development site is one parcel of the West 18th Street Gas Works Site, which is currently under a Voluntary Agreement (VCA) between the New York State Department of Environmental Conservation (NYSDEC) and the Consolidated Edison Company of New York, Inc. effective August 25, 2002. The site was used as a storage area for the Consolidated (Manhattan) Gas Company Works, a manufactured gas plant (MGP), between 1895 and 1921. Per Sanborn Fire Insurance maps and New York City tax maps, the site is located on Block 690, Lot 12 and may have the following addresses: 80 11th Avenue, 527 through 537 West 18th Street, 528 through 542 West 19th Street. Currently the site is occupied by a three-story brick building that is used as a mid- to long-term truck parking garage.

Site and Area Background

Sanborn Fire Insurance maps (Sanborns) for the site from 1895, 1895, 1904, 1921, 1950, 1969, 1975, 1979, 1980, 1983, 1985, 1987, 1988, and 1991 through 1997 and City Ward maps from 1885 and 1902. These maps indicate that the site was used as a storage area for the Consolidated (Manhattan) Gas Company Works between 1895 and 1921, followed by use as a wagon yard and auto garage to its present use as a truck parking garage. Three 1,000 gallon underground storage tanks (USTs) associated with the auto garage were noted on the 1969 through 1996 Sanborn maps. (The Sanborns and other background information, as well as information regarding a preliminary investigation of the site is contained in the Preliminary Site Investigation Report (BBL, November 2002); this report, summarized below, is included in the Application for participation in the Voluntary Cleanup Program submitted by Georgetown 19th Street Development LLC.) A detailed regulatory record review is also included in the Preliminary Site Investigation Report. Supplemental regulatory review records requested by NYSDEC are included in Attachment 1.

Historically surrounding the site were gas holders associated with the Consolidated (Manhattan) Gas Company Works, a marble works, a biscuit factory, and various auto/motor freight/truck services to the north; gas holders, a coal yard, and a pipe yard associated with the Consolidated (Manhattan) Gas Company Works, a filling station, a spring water company, a wagon yard, an auto repair shop, and an auto garage to the east; a retort house, a purifying house, and other facilities (e.g. laboratory, condensers, scrubbers) associated with the Consolidated (Manhattan) Gas Company Works, a doll factory, a packing box factory, an electric power company, and an auto parking lot to the south; and kilns associated with a pottery factory to the west. The Manhattan and Consolidated Gas Companies are predecessor companies to the Consolidated Edison Company of New York, Inc.

BBL performed a site visit on October 2, 2002 of the site and ground floor of the building. The outside perimeter of the site was checked for visual evidence of UST vent pipes and fill ports, chemical drums or containers, oil staining on the building sides or adjacent sidewalks, the presence of monitoring wells or previous soil borings, and utility laterals entering the building. No evidence of vent lines or UST fill ports was observed. No evidence of previous soil borings or groundwater monitoring wells was seen. Oil or staining of the building or the sidewalks was not observed.

Preliminary Site Investigation Report

Based on the historic and current usage of the site and surrounding environs, impacted soil and ground water could be present at the site that could require consideration, management, and (if necessary) remediation prior to or in conjunction with site development. If present, soil and groundwater impacts would likely be related to former MGP residues or petroleum products from USTs and piping resulting from historic site usage. Based on the site background, a preliminary site investigation was performed in October 2002 to assess whether MGP and/or petroleum-related constituents were present in soil and groundwater at concentrations that would require remediation.

The preliminary site investigation included the collection of eight soil samples and four groundwater samples from eight soil borings at the site (Figure 2). The soil borings ranged in depth from 12 to 20 feet below the concrete floor surface of the parking garage. Subsurface soils observed included urban fill to a depth of approximately 4 feet followed by gravelly sands with some silt to depth ranging from approximately 8 to 12 feet. Below 12 feet, the silt content of the sands increased, and a clay layer was observed in boring B6 from 12 to 16 feet in depth. This clay layer was not observed in the other soil borings; however, poor sample recovery limited boring penetration depths. Saturated soils (groundwater) were encountered in the borings at depths between 7 and 8 feet. Non-aqueous phase liquids (NAPLs) were not observed in any of the borings. Odors ranging from slight to strong were observed at all borings at depths ranging between 2 and 12 feet. Elevated PID readings were typically observed in each boring between depths of 6 and 10 feet.

The soil and groundwater samples were analyzed by for target compound list (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). The VOCs detected in the soil and groundwater are indicative of gasoline and kerosene range petroleum and MGP by-product tar. The highest benzene, ethylbenzene, toluene, and xylenes (BTEX) concentrations were detected primarily in the soil and groundwater samples from the borings adjacent to and assumed downgradient of the former UST locations and north of the former MGP retort house (Borings B1, B3, and B4). The SVOCs detected in the soil and groundwater (phenolic compounds and polycyclic aromatic hydrocarbons [PAHs]) are indicative of MGP by-product tar. The highest concentrations of PAHs were detected in the same soil and groundwater samples as the highest concentrations of BTEX (Borings B1, B3, and B4). In addition, relatively higher concentrations of PAHs were observed at B2 in the southeastern corner of the site.

One or more BTEX constituent concentrations exceeded the NYSDEC guidance values for soil (TAGM 4046) at borings B1, B3, B4, and/or B6. Total VOCs greater than 10 mg/kg in soil (TAGM 4046) were detected at B1 and B3. One or more BTEX constituent concentrations exceeded the NYSDEC criteria for groundwater (TOGS 1.1.1) in the samples collected at borings B1, B3, B4, and/or B6. The concentrations of individual PAHs exceeded the NYSDEC guidance values for soil in borings B1, B2, B3, B4, and B8, while the concentrations of phenolic compounds only exceeded the NYSDEC guidance values for soil in boring B2. Total SVOCs (primarily PAHs) greater than 500 mg/kg (TAGM 4046) were detected at boring B2, while total carcinogenic PAHs (cPAHS) greater than 10 mg/kg were detected at borings B1, B2, B3, and B4. For groundwater, the concentrations of phenolic compounds exceeded their respective NYSDEC criteria in the samples collected from borings B1 and B3; and the concentrations of individual PAHs exceeded their respective NYSDEC criteria in the samples collected from borings B1, B3, B4, and B6. Additional information regarding the preliminary site investigation is provided in the Preliminary Site Investigation Report (BBL, November 2002).

Based on the preliminary site investigation, impacted soil and ground water are present at the site that will require consideration, management, and remediation prior to or in conjunction with site development. This investigation is designed to provide additional information regarding the extent of the soil and groundwater impacts. At this time, any detailed design data (e.g. soil profiling for disposal) is anticipated to be collected in conjunction with geotechnical investigations performed by others.

Proposed Investigation

The primary objectives of this investigation at the West 19th Street Development Site are to:

- Delineate the horizontal and vertical extent of BTEX and PAH impacted soils; and
- Delineate the horizontal and vertical extent of BTEX, phenolic compounds, and PAHs in groundwater.

Secondary objectives for the investigation at the site are to:

- Determine the extent of the clay layer;
- Provide additional information to further confirm that NAPLs are not present;
- Assess the presence of other constituents not included in the preliminary investigation (i.e., TAL inorganics and TCL polychlorinated biphenyls (PCBs)/pesticides);
- Evaluate the direction of groundwater flow;
- Evaluate hydrogeologic properties; and
- Collect preliminary soil disposal characterization data.

The investigation will consist of the installation of soil borings and monitoring wells, the collection and laboratory analysis of soil and groundwater samples, and the collection of physical groundwater data.

The investigation will be conducted in manner consistent with the applicable technical and administrative guidelines set forth in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Act of 1980 (42 U.S.C., Sections 9601 et seq.), the National Contingency Plan (NCP) of March 8, 1990 (40 CFR Part 300), the United States Environmental Protection Agency (USEPA) guidance document entitled, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final," dated October 1988 (and subsequent revisions thereto), and other appropriate USEPA and NYSDEC technical and administrative guidance documents.

Field, data evaluation, and quality assurance/ quality control (QA/QC) procedures that support this investigation are provided in Appendix A. A site-specific Health and Safety Plan (HASP) has also been prepared to provide health and safety procedures for the investigation (Appendix B).

Test Borings

Twelve test borings will be completed at the site to delineate the horizontal and vertical extent of impacted soils observed during the preliminary site investigation, to delineate the presence of the clay unit, and to confirm initial observations that NAPLs are not present at the site. The rationale for the test boring locations is provided below:

Proposed Test Boring Location	Rationale
B9, B10, and B11 adjacent to and east and west of B1	To provide horizontal and vertical soil data near B1 where elevated concentrations of BTEX and PAHs were observed. Two of these three borings will extend up to 6 feet into the clay layer (if present) or to depth of approximately 30 feet. One of these borings will extend through the clay layer to a depth of approximately 50 feet. These borings will be used to evaluate if the impacts originate from MGP or other facilities to the south or the site proper.
B12 between borings B1 and B3	To provide vertical soil data to the clay layer near B1 and B3 where elevated concentrations of BTEX, and PAHs were observed. This boring will extend up to 6 feet into the clay layer (if present) or to depth of approximately 30 feet.
B13 east of boring B2	To provide horizontal and vertical soil data at the southeastern edge of the site near B2 where elevated concentrations of PAHs were observed. This boring will extend through the clay layer to a depth of approximately 50 feet. The boring will be used to evaluate if the impacts originate from MGP or other facilities to the east of the site proper.
B14 west of borings B3 and B4	To provide vertical and horizontal soil data to the west of borings B3 and B4 where elevated concentrations of BTEX and PAHs were observed. This boring will extend through the clay layer (if present) to depth of approximately 50 feet. The boring will be used to evaluate if impacts originate from MGP or other facilities to the west of the site.
B15 between borings B3 and B4	To provide vertical soil data to the clay layer near B3 and B4 where elevated concentrations of BTEX and PAHs were observed. This boring will extend up to 6 feet into the clay layer (if present) or to depth of approximately 30 feet.
B16 east of borings B3 and B4	To provide vertical and horizontal soil data to the east of borings B3 and B4 where elevated concentrations of BTEX and PAHs were observed. This boring will extend through the clay layer (if present) or to depth of approximately 50 feet. The boring will be used to evaluate if impacts originate from MGP or other facilities to the west of the site.
B17 between borings B4 and B6	To provide vertical soil data to the clay layer near B4 and B6 where elevated concentrations of BTEX, and PAHs were observed. This boring will extend up to 6 feet into the clay layer (if present) or to depth of approximately 30 feet.
B18 between borings B5 and B6	To provide vertical and horizontal soil data between borings B5 and B6 where relatively lower concentrations of BTEX and PAHs were observed. This boring will extend up to 6 feet into the clay layer (if present) or to depth of approximately 30 feet.
B19 north of B6	To provide horizontal soil data to the north of B6 where slightly elevated concentrations of BTEX were observed. This boring will extend through the clay layer to a depth of approximately 50 feet. The boring will be used to evaluate if the impacts originate from MGP or other facilities to the north or the site proper.
B-29 north of B7	To provide vertical and horizontal soil data north of boring B7 where relatively lower concentrations of BTEX and PAHs were observed. This boring will extend up to 6 feet into the clay layer (if present) or to depth of approximately 30 feet.

The exact boring locations will be determined based on access and existing utilities.

Prior to the installation of the test borings, the drilling subcontractor will notify public utilities of the investigation, and all underground utilities will be delineated. Public utilities will be located by calling the New York City utility clearance center and the appropriate site representatives/owners to request utility delineation at

the site. All discussions with the utilities either via telephone conversations or field utility representatives will be documented. Further safety measures, including utility clearance documentation, are provided in the HASP (Appendix B).

The borings will be drilled using hollow-stem auger techniques to enable penetration through a zone of loose, saturated sand. Seven of the borings will be drilled to the clay layer (anticipated to be encountered between 12 and 20 feet) and will penetrate the clay layer at least 2 feet but no more than 6 feet. If the clay layer is not encountered the boring will be drilled to approximately 30 feet. Five of the borings will be drilled deeper to a depth of 50 feet, the depth of potential building piles based on current building conceptualizations. If bedrock is encountered above 50 feet, the boring will extend only to the top of the bedrock.

Test boring procedures, including field logging, cleaning procedures, and photoionization detector (PID) monitoring and screening are provided in Appendix A. The test borings will be advanced using continuous soil sampling. Test borings may be advanced deeper than 30 feet if observations of significant soil contamination are still noted at 30 feet. Significant contamination is considered to include NAPLs, staining, and PID readings greater than 100 ppm. Soils generated during drilling will be staged in appropriate containers for subsequent disposal (if visual contamination is observed) or placed back into the borehole mixed with bentonite (if visually clean soils are observed). Staged soils will be stored in a designated area and be disposed of in accordance with NYSDEC TAGM #4032 (Appendix A). If the clay layer (and possible confining unit) is breached during advancement of a borehole, the borehole will be sealed with a temporary casing during further advancement of the borehole. The breached clay and/or confining unit will be grouted with a cement/bentonite grout.

During installation of the test borings, soil samples will be collected continuously, visually described using the Unified Soil Classification System (USCS), and screened with a photoionization detector (PID) for the presence and relative concentration of volatile constituents. The PID monitoring procedures will also provide for health and safety monitoring during the installation of the test borings. Additional health and safety procedures are provided in the HASP (Appendix B).

Drilling and sampling equipment will be cleaned prior to initiating the test boring activities, in between each test boring, and at the completion of all boring activities. Equipment cleaning will be conducted in a central area within a plastic-lined pad. Cleaning water and residual materials will be collected and transferred to a central container for interim storage and disposed of in accordance with applicable rules and regulations. Equipment cleaning procedures are provided in Appendix A.

The locations and elevations of the test borings will be surveyed using standard surveying practices.

Soil Sampling and Analysis

Soil samples will be obtained for laboratory chemical analysis to evaluate the horizontal and vertical extent of contamination. Up to four soil samples from each boring will be obtained for chemical analysis from the following depth intervals:

- From the 0 to 7 foot depth interval to assess possible shallow soil contamination in the interval that would require removal and disposal based on current building conceptualization;
- From soils with visible signs of contamination (e.g. staining, non-aqueous phase liquids [NAPLs]) or from soils with the highest PID readings, which will most likely be the water table zone (the 6 to 8-foot depth interval). If there are no visible signs of contamination or elevated PID readings, this interval will be obtained at the water table zone;
- From a depth interval below the water table but above the clay layer to assess the vertical extent of contamination detected at the water table; and
- From a depth interval within the clay layer (if present).

In addition from the five deep borings, a fifth interval of soils below the clay layer with visible signs of contamination or the highest PID readings will be obtained for laboratory analysis.

All soil samples will be analyzed by the following methods:

- Method 8260 for TCL VOCs; and
- Method 8270 for TCL SVOCs.

In addition, soil samples from the first sample interval (i.e. the 0 to 7 foot interval) will be analyzed by the following methods:

- Method 8080 for TCL PCBs/pesticides; and
- Method series 6000/7000/9000 for selected Target Analyte List (TAL) inorganics (antimony, arsenic, barium, beryllium, cadmium, total chromium, lead, mercury, nickel, selenium, silver, thallium, vanadium, zinc, and total cyanide)

Soil samples will be identified, handled, packaged, and shipped to the analytical laboratory using the chain-of custody procedures (Appendix A). The laboratory procedures will be in accordance with NYSDEC Analytical Services Protocol (ASP) methods, QA/QC requirements, and Category B reporting deliverables. Data validation will be performed in the form of a NYSDEC data usability summary report (DUSR) of the analytical data. In addition, a DUSR will be prepared for the analytical data from the preliminary site investigation. Appendix A provides the DUSR requirements.

Monitoring Well Installation

Soil borings B10, B13, B14, and B19 will be converted to shallow groundwater monitoring wells to assess the shallow groundwater flow direction, hydraulic conductivity, and groundwater quality. These wells will be screened across the water table and will have total depths between approximately 12 and 20 feet above the clay layer. The screened intervals will range from 10 to 15 feet depending upon the total depth of the well. The monitoring wells will be constructed using schedule 40 PVC 2-inch diameter casing, 0.020-inch slot screen size, sand filter pack, bentonite seal, neat cement grout, and a flush-mount locking well box. Each well will have a sump attached below the screened interval to collect denser than water NAPLs that may be present.

Drilling equipment used for well installations will be cleaned prior to initiating the well installation activities, in between each boring for well installation, and at the completion of all boring for well installation activities. Equipment cleaning will be conducted in a central area within a plastic-lined pad. Cleaning water and residual materials will be collected and transferred to a central container for interim storage and disposed of in accordance with applicable rules and regulations. Equipment cleaning procedures are provided in Appendix A.

Upon completion of each monitoring well, the well will be developed to remove fine grain materials that may have settled in or around the monitoring well during installation. Development water will be placed in a central container for interim storage. In addition, in-situ hydraulic conductivity tests will be performed using either the slug method of water displacement or removing a known volume of water (or known rate of removal). The procedures for well development and in-situ hydraulic conductivity testing are provided in Appendix A.

The locations and elevations of the groundwater monitoring wells will be surveyed using standard surveying practices.

Groundwater Sampling

In addition to soil samples, groundwater samples will be obtained from the four newly installed groundwater-monitoring wells. The wells will be sampled within approximately one week of installation. Prior to sampling, groundwater elevations will be measured and the presence of both light and dense NAPLs (if any) in the wells will be evaluated. Field parameter measurements (temperature, pH, conductivity, turbidity, and oxygen reduction potential) will be taken to check that the groundwater to be sampled is drawn from the formation. The purged well water will be containerized for subsequent disposal in accordance with applicable rules and regulations. Groundwater sampling procedures are provided in Appendix A.

The groundwater samples will be analyzed by the following methods:

- Method 8260 for TCL VOCs; and
- Method 8270 for TCL SVOCs.

Groundwater samples will be identified, handled, packaged, and shipped to the analytical laboratory using chain-of custody procedures. The laboratory procedures will be in accordance with NYSDEC Analytical Services Protocol (ASP) methods, QA/QC requirements, and Category B reporting deliverables. Data validation will be performed in the form of a NYSDEC DUSR of the analytical data. Appendix A provides the DUSR requirements.

Reporting

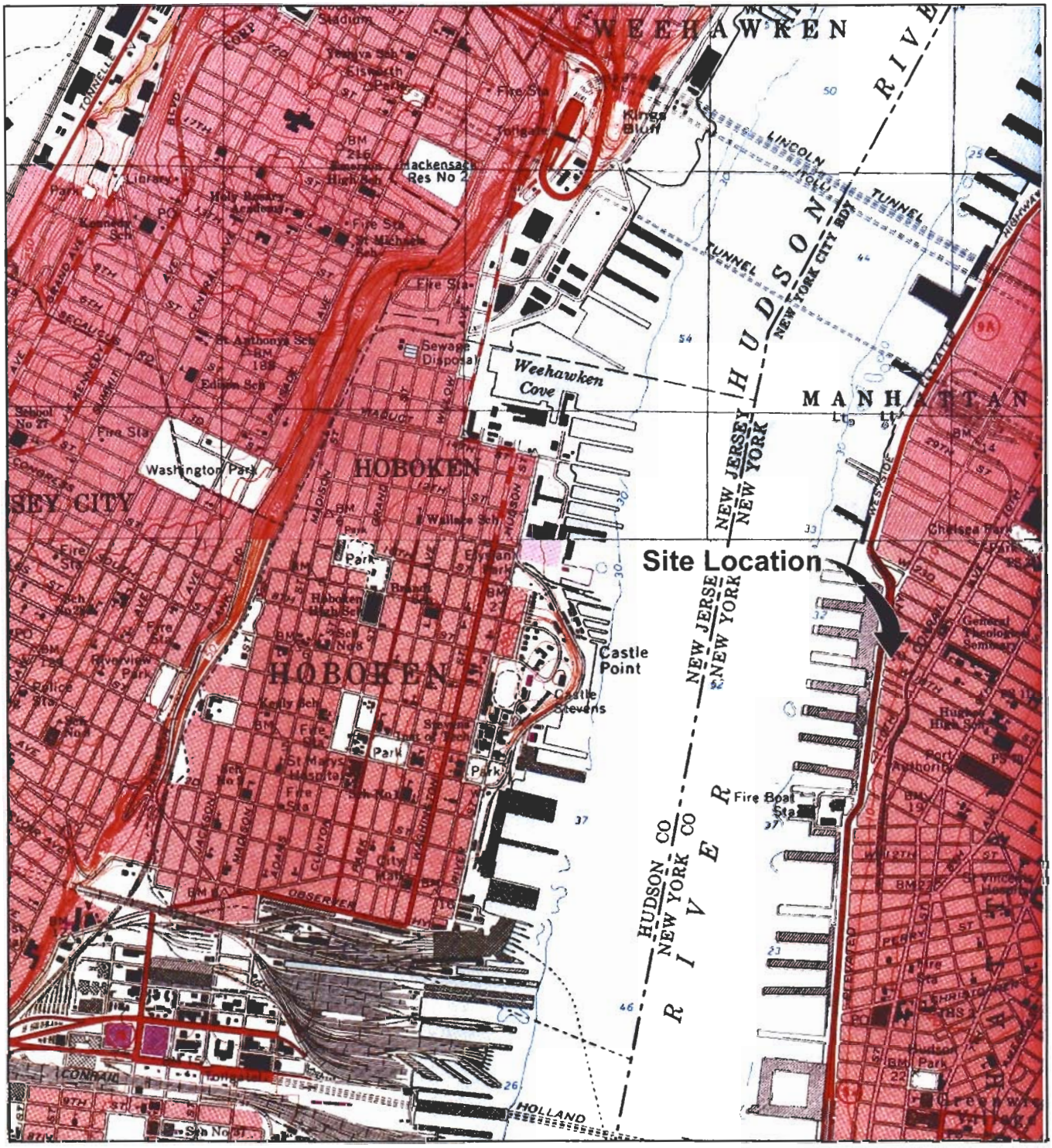
The Investigation Report will include the following elements:

- Description of the investigation activities;
- Evaluation of the investigation results;
- Qualitative exposure assessment;
- Tables of soil analytical data (including comparison to standards, criteria, and guidelines (SCGs);
- Tables of groundwater analytical data (including comparison to SCGs);
- Tables of physical groundwater data;
- Geologic cross sections (east-west and north -south);
- Figures depicting the extent of the primary constituents detected;
- Boring logs;
- Monitoring well logs;
- Groundwater sampling logs;
- Hydraulic conductivity test results;

- Survey data and mapping; and
- DUSRs.

Schedule

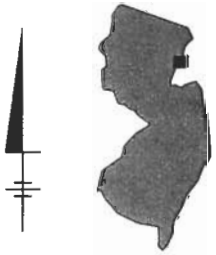
The test borings and monitoring wells will be installed over a two-week period followed by groundwater sampling the third week. Laboratory analyses will occur over a three-week period. Within two weeks of the receipt of the laboratory data, a draft report will be prepared and submitted to the NYSDEC after internal review shortly thereafter. Overall, the investigation will occur over a 2-month period.



REFERENCE: BASE MAP USGS 7.5 MIN. QUADS., JERSEY CITY, AND WEEHAWKEN, NJ - NY, 1967.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK

SITE LOCATION MAP

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE 1

11/18/02 SYR-D54-LBR, DJH
27410001/27410n01.cdr

WEST 19TH STREET

B5

B6

B7

B8

B4

B2

B3

B1

MILLER HIGHWAY
(HUDSON RIVER BLVD.)

SITE

WEST 18TH STREET

LEGEND:

▲ SOIL BORING LOCATION

NOTE:

THIS FIGURE WAS CREATED FROM SANBORN MAPS FROM THE SANBORN LIBRARY, LLC.

0 30' 60'

GRAPHIC SCALE

WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK

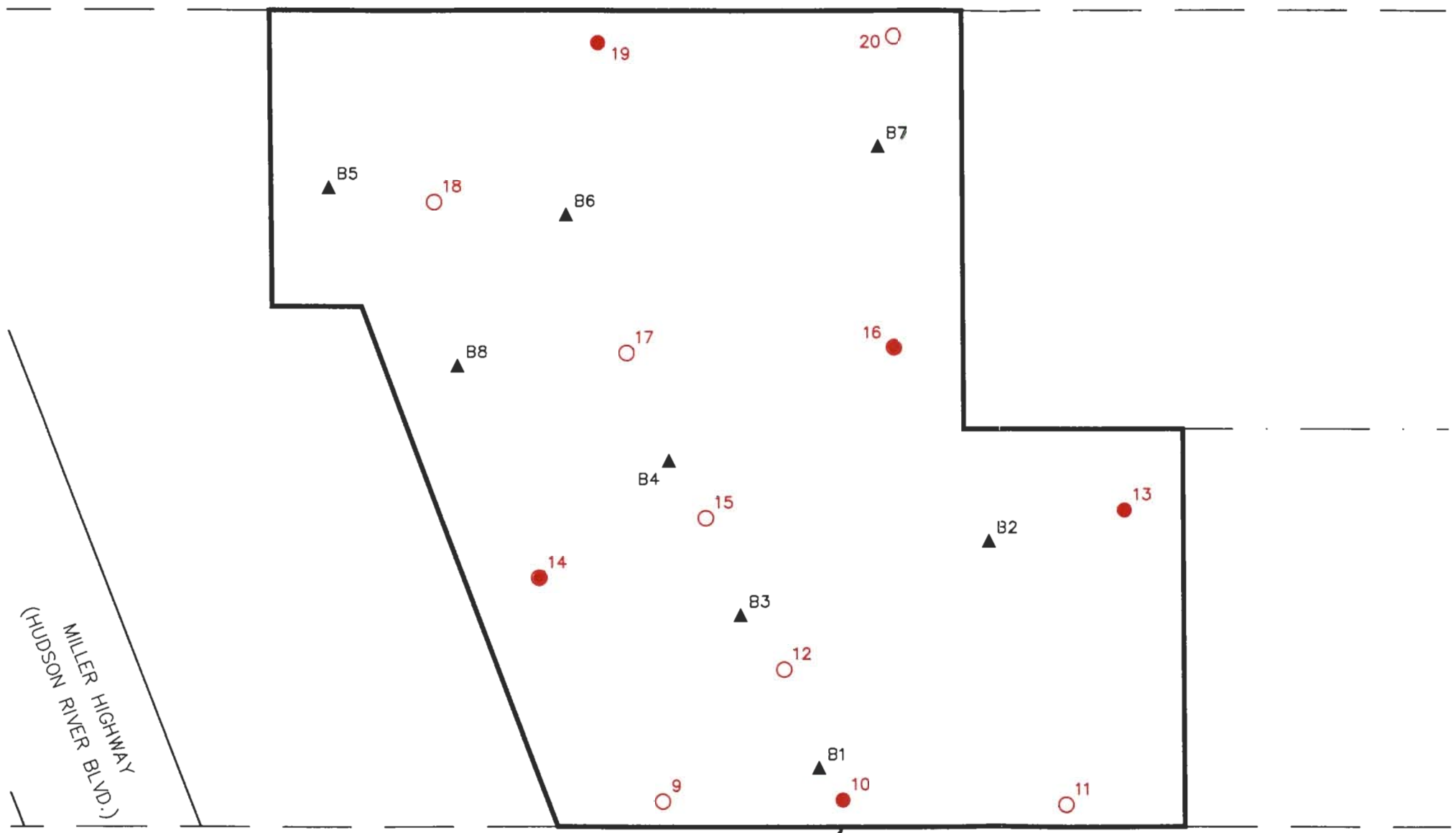
PRELIMINARY SITE INVESTIGATION LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2

X: 27410X01
L: OFF=REF*
P: PAGESET/PLT-BL
11/27/02 CRA-54-TLF, SYR-54-RCB
27410001/27410B01.DWG

WEST 19TH STREET



WEST 18TH STREET

LEGEND:

- ▲ SOIL BORING LOCATION (OCTOBER 2002)
- ○ PROPOSED SHALLOW BORING
- ● PROPOSED DEEP BORING

NOTE:

THIS FIGURE WAS CREATED FROM SANBORN MAPS FROM THE SANBORN LIBRARY, LLC.

0 30' 60'
GRAPHIC SCALE

WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK

PROPOSED BORING LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 3

X: 27410X01
L: OFF=REF*
P: PAGESET/PLT-BL
11/27/02 CRA-54-TLF, SYR-54-RCB
27410001/27410B02.DWG

Attachment 1

Supplemental Regulatory Records

BBL®
BLASLAND, BOUCK & LEE, INC.
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EDR Site Report™

MUCCIO JOHN
528 W 19TH ST
NEW YORK, NY 10011

Inquiry Number:

November 22, 2002

Environmental Data Resources, Inc.

The Source For Environmental Risk Management Data

3530 Post Road
Southport, Connecticut 06490

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

TABLE OF CONTENTS

The EDR-Site Report™ is a comprehensive presentation of government filings on a facility identified in a search of over 4 million government records from more than 600 federal, state and local environmental databases. The report is divided into three sections:

Section 1: Facility Summary ..... **Page 3**

Summary of facility filings including a review of the following areas: waste management, waste disposal, multi-media issues, and Superfund liability.

Section 2: Facility Detail Reports ..... **Page 4**

All available detailed information from databases where sites are identified.

Section 3: Databases Searched and Update Information. ..... **Page 6**

Name, source, update dates, contact phone number and description of each of the databases searched for this report.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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SECTION 1: FACILITY SUMMARY

FACILITY AREA	FACILITY 1 **MUCCIO JOHN** 528 W 19TH ST NEW YORK, NY 10011 EDR ID #1000555587 EPA #NYD986981272
WASTE MANAGEMENT Facility generates hazardous waste (RCRIS)	**YES - p4**
Facility treats, stores, or disposes of hazardous waste on-site (RCRIS/TSDF)	NO
Facility has received Notices of Violations (RCRIS/VIOL)	NO
Facility has been subject to RCRA administrative actions (RAATS)	NO
Facility has been subject to corrective actions (CORRACTS)	NO
Facility handles PCBs (PADS)	NO
Facility uses radioactive materials (MLTS)	NO
Facility manages registered aboveground storage tanks (AST)	NO
Facility manages registered underground storage tanks (UST)	NO
Facility has reported leaking underground storage tank incidents (LUST)	NO
Facility has reported emergency releases to the soil (ERNS)	NO
Facility has reported hazardous material incidents to DOT (HMIRS)	NO
WASTE DISPOSAL Facility is a Superfund Site (NPL)	NO
Facility has a known or suspect abandoned, inactive or uncontrolled hazardous waste site (CERCLIS)	NO
Facility has a reported Superfund Lien on it (LIENS)	NO
Facility is listed as a state hazardous waste site (SHWS)	NO
Facility has disposed of solid waste on-site (SWF/LF)	NO
MULTIMEDIA Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313 (TRIS)	NO
Facility produces pesticides and has notified EPA under Section 7 of FIFRA (SSTS)	NO
Facility manufactures or imports toxic chemicals on the TSCA list (TSCA)	NO
Facility has inspections under FIFRA, TSCA or EPCRA (FTTS)	NO
Facility is listed in EPA's index system (FINDS)	**YES - p5**
Facility is listed in a county/local unique database (LOCAL)	NO
POTENTIAL SUPERFUND LIABILITY Facility has a list of potentially responsible parties PRP	NO
TOTAL (YES)	2

SECTION 2: FACILITY DETAIL REPORTS

WASTE MANAGEMENT

Facility generates hazardous waste

DATABASE: Resource Conservation and Recovery Information System (RCRIS)

MUCCIO JOHN
528 W 19TH ST
NEW YORK, NY 10011
EDR ID #1000555587

Facility Name:	MUCCIO JOHN 528 W 19TH ST NEW YORK, NY 10011 - 2807
Mailing Address:	W 23RD ST NEW YORK, NY 10011
Contact:	JOHN MUCCIO 527 W 23RD ST NEW YORK, NY 10011 (212) 675-8906
EPA-ID:	NYD986981272
Rank Date: Rank Status:	Not reported Not reported
Classification:	Small Quantity Generator
Description:	Handler: - generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or - generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of hazardous waste at any time
Legal Status:	Private
Owner:	MENDON LEASING UNKNOWN UNKNOWN, NY 21255 - 5121 (212) 555-1212

SECTION 2: FACILITY DETAIL REPORTS

...Continued...

MULTIMEDIA

Facility is listed in EPA's index system

DATABASE: Facility Index System (FINDS)

MUCCIO JOHN
528 W 19TH ST
NEW YORK, NY 10011
EDR ID #1000555587

This site is listed in the Federal FINDS database. The FINDS database may contain references to records from government databases included elsewhere in the report. Please note: the FINDS database may also contain references to out of date records formerly associated with the site.

