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Consolidated Edison Company of New York, Inc.

Site Management Plan

West 42nd Street
Former Manufactured Gas Plant Site

July 2006

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

RLA/JOBS/CNED2085(07/10/06)

SITE MANAGEMENT PLAN

WEST 42ND STREET
FORMER MANUFACTURED GAS PLANT SITE
MANHATTAN, NEW YORK

BROWNFIELD CLEANUP PROGRAM

SITE ID #C231024
SITE ID #C231012

Prepared for:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

and

RIVER PLACE I, LLC
RIVER PLACE II, LLC

Prepared by:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
WOODBURY, NEW YORK

JULY 2006

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

List of Appendices

List of Figures

List of Tables

1.0 INTRODUCTION

This Site Management Plan (SMP) is for the properties located between West 41st Street and West 42nd Street and 11th and 12th Avenues on the west side of Manhattan, New York (the Site). The Site comprises both lots of Tax Block 1089, Tax Lots 1 and 3. The current owners of Tax Lots 1 and 3, River Place I, LLC and River Place II LLC, respectively, and Con Edison have entered into a Brownfield Cleanup Agreement with NYSDEC for both the Block 1089 properties. A Remedial Work Plan for these sites was approved by NYSDEC in March 2005.

This SMP addresses the tax lots comprising Block 1089 and has been prepared in accordance with the New York State Brownfield Cleanup Program (BCP) guidelines. In accordance with the Remedial Work Plan dated March 2005, an SMP is the final phase of the remediation process. As required, this SMP provides procedures to accomplish the following:

- maintain engineering controls;
- maintain institutional controls;
- inspect and evaluate site information periodically to confirm that the remedy continues to be effective for the protection of public health and the environment; and
- monitor and report on the performance and effectiveness of the remedy in the short and long-term by, in this case, sampling and analysis of appropriate media.

This SMP is designed to be implemented by the BCP Participants; Con Edison the property owners and support personnel at the Site. A description of the primary responsibilities for each Participant is included in Section 9.0 of this Plan. It is important that the information in the SMP be reviewed/updated as needed by the Participants to reflect changes in site conditions or the manner in which the remedy is operated and maintained.

This SMP has been developed with the understanding that the remediated portions of Tax Lots 3 and 1 will be redeveloped in the near future. However, the specifics concerning this redevelopment have yet to be determined. Once the redevelopment plans have been finalized, the SMP must be updated, including all appendices, to reflect the planned final site conditions.

Furthermore, as detailed in Section 6.0, the SMP must be updated to reflect any future changes in site use.

A Site Characterization Study (SCS) was completed by Dvirka and Bartilucci Consulting Engineers (D&B) for the property in question, in accordance with the Scope of Work presented in the NYSDEC-approved Site Characterization Study Work Plan, dated June 2003. The findings of the SCS were presented in the final Site Characterization Study Report (SCS Report), dated April 2004. The SCS, completed in the fall of 2003, focused on the tax lots of Block 1089 located to the east of 12th Avenue. The research of historical records conducted as part of this SCS confirmed the presence of several former MGP structures also located to the west of 12th Avenue. Supplemental investigation activities to address remaining portions of the former MGP located West of 12th Avenue will be conducted by Con Edison under the VCA.

A Remedial Work Plan (RWP) was prepared to address subsurface contamination present within the Block 1089 property associated with the historic operations of the West 42nd Street Former MGP Site. The RWP was approved by NYSDEC in March 2005. For purposes of this document, the term "site" refers to both tax lots of the Block 1089 property.

Between August 2005 and February 2006, Tax Lot 3 and the easternmost portion of Tax Lot 1 (up to within 50 feet of existing River Place 1 building) were remediated in accordance with the approved RWP. The remediation of the former MGP site included:

- Abandonment of existing on-site monitoring wells prior to site remediation;
- The removal and off-site disposal of approximately 79,000 tons of MGP-impacted soil.
- Placement of permanent steel sheet piling with NYSDEC-approved sealant around the perimeter of the excavation area that was "keyed" into an underlying low-permeable clay unit.
- Removal of gas holder foundations and other former structure foundations.
- Installation and operation of a dewatering system, including the treatment of pumped groundwater, prior to the discharge to the water to the New York City sewer system;

- Documentation sampling after soil removal; and
- Placement of a minimum of 2 feet of recycled concrete aggregate (RCA) over the excavated area inside the steel sheet piling and 2 feet of clean sand over the easternmost portion of Tax Lot 1, immediately west of the sheet piling.

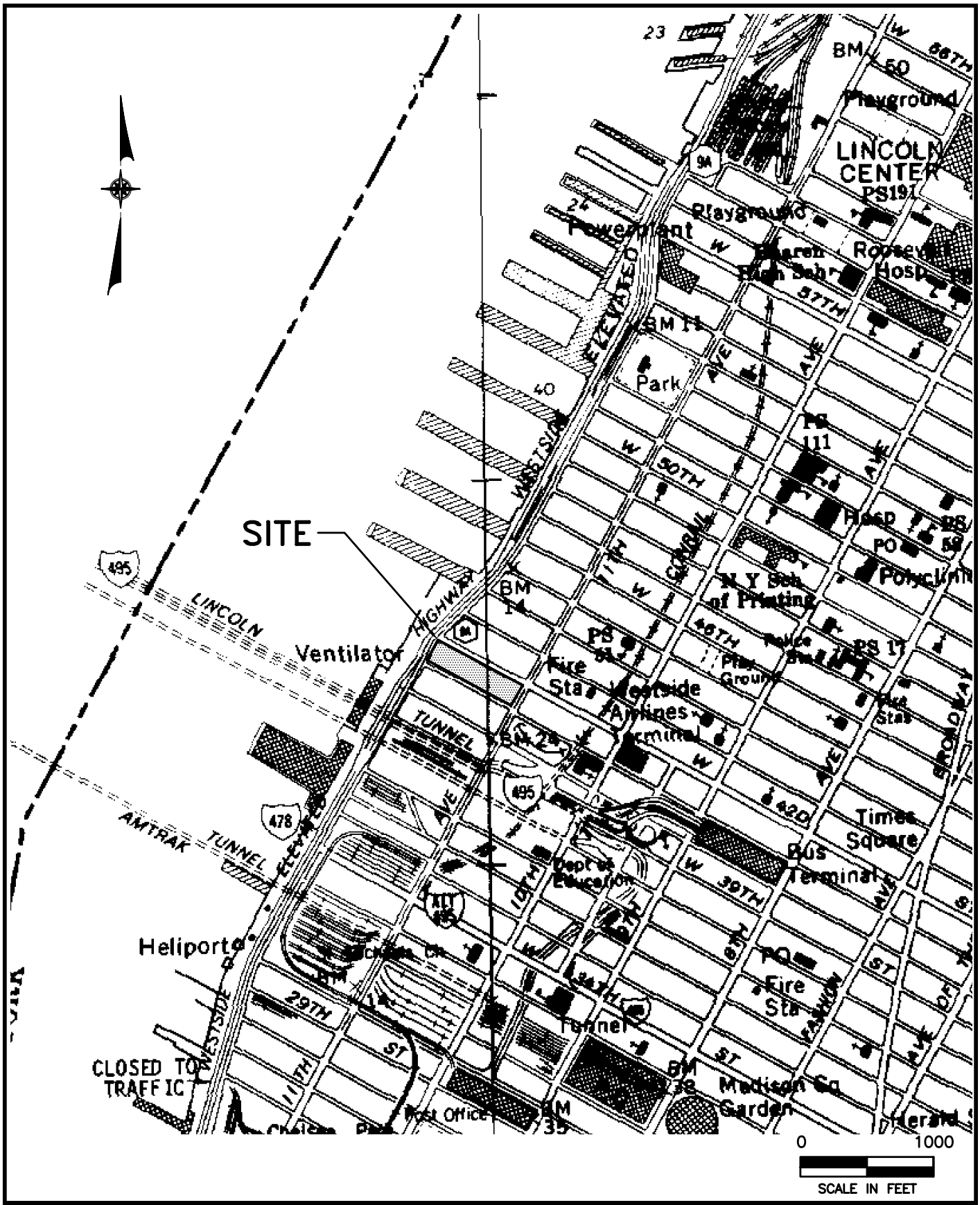
In addition to the remediation of contamination related to the former MGP, six abandoned underground storage tanks (USTs) located in the northeast corner of Tax Lot 3 were removed.

1.1 Site Description

The Site is located in the Borough of Manhattan (New York County), New York City, New York (see Figure 1-1). The area in which the site is located maintains a high population density due to the presence of residential high-rises, office buildings, local tourist attractions, and retail facilities, as well as the influx of the workforce population on any given day of the workweek.

Block 1089, Tax Lots 1 and 3 comprise the entire block bounded by Eleventh and Twelfth Avenues, and West 41st and 42nd Streets (see Figure 1-2). Currently, on Tax Lot 1 a high-rise apartment building occupies approximately 90 percent of the lot. The remaining portion of the lot consists of a landscaped, park-like area and sidewalks. The apartment building is referred to as River Place I and was completed in 2000 with construction "at grade" and no below ground basement or garage areas.

As described in Section 1.0, Tax Lot 3 and the easternmost portion of Tax Lot 1 was remediated in accordance with the NYSDEC-approved RWP between August 2005 and February 2006. The remediated area consists of a steel sheetpile bounded excavation, from 8 to 20 feet in depth covered by two feet of recycled concrete aggregate (RCA).



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT SITE

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

SITE LOCATION MAP

FIGURE 1-1

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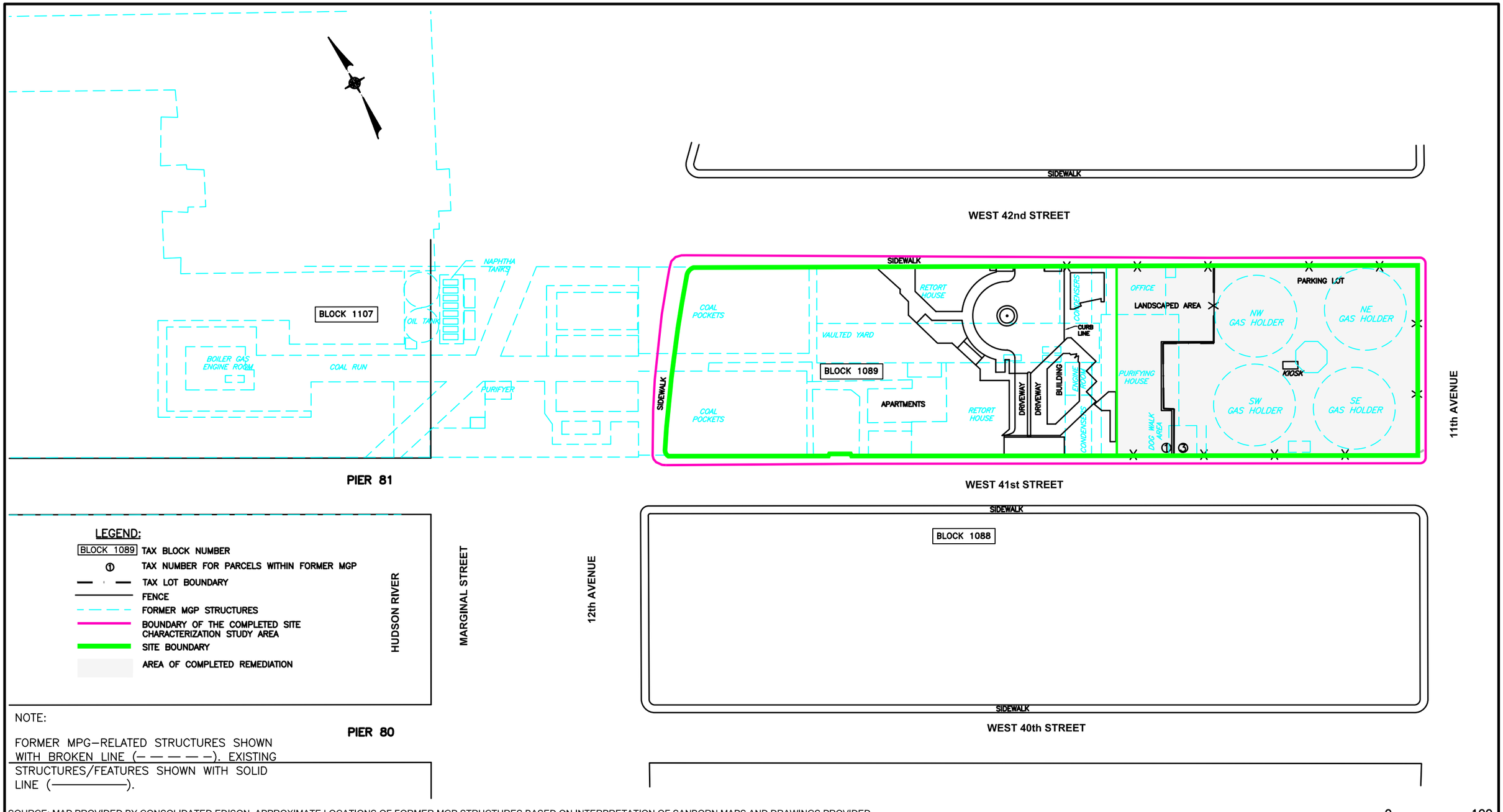

SOURCE: MAP PROVIDED BY CONSOLIDATED EDISON. APPROXIMATE LOCATIONS OF FORMER MGP STRUCTURES BASED ON INTERPRETATION OF SANBORN MAPS AND DRAWINGS PROVIDED BY CONSOLIDATED EDISON CONTAINED WITHIN THE WEST 42nd STREET MANUFACTURED GAS PLANT SITE HISTORY REPORT BY PARSONS, DATED AUGUST 2002 AND THE RIVER PLACE PHASE II, 42nd. STREET AND ELEVENTH AVENUE, GEOTECHNICAL ENGINEERING STUDY BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, P.C., DATED JULY 2000.

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42ND STREET
FORMER MANUFACTURED GAS PLANT SITE

SITE MAP

FIGURE 1-2

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1.2 Site History

Historical records indicate that the land encompassing the former MGP site was originally part of the Hudson River and likely consisted of a shallow embayment, a tidal creek running through present day Block 1089, and associated tidal wetlands. By 1850, this portion of the Hudson River and associated wetlands had been filled.

The construction of the Metropolitan Gas Light Company's West 42nd Street plant began in 1860. The plant operated as a coal gasification plant from 1863 into the early 1920s and was likely demolished in approximately 1925. In 1932, the New York Central Railroad Company acquired the Block 1089 portion of the former MGP site and constructed a railroad yard with several small associated buildings and a gasoline service station. By the 1980s, this property was being utilized as a parking lot. In 2000, a high-rise apartment building was erected on Tax Lot 1.

Currently, the remediated areas of Tax Lots 3 and 1 remain undeveloped pending construction of a multi-story residential building(s). Maintenance of engineering controls, including the RCA cover and the groundwater dewatering system is required until the site is fully developed.

1.3 Summary of Environmental Conditions at the Site

Previously Completed Investigations

Starting in 1995, a number of environmental site investigations and remediation activities were completed at the site by the property owner. In 1995, 18 underground storage tanks (USTs) were removed from the northern side of Tax Lot 1. The USTs were assumed to be associated with the historical use of the site by the New York Central Railroad Company. Several subsurface investigations were completed subsequent to the removal of the USTs and petroleum-related compounds were identified in on-site soil and groundwater within Tax Lot 3. Starting in 1996, several additional subsurface investigations within Tax Lots 1 and 3 were performed by

the property owner. These investigations identified petroleum and MGP-related contaminants present in subsurface soil and groundwater in both tax lots. A transport and fate analysis completed by Woodward-Clyde Associates, L.P. concluded that site-related contaminants are not likely impacting the Hudson River. A human health risk assessment performed by Woodward-Clyde Associates, L.P. concluded that significant exposures to site-related contamination would not be expected after construction of the apartment complex on Tax Lot 1. A detailed description of each of these previous investigations is presented in Section 1.4 of the April 2004 SCS Report.

Site Characterization Study Findings

The following discussion presents a summary of findings related to the SCS, completed by Dvirka and Bartilucci Consulting Engineers on behalf of Consolidated Edison Company of New York. For additional information, the reader is referred to in the April 2004 Site Characterization Study Report.

BCP Site ID No. C231024 (Tax Lot 1)

A total of 11 subsurface soil borings were advanced on or immediately adjacent to Tax Lot 1, and 22 soil samples were selected for chemical analysis. In general, MGP impacts were not observed in shallow subsurface soil less than 4 feet in depth. The most significant MGP impacts, including the highest volatile organic compound (VOC), semivolatile organic compound (SVOC) and metal concentrations were most prevalent in the Fill Unit below a depth of 10 feet, which places the majority of the impacted soil below the water table. However, at most locations, contaminant concentrations decrease rapidly below a depth of 24 feet. This rapid decrease in contaminant concentrations is likely due to the confining ability of the underlying Clay Unit. Exceptions to this general trend include borings located west of the Tax Lot 1 property line, along 12th Avenue where nonaqueous phase liquid (NAPL) or tar at saturated conditions was observed to a depth of up to 38 feet and within the Clay Unit. The Bedrock Unit within Tax Lot 1 was not observed to be impacted by MGP residuals.

Based on existing conditions and use of the site, direct exposure to MGP contaminants would not be expected for most on-site and off-site receptors. Currently, Tax Lot 1 contains a large apartment building and the remaining land is either paved or landscaped. An assessment of soil gas and indoor air quality at Tax Lot 1 was completed under a separate phase of the investigation. The results of that assessment were presented to the NYSDEC by Con Edison in a separate report and indicate that indoor air is not adversely impacted by the intrusion of vapors.

Based on the completed SCS, the only potential for future exposure to MGP contamination at Tax Lot 1 is associated with utility/construction workers who may be involved with on-site excavations in support of the installation or repair of subsurface utilities within Tax Lot 1.

BCP Site ID No. C231012 (Tax Lot 3)

A total of 18 soil borings and 9 test pits were advanced within Tax Lot 3 with a total of 39 subsurface soil samples selected for chemical analysis. All of the 39 samples exhibited detectable levels of VOCs with the maximum total VOC concentration of 865 mg/kg observed in a soil sample collected along the eastern edge of the site at a depth of 19 to 23 feet, between the northeast and southeast former gas holders. In addition, all of the 39 samples exhibited detectable levels of SVOCs with the maximum total SVOC concentration of 12,010 mg/kg observed in a soil sample collected within the footprint of the former Purifying House foundation walls at a depth of 9 to 9.5 feet.

Evidence of NAPL/tar at saturated levels was not observed in subsurface soil within Tax Lot 3. The most significant MGP impacts were observed in the Fill Unit at depths ranging from 17 to 23 feet below ground surface (bgs), and within and adjacent to the former gas holders. Soil below and adjacent to the northwest and northeast former gas holders exhibited sheens and odors to a depth of up to 31 feet bgs. In addition, evidence of MGP impacts, including light to moderate odors, were observed below the southwest former gas holder up to a depth of 31 feet bgs. The southeast former gas holder exhibited the least amount of contaminants associated with former MGP operations with only light to moderate staining and odors observed to 22 feet bgs.

Twenty-nine out of 39 subsurface soil samples selected for analysis exhibited detectable levels of total cyanide. The maximum total cyanide concentration of 1,580 mg/kg was detected in a soil sample collected at a depth of 9 to 13 feet along the western portion of Tax Lot 3 within the vicinity of the former Purifying House. In general, MGP impacts were not observed in shallow subsurface soil at less than 5 feet in depth throughout the majority of Tax Lot 3.

Four existing groundwater monitoring wells and six monitoring wells, installed as part of the SCS field investigation, were sampled in order to characterize site groundwater quality. Measurable separate-phase NAPL was not detected in any of the on-site monitoring wells.

The highest VOC and SVOC concentrations in on-site groundwater were detected in samples collected from existing wells LMW-04 and LMW-03. LMW-03 appears to be located within the northwest former gas holder. Similarly, LMW-04 appears to be located within the southwest former gas holder and both wells are screened well below the water table immediately above the Bedrock Unit. Due to their location and construction, the two existing wells may be serving as migration pathways for contaminants within and below the former holders. As a result, the high concentrations of VOCs and SVOCs detected at these wells may actually be associated with MGP-impacted soil present within and below the former holders and not representative of the actual groundwater quality above the bedrock unit.

Methyl tertiary-butyl ether (MTBE), a common gasoline additive, was detected at concentrations that exceed NYSDEC Class GA Groundwater Standards at monitoring well LMW-01 located directly downgradient of an Exxon/Mobil Service Station located at 553 Eleventh Avenue, New York City. Based on the review of NYSDEC records, there have been at least three petroleum spills that have occurred at this service station. In 2003, a subsurface investigation conducted at the service station on behalf of the Exxon/Mobil Refining and Supply Company identified up to 3 feet of free-phase petroleum in on-site monitoring wells, and an off-site BTEX groundwater plume migrating in a southerly direction towards Tax Lot 3. In addition, strong petroleum-like odors were detected emanating from the borehole during the completion of soil boring SB-15, also located downgradient of the service station. This information indicates

that on-site groundwater, as well as soil vapor, was impacted by a petroleum contaminant plume migrating from this Exxon/Mobil Service Station.

1.4 Completed Remedial Actions Program

The Remedial Action Program was completed in accordance with the Remediated Work Plan (RWP) approved by the NYSDEC. Specifically, the program included excavation of accessible contaminated soil above the clay layer within the landscaped area of Tax Lot 1 to within 50 feet east of the residential tower known as River Place I. Interlocked steel sheeting was installed along the perimeter of the excavation to stabilize the area of excavation and to reduce the volume of groundwater entering the excavation. This sheeting, which extends approximately 30 feet below grade, was left in place. and the portion along the western perimeter of the excavation on Tax Lot 1 was cut off at a depth of approximately 6 feet below grade. This section of sheet piling will also minimize the potential for migration of residual contamination from the unexcavated portion of Tax Lot 1 into the remediated portions of the site.

The Remedial activities performed at Tax Lot 3 included excavation of soil to an average depth of approximately 19 feet below existing grade with certain areas excavated to a depth of 28 feet below grade to accommodate deeper components of the building structures such as elevator pits. Again interlocking steel sheet piling was utilized to provide structural support during the excavation process and to act as a barrier with respect to groundwater infiltration. Sealant was applied within the interlocks of the steel sheeting and the sheeting, which extended approximately 30 feet below the ground surface.

A 4-foot layer of RCA was placed over the excavated area. Engineering controls remain in place including the maintenance of the RCA cover and the operation of a groundwater dewatering system.

1.5 Engineering and Institutional Controls

"Engineering Controls" are any physical barrier or method employed to actively or passively contain, stabilize, or monitor hazardous waste or petroleum, restrict the movement of industrial or hazardous substances, waste or petroleum to ensure the long-term effectiveness of a remedial program, or eliminate potential exposure pathways to such substances. Engineering controls include, but are not limited to, pavement, caps, covers, subsurface barriers, vapor barriers, slurry walls, building ventilation systems, fences, access controls, provision of alternative water supplies via connection to an existing public water supply, adding treatment technologies to such water supplies, and installing filtration devices on private water supplies.

"Institutional Controls" are non-physical means of enforcing a restriction on the use of property that limits human or environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness of a remedial program or with the effectiveness and/or integrity of operation, maintenance, or monitoring activities at a the site.

The engineering controls are utilized at the site to restrict the movement of contamination from unremediated areas to the remediated area. With respect to the Site, engineering controls consist of the steel sheeting installed along the western perimeter of the remediated portion of Tax Lot 1, and the water/vapor barrier that will be installed on the below-grade foundation of any building to be constructed on Tax Lot 3, the concrete or asphalt pavement that covers areas of the Site that are not structures, the concrete floor slabs in River Place 1, and any clean soil cover over soil that has not been remediated.

Specific institutional controls will also be implemented at the site to ensure the viability, reliability and effectiveness of the engineering controls by restricting the use of the property and disturbances of the subsurface soil. These institutional controls will include establishing an environmental easement, which will ensure appropriate future use and control of the site to protect human health and the environment and prohibit use of groundwater extracted from the site. Other institutional controls require that the NYSDEC be notified prior to any ground-

intrusive activities, implement a soil management plan, establish a health and safety plan and community air monitoring plan; continue ambient/indoor air monitoring at the River Place I Property; conduct periodic groundwater monitoring; institute an inspection program; require quarterly and annual reports, and an annual certification by the property owners that institutional and engineering controls are in place and remain effective.

The institutional controls that are likely to be implemented at the site are described in detail in this SMP as follows:

- **Section 2.0** provides a description of the various management activities that need to be maintained at the remediated portions of Tax Lots 3 and 1 during the interim period between the completed remediation phase and the future redevelopment phase.
- ***Section 3.0*** provides a description of required notifications, including those to be submitted to the NYSDEC on a regular basis and those driven by special events.
- ***Section 4.0*** outlines the procedures and schedule for conducting required monitoring at the site, including groundwater monitoring, soil vapor monitoring, and ambient air monitoring.
- ***Section 5.0*** specifies procedures for conducting regular inspections of the site.
- ***Section 6.0*** describes the Certification of Continued Effectiveness that must be submitted by the property owners on an annual basis to certify the effectiveness of engineering and institutional controls at the site.
- ***Section 7.0*** includes a discussion and the decision-making process associated with soil management.
- ***Section 8.0*** provides a description of the procedures to be implemented in the event of an emergency situation at the site.
- ***Section 9.0*** outlines the annual reporting requirements.
- ***Section 10.0*** provides an organizational chart identifying the key personnel required to implement this plan, including a description of the responsibilities of each position and the related training requirements.

In addition, the appendices of this Plan include a Quality Assurance Project Plan, a Field Sampling Plan, a Health and Safety Plan, a Community Air Monitoring Plan and Standard Operating Procedures (SOPs).

1.6 Water/Vapor Barrier

The NYSDEC-approved Remedial Work Plan requires the installation and maintenance of a water/vapor barrier on any below-grade foundation structure that will be constructed on this portion of the site. The horizontal and vertical component of the water/vapor barrier, which may be exposed to contaminated groundwater and vapors, will be composite sheets consisting of a thick HDPE film, a pressure sensitive adhesive and protective coating. The contractor will be required to install the water/vapor barrier in accordance with the specifications provided in Appendix F. The specifications provide details on protecting the water/vapor barrier from damage and wear during application as well as during the construction period. The remedial engineer will be responsible for inspection and photographic documentation during site preparation, installation and post-installation construction activities to confirm that the manufacturer's specifications are followed and the water/vapor barrier, once placed, is not disturbed.

Since the detailed building design has not been completed at this time, the RAP has been modified such that the installation of the water/vapor barrier will be a SMP action. The SMP will be amended with the detailed design of the water/vapor proofing barrier once the future development plans of Tax Lots 3 and 1 have been finalized.

2.0 INTERIM SITE MANAGEMENT

The period of time between the completion of remedial activities at the Site and the construction of the foundation of the new structures, with the required water/vapor barrier, is considered the Interim period. This section describes the various management practices and engineering controls that need to be maintained at the remediated portions of Tax Lots 3 and 1 during the interim period between the completion of the site remediation, as detailed in Section 1.4, and the final site redevelopment. These management practices and engineering controls include the following:

- 24-hour site security
- Maintain the existing site fencing
- Maintain the layer of clean RCA or gravel cover
- Maintain the on-site dewatering system
- Maintain contingency plans related to odor control
- Submit periodic progress reports to NYSDEC

3.0 NOTIFICATIONS

Routine notifications to be submitted by the property owners to the NYSDEC shall include the following:

- Notification of performance of groundwater sampling and ambient/indoor air monitoring.
- An annual certification that the institutional and engineering controls are in place and remain protective of public health and the environment.
- An annual report summarizing the findings of the routine inspections conducted and providing a listing of any repairs, breakdowns, or equipment exchanges implemented at the site.
- Reports providing for periodic groundwater monitoring documenting groundwater quality are to be provided on an annual basis for the first 2 years following completion of the remedial construction. Subsequent to the first 2 years of monitoring, groundwater data will be evaluated to determine future monitoring requirements.
- Indoor air monitoring data will be included in the annual reports.

Non-routine notifications to be submitted by the property owners to the NYSDEC on an as-needed basis according to events at the site include the following:

- Six months advance notice of any proposal for a change in the use of the site.
- Ten-day advanced notice of any proposed ground-intrusive activities.
- Notice within 48 hours of any damage or defect to the foundation structure that reduces or has the potential to reduce the effectiveness of the water/vapor barrier that may be installed and any action taken to mitigate the damage or defect.
- Notice within 48 hours of any emergency, such as a fire, flood or earthquake that reduces or has the potential to reduce the effectiveness of the engineering controls in place at the site, including a summary of action taken and the impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the engineering controls.

4.0 MONITORING PLAN

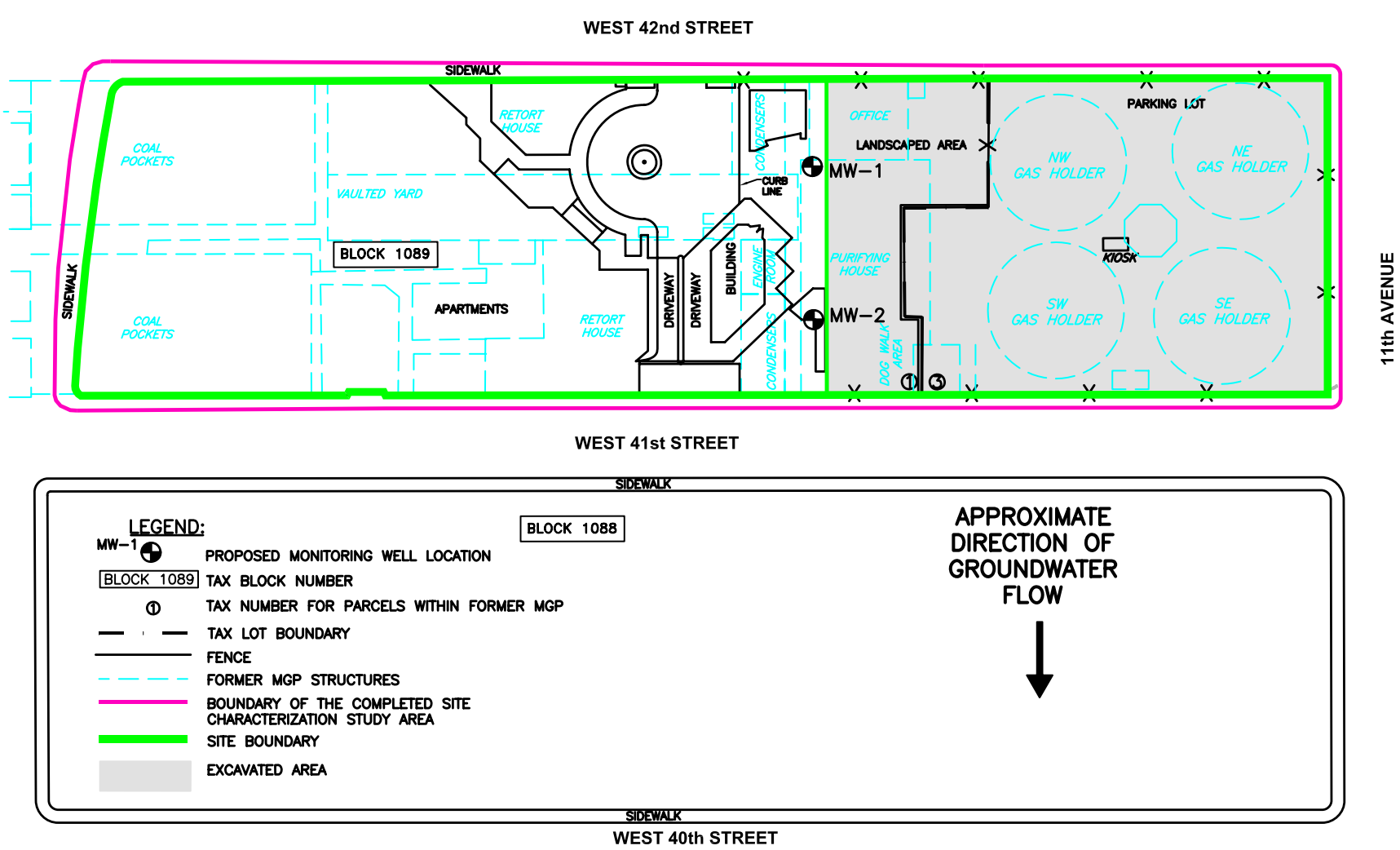
4.1 Groundwater Monitoring

Groundwater monitoring will be conducted to evaluate changes in groundwater contaminant concentrations subsequent to implementation of the remedial action plan and to ascertain the level of any natural attenuation which may occur after completing the remediation. Since all existing monitoring wells were removed as a result of remediation of the site, a total of two new monitoring wells will be installed. As shown on Figure 4-1, two wells will be installed outside the sheeting boundary in the park area. Each well will consist of 2-inch PVC with a 10-foot well screen set to intercept the water table. Figure 4-2 provides the general construction of each well.

The procedures described below will be followed during sampling and analysis associated with the groundwater monitoring plan. Detailed sample collection, and quality assurance and control procedures and requirements are provided in the Quality Assurance Project Plan in Appendix A and Field Sampling Plan in Appendix B.

Sample collection of the monitoring wells described above is to be conducted on a quarterly basis for the first 2 years following completion of remedial construction. Subsequent sampling will be conducted annually if groundwater exhibits consistent or declining levels of contamination. The first sampling round will be performed 6 months after remediation is complete.

As detailed in Appendix A, groundwater samples will be collected using low-flow sampling methods. During the first 2 years, the groundwater samples obtained will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), target analyte list (TAL) metals and cyanide, in accordance with the NYSDEC Analytical Services Protocol (ASP), dated June 2000. The laboratory performing the



SOURCE: MAP PROVIDED BY CONSOLIDATED EDISON. APPROXIMATE LOCATIONS OF FORMER MGP STRUCTURES BASED ON INTERPRETATION OF SANBORN MAPS AND DRAWINGS PROVIDED BY CONSOLIDATED EDISON CONTAINED WITHIN THE WEST 42nd STREET MANUFACTURED GAS PLANT SITE HISTORY REPORT BY PARSONS, DATED AUGUST 2002 AND THE RIVER PLACE PHASE II, 42nd. STREET AND ELEVENTH AVENUE, GEOTECHNICAL ENGINEERING STUDY BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, P.C., DATED JULY 2000.

NOTE:

FORMER MPG–RELATED STRUCTURES SHOWN WITH BROKEN LINE (— — — —). EXISTING STRUCTURES/FEATURES SHOWN WITH SOLID LINE (————).

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42ND STREET
FORMER MANUFACTURED GAS PLANT SITE

LOCATION OF MONITORING WELLS

0 100
SCALE IN FEET

FIGURE 4-1

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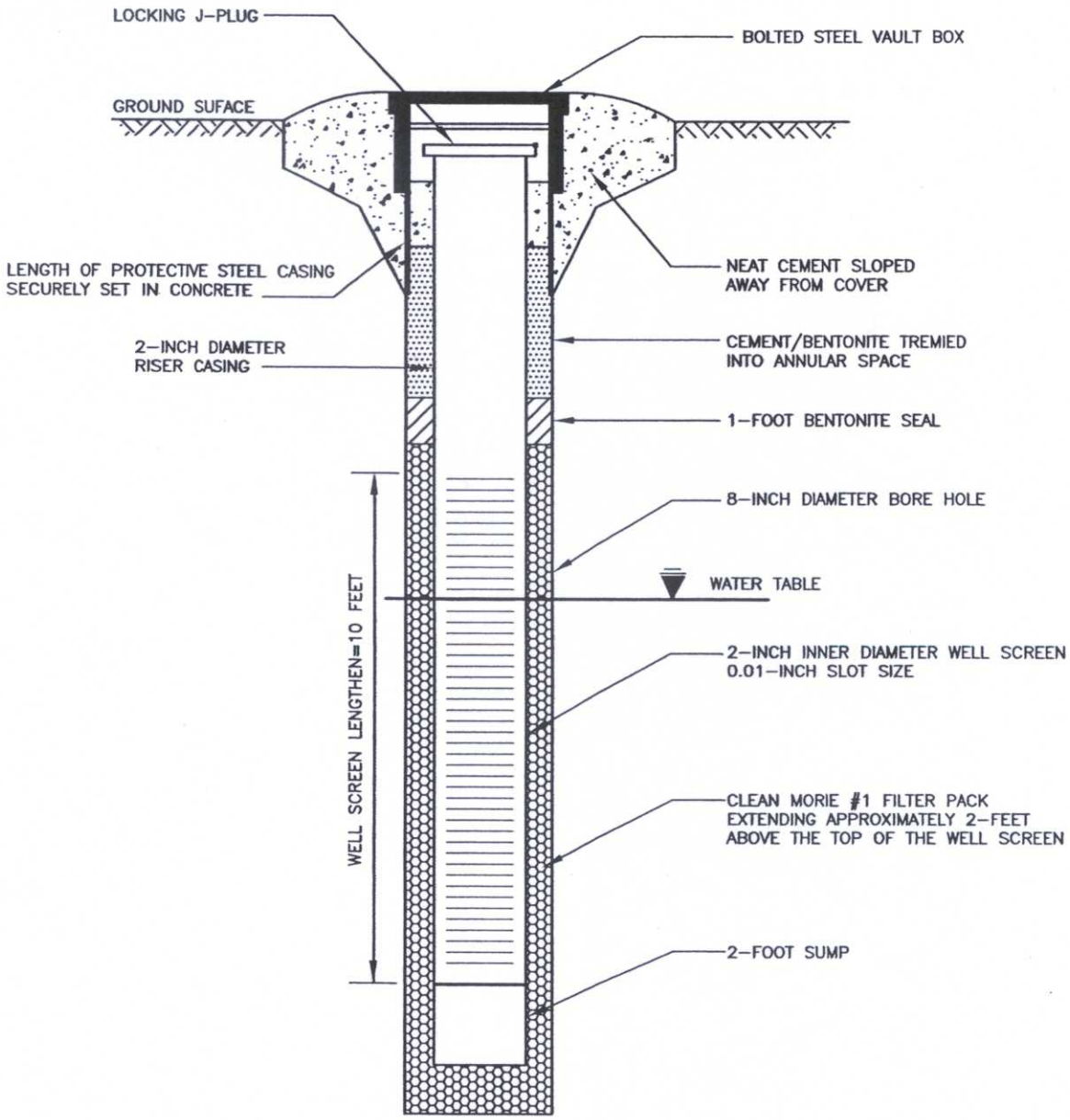

NOT TO SCALE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42ND STREET
FORMER MANUFACTURED GAS PLANT SITE

GROUNDWATER MONITORING WELL SCHEMATIC

FIGURE 4-2

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

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analysis will be Environmental Laboratory Approved Program (ELAP) certified by the New York State Department of Health (NYSDOH). Each new analysis will be compared to the previous analyses to evaluate significant changes in concentrations. The groundwater sample results will be provided to NYSDEC as part of quarterly and annual reports, as appropriate.

4.2 Ambient Indoor Air Monitoring

Ambient and indoor air sampling at River Place I, will be conducted on an annual basis. This sampling will be conducted in accordance with procedures in the Quality Assurance Project Plan (see Appendix A) and Field Sampling Plan (see Appendix B).

An initial sampling event that included ambient and indoor air sampling only was conducted by Consolidated Edison Company of New York, Inc. (Con Edison) at the River Place I site in April 2003. A second sampling event, which also included collection of soil vapor samples, was conducted at the site in April 2004. Data collected during the post-remediation sampling will be evaluated and compared to the results of the previous sampling events.

Ambient/indoor air sampling will be conducted annually at River Place I for 3 years during the heating season (November through March). Ambient and indoor air samples will be collected at the same approximate locations selected as part of the April 2004 sampling program. Two initial ambient samples will be collected, then four indoor samples, followed by two final ambient air samples. Specific sampling procedures and sample analysis are provided in the Quality Assurance Project Plan (see Appendix A) and Field Sampling Plan (see Appendix B).