EPA-ID:	NYD986981272
EPA Records Indicate Facility Is Listed In:	Facility Registry System (FRS)
System ID:	110004480106
Facility Name:	MUCCIO JOHN
Facility Address:	528 W 19TH ST NEW YORK, NY 10011 - 2807
DUNS Number:	Not reported
US Fed Gov Facility:	No
Indian Tribal Land:	Not reported
Sic Code(s):	Not reported
Date Reported to Government:	200105180651

EPA-ID:	NYD986981272
EPA Records Indicate Facility Is Listed In:	Resource Conservation and Recovery Act Information system (RCRAINFO)
System ID:	NYD986981272
Facility Name:	MUCCIO JOHN
Facility Address:	528 W 19TH ST NEW YORK, NY 10011 - 2807
DUNS Number:	Not reported
US Fed Gov Facility:	No
Indian Tribal Land:	No
Sic Code(s):	Not reported
Date Reported to Government:	199907271042

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

To maintain currency of the following federal, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

Elapsed ASTM days: Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

WASTE MANAGEMENT

RCRIS: Resource Conservation and Recovery Information System
Source: EPA/NTIS
Telephone: 800-424-9346
Resource Conservation and Recovery Information System. RCRIS includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

Date of Government Version: 09/09/2002
Database Release Frequency: Varies
Date of Last EDR Contact: 09/24/2002
Date of Next Scheduled Update: 12/23/2002

BRS: Biennial Reporting System
Source: EPA/NTIS
Telephone: 800-424-9346
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/1999
Database Release Frequency: Biennially
Date of Last EDR Contact: 09/16/2002
Date of Next Scheduled Update: 12/16/2002

RAATS: RCRA Administrative Action Tracking System
Source: EPA
Telephone: 202-564-4104
RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 09/10/2002
Date of Next Scheduled Update: 12/09/2002

CORRACTS: Corrective Action Report
Source: EPA
Telephone: 800-424-9346
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 05/02/2002
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 09/09/2002
Date of Next Scheduled Update: 12/09/2002

PADS: PCB Activity Database System
Source: EPA
Telephone: 202-564-3887
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 06/28/2002
Database Release Frequency: Annually
Date of Last EDR Contact: 11/13/2002
Date of Next Scheduled Update: 02/10/2003

MLTS: Material Licensing Tracking System
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 07/12/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 10/08/2002
Date of Next Scheduled Update: 01/06/2003

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

NY AST: Petroleum Bulk Storage
Source: Department of Environmental Conservation
Telephone: 518-402-9549
Registered Aboveground Storage Tanks.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY UST: Petroleum Bulk Storage (PBS) Database
Source: Department of Environmental Conservation
Telephone: 518-402-9549
Facilities that have petroleum storage capacities in excess of 1,100 gallons and less than 400,000 gallons.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

ERNS: Emergency Response Notification System
Source: EPA/NTIS
Telephone: 202-260-2342
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 12/31/2001
Database Release Frequency: Varies
Date of Last EDR Contact: 10/28/2002
Date of Next Scheduled Update: 01/27/2003

HMIRS: Hazardous Materials Information Reporting System
Source: U.S. Department of Transportation
Telephone: 202-366-4555
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 05/31/2002
Database Release Frequency: Annually
Date of Last EDR Contact: 10/21/2002
Date of Next Scheduled Update: 01/20/2003

WASTE DISPOSAL

NPL: National Priority List
Source: EPA
Telephone: Not reported
National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 07/18/2002
Date Made Active at EDR: 09/20/2002
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 08/01/2002
Elapsed ASTM Days: 50
Date of Last EDR Contact: 11/04/2002

PROPOSED NPL: Proposed National Priority List Sites
Source: EPA
Telephone: Not reported

Date of Government Version: 05/29/2002
Date Made Active at EDR: 09/20/2002
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 08/01/2002
Elapsed ASTM Days: 50
Date of Last EDR Contact: 11/04/2002

DELISTED NPL: National Priority List Deletions
Source: EPA
Telephone: Not reported
The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 07/18/2002
Date Made Active at EDR: 09/20/2002
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 08/01/2002
Elapsed ASTM Days: 50
Date of Last EDR Contact: 11/04/2002

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
Source: EPA
Telephone: 703-413-0223
CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 08/15/2002
Date Made Active at EDR: 10/28/2002
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 09/23/2002
Elapsed ASTM Days: 35
Date of Last EDR Contact: 09/23/2002

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned
Source: EPA
Telephone: 703-413-0223
As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. EPA has removed approximately 25,000 NFRAP sites to lift the unintended barriers to the redevelopment of these properties and has archived them as historical records so EPA does not needlessly repeat the investigations in the future. This policy change is part of the EPA's Brownfields Redevelopment Program to help cities, states, private investors and affected citizens to promote economic redevelopment of unproductive urban sites.

Date of Government Version: 09/15/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 09/23/2002
Date of Next Scheduled Update: 12/23/2002

NPL LIENS: Federal Superfund Liens
Source: EPA
Telephone: 205-564-4267
Federal Superfund Liens. Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Made Active at EDR: 03/30/1994
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 02/02/1994
Elapsed ASTM Days: 56
Date of Last EDR Contact: 08/26/2002

NY SHWS: Inactive Hazardous Waste Disposal Sites in New York State
Source: Department of Environmental Conservation
Telephone: 518-402-9553
State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 04/01/2002
Database Release Frequency: Annually
Date of Last EDR Contact: 08/27/2002
Date of Next Scheduled Update: 11/25/2002

NY SWF/LF: Facility Register
Source: Department of Environmental Conservation
Telephone: 518-457-2051
Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 12/31/2001
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/05/2002
Date of Next Scheduled Update: 02/03/2003

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

MULTIMEDIA

TRIS: Toxic Chemical Release Inventory System
Source: EPA
Telephone: 202-260-1531
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2000
Database Release Frequency: Annually
Date of Last EDR Contact: 09/24/2002
Date of Next Scheduled Update: 12/23/2002

SSTS: Section 7 Tracking Systems
Source: EPA
Telephone: 202-564-5008
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2000
Database Release Frequency: Annually
Date of Last EDR Contact: 10/22/2002
Date of Next Scheduled Update: 01/20/2003

TSCA: Toxic Substances Control Act
Source: EPA
Telephone: 202-260-5521
Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/1998
Database Release Frequency: N/A
Date of Last EDR Contact: 09/09/2002
Date of Next Scheduled Update: 12/09/2002

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-564-2501
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/25/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 09/24/2002
Date of Next Scheduled Update: 12/23/2002

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: EPA
Telephone: 202-564-2501

Date of Government Version: 04/25/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 09/24/2002
Date of Next Scheduled Update: 12/23/2002

FINDS: Facility Index System/Facility Identification Initiative Program Summary Report
Source: EPA
Telephone: Not reported
Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 06/13/2002
Database Release Frequency: Quarterly
Date of Last EDR Contact: 10/07/2002
Date of Next Scheduled Update: 01/06/2003

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

NY LTANKS: Spills Information Database
Source: Department of Environmental Conservation
Telephone: 518-402-9549
Leaking Storage Tank Incident Reports. These records contain an inventory of reported leaking storage tank incidents reported from 4/1/86 through the most recent update. They can be either leaking underground storage tanks or leaking aboveground storage tanks. The causes of the incidents are tank test failures, tank failures or tank overfills.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY SPILLS: Spills Information Database
Source: Department of Environmental Conservation
Telephone: 518-402-9549
Data collected on spills reported to NYSDEC as required by one or more of the following: Article 12 of the Navigation Law, 6 NYCRR Section 613.8 (from PBS regs), or 6 NYCRR Section 595.2 (from CBS regs). It includes spills active as of April 1, 1986, as well as spills occurring since this date.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY CORTLAND AST: Cortland County Storage Tank Listing
Source: Cortland County Health Department
Telephone: 607-753-5035

Date of Government Version: 01/02/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 09/04/2002
Date of Next Scheduled Update: 12/02/2002

NY CORTLAND UST: Cortland County Storage Tank Listing
Source: Cortland County Health Department
Telephone: 607-753-5035

Date of Government Version: 01/02/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 09/04/2002
Date of Next Scheduled Update: 12/02/2002

NY NASSAU AST: Registered Tank Database
Source: Nassau County Health Department.
Telephone: 516-571-3314

Date of Government Version: 08/13/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/01/2002
Date of Next Scheduled Update: 02/03/2003

NY NASSAU UST: Registered Tank Database
Source: Nassau County Health Department
Telephone: 516-571-3314

Date of Government Version: 08/13/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/01/2002
Date of Next Scheduled Update: 02/03/2003

NY ROCKLAND AST: Petroleum Bulk Storage Database
Source: Rockland County Health Department
Telephone: 914-364-2605

Date of Government Version: 10/24/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/08/2002
Date of Next Scheduled Update: 01/06/2003

NY ROCKLAND UST: Petroleum Bulk Storage Database
Source: Rockland County Health Department
Telephone: 914-364-2605

Date of Government Version: 10/24/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/08/2002
Date of Next Scheduled Update: 01/06/2003

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

NY SUFFOLK AST: Storage Tank Database
Source: Suffolk County Department of Health Services
Telephone: 631-854-2521

Date of Government Version: 12/31/2001
Database Release Frequency: Annually

Date of Last EDR Contact: 09/10/2002
Date of Next Scheduled Update: 12/02/2002

NY SUFFOLK UST: Storage Tank Database
Source: Suffolk County Department of Health Services
Telephone: 631-854-2521

Date of Government Version: 12/31/2001
Database Release Frequency: Annually

Date of Last EDR Contact: 09/10/2002
Date of Next Scheduled Update: 12/02/2002

NY CBS UST: Chemical Bulk Storage Database
Source: NYSDEC
Telephone: 518-402-9549
Facilities that store regulated hazardous substances in underground tanks of any size

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY CBS AST: Chemical Bulk Storage Database
Source: NYSDEC
Telephone: 518-402-9549
Facilities that store regulated hazardous substances in aboveground tanks with capacities of 185 gallons or greater, and/or in underground tanks of any size.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY MOSF UST: Major Oil Storage Facilities Database
Source: NYSDEC
Telephone: 518-402-9549
Facilities that may be onshore facilities or vessels, with petroleum storage capacities of 400,000 gallons or greater.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY MOSF AST: Major Oil Storage Facilities Database
Source: NYSDEC
Telephone: 518-402-9549
Facilities that may be onshore facilities or vessels, with petroleum storage capacities of 400,000 gallons or greater.

Date of Government Version: 01/01/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/29/2002
Date of Next Scheduled Update: 01/27/2003

NY HSWDS: Hazardous Substance Waste Disposal Site Inventory
Source: Department of Environmental Conservation
Telephone: 518-402-9564
The list includes any known or suspected hazardous substance waste disposal sites. Also included are sites delisted from the Registry of Inactive Hazardous Waste Disposal Sites and non-registry sites which U.S. EPA Preliminary Assessment (PA) reports or Site Investigation (SI) reports were prepared.

Date of Government Version: 09/01/2002
Database Release Frequency: Annually

Date of Last EDR Contact: 09/04/2002
Date of Next Scheduled Update: 12/02/2002

NY MANIFEST: Facility and Manifest Data
Source: NYSDEC
Telephone: 518-457-6585
Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

SECTION 3: DATABASES SEARCHED AND UPDATE DATES

...Continued...

Former Manufactured Gas (Coal Gas) Sites: The existence and location of Coal Gas sites is provided exclusively to EDR by Real Property Scan, Inc. (C) Copyright 1993 Real Property Scan, Inc. For a technical description of the types of hazards which may be found at such sites, contact your EDR customer service representative.

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POTENTIAL SUPERFUND LIABILITY

PRP: Potentially Responsible Parties
Source: EPA
Telephone: 202-564-6064
A listing of verified Potentially Responsible Parties

Date of Government Version: 06/26/2002
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/07/2002
Date of Next Scheduled Update: 01/06/2003

APPENDIX A

Investigation Procedures and Data Quality Assurance/Quality Control

March 2003

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Appendix A

Investigation Procedures and Data Quality Assurance/Quality Control

This appendix sets forth the field and evaluation procedures as well as the quality assurance/quality control (QA/QC) procedures for the Site Investigation.

Project Description and Project Goals

The environmental history of the site is provided in the Introduction section of this work plan and in the Preliminary Site Investigation (BBL, November 2002).

The goals for the site investigation are provided in the Proposed Investigation section of this work plan.

Project Organization

BBL, Inc. has prepared this work plan and will implement the work plan upon authorization. Key BBL personnel include:

- Project Director - Nancy Gensky;
- Project Manager - Greg Albright;
- Quality Assurance Officer - Laurie Indick; and
- Field Supervisor – Glenn Palmer.

Resumes are provided in Attachment A-1.

Analytical Procedures

The analytical laboratory procedures will be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) Analytical Service Protocol (ASP) methods, QA/QC requirements, and Category B deliverables.

A sampling chart defining the sample matrix, the approximate sample numbers, and analytical methods is provided in Attachment A-2.

Maps of proposed borings and initial borings are provided on Figure 3 of the work plan. Attachment A-3 provides summary tables and figures of the initial site investigation data.

Proposed Analytical Laboratory

The laboratory used for the initial site investigation and proposed for the site investigation is Accutest Laboratories of Dayton, NJ (NYS Certification #10983).

Standard Operating Procedures

The following standard operating procedures are provided in Attachment A-4:

- Drilling Procedures for Collecting and Screening Soil Samples;
- Equipment Cleaning Procedures;
- Monitoring Well Installation Procedures;
- Specific Capacity Test Procedures;
- In-situ Hydraulic Conductivity Test Procedures;
- Groundwater Sampling Procedures;
- Field Sample Designation, Containerization, Preservation, Handling, Packing, and Shipping Procedures
- TAGM 4032

Data Validation

Data Usability Summary Report (DUSR) guidelines are provided in Attachment A-5.

Attachment A-1

BBL Resumes

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Nancy E. Gensky

Associate, Geology

Former Manufactured Gas Plant (MGP) Sites

Ms. Gensky has more than 15 years of experience conducting groundwater investigations. Ms. Gensky specializes in project management of complex site investigations and remediations that involve unique geologic settings, multiple sites, and/or multidisciplinary tasking. This includes client communications, regulatory negotiations, and budget and schedule control.

Central Hudson Gas & Electric Corporation. Managed investigations at eight former MGP sites. Oversaw soil boring, rock coring, and monitoring well installations; and soil, sediment, waste, surface-water, groundwater, soil-vapor, and air sampling. Produced combined work and quality assurance project plans, health and safety plans, and work plan addenda. Evaluated MGP processes and potential source areas at the sites. Evaluated potential migration pathways and receptors from the potential identified sources. Evaluated the possible remedial alternatives using the GRI remedial cost spreadsheet for restoration of MPG sites.

Five Former MGP Sites, New York State Electric & Gas. Managing ongoing remedial investigations(RIs) at five former MGP sites in New York (Auburn, Granville, Binghamton, Goshen, and Border City) for NYSEG. Investigations include developing work plans, conceptual model, and data gaps using historical site information; surface soil sampling; subsurface soil and waste sampling; monitoring well installation; groundwater, surface-water, and sediment sampling; and soil screening. Responsibilities include managing budget, invoicing, and contract issues; preparing proposals; reviewing work plans and reports; and client liaison.

Niagara Mohawk Power Corporation, Off-Site Properties Near the Harbor Point Site. Prepared conceptual model and RI work plans for three properties historically operated as a tar emulsion plant, a fuel distribution facility, and spoil areas for materials dredged from the Mohawk River, the Utica Harbor, and the NYS Barge Canal. Conceptual model included known information about potential source areas, likely migration pathways with a relative ranking of significance, and potential exposure pathways with possible receptors. Work plans included provisions for analytically "fingerprinting" the source materials, as well as obtaining engineering and treatability properties. Prepared ancillary documents for each of the three properties, including quality assurance project plans, field sampling plans, and health and safety plans. Responsibilities included primary client contact and primary plan authorship.

Confidential Client, Remedial Technology Demonstration Project. Oversaw the predesign investigations at two demonstration areas at a former MGP site. Investigations included physical characteristic testing of source materials (tars) including viscosity, density, and interfacial tension; installing borings to delineate the nature and extent of the tars; installing piezometers to evaluate hydraulic conditions and mobility of the tars; monitoring to evaluate tar thickness, water levels, and tar recovery; and modeling to evaluate optimal locations for tar recovery systems. Oversaw subsurface installations of the two recovery systems: a recovery and injection well system, and a recovery trench and series of injection wells system. Evaluated three recovery scenarios including tar recovery with no hydraulic manipulation of the system, tar recovery with groundwater withdrawal, and tar recovery with groundwater withdrawal and groundwater injection.

Currently evaluating the results of the demonstration project and future recovery enhancements.

Confidential Client. Providing technical oversight for a preliminary site assessment/interim measures study at a former MGP. The assessment includes preparing work and ancillary plans; implementing field activities such as test pit excavations, test boring installations, monitoring well installations, multimedia sampling and analysis, fish and wildlife impact analysis, and utility pathway analysis; and evaluating applicable interim measures, if any. Responsibilities include technical guidance for overall site strategy, prioritizing site issues, evaluating site history, and evaluating the need for interim measures. Currently providing technical review of the assessment report and technical memoranda.

Confidential Client. Providing technical oversight for a site investigation at a former MGP. Investigation includes installing test boring and monitoring wells, installing sediment cores in river estuary and channel, multimedia sampling and analysis, survey, human health risk assessment, ecological habitat-based assessment, and reporting. Responsibilities include technical guidance for overall site strategy.

Confidential Client. Litigation support for alleged off-site contamination from a former MGP. Providing technical support to counsel, including oversight of field work performed by plaintiff's technical team, attending technical negotiation meetings, preparing affidavits, and preparing accelerated action plans for investigation activities.

Confidential Client. Project manager for an RI/FS at a former MGP, including other off-site areas. RI/FS includes preparing work plan, quality assurance project plan, field sampling plan, health and safety plan, and community participation plan; negotiating with the regulatory agents; and implementing the RI, baseline risk assessment, and the FS. RI includes installing borings and monitoring wells, river sediment probing and assessment, and multimedia sampling and analysis. Currently preparing plans and preliminary information submittal for the regulatory agencies. Responsibilities include technical oversight, primary client contact, and managing project budget and schedule.

Remedial Investigations

Indian Orchard Plant, Monsanto Chemical Company. Prepared a remedial investigation plan (RIP) for a large chemical plant site that includes eight different waste disposal areas. Preparation included meeting with regulatory agencies and the client. Implemented and supervised implementation of Phase 1 and Phase 2 activities of the RIP including geology and hydrogeology review, aerial photograph analysis, control survey, magnetometer and seismic refraction surveys, groundwater flow assessment, groundwater sampling and analysis, site-specific compound evaluation, and test boring installation including on-site soil screening with an HNU/OVA method. Prepared and supervised preparation of the Phase I RIP report. Currently providing management oversight for integrated investigation efforts to meet both state (Massachusetts Contingency Plan) and federal RCRA requirements.

Bloomington Sites, Westinghouse Electric. Managed RIs at five sites contaminated with PCBs and other organic compounds. Prepared work plans, quality assurance project plans, field sampling plans, project-specific health and safety plans, data reports, investigation reports, numerous responses, and information letter to the regulatory

agencies. Field efforts included: boring and monitoring well installations; geophysics (magnetometer, seismic refraction, earth-penetrating radar, gravity); borehole geophysics (gamma ray and hole caliper logging); packer and in-situ hydraulic conductivity testing; soil, groundwater, and surface-water sampling; high- and low-flow groundwater tracer tests using dyes and inorganic constituents; continuous water-level measurements; and geologic mapping (lithologic units and karst features). Reduced physical and chemical data, compiled more than 10 years of soil and water data, evaluated purge water treatment systems for the groundwater extracted during sampling events, prepared routine long-term groundwater monitoring protocols, and evaluated sampling devices. Involved in primary client and regulatory contact, participated in public meetings, interacted with local homeowners during field efforts, acted as liaison with other client consultants, and provided expert witness testimony.

Rosen Site. Project manager for an RI at a former 20-acre scrap yard. Conducted site-wide soil-vapor survey; test pit, soil boring, and monitoring well/piezometer installations; groundwater, surface-water, soil, waste, sediment, and air sampling; and in-situ hydraulic conductivity testing. Performed a historical delineation of waste areas, researching past land uses via the use of aerial photographs and information from the local historical society. Primary client contact for the CPRP Group, primary regulatory agency contact, presented RI approach and answered community questions at a public meeting, primary presenter during internal status meetings with the CPRP Group, interacted with local landowners and school officials during field operations on their properties, and negotiated with regulatory agency officials.

Confidential Client. Managed a hydrogeologic investigation and coordinated the production of pre-RI deliverables associated with an off-site RI. The purpose of the RI is to address the presence of PCBs in a drainage basin associated with the now remediated solvent/oil recovery operations site. Managed the installation of monitoring wells and piezometers. Also conducting groundwater sampling; surface-water sampling during various flow conditions; sediment deposition mapping and sampling; and biota sampling including fish, frogs, and crayfish. Participated in numerous meetings during a three-year period with the client and the state to negotiate the RI. Prepared work plan, quality assurance project plan, field sampling plan, and health and safety plan.

Confidential Client. Project manager for a series of groundwater RIs at an active electronics manufacturing facility in Syracuse, New York. The investigation included preparing work plans, including a data collection quality assurance plan, and a health and safety plan; completing a site-wide soil-vapor survey; installing 10 soil borings with portable gas chromatograph (GC) screening; installing 19 monitoring wells and 7 piezometers; groundwater sampling and analysis; and evaluating site hydraulics via water balance and flow net calculations. Also included was the performance of a pilot screening study to determine the optimal approach to screen large areas and to direct the installation of monitoring wells. Techniques piloted included soil-vapor survey, groundwater survey, and soil borings all coupled with field screening by portable photoionization detectors and field office screening by a GC. Constituents of concern at this site included VOCs, in particular trichloroethene (TCE) and its degradation products. Responsibilities included managing and overseeing investigation activities; coordinating with ongoing engineering activities at the site; and presentations/discussions with NYSDEC (both local and central representatives) and the client. Work efforts and communications were maintained with the state such that the owner was able to continue in a voluntary investigation mode. The investigation results were presented on behalf of the client during a pre-purchase audit,

and the site is now considered a multimedia site where groundwater efforts are integrated into other ongoing programs and visa versa.

Wallace Site, Niagara Mohawk Power Corporation. Project manager for the hydrogeologic investigation portion of an RI of a former scrapyard in Cobleskill, New York. Investigation involved rock coring, test borings, monitoring well installations, packer testing, groundwater sampling, residential well sampling, fracture-trend mapping, and an off-site geologic fractures reconnaissance.

Unique Karst hydrogeologic setting required integrating site and regional geologic and hydrogeologic information. Responsibility included managing and overseeing hydrogeologic activities; coordinating with other ongoing activities at the site; and presentations/discussions with the NYSDEC, NYS Department of Labor, and the client.

Education

- B.S./Geology, 1982, University of Rochester
- Masters Coursework, Syracuse University/University of Waterloo

Registrations

Professional Affiliations

- National Ground Water Association
- Central New York Association of Professional Geologists
- New York State Council of Professional Geologists

Training

- 40-Hour OSHA Training
- 8-hour OSHA Refresher Training
- OSHA Excavation and Trenching Competent Person Training
- Project Planning, BBL in-house seminar
- Time Management, BBL in-house seminar
- Performance Planning/Appraisal, BBL in-house seminar
- Contract Administration, BBL in-house seminar
- Professional Liability, BBL in-house seminar
- Technical Writing, BBL in-house seminar
- Technical Writing for Reviewers, BBL in-house seminar
- Writing Winning Proposals, BBL in-house seminar
- Impact of Environmental Laws on Real Estate Transfers, BBL in-house seminar
- Seismic Refraction Exploration, BBL in-house seminar
- Mediation: Theory and Practice, BBL in-house seminar
- Legal Issues in Engineering and Construction, BBL in-house seminar

Publications

Barker, J., J. Cherry, J. Greenhouse, N. Gensky, M. Moore, and M. Zapico. December 1985. Hazardous Organic Chemicals in Groundwater at Ontario Landfills. *Proceedings of Technology Transfer Conference No. 6, Ontario Ministry of the Environments.*

Lee, G.W., Jr., C.P.G.S., N.E.Gensky, and J.E. Gagnon. July 1984. Hazardous Waste Site Investigation, Development of a Remedial Investigation Plan, Monsanto Company. *Presented at National Water Well Association Technical Division Regional Conference,* Newton, Massachusetts.

Gregory R. Albright, P.G.

Senior Geologist/Manager

Experience

Mr. Albright has more than 15 years of experience as a project manager and geologist. He has been responsible for directing subsurface geological, hydrogeological, geochemical, and contaminant investigations; feasibility studies (FSs); remedial design; and evaluating remediation system performance.

Oversight Management Program

Responsible for technical and financial oversight of remediation contractors working at 40 former retail gasoline outlets in New England, New York, and New Jersey. Responsible for developing tactical and strategic budgets, and environmental goals and objectives; preparing bid packages; and evaluating and selecting environmental contractors. Responsible for site compliance with state and federal regulations. Represented client at regulatory and third-party meetings. Became familiar with client standards and financial system, and developed working relationships with several client company staff members. Maintained client company project files. Project manager for Northeast program.

Forensic Consulting

Provided technical evaluation of client data, data for other RP group members, and joint defendants to support client arguments regarding allocation of responsibility for lead- and solvent-contaminated soil and a chlorinated solvent plume at a Superfund site for a New Jersey law firm.

Provided technical evaluation of RI data and an RP expert allocation report for a state Superfund site in New York. Developed a technical counter position to support client arguments regarding allocation of responsibility and costs for commingled coal tar-, solvent-, and fuel-contaminated soil and groundwater at an industrial site. The site included a former bulk fuel storage site that had several owner/operators, an adjacent former coal and water gas plant, and an asphalt emulsion manufacturing facility.

Provided technical evaluation of soil, groundwater, and geochemical data in support of litigation at various hydrocarbon-contaminated sites in the Northeast for New Jersey and Connecticut law firms.

Remedial Investigations/Feasibility Studies

Implemented a groundwater and surface-water monitoring program approved by the State of New Jersey as part of the ISRA cleanup plan. Data evaluated (by comparison to modeled criteria that predicted the future effects of the discharge of the groundwater plume to surface water) indicated that surface-water VOC concentrations were linked to seasonal fluctuations in groundwater elevations, and that the VOC plume was restricted to the shallow aquifer, with minimal impacts to the underlying glacial and bedrock aquifers. Determined that the ratio of breakdown products to the VOC parent compounds indicated that the dissolved-phase VOC plume was a composite of several different

release periods and the composition had evolved during at least a 20-year period. A baseline groundwater and surface-water monitoring and sampling event was developed to establish a snapshot of present plume conditions. Data from this sampling event clearly showed that there were four distinct VOC plumes in groundwater at the site, each with a unique chemical signature. The data also indicated that one of the VOC plumes had a probable origin outside the previously known source areas. Designed and supervised the removal of soils in a courtyard where a former waste oil/waste solvent UST was located. The excavation work was scheduled to coincide with low groundwater so that the maximum amount of affected soils could be removed. The excavation area was constrained by adjacent building foundations and shoring was necessary. Work conducted for an aerospace firm in West Paterson, New Jersey.

Prepared Site Investigation Report and Remedial Investigation Report in compliance with New Jersey's ISRA requirements for two parcels that are part of a large petroleum refinery in Perth Amboy. In addition, prepared groundwater investigation section of RFI work plan for the remainder of the facility.

Hydrogeology task manager for a hydraulic containment corrective measures implementation (CMI) at a former electronics manufacturing site. Supervised the groundwater monitoring and sampling program, prepared quarterly progress reports and annual report, evaluated the efficiency and effectiveness of the groundwater extraction system. Honeywell site located in Fort Washington, Pennsylvania.

Hydrogeology task manager for Phase 2 and Phase 3 remedial investigations at a research laboratory site. Evaluated existing data and designed continuing investigation work to delineate potential source areas and the limit of a chlorinated hydrocarbon plume in bedrock. Supervised groundwater monitoring and sampling program, prepared geology/ hydrogeology, fate and transport, and interpretive sections of RI reports. Developed conceptual model for site that helped secure a NJDEP approval of a monitored natural attenuation remedial action. The Princeton Plasma Physics Laboratory Site is located in Plainsboro, New Jersey.

Managed the implementation of a biopile treatability study for chlorobenzene-contaminated soil at a manufacturing facility in Delaware. Affected area included groundwater, surface water, and adjacent wetlands at this federal Superfund site.

Prepared the RI/FS work plan, reviewed previous site reports and files on potential off-site sources, prepared a drum removal plan, and assisted in preparing the public participation plan for a state Superfund site in Santa Fe Springs, California.

Responsible for conception and implementation of the site characterization portion of a RCRA closure plan for a solvent recycling facility in Commerce, California. Developed a remedial plan for closure, along with a cost estimate as part of the financial assurance section of the plan. The plan was submitted to the California Department of Toxic Substances Control (DTSC). Developed a work plan and implemented a subsurface investigation for an operating 50-tank UST area.

Prepared Interim Removal Action (IRA) work plan, groundwater remedial investigation work plan, and final RI report for a former manufacturing site contaminated with DNAPL within fractured bedrock in Mohnton, Pennsylvania. Implemented a groundwater

investigation that includes shallow and deep multiple-cased wells, fracture analysis, rock coring, aquifer testing, and IRA consisting of surface-water aeration.

FS and remedial design at a former electrical equipment manufacturing site contaminated with solvents within fractured bedrock in Nutley, New Jersey. Work included soil venting pilot tests, aquifer pump tests, and groundwater modeling.

Responsible for soil and groundwater delineation, designing a groundwater monitoring system, and developing a site conceptual model at an operating bulk fuel distribution terminal in Carson, California.

Assisted in developing a remedial investigation strategy in a complex hydrogeologic system, and reviewed and evaluated proposals, work plans, and reports. Site is a large bulk fuel storage and distribution terminal in Stockton, California.

Environmental Site Investigations/Remediation

Prepared a revised Landfarm Closure Plan for a landfarm unit at a New Jersey refinery. The landfarm unit had received and treated hazardous and nonhazardous waste from past refinery operations. The work included developing a waste characterization sampling plan for the landfarm and assisting the client in obtaining regulatory approval for both the sampling plan and the revised closure plan.

Responsible for the installation, operation, and evaluation of a groundwater extraction and jet fuel recovery and treatment system at a fuel terminal in Long Beach, California. Responsible for permit compliance and regulatory reporting.

Responsible for site inspections and for preparing preliminary assessment reports for clients to comply with New Jersey's Industrial Site Recovery Act (ISRA).

Supervised the characterization and excavation of a 180,000-gallon crude oil spill from a pipeline rupture into a riparian habitat in Beaumont, California. Provided consultation during cleanup negotiations with the Riverside County Health Department, RWQCB, California Department of Fish and Game, and the U.S. Wildlife Service.

Supervised the characterization of a 2,000-gallon crude oil spill in an endangered species area (desert tortoise) in Essex, California. Provided consultation during cleanup negotiations with the San Bernardino County Health Department, RWQCB, California Department of Fish and Game, U.S. Wildlife Service, and the U.S. Bureau of Land Management.

Underground Storage Tank (UST) Management

Directed the subsurface investigation at a former UST site in Huntington Beach, California. Provided pump test design and analysis, remedial design, and field supervision of a 6,500-cubic-yard excavation and aboveground bioremediation project. Negotiated cleanup levels with local regulatory agency. Site closure granted.

Evaluated subsurface conditions at a former UST site in Los Angeles, California. Supervised FS, groundwater modeling, RAP preparation, and design of a vapor and

groundwater well contaminant extraction system (12 wells) using a regenerative oxidizer, oil/water separator and bioreactor. Managed installation of the system.

Evaluated previous characterization data and remediation system performance at a former UST site in Paramount, California. Supervised groundwater modeling, FS, RAP preparation, and design of a vapor and groundwater well contaminant extraction system (45 wells) using a regenerative oxidizer, dual air diffusers, and dual groundwater/product pumps. Supervised construction bid package preparation.

Responsible for the operation and maintenance of a vapor extraction system at a former UST site in Corona Del Mar, California. The system consisted of four wells and 12 piezometers that removed 2,200 gallons of gasoline equivalent in 6,500 hours of operation. Supervised system performance and prepared the evaluation site closure report. Report was accepted by the Orange County Health Department.

Education

- M.S./Geology, 1992, California State University
- B.S./Geology, 1984, Stockton State College
- B.A./History, 1978, Gettysburg College

Registrations

- Registered Geologist, California, 1991
- Certified UST Closure, New Jersey, 1993
- Professional Geologist, Pennsylvania, 1995
- Certified Hydrogeologist, California, 1997

Professional Affiliations

- Geological Society of America
- Society of Economic Paleontologists and Mineralogists
- American Association of Petroleum Geologists, Division of Environmental Geosciences

Training

- 40-Hour OSHA Training
- Beyond the Basics of the Technical Requirements for Site Remediation, Cook College, Rutgers University, 2000
- UST Regulatory Training for New Jersey, 2000
- Risk-Based Corrective Action, New Jersey Petroleum Council, 1996
- Diagnosis and Remediation of DNAPL Sites, University of Waterloo, 1994
- Remediation of NAPL-Contaminated Sites, USEPA Northeast Hazardous Substance Research Center Symposium, 1994
- Data Sufficiency and Decision Making for Site Remediation, University of Wisconsin Extension, 1991
- Soil and Groundwater Contamination Litigation, University of Wisconsin Extension, 1991

- Cost Control of Environmental Remediation Projects, Executive Enterprises, Inc., 1990
- Site Characterization for High-Level Nuclear Waste Disposal, Geological Society of America short course, 1987

Publications

Albright, G.R., M.A. Lowe, E.R. Mancini, and D.W. Chamberlain. 1993. Spill response, environmental and contaminated soil considerations in a high desert, crude-oil pipeline spill. *International Oil Spill Conference,* March 1993 Conference Proceedings.

Albright, G.R. 1992. *Paleogeography of the late Devonian and early Mississippian Carbonate Platform, Death Valley Region, California.* M.S. Thesis, California State University, Long Beach.

Albright, G.R. 1991. Late Devonian and early Mississippian Paleogeography of the Death Valley Region, California. In *Paleozoic Paleogeography of the Western United States - II: Pacific Section,* Society of Economic Paleontologists and Mineralogists, Volume 67.

Albright, G.R. 1989. *Stratigraphy and sedimentology of the Quartz Spring Sandstone and Tin Mountain Limestone, Funeral Mountains, California*, Society of Economic Paleontologists and Mineralogists, Volume and Guidebook for Field Trip No. 3.

Laurie A. Indick

Senior Scientist I/Manager, Quality Assurance

Special Expertise

Ms. Indick has more than 16 years of experience in operating, managing, and performing quality assurance/quality control (QA/QC) of environmental analytical laboratories and related services. Ms. Indick is responsible for managing, performing quality assurance, and validating analytical data being collected at BBL client hazardous waste sites, and has served as on-site field processing laboratory manager. She is also responsible for managing the firm's subcontracts with analytical laboratories.

Quality assurance officer (QAO) for investigations of multiple hazardous waste sites. Sites include impacted aquatic systems, industrial facilities, landfills, and wastewater effluent discharges. As QAO, Ms. Indick serves as the primary communication link between analytical subcontractors and BBL, and is responsible for managing site sample analyses and coordinating field managers and analytical subcontractors. She also has acted as field oversight manager for on-site field processing laboratories.

Current responsibilities include developing quality assurance project plans (QAPPs) that are consistent with project data quality objectives (DQOs), and federal and state guidelines. On a project-specific basis, also involved in selecting sampling and analytical approaches to solve specific project requirements and regulatory needs; developing and reviewing contracts and bid documents for analytical services; and evaluating and auditing laboratory performance.

Field Services

Responsible for the set-up and oversight of on-site processing laboratories for biota collection activities associated with natural resources damages assessment. Specific responsibilities included: laboratory layout and design, developing and implementing field processing system, and procuring materials and supplies. Also supervised processing staff, tracked multiple field crews, and coordinated with regulatory agencies. Established sample and document control through the use of custom designed processing and tracking logs.

Data Quality Services

Responsible for developing and reviewing project quality assurance documentation including project-specific data quality objectives (DQOs), quality assurance project plans (QAPPs), field sampling plans (FSPs), comprehensive sampling and analysis plans (CSAPs), and field operation plans (FOPs).