5.0 INSPECTION PROCEDURES

Periodic inspections are required to be completed by the property owners to verify the effectiveness of the engineering and institutional controls implemented at the site. Reports documenting each inspection are not required to be submitted to the NYSDEC but must be kept on file to document maintenance of the engineering and institutional controls. Inspections shall be conducted in accordance with the following procedures:

- Inspections shall be performed to evaluate the integrity of the engineering controls, including the steel sheeting installed along the western perimeter of the remediated portion of Tax Lot 1 and the water/vapor barrier installed on the below-grade foundation of any constructed building on Tax Lot 3. Inspections of the constructed building shall be completed periodically by property management maintenance staff who have received training as outlined in Section 10.0 and shall be documented on the form provided in Appendix E.

- Inspections shall also be performed to ensure that the institutional controls are in-place. These institutional controls include ensuring current use of the property and groundwater is in accordance with the environmental easement established for the property; ensuring that the soil management plan, health and safety plan and community air monitoring plan are current and in place and that ambient/indoor air monitoring and groundwater monitoring is being performed in accordance with this SM Plan.

- When completed, the Inspection Form shall be signed and dated by the property management maintenance staff personnel completing the inspection. A copy of the completed Inspection Form will be kept in the files maintained on site. The original copy will be forwarded to the site manager for review and signature no later than the 10th day of the following month.

- A status report recorded on the form provided in Appendix D shall be submitted to the site manager to document follow-up action taken to investigate or correct any problems or incidents noted in a report. This report shall be submitted to the site manager within 14 days of the inspection report and a copy of this report shall also be kept in the on-site files.

- Where appropriate, color photographs and other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc., shall be attached to the report and/or the status report. In addition, a sketch showing the approximate location of any problems or incidents noted shall be included either on the inspection form or on an attached sheet.

6.0 CERTIFICATION OF CONTINUED EFFECTIVENESS

An annual certification is required to be submitted by the property owners to confirm the continued effectiveness of the engineering and institutional controls in place at the site. This certification, stamped and signed by a professional engineer licensed in the State of New York, must accompany the annual monitoring and inspection report to be submitted to the NYSDEC. The certification must identify any required institutional and/or engineering controls, and evaluate whether the controls should remain in place and whether they continue to be effective for the protection of public health and the environment. In addition, the certification must confirm that where engineering controls are a component of the remedy, the corresponding institutional controls are maintained. These institutional controls consist of the following:

- Groundwater and soil vapor monitoring continues to be conducted in accordance with Section 4.0 of this SMP;
- Periodic inspections of engineering and institutional controls continue to be conducted and are properly documented in inspection reports which are maintained on file;
- Annual reports of groundwater monitoring and ambient/indoor air monitoring have been submitted to the NYSDEC in accordance with Section 9.0 of the SMP; and
- The information in this SMP has been reviewed and updated where needed.

7.0 SOIL MANAGEMENT

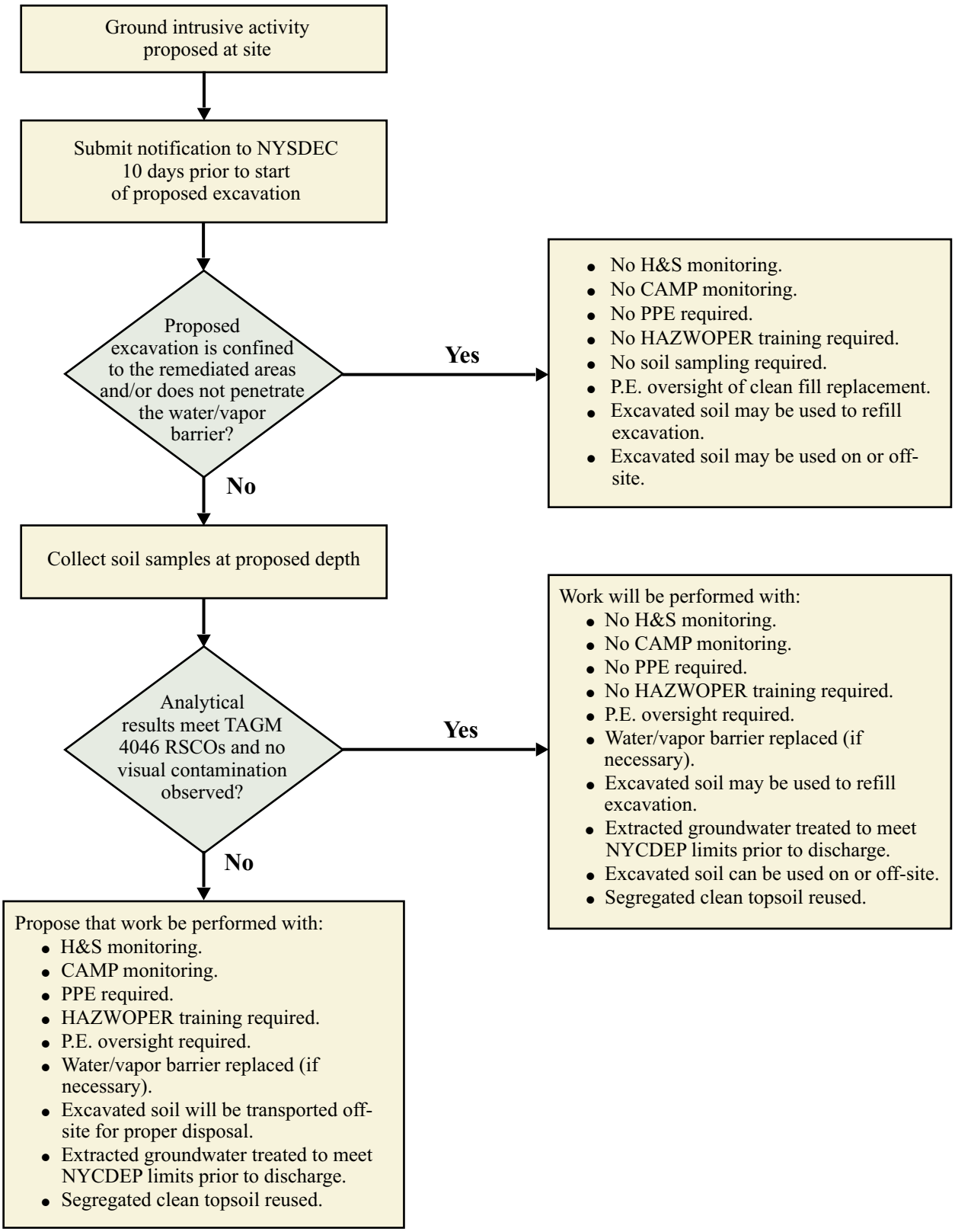
This Soil Management section is applicable for any ground-intrusive work at the site which will intrude through concrete or asphalt pavement, building slabs, or through the clean soil cover into underlying contaminated soil. Notification on the form provided in Appendix E must be submitted by the property owners to the NYSDEC ten days prior to undertaking any action that satisfies the above criteria. On-site work that may require notification includes, but may not be limited to, the following:

- Underground utility work at either Tax Lot 1 or 3;
- Landscaping, other than mowing or spreading mulch or treatments on the surface of the ground on Tax Lot 1;
- Paving or resurfacing of the roadways or parking areas on Tax Lot 1; and
- Any project that breaks or penetrates the ground surface on Tax Lot 1 or penetrates beyond the remediated area on Tax Lot 3.

In addition, any construction or breach of any type or demolition of completed concrete foundations at Tax Lots 1 and 3 would also require notification and approval prior to the start of the project.

The decision tree presented in Figure 7-1 illustrates the procedures to be followed for any proposed ground-intrusive work taking into consideration the conditions expected to be encountered at a location and the associated depth of the work planned.

Excavated soil and debris that requires transportation off-site for proper disposal will undergo the characterization procedure identified in Section 3.0 of the approved RWP. The characterization procedure is presented as a Standard Operating Procedure (SOP) in Appendix E. Development and purge water from groundwater monitoring wells will also be managed in accordance with the procedures in Section 3.0 of the approved RWP, and are also presented in an SOP in Appendix E.



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CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT SITE

SOIL MANAGEMENT

FIGURE 7-1

8.0 CONTINGENCY PLAN

This contingency plan describes procedures to be utilized in the event of an emergency, such as a fire, severe weather or vandalism, which are designed to protect and/or maintain the operation of the institutional and engineering controls implemented at the site. When redevelopment of the remediated portions of Tax Lots 3 and 1 are completed, an Alternate Emergency Contact will be designated to implement this Contingency Plan. These individuals will be available on a 24-hour basis to respond to emergency conditions at the site. A copy of the contingency plan will be provided to the emergency contact and the Property Manager, as well as the Security Department at River Place I, and the security associated with the redevelopment of Tax Lots 3 and 1.

8.1 Emergency Response

Any staff discovering a condition or situation that impacts or has the potential to impact the engineering and/or institutional controls at the site shall immediately contact the Property Manager or in his/her absence, the Alternate Emergency Contact to report the following information:

- Employee's name,
- Location of the incident (i.e., the area where the incident occurred),
- Time of the incident,
- Type and magnitude of the incident or situation,
- Whether personnel have been injured, and
- The portion of the site involved.

The Property Manager or Alternate Emergency Contact will, if necessary, immediately inspect the affected area to identify the character and extent of the incident. The Property Manager/Alternate Emergency Contact will then coordinate with all personnel to initiate appropriate response activities.

The Property Manager/Alternate Emergency Contact will assess possible hazards to human health or the environment that may result from the incident and shall determine appropriate personal protective equipment for essential personnel. The Property Manager/ Alternate Emergency Contact shall ensure that those employees responding to a medical emergency are trained in CPR/first aid and blood borne pathogens.

If the Property Manager/Alternate Emergency Contact determines that additional assistance is required, he or his designated agent shall contact the appropriate authorities. The telephone numbers of outside emergency assistance (i.e., local fire department, local police department and hospital) are listed in Table 8-1.

The Property Manager/Alternate Emergency Contact shall notify all appropriate organizations and federal, state and local agencies, so that necessary measures can be implemented to minimize and/or contain releases of any hazardous materials and/or constituent in order to minimize any threat to human health or the environment. In an emergency that impacts or has the potential to impact the engineering and/or institutional controls, NYSDEC project management will be notified. If the spill response hotline is notified, the caller will state that the site is an inactive hazardous waste site. The caller will also provide the site identification numbers (C2-31-024 and C2-31-012) and the NYSDEC Project Manager name.

The Property Manager/Alternate Emergency Contact or designated agent shall keep a chronological record of the times of visits (if any) by the fire and/or police departments, governmental regulatory agencies and personnel. Names, titles and organizations represented by these personnel shall be recorded.

8.2 Evacuation Plan

An evacuation plan has been prepared for River Place I that provides procedures for effectively and efficiently evacuating the building. A similar plan will be prepared for the remediated areas of Tax Lots 3 and 1 when redevelopment is completed. If the Property

Table 8-1

EMERGENCY TELEPHONE NUMBERS

Redeveloped Property Associated with Remediated Areas of Tax Lots 3 and 1 Property Manager [TBD]	[TBD]
Alternate Emergency Contact [TBD]	[TBD]
NY State 24-hour Oil & Hazardous Material Notification	(800) 457-7362
(callers outside New York State)	(518) 457-7362
National Response Center	(800) 424-8802
USEPA	(732) 548-8730
NYC Department of Environmental Protection	311
(callers outside New York City)	(212) 639-9675
New York City Fire Department	911
New York City Police Department	911
(Switchboard)	(646) 610-5000
Ambulance	911
St. Lukes-Roosevelt Hospital Center 428 West 59th Street New York, NY	(212) 523-4000

Manager/Alternate Emergency Contact or local authorities determine that evacuation of buildings would be necessary or prudent, the property Security Department would initiate evacuation in accordance with the site evacuation plans.

8.3 Fire/Explosion

In the case of a fire or explosion, the New York City Fire Department will be contacted following the procedure outlined below and evacuation of the area will be immediately conducted. The Property Managers and Alternate Emergency Contact will be contacted as soon as possible. Emergency phone numbers are listed in Table 8-1

In case of an emergency, the following Incident Reporting Procedure shall be observed:

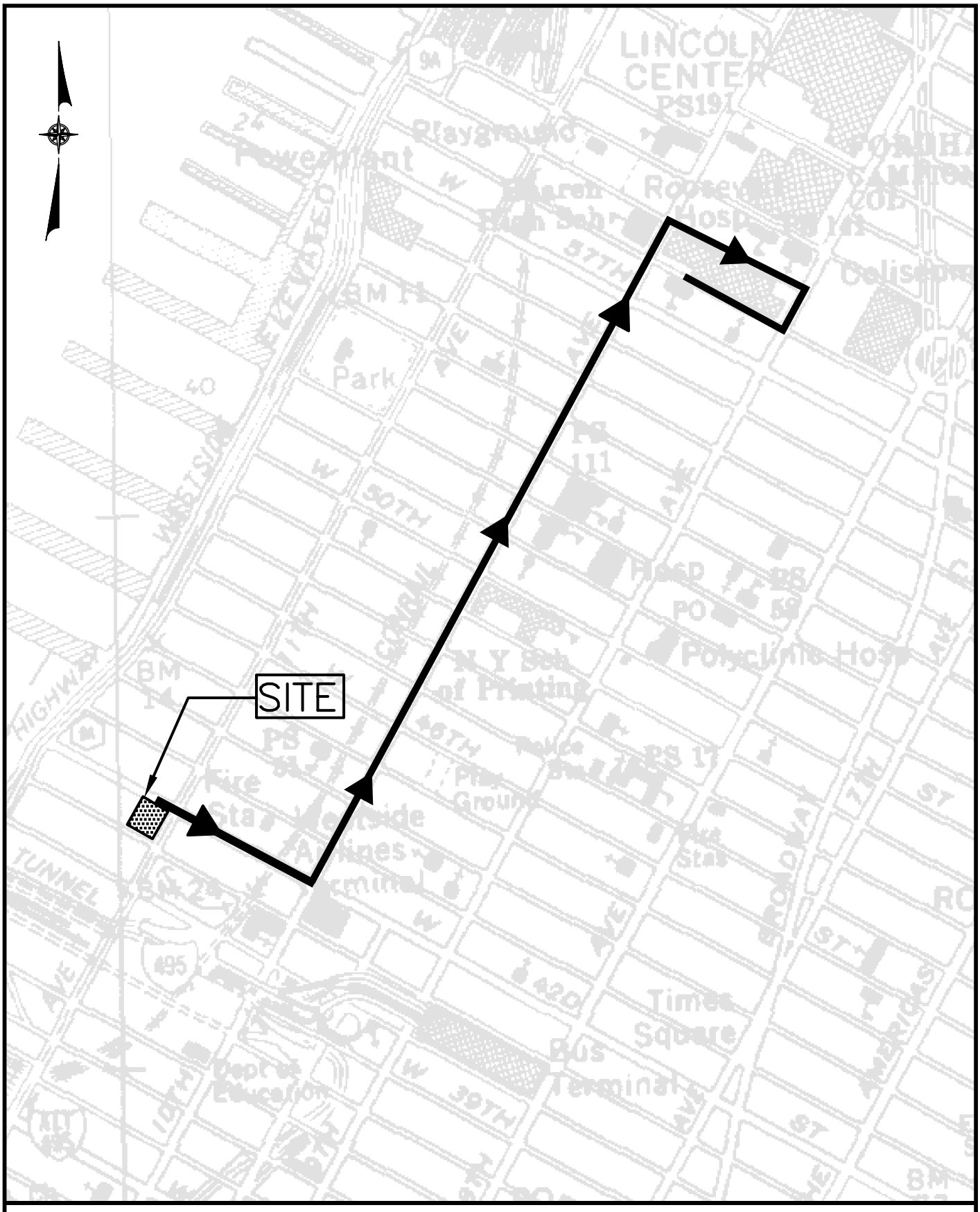
It is important to assure the rapid and accurate transfer of information to appropriate personnel in the event of an emergency situation. To simplify the procedure, emergency situations can be reported by dialing **911**. This includes incidents requiring police assistance, fire department, or medical emergencies.

Be sure to provide the following information to the dispatcher:

1. Caller's full name.
2. The nature of the incident (i.e., "Fire").
3. The location of the incident (i.e., "Street location and nearest intersection"). The more specific the better.
4. What you need (i.e., "Fire Department and First Aid").
5. If you are able, where you will meet emergency responders.
6. If applicable, a call back number or your pager number.
7. Status of the situation (e.g., is the situation stabilized or "I have the fire under control").
8. If anyone is injured or in need of emergency assistance (e.g., "A mechanic working on a pump was burned").

8.4 Personal Injury/Toxic Exposures

In the event of an emergency situation, the staff will contact 911 to request assistance. The Property Managers will also be notified immediately. In case of a life-threatening situation, emergency first aid may be applied on-site as deemed necessary. If possible, the individual should be cleaned up and/or decontaminated and then transported to the nearest medical facility, if needed. A map with directions is provided on Figure 8-1.



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42nd STREET MANUFACTURED GAS PLANT

MAP TO HOSPITAL

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FIGURE 8-1

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9.0 REPORTING

9.1 Record Keeping

Records of inspections, ground-intrusive activities performed at the site, and groundwater monitoring activities will be recorded and maintained in the River Place I building and in the building or facility to be constructed at the remediated portions of Tax Lots 3 and 1, when completed.

9.2 Reporting

Monitoring reports on groundwater and ambient/indoor air quality will be prepared and submitted to NYSDEC, and an annual report summarizing the inspections and monitoring will be provided as described below. Reports are to be presented as bound, written reports of findings or an equivalent electronic format.

9.2.1 Annual Inspection and Monitoring Report

An annual report will be prepared by the property owners and submitted to NYSDEC no later than 90 days after the final sampling event of the year. This report will include the information described above for the quarterly monitoring reports, as well as:

- A site location map;
- A site plan, including sampling locations;
- A summary of all inspections;
- A summary of all ground-intrusive activities performed at the site;
- A compilation and summary of all emergency activities;
- A compilation and summary of all groundwater quality data collected during the year;
- A compilation and summary of all ambient/indoor air quality data collected during the year;

- Review of the data to determine exceedances of applicable water quality criteria, as well as discernible trends in data;

- Conclusions and recommendations based on a review of the groundwater monitoring and ambient/indoor air sampling;

- Any changes from the approved manual, with justification provided for each change; and

- A certification by a professional engineer that all institutional and/or engineering controls are in place, have not been altered and are still effective.

10.0 PERSONNEL ORGANIZATION, RESPONSIBILITIES AND TRAINING REQUIREMENTS

10.1 Key Participants and Responsibilities

This section identifies the key participants involved in the implementation this Site Management Plan, along with the primary responsibilities of each participant:

Key Participants	**Primary Responsibilities**
Volunteers: River Place I, LLC and Owners of the redeveloped portions of Tax Lots 3 and 1	• Performance of annual inspection and certification and submit to NYSDEC; copy to Con Edison. • Preparation and submittal of periodic progress and annual reports; copy to Con Edison. • Notification to NYSDEC of intrusive activities. • Provide training to property personnel.
Participant: Consolidated Edison Company of New York, Inc.	• Performance of groundwater and ambient/indoor air monitoring; results provided to Property Owner. • Review and update of Site Management Plan as necessary. • Conduct citizen participation activities as necessary.
Regulatory Agencies: New York State Department of Environmental Conservation and New York State Department of Health	• Provide regulatory oversight.

Key Participants	Primary Responsibilities
Property Manager: [TBD]	• Supervision and training of site personnel. • Maintain records at the Property. • Provide oversight of ground intrusive work. • Ensure proper management and disposal of contaminated material. • Emergency response coordination.

10.2 Training Requirements

The Property Manager and on-site property management and maintenance personnel shall receive initial training and annual refresher training that will include the following topics:

- Site Management Plan,
- Site-specific SOPs,
- Emergency Response Action and Notification Requirements, and
- Health and Safety.

Records documenting the training dates, the scope and length of the training provided, and the names and titles of individuals attending the training will be maintained by the Property Manager.

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN
SITE MANAGEMENT PLAN
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

Prepared for:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

and

RIVER PLACE I, LLC
RIVER PLACE II, LLC

Prepared by:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
WOODBURY, NY 11797

JULY 2006

QUALITY ASSURANCE PROJECT PLAN
SITE MANAGEMENT PLAN
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

List of Figures

List of Tables

1.0 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) specifies analytical methods to be used to ensure that data from site management plan activities are precise, accurate, representative, comparable and complete.

1.1 Introduction

Site Management Plan sampling will be performed to monitor and report on the performance and effectiveness of the remedy in the short and long-term.

1.2 Project Objectives

The objectives of this project are as follows:

- maintain engineering controls,
- maintain institutional controls,
- inspect and evaluate site information periodically to confirm that the remedy continues to be effective for the protection of public health and the environment, and
- monitor and report on the performance and effectiveness of the remedy in the short and long-term by sampling and analysis of appropriate media.

1.3 Scope of Work

The scope of work for the site management of the West 42nd Street former MGP site is described in the project Site Management Plan. Samples will be collected from the subsurface, groundwater monitoring wells and ambient/indoor air. These samples will be analyzed using the USEPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition (and subsequent updates).

1.4 Data Quality Objectives and Processes

The quality assurance and quality control objectives for all measurement data include:

- ***Precision*** - an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and matrix spike duplicates.

- ***Accuracy*** - a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. Sampling accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

- ***Representativeness*** - expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness will be determined by assessing a number of investigation procedures, including chain of custody, decontamination, and analysis of field blanks and trip blanks.

- ***Completeness*** - the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.

- ***Comparability*** - expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for both sampling and analysis, instrument calibrations, using standard reporting units and reporting formats, and data validation.

Each of the above objectives are discussed in detail in Section 3.

2.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) OBJECTIVES FOR MEASUREMENT OF DATA

2.1 Introduction

The quality assurance and quality control objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in following subsections. They are formulated to meet the requirements of the USEPA SW-846. The analytical methods and their Contract Required Quantitation Limits (CRQLs) are given in Section 7.

2.2 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation (Section 8), calculating the RPD for duplicate sample results.

Analytical precision will be determined by the laboratory by calculating the RPD for the results of the analysis of internal QC duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{V1 - V2}{(V1 + V2)/2} \times 100$$

where:

RPD	=	Relative Percent Difference.
V1, V2	=	The two values to be compared.
|V1 - V2|	=	The absolute value of the difference between the two values.
(V1 + V2)/2	=	The average of the two values.

The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, are presented in Tables 1 and 2.

2.3 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987), or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity, which is recovered or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are close to the detection limits are less accurate because they are more affected by such factors as instrument "noise." Higher concentrations will not be as affected by instrument noise or other variables and thus will be more accurate.

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be performed and

accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a spike, added to a sample (matrix spike) or to a blank (blank spike). The %R is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where:

%R	=	Percent recovery.
SSR	=	Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added.
SR	=	Sample result: the background value, i.e., the concentration of the analyte obtained by analyzing the sample.
SA	=	Spiked analyte: concentration of the analyte spike added to the sample.

The acceptance limits for accuracy for each parameter are presented in Tables 1 and 2.

2.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the

material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples as outlined in the Field Sampling Plan. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank, duplicate and Chain-of-custody procedures are presented in Sections 4 and 5.

2.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid (USEPA, 1987). The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness.
V = Number of measurements judged valid.
T = Total number of measurements.

2.6 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project;
- Requiring traceability of all analytical standards and/or source materials to the U.S. Environmental Protection Agency (USEPA) or National Institute of Standards and Technology (NIST);
- Requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable);
- Using standard reporting units and reporting formats including the reporting of QC data;
- Performing a complete data validation on a representative fraction of the analytical results, including the use of data qualifiers in all cases where appropriate; and
- Requiring that all validation qualifiers be used any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

3.0 SAMPLING PROGRAM

3.1 Introduction

This section presents sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements. Sample locations, and the number of environmental and QC samples to be taken are given in Table 3. The sampling procedures are presented in the Field Sampling Plan.

3.2 Sample Container Preparation and Sample Preservation

Sample containers will be properly washed and decontaminated prior to their use by either the analytical laboratory or the container vendor to the specifications required by the USEPA. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used to obtain samples. The containers will be tagged, the appropriate preservatives will be added. The types of containers are shown in Tables 4 and 5.

Samples shall be preserved according to the preservation techniques given in Tables 4 and 5. Preservatives will be added to the sample bottles by the laboratory prior to their shipment in sufficient quantities to ensure that proper sample pH is met. Following sample collection, the sample bottles should be placed on ice in the shipping cooler, cooled to 4^{o}C with ice or "blue ice," and delivered to the laboratory within 48 hours of collection. Chain-of-custody procedures are described in Section 5.

3.3 Sample Holding Times

The sample holding times for organic and inorganic parameters are given in Tables 4 and 5 and must be in accordance with the NYSDEC ASP requirements. The NYSDEC ASP holding times must be strictly adhered to by the laboratory.

3.4 Field QC Samples

To assess field sampling and decontamination performance, two types of "blanks" will be collected and submitted to the laboratory for analyses. In addition, the precision of field sampling procedures will be assessed by collecting coded field duplicates and matrix spike/matrix spike duplicates (MS/MSDs). The blanks will include:

- Trip Blanks - A Trip Blank will be prepared before the sample containers are sent by the laboratory. The trip blank will consist of a 40-ml VOA vial containing distilled, deionized water, which accompanies the other water sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for target compound list (TCL) volatiles analysis. The Trip Blank will be analyzed for TCL volatile organic compounds to assess any contamination from sampling and transport, and internal laboratory procedures.

- Field Blanks - Field Blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix. Field blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of deionized, distilled water provided by the laboratory that has passed through a decontaminated bailer or other sampling apparatus. It is usually collected as a last step in the decontamination procedure, prior to taking an environmental sample. The field blank may be analyzed for all or some of the parameters of interest.

The duplicates will consist of:

- Coded Field Duplicate - To determine the representativeness of the sampling methods, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are a duplicate sample. This will eliminate any possible bias that could arise.

- Matrix Spike/Matrix Spike Duplicate (MS/MSD) - MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The percent recoveries and RPDs are given in Tables 1 and 2.

4.0 SAMPLE TRACKING AND CUSTODY

4.1 Introduction

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the Chain-of-custody (COC) and transfer of samples will be trained as to the purpose and procedures prior to implementation.

Evidence of sample traceability and integrity is provided by COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is shown in Figure 1. A sample is considered to be in a person's custody if the sample is:

- In a person's possession;
- Maintained in view after possession is accepted and documented;
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody; or
- In a secured area which is restricted to authorized personnel.

4.2 Field Sample Custody

A COC record (Figure 2 or similar) accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample containment and preservation, and during return to the laboratory. Triplicate copies of the COC must be completed for each sample set collected.

The COC lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of

sample shipment. The COC also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample.

The REMARKS space on the COC is used to indicate if the sample is a matrix spike, matrix spike duplicate, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and field blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper airbill number on the top of the COC. Mistakes will be crossed out with a single line in ink and initialed by the author.

One copy of the COC is retained by sampling personnel (notations identifying blind duplicate samples will be added to this copy of the COC but not the others that will go to the laboratory) and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample will not be analyzed.

4.3 Laboratory Sample Custody

The laboratory will be notified of upcoming field sampling activities, and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples, and for maintaining all associated records documenting that custody.

- Upon receipt of the samples, the custodian will check cooler temperature, and check the original COC documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.

- Care will be exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact Con Edison as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain-of-custody procedure.

- The samples will be stored in a secured area at a temperature of approximately 4 degrees Celsius until analyses commence.

- A laboratory tracking record will accompany the sample or sample fraction through final analysis for control.

- A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

5.0 CALIBRATION PROCEDURES

5.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions and are described in the Field Sampling Plan. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Records of all instrument calibration and copies of instrument manuals will be maintained.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photoionization detector and explosimeter) are provided in the Health and Safety Plan.

5.2 Laboratory Instruments

The laboratory will follow all calibration procedures and schedules as specified in the sections of the USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods given in Section 7.

6.0 ANALYTICAL PROCEDURES

6.1 Introduction

Samples will be analyzed according to the USEPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition and subsequent updates. The methods to be used for the laboratory analysis of water and soil samples are presented in Table 6. These methods were selected because they attain the quantitation limits, which are compiled in Table 6.

7.0 DATA REDUCTION, VALIDATION AND REPORTING

7.1 Introduction

Data collected during implementation of the site management plan will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the Chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

7.2 Data Reduction

Two copies of the analytical data packages and an electronic disk deliverable will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group.

7.3 Data Validation

Data validation will be performed on all the chemical results for the West 42nd Street former MGP site characterization. Data validation will be performed in accordance with the USEPA Contract Laboratory Program for Organic Data Review, EPA 540/R-99/008 (October 1999), USEPA Contract Laboratory Program for Inorganic Data Review, EPA 540/R-94/013 (February 1994). Data validation for all samples will include a review of holding times, method blanks, surrogates, reporting limits, chain-of-custody records and QC samples.

7.4 Data Reporting

Prior to release by the laboratory, the data must first meet all the specific QA/QC associated with the Standard Operating Procedures (SOP) that was used for the analysis. The Laboratory Quality Assurance officer (LQA) at the laboratory is responsible for the final verification of the data.

The laboratory employs a system of sign-off sheets where each analyst must sign off after their respective part of the analysis is complete and the analysis meets the QA/QC requirements of the specific SOP. Any deviations must be noted and explained in the project narrative, which will be incorporated into the final report. The LQA has final sign-off on the data package and is responsible for ensuring the overall quality of the data.

7.5 Data Management

An electronic database of all chemical data will be created and maintained for this project from the Electronic Data Deliverables (EDDs) provided by the laboratory. The following data management procedure will be used for all laboratory analytical data.

- Data package, including data summaries (Form Is) and all laboratory QA/QCs and other backup information is sent to an independent data validator.
- Digital data disks are used to import electronic data into the database.
- When validation is complete, qualifiers are entered into the database.
- Original Form Is with qualifiers are filed in the project files. Copies of the Form Is with qualifiers are organized in three-ring binders in order of sample identification.
- Site data tables are generated from the database.
- Database tables are checked against validated Form Is for accuracy and completeness.
- Data is exported from the database to MS Excel for creation of tables.

All Excel tables are spot-checked against Form I's after formatting or updating with new sample data.

8.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

8.1 Quality Assurance Batching

Each set of samples will be analyzed concurrently with calibration standards, method blanks, matrix spikes (MS), matrix spike duplicates (MSD) or laboratory duplicates, and QC check samples (if required by the protocol). The MS/MSD samples will be designated by the field personnel. If no MS/MSD samples have been designated, the laboratory will contact the BCP Volunteer/Participant for corrective action.

8.2 Calibration Standards and Surrogates

All organic standard and surrogate compounds are checked by the method of mass spectrometry for correct identification and gas chromatography for degree of purity and concentration. All standards are traceable to a source of known quality certified by the USEPA or NIST, or other similar program. When the compounds pass the identity and purity tests, they are certified for use in standard and surrogate solutions. Concentrations of the solutions are checked for accuracy before release for laboratory use. Standard solutions are replaced monthly or more frequently, based upon data indicating deterioration.

8.3 Organic Blanks and Matrix Spike

Analysis of blank samples verifies that the analytical method does not introduce contaminants or detect "false positives." The blank water can be generated by reverse osmosis and Super-Q filtration systems, or distillation of water containing $KMnO_4$. The matrix spike is generated by addition of surrogate standard to each sample.

8.4 Trip and Field Blanks

Trip blanks and field blanks will be utilized in accordance with the specifications in Section 3.4. These blanks will be analyzed to provide a check on sample bottle preparation and to evaluate the possibility of atmospheric or cross contamination of the samples.

9.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

9.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the project Quality Assurance Officer (QAO). These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

9.2 System Audits

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

9.3 Performance Audits

The laboratory may be required to conduct an analysis of Performance Evaluation (PE) samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

9.4 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Noncompliances will be logged, and documented through audit findings which are attached to and are a part of the integral audit report. These audit finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The BCP Volunteer/Participant has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the BCP Volunteer/Participant within fifteen days of completion of the audit. Serious deficiencies will be reported to the BCP Volunteer/Participant within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

10.0 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

10.1 Preventive Maintenance Procedures

Equipment, instruments, tools, gauges and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators.

A list of critical spare parts will be established by the operator. These spare parts will be available for use in order to reduce the downtime. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

10.2 Schedules

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule, and arrange any necessary and prompt service. Required service will be performed by qualified personnel.

10.3 Records

Logs shall be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories. The QAO may audit these records to verify complete adherence to these procedures.

11.0 CORRECTIVE ACTION

11.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

11.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, the BCP Volunteer/Participant and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;

- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 3 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the BCP Volunteer/Participant. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The BCP Volunteer/Participant will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

12.0 REFERENCES

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7, U.S. Environmental Protection Agency, Washington, D.C.

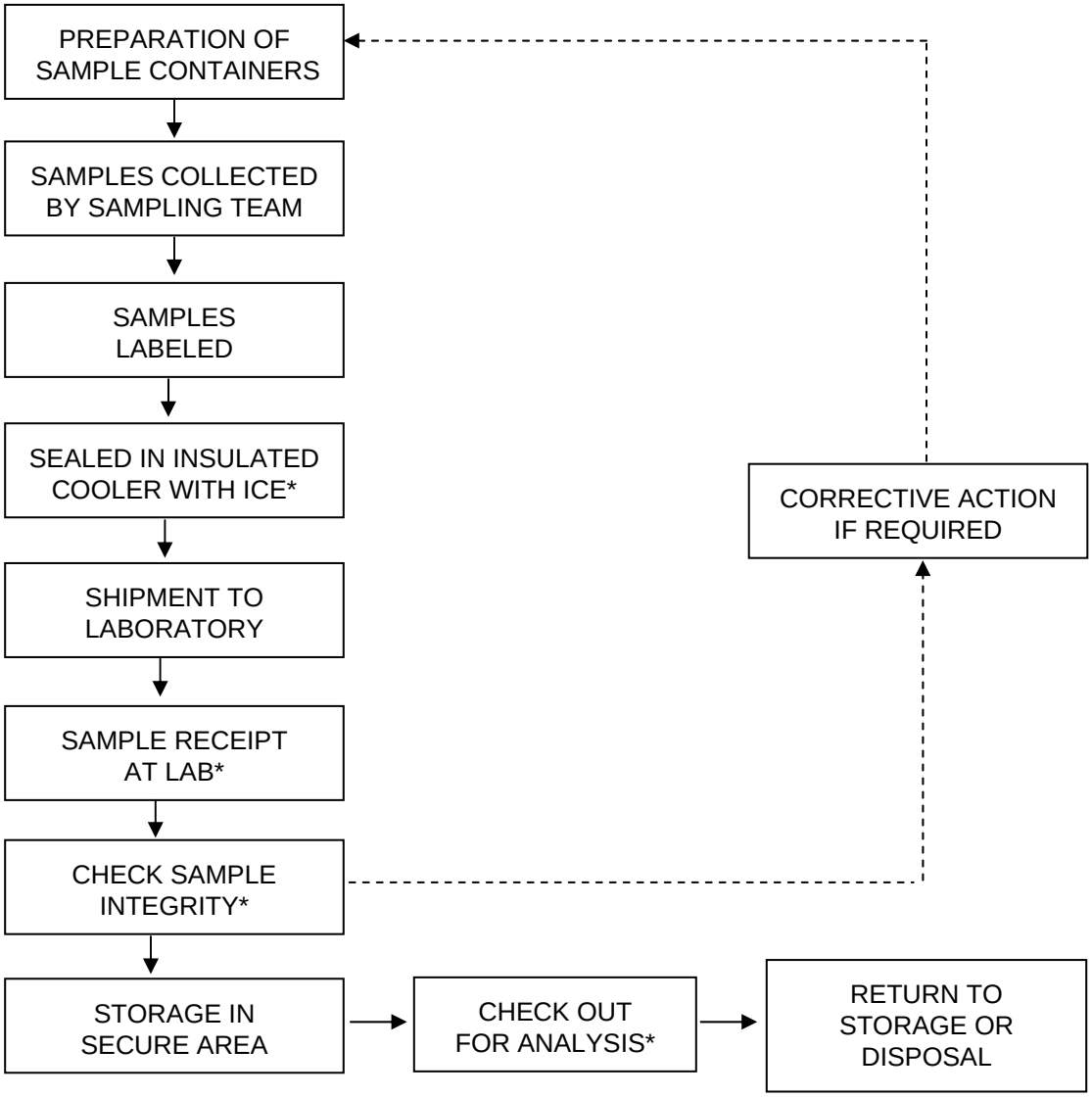
USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.

USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.

FIGURES

FIGURE 1

SAMPLE CUSTODY



*REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

MITKEM CORPORATION

175 Metro Center Boulevard
Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
email: mitkem@mitkem.com

CHAIN-OF-CUSTODY RECORD

Page ____ of ____

REPORT TO		INVOICE TO		
COMPANY	PHONE	COMPANY	PHONE	LAB PROJECT #:
NAME	FAX	NAME	FAX	
ADDRESS		ADDRESS		TURNAROUND TIME:
CITY/ST/ZIP		CITY/ST/ZIP		

CLIENT PROJECT NAME:	CLIENT PROJECT #:	CLIENT P.O.#:

REQUESTED ANALYSES

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS													COMMENTS
	/																				
	/																				
	/																				
	/																				
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TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME	ADDITIONAL REMARKS:	COOLER TEMP:
		/		/		
		/		/		
		/		/		

WHITE: LABORATORY COPY YELLOW: REPORT COPY PINK: CLIENT'S COPY

FIGURE 3

CORRECTIVE ACTION REQUEST

Number: _____ Date: _____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOW UP:

CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

TABLES

Table 1

QUALITY CONTROL LIMITS FOR WATER SAMPLES

		Laboratory Accuracy and Precision					
Analytical Parameters	**Analytical Method (a)**	**Matrix Spike (MS) Compounds**	**MS/MSD (b) % Recovery**	**MS/MSD RPD (c)**	**LCS (d) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260	1,1-Dichloroethane	61-145	14	NA	Toluene-d8	88-110
		Trichloroethene	71-120	14	NA	Bromofluorobenzene	86-115
		Benzene	76-127	11	NA	1,2-Dichloroethane-d4	76-114
		Toluene	76-125	13	NA		
		Chlorobenzene	75-130	13	NA		
SVOCs (f)	8270	Phenol	12-110	42	NA	Nitrobenzene-d5	35-114
		2-Chlorophenol	27-123	40	NA	2-Fluorobiphenyl	43-116
		1,4-Dichlorobenzene	36-97	28	NA	Terphenyl-d14	33-141
		N-Nitroso-di-n-propylamine	41-116	38	NA	Phenol-d5	10-110
		1,2,4-Trichlorobenzene	39-98	28	NA	2-Fluorophenol	21-110
		4-Chloro-3-methylphenol	23-97	42	NA	2,4,6-Tribromophenol	10-123
		Acenaphthene	46-118	31	NA	2-Chlorophenol-d4	33-110 (g)
		4-Nitrophenol	10-80	50	NA	1,2-Dichlorobenzene-d4	16-110 (g)
		2,4-Dinitrotoluene	24-96	38	NA		
		Pentachlorophenol	9-103	50	NA		
		Pyrene	26-127	31	NA		
Inorganics (i)	6010,7470/7471, 9010, OIA-1677	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990; any subsequent revisions shall supersede this information
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semivolatile Organic Compounds
(g) Limits are advisory only
(i) Target Analyte List Inorganics (metals and cyanide)
(j) Matrix spike only
(k) Laboratory duplicate RPD
NA - Not Applicable

Table 2

QUALITY CONTROL LIMITS FOR SOIL SAMPLES

		Laboratory Accuracy and Precision					
Analytical Parameter	**Analytical Method (a)**	**Matrix Spike (MS) Compounds**	**MS/MSD (b) % Recovery**	**MS/MSD RPD (c)**	**LCS (d) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260	1,1-Dichloroethane	59-172	22	NA	Toluene-d8	84-138
		Trichloroethene	62-137	24	NA	Bromofluorobenzene	59-113
		Benzene	66-142	21	NA	1,2-Dichloroethane-d4	70-121
		Toluene	59-139	21	NA		
		Chlorobenzene	60-133	21	NA		
SVOCs (f)	8270	Phenol	26-90	35	NA	Nitrobenzene-d5	23-120
		2-Chlorophenol	25-102	50	NA	2-Fluorobiphenyl	30-115
		1,4-Dichlorobenzene	28-104	27	NA	Terphenyl-d14	18-137
		N-Nitroso-di-n-propylamine	41-126	38	NA	Phenol-d5	24-113
		1,2,4-Trichlorobenzene	38-107	23	NA	2-Fluorophenol	25-121
		4-Chloro-3-methylphenol	26-103	33	NA	2,4,6-Tribromophenol	19-122
		Acenaphthene	31-137	19	NA	2-Chlorophenol-d4	20-130 (g)
		4-Nitrophenol	11-114	50	NA	1,2-Dichlorobenzene-d4	20-130 (g)
		2,4-Dinitrotoluene	28-89	47	NA		
		Pentachlorophenol	17-109	47	NA		
		Pyrene	35-142	36	NA		
Inorganics (i)	6010, 7470/7471, 7841, 9010	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semivolatile Organic Compounds
(g) Limits are advisory only
(i) Target Analyte List Inorganics (metals and cyanide)
(j) Matrix spike only
(k) Laboratory duplicate RPD
NA - Not Applicable

Table 3

SUMMARY OF ANALYSES

Matrix	Parameter	Analytical Method
Soil Samples	TCL VOCs TCL SVOCs Cyanide TAL Metals	EPA SW 8260 EPA SW 8270B EPA SW 9012 EPA SW 6000/7000
Groundwater Samples	TCL VOCs TCL SVOCs Cyanide (total) Cyanide (available) TAL Metals	EPA SW 8260 EPA SW 8270 EPA SW 9012 EPA OAI-1677 EPA SW 6000/7000
Ambient/Indoor Air	TCL VOCs	EPA T015

[(a)]Matrix spike/matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis.