Oversee the validation of mixed media (soil, sediment, water, biota, wipes, building material, and air) data from investigations of multiple hazardous waste sites, including data validation pursuant to USEPA Functional Guidelines, and provide guidance on data usability. Manage and perform data validation efforts pursuant to USEPA regional and individual state guidelines. Proficient in USEPA-CLP, USEPA-Regional, USEPA SW-846, 40 CFR Part 136, NJDEP, and NYSDEC ASP procedures.

Representative data quality projects throughout the United States include the following:

- Using the Six-Sigma process for optimizing the quality of subcontracted analytical services for a major industrial client.

- Critical review of analytical methods for determining PCB levels in industrial waste streams for the pulp and paper industry.

- Data validation in support of the RI at Monsanto Chemical Company's Indian Orchard Plant in Springfield, Massachusetts, pursuant to USEPA Region 1 guidelines.

- Data quality services as part of ECRA compliance activities for GEI International Corporation in Lansing, New Jersey, pursuant to NJDEP guidelines.

- Data validation in support of the RI/FS at the Rosen Brothers Scrapyard Superfund Site for a PRP Group in Cortland, New York, pursuant to USEPA Region 2 guidelines.

- Data validation in support of the RI/FS at the Kalamazoo River Superfund Site for a Paper Manufacturing PRP Group in Kalamazoo and Allegan Counties, Michigan, pursuant to USEPA Region 5 guidelines.

- Data quality services as part of remedial oversight for Chemical Control Corporation in Fairfield, New Jersey, pursuant to USEPA Region 2 guidelines.

- Data validation in support of the sediment sampling and engineering evaluation at Manistique River and Harbor Superfund Site for Manistique Harbor PRP Group, in Upper Peninsula, Michigan, pursuant to USEPA Region 5 guidelines.

- For American Cyanamid's Bound Brook, New Jersey Facility, responsible for data validation pursuant to NJDEP guidance. Data validation efforts supported the implementation of a RCRA Corrective Action Program being implemented by BBL at the site.

- For Cytec Industries Inc.'s Warners Plant, responsible for data validation pursuant to NJDEP guidance.

Laboratory Audits

Laboratory audits have been performed in support of:

- Remedial design/remedial action at a Superfund site in Massena, New York;
- River and sediment investigation at the Grasse River in Massena, New York;
- RI/FS for the Kalamazoo River Superfund Site in Kalamazoo, Michigan;
- Site investigation at an industrial facility in Michigan;
- Discharge permit negotiations for an industrial facility in Bay City, Michigan;
- Corrective measures in-situ stabilization program for an industrial facility in New York;
- River and sediment investigation in Russellville, Kentucky; and
- BBL corporate analytical contract program.

Other Related Experience

Instrumental in developing the framework for the BBL corporate analytical contract program, and in reviewing and selecting potential subcontractors.

Prior to joining BBL, held the positions of GC/MS department manager and analytical quality assurance/quality control coordinator at laboratories in the Northeast. Prior responsibilities included client contact for industrial and consulting firms regarding analytical services for a major CLP laboratory. Was responsible for the daily operation of the GC/MS department for an analytical laboratory. Participated in developing software to manage, track, and report analytical data.

Education

- B.A./Environmental Science, 1984, State University of New York at Plattsburgh
- Graduate Studies/Environmental Science, 1984, University of Massachusetts at Boston

Registrations

- Inorganic Data Validation, State University of New York, Westchester Community College, March 1994
- Organic Data Validation, State University of New York, Westchester Community College, October 1994

Professional Affiliations

Training

- 40-Hour OSHA Training
- 8-Hour OSHA Supervisory Training
- American Red Cross CPR Training
- American Red Cross First Aid Training
- Leadership
- Negotiation Skills

Publications

Attachment A-2

Sampling Chart

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Attachment A-2

West 19th Street Development Site
Environmental and Quality Control Sample Check List

Matrix	Parameter	Sample Numbers				
		Analytical Method[1]	Sample Frequency	Field QA/QC	Lab QA/QC	Total
Soil						
	TCL VOCs	8260	53	3	6	62
	TCL SVOCs	8270	53	3	6	62
	TAL Metals	(2)	12	1	2	15
	TCL Pesticides/ PCBs	8081/8082	12	1	2	15
Groundwater						
	TCL VOCs	8260	4	2	2	8
	TCL SVOCs	8270	4	1	2	7

Notes:

1. Analtyical methods referenced in USEPA SW-846 Test Methods for Evaluating Solid Wastes, Physical, and Chemical Methods, Third Edition, Revision 2, 1994 and NYSDEC ASP, 10/95 Edition.
2. Select TAL metals and cyanide using 6000/7000/9000 series methods.

Attachment A-3

Initial Site Investigation Data

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Table 1

West 19th Street Development Site
New York, New York

Soil Analytical Results - Volatile Organic Compounds

Sample I.D.	TAGM Guidance Values[1]	B1	B2	B3	B4	B5	B6	B7	B8
Sample Interval (ft.)		7-8	7-8	7-8	7-8	7-8	7-8	7-8	7-8
Date Collected		10/16/2002	10/16/2002	10/16/2002	10/17/2002	10/17/2002	10/17/2002	10/17/2002	10/17/2002
Benzene	0.06	**0.237**		**2.45**	**0.9**			**0.429**	
Ethylbenzene	5.5	3.58		**24.0**	1.89		0.0219		
Toluene	1.5	0.597		**3.9**	1.45				
Xylenes (Total)	1.2	**26.6**	0.0077	**28.3**	**3.04**				
Styrene	NA								
Chloromethane	NA								
Vinyl Chloride	0.2								
Chloroethane	1.9								
Methylene Chloride	0.1					0.0089			
Acetone	0.2		0.0838			0.114	**0.239**		
2-Butanone (MEK)	0.3					0.0145			
Carbon Disulfide	2.7					0.0033	0.0336		
Trichlorofluoromethane	NA								
1,1-Dichloroethene	0.4								
1,1-Dichloroethane	0.2								
trans-1,2-Dichloroethene	0.3								
cis-1,2-Dichloroethene	0.3								
Chloroform	0.3								
1,2-Dichloroethane	0.1								
1,1,1-Trichloroethane	0.8								
CarbonTetrachloride	0.6								
Trichloroethene	0.7								
1,1,2-Trichloroethane	NA								
Tetrachloroethene	1.4								
1,1,2,2-Tetrachloroethane	0.6								
Chlorobenzene	1.7								

NOTES:
All concentrations are presented in milligrams per kilogram (mg/kg)**bold** indicating exceedance of TAGM guidance value.
1. NYSDEC TAGM #4046: Determination of Soil Cleanup Objectives and Cleanup Levels. Appendix A, Table 1 Recommended Soil Cleanup Objectives, Volatile Organic Contaminants.
2. NA = Not Available

Table 2

West 19th Street Development Site
New York, New York

Soil Analytical Results - Semivolatile Organic Compounds

Sample I.D. Sample Interval (ft.) Date Collected	TAGM Guidance Value[1]	B1 10/16/2002	B2 10/16/2002	B3 10/16/2002	B4 10/17/2002	B5 10/17/2002	B6 10/17/2002	B7 10/17/2002	B8 10/17/2002
Phenol	0.03								
2-Methylphenol	0.03		**0.206**						
3,4-Methylphenol	0.03		**0.449**						
2,4-Dimethylphenol	0.03		**0.303**						
Pentachlorophenol	1								
1,3-Dichlorobenzene	1.6								
1,4-Dichlorobenzene	8.5								
1,2-Dichlorobenzene	7.9								
Isophorone	4.4								
1,2,4-Trichlorobenzene	3.4								
Naphthalene	13	**91.6**	8.46	**47.8**	0.936		0.295		1.45
2-Methylnaphthalene	36.4	**37.2**	49.6	14.9	0.349		0.250		0.481
Acenaphthylene	41	18.5	1.83	12.8	0.188				0.0663
Acenaphthene	50	4.59	15	5.55	3.06				0.612
Diethylphthalate	7.1								
Fluorene	50	25	17.8	20	2.22				0.792
Hexachlorobenzene	0.41								
Phenanthrene	50	**66.4**	**111**	**59.5**	23.5		0.122		1.41
Anthracene	50	27.5	37	20.3	7.88		0.0431		0.67
Di-n-butylphthalate	8.1								
Fluoranthene	50	33.8	**105**	37.1	31.4		0.269	0.0506	4.67
Pyrene	50	35.5	**84.5**	31.6	24.1		0.261	0.0519	4.76
Benzo(a)anthracene	0.224	**17.1**	**62.9**	**22.4**	**24.7**		0.319		**4.35**
Chrysene	0.4	**14.9**	**53.8**	**19.3**	**20.9**		0.297		**4.11**
Carbazole		14.5	12.8	7.79	4.31				0.264
bis(2-Ethylhexyl)phthalate	50								
Benzo(b)fluoranthene	1.1	**10.2**	**72.1**	**17.8**	**43.2**		0.579	0.0432	**9.27**
Benzo(k)fluoranthene	1.1	**4.39**	**34.4**	**11.9**	**17.1**		0.333		**4.2**
Benzo(a)pyrene	0.061	**11.1**	**72.9**	**18.9**	**43.3**		0.615	0.0503	**9.21**
Indeno(1,2,3-cd)pyrene	3.2	2.09	**19.8**	**3.69**	**18.6**		0.316		2.23
Dibenzofuran		15.6	11.3	14.1	1.5				0.469
Dibenzo(a,h)anthracene	0.014	**0.743**	**7.8**	**2.04**	**6.26**		0.0912		**0.652**
Benzo(g,h,i)perylene	50	2.31	17.6	3.87	15.8		0.294		2.32
Total PAHs		402.92	726.85	349.45	283.49	ND	4.08	0.196	51.25
Total CPAHs		60.52	323.7	96.03	174.06	ND	2.55	0.094	0.685

NOTES:
All concentrations are presented in milligrams per kilograms (mg/kg), **bold** indicating exceedance of TAGM guidance value.
1. NYSDEC TAGM #4046: Determination of Soil Cleanup Objectives and Cleanup Levels. Appendix A, Table 2, Recommended Soil Cleanup Objectives, Semi-Volatile Organic Contaminants.
2. NA = Not Available
3. CPAHs = Carcinogenic PAHs: benzo(a)anthracene, chrysene, benzo (b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno (1,2,3-cd)pyrene, and dibenzo(a,h)anthracene.

Table 3

West 19th Street Development Site
New York, New York

Groundwater Analytical Results - Volatile Organic Compounds

Sample I.D.	TOGS	B1	B3	B4	B6		
Date Collected	Criteria	10/16/2002	10/16/2002	10/17/2002	10/17/2002		
Benzene	0.7	**3,750**	**446**	**24.5**	**1.8**		
Ethylbenzene	5	**646**	**256**	**303**	**56.2**		
Toluene	5	**4,320**	**343**	13.8	1.3		
Xylenes (Total)	5	**3,190**	**413**	**60.4**	2.4		
Styrene	5		**48.2**				
Vinyl Chloride	2						
Chloroethane	50						
Methylene Chloride	5						
Acetone	50				8.5		
Trichlorofluoromethane	5						
1,1-Dichloroethene	5						
1,1-Dichloroethane	5						
trans-1,2-Dichloroethene	5						
cis-1,2-Dichloroethene	5						
Chloroform	7						
1,2-Dichloroethane	5						
1,1,1-Trichloroethane	5						
CarbonTetrachloride	5						
Trichloroethene	5						
1,1,2-Trichloroethane	5						
Tetrachloroethene	5						
1,1,2,2-Tetrachloroethane	5						
Chlorobenzene	5						

NOTES:
All concentrations are presented in micrograms per liter (ug/L),**bold** indicating exceedance of TOGS Criteria.
TOGS Criteria = Division of Water Technical and Operational Guidance Series (1.1.1). Ambient Water Quality Standards and Guidance Values.

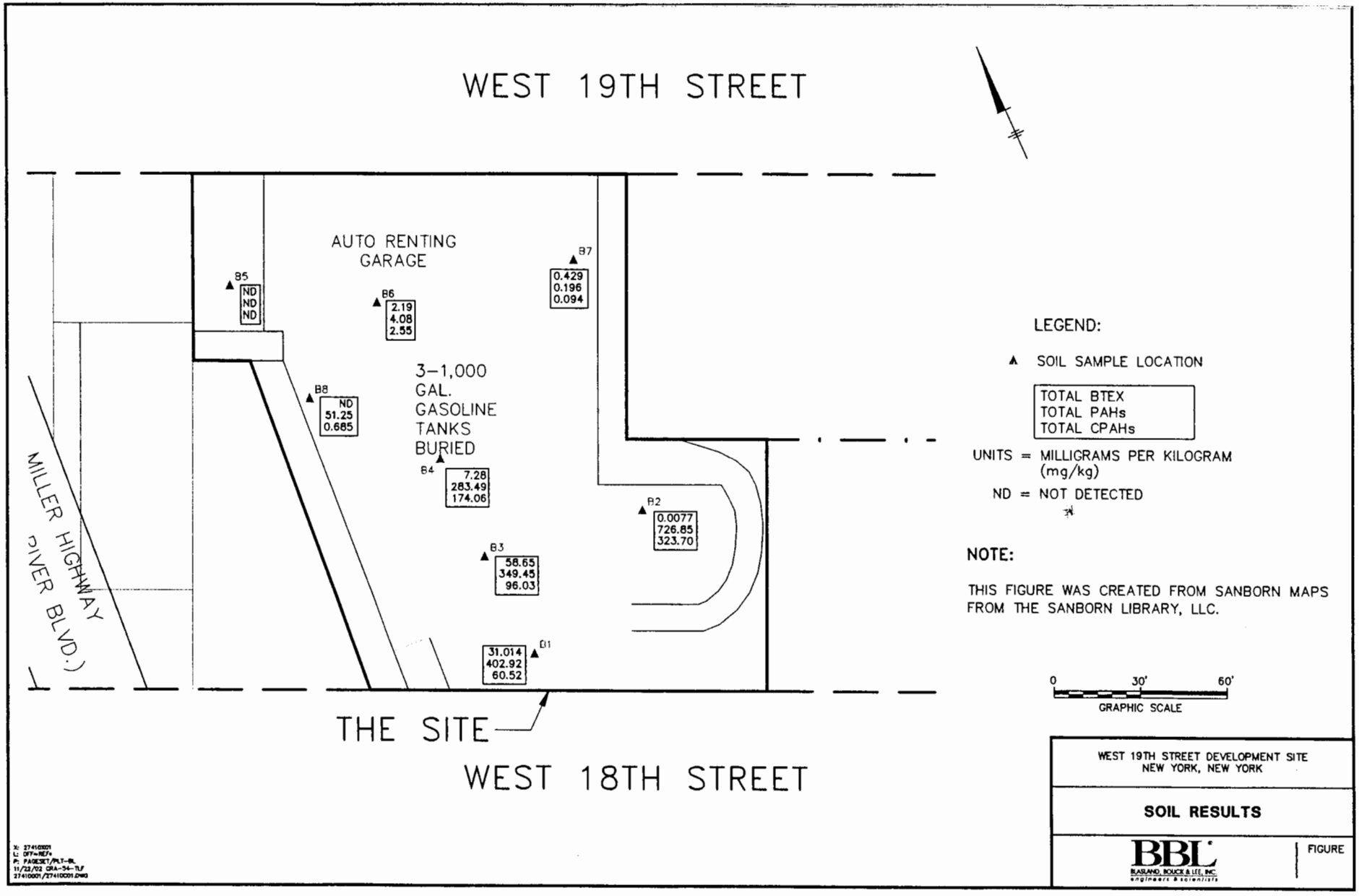
Table 4

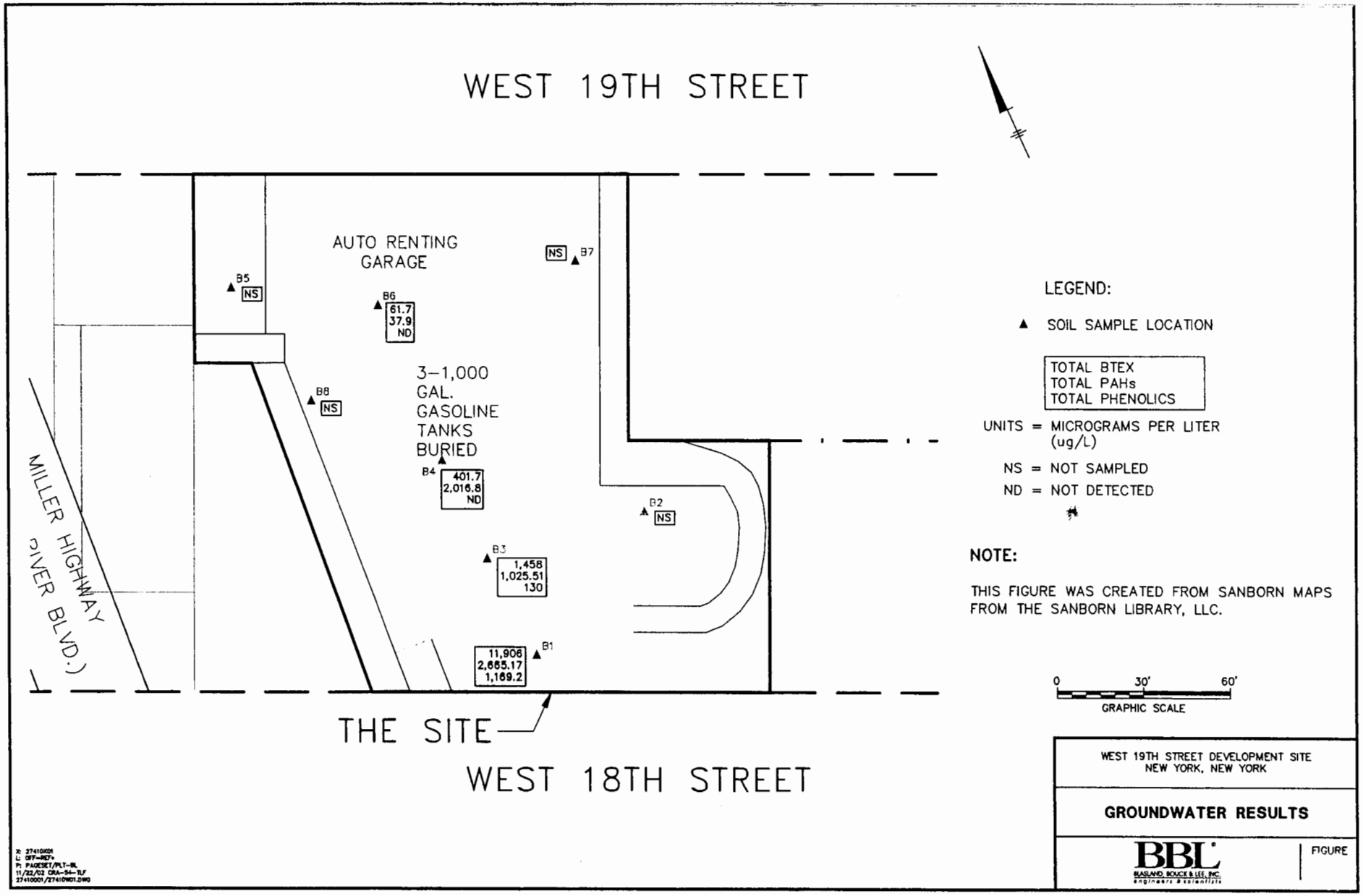
West 19th Street Development Site
New York, New York

Groundwater Analytical Results - Semivolatile Organic Compounds

Sample I.D.	TOGS	B1	B3	B4	B6	
Date Collected	Criteria	10/16/2002	10/16/2002	10/17/2002	10/17/2002	
Phenol	1	**22.8**				
2-Methylphenol	5	**97.4**	**8.1**			
3,4-Methylphenol	50	**137**	**12.9**			
2,4-Dimethylphenol	5	**912**	**109**			
Pentachlorophenol	1					
1,3-Dichlorobenzene	3					
1,4-Dichlorobenzene	3					
1,2-Dichlorobenzene	3					
Isophorone	50					
1,2,4-Trichlorobenzene	5					
Naphthalene	10	**1,650**	**634**	**278**	**16.7**	
2-Methylnaphthalene	50	**219**	**88.4**	**121**	10.6	
Acenaphthylene	20	**76.2**	**48.4**	16.9		
Acenaphthene	20	17.8	**32.8**	**145**	0.54	
Diethylphthalate	50		1.6			
Fluorene	50	49.4	48.7	**169**		
Hexachlorobenzene	0.35					
Phenanthrene	50	**85.1**	**70.8**	**387**	0.82	
Anthracene	50	30.4	16.8	**113**		
Di-n-butylphthalate	50					
Fluoranthene	50	20.3	25.4	**232**	1.4	
Pyrene	50	19.6	21.5	**204**	1.4	
Benzo(a)anthracene	0.002	**8.6**	**10**	**90.7**	**1.1**	
Chrysene	0.002	**7.1**	**7.9**	**67.3**	**0.94**	
Carbazole	50	**232**	46.1	4.7		
bis(2-Ethylhexyl)phthalate	50					
Benzo(b)fluoranthene	0.002	**4.1**	**5.3**	**70.1**	**1.5**	
Benzo(k)fluoranthene	0.002	**6.2**	**5.4**	**37.7**	**0.87**	
Benzo(a)pyrene	0.002	**6.4**	**6.9**	**63.8**	**1.3**	
Indeno(1,2,3-cd)pyrene	0.002			**9.6**	**0.82**	
Dibenzofuran	5	**30.5**	**40.3**	**88.3**		
Dibenzo(a,h)anthracene	50		0.91	4		
Benzo(g,h,i)perylene	5	0.97	2.3	**7.7**		
Total PAHs		2,665.17	1,025.51	2,016.80	37.9	
Total CPAHs		32.4	36.41	343.2	6.53	

NOTES:
All concentrations are presented in micrograms per liter (ug/L), **bold** indicating exceedance of TOGS Criteria.
TOGS Criteria = Division of Water Technical and Operational Guidance Series (1.1.1). Ambient Water Quality Standards and Guidance Values.
NA = Not Available
(*) = Dilution Factor
CPAHs = Carcinogenic PAHs: benzo(a)anthracene, chrysene, benzo (b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno (1,2,3-cd)pyrene, and dibenzo(a,h)anthracene.


WEST 19TH STREET
AUTO RENTING GARAGE
B5
ND
ND
ND
B6
2.19
4.08
2.55
B7
0.429
0.196
0.094
B8
ND
51.25
0.685
3–1,000 GAL. GASOLINE TANKS BURIED
B4
7.28
283.49
174.06
B2
0.0077
726.85
323.70
B3
58.65
349.45
96.03
B1
31.014
402.92
60.52
MILLER HIGHWAY (RIVER BLVD.)
THE SITE
WEST 18TH STREET
LEGEND:
SOIL SAMPLE LOCATION
TOTAL BTEX
TOTAL PAHs
TOTAL CPAHs
UNITS = MILLIGRAMS PER KILOGRAM (mg/kg)
ND = NOT DETECTED
NOTE:
THIS FIGURE WAS CREATED FROM SANBORN MAPS FROM THE SANBORN LIBRARY, LLC.
0
30'
60'
GRAPHIC SCALE
WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK
SOIL RESULTS
BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists
FIGURE



WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK

GROUNDWATER RESULTS

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE

X: 27410X01
L: OFF-REF=
P: PAGESET/PLT-BL
11/22/02 CRA-54-TLF
27410001/27410W01.DWG

Attachment A-4

Standard Operating Procedures

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Drilling Procedures for Collecting and Screening of Soil Samples

I. Introduction

Soil borings performed may be completed using the direct-push method or the hollow-stem auger drilling method to a depth specified by the Field Supervisor.

Prior to commencing drilling activities, the locations will be cleared for underground utilities by contacting the appropriate utility clearing organization to mark the location of underground lines. Private utilities may be delineated by field personnel using appropriate devices and/or by a private utility locating contractor (if necessary). This contractor will survey the site to determine the presence of known, as well as unknown, utilities/underground piping at the site, especially in those areas where drilling is proposed.

II. Soil Sampling

Samples of the encountered subsurface material will be collected continuously using a 1.5-inch x 4-foot lined direct-push or soil sampler using standard 2-inch x 2-foot split spoons driven by a 140-lb. hammer, or standard Shelby tubes, unless otherwise specified. Where appropriate, the sampling method employed will be ASTM D-1586/Split-Barrel Sampling (Standard Method for Penetration Test and Split-Barrel Sampling of Soils, ASTM D 1586-84) or ASTM D-1587-83/Thin Walled Tube Sampling, both published in Annual Book of ASTM Standards, Volume 04.08. Upon retrieval of the sampler, all samples will be screened for organic vapors with a photoionization detector (PID) or flame ionization detector (FID), using the procedures described in Section III below. In addition, the Field Supervisor will be on site during the drilling operations to describe each soil sample including:

- Color
- Principal components
- Minor components
- Structure and bedding
- Field moisture condition
- Fill or geologic origin, if known
- Unified Soil Classification System group symbol
- Particle sizes
- Density/consistency
- Moisture content
- Organic content
- Hardness of coarse particles (Mohs hardness scale)
- Plasticity of fines
- Cohesiveness
- Odors/discoloration
- Mottling/staining
- Weathering
- Local name, if known
- Items that may indicate age of deposit; archeological artifacts, newspapers, etc.
- Fill component description

- Particle angularity/shape
- Contacts when observed
- Pliability
- (cinder, metal, tires, etc.)
- Percent recovery

The descriptions will be according to the Unified Soil Classification System (USCS) and will be recorded in a field notebook. The Field Supervisor will be responsible for documenting drilling events in the field notebook.

The Drilling Contractor will be responsible for obtaining accurate and representative samples, informing the Field Supervisor of changes in drilling pressure and loss of circulation, and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil sampling drive weight [140 pounds] required to drive the split-barrel sampler in 6-inch increments), if applicable.

The Field Supervisor will be responsible for documenting drilling events in the field log book. A documentation of drilling events will include:

1) Start and finish dates of drilling;
2) Name and location of project;
3) Project number, client, and project location;
4) Sample number and depth;
5) Type and size of samples;
6) Depth to water;
7) Type of drilling equipment;
8) Size of casing;
9) Names of contractor's drillers, inspectors, or people at the site; and
10) Weather conditions.

Soil borings will be advanced through a sheet of plywood to help manage soil cuttings (if appropriate). Soils generated during drilling will be staged on plastic for subsequent disposal (if visually clean soils are observed). Soils will be segregated based on visual staining, olfactory observations, and PID screening. Only soil not exhibiting such indications will be used in the grout mixture to close the borehole. If a clay layer/confining unit is breached during advancement of the borehole, the borehole and/or the breached confining unit will be grouted with a cement/bentonite grout. If impacted soil is present o r suspected to be present above a confining unit, a temporary casing may be installed into the confining unit prior to deeper drilling that may extend deeper than

the confining unit. Soils will be subsequently stored in drums or other appropriate containers in a designated area.

III. Field Screening Procedures

All soil samples will be field screened upon collection with the PID or FID for a relative measure of the total volatile concentration. PID lamp size will be determined based on constituents present or expected to be present at the site. Screening will occur after the sampler is opened, by placing the probe close (but not touching) the freshly exposed sample and the range of PID readings will be recorded for the sampler interval.

The PID or FID meter will be calibrated according to manufacturer's instructions or more frequently if field conditions warrant.

IV. Sampling for Laboratory Analysis Procedures

Samples designated for laboratory analysis will be placed in the appropriate containers. Sample containers for volatile organic analysis will be filled first. Next, a sufficient amount of the remaining soil will be homogenized by mixing in a stainless steel bowl with a clean stainless steel trowel, and distributed to the appropriate sample containers.

In certain instances, representative soil samples from several depth increments may be composited into a single sample for subsequent analyses. In such instances, the following protocols will be used to support the performance of composite sample collection and analysis:

- As soil samples from individual sample depth increments (e.g., 2-foot depth increments) are collected, a representative sample will be placed into a clean, stainless steel bowl for subsequent composting with other samples from the specified composite depth interval.

Field duplicates will be prepared by composting soil collected at the same time and depth and then filling two sets of sample jars. For VOCs, the samples will not be composited prior to placement in the sample jars. The duplicate sample will be labeled in such a way that the sample designations will not indicate the duplicate nature of the samples.

V. Survey

A field survey control program will be conducted using standard instrument survey techniques to document soil boring locations.

VI. Equipment Cleaning

Equipment cleaning will occur prior to use on the site, between each drilling location, and upon completion of the drilling prior to leaving the site. Split spoons will be cleaned prior to each use. All drilling equipment and associated tools including augers, drill rods, direct-push samplers, core barrels, sampling equipment, wrenches, and any other equipment or tools that may have come in contact with the soil will be cleaned with high-pressure steam cleaning equipment using a tap water source or manual scrubbing. If gross contamination is present on the drilling equipment, high pressure steam cleaning may be more appropriate to use. The drilling equipment will be cleaned in an area designated by the Field Supervisor. Cleaning water and residual materials will be collected and transferred to a central location for subsequent disposal.

VII. Disposal Methods

Investigation-derived waste will be placed in appropriate containers and disposed of by client/owner.

Ground-Water Sampling Procedures

I. Introduction

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

II. Materials

The following materials, as required, shall be available during ground-water sampling:

- Sample pump;
- Sample tubing;
- Power source (i.e. generator)
- Photoionization detector (PID);
- Appropriate health and safety equipment as specified in the Health and Safety Plan;
- Plastic sheeting (for each sampling location);
- Dedicated or disposable bailers;
- New disposable polypropylene rope;
- Buckets to measure purge water;
- Water level probe;
- 6' rule with gradation in hundredths of a foot;
- Conductivity/temperature meter;
- pH meter;
- Turbidity meter;
- Oxidation-reduction potential (ORP) meter;
- Appropriate water sample containers;
- Appropriate blanks (trip blank supplied by the laboratory);
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials;
- Ground-water sampling logs;
- Chain-of-Custody forms;
- Indelible ink pens;
- Site map with well locations and ground-water contours maps;
- Peristaltic pump and dedicated tubing; and
- Keys to wells.

III. Procedures for Monitoring Wells

The procedures to sample monitoring wells will be as follows:

1. Review materials check list (Part II) to ensure the appropriate equipment has been acquired.

2. Identify site and well sampled, along with date, arrival time, and weather conditions. Identify the personnel and equipment utilized and other pertinent data requested on the logs (Attachment 1).

3. Label all sample containers using the laboratory-supplied label.

4. Don safety equipment, as required in the Health and Safety Plan.

5. Place plastic sheeting adjacent to well to use as a clean work area.

6. Establish the background reading with the PID and record the reading on the field log (Attachment 1).

7. Remove lock from well and if rusted or broken replace with a new brass keyed-alike lock.

8. Unlock and open the well cover while standing upwind of the well. Remove well cap and place on the plastic sheeting. Insert PID probe in the breathing zone above the well casing following instructions in the Health and Safety Plan.

9. Set out on plastic sheeting the dedicated or disposable sampling device and meters.

10. Prior to sampling, ground-water elevations will be measured at each monitoring well and the presence of NAPL (if any) within the well will be evaluated. Obtain a water level depth and bottom of well depth using an electric well probe and record on sampling log sheet. Clean the well probe after each use with a soapy (Alconox) water wash and a tap water rinse. [Note: water levels will be measured at all wells prior to initiating a sampling event].

11. After ground-water elevations are measured and NAPLs are determined not to be present, groundwater will be purged from the wells. Purge water will be disposed of properly.

12. Pump, safety cable, tubing, and electrical lines will be lowered slowly into the well to a depth corresponding to the center of the saturated screen section of the well, or at a location determined to either be a preferential flow path, or zone where contamination is present. The pump intake must be kept at least two feet above the bottom of the well to prevent mobilization of any sediment or NAPL present in the bottom of the well.

13. Measure the water level again with the pump in well before starting the pump. Start pumping the well at 200 to 500 milliliters per minute. Ideally, the pump rate should cause little or no water level drawdown in the well (less than 0.3 feet and the water level should stabilize). The water level should be monitored every three to five minutes (or as appropriate) during pumping. Care should be taken not to cause pump suction to be broken or entrainment of air in the sample. Record pumping rate adjustments and depths to water. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or to ensure stabilization of indicator parameters. If the recharge rate of the well is very low, purging should be interrupted so as not to cause the drawdown within the well to advance below the pump. However, a steady flow rate should be maintained to the extent practicable. Sampling should commence as soon as the volume in the well has recovered sufficiently to permit collection of samples.

14. During purging of the well, monitor the field indicator parameters (turbidity, temperature, specific conductance, ORP, pH, etc.). The well is considered stabilized and ready for sample collection once all the field indicator parameter values remain within 10% for three consecutive readings. If the parameters have stabilized, but the turbidity is not in the range of the 50 NTU goal, the pump flow rate should be decreased

to no more than 100 ml/min. If not technically feasible to use the low flow sampling method, at least three well volumes should be purged from the well (Attachment 2).

15. Prior to obtaining samples for inorganic analyses (e.g., TAL constituents), turbidity will be measured. If the ground-water turbidity exceeds 50 NTUs prior to sample collection, additional well development attempts may be warranted. If ground-water turbidity levels do not fall below 50 NTUs after additional well development attempts, ground-water samples should be collected for total and dissolved metal analyses.

16. Fill in the sample label and cover the label with clear packing tape to secure the label onto the container.

17. After the appropriate purge volume of ground water in the well has been removed obtain the ground water sample needed for analysis directly from the sampling device in the appropriate container and tightly screw on the caps. The sample collection order (as appropriate) will be as follows: VOCs, SVOC, PCBs/pesticides, metals and cyanide, and others.

18. Secure with packing material and store at 4°C on wet ice in an insulated transport container provided by the laboratory.

19. After all sampling containers have been filled, remove an additional volume of ground water. Check the calibration of the meters and then measure and record on the field log physical appearance, pH, temperature, ORP turbidity, and conductivity.

20. If using a dedicated bailer, replace dedicated bailer in the well and replace the well cap and lock well.

21. Record the time sampling procedures were completed on the field logs.

22. Place all disposable sampling materials (plastic sheeting, disposable bailers, and health and safety equipment) in an appropriately labeled containers. Go to next well and repeat Step 1 through Step 21 until all wells are sampled.

23. Complete the procedures for packaging, shipping, and handling with associated chain-of-custody.

IV. Field Quality Control

The following quality control procedures should be observed in the field:

- Samples should be collected from monitoring wells in order of increasing concentration, to the extent known;

- Equipment blanks should include the pump and tubing (if using disposable tubing) or the pump only (if using tubing dedicated to each well);

- Equipment blanks should be collected after wells with higher concentrations (if known) have been sampled; and

- All monitoring instrumentation shall be operated in accordance with manufacturer's instructions and calibration procedures. Instruments should be calibrated at the beginning of the sampling event.

V. Equipment Cleaning

All groundwater sampling equipment should be cleaned prior to use in the first well and after each subsequent well.

VI. Material Disposal

Materials generated during groundwater sampling activities, including disposable equipment will be placed in appropriate containers and disposed of by the client/owner.

Attachment 1

GROUND-WATER SAMPLING LOG

Well No. _____ Site Name _____

Key No. _____ Sampling Personnel _____

Date/Time _____ Weather _____

Sample ID _____ PID Background _____

Duplicate Sample ID _____ PID Well _____

MS/MSD ID _____

WELL INFORMATION

	TIC	TOC	BGL
Reference Point Marked on Casing			
Well Diameter			
Well Depth			
Water Table Depth			
Depth to Casing Below Grade			

Slug Test? _____ Redevelop? (Y/N) _____

WELL WATER INFORMATION

Length of Water Column	
Volume of Water in Well	
Pumping Rate of Pump	
Volume of Bailer	
Minutes of Pumping	
Number of Bails	

EVACUATION INFORMATION

Volume of Water Removed from Well _____ gallons Evacuation Method: Bailer ( ) Grundfos Pump ( ) Peristaltic Pump ( ) [Pump & dedicated tubing]

Did well go dry? Y N Pumping Rate _____ mL/min

	Time	Water Level (ft)	Temperature (celcius)	pH	SpC (ms/cm)	Turbidity (NTU)	DO (mg/L)	ORP (mV)
Initial								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
Final								

MISCELLANEOUS OBSERVATIONS/PROBLEMS _____

_____

_____

SAMPLE DESTINATION

Analysis Requested _____

Laboratory _____

Via _____

Sent By _____

_____

Field Sampling Coordinator

Notes:
TIC = Top of inner casing.
TOC = Top of outer casing.
BGL = Below ground level.
gpm = Gallons per minute.
C = Degrees Centigrade.
mS/cm = MilliSiemens per centimeter.
SU = Standard unit.
NTU = Nephelometric Turbidity Units
mg/L = Milligrams per liter.

ATTACHMENT 2

WELL VOLUME CHART

Feet of Water	Casing Diameter (inches)							
	1.50	2.00	3.00	4.00	6.00	8.00	10.00	12.00
1	0.09	0.16	0.38	0.66	1.48	2.61	4.09	5.88
2	0.19	0.33	0.75	1.32	2.96	5.21	8.18	11.751
3	0.28	0.49	1.13	1.97	4.44	7.82	12.27	17.627
4	0.38	0.66	1.50	2.63	5.92	10.43	16.36	23.50
5	0.47	0.82	1.88	3.29	7.40	13.04	20.45	29.378
6	0.56	0.99	2.26	3.95	8.88	15.64	24.54	35.253
7	0.66	1.15	2.63	4.61	10.36	18.25	28.63	41.129
8	0.75	1.32	3.01	5.26	11.84	20.86	32.72	47.00
9	0.85	1.48	3.38	5.92	13.32	23.46	36.80	52.88
10	0.94	1.65	3.76	6.58	14.80	26.07	40.89	58.755
11	1.03	1.81	4.14	7.24	16.28	28.68	44.98	64.631
12	1.13	1.97	4.51	7.90	17.76	31.28	49.07	70.506
13	1.22	2.14	4.89	8.55	19.24	33.89	53.16	76.382
14	1.32	2.30	5.26	9.21	20.72	36.50	57.25	82.258
15	1.41	2.47	5.64	9.87	22.20	39.11	61.34	88.133
16	1.50	2.63	6.02	10.53	23.68	41.71	65.43	94.009
17	1.60	2.80	6.39	11.19	25.15	44.32	69.52	99.884
18	1.69	2.96	6.77	11.85	26.63	46.93	73.61	105.76
19	1.79	3.13	7.14	12.50	28.11	49.53	77.70	111.64
20	1.88	3.29	7.52	13.16	29.59	52.14	81.79	117.51
21	1.97	3.45	7.90	13.82	31.07	54.75	85.88	123.39
22	2.07	3.62	8.27	14.48	32.55	57.36	89.97	129.26
23	2.16	3.78	8.65	15.14	34.03	59.96	94.06	135.14
24	2.26	3.95	9.02	15.79	35.51	62.57	98.15	141.01
25	2.35	4.11	9.40	16.45	36.99	65.18	102.23	146.89
26	2.44	4.28	9.78	17.11	38.47	67.78	106.32	152.76
27	2.54	4.44	10.15	17.77	39.95	70.39	110.41	158.64
28	2.63	4.61	10.53	18.43	41.43	73.00	114.50	164.52
29	2.73	4.77	10.91	19.08	42.91	75.61	118.59	170.39
30	2.82	4.94	11.28	19.74	44.39	78.21	122.68	176.27
31	2.91	5.10	11.66	20.40	45.87	80.82	126.77	182.14
32	3.01	5.26	12.03	21.06	47.35	83.43	130.86	188.02
33	3.10	5.43	12.41	21.72	48.83	86.03	134.95	193.89
34	3.20	5.59	12.79	22.37	50.31	88.64	139.04	199.77
35	3.29	5.76	13.16	23.03	51.79	91.25	143.13	205.64
36	3.38	5.92	13.54	23.69	53.27	93.85	147.22	211.52
37	3.48	6.09	13.91	24.35	54.75	96.46	151.31	217.39
38	3.57	6.25	14.29	25.01	56.23	99.07	155.40	223.27
39	3.67	6.42	14.67	25.66	57.71	101.68	159.49	229.15
40	3.76	6.58	15.04	26.32	59.19	104.28	163.58	235.02
41	3.85	6.75	15.42	26.98	60.67	106.89	167.66	240.9
42	3.95	6.91	15.79	27.64	62.15	109.50	171.75	246.77
43	4.04	7.07	16.17	28.30	63.63	112.10	175.84	252.65
44	4.14	7.24	16.55	28.95	65.11	114.71	179.93	258.52
45	4.23	7.40	16.92	29.61	66.59	117.32	184.02	264.40
46	4.32	7.57	17.30	30.27	68.07	119.93	188.11	270.27
47	4.42	7.73	17.67	30.93	69.55	122.53	192.20	276.15
48	4.51	7.90	18.05	31.59	71.03	125.14	196.29	282.03
49	4.61	8.06	18.43	32.24	72.50	127.75	200.38	287.90
50	4.70	8.23	18.80	32.90	73.98	130.35	204.47	293.78

Notes:

Well volumes are calculated using the formula: Pi x r2 x L x 7.48 gal/ft3.
Where L = feet of water and r = radius of well.

Equipment Cleaning Procedures

I. Introduction

Equipment cleaning areas will be located within or adjacent to a specific area, as designated by the Field Supervisor. The equipment cleaning procedures described herein include pre-field, in the field, and post-field cleaning of sampling equipment. The sampling equipment consists of soil materials sampling equipment, groundwater sampling devices, water testing instruments, and other activity-specific sampling equipment. The non-disposable equipment will be cleaned after completion of each sampling event.

II. Materials

The following materials, as required, shall be available during equipment cleaning:

- Personal protection equipment (as required in the Health and Safety Plan);
- Tap water source sampled and analyzed prior to field activities;
- Non-phosphate soap (Alconox® or equivalent);
- Pesticide grade methanol or hexane solvents;
- Nitric acid;
- High-pressure water/steam cleaning unit;
- Wash basins;
- Rinse collection plastic containers;
- Brushes;
- Polyethylene sheeting;
- Aluminum foil;
- Pre-cleaned plastic overpack drum or garbage can for cleaning submersible pump;
- Large heavy-duty garbage bags;
- Spray bottles cleaning reagents; and
- Disposable gloves.

III. Storage of Equipment

All cleaned sampling equipment will be stored in a clean environment and, where appropriate, the equipment will be covered with aluminum foil.

IV. Safety Procedures During Equipment Cleaning

1. Personnel will wear the following personal protection equipment when cleaning smaller sampling equipment (e.g., split-spoon sampler, trowels):

    - Safety glasses, goggles, or a splash shield; and
    - Disposable gloves.

2. Personnel will wear the following additional personal protection equipment when cleaning larger equipment (e.g., drilling rigs) with a high-pressure water/steam cleaning unit:

- Safety glasses, goggles, splash shield;
- Disposable gloves;
- Tyvek® disposable coveralls; and
- Chemically resistant overboots.

3. All solvent rinsing will be conducted in an adequately ventilated area.

4. All solvents transported into the field will be stored and packaged in appropriate containers with care taken to avoid exposure to extreme heat.

5. Handling of solvents will be consistent with the manufacturer's Material Safety Data Sheets (MSDS). The MSDS for the solvent used can be found in Attachment 1.

V. Field Cleaning Procedures

A. Cleaning Station

Selection of a field equipment cleaning station location will be important. It will be located away from the immediate work area so as not to adversely impact the cleaning procedure, but close enough to the sampling personnel to keep equipment handling to a minimum.

An equipment cleaning area will be constructed with two layers of 3-mil polyethylene sheeting supported on three sides by 2- by 8-foot planks. The equipment cleaning area will be sloped toward a collections sump to allow for pumping water from the pad to an interim storage container. The fourth side of the equipment cleaning area will not be supported by planks to allow access of the drill rig to the decontamination pad. The area will be a sufficient size to collect over spray during equipment cleaning activities.

A designated area will be established to conduct all cleaning at each work area. All equipment such as drill rigs, backhoes, and other mobile equipment will receive an initial cleaning prior to use. The frequency of subsequent cleaning while at the project area will depend on the extent to which the equipment is actually used in relation to the collection of environmental samples.

B. Cleaning of Smaller Sampling Equipment

Cleaning of smaller sampling equipment for soil sampling will include a non-phosphate soap and tap water wash to remove all visible particulate matter and residual oil and grease. This may be preceded by a steam cleaning to facilitate solids removal. Cleaning of smaller sampling equipment for water sampling will include the procedures presented below.

The water sampling equipment cleaning procedures when analyzing for organic constituents are as follows:

1. Non-phosphate soap (Alconox® or equivalent) and tap water wash;
2. Tap water rinse;
3. Pesticide grade hexane or methanol solvent spray rinse;
4. Distilled water rinse; and
5. Repeat solvent and water rinse up to two more times and allow to air dry and wrap in aluminum foil if not using equipment immediately.

The water sampling equipment cleaning procedures when analyzing for inorganic constituents are as follows:

1. Non-phosphate soap (Alconox® or equivalent) and tap water wash;
2. Nitric acid rinse;
3. Distilled water rinse; and
4. Allow to air dry and wrap in aluminum foil if not using equipment immediately.

When samples are to be analyzed for organic constituents, the soap and tap water wash will be followed by a tap water rinse to remove the detergent and a triple rinse sequence of pesticide grade methanol or hexane and tap water. When analyzing for inorganic constituents, the soap and tap water wash will be followed by a nitric acid rinse and a tap water rinse.

C. Cleaning of Submersible Pumps

Submersible pumps may be used to evacuate ground water in well. The pumps will be cleaned and flushed between uses. This cleaning process will consist of an external detergent wash and tap water rinse, or a steam cleaning of pump casing, hose, and cables followed by a flushing with tap water through the pump. This flushing will be performed with the use of a clean plastic overpack drum or plastic garbage can filled with tap water. The pump will run long enough to flush water sufficiently through the pump housing and hose. Care should be taken to avoid contact with the pump casing and water in the drum while the pump is running to avoid electric shock. The pump and hose will be placed on clean polyethylene sheeting to avoid contact with the ground surface.

D. Cleaning of Heavy Equipment

Other equipment and material associated with sampling events will be cleaned prior to use. Items such as drill rigs, well casings, and auger flights could contain potential sources of interference to environmental samples. The sampling equipment may have come in contact with the materials adjacent to the matrix being sampled or media may be attached to the actual sampling equipment. Heavy equipment may also retain constituents from other sources such as roadways or storage areas or material from previous job sites that were not adequately removed. For these reasons, it is important that these items be cleaned prior to use during the investigation.

Two methods are used for cleaning heavy equipment: steam cleaning and manual scrubbing. Steam cleaning can remove visible debris. Since steam cleaners provide a high pressure medium they are very effective for solids removal. They are also easy to handle and generate low volumes of wash solutions.

A second method involves manual scrubbing of equipment using brushes and an Alconox®/water solution. This procedure can be as effective as steam cleaning and is preferred in situations where steam cleaning fails to remove visible materials. Disadvantages to manual scrubbing are that it is labor intensive and it generates large volumes of wash and rinse solutions.

Heavy equipment will be thoroughly steam cleaned or manually scrubbed upon arrival and when moved between sampling locations. Drill rig items such as auger flights, drill rods, and drill bits will be cleaned before changing sample locations.

VI. Disposal Methods

Water generated during cleaning procedures will be collected and transferred to a central container for interim storage.

Rinsate from cleaning activities (e.g., tap water containing small amounts of cleaning reagents) will be containerized at each sampling location or group of locations. Upon completion of the field activities, the rinsate will be placed in an appropriately labeled separate container and stored at a designated area. The container contents will be characterized for disposal and disposed of properly.

Personal protective equipment, such as gloves, disposable clothing, and other disposable equipment, resulting from personnel cleaning procedures, will be placed in plastic bags. These bags will be transferred into appropriately labeled containers which will be stored at a designated area. The contents will be disposed of in accordance with applicable rules and regulations by the client/owner.

MSDSs

1. Methanol
2. Hexane
3. Nitric Acid

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Material Safety Data Sheets Collection:

Sheet No. 354
Methyl Alcohol

Issued: 11/77 Revision: D, 11/91

Section 1. Material Identification

36

Methyl alcohol (CH_3OH) **Description:** Derived from destructive distillation of wood, oxidation of hydrocarbons, or high-pressure catalytic synthesis from hydrogen and carbon dioxide or carbon monoxide. Used as a solvent in manufacturing industrial chemicals and chemical pharmaceuticals, a raw material for making formaldehyde and methyl esters, a softening agent for pyroxylin plastics, a dehydrator for natural gas, a feedstock for manufacturing synthetic proteins by continuous fermentation, an octane booster in gasoline, an extractant for animal and vegetable oils; in antifreeze for automotive radiators, air brakes, gasoline, and diesel oil; and in denaturing ethanol.
Other Designations: CAS No. 67-56-1, carbinol, Columbian spirits, methanol, methyl hydroxide, methylol, monohydroxymethane, pyroxylic spirit, wood alcohol, wood naphtha, wood spirit.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(TM) for a suppliers list.

R 1
I 2
S 1*
K 4
* Skin absorption

NFPA



HMIS
H 2
F 3
R 0
PPG†
† Sec. 8

Cautions: Methyl alcohol is moderately toxic by ingestion and mildly toxic by inhalation and skin absorption. It is flammable, volatile, and a dangerous fire hazard.

Section 2. Ingredients and Occupational Exposure Limits

Methyl alcohol, ca 100%

1990 OSHA PELs (Skin)
8-hr TWA: 200 ppm (260 mg/m³)
15-min STEL: 250 ppm (310 mg/m³)

1990 IDLH Level
25,000 ppm

1991-92 ACGIH TLVs (Skin)
TWA: 200 ppm (262 mg/m³)
STEL: 250 ppm (328 mg/m³)

1990 DFG (Germany) MAK
200 ppm (260 mg/m³)

1990 NIOSH RELs (Skin)
TWA: 200 ppm (260 mg/m³)
Ceiling: 250 ppm (325 mg/m³)

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 300 ppm caused eye (visual field change), CNS (headache), and pulmonary effects
Human, oral, LD_{Lo}: 428 mg/kg causes CNS (headache) and pulmonary (respiratory change) effects
Rat, oral, TD_{Lo}: 7500 mg/kg administered continuously to the female during the 17th to 19th day of gestation produced behavioral effects on newborns
Rat, inhalation, TC_{Lo}: 20,000 ppm/7 hr administered continuously to the female during the 1st to 22nd day of gestation produced specific developmental abnormalities

* See NIOSH, *RTECS* (PC1400000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: 148 °F (64.5 °C)
Freezing Point: -144.04 °F (-97.8 °C)
Vapor Pressure: 29 mm Hg at 68 °F (20 °C)
Vapor Density (air = 1): 1.11
Viscosity: 0.00593 P at 68 °F (20 °C)
Molecular Weight: 32.05
Density: 0.7924 at 68 °F (20 °C)
Water Solubility: Soluble
Other Solubilities: Soluble in ethanol, ether, benzene, ketones, and most organic solvents

Appearance and Odor: Clear, colorless, volatile liquid with a slight alcohol odor when pure, a disagreeably pungent odor when crude, and a low 10-ppm odor threshold.

Section 4. Fire and Explosion Data

Flash Point: 54 °F (12 °C), CC	Autoignition Temperature: 878 °F (470 °C)	LEL: 6% v/v	UEL: 36.5% v/v

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray, or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Do not scatter material with any more water than needed to extinguish fire.
Unusual Fire or Explosion Hazards: Methyl alcohol is a dangerous fire hazard when exposed to heat, flame, or oxidizers. It is explosive in its vapor form when exposed to heat or flame. Vapors may travel to an ignition source and flash back.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Structural firefighters' protective clothing is *ineffective* for fires involving methyl alcohol. If possible without risk, remove container from fire area. Apply cooling water to sides of fire-exposed container until fire is well out. Stay away from ends of tanks. Leave area immediately if you hear a rising sound from venting safety device or see any tank discoloration due to fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Methyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Methyl alcohol is incompatible with beryllium dihydride, metals (such as potassium or magnesium), oxidants (such as barium perchlorate, bromine, chlorine, hydrogen peroxide, and sodium hypochlorite), potassium tertbutoxide, carbon tetrachloride + metals; reacts explosively with chloroform + heat, and diethyl zinc; and reacts violently with alkyl aluminum salts, acetyl bromide, chloroform + sodium hydroxide, cyanuric chloride, and nitric acid.
Conditions to Avoid: Avoid vapor inhalation and contact with oxidizers and other incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of methyl alcohol can produce carbon oxides (CO and CO_2), possible formaldehyde (HCHO) and acrid smoke, and irritating fumes.

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Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list methyl alcohol as a carcinogen.
Summary of Risks: Methyl alcohol is toxic mainly to the nervous system, particularly optic nerves, where damage can progress to permanent blindness. Poisoning may also result in metabolic acidosis. Methyl alcohol oxidizes in the body to form formaldehyde and formic acid. These derivatives are believed responsible for many of methyl alcohol's poisonous and toxic effects. Since it is eliminated slowly from the body, methyl alcohol is considered a cumulative poison. The fatal ingestion dose is 100 to 250 ml, although death is reported from less than 33 ml.
Medical Conditions Aggravated by Long-Term Exposure: None reported
Target Organs: Eyes, central nervous system, skin, and digestive tract.
Primary Entry Routes: Inhalation, ingestion, skin absorption.
Acute effects: Inhalation can cause irritation of eyes and nose, headache, fatigue, nausea, visual impairment (optic nerve neuropathy or visual field changes) or complete and possibly permanent blindness, acidosis, convulsions, circulatory collapse, respiratory failure, and death. Ingestion can cause gastrointestinal (GI) irritation followed by the symptoms described for inhalation and possible kidney impairment. Skin contact results in a feeling of coldness, dryness, and cracking possibly leading to dermatitis. Methyl alcohol can absorb through skin and may cause headache, fatigue, and visual disturbances. Eye contact causes irritation and watering of eyes, inflamed lids, and painful sensitization to light.
Chronic Effects: Chronic inhalation or skin absorption may produce visual impairment or complete blindness.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do not let victim rub or keep eyes tightly shut. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Since methyl alcohol is volatile and flammable, carefully dispose of contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Consider administering 10% ethanol in D5W intravenously to maintain ethyl alcohol blood level at 100 mg/dl. Check formic acid in urine and measure blood pH and plasma bicarbonate. After ingestion, there is typically an 18- to 48-hr latency period before clinical toxicity

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources—no flares, smoking, or flames in hazard area. Cleanup personnel should wear fully encapsulating, vapor-protective clothing for spills or leaks with no fire. Water spray may reduce vapor, but not prevent ignition in closed spaces. For small spills, use nonsparking tools to take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of spill and await disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: Aquatic toxicity rating: TLm 96, over 1000 ppm.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): Hazardous Waste No. U154
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in cool, dry, well-ventilated flammables storage area, away from strong oxidizers and other incompatibles. To prevent static sparks, electrically ground all equipment used in methyl alcohol storage, manufacture, and transportation. Use nonsparking tools.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous airborne contaminants and to maintain concentrations at the lowest practical level.
Other Precautions: Consider preplacement and periodic medical examinations of exposed workers emphasizing neurological, kidney, liver, and visual function. Practice good personal hygiene and housekeeping procedures. If respirators are used, institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Methyl alcohol
DOT Hazard Class: Flammable liquid
ID No.: UN1230
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Methanol
IMO Hazard Class: 3.2
ID No.: UN1230
IMO Label: Flammable Liquid, Poison
IMDG Packaging Group: II

MSDS Collection References: 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 140, 143, 146, 148, 149, 153, 159, 163
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD, MPH; **Edited by:** JR Stuart, MS

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Material Safety Data Sheets Collection:
Sheet No. 397
n-Hexane
Issued: 10/78 Revision: D, 9/92

Section 1. Material Identification

***n*-Hexane ($CH_3(CH_2)_4CH_3$) Description:** Derived by fractional distillation from petroleum (molecular sieve process). Used as a solvent for glues, cements, adhesives, fats, and oils; a lab reagent; liquid in low temperature thermometers (instead of mercury); thinner, cleaning agent; polymerization reaction medium; an alcohol denaturant; in retreading tires for determining the refraction index of minerals.

Other Designations: CAS No. 110-54-3, dipropyl, Gettysolve-B, hexyl hydride, NCI-C60571, Skellysolve-B.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

R 1
I 3
S 2*
K 3
* Skin absorption

NFPA



HMIS
H 2†
F 3
R 0
PPE-Sec. 8
† Chronic effects

Cautions: *n*-Hexane is highly flammable. It is irritating to the eyes, skin, and mucous membranes. Vapor inhalation produces central nervous system (CNS) depression, becoming anesthetic at high concentrations. Chronic exposure may result in polyneuropathy.

Section 2. Ingredients and Occupational Exposure Limits

n-Hexane; commercial hexane is a mixture of *n*-hexane and isomers of methyl pentane and heptane. 1 to 6% benzene may also be present.

1991 OSHA PEL
8-hr TWA: 50 ppm (180 mg/m³)

1990 IDLH Level
5000 ppm

1990 NIOSH REL
TWA: 50 ppm (180 mg/m³)

1992-93 ACGIH TLV
TWA: 50 ppm (176 mg/m³)

1990 DFG (Germany) MAK
TWA: 50 ppm (180 mg/m³)
Category II: substances with systemic effects
Half-life: < 2 hr
Peak Exposure Limit: 100 ppm, 30 min average value, 4/shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 5000 ppm/10 min caused hallucinations and distorted perceptions.
Rat, oral, LD_{50}: 28,710 mg/kg; no toxic effect noted
Rat, inhalation, TC_{Lo}: 1000 ppm/6 hr from the 8th to 16th day of pregnancy produced effects on newborn growth.
Rabbit, eye: 10 mg caused mild irritation.

* See NIOSH, *RTECS* (MN9275000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 156 °F (69 °C)
Freezing Point: -139 °F (-95 °C)
Vapor Pressure: 150 mm Hg at 77 °F (25 °C)
Refraction Index: 1.37486 at 68 °F (20 °C)
Critical Temperature: 453.2 °F (234 °C)
Critical Pressure: 29.7 atm
Liquid Surface Tension: 18.4 dyne/cm
Odor Threshold: 65 ppm

Molecular Weight: 86.17
Density: 0.66 at 20/4 °C
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.1049 lb/ft³ or 1.678 kg/m³
Water Solubility: Slightly, 0.014 mg/ml at 68 °F (20 °C)
Other Solubilities: Alcohol, acetone, chloroform, ether, and most non-polar solvents.
Ionization Potential: 10.18 eV
Viscosity: 0.334 cP at 35 °F (2 °C), 0.306 cP at 80 °F (27 °C), 0.276 cP at 145 °F (62.5 °C)
Appearance and Odor: A colorless, volatile liquid with a gasoline-like odor.

Section 4. Fire and Explosion Data

Flash Point: -7.6 °F (-22 °C)	Autoignition Temperature: 437 °F (225 °C)	LEL: 1.2% v/v	UEL: 7.5% v/v

Extinguishing Media: *n*-Hexane is a Class 1B Flammable Liquid. For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam. **Unusual Fire or Explosion Hazards:** Vapors may travel to an ignition source and flash back. Container may explode in heat of fire. *n*-Hexane poses a vapor explosion hazard indoors, outdoors, and in sewers. Burning rate = 7.3 mm/min. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing appar-atus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection. If possible without risk, move container from fire area. Apply cooling water to sides of container until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from fire and let burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Discoloration may indicate danger of BLEVE (boiling liquid expanding vapor explosion). Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: *n*-Hexane is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Incompatible with strong oxidizers and may explode at 82.4 °F (28 °C) when mixed with dinitrogen tetraoxide. **Conditions to Avoid:** Contact with heat and incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of *n*-hexane can produce acrid smoke and irritating vapors.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list *n*-hexane as a carcinogen. Although there is no data on human carcinogenicity specifically caused by n-hexane, there is an increase in association between Leukemia risk in the rubber industry and exposure to a variety of substances including hexane. **Summary of Risks:** Vapors are irritating to the skin, eyes, and respiratory tract. Inhalation produces varying degrees of CNS depression depending on concentration. High concentrations may lead to asphyxia (oxygen displacement). Chronic exposure (usually at least 60 to 240 ppm) results in neurotoxicity characterized by sensory loss, pain, and neurogenic atrophy of skeletal muscle. Peripheral neuropathy is mostly of the 'stocking & glove' type. *n*-Hexane is ultimately converted to 2,5-hexanedione during metabolism and is considered to be the metabolite responsible for toxicity. Evidence exists that *n*-hexane accumulates in fatty tissue which would explain its affinity for the blood, liver, and brain where lipids are prevalent. After exposure has ceased, the half-life is 64 hrs. Metabolism is inhibited by co-exposure to toluene, methylethyl ketone, or methyl *n*-butyl ketone. *n*-Hexane is absorbed through the skin in both liquid and vapor form. Therefore, dermal vapor absorption raises biological levels above those reached during inhalation of or below the TLV concentration. This is why it is imperative that protective clothing be used so that the TLV levels are sufficient to prevent over-exposure. **Medical Conditions Aggravated by Long-Term Exposure:** Skin, CNS, PNS, and respiratory diseases. **Target Organs:** Eyes, skin, respiratory system, central and peripheral nervous system. **Primary Entry Routes:** Inhalation, skin contact/absorption, eyes, ingestion. **Acute Effects:** Vapor inhalation produced marked vertigo and hallucinations at 5000 ppm/10 min; drowsiness, fatigue, appetite loss, and paresthesia in the distal extremities at 1000 to 2500/12 hrs; muscle weakness, cold pulsation in extremeties, blurred vision, headache, anorexia and onset of polyneuropathy at 500 to 2500 ppm (time not given).

Continue on next page

Section 6. Health Hazard Data

Skin contact causes immediate irritation with redness, painful burning and possible blisters. Eye contact produces irritation, watering, and burning. Ingestion poses a serious aspiration hazard. If aspiration into the lungs occurs, asphyxiation from oxygen displacement may lead to brain damage and cardiac arrest. Cardiac sensitization to epinephrine (the body's adrenalin) may cause rhythm disturbances with potentially fatal consequences. Chronic Effects: Polyneuropathy occurs from repeated exposure to levels typically in the 400 to 600 ppm range; there is a case of polyneuropathy after exposure to 54 to 200 ppm/1 year. Initial symptoms include muscle weakness, motor loss, sensation disturbances (numbness and pain without stimulus), and distal symmetric leg pain after 2 to 6 months exposure. Clinical studies indicate muscle atrophy (wasting away), foot drop, decreased muscle tone and strength, and paresthesias of the arms and legs. Vision problems including changes in color vision, retinal pigmentation, and in perifoveal capillaries were found in workers exposed to 420 to 1280 ppm for > 5 years. Progression of neuropathy may continue for several months after exposure has ceased, followed by slow recovery taking on the average of 9 to 10 months and rarely, up to 2 years. Residual spinal cord damage was noted in most severely injured victims.

FIRST AID *Emergency personnel should protect against exposure*

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Inhalation: Remove exposed person to fresh air and administer supplemental oxygen as needed. Intubation may be necessary in severe cases (aspiration of liquid). Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting because of severe aspiration hazard. If spontaneous vomiting occurs, position head to avoid aspiration of vomitus.

Note to Physicians: BEI = 2,5-hexanedione in urine, sample at end of shift at workweeks end, 5 mg/g creatine. Also measure *n*-hexane in expired air. Analgesics may be necessary for pain management, there is no specific antidote. Monitor arterial blood gases in cases of severe aspiration.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers. Dike far ahead of large spill for later disposal or reclamation. For water spills, use oil skimming equipment to lift spill. Absorbent foams can be applied to slick. Follow applicable OSHA regulations (29 CFR 1910.120). Environmental Degradation: If released on soil, *n*-hexane will readily volatilize from moist surfaces although some may absorb to soil. In water, *n*-hexane will volatilize rapidly although some will absorb to sediment. The log bioconcentration factor (log BCF) estimated at 2.24 to 2.89 suggests bioconcentration is not an important factor in aquatic systems. The estimated Koc of 1250 to 4100 indicates that *n*-hexane absorbs to carbon/organic matter. Volatilization half-life from a model river is 2.7 hr at 77 °F (25 °C), 1 meter deep flowing at 1m/sec with a 3 m/sec wind speed. Volatilization from a model pond (which considers effect of absorption) is estimated at 6.8 days. In the atmosphere, it is expected to exist entirely in the vapor phase. It does not absorb UV light in the environmentally significant range (> 290 nm). It reacts with photochemically produced hydroxyl radicals. Estimated lifetime under photochemical smog conditions is 5.9 hr (SE England). Disposal: Spray into an incinerator (may burn quicker by addition of another flammable solvent). Evaporation in a suitable hood may be used for smaller amounts. Landfill is *not* recommended. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
Listed as a RCRA Hazardous Waste (40 CFR 261.21): D001, *Characteristic of ignitability*
Listed as 'Unlisted hazardous Waste, *Characteristic of ignitability*' a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 100 lb (45.4 kg) [* per RCRA, Sec. 3001]

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 500 ppm, use a supplied-air respirator (SAR) or SCBA. For < 1250 ppm, use a SAR operated in continuous-flow mode. For 2500 ppm, use a SAR with a tight-fitting facepiece operated in continuous-flow mode or a SCBA with a full facepiece. For < 5000 ppm, use a SAR operated pressure demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. Other: Wear chemically protective gloves, boots, aprons, and gauntlets made of nitrile, Viton, polyvinyl chloride, or chlorinated polyethylene to prevent skin contact. Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. Contaminated Equipment: Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean PPE. Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 5).

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Purge all vessels previously containing *n*-hexane with steam before entering for the purpose of repair (cutting, welding). Refer to OSHA's Confined Space Standard (29 CFR 1910.119). Administrative Controls: Consider preplacement and periodic medical exams of exposed workers that emphasize the central and peripheral nervous systems, skin, eyes, and respiratory system.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Hexanes
DOT Hazard Class: 3
ID No.: UN1208
DOT Packing Group: II
DOT Label: Flammable Liquid
Special Provisions (172.102): T8

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
a) Vessel Stowage: E
b) Other:

MSDS Collection References: 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 139, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171, 174
Prepared by: M Gannon, BA; Industrial Hygiene Review: PA Roy, MPH, CIH; Medical Review: W Silverman, MD

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Material Safety Data Sheets Collection:

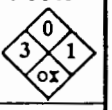
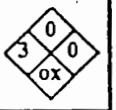
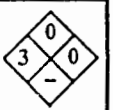
Sheet No. 7
Nitric Acid

Issued: 10/88 Revision: D, 9/92

Section 1. Material Identification

Nitric Acid (HNO_3) Description: A solution of nitrogen dioxide in water commercially available in many concentrations. Derived by oxidation of ammonia by catalytic process (heated platinum catalyst); or by direct synthesis, combining atmospheric nitrogen and oxygen in an electric arc (an expensive process, thus largely abandoned). HNO_3 is usually found in conjunction with nitrogen dioxide, which is considered more hazardous. Used in fertilizer production (ammonium nitrate), in photoengraving, steel etching, explosives (TNT, nitroglycerin, trinitrophenol); manufacture of metallic nitrates, sulfuric acid, aqua regia and oxalic acid, jewelry, various dyes and dyestuffs, pharmaceuticals; as a laboratory reagent, in metallurgy (*mainly* as a pickling agent) and the printing industry.
Other Designations: CAS No. 7697-37-2, aqua fortis, aqua regia, azotic acid, engravers nitrate, hydrogen nitrate, red fuming nitric acid (RFNA), white fuming nitric acid (WFNA).
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for suppliers list.

Cautions: Nitric acid is a corrosive, strong oxidizer that causes irritation or severe burns to the skin, eyes, and respiratory tract. Exposures to high levels of the concentrated acid can be fatal. Increases the flammability of combustibles. Use extreme caution when handling HNO_3.

	HMIS		NFPA
R 2	H 3*	*Fuming* nitric acid	
I 4	F 0		
S 4	R 1		
K 0	PPE**		
R 2	H 3*	*> 40%* nitric acid	
I 4	F 0		
S 4	R 1		
K 0	PPE**		
R 2	H 3*	*≤ 40%* nitric acid	
I 3	F 0		
S 3	R 0		
K 0	PPE**		

* Chronic effects ** See Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Nitric acid, various %. Commercially available in nearly all concentrations; most common are 56 and 68%. RFNA (85%), WFNA (97.5%).

1991 OSHA PELs
8-hr TWA: 2 ppm (5 mg/m³)
15-min STEL: 4 ppm (10 mg/m³)

1990 IDLH Level
100 ppm

1990 NIOSH REL
8-hr TWA: 2 ppm (5 mg/m³)
15-min STEL: 4 ppm (10 mg/m³)

1992-93 ACGIH TLVs
TWA: 2 ppm (5.2 mg/m³)
STEL: 4 ppm (10 mg/m³)

1990 DFG (Germany) MAK
2 ppm (5 mg/m³)
Category I: local irritants
Peak Exposure Limit: 2 ppm
5 min momentary value, 8 per shift

1985-86 Toxicity Data*
Man, unreported route, LD_{Lo}: 110 mg/kg; toxic effects not yet reviewed
Rat, oral, TD_{Lo}: 5275 g/kg administered from 1 to 21 days of pregnancy caused post-implantation mortality and specific developmental abnormalities of the musculoskeletal system.
Rat, inhalation, LC_{50}: 67 ppm (NO_2)/4 hr; toxic effects not yet reviewed

* See NIOSH, *RTECS* [QU5775000 (nitric acid), QU5900000 (RFNA), QU6000000 (WFNA)], for additional reproductive and toxicity data.