Table 4

WATER SAMPLE CONTAINERIZATION, PRESERVATION, AND HOLDING TIMES

Analysis	Bottle Type[a]	Preservation[b]	Holding Time[c]
Volatile Organic Compounds (VOCs)	2-40 mL glass vial w/ Teflon septum	Cool to 4°C	7 days
Semivolatile Organics Compounds (SVOCs)	1000 mL glass w/ Teflon lined cap	Cool to 4°C	5 days*
PCBs	Glass w/teflon cap	Cool to 4°C	5 days*
Metals	1000 mL plastic bottle	Nitric Acid to pH < 2 Cool to 4°C	6 months, except mercury (26 days)
Cyanide	500 mL plastic bottle	NaOH to pH > 12 Cool to 4°C	14 days

(a)IChem Series 300 or equivalent.

(b)All samples to be preserved in ice during collection and transport.

(c)Days from validated time of sample receipt (VTSR).

* Extraction of water samples for PCB analysis by separatory funnel must be completed within 5 days of VTSR. Continuous liquid-liquid extraction is the required extraction for water samples for SVOCs. Continuous liquid-liquid extraction and concentration of water samples for SVOCs analysis completed within 5 days of VTSR. Extracts of water samples must be analyzed within 40 days of extraction.

Table 5

SOIL SAMPLE
CONTAINERIZATION AND HOLDING TIMES

Analysis	Bottle Type[(a)]	Preservation[(b)]	Holding Time[(c)]
Volatile Organic Compounds (VOCs)	Wide-mouth glass w/teflon lined cap	Cool to 4°C	7 days
Other Organic Compounds[(d)]	Wide-mouth glass w/teflon lined cap	Cool to 4°C	10 days*
Metals	Wide-mouth plastic or glass	Cool to 4°C	6 months, except mercury (26 days)
Cyanide	Wide-mouth plastic	Cool to 4°C	14 days

[(a)] IChem Series 200 or equivalent.

[(b)] All samples to be preserved in ice during collection and transport.

[(c)] Days from date of sample collection.

[(d)] Semivolatile organic compounds or PCBs.

* Sohxlet or sonication procedures for extraction and concentration of soil/waste samples for SVOCs must be completed within 10 days of collection. Sohxlet or sonication procedures for extraction and concentration of soil/sediment/waste samples for PCBs must be completed within 10 days of collection. Extracts of soil samples must be analyzed within 40 days of extraction.

Table 6

PROJECT QUANTITATION LIMITS

	Analysis/Compound	Method	Quantitation Limits Water (ug/L)	Quantitation Limits Soil (ug/kg)	State of New York Standards Water (ug/L)[a]	State of New York Standards Soil (ug/kg)[b]
	Volatile Organics					
1	1,1,1-Trichloroethane	SW8260B	1	5	5	800
2	1,1,2,2-Tetrachloroethane	SW8260B	1	5	5	600
3	1,1,2-Trichloroethane	SW8260B	1	5	1	
4	1,1-Dichloroethane	SW8260B	1	5	5	200
5	1,1-Dichloroethene	SW8260B	1	5	5	400
6	1,2-Dichloroethane	SW8260B	1	5	0.6	100
7	1,2-Dichloroethene(total)	SW8260B	1	5	5	300
8	1,2-Dichloropropane	SW8260B	1	5	1	
9	2-Butanone (MEK)	SW8260B	10	20		300
10	2-Hexanone	SW8260B	10	20		
11	4-Methyl-2-pentanone(MIBK)	SW8260B	5	20		1000
12	Acetone	SW8260B	10	20		200
13	Benzene	SW8260B	1	5	1	60
14	Bromodichloromethane	SW8260B	1	5		
15	Bromoform	SW8260B	1	5		
16	Bromomethane	SW8260B	2	10	5	
17	Carbon Disulfide	SW8260B	1	5		2700
18	Carbon Tetrachloride	SW8260B	1	5	5	600
19	Chlorobenzene	SW8260B	1	5	5	1700
20	Chloroethane	SW8260B	2	10	5	1900
21	Chloroform	SW8260B	1	5	7	300
22	Chloromethane	SW8260B	2	10	5	
23	cis-1,3-Dichloropropene	SW8260B	1	5	0.4	
24	Dibromochloromethane	SW8260B	1	5	5	
25	Ethyl Benzene	SW8260B	1	5	5	5500
26	Methylene Chloride	SW8260B	1	5	5	100
27	Styrene	SW8260B	1	5	5	
28	Tetrachloroethene	SW8260B	1	5	5	1400
29	Toluene	SW8260B	1	5	5	1500
30	trans-1,3-Dichloropropene	SW8260B	1	5	0.4	
31	Trichloroethene	SW8260B	1	5	5	700
32	Vinyl Chloride	SW8260B	2	10	2	200
33	Xylenes (total)	SW8260B	1	5	5	1200

Table 6 (continued)

PROJECT QUANTITATION LIMITS

	Analysis/Compound	Method	Quantitation Limits Water (ug/L)	Quantitation Limits Soil (ug/kg)	State of New York Standards Water (ug/L)	State of New York Standards Soil (ug/kg)
	Semivolatile Organics					
1	1,2,4-Trichlorobenzene	SW8270C	10	330	5	3400
2	1,2-Dichlorobenzene	SW8270C	10	330	3	7900
3	1,3-Dichlorobenzene	SW8270C	10	330	3	1600
4	1,4-Dichlorobenzene	SW8270C	10	330	3	8500
5	2,2'-oxybis(1-chloropropane)*	SW8270C	10	330	5	
6	2,4,5-Trichlorophenol	SW8270C	25	330	1	100
7	2,4,6-Trichlorophenol	SW8270C	10	330	1	
8	2,4-Dichlorophenol	SW8270C	10	330	1	400
9	2,4-Dimethylphenol	SW8270C	10	330	1	
10	2,4-Dinitrophenol	SW8270C	25	330	1	200
11	2,4-Dinitrotoluene	SW8270C	10	330	5	
12	2,6-Dinitrotoluene	SW8270C	10	330	5	1000
13	2-Chloronaphthalene	SW8270C	10	330		
14	2-Chlorophenol	SW8270C	10	330	1	800
15	2-methyl-4,6-Dinitrophenol	SW8270C	25	330		
16	2-Methylnaphthalene	SW8270C	10	330		36400
17	2-Methylphenol	SW8270C	10	330	1	100
18	2-Nitrolaniline	SW8270C	25	330	5	430
19	2-Nitrophenol	SW8270C	10	330	1	330
20	3,3'-Dichlorobenzidine	SW8270C	10	330	5	
21	3-Nitroaniline	SW8270C	25	330	5	500
22	4-Bromophenyl-phenyl ether	SW8270C	10	330		
23	4-Chloro-3-methylphenol	SW8270C	10	330		240
24	4-Chloroaniline	SW8270C	10	330	5	220
25	4-Chlorophenyl-phenyl ether	SW8270C	10	330		
26	4-Methylphenol	SW8270C	10	330	1	900
27	4-Nitroaniline	SW8270C	25	330	5	
28	4-Nitrophenol	SW8270C	25	330	1	100
29	Acenaphthene	SW8270C	10	330		50000
30	Acenaphthylene	SW8270C	10	330		41000
31	Anthracene	SW8270C	10	330		50000
32	Benzo(a)anthracene	SW8270C	10	330		224
33	Benzo(a)pyrene	SW8270C	10	330		61
34	Benzo(b)fluoranthene	SW8270C	10	330		1100
35	Benzo(g,h,i)perylene	SW8270C	10	330		50000
36	Benzo(k)fluoranthene	SW8270C	10	330		1100
37	bis(2-Chloroethoxy)methane	SW8270C	10	330	5	
38	bis(2-Chloroethyl)ether	SW8270C	10	330	1	
39	bis(2-ethylhexyl)phthalate	SW8270C	10	330	5	50000
40	Butylbenzylphthalate	SW8270C	10	330		50000
41	Carbazole	SW8270C	10	330		
42	Chrysene	SW8270C	10	330		400
43	Di-n-butylphthalate	SW8270C	10	330	50	8100
44	Di-n-octylphthalate	SW8270C	10	330		50000
45	Dibenz(a,h)anthracene	SW8270C	10	330		14
46	Dibenzofuran	SW8270C	10	330		6200
47	Diethylphthalate	SW8270C	10	330		7100
48	Dimethylphthalate	SW8270C	10	330		2000
49	Fluoranthene	SW8270C	10	330		50000
50	Fluorene	SW8270C	10	330		50000

Table 6 (continued)

PROJECT QUANTITATION LIMITS

			Quantitation Limits		State of New York Standards	
	Analysis/Compound	**Method**	**Water (ug/L)**	**Soil (ug/kg)**	**Water (ug/L)**	**Soil (ug/kg)**
	Semivolatile Organics					
51	Hexachlorobenzene	SW8270C	NA (8081A)	330		410
52	Hexachlorobutadiene	SW8270C	10	330	0.5	
53	Hexachlorocyclopentadiene	SW8270C	10	330	5	
54	Hexachloroethane	SW8270C	10	330	5	
55	Indeno(1,2,3-cd)pyrene	SW8270C	10	330		3200
56	Isophorone	SW8270C	10	330		4400
57	N-Nitroso-di-n-propylamine	SW8270C	10	330		
58	N-nitrosodiphenylamine	SW8270C	10	330		
59	Naphthalene	SW8270C	10	330		13000
60	Nitrobenzene	SW8270C	10	330	0.4	200
61	Pentachlorophenol	SW8270C	25	330	1	1000
62	Phenanthrene	SW8270C	10	330		50000
63	Phenol	SW8270C	10	330	1	30
64	Pyrene	SW8270C	10	330		50000

Table 6 (continued)

PROJECT QUANTITATION LIMITS

			Estimated Quantitation Limits		State of New York Standards	
	Analysis/Compound	**Method**	**Water (ug/L)**	**Soil (ug/kg)**	**Water (ug/L)**	**Soil (ug/kg)**
	PCBs					
1	Aroclor-1016	SW8082	1.0	33	0.09	1000
2	Aroclor-1221	SW8082	2.0	33	0.09	1000
3	Aroclor-1232	SW8082	1.0	33	0.09	1000
4	Aroclor-1242	SW8082	1.0	33	0.09	1000
5	Aroclor-1248	SW8082	1.0	33	0.09	1000
6	Aroclor-1254	SW8082	1.0	33	0.09	1000
7	Aroclor-1260	SW8082	1.0	33	0.09	1000
	Metals		**(mg/L)**	**(mg/kg)**	**(mg/L)**	**(mg/kg)**
1	Antimony	SW6010B	0.006	5.0	0.003	
2	Arsenic	SW6010B	0.01	1	0.025	7.5
3	Barium	SW6010B	0.01	1	1	300
4	Beryllium	SW6010B	0.005	0.5	0.003	0.16
5	Cadmium	SW6010B	0.005	0.5	0.005	1
6	Chromium	SW6010B	0.01	1	0.05	10
7	Copper	SW6010B	0.03	2.5	0.2	25
8	Lead	SW6010B	0.01	0.5	0.025	400[(c)]
9	Mercury	SW7470A/7471A	0.0002	0.01	0.0007	0.1
10	Nickel	SW6010B	0.04	4	0.1	13
11	Selenium	SW6010B	0.01	1	0.01	2
12	Silver	SW6010B	0.01	1	0.05	
13	Thallium	SW7841	0.002	1	0.0005	
14	Zinc	SW6010B	0.02	2	2	20
*15	Vanadium	SW6010B	0.05	1	0.0005	150
*16	Cobalt	SW6010B	0.05	1		30
*17	Aluminum	SW6010B	0.2	20		
*18	Calcium	SW6010B	5	500		
*19	Iron	SW6010B	0.1	10	0.3	2000
*20	Magnesium	SW6010B	5	500	35	
*21	Manganese	SW6010B	0.015	1.5	0.3	
*22	Potassium	SW6010B	5	500		
*23	Sodium	SW6010B	5	500	20	
*24	Cyanide	SW9010A	0.01	0.01	200	

N/A - Not Applicable

[(a)]Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, NYSDEC, October 1993.

[(b)]Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

[(c)]EPA Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead Contaminated Soil, July 14, 1994.

APPENDIX B

FIELD SAMPLING PLAN

APPENDIX B

FIELD SAMPLING PLAN
SITE MANAGEMENT PLAN
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

Prepared for:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

and

RIVER PLACE I, LLC
RIVER PLACE II, LLC

Prepared by:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
WOODBURY, NEW YORK

JULY 2006

FIELD SAMPLING PLAN
SITE MANAGEMENT PLAN
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

List of Figures

1.0 INTRODUCTION

This Field Sampling Plan (FSP) is intended to define the methods and procedures to be used for conducting soil, groundwater and ambient/indoor air sampling as part of ongoing site management at the West 42nd Street former Manufactured Gas Plant (MGP) site.

1.1 Overview of Field Activities

The following field activities will be performed as part of the site investigation:

- **Groundwater Sampling** - Groundwater samples will be collected from the monitoring wells and will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), Target Analyte List (TAL) metals and cyanide.
- **Ambient/Indoor Air Sampling** - Ambient and indoor air samples will be collected on the River Place I property and will be analyzed for TCL VOCs.

The following field activities may be performed as part of the site management:

- **Soil Sampling**- Surface and or subsurface soil samples may be collected if ground intrusive activities are to be performed at the site. Soil samples will be collected and analyzed for TCL VOCs, TCL SVOCs, TAL metals and cyanide.

2.0 GENERAL FIELD GUIDELINES

2.1 Site Hazards

Potential on-site surface hazards, such as sharp objects, overhead power lines, energized areas, and building hazards will be identified prior to initiation of fieldwork. Generally, such hazards will be identified during a site visit prior to the first day of fieldwork.

2.2 Underground Utilities

All underground utilities, including electric lines, gas lines, and communication lines will be identified prior to initiation of drilling and other subsurface work. This will be accomplished as follows:

- All intrusive activities will be conducted in accordance with Con Edison's Utility Clearance Process for Intrusive Activities.
- All on-site underground utilities in the vicinity of proposed drilling locations will be located in conjunction with Con Edison.
- Con Edison will conduct an M-scope survey of the chosen drilling locations. A test pit will be conducted at each drilling location to clear subsurface utilities. Test pits will be excavated using a hand-auger to a minimum depth of 5 feet or to a depth specified by Con Edison personnel.
- Any off-site underground utilities in the vicinity of proposed drilling locations will be located and marked by a representative of the New York City/Long Island One Call Center: at (800) 272-4480 as required by New York Code 753. New York State law requires that Dig Safely New York be notified at least two working days, and not more than 10 working days, before subsurface work is conducted. Non-participating members including, but not limited to, the NYC Department of Environmental Protection (NYCDEP) Departments of Sewer and Water will be visited and the plates obtained. (See also, Con Edison's updated utility clearance procedures.)

2.3 Field Log Books

All field activities will be carefully documented in field log books. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is obtained. The field log book will provide a legal record of the activities conducted at the site. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Field Team Leader while field work is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections made after departing the field will be made by the person who made the original entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.

At a minimum, daily field book entries will include the following information:

- Location of field activity;
- Date and time of entry;
- Names and titles of field team members;
- Names and titles of any site visitors and site contacts;
- Weather information, for example: temperature, cloud coverage, wind speed and direction;
- Purpose of field activity;
- A detailed description of the field work conducted;

- Sample media (soil, sediment, groundwater, etc.);
- Sample collection method;
- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Volume of groundwater removed before sampling;
- Preservatives used;
- Analytical parameters;
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (e.g., laboratory);
- Field observations;
- Any field measurements made, such as pH, temperature, conductivity, water level, etc.;
- References for all maps and photographs of the sampling site(s);
- Information pertaining to sample documentation such as:
  - Bottle lot numbers;
  - Dates and method of sample shipments;
  - Chain-of-Custody Record numbers;
  - Federal Express Air Bill Numbers.

3.0 FIELD EQUIPMENT DECONTAMINATION AND MANAGEMENT OF INVESTIGATION DERIVED WASTES

3.1 Decontamination Area

A temporary decontamination area lined with polyethylene sheeting will be constructed for steam cleaning ground intrusive equipment. The location of the decontamination area will be coordinated with the property owner. Equipment may also be decontaminated using the sampling equipment methods described in Section 3.2.1. Water collected from the steam-cleaning activities will be collected in 55-gallon drums and managed as described in Section 3.3.

3.2 Equipment Decontamination

The following procedures will be used to decontaminate equipment used during the Site Management activities.

- All drilling equipment including the drilling rig, augers, bits, rods, tools, split-spoon samplers and tremie pipe will be cleaned with a high-pressure steam cleaning unit before beginning work.
- Tools, drill rods and augers will be placed on sawhorses or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided.
- All augers, rods and tools will be decontaminated between each drilling location according to the above procedures.
- The back of the drill rig and all tools, augers and rods will be decontaminated at the completion of the work and prior to leaving the site.

3.2.1 Sampling Equipment Decontamination

Suggested Materials

- Potable water
- Phosphate-free detergent – ***Simple Green***

- Distilled water
- Aluminum foil
- Plastic/polyethylene sheeting
- Plastic buckets and brushes
- Personal protective equipment in accordance with the HASP

Procedures

- Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, interface probes, etc.) will be either steam cleaned or washed with potable water and a phosphate-free detergent (***Simple Green***). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.
- The sampling equipment will then be rinsed with potable water followed by a de-ionized water rinse.
- Between rinses, equipment will be placed on polyethylene sheets or aluminum foil if necessary. At no time will washed equipment be placed directly on the ground.
- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

3.3 Management of Investigation Derived Wastes

3.3.1 Decontamination Fluids

Steam cleaning and decontamination fluids will be collected in DOT approved 55-gallon drums. The drums will be labeled as site management derived wastewater and temporarily stored in a secured area, characterized, and subsequently disposed of by the BCP Volunteer/Participant.

3.3.2 Soil

Soils will be contained in 55-gallon drums. The drums will be labeled as site management derived soils and temporarily stored in a secured area, characterized, and subsequently disposed of by the BCP Volunteer/Participant.