Section 3. Physical Data

Boiling Point: 186.8 °F (86 °C)
Melting Point: -43.6 °F (-42 °C)
Vapor Pressure: 67% HNO_3 = 6.8 mm Hg at 68 °F (20 °C); 95 to 98% = 113 at 100.4 °F (38 °C)
Saturated Vapor Density (Air = 1.2 kg/m³): 1.212 kg/m³ or 0.0757 lb/ft³ (67 % HNO_3)
pH: 1

Molecular Weight: 63.02
Density: 1.50269 at 77/39.2 °F (25/4 °C)
Water Solubility: Soluble (releases heat)
Ionization Potential: 11.95 eV

Appearance and Odor: Transparent, clear to yellow, fuming liquid with an acrid, suffocating odor which darkens to a brownish color on aging and exposure to light. "Fuming" nitric acid is red-brown in color.

Section 4. Fire and Explosion Data

Flash Point: Noncombustible	Autoignition Temperature: Noncombustible	LEL: None reported	UEL: None reported

Extinguishing Media: For small fires (< 40% HNO_3), use dry chemical, carbon dioxide (CO_2), water spray, or regular foam. For large fires, use water spray, fog, or regular foam. For small fires (> 40% HNO_3), use water spray, dry chemical, or soda ash. For large fires, flood area with water (*do not* get inside HNO_3 containers). Apply water from as far a distance as possible.
Unusual Fire or Explosion Hazards: HNO_3 is noncombustible but is an oxidizer which increases fire involving combustibles and can initiate an explosion. It releases flammable hydrogen gas in contact with many metals.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for fires involving nitric acid. Acid-resistant clothing is needed. Apply cooling water to sides of containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Nitric acid decomposes in air and in contact with light and organic matter. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Nitric acid reacts explosively with combustibles, organics or readily oxidizable materials such as wood, turpentine, metal powder and hydrogen sulfide, carbides, cyanides, and alkalies; causes spattering with strong bases; is corrosive to paper, cloth and most metals (except aluminum, gold, platinum, thorium, and tantalum. Will also attack some forms of plastics, rubber, and coatings. There are at least 150 chemicals and chemical combinations which are incompatible with nitric acid. HNO_3 reacts with water to produce heat and toxic corrosive fumes. Refer to *Genium* references 126 and 159 for further detail. **Conditions to Avoid:** Avoid exposure to moisture, heat, and incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of HNO_3 produces nitrogen peroxide and toxic, irritating nitrogen oxides.

Section 6. Health Hazards Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list nitric acid as a carcinogen.
Summary of Risks: Nitric acid is very corrosive to the skin, eyes, digestive and respiratory tract or any tissue it comes in contact with. 58 to 68% (nitric acid) vapors are moderately irritating and can't be tolerated at high concentrations. 95% (nitric acid) vapors cause severe irritation at very low levels and the liquid causes 2nd and 3rd degree burns on short contact with skin or eyes. Vapor inhalation may cause pulmonary edema (fluid in lungs) leading to death. HNO_3 vapor or mist can slowly corrode teeth when chronically exposed. **Medical Conditions Aggravated by Long-Term Exposure:** Chronic respiratory diseases. **Target Organs:** Eyes, skin, respiratory tract, teeth.

Continue on next pa

Section 6. Health Hazard Data, continued

Primary Entry Routes: Inhalation, ingestion, skin and eye contact. **Acute Effects:** Inhalation symptoms may take several hours and include throat and nose irritation, cough, chest pain, difficulty breathing, salivation, giddiness, nausea, muscular weakness, ulceration of nasal mucous membranes, pulmonary edema, and chemical pneumonia. Skin contact is moderately irritating to severely corrosive depending on % of nitric acid. Burns may penetrate deeply causing ulcers. Skin may be stained yellowish brown. Dilute solutions cause irritation and tend to harden the epithelium (outer skin layer) without destroying it. HNO_3 liquid causes yellow discoloration of the eyes and severe burns which may result in permanent damage, i.e., sight loss. Ingestion produces immediate pain and digestive tract burns followed by throat swelling, convulsions, risk of stomach perforation (causing a rigid abdomen) and possible coma. **Chronic Effects:** Repeated inhalation of low concentrations may cause chronic bronchitis, tooth erosion, and/or appetite loss. Repeated exposure to $NO_{(g)}$ such as produced by thermal decomposition of HNO_3 is implicated in chronic lung diseases.

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing (*do not force removal if stuck to skin*). Rinse with flooding amounts of water for at least 15 min. Apply a 5% triethanolamine solution to affected area. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute followed by lime milk or milk of magnesia. Do not induce vomiting. *Do not* give sodium bicarbonate or attempt to neutralize the acid.

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

Note to Physicians: Observe for several hours since symptoms such as pulmonary edema may be delayed.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel should wear fully-encapsulating vapor-protective clothing. Use water spray to cool and disperse vapor. Keep combustibles away from spilled material. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in dry containers for disposal. For large spill, flush with water to containment area and neutralize with agricultural (slaked) lime, sodium bicarbonate, crushed limestone, soda ash, or lime. Report any release in excess of 1000 lb. Control runoff and dike for disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 1000 lb
Listed as a RCRA Hazardous Waste (40 CFR 261.22): No. D001, Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311(b)(4)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)
Listed as a Process Safety Hazardous Chemical (29 CFR 1910.119), TQ: 500 lb

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For < 50 ppm, use any supplied-air respirator operated in a continuous-flow mode. For < 100 ppm, use any supplied-air respirator or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear acid-proof gloves, boots, aprons, and gauntlets to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in aluminum, stainless steel, or glass containers on a cement floor in a cool, dry, well-ventilated area away from incompatibles (Sec. 5). Dike around storage tanks with large kirbs or stills to retain the acid in event of leakage. Keep neutralization agents on hand and install a fire hydrant in storage area. (See NFPA Code 43A). **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers that emphasize the eyes, skin, respiratory tract and teeth. Pulmonary function tests (FEV< FVC) are helpful. Educate workers about the hazardous properties of nitric acid.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: *, †, ‡, §, ¥, ψ, ϕ
DOT Hazard Class: 8
ID No.: UN1826 (*†), UN1796 (‡§), UN2031 (¥ψ), UN2032 (ϕ)
DOT Packing Group: I (†§¥ϕ), II (*‡ψ)
DOT Packaging Label: Corrosive (*‡¥ψ), Corrosive, Oxidizer (†§), Corrosive, Oxidizer, Poison (ϕ)
Special Provisions (172.102): B2, T12, T27 (*); T12, T27 (†); B2, T12, T27 (‡); T12, T27 (§); B12, B53, T9, T27 (¥); B2, B12, B53, T9, T27(ψ); 2, B9, B32, B74, T38, T43, T45(ϕ)

Packaging Authorizations

a) **Exceptions:** None
b) **Non-bulk Packaging:** 173.158 (*†‡§¥ψ), 173.227 (ϕ)
c) **Bulk Packaging:** 173.242 (*‡ψ), 173.243 (†§¥), 173.244(ϕ)

Quantity limitations

a) **Passenger Aircraft or Railcar:** Forbidden
b) **Cargo Aircraft Only:** 30L (*‡ψ), 2.5L (†§¥), Forbidden (ϕ)

Vessel Stowage Requirements

a) **Vessel stowage:** D
b) **Other:** 40(*); 40, 66, 89 (†); 40 (‡); 40, 66, 89 (§); 110, 111 (¥); 110, 111 (ψ); 40, 66, 74, 89, 90, 95 (ϕ)

* Nitrating acid mixtures spent, < 50% HNO_3
† Nitrating acid mixtures spent, > 50% HNO_3
‡ Nitrating acid mixtures, < 50% HNO_3
§ Nitrating acid mixtures, > 50% HNO_3
¥ Nitric acid other than red fuming, > 70% HNO_3
ψ Nitric acid other than red fuming, < 70% HNO_3
ϕ Nitric acid, red fuming.

***MSDS Collection* References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 136, 139, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171, 174, 175
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

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Monitoring Well Installation and Development Procedures

I. Introduction

Soil borings and monitoring wells typically will be completed using the hollow-stem auger drilling method. However, direct-push techniques (e.g., Geoprobe® or cone penetrometer) may be used in some cases. No oils or grease will be used on equipment introduced into the boring (e.g., drill rod, casing, or sampling tools, etc.). Prior to beginning work, all underground utilities will be delineated by the drilling contractor or an independent underground utility locator service.

II. Materials

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

- Site plan with proposed soil boring/well locations;
- Project-specific work plan and Site Health and Safety Plan;
- Personal protective equipment (as required by the Site Health and Safety Plan);
- Drilling equipment required by ASTM D-1586;
- Appropriate sampling equipment (e.g., spatulas);
- Equipment cleaning materials;
- Appropriate sample containers, labels, and chain-of-custody forms;
- Insulated coolers with ice;
- Photoionization detector (PID);
- Well construction materials; and
- Field notebook.

III. Procedures for Hollow-Stem Auger Monitoring Well Installation

The procedures for the installation of groundwater monitoring wells in soil using the hollow-stem auger drilling method are presented below:

Step 1 - Locate boring/well location, establish work zone, and set up sampling equipment cleaning area.

Step 2 - Advance soil boring to depth specified in the work plan. Collect representative soil samples at intervals specified in the work plan. The sampling method employed will be the American Society of Testing and Materials (ASTM) D1586 - *Standard Method for Penetration Test and Split-Barrel Sampling of Soils.* Fully describe each soil sample, including 1) soil type; 2) color; 3) percent recovery; 4) relative moisture content; 5) soil texture; 6) grain size and shape; 7) consistency; and 8) any other pertinent observations. Record descriptions in field notebook. During soil boring advancement, document all drilling events, including blow counts (number of blows required to advance split-spoon sampler in 6-inch increments) and work stoppages, in field notebook. Blow counts may not be available if direct push methods are utilized.

Step 3 - Upon completion of the borehole to the desired depth, the monitoring well will be installed by lowering the screen and casing assembly with sump through the hollow axis of the auger column. Monitoring wells typically will be constructed of 2-inch diameter, flush-threaded PVC slotted

well screen and blank riser casing. Smaller diameters may be utilized if wells are installed using direct-push methodology. The screen length typically will be 10 feet, but will be dictated by field conditions and objectives. The slot size typically will be either 0.010 or 0.020 inches. A 1-foot sump may be attached below the well screen if the well is being installed for DNAPL recovery/monitoring purposes. A blank riser will extend from the top of the screen to approximately 2.5 feet above grade or, if necessary, just below grade where conditions warrant a flush-mounted monitoring well.

Step 4 - When the monitoring well assembly has been set in place, a washed silica sand pack will be placed in the annular space from the bottom of the boring to a height of 1 to 2 feet above the top of the well screen. The graded filter sand pack will be consistent with the screen slot size and the soil particle size in the screened interval. A hydrated bentonite seal, a minimum of 2 feet thick, will then be placed in the annular space above the sand pack. If non-hydrated bentonite is used, the bentonite should be permitted to hydrate in place a minimum of 30 minutes before proceeding. Potable water may be added to hydrate the bentonite if the seal is above the water table. Monitor the placement of the sand pack and bentonite with a weighted tape measure. During the extraction of the augers, a cement/bentonite grout will be pumped through a tremie pipe to fill the annular space from the bentonite seal to a depth approximately 2 feet below the ground surface.

Step 5 - A vented protective steel casing (extended at least 1.5 feet below grade and 2 feet above grade) shall be placed over the riser casing and secured by a neat Portland Cement seal. The cement seal shall extend approximately 1.5 to 2.0 feet below grade and laterally at least 1 foot in all directions from the protective casing, and shall slope gently away to promote drainage away from the well. A vented slip-on steel cap will be fitted on and around the protective casing. Monitoring wells will be labeled with the appropriate designation both on the inner and outer well casings.

At those locations where a flush-mounted installation is desired, the steel protective casing will be replaced with a 10-inch curb box or equivalent. When a flush-mounted installation is used, the PVC riser shall be sealed using an unvented expandable locking plug.

Step 6 - During well installation record exact construction details and actual measurements relayed by the drilling contractor, and tabulate all materials used (e.g., screen and riser footages, bags of bentonite, cement, and sand) in the field notebook.

Step 7 - Following the completion of the well installation, lock the well, clean the area, and dispose of materials appropriately.

IV. Procedures for Direct-Push Monitoring Well Installation

The direct-push drilling method also may be used to complete soil borings and monitoring wells. Environmental probe systems typically use a hydraulically-operated percussion hammer. Depending on the equipment used, the hammer delivers 140 to 350 foot pounds of energy with each blow. The hammer, operated at 1,200 blows per minute, provides the force needed to penetrate very stiff/medium dense soil formations. The hammer simultaneously advances an outer steel casing which contains a dual tube liner for sampling soil. Depending on the system utilized, the outside diameter (OD) of the outer casing ranges from 1.75 to 2.4 inches, and the OD of the inner sampling tube ranges from 1.1 to 1.8 inches. The outer casing isolates shallow layers and permits the unit to continue to probe at depth. The double rod system provides a borehole that may be tremie grouted from the bottom up. Alternatively, the inside diameter (ID) of the steel casing provides clearance

for the installation of small diameter (e.g., 0.75- to 1-inch ID) microwells. The procedures for installing monitoring wells in soil using direct-push methods are described below.

Step 1 - Locate boring/well location, establish work zone, and set up sample equipment cleaning area.

Step 2 - Advance soil boring to designated depth, collecting samples at intervals specified in the work plan. Samples will be collected using dedicated, disposable plastic liners. Describe samples in accordance with the procedures outlined in Step 2 of Section III above.

Step 3 - Upon completion of the borehole to the desired depth, install the microwell through the inner drill casing. The microwells will consist of approximately 1-inch ID PVC slotted screen and blank riser. The sand pack, bentonite seal, and cement/bentonite grout will be installed as described, where applicable, in Section III (Steps 3 and 4) above.

Step 4 - Install protective steel casing or flush-mount, as appropriate, as described in Section III (Step 5). During well installation, record exact construction details and tabulate all materials used.

Step 5 - Following the completion of the well installation, lock the well, clean the area, and dispose of materials appropriately.

V. Procedures for Well Point Installation

Well points will be installed either by hollow-stem auger or direct-push methods (as described above), or hand-driven where possible. The well point construction materials will consist of a 1- to 2-inch diameter threaded steel casing with either 0.010 or 0.020 slotted stainless steel screen. The screen length will vary depending on the hydrogeologic conditions of the site. The casings will be joined together with threaded couplings and the terminal end will consist of a steel well point. Sand pack will not be installed around the screen since the well points are intended for water level/NAPL monitoring and not groundwater sampling.

VI. Equipment Cleaning

All drilling equipment and associated tools, including augers, drill rods, sampling equipment, wrenches, and any other equipment or tools that may have come in contact with soil, shall be cleaned prior to and in between well installations.

VII. Survey

A field survey control program will be conducted using standard instrument survey techniques to document well or piezometer location, ground, and inner and outer casing elevations. At a minimum, the elevation of the top of the inner casing which is used for water level measurements should be measured to the nearest 0.01 feet. A permanent mark will be placed on the top of the inner casing to mark the point for water level measurements.

VIII. Procedures for Monitoring Well Development

A. Introduction

All monitoring wells or piezometers which yield water will be developed (i.e., cleared of fine-grained materials and sediments and any drilling fluids) to ensure the screen is transmitting groundwater representative of the

surrounding formation groundwater. Development will be accomplished by surging (using a surge block, where possible) and evacuating well water by either pumping or bailing. Acceptable pumping methods include the use of the following:

- Electric submersible pump;
- Surface inertial pump (Waterra™ pump);
- Centrifugal pump; and
- Moyno shaft drilling pump.

When developing a well using the pumping method, dedicated polyethylene tubing from the pump is lowered to the screened portion of the well; the tubing will be moved up and down the screened interval until the well yields relatively clear water. A procedure that may be used for well development includes moving groundwater through the well screen using a centrifugal pump and/or a submersible pump. The centrifugal pump uses atmospheric pressure to lift water from the well and therefore can only be used where the depth to water is less than 25 feet. The submersible pump is attached to the end of the tubing that goes into the well, and therefore pushes the water to the surface; this method is effective for all wells.

B. Materials

Materials for monitoring well development using a pump include:

- Health and safety equipment (as required by the Site Health and Safety Plan);
- Cleaning equipment;
- PID to measure headspace vapors;
- Polyethylene tubing (discarded between well locations);
- Plastic sheeting;
- Power source (generator or battery);
- Field notebook;
- Graduated pails;
- Pump;
- Appropriate containers; and
- Monitoring well keys.

Materials for monitoring well development using a bailer include:

- Personnel protective equipment (as required by the Site Health and Safety Plan);
- Cleaning equipment;
- PID to measure headspace vapors;
- Bottom loading bailer, sand bailer;
- Polypropylene rope;
- Plastic sheeting;
- Graduated pails;
- Appropriate containers; and
- Monitoring well keys.

C. Development Procedures

The procedures for monitoring well development using a pump are described below:

Step 1 - Don appropriate personal protective equipment (as required by the Site Health and Safety Plan).

Step 2 - Place plastic sheeting around the well.

Step 3 - All equipment entering each monitoring well will be cleaned.

Step 4 - Open the well cover while standing upwind of the well; remove well cap. Insert PID probe approximately 4 to 6 inches into the casing or the well headspace and cover with gloved hand. Record the PID reading in the field log. If the well headspace reading is less than 5 PID units, proceed; if the headspace reading is greater than 5 PID units, screen the air within the breathing zone. If the PID reading in the breathing zone is below 5 PID units, proceed. If the PID reading is above 5 PID units, move upwind from well for 5 minutes to allow the volatiles to dissipate. Repeat the breathing zone test. If the reading is still above 5 PID units, don appropriate respiratory protection in accordance with the requirements of the Site Health and Safety Plan. Record all PID readings.

Step 5 - A surge block will be lowered into the screened portion of the well on a rigid pipe or high density tubing and cycled up and down to force water in and out of the screen slots and formation. After surging the well, formation water will be removed by pumping or bailing. Surging and bailing will be performed for a period of 30 to 60 minutes.

Step 6 - If well runs dry, shut off pump and allow well to recover.

Step 7 - Contain all water in appropriate containers.

Step 8 - When complete, secure the lid back on the well.

Step 9 - Place plastic sheeting and tubing in plastic bags for appropriate disposal and clean pump.

The procedure for developing a well using the bailer method is outlined below:

Step 1 - Don appropriate personal protective equipment (as required by the Site Health and Safety Plan).

Step 2 - Place plastic sheeting around the well.

Step 3 - Bailers and new rope will be cleaned.

Step 4 - Open the well cover while standing upwind of the well. Remove well cap and place on the plastic sheeting. Insert PID probe approximately 4 to 6 inches into the casing or the well headspace and cover with gloved hand. Record the PID reading in the field log. If the well headspace reading is less than 5 PID units, proceed; if the headspace reading is greater than 5 PID units, screen the air within the breathing zone. If the breathing zone reading is less than 5 PID units, proceed. If the PID reading in the breathing zone is above 5 PID units, move upwind from well for 5 minutes to allow the volatiles to dissipate. Repeat the breathing zone test. If the reading is still above 5 PID units, don appropriate respiratory protection in accordance with the requirements of the Site Health and safety plan. Record all PID readings.

Step 5 - Determine depth of well through examination of drilling log data and measure a length of rope at least 10 feet greater than the total depth of the well.

Step 6 - Secure one end of the rope to the well casing; secure the other end of the rope to the bailer. Test the knots and make sure the rope will not loosen. Check bailers to be sure all parts are intact and will not be lost in the well.

Step 7 - Lower bailer into well until bailer reaches the bottom of the well.

Step 8 - Surge/purge by raising and lowering the bailer at 2-foot intervals, at least 10 times.

Step 9 - Contain all water in appropriate containers.

Step 10 - Lower bailer back into the well and repeat surging/purging at an interval 2 feet above the previous interval.

Step 11 - Repeat Step 8 and Step 9 until entire screen has been surged/purged and the purge water is relatively clear of silt.

Step 12 - Upon completion of surging of the well, remove bailer and remove the rope from the bailer and the well.

Step 13 - Secure lid on well.

Step 14 - Place plastic sheeting and polypropylene rope in plastic bags for appropriate disposal and clean bailer.

IX. Disposal Methods

Materials generated during monitoring well installation and development will be placed in appropriate containers. Containerized waste will be disposed of by client/owner.

Field Sample Designation, Containerization, Preservation, Handling, Packing, and Shipping Procedures

I. Sample Designation

Each sample will be assigned an identification code.

The sample designation code coupled with the sample date will provide each sample with a unique "name." This alpha numeric system will apply to all samples collected, which are to be transmitted to the analytical laboratory. The designation code system includes a number indicating the sample location, and a one-digit letter suffix depicting the sample type. Sample codes for soil samples will include the depth interval from which the sample was obtained.

The one digit letter suffix, which designates the sample type, will be taken from the following list:

Duplicate - "D"
Composite - "C"
Discrete sample - "S"
Rinse blank - "R"
Trip blank - "T"
Matrix spike/matrix spike duplicate - "M"

II. Sampling Containerization and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for groundwater and soil samples are provided on Table 1.

The analytical laboratory will supply appropriate sample containers in sealed cartons, as well as sample labels and preservatives. The field personnel will be responsible for properly labeling containers and preserving samples (as appropriate).

III. Handling

1. Fill in sample label with:

    a. Sample type;
    b. Project number and site name;
    c. Sample identification code and other sample identification information, if applicable;
    d. Analysis required;
    e. Date;
    f. Time sampled;
    g. Name, affiliation, and contact phone number;
    h. Sample type (composite or grab); and
    i. Preservative added, if applicable.

    In addition, record the same information and the sampling method in the field notebook.

2. Cover the label with clear packing tape to secure the label onto the container.

3. Check the caps on the sample containers to ensure that they are tightly sealed and wrap with clear packing tape.

4. Initiate laboratory-supplied chain-of-custody by designated sampling personnel responsible for sample custody (after sampling or prior to sample packing). Note: If the designated sampling person relinquishes the samples to other sampling or field personnel for packing or other purposes, the samplers will complete the chain-of-custody prior to this transfer. The appropriate personnel will sign and date the chain-of-custody form to document the sample custody transfer.

IV. Chain-of Custody Procedures

Step 1 – Prior to collecting samples, complete the chain-of-custody form header information by filling in the project number, project name, and the name(s) of the sampling personnel. Please note that it is important that chain-of-custody information is printed legibly using indelible ink.

Step 2 – After sample collection, enter the individual sample information by filling in the following chain-of-custody fields:

1. Location ID – Indicates the location that the sample was collected from. Appropriate values for this field include well locations, grid points, or soil boring identification numbers (e.g., MW-3, X-20, SB-30, etc.

2. Date – Indicates the date that the sample was collected. The date format to be followed should be mm/dd/yyyy.

3. Time – Indicates the time at which the sample was collected. The time value should be presented using the military format.

4. Comp – This field should be marked with an "X" if the sample was collected as a composite.

5. Grab – This field should be marked with an "X" if the sample was collected as an individual grab sample.

6. Location – This field should represent the complete sample designation identification; although in some instances it may be similar to the Location I.D. An example of a complete sample name is SB-3 (0.5-1.0), where the 0.5-1.0 represents the depth interval in feet from where the sample was collected. Please note that it is very important that the use of hyphens in sample names and the depth units (i.e., feet or inches) remain consistent for all samples entered on the chain-of-custody form.

7. Number of Containers – This field represents the number of containers that were collected at the sampling location to be submitted for analysis.

8. Analytical Parameters – The analytical parameters that the samples are being analyzed for should be written legibly on the diagonal lines to the right of the "number of containers" column. As much detail as possible should be presented to allow the analytical laboratory to properly analyze the samples. Multiple methods and/or analytical parameters may be combined for each column

(e.g., PCBs/VOCs/SVOCs or 8082/8260/8270). QA/QC information may also be entered in a separate column for each parameter (e.g., PCBs – MS/MSD) to identify a sample that the laboratory is to use for a specific QA/QC requirement. Each sample that requires a particular parameter analysis will be identified by placing an "X" in the appropriate analytical parameter column.

9. Remarks – The remarks field should be used to communicate special analytical requirements to the laboratory. These requirements may be on a per sample basis such as "extract and hold sample until notified" or may be used to inform the laboratory of special reporting requirements for the entire SDG. Reporting requirements that should be specified in the remarks column include: 1) turn around time; 2) contact and address where data reports should be sent; 3) name of laboratory project manager; and 4) type of sample preservation that was utilized.

10. Relinquished By – This field should contain the signature of the sampling technician that relinquished custody of the samples to the shipping courier or the analytical laboratory.

11. Date – Indicates the date that the samples were relinquished. The date format should be mm/dd/yyyy.

12. Time – Indicates the time that the samples were relinquished. The time value should be presented using the military format.

13. Received By – This field should contain the signature of the sample courier or laboratory representative that received the samples from the sampling technician.

Step 3 – Complete as many chain-of-custody forms as necessary to properly document the collection and transfer of the samples to the analytical laboratory.

Step 4 – Upon completion of the chain-of-custody forms, forward two copies to the analytical laboratory and retain one for the field records.

V. Packing

1. Using duct tape, secure the outside and inside of the drain plug at the bottom of the cooler that is used for sample transport.

2. Place each sample container or package in individual polyethylene bags (Ziploc®-type) and seal.

3. Place one to two inches of vermiculite or bubble wrap at the bottom of the cooler as a cushioning material.

4. Place the sealed sample containers and package upright in the cooler.

5. Repackage ice (if required) in small Ziploc®-type plastic bags and place loosely in the cooler. Do not pack ice so tightly that it may prevent addition of sufficient cushioning material.

6. Fill the remaining space in the cooler with vermiculite or bubble wrap.

7. Place the completed chain-of-custody forms in a large Ziploc®-type bag and tape the forms to the inside of the cooler lid.

8. Close the lid of the cooler and fasten with duct tape.

9. Wrap strapping tape around both ends of the cooler at least twice.

10. Mark the cooler on the outside with the following information: shipping address and return address.

11. Place custody seal evidence tape over front right and back left of the cooler lid and cover with clear plastic tape.

VI. Shipping

1. All samples will be hand delivered or delivered by an express carrier within 48 hours or less from the date of sample collection.

2. The following chain-of-custody procedures will apply to sample shipping:

   a. Relinquish the sample containers to the laboratory via express carrier. The signed and dated forms should be included in the cooler. The express carrier will not be required to sign the chain-of-custody forms. The sampler should retain the express carrier receipt or bill of lading.

   b. When the samples are received by the laboratory, the laboratory personnel shall complete the chain-of-custody forms by recording receipt of samples, measure and record the internal temperature of the shipping container, and then check the sample identification numbers on the containers to the chain-of-custody forms.

Table 1

Sample Method Container, Preservation and Holding Time Requirements

Parameter	Method	Reporting Level	Container	Preservation	Maximum Holding Time VTSR
Soil					
VOCs	SW-846 8260	NYSDEC ASP Category B	(1) 250 ml container	Cool 4°	7 Days
SVOCs	SW-846 8270	NYSDEC ASP Category B	(1) 250 ml container	Cool 4°	5 days extraction; 40 days analysis
Metals	SW-846 6010/7000 series	NYSDEC ASP Category B	(1) 250 ml container	Cool 4°	180 days (26 days for Mercury)
PCBs/ Pesticides	SW-846 8082/8081	NYSDEC ASP Category B	(1) 250 ml container	Cool 4°	5 days extraction; 40 days analysis
Cyanide	SW-846 9010	NYSDEC ASP Category B	(1) 250 ml container	Cool 4°	12 days
Ground water					
VOCs	SW-846 8260	NYSDEC ASP Category B	(2) 40 ml teflon lined septa	Cool 4°	7 days (unpreserved)
SVOCs	SW-846 8270	NYSDEC ASP Category B	(2) 1 liter containers	Cool 4°	5 days extraction; 40 days analysis
Metals	SW-846 6010/7000 series	NYSDEC ASP Category B	(1) liter container	Cool 4° HNO_3 to pH<2	180 days (25 days for mercury; 24 hours for chromium)
Cyanide	SW-846 9010	NYSDEC ASP Category B	(1) 500 ml container	Cool 4° NaOH to pH >12	12 days
PCBs/ Pesticides	SW-846 8082/8081	NYSDEC ASP Category B	(1) 500 ml container	Cool 4°	5 days extraction; 40 days analysis

Notes:

VTSR - Validated time of sample receipt. Samples must be received with in 48 hours from day of collection. Holding times are per NYSDEC ASP.
SW-846 - SW846 Test Methods for Evaluating Solid Waste.

In-Situ Hydraulic Conductivity Test Procedures

I. Introduction

In-situ hydraulic conductivity tests may be conducted at each newly installed monitoring well and at those existing wells that have not been previously tested. The tests will be used to calculate hydraulic conductivity of the geologic formation immediately surrounding the screened interval of each monitoring well. These tests consist of creating an "instantaneous" water level change in the well and monitoring the water level through time as the well is allowed to recover to static or near-static conditions.

The type of test conducted will be one or a combination of the following:

1) A falling head test accomplished by using solid cylinder ("slug") that will be submerged below the water table in a well to displace a known volume of water;

2) A rising head test accomplished by inserting a slug into the well allowing the water to equilibrate, then removing the slug and recording data immediately; and

3) A rising head test utilizing a pressure system which lowers the static water level by a specified amount of displacement under positive air pressure.

Falling head tests are not valid in wells whose screened intervals straddle the water table, because the elevated water level would flow out of the well into the previously unsaturated material above the water table. The field water level data will be evaluated using Hvorslev's and/or the Bouwer Rice method.

II. Materials

The following materials, as required, shall be available during in-situ hydraulic conductivity testing:

- Personal protective equipment (as required by the Site Health and Safety Plan)
- Cement weighed PVC slug

- Polypropylene rope
- Water level indicator and extra batteries
- Masking or electrical tape to secure transducer cable to well standpipe
- Waterproof marker
- Engineer's rule
- Cleaning supplies (including non-phosphate soap, brushes, buckets, distilled/deionized water, tap water, cleaning solvents, aluminum foil, plastic sheeting, etc.)
- Garbage bags
- Disposable gloves
- Flashlight
- Stopwatch
- Well keys
- Extra locks
- Hacksaw
- Field notebook
- Pressure system well head assembly and a hand pump or a compressed air supply with regulator and a pressure gauge

- Data acquisition unit (data logger Hermit SE2000 or equivalent) and pressure transducer

- Portable personal computer (PC), appropriate cables, software, floppy disks.

- Extra batteries for PC

III. Procedures

1. Identify site and well number in the field notebook along with date, time, personnel and weather conditions. Include the type of test conducted and the range and pressure of the transducer in pounds per square inch (PSI). (Two persons will be required to conduct this test.)

2. Make sure all equipment that enters the well is decontaminated before use (i.e., slug, pressure transducer and cable). Use new, clean materials when decontamination is not appropriate (i.e., polypropylene rope, disposable gloves). Document decontamination procedures in the field notebook.

3. Place the cleaned equipment and instruments on plastic sheeting near the well.

4. Measure the static water level of the well with a water level indicator and record the measurement in the field notebook. This measurement will aid in determining the depths for the placement of the pressure transducer and the slug.

5. If using a solid slug to conduct the test continue with step 5. If using the pressure system to conduct the test go directly to step 13. Install the precleaned pressure transducer in the well to a predetermined depth making sure it will be below the slug once the slug is fully submerged. Record this depth in the field notebook. The installation depth also depends on the amount of water displacement and the range of the pressure transducer. If the transducer is installed at a depth below its maximum range, damage may occur to the sensor and the output reading will not be correct. One PSI is equal to approximately 2.31 feet of water. If a 5 PSI pressure transducer is utilized, the range is 11.55 feet of water and the pressure transducer should not be installed at a depth below 11.55 feet. Tape the transducer cable to the well to eliminate any movement of the pressure transducer and ensure stability.

6. Connect the pressure transducer cable to the data logger, and verify that the equipment is working properly. Program the data logger accordingly using the PC and appropriate software. Monitor the water level displayed on the PC screen to ensure the pressure transducer sensor is not below its maximum range and to ascertain when the water level has reached static conditions after the insertion of the pressure transducer and cable. Record the equilibrated water level reading displayed on the PC in the field notebook.

7. Measure out a length of rope and attach it to the slug. It is important that the slug does not come in contact with the transducer sensor once it is inserted in the well.

8. Run a rising head slug test by inserting the precleaned slug and allowing the water level to equilibrate (i.e., return to static or near-static conditions). Remove the slug and begin recording the data immediately. Collect the water level data according to a predetermined schedule while water levels rise and the aquifer returns to static or near-static conditions.

OR

Run a falling head test by inserting the precleaned slug and immediately collecting the water level data according to a predetermined schedule while the water levels fall and the aquifer returns to static or near-static conditions. Do not disturb the slug following its introduction into the well because this will adversely affect the test results.

9. Review the data to determine if a meaningful test has been conducted and perform a duplicate test if deemed necessary (Results of duplicate test should be within a half order of magnitude). Record the start and finish time of the test.

10. Transfer the data from the data logger to the PC and create a spreadsheet compatible file. Copy recorded data to a floppy disk.

11. Remove the pressure transducer and cable from the well. Clean all test equipment that came into contact with the groundwater.

12. Secure the test well prior to leaving by replacing the well cap and/or cover and lock it. Place all disposable equipment (i.e., rope, plastic sheeting, and disposable gloves, etc.) in a plastic bag and dispose in an appropriate manner. Go to next well and repeat step 1 through 12.

13. The pressure system well head assembly consists of 2-inch I.D. PVC pipe with a cap at one end, with air tight fittings for the air line and pressure transducer cable. A 2-inch I.D. quick release ball valve is attached to a Y-connector (a T-connector can also be used) in-line with the well head assembly. The well head assembly is attached to the well riser pipe by a rubber sleeve and hose clamps.

14. Pass the precleaned pressure transducer through the well head assembly cap and suspend the transducer at a predetermined depth below the water table. Record this depth in the field notebook. The appropriate depth will depend on the amount of water displacement and the transducer pressure rating (refer to Step 5). Secure the well head assembly to the well riser by tightening the hose clamps. Check the seals and make sure the seals are air tight.