3.3.3 Development and Purge Water

All development and purge water will be contained in 55-gallon drums. The drums will be labeled as site management derived wastewater from the corresponding well and temporarily stored in a secured area, characterized, and subsequently disposed of by the BCP Volunteer/Participant.

3.3.4 Personal Protective Equipment

All personal protective equipment (PPE) will be placed in 55-gallon drums or roll-off containers for proper disposal by the BCP Volunteer/Participant.

3.3.5 Dedicated Sampling Equipment

All dedicated soil sampling equipment (Macrocore sampler liners and catchers) and groundwater sampling equipment (dedicated disposable polyethylene bailer and dedicated polypropylene line) will be placed in 55-gallon drums for disposal by BCP Volunteer/ Participant.

4.0 DRILLING/SOIL SAMPLING PROCEDURES

4.1 Introduction

Intrusive activities that may be conducted at the West 42nd Street former MGP site as part of site management consist of:

- Test pit excavations;
- Soil borings; and
- Monitoring well installations.

These procedures are described in the following section. Equipment decontamination procedures are described in Section 3.

4.2 Subsurface Soil Sampling

The following equipment and methods will be used for collecting subsurface soil samples.

Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Stakes and flagging
- Ziploc bags or one-pint containers for lithology samples
- Tape measure
- Stainless steel spatula
- Hand auger with extension handle

- Metal Detector
- Decontamination supplies including Simple Green
- PID
- Camera
- Clear tape, duct tape
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies

Subsurface Soil Sampling Method

- Soil samples retrieved will be visually described for: 1) soil type, 2) color, 3) moisture content, 4) texture, 5) grain size and shape, 6) consistency, 7) visible evidence of staining, and 8) any other observations. The descriptions will be in accordance with the Unified Soil Classification System (USCS).
- Soil samples will be immediately screened for the evolution of organic vapors with a photoionization detector (PID).
- A representative portion of the sample will be placed in a plastic "ziplock" bag or an eight-ounce sample jar filled approximately half full. The container will be labeled and closed tightly.
- If appropriate, a representative portion of the sample will be collected with a dedicated disposable polyethylene scoop and placed in a sample container provided by the laboratory for shipment to and analysis by the laboratory.
- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4ºC). The cooler will be shipped overnight or delivered to the laboratory for analysis.
- Chain-of-Custody procedures will be followed as outlined in the QAPP.
- Remaining soil will be disposed of in accordance with methods specified in Section 3.3.
- All borings will be sealed with bentonite or cement/bentonite grout following completion.

- All equipment will be decontaminated between each boring in accordance with methods specified in Section 3.2.

4.3 Monitoring Well Installation and Development

The following methods will be used for drilling, installing, and developing the monitoring wells.

Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HSP
- Metal detector
- One pint containers for lithology samples
- Tape measure
- Decontamination supplies
- Water level indicator
- Photovac PID
- Camera
- Clear tape, duct tape
- Aluminum foil
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies
- Polyethylene disposable bailers (development)
- Polypropylene rope (development)

- Waterra pump or other purge pump (development)
- Stainless steel or glass beakers (development)
- Turbidity meter (development)
- Temperature, conductivity, pH meter (development)

Overburden Monitoring Well Installation

Figure 3 shows a cross-section for a typical monitoring well. The monitoring wells will be installed in accordance with the following specifications:

- The monitoring well borings will be advanced with 6.25-inch outer diameter (OD) hollow stem augers and a track-mounted drill rig.
- Wells will be constructed with two-inch, inside diameter (ID), threaded, flush-joint, PVC casings and screens.
- Screens will be 10 feet long with 0.02-inch slot openings and a 2-foot sump at the base. Alternatives may be used at the discretion of the field geologist and approval of Con Edison, based on site conditions.
- The annulus around the screens will be backfilled with a sand filer pack to a height of one to 2 feet above the top of the screen. Auger flights will be withdrawn as sand is poured in a manner that will minimize hole collapse and bridging.
- A bentonite pellet seal or slurry seal with a height of one to 2 feet will be placed above the sand pack. The bentonite seal (pellets) will be allowed to hydrate before placement of grout above the seal.
- The remainder of the annular space will be filled with a cement-bentonite grout to near the ground surface. The grout will be pumped from the bottom up. The grout will be allowed to set for a minimum of 24 hours before wells are developed.
- Each monitoring well will have a sealed cap (J-plug) and will be contained in a flush-mounted vault. The J-plug will be used to keep surface water from infiltrating into the well during rain events, high water conditions, etc.
- The concrete seal or pad will be sloped slightly to channel water away from the well, and be deep enough to remain stable during freezing and thawing of the ground. Monitoring wells will be installed in high pedestrian traffic areas so the vault and concrete pad cannot pose a trip hazard when completed.

- The top of the PVC well casing will be marked and surveyed to 0.01 foot, and the elevation will be determined relative to a fixed benchmark or datum.

- The measuring point on all wells will be on the innermost PVC casing.

- Monitoring well construction details will be recorded in the field book and on the Construction Log shown in Figure 4, or similar form.

Monitoring Well Development

- After approximately 24 hours following completion, the monitoring wells will be developed by surging, bailing, using a centrifugal or peristaltic pump and dedicated polyethylene tubing, using a Waterra positive displacement pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist.

- Water levels will be measured in each well to the nearest 0.01 foot prior to development.

- The wells will be developed until the water in the well is reasonably free of visible sediment (50 NTU, if possible or until pH, temperature and specific conductivity stabilize). A portable nephelometer will be used to make this measurement.

- Development water will be contained in accordance with methods specified in Section 3.3.

- Following development, wells will be allowed to recover for a minimum of 7 days before groundwater is purged and sampled. All monitoring well development will be overseen by a field geologist and recorded in the field book.

5.0 GROUNDWATER SAMPLING PROCEDURES

5.1 Introduction

Groundwater sampling will be conducted at the site. Procedures for obtaining samples are described in this section. Sample handling procedures are described in Section 8.

5.2 Groundwater Sampling

The following method will be used to collect groundwater samples from monitoring wells.

Suggested Equipment and Supplies

- Field book
- Project plans
- Personal protective equipment in accordance with the HSP
- Water level indicator
- Disposable polyethylene bailers
- Polypropylene rope
- Temp, conductivity, pH meters
- Turbidity meter
- 250-mL glass beaker
- Decontamination supplies
- Waterra pump or other purge pump
- Plastic tubing
- Plastic sheeting

- Photovac PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

Groundwater Sampling Method

Purging

- The number and frequency of groundwater samples to be collected and the associated analytical parameters are summarized in Table 3 of the QAPP (Appendix B).
- Prior to sampling, the static water level and thickness of any free product will be measured to the nearest 0.01 foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. The measurement will be recorded in the field book.
- The probe will be decontaminated according to procedures outlined in Section 3.
- The well will be purged by removing a minimum of three well volumes of water. Purging will be conducted with either a bailer, a peristaltic pump, a Waterra positive displacement pump equipped with dedicated tubing, or a decontaminated submersible pump and dedicated tubing.
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required volumes are removed and sampled when it recovers sufficiently.
- Purge water will be managed and disposed of in accordance with procedures described in Section 3.

Sampling

- Samples will be collected with a dedicated disposable polyethylene bailer lowered with a dedicated polypropylene line or a Waterra positive displacement pump equipped with dedicated tubing.

- Prior to filling the sample bottles, one “clean” container will be filled with water. The temperature, pH and conductivity will be measured with a precalibrated probe and recorded in the field book.

- Sample containers for VOCs will be filled first. Sample containers for the other analytes will follow. If turbidity is a problem in the samples, extra water will be collected for metals and placed in unpreserved bottles provided by the laboratory. The turbidity will be allowed to settle. The water will then be decanted into a pre-preserved bottle provided by the laboratory for shipment to and analysis by the laboratory.

- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4°C). The cooler will be shipped overnight or delivered to the laboratory for analysis.

- Chain-of-custody procedures will be followed as outlined in the QAPP.

- After all samples are collected, the polypropylene rope and bailer will be disposed of in accordance with methods described in Section 3.3.

- Well sampling data will be recorded in the field logbook and on the Groundwater Sampling Record shown in Figure 5, or similar form.

6.0 AMBIENT/INDOOR AIR SAMPLING

6.1 Introduction

Ambient/indoor air sampling will be conducted at the River Place I property. Procedures for obtaining the samples are described in this section. Sample handling procedures are described in Section 8.

6.2 Ambient Air Sampling

One ambient air sample will be collected concurrently with each set of indoor air samples. The sample will be collected upwind, or on each air intake side of the building being samples. Because outdoor air concentrations are subject to more short-term variability than indoor samples, the ambient air samples will be taken over a 1 to 8-hour period. The ambient air sampling will begin at least 1-hour prior to the indoor air sampling event, in accordance with USEPA Guidance Assessing Potential Indoor Air Impacts for Superfund sites, 1992. This will allow sampling of the air that is most representative of air entering the building and remaining present during indoor air sampling.

Ambient Air Sampling Method

To the extent possible, ambient air samples will be collected from open areas and away from extraneous point sources such as car exhausts or fuel tanks. Ambient air samples will be collected at the approximate midpoint of the ground story level of the building, usually about 5 feet above the ground surface, and about 5 to 15 feet away from the building (EPA, 1992) Outdoor barometric air pressure and air temperature will be collected at the beginning, midpoint and end of ambient air sampling event.

Ambient air samples will be collected over a 1 to 8-hour period in 6-liter Summa canisters by drawing all through Teflon tubing. The end of the tubing will be placed

approximately 5 feet above the ground surface. A vacuum gauge will be used to check both the initial and final vacuum in the canisters.

Atmospheric conditions will be noted, including general weather conditions, temperature, the presence of a temperature inversion, humidity, wind direction, wind speed, barometric pressure and trend (rising or falling). Environmental conditions such as unusual vehicle traffic will also be noted.

6.3 Indoor Air Sampling

Air samples will be collected from within the building. The indoor sampling program will be conducted in general accordance with the NYSDOH Indoor Air Sampling and Analysis Guidance (NYSDOH, 2005).

Indoor Air Sampling Method

Samples of indoor air will be collected from the first floor living/work space of the building.

Indoor air samples will be collected over a 1-hour period in 6-liter Summa canisters by drawing air through Teflon tubing. The end of the tubing will be placed approximately 3 feet above the floor level. A vacuum gauge will be used to check both the initial and final vacuum in the canisters. Indoor air temperature will be recorded at the time of sample collection.

7.0 AIR MONITORING

7.1 Breathing Zone Air Monitoring During Ground Intrusive Activities and Sampling

Air monitoring of the breathing zone will be conducted periodically during all intrusive activities to assure proper health and safety protection for the team and nearby occupants and workers.

- A RaeSystems MiniRae 2000 photoionization detector (PID) or equivalent will be used to monitor for organic vapors in the breathing zone and borehole, and to screen the samples.
- Additional air monitoring may be required as specified in the site-specific health and safety plan.

The PID readings will be recorded in the field book during drilling activities for later transferred to the boring log form. The procedure for the PID operation and calibration is included in Section 8.

7.2 Community Air Monitoring Plan (CAMP)

In accordance with NYSDEC and NYSDOH requirements, a Community Air Monitoring Plan (CAMP) will be implemented at the site during ground-intrusive site management activities. The objective of the CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors, including residences and businesses and on-site workers not involved with site activities) from potential airborne contaminant releases as a direct result of site management activities. Two air monitoring stations will be set up during site management activities. Volatile organic compounds (VOCs) and respirable particulates (PM-10) will be monitored at the downwind perimeter of the immediate work area on a contiguous basis. Wind direction will be determined using a wind sock(s) and/or flagging poles installed on-site. Upwind concentration will also be measured continuously to establish background conditions. VOC vapors will be monitored using a photoionization detector (PID). Particulate dust will be monitored using a MiniRAM™ PM-10 particulate meter. Fifteen-minute running average

concentrations will be collected from each of the two air monitoring stations during work activities.

8.0 FIELD INSTRUMENTS AND CALIBRATION

All field analytical equipment will be calibrated immediately prior to each day's use and more frequently, if required. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Records of all instrument calibration will be maintained by the Field Team Leader and will be subject to audit by the Project Quality Assurance Manager (PQAM). Copies of all of the instrument manuals and/or instruction sheets will be maintained on-site by the Field Team Leader.

The following field instruments will be used during the investigation:

- Photoionization Detector (PID);
- MiniRAM real-time aerosol monitor;
- pH Meter;
- Specific Conductivity Meter and Temperature Probe; and
- Turbidity Meter.

8.1 Portable Photoionization Analyzer

- The photoionization analyzer will be a RaeSystems MiniRae 2000 (or equivalent), equipped with a 10.6 eV lamp. The MiniRae is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73% of the volatile organic compounds on the Target Compound List.
- Calibration must be performed at the beginning and end of each day of use with a standard calibration gas having an approximate concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, additional calibration will be required.
- All calibration data must be recorded in field notebooks and on calibration log sheets to be maintained on-site.

- A battery check must be completed at the beginning and end of each working day.

8.2 MiniRAM

- The operator shall ensure that the instruments respond properly to the substances that they are designed to monitor. Real time aerosol monitors, such as the MiniRAM, must be zeroed at the beginning of each sampling period. The specific instructions for calibration and maintenance provided for each instrument should be followed.

- All calibration data must be recorded in field notebooks and on calibration log sheets to be maintained on-site.

- A battery check must be completed at the beginning and end of each working day.

8.3 pH Meter

- Calibration of the pH meter must be performed at the start of each day of use and after very high or low readings, as required by this plan, according to manufacturer's instructions.

- National Institute of Standards and Technology - traceable standard buffer solutions which bracket the expected pH range will be used. The standards will be pH of 4.0, 7.0 and 10.0 standard units.

- The use of the pH calibration must be used to set the meter to display the value of the standard being checked.

- The calibration data must be recorded on calibration sheets maintained on-site or with the piece of equipment.

8.4 Specific Conductivity Meter and Temperature Probe

- Calibration checks using the conductivity standard must be performed at the start of each day of use, after five to ten readings or after very high or low readings, as required by this plan, according to manufacturer's instructions.

- The portable conductivity meter must be calibrated using a reference solution of 200 uohms/cm on a daily basis. Readings must be within five percent to be acceptable.

- The thermometer of the meter must be calibrated against the field thermometer on a weekly basis.

8.5 Turbidity Meter

- The turbidity meter must be checked at the start of each day of use and at the end of the day according to manufacturer's instructions.

9.0 FIELD SAMPLE IDENTIFICATION AND CUSTODY

9.1 Sample Identification

Each sample will be given a unique alphanumeric identifier in accordance with the following classification system:

SAMPLE IDENTIFICATION

LL* Sample Type	NN* Sample Number	N-N Depth Code	LL QC Identifier

	Solid	Water
Sample Type:	MW - Monitoring Well Boring SB - Soil Boring TP - Test Pit	MW - Monitoring Well
Sample Number:	Number referenced to a sample location map.	
Depth Code:	Depth in feet of sample interval (a=0-0.5, A=0-2, B=2-4, F=10-12, etc.)	
QC Identifier:	FB - Field Blank TB - Trip Blank WB - Wash or Rinse Blank	MS - Matrix Spike MSD - Matrix Spike Duplicate MB - Matrix Blank

*L = Letter
*N = Number

Field duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as field duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

9.2 Chain-of-Custody

- A Chain-of-Custody (COC) record (Figure 6 or similar) will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field and during return shipment to the laboratory.

- The COC will identify each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, the project name and number, the name of the analytical laboratory that will receive the samples and the method of sample shipment.

- If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample shipment.

- The COC will be completed by field personnel as samples are collected and packed for shipment.

- Erroneous markings will be crossed-out with a single line and initialed by the author.

- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate or matrix duplicate.

- Trip and field blanks will be listed on separate rows.

- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s) and the shipper air-bill number will be entered on the COC.

- A second member of the field team will review the COC for completeness and accuracy whenever possible.

- Finally, a member of the sampling team will write his/her signature, the date and time on the first RELINQUISHED BY space. Duplicate copies of each COC must be completed.

- One copy of the COC will be retained by sampling personnel. Blind duplicate samples will be identified on the copy retained by the sampling crew. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler without the additional identification of blind duplicate samples.

- Sample shipments will be refrigerated at 4°C, typically by packing with ice, to preserve the samples during shipment.

- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid and signed by the person relinquishing the samples to the shipper.

- The seal will be covered with clear tape and the cooler lid will be secured by wrapping with packing tape.

- The cooler will be relinquished to the shipper, typically an overnight carrier.

- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager and the samples will not be analyzed.

- The samples must be delivered to the laboratory within 48 hours of collection.

9.3 Sample Documentation

The field team leader will be retaining a copy of the COC and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier;
- Identification of sampled media (e.g., soil, sediment, groundwater);
- Sample location with respect to known reference point;
- Physical description of sample location;
- Field measurements, (e.g., pH, temperature, conductivity, and water levels);
- Date and time of collection;
- Sample collection method;
- Volume of groundwater purged before sampling;
- Number of sample containers;
- Analytical parameters;
- Preservatives used; and
- Shipping information:
  - Dates and method of sample shipments;
  - Chain-of-Custody Record numbers;
  - Federal Express Air Bill numbers;
  - Sample recipient (e.g., laboratory name).

FIGURES

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

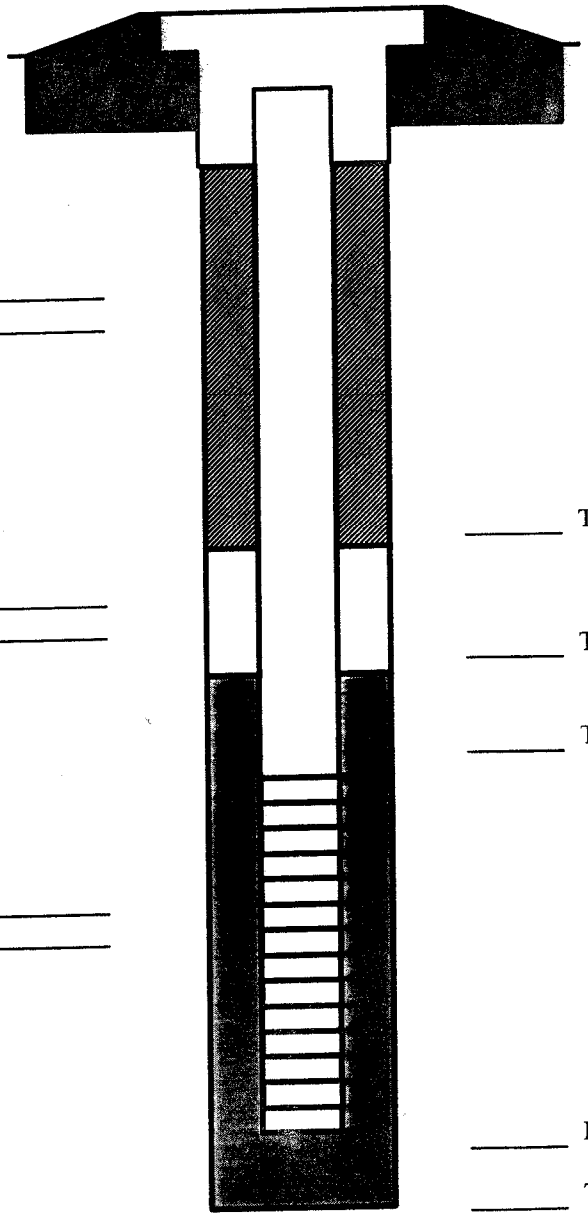
Site _____ Job No. _____ Well No. _____

Total Depth _____ Surface Elevation _____ Top Riser Elevation _____

Water Levels (Depth, Date, Time) _____ Date Installed _____

Riser Dia. _____ Material _____ Length _____
Screen Dia. _____ Material _____ Length _____ Slot Size _____

SCHEMATIC



Surface Seal Type _____
_____

Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal

Grout Type _____
_____

_____ Top Seal

Seal Type _____
_____

_____ Top Sand Pack

_____ Top Screen

Sand Pack Type _____
Size _____

_____ Bottom Screen

_____ Total Depth of Boring

D&B_WCLF

Figure 1

Monitoring Well Sample Data Form

Well ID: _____

Total Well Depth (from top of casing): _____

Well Diameter: _____

Sampling Crew: _____

Purging Method: _____

Sampling Method: _____

Sample Analysis: _____

Sample Date: _____

Depth to Water (from top of casing): _____

Volume of Standing Water in well: _____

Purge Time: *Start:* _____ *Finish:* _____

Sample Time: *Start:* _____ *Finish:* _____

PURGE DATA

Sample Time:	Flow Rate *(gpm)*	Volume Purged *(gallons)*	pH *(pH units)*	Conductivity *(mS/cm)*	Dissolved Oxygen *(mg/l)*	Temperature *(Celcius)*	Salinity *(Percent)*	Turbidity *(NTU)*	Redox Potential *(mV)*	General Comments

Figure 2

MITKEM CORPORATION

175 Metro Center Boulevard
Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
email: mitkem@mitkem.com

CHAIN-OF-CUSTODY RECORD

Page ____ of ____

REPORT TO			INVOICE TO		
COMPANY	PHONE		COMPANY	PHONE	LAB PROJECT #:
NAME	FAX		NAME	FAX	
ADDRESS			ADDRESS		TURNAROUND TIME:
CITY/ST/ZIP			CITY/ST/ZIP		

CLIENT PROJECT NAME:	CLIENT PROJECT #:	CLIENT P.O.#:

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS	REQUESTED ANALYSES	COMMENTS
	/									
	/									
	/									
	/									
	/									
	/									
	/									
	/									
	/									
	/									
	/									
	/									

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME	ADDITIONAL REMARKS:	COOLER TEMP:
		/		/		
		/		/		
		/		/		

WHITE: LABORATORY COPY YELLOW: REPORT COPY PINK: CLIENT'S COPY

Figure 3

APPENDIX C

HEALTH AND SAFETY PLAN AND
COMMUNITY AIR MONITORING PLAN

APPENDIX C

HEALTH AND SAFETY PLAN AND COMMUNITY AIR MONITORING PLAN
SITE MANAGEMENT PLAN
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

Prepared for:

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

and

RIVER PLACE I, LLC
RIVER PLACE II, LLC

Prepared by:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
WOODBURY, NEW YORK

JULY 2006

HEALTH AND SAFETY PLAN AND COMMUNITY AIR MONITORING PLAN
SITE MANAGEMENT PLAN
WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

List of Attachments

List of Attachments (continued)

List of Figures

List of Tables

1.0 INTRODUCTION

1.1 Purpose and Policy

The purpose of this safety plan is to establish personnel protection standards and mandatory safety practices and procedures. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

The provisions of the plan are mandatory for all on-site personnel. Any supplemental plans used by subcontractors shall conform to this plan as a minimum. All personnel who engage in project activities must be familiar with this plan, comply with its requirements, and sign the Health and Safety Plan Acceptance Form (see Attachment A) prior to working on the site. A copy of the Plan Acceptance Form must be submitted to the on-site Health and Safety representative.

1.2 Site Description

The site is located in the Borough of Manhattan (New York County), New York City, New York. The area in which the site is located maintains a high population density due to the presence of residential high-rises, office buildings, local tourist attractions, and retail facilities, as well as the influx of the workforce population on any given day of the workweek.

The entire former MGP site occupied approximately 5 acres, including all of modern-day Block 1089, the Hudson River waterfront property immediately west of Block 1089 (now designated modern-day Block 1107), and the stretch of 12th Avenue currently separating Blocks 1089 and 1107. Block 1089 is further divided into Tax Lots 1 and 3. Currently, on Tax Lot 1, a high-rise apartment building occupies approximately 90 percent of the lot. The remaining portion of the lot consists of a landscaped, park-like area and sidewalks. The apartment building is referred to as River Place I and was built in 2000 with construction “at grade” and no below ground basement or garage areas. The ground level is used for retail space. Additionally, an

elevated parking garage is located within the second floor of the building. As described in the Site Management Plan, Tax Lot 3 and the easternmost portion of Tax Lot 1 were remediated in accordance with the NYSDEC-approved RWP between August 2005 and January 2006. Currently, the remediated areas of Tax Lots 3 and 1 remain undeveloped.

1.3 Scope of Work

The scope of work, as detailed in the Site Management (SM) Plan, addresses the tax lots comprising Block 1089 and has been prepared in accordance with the Brownfield Cleanup Program (BCP) guidelines. In accordance with the Remedial Work Plan dated March 2005, Tax Lot 3 and a portion of Tax Lot 1 were selected for remediation and as such, an SM plan is the final phase of the remediation process. As required, the SM Plan provides procedures to accomplish the following:

- maintain engineering controls;
- maintain institutional controls;
- inspect and evaluate site information periodically to confirm that the remedy continues to be effective for the protection of public health and the environment; and
- monitor and report on the performance and effectiveness of the remedy in the short and long-term by, in this case, sampling and analysis of appropriate media.

A Site Characterization Study (SCS) was completed by Dvirka and Bartilucci Consulting Engineers (D&B) for the property in question, in accordance with the Scope of Work presented in the NYSDEC-approved Site Characterization Study Work Plan, dated June 2003. The findings of the SCS were presented in the final Site Characterization Study Report (SCS Report), dated April 2004. The SCS, completed in the fall of 2003, focused on the tax lots of Block 1089 located to the east of 12th Avenue. The research of historical records conducted as part of this SCS confirmed the presence of several former MGP structures also located to the west of 12th Avenue. Supplemental investigation activities to address remaining portions of the site are currently being conducted.

A Remedial Work Plan (RWP) was prepared to address subsurface contamination present within the Block 1089 property associated with the historic operations of the West 42nd Street Former MGP Site. The RWP was approved by NYSDEC in March 2005. For purposes of this document, the term "site" refers to both tax lots of the Block 1089 property.

A detailed description of the work can be found in the Site Management Plan.

1.4 On-site Personnel

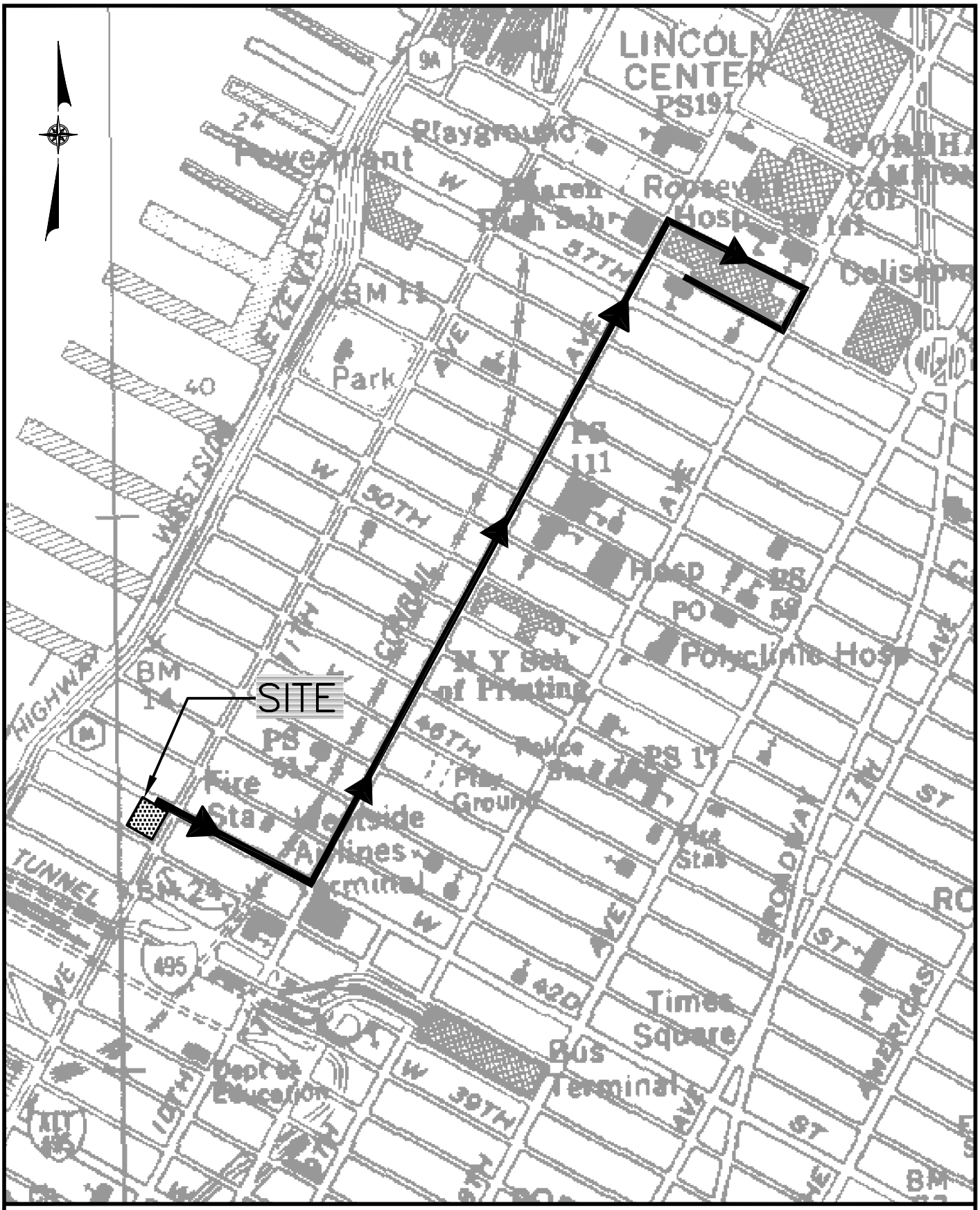
The SM Plan institutes a contingency plan describing procedures to be utilized in the event of an emergency, such as a fire, severe weather or vandalism, which are designed to protect and/or maintain the operation of the institutional and engineering controls implemented at the site. The Property Owner and an Alternate Emergency Contact will be designated to implement this Contingency Plan. These individuals are available on a 24-hour basis to respond to emergency conditions at the site. A copy of the contingency plan will be provided to the Emergency Contact and Property Manager, as well as the Security Department at River Place I and the security associated with the redevelopment of Tax Lots 3 and 1. A route to hospital map has been provided as Figure 1-1.

1.5 Personnel Responsibilities

Any staff discovering a condition or situation that impacts or has the potential to impact the engineering and/or institutional controls at the site shall immediately contact the Property Manager or, in his/her absence, the Alternate Emergency Contact.

The Property Manager or Alternate Emergency Contact is responsible to:

- immediately inspect the affected area to identify the character and extent of the incident;
- coordinate with all personnel to initiate appropriate response activities;



CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 42nd STREET MANUFACTURED GAS PLANT

MAP TO HOSPITAL

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

FIGURE 1-1

- assess possible hazards to human health or the environment that may result from the incident and shall determine appropriate personal protective equipment for essential personnel;

- ensure that those employees responding to a medical emergency are trained in CPR/first aid and blood borne pathogens;

- notify all appropriate organizations and federal, state and local agencies, so that necessary measures can be implemented to minimize and/or contain releases of any hazardous materials and/or constituent in order to minimize any threat to human health or the environment; and

- keep a chronological record of the times of visits (if any) by the fire and/or police departments, governmental regulatory agencies and personnel. Names, titles and organizations represented by these personnel shall be recorded.

All personnel shall be appropriately trained in first aid and hazardous waste safety procedures (OSHA 40-hour HAZWOPER), including the operating and fitting of personal protective equipment, and are experienced with the field operations planned for this site.

2.0 RISK ANALYSIS

2.1 Chemical Hazards

Potential contaminants that may be encountered while conducting intrusive activities at the site include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs), cyanide, and metals. Some relevant properties of these compounds are shown in Table 2-1.

Of the listed volatile chemicals, benzene has the lowest Permissible Exposure Limit (PEL) as set by OSHA and hence sets the action limit for monitoring with a Photoionization Detector (PID). PAHs could pose significant health threats if ingested or inhaled as a dust. Onsite personnel will make efforts to avoid activities that could generate potentially contaminated dust, and work upwind of soils and groundwater during excavation activities. The metals potentially present in the site soils are unlikely to become airborne because of their low vapor pressures and moist conditions under which they are expected to be encountered.

In addition to the compounds detected onsite, some of the solvents used in decontamination of equipment are potentially hazardous to human health if they are not used properly. Material Safety Data Sheets for substances that will be used on site and a select number of site contaminants are included in Attachment B.

2.2 Radiation Hazards

No radiation hazards are known or expected at the site.

2.3 Physical Hazards

2.3.1 Explosion

No explosion hazards are expected for the scope of work at this site.

Table 2-1

RELEVANT PROPERTIES OF VOLATILES AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE WEST 42ND STREET FORMER MANUFACTURED GAS PLANT

Compound (Synonym)	OSHA PEL[1] (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold[2] (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/10.6 Ev lamp PID (I.P. eV)
Benzene	1 5 [STEL]	500 [Ca]	1.2	119	Aromatic, sweet	75	Flammable Liquid	Yes (9.24)
o-, m-, p-Xylenes	100 150 [STEL]	900	0.9	20	Aromatic	7,9,9 vapor	Flammable Liquid	Yes (8.4-8.6)
Toluene	200 300 [CEIL]	500	1.1	37	Sweet, pungent Benzene-like	20	Flammable Liquid vapor	Yes (8.82)
Ethyl Benzene	100 125 [TLV-STEL]	800	0.8	0.6	Oily Solvent	10	Flammable Liquid	Yes (8.76)

(1) 29 CFR 1910, June 30, 1993 (8-hour Time weighted average unless otherwise specified.)
(2) ACGIH 1989 Highest reported value of acceptable odor threshold range.
[IDLH] Immediately dangerous to life or health.
[CA] Suspect carcinogen - Minimize all possible exposures.
[STEL] 15 minute Short Term Exposure Limit
[SKIN] Designates that skin is an important possible route of exposure.
[CEIL] Ceiling Limit - not to de exceeded at any time during a work day.
[TLV] Threshold Limit Value.

Table 2-1 (continued)

RELEVANT PROPERTIES OF VOLATILES AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE WEST 42nd STREET FORMER MANUFACTURED GAS PLANT

Compound (Synonym)	OSHA PEL[(1)] (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold[(2)] (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/10.6 Ev lamp PID (I.P. eV)	
Naphthalene	10 15 [TLV-STEL]	250	0.9	0.64	Mothballs/Tar/ Creosote	0.08	Combustible Solid	Yes	(8.12)
Polynuclear Aromatic Hydrocarbons (PAHs)	0.2 mg/m^3	80 mg/m^3 [Ca]	varies	varies	varies	very low	Combustible Solid	No	(?)
Hydrogen Cyanide	5.0 mg/m^3 [STEL] [SKIN]	50	5.6	5	Bitter almond	630	Flammable Liquid	No	(13.6) (Dräger Tube)

(1) 29 CFR 1910, June 30, 1993 (8-hour Time weighted average unless otherwise specified.)
(2) ACGIH 1989 Highest reported value of acceptable odor threshold range.
[IDLH] Immediately dangerous to life or health.
[CA] Suspect carcinogen - Minimize all possible exposures.
[STEL] 15 minute Short Term Exposure Limit
[SKIN] Designates that skin is an important possible route of exposure.
[TLV] Threshold Limit Value

2.3.2 Flora and Fauna

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps and spiders. Personnel shall avoid contact with poisonous plants, cover arms and hands, and frequently wash potentially exposed skin. Mosquito and tick repellant should be used in infested areas, and pant legs should be tucked into boots.

2.3.3 Slips, Trips and Falls

The wok 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.

2.3.4 Electrocution

All drilling equipment will be kept a safe distance from live sources of electricity. Drill rods and other metal objects will not be raised above the height of the rig. The length of drill rods will be less than the distance to the nearest live electrical source so if the drill string is dropped it can not fall across electrified equipment. All subsurface and overhead electrical sources and lines will be identified before digging, drilling, or sampling activities commence. Where possible and/or practical, electric lines and sources will be deactivated or insulated before digging, drilling or sampling activities are commenced.

2.3.5 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 2-2 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates

Table 2-2

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATED WORKERS[a]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (ta adj) by using this equation: ta adj oF = ta oF + (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.

are observed. Refer to the Table 2-3 below to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice).

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- Prickly Heat (Heat rash)
  - Painful, itchy red rash. Occurs during sweating, on skin covered by clothing.
- Heat Cramps
  - Painful spasm of arm, leg or abdominal muscles, during or after work.
- Heat Exhaustion
  - Headache, nausea, dizziness. Cool, clammy, moist skin. Heavy sweating. Weak, fast pulse. Shallow respiration, normal temperature.
- Heat Fatigue
  - Weariness, irritability, loss of skill for fine or precision work. Decreased ability to concentrate. No loss of temperature control.
- Heat Syncope (Heat Collapse)
  - Fainting while standing in a hot environment.
- Heat Stroke
  - Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. **This is a life threatening condition.**
  - Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

Table 2-3
HEAT INDEX

ENVIRONMENTAL TEMPERATURE (Fahrenheit)

RELATIVE HUMIDITY	70	75	80	85	90	95	100	105	110	115	120
	APPARENT TEMPERATURE*										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	**130**
30%	67	73	78	84	90	96	104	113	123	**135**	**148**
40%	68	74	79	86	93	101	110	123	**137**	**151**	
50%	69	75	81	88	96	107	120	**135**	**150**		
60%	70	76	82	90	100	114	**132**	**149**			
70%	70	77	85	93	106	124	**144**				
80%	71	78	86	97	113	**136**					
90%	71	79	88	102	122						
100%	72	80	91	108							

*Combined Index of Heat and Humidity...what it "feels like" to the body
Source: National Oceanic and Atmospheric Administration

How to use Heat Index:
1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

Apparent Temperature	Heat Stress Risk with Physical Activity and/or Prolonged Exposure
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible
>130	Heatstroke Highly Likely

To monitor the worker, measure:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.
  - If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
  - If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
  - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F.
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third.
  - Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.

- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

  - Maintain water temperature 50° to 60°F (10o to 16.6°C).

  - Provide small disposal cups that hold about four ounces (0.1 liter).

  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.

- Train workers to recognize the symptoms of heat related illness.

2.3.6 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

Hypothermia - Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness and unconsciousness.

Frostbite - Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or

whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale and solid.

Prevention of Cold-Related Illness - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia.
- Identify and limit known risk factors.
- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
  - At the Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status
  - At a worker's request
  - As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30ºF with precipitation)
  - As a screening measure whenever any one worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92ºF) cannot return to work for 48 hours.

2.4 Task Hazard Analysis

2.4.1 Test Borings and Monitoring Well Installation

Excavation and drilling activities associated with these tasks are inherently dangerous. Special attention should be given to establishing the location of any underground utilities prior to excavating or drilling. Prior to beginning the field investigation work, Dig Safely New York

(800-272-4480) will be contacted for a utility mark-out as required by New York State Code 753. For intrusive locations not covered by Code 753 (e.g., Con Edison property/private property), on-site drilling locations will be M-scoped and cleared of utilities by Con Edison. A test boring/test pit will then be conducted at each drilling location. Test boring/test pit will be excavated to a minimum depth of 5 feet or to a depth specified by the on-site Con Edison representative. The diameter of the boring/test pit shall be 3 inches larger than the drill bit diameter. Vacuum excavation is not anticipated to be used for utility clearance. However, if a vacuum truck is used, an emergency vacuum cutoff device (e.g., a "butterfly" valve or instantaneous remote electronic vacuum shutdown) shall be installed and in use while vacuum is generated. If an obstacle is encountered in a test boring, work will immediately stop and the on-site Con Edison representative will be notified.

Chemical exposure may also occur as drill cuttings are handled, split spoon samples are taken, or CO levels increase in poor ventilation areas. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C when pockets of contaminants are brought to the surface and breathing zone air becomes contaminated.

If evidence of historic contamination is encountered during test boring installation or drilling (such as oily materials, high PID readings, etc.), work will be stopped and the Con Edison emergency contacts listed in Table 5 of this HASP will be immediately notified.