15. Connect the pressure transducer cable to the data logger, and verify that the equipment is working properly. Program the data logger accordingly, using the PC and appropriate software, if necessary. Monitor the water level displayed on the data logger screen or the PC screen to ensure the pressure transducer sensor is not below its maximum range and to ascertain when the water level has reached static conditions after the insertion of the pressure transducer and cable. Record the equilibrated water level reading displayed on the PC in the field notebook.

16. Close the quick release valve. A simple hand pump can be used to supply the appropriate amount of air pressure to achieve the desired change in water level. This change is monitored on a gauge connected to the well head assembly which displays air pressure in inches of water. A tank of compressed air with a regulator equipped with a pressure gauge can also be used. This is accomplished by connecting an air line from the regulator to the fitting on the top of the well head assembly.

17. Monitor the change in pressure and water level displayed on the data logger or PC screen until the water and air pressure equilibrates and is equal to the static total head recorded prior to pressurizing the well.

18. Begin recording data while simultaneously opening the quick release valve. Collect the water level data according to a predetermined schedule while water levels rise and the aquifer returns to static or near-static conditions.

19. Review the data to determine if a meaningful test has been conducted and perform a duplicate test if deemed necessary. Record the start and finish time of the test.

20. Transfer the data from the data logger to the PC and create a spreadsheet compatible file. Copy recorded data to a floppy disk.

21. Remove the well head assembly and the pressure transducer and cable from the well. Clean all test equipment.

22. Secure the test well prior to leaving by replacing the well cap and/or cover and lock it. Place all disposable equipment (i.e., rope, plastic sheeting, and disposable gloves, etc.) in a plastic bag and dispose in an appropriate manner. Go to next well and repeat Step 1 through Step 4 and Step 13 through Step 22.

Specific Capacity Test Procedures

I. Introduction

Specific capacity testing is a field method used to estimate the transmissivity of a saturated geologic medium surrounding the screened or open interval of a well. A specific capacity test involves pumping ground water from a well at a constant rate and quantifying the pumping rate and the magnitude of drawdown inside of the tested well after a known duration of pumping. Specific capacity tests are also referred to as single well pumping tests or constant rate tests.

The transmissivity is calculated based on the observed test pumping rates, the drawdown measured immediately before the end of pumping, the pumping duration that preceded the drawdown measurement, the effective radius of the well, and the estimated storativity of the formation. If the thickness of the effective water bearing zone transmitting ground-water to the well intake is assumed to be approximately equal to the length of the intake, the hydraulic conductivity can be estimated by dividing the transmissivity by the length of the intake.

II. Materials

The equipment needed for specific capacity testing includes:

- a pump (preferably submersible) capable of pumping at a controlled rate between a fraction of one gallon per minute and several gallons per minute, equipped with discharge line;
- a power source for the pump;
- a calibrated in-line totalizing flow meter or two calibrated buckets;
- a stopwatch; and
- an electronic water-level indicator.

III. Pre-Test Set-Up

Prior to the installation of the pump into the well to be tested, the static water level inside the well is measured to the nearest 0.01 feet relative to a specified datum at the top of the well using the electronic water-level indicator. The water level and the time of the measurement are recorded in the field notebook. The water level

is measured again several minutes after the initial measurement. This measurement and time are recorded. This procedure is repeated until two consecutive measurements are identical, indicating approximately static conditions. The static depth to water is recorded.

The pump is installed into the well to at least 10 feet below the static water level, or within approximately 1 foot of the bottom of the well if the initial water column in the well is less than 11 feet. The depth of the pump intake below the static water level (indicating the length of the pre-test water column above the pump) is recorded. After the pump is installed but prior to pumping, the water level in the well is monitored until it has returned to within 0.01 feet of the static water level.

VI. Test Procedures

The specific capacity test is performed as follows:

1. Hold the water level probe in the well just above the static water level. If an in-line totalizing flow meter is used, record the pre-test volume measurement in the field notebook. If no in-line flow meter is available, place the end on the discharge line in one of the two calibrated buckets. Record the total volumetric capacity of each bucket.

2. Simultaneously start the pump and the stopwatch. Record the start time.

3. Immediately begin monitoring the water level in the well. If the water level inside the test well declines rapidly, quickly reduce the pumping rate to a slower, constant rate. To avoid pumping the well "dry" during the test, the drawdown after one minute of pumping should be less than or equal to 20% of the height of the pre-pumping water column above the pump. All pumping rate adjustments should be completed within one or two minutes of the start of pumping, after which no adjustment should be made other than minor adjustments that may be necessary to maintain a steady pumping rate.

4. Continue to pump for at least 20 minutes, recording the water level in the well approximately every 5 to 10 minutes throughout the test. If an in-line flow meter is used, record the volume measurement on the totalizer gauge approximately every 2 minutes during the test. If calibrated buckets are used to measure the pumping rate, record the time at which the bucket reaches is known, recorded volumetric capacity, and the

volume of the bucket. Transfer the discharge line to the other (empty) calibrated bucket and record the time when it becomes full. Repeat this procedure for the duration of the test.

5. The specific capacity test is complete after at least 20 minutes of pumping have elapsed. A longer pumping period is not necessary to estimate transmissivity from the test. However, increasing the length of the test may further increase the reliability of the resulting transmissivity estimate. Immediately before the termination of pumping, record the final water level measurement plus the time of the measurement.

6. Calculate and record the total volume of ground water removed from the well during the test, and the total duration of the test. Divide the total volume (in gallons) by the total pumping duration (in minutes) to calculate and record the average test pumping rate (in gallons per minute).

V. Specific Capacity Test Data Reduction

Data from a specific capacity test are reduced to a transmissivity estimate for water-bearing formation surrounding the intake of the tested well by solving for the value of transmissivity in the equation (Walton 1962):

$$Q/s = T / [264 \log(Tt/2693r_w^2S) - 65.5],$$

where Q/s is the specific capacity of the well in gallons per minute per foot, Q is the average test pumping rate in gallons per minute, s is the drawdown measured inside of the tested well after a known duration of pumping (t), T is the transmissivity of the water-bearing zone surrounding the intake of the tested well, S is the estimated storativity of the aquifer, r_w is the effective radius of the well, and t is the time in minutes between the start of pumping and the time when the drawdown was measured. If the well screen is surrounded by a sand pack that may be assumed to be substantially more permeable than the formation, the effective radius of the well is taken to be that of the borehole.

The value of S may be estimated without introducing serious error into the results. For confined aquifers, S should be estimated as 0.0001. For unconfined aquifers, the short-term storativity may be comparable to that of a confined aquifer. Only after a protracted pumping duration (several hours or more) does the storativity begin to approximately the aquifer specific yield of approximately 0.2 to 0.3 (Nwankwor et al., 1984). In the

calculation of transmissivity from a specific capacity test of less than several hours duration, therefore, an estimated storativity value of 0.01 can be used.

To obtain an estimate of the hydraulic conductivity of the water-bearing zone that transmits ground-water to the well, the calculated transmissivity value may be divided by the estimated thickness of the water-bearing zone. In a stratified formation in which the horizontal hydraulic conductivity may be expected to greatly exceed the vertical hydraulic conductivity, the thickness of the water-bearing zone may be estimated as the length of the well intake to obtain an estimate of the hydraulic conductivity immediately surrounding the well intake.

It should be noted that the Walton (1962) specific-capacity data analysis method is based on the modified non-equilibrium equation. According to Kruseman and deRidder (1990), these methods are useful provided that:

$$u <= 0.15,$$

where u = r^2 S/4Tt, r= effective well radius, S = storativity, T = transmissivity of the test zone (formation interval adjacent to saturated sandpack), and t is the pumping duration. Following data analysis, the value of u should be calculated to confirm that the above condition is satisfied. If u > 0.15, then a different hydraulic conductivity test method should be employed.

In addition, in circumstances when the pumping rate is low (e.g., less than 1 gpm) and the drawdown is high or occurs within the sandpack, the water removed from well and sandpack storage should be calculated and subtracted from the pumped volume to estimate the volume of water produced by the formation. The volume of water produced by the formation should be divided by the pumping duration to obtain an effective average test pumping rate for use in calculating T and K.

REFERENCES

Kruseman, G.P., and N.A. de Ridder. Analysis and Evaluation of Pumping Test Data. International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands. Second Edition, Publication 47, 377 p. 1990.

Nwankwor, G.I., Cherry, J.A., and R.W. Gillham, 1985, A comparative study of specific yield determinations for a shallow sand aquifer, Ground Water, Vol. 22, No. 6, pp. 764-772.

Walton, W.C., 1962, Selected Analytical Methods for Well and Aquifer Evaluation, Illinois State Water Survey Bulletin 19.

15 (12-75)

HWR-89-4032
November 21, 1989

New York State Department of Environmental Conservation

MEMORANDUM

TO: Reg. Haz. Waste Remediation Engineers, Bureau Dir. and Section Chiefs
FROM: Michael J. O'Toole, Jr., Director, Div. of Hazardous Waste Remediation
SUBJECT: FINAL DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM (TAGM) - DISPOSAL OF DRILL CUTTINGS

DATE: NOV 21 1989

Michael J. O'Toole Jr

I. Purpose

This document presents disposal alternatives for drilling cuttings and spoils from the installation of monitoring wells or soil borings at Class 2 sites. For the purposes of this TAGM, the Site shall be considered one "Area of Contamination" as defined in the RCRA Land Disposal Restrictions.

II. Introduction

This document specifically addresses the handling of drill cuttings derived from remedial investigations at or near Class 2 sites. The disposal of these cuttings may generally be subject to the derivative rule [Part 371.1 (d)(3) and (4)] which defines any waste derived from a mixture of a listed hazardous waste as a hazardous waste and requires handling of these materials as hazardous wastes. Soil containing listed hazardous wastes must be managed as hazardous wastes unless delisted in accordance with Part 370.3(a) and (c).

III. Disposal of Cuttings and Spoil Generated On-Site During Remedial Investigations of a Class 2 Site

Drill cuttings and spoils generated on-site during Remedial Investigations of a Class 2 inactive hazardous waste site are presumed to be hazardous wastes. Such cuttings and spoil may be disposed at the Class 2 Site provided the following precautions are taken:

a. The drill cuttings may be disposed within the borehole subject to the following:

   i. The bore will not be used for the installation of a monitoring well (cuttings may be used to backfill boreholes resulting from soil sampling);

   ii. The bore did not penetrate an aquitard nor an aquiclude;

   iii. Backfilling the borehole with cuttings will not create a significant path for vertical movement of contaminants. Soil additives (bentonite) may be added to the cuttings to reduce permeability;

iv. Six (6) inches of cohesive, compacted soil will be placed over the area of the bore; and

v. Cuttings not disposed in the borehole will be managed as described below.

b. In general, the cuttings or spoil may be disposed within the confines of the Class 2 site provided all other precautions presented below are taken.

c. Cuttings and spoil from several wells which are chemically compatible (see Item e below) may be collected and disposed at one on-site location provided all other precautions presented below are taken.

d. The cuttings and spoil may be stored temporarily on-site to allow for dewatering prior to disposal. Water which results from the dewatering may be allowed to infiltrate the site. During storage and upon disposal, cuttings and spoil shall be covered to prevent the release of chemical contaminants into the air or surface waters which might escape the site. Generally, six (6) inches of a compacted, cohesive soil will be a sufficient cover.

e. To ensure that contaminated cuttings may be safely managed on-site, the following precautions shall be taken:

i. If pure wastes are present in the cuttings, the material shall be sampled and analyzed to ensure chemical compatibility with other cuttings before placing the materials in a common storage/disposal area;

ii. Cuttings which are stored/disposed on-site in bulk (not in containers) shall be monitored for volatile emissions and for fugitive dust emissions. Monitoring instruments available at the site as determined by the site-specific Health and Safety Plan (HASP) may generally be sufficient. If any action level specified in the HASP is exceeded, corrective actions such as interim cover, placement in containers, etc., shall be implemented promptly.

f. Drill cuttings shall be handled and disposed of in a manner that does not pose a threat to health and the environment.

Drill cuttings and spoil generated during Remedial Investigations on a Class 2 inactive hazardous waste site may also be disposed at a properly permitted treatment, storage, or disposal facility. Representative samples of cuttings and spoils will have to be analyzed to determine if the materials are a "hazardous waste" or a "solid waste" and to ensure proper classification, treatment, and disposal.

Cuttings and spoils sent off site for disposal shall be transported by a hauler licensed in accordance with 6 NYCRR Part 364, and if determined to be a hazardous waste, the waste shipment shall be accompanied by a manifest in accordance with 6 NYCRR Part 372. The project manager shall be responsible for implementing sufficient controls over the work, to ensure the wastes are properly disposed. Such controls include issuance and collection of "trip tickets", collection of receipts for tipping fees, etc.

IV. Disposal of Cuttings and Spoil Generated During Remedial Investigations Near or Adjacent to a Class 2 Site

Drill cuttings and spoils generated during Remedial Investigations near or adjacent to a Class 2 Site are not presumed to be hazardous wastes nor solid wastes until such materials are first sampled and analyzed.

Such materials shall be collected and transported to the Site for storage/disposal unless an alternate disposal method is proposed and determined to be acceptable at the project review for the RI/FS work plan. Transport need not be accompanied by a manifest nor must a licensed hauler be used. Such materials may be disposed on the Class 2 Site provided all the precautions detailed in Section III above are satisfied.

Drill cuttings and spoils generated during Remedial Investigations near or adjacent to a Class 2 Site may also be placed in containers and transported to an approved treatment, storage, or disposal facility. In order to determine proper containers, treatment, storage, or disposal, representative samples of the materials shall first be collected and analyzed. If the materials are determined to be hazardous, disposal off site shall be at a properly permitted treatment, storage, or disposal facility. Hazardous wastes shall be accompanied by a manifest and shall be transported by a licensed hauler. All drill cuttings and spoils generated during remedial investigations for which there is no known "Site" shall be placed in containers, sampled, analyzed and transported to a permitted facility for proper treatment, storage or disposal.

If the drill cuttings and spoils are determined to be non-hazardous, off-site disposal is allowed at any permitted solid waste management facility authorized to receive such solid wastes. Such solid wastes shall be transported by a licensed hauler. The project manager shall be responsible for implementing sufficient controls over the work, to ensure the wastes are properly disposed. Such controls include issuance and collection of "trip tickets", collection of receipts for tipping fees, etc.

V. Implementation

The procedures described in this TAGM shall serve as guidance to all Project Managers as of the date of the TAGM. It shall be the responsibility of the Project Manager to arrange for the disposition of drill cuttings before completing the field work related to a remedial investigation.

cc: E. Sullivan
D. Markell
A. DeBarbieri
C. Goddard
R. Tramontano, DOH
E. McCandless
A. Fossa
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J. Colquhoun
M. Keenan
Regional Directors
Regional Engineers
Regional Solid and Hazardous Waste Engineers
Regional Citizen Participation Specialists
D. Ritter

Attachment A-5

Data Usability Summary Report (DUSR) Guidelines

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

New York State Department of Environmental Conservation
Division of Environmental Remediation

Guidance for the Development of Data Usability Summary Reports

Background:

The Data Usability Summary Report (DUSR) provides a thorough evaluation of analytical data without the costly and time consuming process of third party data validation. The primary objective of a DUSR is to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use.

Though the substitution of a DUSR for a full third party data validation may seem to be a relaxation of the Division's quality assurance requirements, this is definitely not the case. The development of the DUSR must be carried out by an experienced environmental scientist, such as the project Quality Assurance Officer, who is fully capable of conducting a full data validation. Furthermore, the DUSR is developed from a full New York State Department of Environmental Conservation Analytical Services Protocol (NYSDEC ASP) Category B or a United States Environmental Protection Agency Contract Laboratory Protocol (USEPA CLP) deliverables package.

The DUSR and the data deliverables package will be reviewed by the Division's Quality Assurance Unit. In most cases, we expect that this review will result in agreement or with only minor differences that can be easily reconciled. If data validation is found to be necessary (e.g. pending litigation) this can be carried out at a later date on the same data package used for the development of the DUSR.

Personnel Requirements:

The Environmental Scientist preparing the DUSR must hold a Bachelors Degree in a relevant natural or physical science or field of engineering and must submit a resume to the Division's Quality Assurance Unit documenting experience in environmental sampling, analysis and data review.

Preparation of a DUSR:

The DUSR is developed by reviewing and evaluating the analytical data package. During the course of this review the following questions must be asked and answered:

1. Is the data package complete as defined under the requirements for the NYSDEC ASP Category B or USEPA CLP deliverables?

2. Have all holding times been met?

3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?

4. Have all of the data been generated using established and agreed upon analytical protocols?

5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?

6. Have the correct data qualifiers been used ?

Once the data package has been reviewed and the above questions asked and answered the DUSR proceeds to describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed. The DUSR shall also include recommendations on resampling/reanalysis. All data qualifications must be documented following the NYSDEC ASP '95 Rev. guidelines.

Contact the Division of Environmental Remediation Quality Assurance Group at (518) 457- 9280, with any questions on the preparation of a DUSR.

Revised 09/97

APPENDIX B

Health and Safety Plan

March 2003

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

BBL

APPROVALS AND ACKNOWLEDGMENTS

APPROVALS

I have read and approved this HASP with respect to project hazards, regulatory requirements, and BBL procedures.

Project Name: West 19th Street Development Site
Project Number:

Project Manager/Date	HSO/Date
HSS/Date	Site Supervisor/Date

ACKNOWLEDGMENTS

The final approved version of this HASP has been provided to the Site Supervisor. I acknowledge my responsibility to provide the Site Supervisor with the equipment, materials and qualified personnel to implement fully all safety requirements in this HASP. I will formally review this plan with the HS Staff every six months until project completion.

Project Manager	Date

I acknowledge receipt of this HASP from the Project Manager, and that it is my responsibility to explain its contents to all site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the Project Manager and/or the Health and Safety Representative.

Site Supervisor	Date

HEALTH & SAFETY PLAN ACKNOWLEDGEMENT

I have read the Site-Specific Health and Safety Plan, or its contents have been presented to me, and I understand the contents and I agree to abide by its requirements.

Name (Print)	Signature	Representing	Date

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I Environmental Operations Audit Form

1. Objectives

The objective of this plan is to provide a mechanism for establishing safe working conditions during the implementation of site investigation activities at the West 19th Street Development Site located in New York, New York. Site activities may include the following components:

- Mobilization;
- Site Reconnaissance;
- Soil Boring Installation;
- Soil Sampling;
- Monitoring Well Installation/Decommissioning;
- Well Development and Groundwater Sampling;
- In-Situ Hydraulic Conductivity Testing/ Specific Capacity Testing;
- Equipment Cleaning and Decontamination; and
- Demobilization.

The safety organization, procedures, and protective equipment specified herein have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.1 Site and Facility Description

The West 19th Street Development site located between West 18th and West 19th Streets and 10th and 11th Avenues in the Borough of Manhattan, New York City (Figure 1). The development site is one parcel of the West 18th Street Gas Works Site, which is currently under a Voluntary Agreement (VCA) between the New York State Department of Environmental Conservation (NYSDEC) and the Consolidated Edison Company of New York, Inc. effective August 25, 2002. The site was used as a storage area for the Consolidated (Manhattan) Gas Company Works (a manufactured gas plant (MGP)) between 1895 and 1921 followed by use as a wagon yard and auto garage to its present use as a truck parking garage. Three 1,000 gallon underground storage tanks (USTs) were associated with the auto garage. Currently the site is occupied by a three-story brick building that is used as a mid- to long-term truck parking garage.

Based on the site background, a preliminary site investigation was performed in October 2002 to assess whether MGP and/or petroleum-related constituents were present in soil and groundwater at concentrations that would require remediation. The preliminary site investigation included the collection of eight soil samples and four groundwater samples from eight soil borings at the site (Figure 2). The soil borings ranged in depth from 12 to 20 feet below the concrete floor surface of the parking garage. Subsurface soils observed included urban fill to a depth of approximately 4 feet followed by gravelly sands with some silt to depth ranging from approximately 8

to 12 feet. Below 12 feet, the silt content of the sands increased, and a clay layer was observed in boring B6 from 12 to 16 feet in depth. This clay layer was not observed in the other soil borings; however, poor sample recovery limited boring penetration depths. Saturated soils (groundwater) were encountered in the borings at depths between 7 and 8 feet. Non-aqueous phase liquids (NAPLs) were not observed in any of the borings. Odors ranging from slight to strong were observed at all borings at depths ranging between 2 and 12 feet. Elevated PID readings were typically observed in each boring between depths of 6 and 10 feet. The soil and groundwater samples were analyzed by for target compound list (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). The VOCs detected in the soil and groundwater are indicative of gasoline and kerosene range petroleum and MGP by-product tar. The SVOCs detected in the soil and groundwater (phenolic compounds and polycyclic aromatic hydrocarbons [PAHs]) are indicative of MGP by-product tar.

1.2 Policy Statement

The policy of BBL is to provide a safe and healthful work environment for all employees. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety is that all accidents and injuries are preventable. BBL will take every reasonable step to eliminate or control hazards in order to minimize the possibility of injury, illness, or accident.

This Health and Safety Plan (HASP) prescribes the procedures that must be followed during activities at the site. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Representative. This document will be periodically reviewed to ensure that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification to the HASP. Such changes will be completed in the form of an addendum to this plan or a revision of the plan.

The provisions of this plan are mandatory for all BBL personnel and BBL's subcontractors assigned to the project. All visitors to the work site must also abide by the requirements of the plan. It should be acknowledged that the employees of other consulting and/or contracted companies may work in accordance with their own independent HASPs. Subcontractor HASPs, if prepared, must meet the requirements of this HASP.

1.3 References

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, United States Environmental Protection Agency (USEPA) regulations, and BBL Health and Safety policies and procedures. This plan follows the guidelines established in the following:

- Standard Operating Safety Guides, USEPA (Publication 9285.1-03, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH, OSHA, USCG, USEPA (86-116, October 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.120.
- Title 29 of the Code of Federal Regulations (CFR), Part 1926.
- Pocket Guide to Chemical Hazards, DHHS, PHS, CDC, NIOSH (1994).

- Threshold Limit Values, ACGIH (1995).
- Quick Selection Guide to Chemical Protective Clothing, Forsberg, K. and S.Z. Mansdorf, 2nd Ed. (1993).
- Health and Safety Policies and Procedures Manual, BBL.

1.4 Definitions

The following definitions are applicable to this HASP:

Site - the area where the work is to be performed by BBL personnel. The site includes the exclusion zone (EZ), contaminant reduction zone (CRZ), and support zone (SZ).

Project - all on-site work performed under the Work Plan or addenda thereto.

Subcontractor - includes subcontractor personnel hired by BBL.

On-Site Personnel - all client personnel, BBL, and subcontractor personnel directly involved with the project activities.

Visitor - all other personnel, except the on-site personnel. All visitors must receive approval to enter the site.

Exclusion Zone (EZ) - any portion of the site where hazardous substances are, or are reasonably suspected to be, present in the air, water, or soil.

Contamination Reduction Zone (CRZ) - area between the Exclusion Zone and Support Zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.

Support Zone (SZ) - all areas of the site excluding the EZ and CRZ. The SZ surrounds the immediate area where project activities are underway. Support equipment is located in this zone.

2. Roles and Responsibilities

2.1 All Personnel

All BBL and subcontractor personnel must adhere to these procedures during the performance of their work. Each person is responsible for completing tasks safely, and reporting any unsafe acts or conditions to his or her immediate supervisor or to the Site Supervisor (SS). No person may work in a manner that conflicts with these procedures. After due warnings, the PM will dismiss from the site any person who violates safety procedures.

All on-site personnel will receive training in accordance with 29 CFR 1910.120, and be familiar with the requirements and procedures contained in this document prior to the beginning of project operations.

The roles of key BBL personnel are outlined in the following sections. Key personnel and contacts are summarized in Table 2.1 at the end of this section.

2.2 Corporate Health and Safety Officer

The BBL Corporate Health and Safety Officer (CHSO) is responsible for all corporate health and safety aspects of the project. Inquiries regarding BBL procedures, project procedures, and other technical or regulatory issues should be addressed to this individual.

2.3 Regional Health and Safety Coordinator

The BBL Regional Health and Safety Coordinator (RHSC) is also responsible for technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding BBL procedures, project procedures, and other technical or regulatory issues also may be addressed to this individual. The RHSC will conduct semi-annual inspections/audits of the project site, including a review of periodic inspections conducted by the SS/HSS and a comprehensive review of site conditions. Any changes or addenda to this HASP must be approved by the RHSC or the CSA.

2.4 Health and Safety Supervisor (HSS)

The project HSS is responsible for technical health and safety aspects of the project, including preparation, review, and approval of this HASP. Inquiries regarding BBL procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. Any changes or addenda to this HASP must be approved by the HSS, who is also responsible for coordinating on-site health and safety issues. The HSS will advise the PM on health and safety issues, and will establish and oversee the project air-monitoring program. The HSS is the primary site contact on occupational health and safety matters.

It is the responsibility of the HSS or designated alternate to:

- Provide on-site technical assistance, if necessary;

- Conduct site and personal air monitoring, including equipment maintenance and calibration. Where necessary, submit samples to an American Industrial Hygiene Association (AIHA) accredited laboratory;
- Prepare material for site safety orientation training and daily safety meetings;
- Verify that on-site personnel have received the required physical examinations and medical certifications;
- Review site activities with respect to compliance with the HASP;
- Maintain required health and safety documents and records; and
- Assist, if necessary, the Site Supervisor (SS) in the instruction of field personnel on the hazards, and equipment procedures required.

2.5 Project Manager

The PM is ultimately responsible for verifying that all project activities are completed in accordance with the requirements and procedures in this plan. The PM is responsible to provide the Site Supervisor (SS) with the equipment, materials, and qualified personnel to implement fully all safety requirements in this HASP.

It is the responsibility of the PM to:

- Review safety inspection reports;
- Thoroughly investigate all accidents and incidents on the project;
- Approve, in writing, addenda or modifications of this HASP; and
- Suspend work if health- and/or safety-related concerns arise.

2.6 Site Supervisor

The SS is responsible for implementation of the HASP, including communication of site requirements to all on-site project personnel (including subcontractors). The SS will be responsible for informing the PM of any changes in the work plan or procedures so that those changes may be addressed in the HASP. Other responsibilities include:

- Consultation with the HSS on site safety and health issues;
- Conducting a daily safety inspection of the site, and completing a weekly inspection form (Attachment B);
- Stopping work, as required, to ensure personal safety and protection of property, or in cases of life- or property-threatening safety non-compliance;
- Obtaining a site map and determining and posting routes to medical facilities and emergency telephone numbers, and arranging emergency transportation to medical facilities;

- Notifying local public emergency officers of the nature of the site operations, and posting of their telephone numbers in an appropriate location;
- Observing on-site project personnel for signs of chemical or physical trauma;
- Verifying that all site personnel have the proper medical clearance, have met applicable training requirements, and have training documentation available in the office;
- Verifying that all on-site personnel are made aware of the provisions of the HASP and have been informed of the nature of any physical, chemical, and biological hazards associated with the site activities;
- Verifying that on-site personnel and visitors have received the required training, including instructions for safety equipment and personal protective equipment (PPE) use;
- Suspending work if health- and/or safety-related concerns arise; and
- Issuing/obtaining required work permits.

2.7 Subcontractors

On-site subcontractors and their personnel must understand and comply with the site requirements established in this HASP. Subcontractors may prepare their own task-specific HASPs, which must be consistent with the requirements of this HASP. Subcontractor personnel must attend and participate in the Daily Safety Meetings and all other site safety meetings.

2.8 On-Site Personnel and Visitors

All personnel must read and acknowledge their under-standing of this HASP, abide by the requirements of the plan, and cooperate with site supervision in ensuring a safe work site. Site personnel will immediately report any of the following to the SS or HSS:

- Accidents and injuries, no matter how minor;
- Unexpected or uncontrolled release of chemical substances;
- Symptoms of chemical exposure;
- Unsafe or malfunctioning equipment;
- Changes in site conditions that may affect the health and safety of project personnel;
- Damage to equipment or property; and
- Situations or activities for which they are not properly trained.

Table 2-1
Key Personnel

BBL Personnel		
Role	**Name**	**Address/Telephone No.**
Site Health and Safety Supervisor/Field Supervisor	Greg Kendall	8 South River Road Cranbury, New Jersey 08512 (609) 860-0509
Project Manager	Greg Albright	8 South River Road Cranbury, New Jersey 08512 (609) 860-0509
Project Director	Nancy Gensky	200 South Wacker Drive Suite 3100 Chicago, IL 60606-5802 (312) 674-4841
Project Officer	David Ulm	6723 Towpath Road Syracuse, New York 13214 (315) 446-9120
Corporate Health and Safety Officer	Jay D. Keough, CIH	8 South River Road Cranbury, NJ 08512 (609) 860-0590
Regional Health and Safety Coordinator	Greg Ertel, CIH, CSP	155 Corporate Woods, Suite 150 Rochester, NY 14623 (716) 292-6740

3. Project Hazards and Control Measures

3.1 Job Hazard Assessment

The scope of site investigations at the site may include the following field activities:

- Mobilization;
- Site Reconnaissance;
- Soil Boring Installation;
- Soil Sampling;
- Monitoring Well Installation/Decommissioning;
- Well Development and Groundwater Sampling;
- Site Surveying Activities;
- In-situ Testing;
- Equipment Cleaning and Decontamination; and
- Demobilization.

This section identifies potential safety, health, and environ-mental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the work site to identify hazards that may affect site personnel, the community, or the environment. The SS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment, or performance of the project. The SS will keep BBL personnel and subcontractors informed of the changing conditions, and the PM will write or approve addenda or revisions to this HASP as necessary.

3.2 Field Activities, Hazards, Control Procedures

3.2.1 Mobilization/Site Reconnaissance

Site mobilization/site reconnaissance will include establishing sample locations, determining location of utilities and other installations, and establishing work zones. A break area will be set up outside of regulated work areas. During this initial phase, project personnel will walk the site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this plan.

The hazards of this phase of activity are associated with heavy equipment movement, manual materials handling, installation of temporary on-site facilities, and manual site preparation.

Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion and laceration hazards. The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders and snakes. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil-.

Exposure to soil containing site constituents is possible. Depending on the nature of the work activity, airborne particulate and/or organic vapors may be monitored according to Section 8, Air Monitoring. In accordance with Section 5, decisions on personal protective equipment (PPE) for the chemical hazards will be based on measurements made before and during work activities. Control procedures for environmental and general hazards are discussed in Section 4.0.

Installation of temporary field office or support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to manual lifting and moving of materials.

3.2.2 Field Sampling Activities

Field sampling operations consist of the collection of soil, product and groundwater samples for subsequent analysis and evaluation of potential site impact. The physical hazards of these operations are primarily associated with the sample collection methods and procedures utilized.

Samples of soil and groundwater will be obtained to evaluate the extent of potential site impact. Inhalation and absorption (contact) of constituents are the primary routes of entry associated with soil, product, and groundwater sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. To control dermal exposure during soil and groundwater sampling activities, a minimum of Modified Level D protection (See Section 5.0) will be worn. Air sampling may be conducted during soil and groundwater sampling to assess the potential for exposure to airborne constituents. If the results of air monitoring indicate the presence of organic vapors in a concentration exceeding the site action level for Modified Level D, personnel will upgrade to Level C protection. Refer to Section 8 for a description of air monitoring requirements and action levels. A description of each level of protection is included in Section 5.

The collection of soil and groundwater samples involves advancing soil borings with a drill rig. The equipment poses a hazard if it is not properly operated. The presence of overhead utilities and underground obstacles poses a hazard if they are contacted by the drill rig. Safety hazards and procedures associated with drilling activities are presented in the following section.

If conducted, all on-site analysis of samples will be conducted in accordance with standard safety operating procedures for laboratory activities and 29 CFR 1910.1450.

3.2.3 Drilling Safety

3.2.3.1 Drilling Hazards

This task includes the installation of soil borings and groundwater monitoring wells at specified locations. Prior to monitoring well installation, soil borings will be drilled using the hollow-stem auger or direct-push drilling technique. After the wells are completed, the wells will be developed using the standard operating procedures.

The primary physical hazards for this project are associated with the use of the drilling rig and supporting vehicles. Rig accidents can occur as a result of improperly placing the rig on uneven or unstable terrain, or failing to adequately secure the rig prior to the start of operations. Underground and overhead utility lines can create hazardous conditions if contacted by drilling equipment. Rotating augers, tools, and equipment such as elevators, cat lines, and wire rope have the potential for striking, pinning, or cutting personnel. The Underground/Overhead Utility Checklist in Appendix B must be completed prior to any subsurface activities.

Wire Rope: Worn or frayed wire rope presents a laceration hazard if loose wires protrude from the main bundle.

Cat Lines: Cat lines are used on drilling rigs to hoist material. Accidents that occur during cat line operations may injure the employee doing the rigging as well as injure the operator. Minimal hoisting control causes sudden and erratic load movements, which may result in hand and foot injuries.

Working Surfaces: Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, and slips and falls.

Derrick Operations: The derrick man on a well drilling operation performs his tasks from various elevated work platforms in the mast. He is exposed to falls when not utilizing fall protection equipment while climbing the derrick ladder, while working with the pipe stands, and while moving from the ladder to his platform station.

Materials Handling: The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.

3.2.3.2 Drilling Safety Procedures

Drill Crews: All drillers performing work must possess required state or local licenses to perform such work. All members of the drill crew shall receive site specific training prior to beginning work.

The driller shall be responsible for the safe operation of the drill rig as well as the crew's adherence to the requirements of this HASP. The driller must ensure that all safety equipment is in proper condition and is properly used. The members of the crew shall follow all instructions of the driller, wear all personal protective equipment, and be aware of all hazards and control procedures. The drill crews shall participate in the Daily Safety Meetings and be aware of all emergency procedures.

Rig Inspection: Each day, prior to the start of work, the drill rig and associated equipment shall be inspected by the driller and/or drill crew. The following items shall be inspected:

- Vehicle condition;
- Proper storage of equipment;
- Condition of all wire rope;
- Fire extinguisher; and
- First Aid Kit.

Drill Rig Set Up: The drill rig shall be properly blocked and leveled prior to raising the derrick. The wheels which remain on the ground must be chocked. The leveling jacks shall not be raised until the derrick is lowered. The rig shall be moved only after the derrick has been lowered. The drill rig must be grounded prior to beginning drilling activities at each boring location.

Site Drilling Rules: Before drilling, the existence and location of underground pipe, electrical equipment and gas lines must be determined. The underground utilities will be located and identified by contacting the Underground Facilities Protection Organization (UFPO) or equivalent one-call service, reviewing available drawings showing locations of on-site underground utilities, and by contacting the appropriate client representative to mark the location of underground utilities. The Underground/Overhead Utilities Checklist in Attachment C will be used to document this process.

BBL's site supervisor will conduct a site walk-over to visually identify each location where sampling and drilling activities are to be completed during the project. Documentation that nearby utilities have been marked on the ground, and that the drill site has been cleared shall be in the possession of the SS or HSS prior to commencement of the intrusive investigation at that point of the site (Attachment C).

No ignition sources are permitted if the ambient airborne concentration of flammable vapors exceeds 10% of the lower explosive limit (LEL) when drilling. A combustible gas indicator will be used to make this determination (Section 8).

Operations must be suspended and corrective action taken if the airborne flammable concentration reaches 10 percent of LEL in the immediate area (a one-foot radius) of the point of drilling.

Combustible gas readings of the general work area will be made regularly (Section 8).

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the catline be used as a personnel carrier.

At the end of each work day, drilling equipment will be moved to a location away from high-voltage electrical equipment and away from routes necessary to access high-voltage electrical equipment.

Overhead Electrical Clearances: If drilling is conducted in the vicinity of overhead power lines, the power to the lines must be deenergized, tested deenergized, marked up/guaranteed, and grounded or the equipment must be positioned and blocked such that no part, including cables can come within the minimum clearances as follows:

Nominal System Voltage	Minimum Required Clearance
0-50 kV	10 feet
51-100 kV	12 feet
101-200 kV	15 feet
201-300 kV	20 feet
301-500 kV	25 feet
501-750 kV	35 feet

When the drill rig is in transit, with the boom lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50 kV, 10 feet for voltages of 50 kV to 345 kV, and 16 feet for voltages above 345 kV.

Rig Set Up: All well sites will be inspected by the driller prior to the location of the rig to ensure a stable surface exists. This is especially important in areas where soft, unstable terrain is common.

All rigs will be properly blocked and leveled prior to raising the derrick. Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that differential settling of the rig does not occur.

When the ground surface is soft or otherwise unstable, wooden blocks, at least 24" by 24" and 4" to 8" thick shall be placed between the jack swivels and the ground. The emergency brake shall be engaged, and the wheels that are on the ground shall be chocked.

Hoisting Operations: Drillers should never engage the rotary clutch without watching the rotary table, and ensuring it is clear of personnel and equipment.

Unless the drawworks is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

Drill pipe, auger strings or casing should be picked up slowly.

Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrick man has signaled that he may safely hoist the pipe.

During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor, and no one should be on the rig or derrick.

The brakes on the drawworks of every drilling rig should be tested by each driller each day. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the borehole whenever any wire line device is being run.

Hoisting control stations should be kept clean and controls labeled as to their functions.

Catline Operations: Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the catline.

The cathead area must be kept free of obstructions and entanglements.
The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or catline which is under tension.

Employees rigging loads on catlines shall:

- Keep out from under the load,
- Keep fingers and feet where they will not be crushed,
- Be sure to signal clearly when the load is being picked,
- Use standard visual signals only and not depend on shouting to coworkers,
- Make sure the load is properly rigged, since a sudden jerk in the catline will shift or drop the load.

Wire Rope: When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or resocketed. Special attention shall be given to the inspection of end fittings on boom support, pendants, and guy ropes.

Wire rope removed from service due to defects shall be cut up or plainly marked as being unfit for further use as rigging.

Wire rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope; the clip nuts shall be re-tightened immediately after initial load carrying use and at frequent intervals thereafter.

When a wedge socket fastening is used, the dead or short end of the wire rope shall have a clip attached to it or looped back and secured to itself by a clip; the clip shall not be attached directly to the live end.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted.

Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, shall consist of one continuous piece without knot or splice.

An eye splice made in any wire rope shall have not less that five full tucks.

Wire rope shall not be secured by knots except on haul back lines on scrapers.

Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire clips or knots.

Wire rope clips shall not be used to splice rope.

Pipe/Auger Handling: Pipe and auger sections shall be transported by cart or carried by two persons. Individuals should not carry auger or pipe sections without assistance.

Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.

Slip handles should be used to lift and move slips. Employees should not be permitted to kick slips into position.

When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.

Pipe and augers stored in racks, catwalks or on flatbed trucks should be chocked or otherwise secured to prevent rolling.

3.2.4 Well Development

Field operations consist of developing the well after installation to remove material or contaminants from the well prior to its being placed in service. The physical hazards of these operations are primarily associated manipulation and operation of the pump and its associated equipment. Other physical hazards of this phase of activity are associated with site conditions and manual materials handling. Equipment operation may present noise hazards, vibration hazards, and potential for employee contact with hot surfaces. Manual materials handling may cause blisters, sore muscles, and joint and/or skeletal injuries. The work area presents "slip, trip and fall" hazards from scattered debris and wet or irregular walking surfaces. Wet weather may cause wet, muddy, and/or slick walking surfaces.

For well development, Modified Level D protection should be sufficient for dermal protection unless, based upon air monitoring and conditions present during sampling activities, the Site Supervisor determines that a higher level of protection is necessary. Air sampling may be conducted during well development to assess the potential for exposure to potential contaminants. If the results of air monitoring indicate its presence in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 8 for a description of air monitoring requirements and action levels. A description of each level of protection is included in Section 5.

Environmental hazards may include aggressive fauna, such as mosquitoes; weather, such as sunburn, lightning, rain, and heat; and pathogens, such as blood-borne pathogens.

3.2.5 Water Level Measurement Activities

At each of the monitoring wells, field personnel will obtain depth-to-water measurements using an electronic water level indicator. The hazards associated with these activities are primarily associated with the working surfaces and contact with groundwater.

The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil-. For water level measurement, Modified Level D protection should be sufficient for dermal protection unless, based upon air monitoring and conditions present during activities, the Site Supervisor determines that a higher protection is necessary. For product level measurement, Modified Level D must be worn whenever field personnel may contact free product. Air sampling may be conducted to assess the potential for inhalation of potential contaminants. If the results of air monitoring indicate its presence in a concentration causing concern, personnel will upgrade to Level C

protection. Refer to Section 8 for a description of air monitoring requirements and action levels. A description of each level of protection is included in Section 5.

3.2.6 Groundwater Sampling Activities

The groundwater sampling program will involve uncapping, purging (pumping water out of the well), and sampling existing and newly installed monitoring wells. A mechanical pump may be utilized to purge the wells and can be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis.

During the course of this project, several different sampling methodologies may be utilized based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling methods are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards of these types of sampling methods are generally limited to strains/sprains resulting from hand bailing and potential eye hazards resulting from water sampling activities.

Inhalation and absorption (contact) of constituents are the primary routes of entry associated with groundwater sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. To control dermal exposure during sampling activities, a minimum of Modified Level D protection (See Section 5) will be worn. Air sampling may be conducted during soil and groundwater sampling to assess the potential for exposure to airborne constituents. If the results of air monitoring indicate the presence of organic vapors in a concentration exceeding the site action level for Modified Level D, personnel will upgrade to Level C protection. Refer to Section 8 for a description of air monitoring requirements and action levels. A description of each level of protection is included in Section 5.

In addition to the safety hazards specific to sampling operations, hazards associated with the operation of vehicles, particularly large vehicles, in a small area will be a concern. Of particular concern will be the backing up of trucks, excavation equipment, and other support vehicles.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders and snakes. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil-.

Exposure to materials containing site constituents is possible. Airborne organic vapors will be monitored according to Section 8, Air Monitoring. In accordance with Section 5, decisions on personal protective equipment (PPE) for the chemical hazards will be based on measurements made before and during work activities. Control procedures for environmental and general hazards are discussed in Section 4.0.

If conducted, all on-site analysis of samples will be conducted in accordance with standard safety operating procedures for laboratory activities and 29 CFR 1910.1450.

3.2.7 In-situ Testing

This task includes the in-situ testing of wells for hydraulic properties using in-situ hydraulic conductivity test techniques or specific capacity tests. The testing will involve uncapping the well, placing slugs or

instrumentation into the well, obtaining water levels, and/or pumping water out of the well. A mechanical pump may be utilized to pump the wells and can be hand-, gas-, or electric-operated.

Different testing methodologies may be utilized based on equipment accessibility and the types of hydrogeologic conditions. The primary hazards associated with the testing methods are not potentially serious; however, other operations in the area, or the conditions under which tests must be conducted, may present chemical and physical hazards. The hazards of these types of testing methods are generally limited to strains/sprains resulting from equipment handling and potential eye hazards resulting from water contact.

Inhalation and absorption (contact) of constituents are the primary routes of entry associated with groundwater testing due to the manipulation of sample media and equipment, manual transfer of media into containers, and proximity of operations to the breathing zone. To control dermal exposure during sampling activities, a minimum of Modified Level D protection (See Section 5) will be worn. Air sampling may be conducted during testing to assess the potential for exposure to airborne constituents. If the results of air monitoring indicate the presence of organic vapors in a concentration exceeding the site action level for Modified Level D, personnel will upgrade to Level C protection. Refer to Section 8 for a description of air monitoring requirements and action levels. A description of each level of protection is included in Section 5.

In addition to the safety hazards specific to testing operations, hazards associated with the operation of vehicles, particularly large vehicles, in a small area will be a concern. Of particular concern will be the backing up of trucks, excavation equipment, and other support vehicles.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders and snakes. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil-.

Exposure to materials containing site constituents is possible. Airborne organic vapors will be monitored according to Section 8, Air Monitoring. In accordance with Section 5, decisions on personal protective equipment (PPE) for the chemical hazards will be based on measurements made before and during work activities. Control procedures for environmental and general hazards are discussed in Section 4.0.

If conducted, all on-site analysis of samples will be conducted in accordance with standard safety operating procedures for laboratory activities and 29 CFR 1910.1450.

3.2.8 Equipment Decontamination

All equipment will be decontaminated before leaving the site using visual inspection to verify that COCs have been removed. In addition all operations that have the potential to generate or release hazardous material will be conducted in a controlled area using the appropriate engineering controls. Specific Decontamination techniques will be established based on site conditions. Decontamination procedures will be reviewed with all personnel on-site. We anticipate constructing a decontamination pad on a suitable surface (concrete or paved area) with polyethylene sheeting or other appropriate containment system. Pressure washing with manual scrub brushing as needed will be used to decon equipment. COC impacted equipment will be determined "clean" by using visual inspection of all equipment.

The decon facility will be inspected on a daily basis for evidence of leaks or loss of integrity to the containment system. If any deficiencies are noted they will be corrected immediately and documented on the attached Daily

Project Report (Attachment F). All wastewater that is generated on-site will be contained in the decon system for characterization and determination of disposal options.

Personnel involved in decontamination activities may be exposed to skin contact with contaminated materials and chemicals brought to the site as part of the project work. All personnel will review the operating procedures and PPE prior to decontamination. The pressure washer and decon containment facility will be inspected daily prior to use. Personnel involved in decontamination activities must wear PPE that is one level below the level worn by personnel working in the EZ or as specified in Section 5.0.

3.2.9 Demobilization

Demobilization will involve the removal of all tools, equipment, supplies, and vehicles brought to the site. The physical hazards of this phase of activity are associated with heavy equipment operation and manual materials handling. Heavy equipment operation presents noise and vibration hazards and hot surfaces. Manual materials handling and manually working with soils may cause blisters, sore muscles, joint and skeletal injuries. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Freezing weather hazards include frozen, slick and irregular walking surfaces. Wet weather may cause wet, muddy, slick walking surfaces.

Exposure to soil and water containing site constituents is possible. Airborne particulate and organic vapors will be monitored according to Section 8, Site Monitoring. In accordance with Section 5, decisions on personal protective equipment (PPE) for the chemical hazards will be based on measurements made prior to and during work activities.

Environmental hazards include aggressive fauna, such as ticks, fleas, mosquitoes, wasps, and spiders; weather, such as sunburn, lightning, rain, and heat-related illnesses. Control procedures for these hazards are discussed in Section 4.0.

3.3 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to soil and groundwater containing site constituents of concern (COC). Site COC may include:

VOC	SVOC
Benzene	Acenaphthene
Ethylbenzene	Acenaphthylene
Toluene	Anthracene
Styrene	Benz(a)anthracene
Xylenes	Benzo(a)pyrene
	Benzo(b)fluoranthene
	Benzo(k) fluoranthene
	Benzo(g,h,i)perylene
	Carbazole
	Chrysene
	Dibenzo(a,h) anthracene
	Dibenzofuran
	Fluoranthene

Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
2-Methylnaphthalene
Phenanthrene
Pyrene
2-Methylphenol
3,4-Methylphenol
2,4-Methylphenol

In addition concentrations of the following constituents were detected during the initial site investigation at relatively low concentrations:

- Acetone;
- 2-Butanone;
- Carbon disulfide;
- Methylene Chloride;
- Hexachlorobenzene;
- Diethylphthalate;
- Di-n-butyl phthalate; and
- Bis(2-ethylhexyl) phthalate.

Airborne concentrations of COC may be measurable during certain tasks, and may require air monitoring of potentially toxic atmospheres during such operations. Air monitoring requirements for site tasks are outlined in Section 8.1.

The potential for inhalation of site media containing COC during soil boring installation, well installation, soil sampling, surveying, and groundwater sampling is moderate. The potential for dermal contact with site media containing site COC during soil boring installation, well installation, surveying, soil sampling, in-situ testing, and groundwater sampling is moderate to high.

The material safety data for selected site COC are included in Attachment D.

4. General Safety Practices

4.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the site that is readily available to personnel, and all project personnel shall review the plan prior to starting work.
- Consume or use food, beverages, chewing gum, and tobacco products only in the SZ or other designated area outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required, and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and ensure closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COC, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COC must be reported to the SS or HSS immediately. If needed, medical attention should be sought.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COC, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COC-containing materials.
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles designated for this purpose.
- Removing soil containing site COC from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.
- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.
- Recognize emergency signals used for evacuation, injury, fire, etc.
- Report all injuries, illnesses, near misses, and unsafe conditions or work practices to the SS or HSS.
- Use the "buddy system" during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.

- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.

- Use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer's directions.

- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.

- The presence or consumption of alcoholic beverages or illicit drugs during the workday is strictly prohibited. Do not take prescription or over-the-counter drugs when assigned to tasks with the potential for absorption, inhalation, or ingestion of hazardous substances, unless given written approval by an appropriate health care professional.

- Remain upwind during site activities whenever possible.

4.2 Safe Performance Self-Assessment (SPSA)

All on-site personnel are required to perform a SPSA prior to beginning any activity. This three-step process requires each individual to:

- Assess the risk of the task to be performed. Ask the following questions:

  - What could go wrong?
  - What is the worst thing that could happen if something does go wrong?

- Analyze the ways the risk can be reduced. Ask the following questions:

  - Do I have all the necessary training and knowledge to do this task safely?
  - Do I have all the proper tools and PPE?

- Act to control the risk and perform the task safely.

  - Take the necessary action to perform the job safely.
  - Follow written procedures, and ask for assistance if necessary.

This process must be performed prior to beginning any activity, and must be performed after any near miss or other incident in order to determine if it is safe to proceed.

4.3 Incident Investigation

An incident is any of the following events: first aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions. All incidents shall be investigated within 24 hours and reported to the PM and the HSO.

The purpose of an II is to prevent the recurrence of a similar hazardous event. II investigates all incidents in the same manner. Using the information gathered during an II, appropriate measures will be taken to protect personnel from the hazard in question. The II form is included in Attachment E.

4.4 Incident Prevention Observation

The SS or the HSS will perform the IPO (see Attachment F for the IPO form). The purpose of the IPO is to identify and correct potential hazards, and to positively reinforce behaviors and practices that are correct. The SS or HSS must identify potential deviations from safe work practices that could possibly result in an incident, and take prompt corrective action. The IPO process steps are:

- Identify tasks that have the greatest potential for hazardous incidents;
- Review the standard procedure for completing the task;
- Discuss with the observed employee the task and the SS/HSS role in observing the task;
- Observe the employee completing the task;
- Reference the IPO form for criteria. Complete the form, documenting positive, as well as areas in need of improvement;
- Discuss the results of the IPO with the employee. Discuss corrective action necessary;
- Implement corrective action; and
- Communicate the results of the IPO and corrective action to the PM and the HSO.

4.5 Job Safety Analysis

A JSA is a tool used of identifying potential hazards and developing corrective or protective systems to eliminate the hazard. A JSA lists all the potential hazards associated with an activity. Hazards may be physical, such as lifting hazards or eye hazards, or environmental, such as weather or biological (stinging insects, snakes, etc.). Following the identification of the hazards associated with an activity, control measures are evaluated and protective measures or procedures are then instituted. JSAs are reviewed periodically to ensure that the procedures and protective equipment specified for each activity are current and technically correct. Any changes in site conditions and/or the scope of work may require a review and modification to the JSA in question. During this review process, comments on the JSA and its procedures should be obtained from personnel associated with the activity being analyzed.

4.6 Buddy System

- All on-site personnel must use the buddy system. Visual contact must be maintained between crew members at all times, and crew members must observe each other for signs of chemical exposure, heat or cold stress. Indications of adverse effects include, but are not limited to:
  - changes in complexion and skin coloration;

- changes in coordination;
- changes in demeanor;
- excessive salivation and pupillary response; and
- changes in speech pattern.

- Team members must also be aware of potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.
- Employees must inform their fellow team members of non-visible effects of exposure to toxic materials. The symptoms of such expo-sure may include:
  - headaches;
  - dizziness;
  - nausea;
  - blurred vision;
  - cramps; and/or
  - irritation of eyes, skin, or respiratory tract.
- If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.7 Emergency Equipment

Adequate emergency equipment for the activities conducted on-site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926. Personnel will be provided with access to emergency equipment including but limited to the following:

- Emergency eyewash and shower meeting ANSI Z358.1-1990.
- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 29 CFR 1926.
- Industrial First Aid Kit of adequate size for number of personnel on-site.

4.8 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular,

because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are the one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much and too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature. If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of work load and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, an employee suspected of being ill from heat stroke should not be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in the Table 4-1.

Table 4-1
Work/Rest Schedule

Adjusted Temperature[b]	Work-Rest Regimen Normal Work Ensemble[c]	Work-Rest Regimen Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (30.8°-32.2°C)	After each 150 minutes of work	After each 120 minutes of work

a. For work levels of 250 kilocalories/hour (Light-Moderate Type of Work)
b. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ıF = ta ıF + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
d. The information presented above was generated using the information provided in Table 8-10 of the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH, OSHA, USCG, USEPA (86-116, October 1985).

In order to determine if the work rest cycles are adequate for the personnel and specific site conditions additional monitoring of individuals heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period

Additional one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding of 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60□F) .
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek-type garments.
- All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

4.9 Cold Stress Hazards

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40□F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10□F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18oF. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in Table 4-2.

Table 4-2
Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

[This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents)].

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- ***Frost Nip or Incipient Frostbite*** - characterized by suddenly blanching or whitening of skin.
- ***Superficial Frostbite*** - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- ***Deep Frostbite*** - tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95 F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and 5) death. Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be

made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

Safety Precautions for Cold Stress Prevention

- For air temperature of 0°F or less, the hands should be protected by mittens. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.

- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.

- If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must ensure that their clothing is not wet as a consequence of sweating. If wet, field personnel must change into dry clothes prior to entering the cold area.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

- Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

Safe Work Practices

- Direct contact between bare skin and cold surfaces (< 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.

- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.

- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.

- Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.10 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, and other pests.

4.10.1 Tick-Borne Diseases

Lyme disease, erlichiosis, and Rocky Mountain Spotted Fever (RMSF) are diseases transmitted by ticks and occur throughout the United States during spring, summer, and fall.

Lyme Disease - The disease commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota and Wisconsin. Few cases have been identified in other states.

Erlichiosis - The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota and Wisconsin. Few cases have been identified in other states.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Rocky Mountain Spotted Fever - This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (Rickettsia rickettsii) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control - Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pants legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.10.2 Poisonous Plants

Poison ivy may be present in the work area. Personnel should be alerted to its presence, and instructed on methods to prevent exposure.

Control - The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water, and observed for signs of reddening.

4.10.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snake bites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control - To minimize the threat of snake bites and insect hazards, all personnel walking through vegetated areas must be aware of the potential for encountering snakes, and the need to avoid actions for potential encounters, such as turning over logs, etc. If a snake bite occurs, an attempt should be made to kill the snake for identification. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band, and washing the area around the wound to remove any unabsorbed venom.

4.11 Noise

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

Control - All personnel must wear hearing protection - with a Noise Reduction Rating (NRR) of at least 20 - when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audio-grams and training as to the causes and prevention of hearing loss. Noise monitoring is discussed in Sect-ion 8.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

4.12 Sanitation

Site sanitation will be maintained according to OSHA and Department of Health requirements.

4.12.1 Break Area

Breaks must be taken in the SZ, away from the active work area after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in the area other than the SZ.

4.13 Electrical Hazards

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, it must be performed by a qualified electrician.

General electrical safety requirements include:

All electrical wiring and equipment must be a type listed by UL, Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.

- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard regulations.
- Portable and semi portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension outlets must be equipped with ground fault circuit interrupters (GFCI).
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.

- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.14 Lifting Hazards

Back strain or injury may be prevented by using proper lifting techniques. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points which could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

4.15 Ladder Safety

When portable ladders are used to access an upper landing surface, the ladder side rails must extend at least 3 feet (1 m) above the upper landing surface to which the ladder is used to gain access. Or, when such an extension is not possible because of the ladder's length, then the ladder must be secured at its top to a rigid support that will not deflect, and a grasping device (such as a grabrail) must be provided to assist employees in mounting and dismounting the ladder. In no case must the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.

Additional ladder precautions include:

- Ladders must be maintained free of oil, grease, and other slipping hazards.
- Ladders must not be loaded beyond the maximum intended load for which they were built or beyond their manufacturer's rated capacity.

- Ladders must be used only for the purpose for which they were designed.

- Non-self-supporting ladders must be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).

- Wood-job-made ladders with spliced side rails must be used at an angle such that the horizontal distance is one-eighth the working length of the ladder.

- Fixed ladders must be used at a pitch no greater than 90° from the horizontal, as measured to the back side of the ladder.

- Ladders must be used only on stable and level surfaces unless secured to prevent accidental displacement.

- Ladders must not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement. Slip-resistant feet must not be used as a substitute for care in placing, lashing, or holding a ladder that is used on slippery surfaces, including, but not limited to, flat metal or concrete surfaces that are constructed so they cannot be prevented from becoming slippery.

- Ladders placed in any location where they can be displaced by workplace activities or traffic, such as in passageways, doorways, or driveways, must be secured to prevent accidental displacement, or a barricade must be used to keep the activities or traffic away from the ladder.

- The area around the top and bottom of ladders must be kept clear.

- The top of a non-self-supporting ladder must be placed with the two rails supported equally unless it is equipped with a single support attachment.

- Ladders must not be moved, shifted, or extended while occupied.

- Ladders must have non-conductive siderails if they are used where the employee or the ladder could contact exposed energized electrical equipment.

- The top, top step, or the step labeled that it or any step above it should not be used as a step.

- Cross-bracing on the rear section of stepladders must not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.

- Ladders must be inspected by the HSO for visible defects daily and after any occurrence that could affect their safe use.

- Portable ladders with structural defects such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components must either be immediately marked in a manner that readily identifies them as defective, or be tagged with "Do Not Use" or similar language, and withdrawn from service.

- Fixed ladders with structural defects such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; or corroded components must be withdrawn from service.

- Ladder repairs must restore the ladder to a condition meeting its original design criteria before the ladder is returned to use.

- Single-rail ladders must not be used.

- When ascending or descending a ladder, the user must face the ladder.

- Each employee must use at least one hand to grasp the ladder when progressing up and/or down the ladder.

- An employee must not carry any object or load that could cause the employee to lose balance and fall.

4.16 Traffic Safety

The project site may be located adjacent to a public roadway where exposure to vehicular traffic is likely. Traffic may also be encountered as vehicles enter and exit the area. To minimize the likelihood of project personnel and activities being affected by traffic, the following procedures will be implemented:

- Cones must be placed along the shoulder of the roadway starting 100 feet from the work area to alert passing motorists to the presence of personnel and equipment. A "Slow" or "Men Working" sign must be placed at the first cone. Barricades with flashing lights should be placed between the roadway and the work area.

- During activities along a roadway, equipment will be aligned parallel to the roadway to the extent feasible, facing into the oncoming traffic so as to place a barrier between the work crew and the oncoming traffic. All crewmembers must remain behind the equipment and the traffic barrier.

- All site personnel who are potentially exposed to vehicular traffic must wear an outer layer of orange warning garments, such as vests, jackets, or shirts. If work is performed in hours of dusk or darkness, workers will be outfitted with reflective garments, either orange, white (including silver-coated reflective coatings or elements that reflect white light), yellow, fluorescent red-orange, or fluorescent yellow-orange.

- The flow of traffic into and out of the adjacent business must be assessed and precautions taken to warn motorists of the presence of workers and equipment. Where possible, vehicles should be aligned to provide physical protection of people and equipment.

5. Personal Protective Equipment

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the level of constituents and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level.

5.1 Levels of Protection

Protection levels are determined based on constituents present in the work area. A summary of the levels is presented in this section.

5.1.1 Level D Protection

The minimum level of protection that will be required of BBLES personnel and subcontractors at the site will be Level D, which will be worn when site conditions or air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- Work clothing as prescribed by weather;
- Safety toe work boots, meeting ANSI Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Hard hat, meeting ANSI Z89; and
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a US EPA NRR of at least 20 dBA must be used).

5.1.2 Modified Level D Protection

Modified Level D will be used when airborne constituents are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Polyethylene Tyvek□ coveralls or equivalent;
- Safety-toe work boots meeting ANSI Z41;
- Latex booties over steel-toe work boots;
- Safety glasses or goggles meeting ANSI Z87;
- Hard hat meeting ANSI Z89;
- Face shield in addition to safety glasses or goggles when projectiles or splashes pose a hazard;
- Heavy nitrile (outer) gloves over nitrile sample gloves (inner); and
- Hearing protection (if necessary).

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of site constituents reaches or exceeds site action levels. The following equipment will be used for Level C protection:

- NIOSH-certified full-face, air purifying respirator with organic vapor and P-100 particulate combination cartridges, or equivalent.
- Polyethylene coated Tyvek□ coverall suit, ankles and cuffs taped to boots and gloves;
- Safety-toe work boots meeting ANSI Z41;
- Latex booties over steel-toe work boots;
- Safety glasses or goggles meeting ANSI Z87;
- Hard hat meeting ANSI Z89;
- Face shield in addition to safety glasses or goggles when projectiles or splashes pose a hazard;
- Heavy nitrile (outer) gloves over nitrile sample gloves (inner); and
- Hearing protection (if necessary).

5.1.4 Selection of PPE

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and HS professionals. The PPE used will be chosen to be effective against the compound(s) present on the site.

5.2 Site Respiratory Protection Procedures

Respiratory protection is an integral part of employee health and safety at the site due to the potential for airborne constituents. The site respiratory protection procedures will consist of the following:

- All site personnel who may use respiratory protection will have an assigned respirator.

- All site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air purifying respirator within the past 12 months.

- All site personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the HSS, prior to commencement of site work.

- Only cleaned, maintained, NIOSH-approved respirators are to be used on this site.

- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.

- Contact lenses are not to be worn on-site.

- All site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.

- Respirators will be inspected, and a negative pressure test per-formed prior to each use.

- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.3 Using PPE

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory when Modified Level D or higher PPE is used.

All people entering the EZ must put on the required PPE in accordance with the requirements of this plan. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of contamination.

5.3.1 Donning Procedures

These procedures are mandatory when Modified Level D or higher PPE is used on the project:

- Remove bulky outerwear. Remove street clothes and store in clean location;

- Put on work clothes or coveralls;

- Put on the required chemical protective coveralls or rain gear;

- Put on the required chemical protective boots or boot covers;

- Tape the legs of the coveralls to the boots with duct tape;

- Put on the required chemical protective gloves;

- Tape the wrists of the protective coveralls to the gloves;

- Don the required respirator (Level C or higher) and perform appropriate fit check;

- Put hood or head covering over head and respirator straps (Level C or higher) and tape hood to face piece; and

- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

5.3.2 Doffing Procedures

The following procedures are mandatory when Modified Level D or higher PPE is required for this project. Whenever a person leaves a Modified Level D or higher work site, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers;
- Clean reusable protective equipment;
- Remove protective garments, equipment, and respirator (Level C or higher). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels;
- Wash hands, face and neck or shower (if necessary);
- Proceed to clean area and dress in clean clothing; and
- Clean and disinfect respirator (Level C or higher) for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags, labeled for disposal. See Section 7 for detailed information on decontamination stations.

5.4 Selection Matrix

The level of personal protection selected will be based upon real-time air monitoring of the work environment and an assessment by the SS of the potential for skin contact with impacted materials. The PPE selection matrix is given in Table 5-1. This matrix is based on information available at the time this plan was written. The Airborne Constituent Action Levels in Table 8-1 should be used to verify the need for upgrade and downgrade of PPE.

Table 5-1
PPE Selection Matrix

Task	Anticipated Level of Protection for Task Initiation
Mobilization/Demobilization/Site Recon.	Level D
Support Zone Activities	Level D
Soil Boring and Well Installation	Modified Level D
Soil Sampling Activities	Modified Level D
Groundwater Sampling/Water Elevation Survey/Well Development	Level D or Modified Level D
Field Sampling Activities	Level D or Modified Level D
In-situ Testing	Level D or Modified Level D
Equipment Decontamination and Cleaning	Modified Level D

6. Site Control

6.1 Authorization to Enter

All personnel who are potentially exposed to hazardous substances must have completed hazardous waste operations initial training as defined under OSHA Regulation 29 CFR 1910.120, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations in order to enter a site area designated as an EZ or CRZ. Personnel without such training or medical certification may enter the designated SZ only. The SS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed within the EZ or CRZ.

6.2 Site Orientation and Hazard Briefing

No person will be allowed in the general work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the HSS, and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. In addition to this meeting, Daily Safety Meetings will be held each day before work begins.

All people on the site, including visitors, must document their attendance to this briefing as well as the Daily Safety Meetings on the forms included with this plan.

6.3 Certification Documents

A training and medical file may be established for the project and kept on site during all site operations. The 24 or 40-hour training, update, and specialty training [first-aid/cardio-pulmonary resuscitation (CPR)] certificates, as well as current medical clearance for all project field personnel, will be maintained within that file. All BBL and subcontractor personnel must provide their training and medical documentation to the HSS prior to the start of field work.

6.4 Entry Log

A log-in/log-out sheet will be maintained at the site by the SS. Personnel must sign in and out on a log sheet as they enter and leave the CRZ, and the SS may document entry and exit in the field notebook.

6.5 Entry Requirements

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed on any BBL field site unless he or she is wearing the minimum SZ PPE as described in Section 5. Personnel entering the EZ or CRZ must wear the required PPE for those locations.

6.6 Emergency Entry and Exit

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed on any BBL field site unless he or she is wearing the minimum SZ PPE as described in Section 5. Personnel entering the EZ or CRZ must wear the required PPE for those locations.

6.7 Contamination Control Zones

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

6.7.1 Exclusion Zone

The EZ consists of the specific work area, or may be the entire area of suspected contamination. All employees entering the EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. The location of each exclusion zone will be identified by cones, caution tape, or other appropriate-ate means.

6.7.2 Contamination Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

6.7.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

6.7.4 Posting

The EZ, CRZ, and SZ will be prominently marked and delineated using cones, caution tape, or other suitable means.

6.8 Site Inspections

The site supervisor will conduct a daily inspection of site activities, equipment, and zone set up to verify that the required elements are in place. The inspection form in Attachment B may be used as a guide for daily inspections. The form must be completed weekly, and forwarded to the HSS and PM for review.

7. Decontamination

7.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the contaminated zone must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations.

Station 1: Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.

Station 2: Personnel will remove their outer garment and gloves and deposit them in the lined waste receptacles. Personnel will then decontaminate their hard hats, and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.

Station 3: Personnel will thoroughly wash their hands and face before leaving the decontamination zone. Respirators will be sanitized and then placed in a clean plastic ziplock bag.

7.2 Equipment Decontamination

All vehicles that have entered the contaminated zone will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

7.3 Personal Protective Equipment Decontamination

Where and whenever possible, single use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers.

Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves and covers must be thoroughly cleaned at the end of each work shift, and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water, or by using a spray disinfectant.

8. Site Monitoring

8.1 Air Monitoring

Air monitoring will be conducted to evaluate airborne constituent levels. Personal exposure monitoring may be necessary to evaluate employee exposures. The monitoring results will dictate work procedures and the selection of PPE. Depending on the nature of the work activity, the monitoring devices to be used may include, but are not limited to, are a combustible gas/oxygen/carbon monoxide (LEL/O2/CO) meter, MiniRAM portable dust monitor, and a photo ionization detector (PID).

If BBL and one or more BBL subcontractors are working in an area, one subcontractor may conduct direct-reading air monitoring and share the results with the other subcontractors working in the area. In this situation all subcontractors must coordinate air monitoring through a mutually-agreed upon air monitor. The BBL HSS will be responsible for utilizing the air monitoring results to determine appropriate health and safety precautions for BBL personnel only.

Monitoring for organic vapors for the purpose of estimating worker exposure level will be conducted in the breathing zone with the PID during intrusive field activities. If the total organic vapor action level of 1 ppm is exceeded then the breathing zone will be monitored with a benzene colorimetric tube (Drager, Sensidyne, etc.). At a minimum, all readings will be recorded on a half-hourly basis on air monitoring logs or in a field notebook.

Air monitoring will be conducted continuously with the LEL/O2/CO meter in areas where flammable vapors or gases are suspected. All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10 percent of the LEL at any location. Such an area must be ventilated to reduce the concentration to an acceptable level. Continuous carbon monoxide monitoring is required to be conducted if internal combustion engines (drill rig, etc.) During operations which may cause airborne particulate (sampling, excavation, and soil boring installation), a MIE MiniRAM portable dust monitor will be used to measure airborne concentrations of total particulate material. At a minimum, all readings will be manually recorded on an hourly basis on air monitoring logs (Attachment G) or field notebooks.

All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10% of the Lower Explosive Limit (LEL) at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

8.2 Noise Monitoring

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

8.3 Monitoring Equipment Maintenance and Calibration

All direct-reading instrumentation calibrations should be conducted under the approximate-mate environmental conditions the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments which are necessary. All air monitoring equipment calibrations, including the

standard used for calibration, must be documented on a calibration log or in the field notebook. All completed HS documentation/forms must be reviewed by the HSS and maintained by the SS.
All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturers' procedures. Preventive maintenance and repairs will be conduct-ed in accordance with the respective manufacturers' procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

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

8.4 Action Levels

Table 8-1 at the end of this section presents airborne constituent action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the site.

8.5 On-Site Monitoring Plan and Response Activities

As mentioned above, air monitoring will be conducted in the worker breathing zone to determine the level of protection required for personnel completing site activities. If action levels in the worker breathing zone are exceeded, air monitoring will be required at various on-site/perimeter locations to determine appropriate response activities that are protective of personnel on-site who are not directly involved with the investigation, personnel at adjacent commercial sites, and the surrounding community. NYSDOH community air monitoring procedures (Attachment A) will be followed as outlined below. Additional monitoring (and appropriate response activities) to be implemented if the total organic vapor and particulate levels in the worker breathing zone exceed action levels is discussed below.

Total Organic Vapors

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

During the investigation, it is possible that the downwind perimeter of the work area will coincide with the exterior of an on-site building. If, at any time, the level of total organic vapors adjacent to a downwind on-site building reaches 1 ppm above background, continuous monitoring will be conducted adjacent to the building and efforts will be taken to abate the source of organic vapors. If after 30 minutes, the total organic vapor level adjacent to the building has not subsided below 1 ppm above background, then the HSS will contact the client coordinator to request that personnel be evacuated from the building. Personnel will not be allowed to return to the building until after the level of total organic vapors adjacent to the building subsides to below 1 ppm above

background and monitoring inside the building indicates that total organic vapors inside the building are below 1 ppm above background.

During the investigation, it is also possible that the downwind perimeter of the work area will coincide with the site perimeter. If, at any time, the level of total organic vapors adjacent to the downwind site perimeter reaches 5 ppm above background, then the level of total organic vapors adjacent to the nearest downwind residential or commercial property from the work zone will be monitored. If after 30 minutes, the total organic vapor level adjacent to the residential or commercial property has not subsided below 1 ppm above background, then the HSS will inform the local emergency response contacts (in addition to project managers from the client and BBL) listed in Section 11.5 and persons who may be exposed at the residential or commercial properties will be notified to evacuate. These persons will not be permitted to return to the residential or commercial properties until after the level of total organic vapors on the properties subsides to below 1 ppm above background.

Particulate

If the level of particulate in the worker breathing zone exceeds 100 ug/m3 above background, then the level of particulate will be manually recorded at the downwind perimeter of the work area at 15 minute intervals. If the level of particulate at the downwind perimeter of the work area is 150 ug/m3 or greater, then work activities will cease and dust suppression techniques must be employed to maintain particulate levels below 150 ug/m3. In addition, the work area will be enlarged if necessary to keep personnel who are not involved with the investigation (and the public) from being exposed to particulate levels greater than 150 ug/m3.

Table 8-1
Airborne Constituent Action Levels

Parameter	Reading	Action
Total Organic Vapors (determined with a PID)	0 ppm to ≤ 1 ppm	Normal operations; continue breathing zone monitoring every 30 minutes
	> 1 ppm	Screen for benzene with colorimetric tubes
	> 1 ppm to 10 ppm	Normal operations as long as action levels for benzene are not exceeded;
	> 10 ppm to 50 ppm	Upgrade to Level C if benzene action levels are not exceeded; increase monitoring frequency to every 15 minutes
	≥ 50 ppm	Stop work; investigate cause of reading.
Benzene (Colorimetric Tube)	0 to 0.5 ppm	Normal Operations
	0.5 ppm to 10 ppm	Upgrade to Level C operations
	> 10 ppm	Stop work; evacuate area; investigate potential interferences and sources.
Carbon Monoxide	< 20 ppm	Normal operations
	≥ 20 ppm	Stop work; evacuate and ventilate area; investigate source of vapors
Flammable Vapors (LEL)	< 10% LEL	Normal operations
	≥ 10% LEL	Stop work; ventilate area; investigate source of vapors
Total Particulate	0 to 0.100 mg/m^3 above background	Normal operations
	> 0.100 mg/m^3 above background	Initiate wetting of work area to control dust; upgrade to Level C if dust control measures do not control dust within 15 minutes, Monitor downwind impacts.
	> 0.15 mg/m^3 in breathing zone or at downwind perimeter of work area	Stop work; investigate cause of reading; contact BBL project manager and RHSC
Oxygen	≤ 19.5 %	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact RHSC
	> 19.5% to < 23.5 %	Normal operations
	≥ 23.5 %	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact RHSC
Hydrogen Sulfide	0 ppm to ≤ 5 ppm	Normal operations
	> 5 ppm	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact RHSC

9. Employee Training

9.1 General

All on-site project personnel who work in areas where they may be exposed to site constituents must be trained as required by OSHA Regulation 29 CFR 1910.120. Such field employees also receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The BBL SS must have completed an addition-al 8 hours of training for supervisors, and must have a current first-aid/CPR certificate.

9.2 Initial 40-Hour Course

The following is a list of the topics typically covered in a 40-hour training course:

- general safety procedures;
- physical hazards (fall protection, noise, heat stress, cold stress);
- names and job descriptions of key personnel responsible for site HS;
- safety, health, and other hazards typically present at hazardous waste sites;
- use, application and limitations of PPE;
- work practices by which employees can minimize risks from hazards;
- safe use of engineering controls and equipment on site;
- medical surveillance requirements;
- recognition of symptoms and signs which might indicate overexposure to hazards;
- worker right-to-know (Hazard Communication OSHA 1910.1200);
- routes of exposure to constituents;
- engineering controls and safe work practices;
- components of a site HS program and HASP;
- decontamination practices for personnel and equipment;
- confined-space entry procedures; and

- general emergency response procedures.

9.3 Supervisor Course

Management and supervisors receive an additional eight hours of training which typically includes:

- general site safety and health procedures;
- PPE programs; and
- air monitoring techniques.

9.4 Site-Specific Training

Site-specific training will be accomplished by each site worker reading this HASP and through a site briefing by the PM, SS, or HSS on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards, the protective equipment and safety procedures, and emergency procedures.

9.5 Daily Safety Meetings

Daily Safety Meetings will be held to cover the work to be accomplished, the hazards anticipated, the protective clothing and procedures required to minimize site hazards, and emergency procedures. These meetings should be presented by the SS or HSS prior to beginning the day□s field work. No work will be performed in an EZ before the Daily Safety Meeting has been held. The Daily Safety Meeting must also be held prior to new tasks, and repeated if new hazards are encountered. The Daily Safety Meeting Log is included in Attachment H.

9.6 First Aid and CPR

At least two employees current in first aid/CPR will be assigned to the work crew and will be on the site during operations. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

10. Medical Surveillance

10.1 Medical Examination

All personnel who are potentially exposed to site constituents must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

10.1.1 Preplacement Medical Examination

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable OSHA Regulations. The preplacement and periodic medical examinations typically include the following elements:

- medical and occupational history questionnaire;
- physical examination;
- complete blood count, with differential;
- liver enzyme profile;
- chest X-ray, at a frequency determined by the physician;
- pulmonary function test;
- audiogram;
- electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- drug and alcohol screening, as required by job assignment;
- visual acuity; and
- follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each on-site employee.

10.1.2 Other Medical Examination

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- at employee request after known or suspected exposure to toxic or hazardous materials;
- at the discretion of the client, HS professional, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials; and
- at the discretion of the occupational physician.

10.1.3 Periodic Exam

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 18 months.

10.2 Medical Restriction

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the HSS. The terms of the restriction will be discussed with the employee and the supervisor.

11. Emergency Procedures

11.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, constituent release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the SS/HSS immediately.

The SS/HSS will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of this route and the assembly area.

11.2 Emergency Response

If an incident occurs, the following steps will be taken:

- the SS/HSS will evaluate the incident and assess the need for assistance and/or evacuation;
- the SS/HSS will call for outside assistance as needed;
- the SS/HSS will ensure the PM is notified promptly of the incident; and
- the SS/HSS will take appropriate measures to stabilize the incident scene.

11.2.1 Fire

In the case of a fire on the site, the SS/HSS will assess the situation and direct fire-fighting activities. The SS/HSS will ensure that the client site representative (as appropriate) is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available e-extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish, the local fire department will be summoned.

11.2.2 Constituent Release

In the event of a constituent release, the following steps will be taken:

- notify SS/HSS immediately;
- evacuate immediate area of release;
- conduct air monitoring to determine needed level of PPE; and
- don required level of PPE and prepare to implement control procedures.

The SS/HSS has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-site areas.

11.3 Medical Emergency

All employee injuries must be promptly reported to the HSS/SS, who will:

- ensure that the injured employee receives prompt first aid and medical attention;
- in emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room); and
- The CSA or RHSC is to be notified by BBL site personnel as soon as possible after an injured BBL employee has left the site.

11.3.1 First Aid – General

All persons must report any near-miss incident, accident, injury, or illness to their immediate supervisor or the SS. First aid will be provided by trained personnel. Injuries and illnesses requiring medical treatment must be documented. The SS must conduct an accident investigation as soon as emergency conditions no longer exist and first-aid and/or medical treatment has been ensured. These two reports must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured should be transported to the medical facility. If the injured is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance-/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions which caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.

Do a primary survey of the victim. Check for airway obstruction, breathing-, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.

Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victims' condition, and help being given.

Maintain airway and perform rescue breathing as necessary.

Perform cardiopulmonary resuscitation (CPR) as necessary.

Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.

Treat other conditions as necessary. If the victim can be moved, take him to a location away from the work area where EMS can gain access.

11.3.2 First Aid – Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Sect-ion 3 will be removed from the work area and transported to the designated medical facility for examination and treatment.

11.3.3 First Aid – Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information, if recommended. If unconscious, keep the victim on his side and clear the airway if vomiting occurs.

11.3.4 First Aid – Skin Contact

Project personnel who have had skin contact with constituents will, unless the contact is severe, proceed through the decontamination zone to the wash-up area. Personnel will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he shows any sign of skin reddening, irritation, or if he requests a medical examination.

11.3.5 First Aid – Eye Contact

Project personnel who have had constituents splashed in their eyes or who have experienced eye irritation while in the contaminated zone, must immediately proceed to the eyewash station, set up in the decontamination zone. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

11.4 Reporting Injuries and Illnesses

All injuries and illnesses, however minor, will be reported to the SS immediately. The SS will complete an incident report (Attachment E) and submit it to the PM within 24 hours.

11.5 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the Daily Safety Meeting. The site telephone is located inside the air stripper building. Emergency agencies are identified in Table 11-1. A copy of Table 11-1 will be posted next to the on-site telephone.

Table 11-1
Emergency Contacts

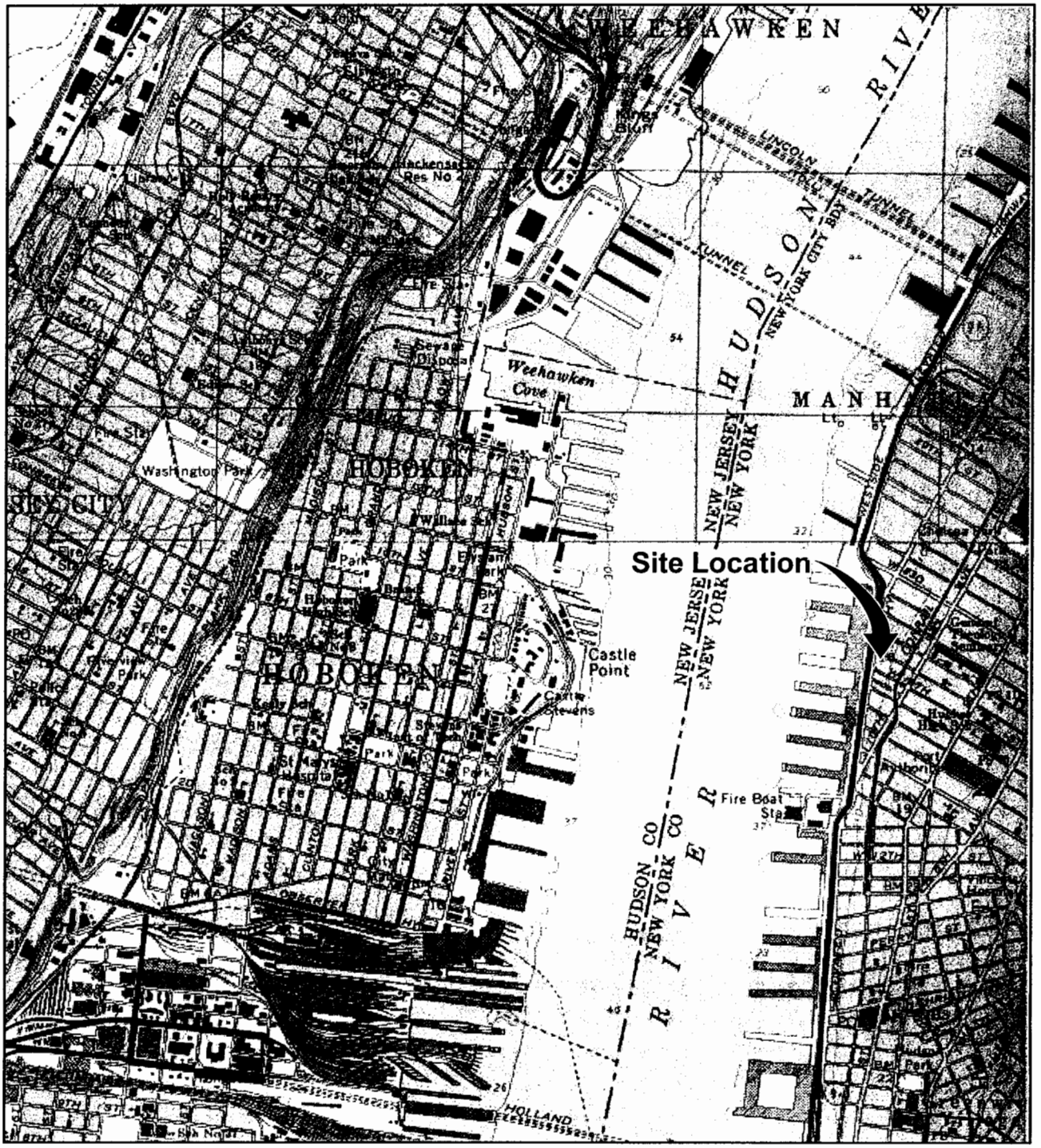
Agency/Contact		Telephone Number
Police Department		911
Fire Department		911
Ambulance		911
Hospital: Beth Israel Medical Center		
356 West 18th Street		
New York, New York		(212) 206-7206
(212) 420-2847 (24-hour emergency number)		
Poison Control Center		1-800-336-6997
National Response Center		1-800-424-8802
NYSDEC Spill Hotline		1-800-457-7362
Role	**Name**	**Telephone Number**
BBL Corporate Health and Safety Vice-President	Jay D. Keough, CIH	(609) 860-0590
BBL Regional Health and Safety Coordinator	Greg Ertel, CIH, CSP	(716) 292-6740
BBL Site Health and Safety Supervisor/BBL Site Supervisor	Greg Kendall	(609) 860-0590
BBL Project Manager	Greg Albright	(609) 860-0590

12. Health and Safety Audits

The BBL health and safety staff may elect to audit the site operations for compliance with this HASP and the BBL policies and procedures (Attachment I).

Figures

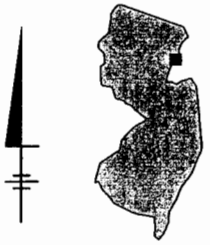
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engineers & scientists



REFERENCE: BASE MAP USGS 7.5 MIN. QUADS., JERSEY CITY, AND WEEHAWKEN, NJ - NY, 1967.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

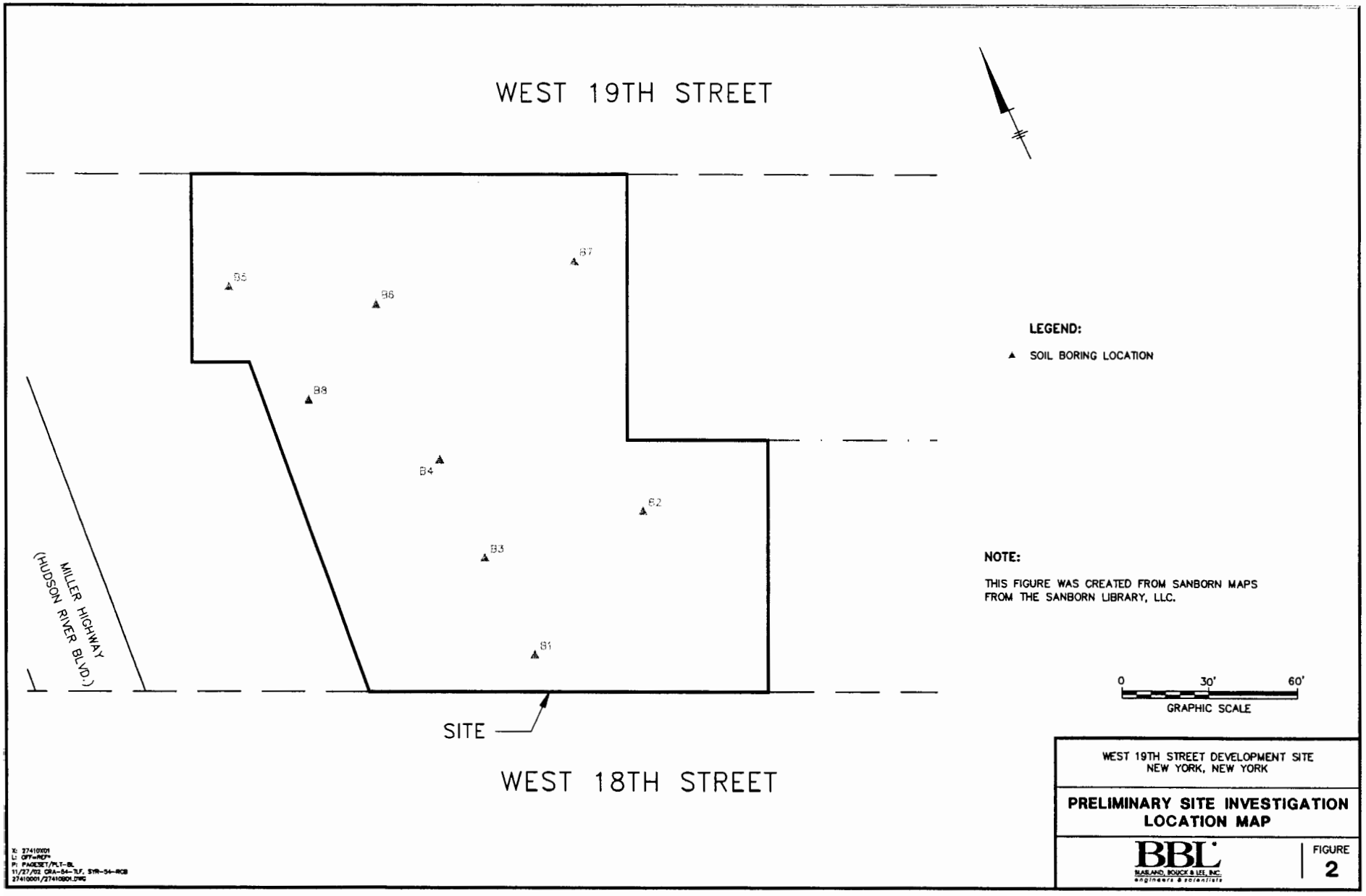
11/18/02 SYR-D54-LBR, DJH
27410001/27410n01.cdr

WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK

SITE LOCATION MAP

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engineers & scientists

FIGURE 1



WEST 19TH STREET DEVELOPMENT SITE
NEW YORK, NEW YORK

PRELIMINARY SITE INVESTIGATION LOCATION MAP

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FIGURE 2

X: 27410X01
L: OFF=REF*
P: PAGESET/PLT-BL
11/27/02 CRA-54-TLF, SYR-54-RCB
27410001/27410B01.DWG

Attachment A

NYSDOH Community Air Monitoring Plan

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Community Air Monitoring Plan
(Non-Intrusive Activities)

Real-time air monitoring, for volatile compounds and particulate levels at the perimeter of the work area is necessary. The plan must include the following:

- Volatile organic compounds must be monitored at the downwind perimeter of the work area daily at **2 hour intervals.** If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

- Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations. If the downwind particulate level is 150 $\mu g/m^3$ greater than the upwind particulate level, then dust suppression techniques must be employed. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- the organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background, and

- more frequent intervals of monitoring, as directed by the Safety Officer, are conducted.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the Safety Officer will be implemented to ensure that

vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and if the following levels persist for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect;

- if organic vapor levels are approaching 5 ppm above background.

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

Major Vapor Emission Response Plan:

Upon activation, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in the Health and Safety Plan of the Work Plan will be notified.

2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation.

3. Frequent air monitoring will be conducted at 30 minutes intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

Attachment B

Daily Health and Safety Checklist

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BBL, INC.

Health and Safety Inspection Form

Project Name/# : _____ Date: _____

Auditor: _____

HSS on Site

SEND A COPY OF COMPLETED FORM TO THE HEALTH AND SAFETY MANAGER

	YES	NO	N/A	COMMENTS
GENERAL				
HASP on site?				
HASP finalized and approved?				
OSHA poster displayed?				
Emergency telephone numbers posted?				
Emergency eyewash immediately available?				
Emergency shower immediately available?				
Emergency Notification Means available (radio, telephone)?				
First-Aid kit immediately available?				
First-Aid kit adequately stocked?				
Proper sanitation facility on site?				
DOCUMENTATION AND RECORDKEEPING				
Only personnel listed and approved on HASP site?				
All personnel properly trained? (Check company-issued wallet cards.)				
All personnel in health monitoring program? (Check company-issued wallet cards.)				
Daily field log kept by the Site Manager?				
Levels of PPE recorded?				
Contaminant levels recorded?				
Site surveillance records kept by HSS?				
Copy of current fit test records on site?				
Calibration records maintained for air monitoring equipment?				
Accident/incident forms on site?				
Field team review sheets signed?				
Additional hospital route directions available?				
Visitors logbook being accurately maintained?				
MSDSs available for all chemicals on site?				
HASP revisions recorded?				
First-Aid kit inspected weekly?				
Are daily safety meetings held?				
Emergency procedures discussed during safety meetings?				
EMERGENCY RESPONSES				
Vehicle available on site for transportation to the hospital?				
Fire extinguishers on site and immediately available at designated work areas?				
At least one person trained in CPR and First Aid on site at all times during work activities?				
All personnel know who is trained in CPR/First Aid?				

*N/A – Not Applicable

BBL, INC.

Health and Safety Inspection Form

	YES	NO	N/A	COMMENTS
PERSONAL PROTECTIVE EQUIPMENT (PPE)				
Proper PPE being worn as specified in HASP?				
Level of PPE being worn				
PPE adequate for work conditions?				
In not, give reason				
Upgrade/downgrade to PPE level				
Does any employee have facial hair that would interfere with fit of respirators?				
If yes, willing to shave, as necessary?				
Fit-tested within the last year? (Documentation present)				
If Level B, back-up/emergency person suited up (except for air)?				
HSS periodically inspects PPE and equipment?				
PPE not in use properly stored?				
All equipment required in HASP on site?				
Properly calibrated?				
In good condition?				
Used properly?				
Other equipment needed?				
List				
Monitoring equipment covered with plastic to minimize contamination?				
PERSONNEL AND EQUIPMENT DECONTAMINATION				
Decon area properly designated?				
Appropriate cleaning fluid used for known or suspected contaminants?				
Appropriate decon procedures used?				
Decon personnel wearing proper PPE?				
Equipment decontaminated?				
Sample containers decontaminated?				
Disposable items replaced as required?				
WORK PRACTICES				
Proper collection and disposal of potentially contaminated PPE?				
Proper collection and disposal of decon fluid?				
Water available for decon?				
Buddy system used?				
Equipment kept off drums and ground?				
Kneeling or sitting on drums or ground prohibited?				
Personnel avoid standing or walking through puddles or stained soil?				
Work zones established?				
If night work is conducted, is there adequate illumination?				

*N/A – Not Applicable

BBL, INC.

Health and Safety Inspection Form

	YES	NO	N/A	COMMENTS
WORK PRACTICES, CONT.				
Smoking, eating, or drinking in the exclusion or CRZ prohibited?				
To the extent feasible, contaminated materials handled remotely?				
Contact lenses not allowed on site?				
Entry into excavations not allowed unless properly shored or sloped?				
Competent person on site during excavation?				
All unusual situations on site listed in HASP?				
If not, when?				
Action taken?				
HASP revised?				
CONFINED SPACE ENTRY				
Employees trained according to 1910.146 – Confined Space Entry?				
All confined spaces identified? If not, list:				
All appropriate equipment available and in good working order?				
Equipment properly calibrated?				
Confined space permits used?				
Confined space permits completely and correctly filled out?				

*N/A – Not Applicable

Comments: _____

Attachment C

Underground/Overhead Utilities Checklist

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UNDERGROUND/OVERHEAD UTILITY CHECKLIST

Project Name/Number_____ **Date**_____
Location_____
Prepared By_____ **Project Manager**_____

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

Procedure

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

Type of Structure	Present	Not Present	Method of Markout
Electric Power Line			
Natural Gas Line			
Telephone Line			
Water Line			
Product Line			
Sewer Line			
Steam Line			
Drain Line			
Underground Tank			
Underground Cable			
Overhead Power Line			
Overhead Product Line			
Other (Specify)			

Client Representative_____ Date_____

BBL Project Manager_____ Date_____

BBL Site Supervisor_____ Date_____

Attachment D

Material Safety Data Sheets

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Attachment E

Incident/Near Miss Investigation Report

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BBL Incident/Near-Miss Investigation Report

☐ OSHA Recordable	☐ First Aid Injury	☐ Fire	Date of Incident:
☐ Lost Workday Injury	☐ Vehicle Accident	☐ Spill/Leak	
☐ Restricted Duty Injury	☐ Equipment Damage	☐ Near Miss	Incident Number:

Every employee injury, accident, and near miss must be reported within twenty-four hours of the injury. If the incident results in hospitalization, an immediate report must be made by telephone to the Project Manager and the Health and Safety Officer.

Project Information

Project Name:	Project #
Location of Incident:	

EMPLOYEE

Name:	Employee Number:
Employment Status: ☐ Regular ☐ Part Time	How long in present job?

INJURY OR ILLNESS INFO

Where did incident / near miss occur? (number, street, city, state, zip):	
Employee's specific activity at the time of the incident / near miss:	
Equipment, materials, or chemicals the employee was using when the incident / near miss occurred (e.g., the equipment employee struck against or which struck employee; the vapor inhaled or material swallowed; what the employee was lifting, pulling, etc.):	
Describe the specific injury or illness (e.g., cut, strain, fracture, etc.):	
Body part(s) affected (e.g., back, left wrist, right eye, etc.):	
Name and address of treatment provider (e.g., physician or clinic):	Phone No.:
If hospitalized, name and address of hospital:	Phone No.:
Date of injury or onset of illness / /	Time of event or exposure: ☐ AM ☐ PM
Did employee miss at least one full shift's work? ☐ No ☐ Yes, 1st date absent (MM/DD/YYYY) / /	
Has employee returned to work? ☐ Regular work ☐ Restricted work ☐ No	
☐ Yes, date returned (MM/DD/YYYY) / /	
To whom reported:	Other workers injured/made ill in this event? ☐ Yes ☐ No

Description of Incident / Near Miss: (Describe what happened and how it happened.)

BBL Incident/Near-Miss Investigation Report

☐ OSHA Recordable	☐ First Aid Injury	☐ Fire	Date of Incident:
☐ Lost Workday Injury	☐ Vehicle Accident	☐ Spill/Leak	
☐ Restricted Duty Injury	☐ Equipment Damage	☐ Near Miss	Incident Number:

Every employee injury, accident, and near miss must be reported within twenty-four hours of the injury. If the incident results in hospitalization, an immediate report must be made by telephone to the Project Manager and the Health and Safety Officer.

Project Information

Project Name:	Project #
Location of Incident:	

EMPLOYEE

Name:	Employee Number:
Employment Status: ☐ Regular ☐ Part Time	How long in present job?

INJURY OR ILLNESS INFO

Where did incident / near miss occur? (number, street, city, state, zip):		
Employee's specific activity at the time of the incident / near miss:		
Equipment, materials, or chemicals the employee was using when the incident / near miss occurred (e.g., the equipment employee struck against or which struck employee; the vapor inhaled or material swallowed; what the employee was lifting, pulling, etc.):		
Describe the specific injury or illness (e.g., cut, strain, fracture, etc.):		
Body part(s) affected (e.g., back, left wrist, right eye, etc.):		
Name and address of treatment provider (e.g., physician or clinic):		Phone No.:
If hospitalized, name and address of hospital:		Phone No.:
Date of Injury or onset of illness / /	Time of event or exposure: ☐ AM ☐ PM	
Did employee miss at least one full shift's work? ☐ No ☐ Yes, 1st date absent (MM/DD/YYYY) / /		
Has employee returned to work? ☐ Regular work ☐ Restricted work ☐ No		
☐ Yes, date returned (MM/DD/YYYY) / /		
To whom reported:	Other workers injured/made ill in this event? ☐ Yes ☐ No	

Description of Incident / Near Miss: (Describe what happened and how it happened.)

Motor Vehicle Accident (MVA)

Company Vehicle?	☐ Yes ☐ No

Accident Location (street, city, state)									
Vehicle Towed?	☐ Yes ☐ No	Other Vehicle?	☐ Yes ☐ No	# Vehicles Towed		# of Injuries			

Spill

Material Spilled	Quantity	Source
Agency Notifications		

Cost of Incident $

Third Party Incidents

Name of Owner		Address	Telephone
Description of Damage:			
Witness Name		Address	Telephone
Witness Name		Address	Telephone

Root Cause and Contributing Factors: Conclusion (Describe in Detail Why Incident / Near Miss Occurred)

1	
2	
3	
4	
5	

Root Cause(s) Analysis (RCA):

1. Lack of skill or knowledge
2. Lack of or inadequate operational procedures or work standards
3. Inadequate communication of expectations regarding procedures or work standards
4. Inadequate tools or equipment
5. Correct way takes more time and/or requires more effort
6. Short-cutting standard procedures is positively reinforced or tolerated
7. Person thinks there is no personal benefit to always doing the job according to standards
8. Uncontrollable

#	RCA #	Solution(s): How to Prevent Incident / Near Miss From Reoccurring	Person Responsible	Due Date	Closure Date

Investigation Team Members

Name	Job Title	Date

Results of Solution Verification and Validation

Reviewed By

Name	Job Title	Date
	Project Manager	
	Health and Safety Reviewer	

Attachment F

Incident Prevention Operation

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BBL Incident Prevention Observation

Observer Name	Observer Title	Contractor Company Name
Date _____ Time ___ ☐ AM ☐ PM	Project Type / Task Observed	

Background Information and Miscellaneous Comments

Observer's Positive Comments

Feedback Conducted By		Date		Time	☐ AM ☐ PM

Conclusion (Describe in Detail Why the Questionable Item Occurred). Add Any Employee Comments

Root Cause(s) Analysis (RCA):

1. Lack of skill or knowledge
2. Lack of or inadequate operational procedures or work standards
3. Inadequate communication of expectations regarding procedures or work standards
4. Inadequate tools or equipment
5. Correct way takes more time and/or requires more effort
6. Short-cutting standard procedures is positively reinforced or tolerated
7. Person thinks there is no personal benefit to always doing the job according to standards
8. Uncontrollable.

Questionable Item #	RCA #	Solution(s): How to Prevent Questionable Behavior From Reoccurring	Person Responsible	Due Date	Closure Date

Results of Solution Verification and Validation

Reviewed by	Date	Reviewed by	Date

Attachment G

Daily Air Monitoring Log

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Daily Air Monitoring Log

Project: **Date:**

Monitoring Instruments:

Air Monitor: **Activity:**

Level of Protection:

Time	Location	Instrument Reading	Comments

Attachment H

BBL Daily Safety Meeting Log

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BBL DAILY SAFETY MEETING LOG

PROJECT:_____ LOCATION: _____

DATE/TIME: _____ ACTIVITY:_____

1. Work Summary
2. Physical Chemical Hazards
3. Protective Equipment/Procedures
4. Emergency Procedures
5. Signatures of Attendees

Attachment I

Environmental Operations Audit Form

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Environmental Operations

	PRE-TASK PREPARATION	Correct	Questionable	Comments
1.	Health and Safety Plan / MSDSs on site			
2.	Employee familiar / trained on task			
3.	OSHA-required training/medical surveillance			
4.	Utility mark out / check performed			
5.	Traffic hazard addressed / work area marked			
6.	Walking / working surfaces free of hazards			
7.	Tailgate safety meeting performed			
8.	SPSA performed prior to beginning work			
9.	Communicates intentions to other personnel			
10.	Knowledge of emergency procedures			
11.	Distance between equipment and power lines			
12.	Personal protective equipment			
13.	Air monitoring equipment on site, calibrated			
14.	First aid kit / fire extinguisher on site			
15.	One person trained in first aid / CPR			
16.	Work zones established and marked			
	PERFORMING TASK			
17.	SPSA before beginning new task			
18.	Correct body positioning			
19.	Proper lifting / pushing / pulling techniques			
20.	Keep hands / body away from pinch points			
21.	Walking / working surfaces kept clear of debris			
22.	Faces traffic as appropriate			
23.	Vehicles/ barricades to protect against traffic			
24.	Drill rig located properly, blocked / chocked			
25.	Drill rig moved only with derrick lowered			
26.	Excavator located on stable ground			
27.	Eye contact made with equipment operator			
28.	Spoil at least 2 feet back from edge of excavation			
29.	Excavation shored/sloped/benched			
30.	Excavation entry controlled			
31.	Equipment/tools used properly			
32.	Electrical equipment connected through GFCI			
33.	Power tools handled properly			
34.	Electrical cords inspected / in good condition			
35.	Follows lockout / tagout procedures			
36.	Air monitoring conducted/action levels understood			
37.	Equipment decontaminated properly			
38.	Personnel decon prior to eating/drinking/smoking			
39.	Decontamination effective			
	POST – TASK			
40.	Procedures / JSA adequate			
41.	Equipment / tools stored properly			
42.	Proper storage of soil / water / waste material			
43.	Work area secured			
44.	Other			
	Total #			**% Safe:** ((Total Correct/(Total Correct + Total Questionable)) * 100)