2.4.2 Groundwater Sampling

Sampling monitoring wells involves the transfer of potentially contaminated water to sample vials. Care shall be taken to avoid contact of sample water with skin. Sampling shall be performed with gloves and standard Level D protection. Gloves will be changed between sample locations and if the gloves become soiled.

2.4.3 Test Pit/Excavation Work

Test pits or excavations greater than 5 feet must be shored or sloped as appropriate to prevent accidental collapse in accordance with Subpart P of 29 CFR Part 1926, if it is necessary for personnel to enter the excavation. If the excavation is at least 5 feet deep, sloping must follow these guidelines:

Type	Angle (degrees)	Max. Depth (feet)
Solid rock, cemented sand or gravel	90	20
Compact angular gravel	63	20
Compact sharp sand	33	20
Rounded loose sand	26	20

Excavations deeper than 20 feet must be designed by a civil engineer. Prior to any excavation activity, efforts will be made to determine whether underground installations will be encountered and, if so, where these installations are located. Hard hats and safety boots must, as a minimum, be worn within 50 feet of the excavation equipment. Workers not involved in the excavation activities will remain at least 50 feet from the excavation if possible based on site conditions. The excavation equipment cannot be operated within 15 feet of power lines. Excavations that are not back-filled at day's end must be barricaded. A Field Team Leader or Site Health and Safety Officer will provide constant on-site supervision of the excavation subcontractor to ensure that they are meeting the health and safety requirements. If deficiencies are noted, work will be stopped and corrective action will be taken (e.g., retrain personnel, purchase additional safety equipment, etc.). Reports of health and safety deficiencies and the corrective action taken will be forwarded to the Project Manager. The backhoe will not be placed on unstable ground or ground not capable of supporting heavy equipment.

3.0 PERSONNEL PROTECTION AND MONITORING

3.1 Medical Surveillance

The selected consultant will use the services of a licensed occupational health physician who is familiar with the hazards associated with the project to provide the medical examinations and surveillance specified herein.

All personnel working on the Site Management program will participate in a medical monitoring program designed by a Corporate Physician. This medical monitoring program will be designed to meet the requirements of OSHA Standard 29 CFR 1910.120 and be at least equivalent to the EPA Medical Monitoring Guidelines. The purpose is to establish a baseline health record and to seek conditions that would predispose the employee to illness due to exposure to hazardous materials and/or due to the physical demands of using personal protective equipment.

The medical assessment includes a work history, a medical history, a physical examination, customary laboratory tests and agent specific tests, when appropriate, for specific exposures. Additional clinical tests may be included at the discretion of the Physician performing the medical examination.

Medical surveillance of the workers covered under this HASP must be performed by a physician with experience in occupational medicine. Records of each person's medical exam shall be maintained and evidence of each examination shall be provided to the contractor. The physician must certify that each individual is medically qualified to wear respiratory protective devices and to perform stated work assignments.

The following medical protocol is recommended but may be modified by the physician where appropriate for specific work assignments and for potential chemical exposures.

- Medical History
- General Physical
- Pulmonary Function
- Electrocardiogram
- Blood Profile
- Complete Blood Count
- Hemoglobin
- Urinalysis
- Serum Cholinesterase
- Liver Function
- Kidney Function
- Urine Heavy Metals
- Chest X-ray
- Serum Lead
- Visual Acuity
- Hearing
- Otoscoptic Exam
- Tetanus
- Stress Test
- Neurological Test

3.1.1 Periodic Medical Examinations

Periodic medical examinations of personnel working at former MGP sites will be conducted, depending on site conditions and site activities. The periodicity and content of these assessments must be determined by the occupational physician. Depending upon the site-specific conditions, they should include:

- Biannual examinations or annual examinations depending upon degree and/or frequency of exposure to contaminated material.
- Examinations following an acute exposure to any hazardous material.

These assessments include an updating of the employee's work and medical histories, including occurrences of any accidental exposures previously unreported. The periodic health assessment must include a physical examination and may also include biochemical or other measurements of body fluids and an evaluation of pertinent functional systems of the body.

The following information must be included in the employee's medical record:

- Names of hazardous materials to which the employee may have been exposed;
- Information on the probability, frequency and extent of exposures; and
- Any available environmental measurements relating to hazardous materials.

The Corporate Health and Safety Officer is responsible for requesting and helping to schedule examinations for employees. Prior to each examination employees are responsible for filling out a medical questionnaire which the occupational physician uses as a tool when determining if there have been any negative impacts on an individual's health due to an exposure or any other work-related activities.

3.2 OSHA Training

All on-site personnel who will be actively involved in the field investigation activities must have completed hazardous waste operations-related training, as required by OSHA Regulations 29 CFR 1910.120. Personnel who completed this 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. Documentation of OSHA training for project personnel must be provided to Con Edison prior to starting work.

3.3 Site-Specific Training

A site-specific occupational hazard training program will be developed to provide training to all personnel that are to work at the site. This training will be conducted prior to starting field work and will consist of the following topics:

- Names of personnel responsible for site safety and health.
- Safety, health, and other hazards at the site.
- Proper use of personal protective equipment.

- Requirements of this HASP.

Work practices by which the employee can minimize risk from hazards. This may include a specific review of heavy equipment safety, safety during inclement weather, changes in common escape rendezvous point, site security measures, or other site-specific issues that need to be addressed before work begins.

- Safe use of engineering controls and equipment on the site.
- Acute effects of compounds at the site.
- Decontamination procedures.

Upon completion of site-specific training, workers will sign the Site-Specific-Training Form provided in Attachment A. A representative from the BCP Volunteer/Participant will be present during the site-specific training. A copy of the completed Site-Specific Training Form will be provided to the BCP Volunteer/Participant.

3.4 Monitoring Requirements

Air monitoring will be performed by the Air Monitoring Technician consistent with the methods and procedures outlined in the Community Air Monitoring Plan (CAMP). A copy of the CAMP is provided in Attachment C. Air monitoring of the worker breathing zone will be conducted continuously during all intrusive activities. Organic vapors will be monitored with a photoionization detector (PID) such as the RaeSystems MiniRae 2000, equipped with a 10.6 eV lamp. Air monitoring equipment calibration and maintenance details are provided in Attachment D. Background PID levels will be taken initially upwind from planned site activities. If, during site activities, sustained PID readings reach 1 ppm above background levels (and are sustained for 15 minutes), the Air Monitoring Technician will then call up the correction factor for benzene from the instruments memory and measure for benzene. If benzene is present between 1 and 5 ppm, then all personnel will upgrade to Level C personal protective gear with a half mask respirator. In addition, if sustained readings for total VOCs reach 25 ppm, then all personnel will upgrade to Level C personal protective gear with a half-mask respirator. If benzene levels are

greater than 5 ppm and less than 25 ppm, all personnel will upgrade to the use of a full mask respirator. If benzene is greater than 25 ppm, personnel will immediately retreat to an up-wind location and discuss whether to (1) don Level B protection and continue work or (2) wait until the concentration of volatile organics falls below the established action levels for Level B work.

Should visible dust emissions occur in potentially impacted areas, real time aerosol monitoring or upgrading to Level C may be warranted for affected personnel.

3.5 Summary of Action Levels and Restrictions

Conditions for Level D

All areas

- PID readings <1 ppm

Conditions for Level C (with half-face mask respirator)

All areas

- PID readings >25 ppm, or
- Benzene >1 ppm and <5 ppm, or
- Any visible fugitive dust emissions from site activities that disturb contaminated soil.

Conditions for Level C (with full-face mask respirator)

All areas

- Benzene >5 ppm and <25 ppm.

Conditions for Level B (or retreat)

All areas

- Benzene >25 ppm

3.5.1 Level D

- Level D protection will be worn for initial entry on-site and initially for all activities. Level D protection will consist of:
  - Standard work clothes.
  - Steel-toe safety boots.
  - Safety glasses (goggles must be worn when splash hazard is present).
  - Nitrile outer gloves and PVC inner gloves must be worn during all activities requiring contact with soils.
  - Nonwhite hard hat and a traffic safety vest (must be worn at all times).

3.5.2 Level C

The level of personal protection will be upgraded to Level C if the concentration of volatile organic compounds which can be detected with a photoionization detector (PID) in the breathing zone equals or exceeds the specified action limits and the contaminants of concern have characteristic warning properties appropriate for air purifying respirators (e.g., taste, odor). Level C protection will consist of the following equipment:

- Full-face or half-face mask air-purifying respirator.
- Combination HEPA filter/organic vapor cartridges.
- Tyvek coveralls if particulate hazards only are present, poly-coated Tyvek coveralls if liquid hazards are present.
- Steel-toe safety boots.
- Nitrile outer gloves and PVC inner gloves must be worn during all activities requiring contact with soils.
- Nonwhite hard hat and a traffic safety vest (must be worn at all times).
- Cartridges will be disposed at the end of each day's use.

3.5.3 Level B (Retreat)

If the concentration of volatile organics or cyanide equals or exceeds the specified action levels, all field personnel associated with the project will immediately retreat to a location up-wind of the source of contamination. At this point the workers must consult with Con Edison to discuss appropriate actions.

3.5.4 OSHA Requirements for Personal Protective Equipment

All personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133 29 CFR 1926.102	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134 29 CFR 1926.103	ANSI Z88.1-1980
Head	29 CFR 1910.135 29 CFR 1926.100	ANSI Z89.1-1969
Foot	29 CFR 1910.136 29 CFR 1926.96	ANSI Z41.1-1967

ANSI = American National Standards Institute

Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134).

Based on performance criteria of air purifying respirators, they cannot be worn under the following conditions:

- Oxygen deficiency;
- IDLH concentrations;
- High relative humidity; and
- If contaminant levels exceed designated use concentrations.

4.0 WORK ZONES AND DECONTAMINATION

4.1 Site Work Zones

To reduce the spread of hazardous materials by workers from the contaminated areas to the clean areas, work zones will be delineated at the site. The flow of personnel between the zones should be controlled. The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

4.1.1 Hot Zone

Hot zones will be established at the site for all drilling activities; unprotected onlookers should be located 50 feet upwind of drilling or soil sampling activities. In the event that volatile organics are detected in the breathing zone as discussed in Section 3, all personnel within the hot zone must don Level C protection. Hot zones will also be established during any activity when Level C protection is established as a result of conditions discussed in Section 3.

All personnel within the hot zone will be required to use the specified level of protection. No food, drink, or smoking will be allowed in the hot or warm zones. Contact lenses and cosmetics are not permitted on-site.

4.1.2 Warm Zone

A warm zone will be established and utilized during the field activities. This zone will be established between the hot zone and the cold zone, and will include the personnel and equipment necessary for decontamination of equipment and personnel (discussed below). Personnel and equipment in the hot zone must pass through this zone before entering the cold zone. This zone should always be located upwind of the hot zone.

4.1.3 Cold Zone

The cold zone will include the remaining areas of the job site. Break areas, operational direction and support facilities (to include supplies, equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the personnel or equipment decontamination station. Eating, smoking, and drinking will be allowed only in this area.

4.2 Decontamination

Generally, any water used in decontamination procedures will be placed in containers and stored on-site. Disposal procedures that may be required by site-specific conditions are described in the Field Sampling Plan.

4.2.1 Decontamination of Personnel

Decontamination of personnel will be necessary if Level C or Level B protection is used. Decontamination will not be necessary if only Level D protection is used. However, disposable gloves used during sampling activities should be removed and bagged; personnel should be encouraged to remove clothing and shower as soon as is practicable at the end of the day. All clothing should be machine-washed. All personnel will wash hands and face prior to eating and before and after using the restroom.

The following OSHA-specified procedures include steps necessary for complete decontamination prior to entry into the cold zone, and steps necessary if a worker only needs to change a respirator or respirator canister. Modification can be made to the twelve-station decontamination process by a site health and safety officer, depending upon the extent of contamination.

Station 1 - Segregated Equipment Drop

Deposit equipment used on the site (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Station 2 - Suit, Safety Boots, and Outer Glove Wash

Thoroughly wash chemically resistant suit, safety boots and outer-gloves. Scrub with long-handle, soft-bristle scrub brush and copious amounts of Simple Green/water solution. Necessary equipment includes:

- Wash tub (30 gallon or large enough for person to stand in);
- Simple Green/water solution; and
- Long-handle soft-bristle scrub brushes.

Station 3 - Suit, Safety Boots, and Outer Glove Rinse

Rinse off Simple Green/water solution using copious amounts of water. Repeat as many times as necessary. Necessary equipment includes:

- Wash tub (30 gallon or large enough for person to stand in);
- Spray unit;
- Water; and
- Long-handle, soft-bristle scrub brushes.

Station 4 - Outer Gloves Removal

Remove the outer gloves and deposit in individually marked plastic bags. Necessary equipment includes:

- Plastic bag.

Station 5 - Canister, Air Tank, or Mask Change

If a worker leaves the hot zone to change a canister, mask or air tank, this is the last step in the decontamination procedures. The worker's canisters or tank are exchanged, new outer glove donned, and joints taped. Worker returns to duty. Otherwise the worker proceeds to Station 6. Necessary equipment includes:

- Canisters, air tanks, or mask;
- Tape; and
- Gloves.

Station 6 - Removal of Chemically Resistant Suit

With assistance of helper, remove suit. Deposit in container with plastic liner. Necessary equipment includes:

- Container with plastic liner.

Station 7 - Inner-Glove Wash

Wash inner gloves with Simple Green/water solution that will not harm skin. Repeat as many times as necessary. Necessary equipment includes:

- Simple Green/water solution;
- Wash tub; and
- Long-handle, soft-bristle brushes.

Station 8 - Inner-Glove Rinse

Rinse inner-gloves with water. Repeat as many times as necessary. Necessary equipment includes:

- Water; and
- Wash tub.

Station 9 - Respirator Removal

Remove face-piece. Avoid touching face. Wash respirator in clean, sanitized solution, allow to dry and deposit face-piece in plastic bag. Store in clean area. Necessary equipment includes:

- Plastic bags;
- Sanitizing solution; and
- Cotton.

Station 10 - Inner-Glove Removal

Remove inner gloves and deposit in container with plastic liner. Necessary equipment includes:

- Container with plastic liner.

Station 11 - Field Wash

Wash hands and face. Necessary equipment includes:

- Water;
- Soap;
- Tables;
- Wash basins or buckets; and
- Clean towels.

Station 12 - Redress

If re-entering Hot Zone put on clean field clothes (e.g., Tyvek, gloves, etc.). Necessary equipment includes:

- Table; and
- Clothing.

4.2.2 Decontamination of Field Equipment

Field Equipment decontamination procedures are described in the project Field Sampling Plan. All sampling equipment will be decontaminated with a "Simple Green" solution.

4.3 Investigation-Derived Waste

All investigation-derived waste materials (PPE, decontamination waste, excess drill cuttings, and well purge/development water) will be placed in 55-gallon drums and labeled appropriately. The drums will be temporarily stored in a secured area, characterized and subsequently disposed by the BCP Volunteer/Participant.

5.0 SAMPLE SHIPMENT

5.1 Environmental Samples

Samples collected in this study will be classified as environmental samples. In general, environmental samples are collected from soils or wells and are not expected to be grossly contaminated with high levels of hazardous materials.

Sample containers must have a completed sample identification tag and the outside container must be marked "Environmental Sample." The sample tag will be legibly written and completed with an indelible pencil or waterproof ink. The information will also be recorded in a log book. As a minimum, it will include:

- Exact location of sample;
- Time and date sample was collected;
- Name of sampler witnesses (if necessary);
- Project codes, sample station number, and identifying code (if applicable);
- Type of sample (if known);
- Laboratory number (if applicable); and
- Any other pertinent information.

Environmental samples will be packaged and shipped according to the following procedure:

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal bag;
2. Place sample in a fiberboard container or picnic cooler which has been lined with a large polyethylene bag;
3. Pack cooler with ice (double bagged) to maintain temperature of 4 degrees C;

4. Pack with enough noncombustible, absorbent, cushioning material to minimize the possibility of the container breaking;

5. Seal large bag; and

6. Seal or close outside container.

The appropriate side of the container must be marked "This End Up" and arrows should be drawn accordingly. No DOT marking labeling is required. No DOT shipping papers are required. There are no DOT restrictions on mode of transportation.

5.2 Hazardous Samples

Personnel who must complete a Hazardous Goods Airway Bill must first be DOT trained and certified every two years. Drum samples, tank samples, sludge samples, and grossly contaminated soil samples will be shipped as DOT Hazardous Materials. The shipping of samples will comply with Air Transport Association's Dangerous Goods Regulations. The designation "Flammable Liquid" or "Flammable Solid" will be used. The samples will be transported as follows:

1. Collect sample in a 16-ounce or smaller glass or polyethylene container with nonmetallic Teflon-lined screw cap. Allow sufficient air space (approximately 10% by volume) so container is not liquid full at 54ºC (130ºF). If collecting a solid material, the container plus contents should not exceed 1 pound net weight. If sampling for volatile organic analysis, fill VOA container to septum but place the VOA container inside a 16-ounce or smaller container so the required air space may be provided. Large quantities, up to 3.786 liters (1 gallon), may be collected if the sample's flash point is 23ºC (75ºF) or higher. In this case, the flash point must be marked on the outside container (e.g., carton, cooler), and shipping papers should state that "Flash point is 75ºF or higher."

2. Seal sample and place in a 4-mil thick polyethylene bag, one sample per bag.

3. Place sealed bag inside a metal can with noncombustible, absorbent cushioning material (e.g., vermiculite or earth) to prevent breakage, one bag per can. Pressure-close the can and use clips, tape or other positive means to hold the lid securely.

4. Mark the can with:

    - Name and address of originator

- "Flammable Liquid N.O.S. UN 1993"
- (or "Flammable Solid N.O.S. UN 1325)
- NOTE: UN numbers are now required in proper shipping names.

5. Place one or more metal cans in a strong outside container such as a picnic cooler or fiberboard box. Preservatives are not used for hazardous waste site samples.

6. Prepare for shipping:

   "Flammable Liquid, N.O.S. UN 1993" or "Flammable Solid, N.O.S. UN 1325"; "Cargo Aircraft Only (if more than 1 quart net per outside package); "Limited Quantity" or "Ltd. Qty."; "Laboratory Samples"; "Net Weight ___" or "Net Volume ___" (of hazardous contents) should be indicated on shipping papers and on outside of shipping container. "This Side Up" or "This End Up" should also be on container. Sign shipper certification.

7. Stand by for possible carrier requests to open outside containers for inspection or modify packaging. It is wise to contact carrier before packing to ascertain local packaging requirements and not to leave area before the carrier vehicle (aircraft, truck) is on its way.

5.3 Shipping Papers

A blank shipping paper should be filled out and maintained within the driver's reach, whenever an employee carries hazardous materials in a vehicle in quantities above those allowed for Materials of Trade (MOTs). Such materials may include more than 8 gallons of the following:

- Gasoline (for use in a generator) UN1203, Guide #27;
- Methanol (for use in decontamination procedures) UN 1230, Guide #28;
- Nitric Acid (for use in decontamination procedures) UN 1760, Guide #60; and
- Hydrochloric Acid (for use in decontamination procedures) UN 1789, Guide #60.

Other materials may include the following:

- 220 pounds of compressed Gas [Air, Compressed] (calibration gas for the PID, or Grade D breathing air for Level B work) UN 1002, Class 2.2; and
- Other hazardous materials as defined by the DOT.

Appropriate MSDSs should be maintained with the shipping papers and/or the pocket DOT Emergency Response Guidebook.

6.0 ACCIDENT PREVENTION AND CONTINGENCY PLAN

6.1 Accident Prevention

6.1.1 Site-Specific Training

All field personnel will receive health and safety training prior to the initiation of any site activities. The site-specific training form provided in Attachment A must be signed and dated. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. A map to the hospital has been provided as Figure 1-1. Rapid recognition of dangerous situations can avert an emergency. Before daily work assignments, regular meetings should be held. Discussion should include:

- Tasks to be performed;
- Time constraints (e.g., rest breaks, cartridge changes);
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals; and
- Emergency procedures.

6.1.2 Vehicles and Heavy Equipment

Working with large motor vehicles and heavy equipment could be a major hazard at this site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, or overturning of vehicles. Vehicle and heavy equipment design and operation will be in accordance with 29 CFR, Subpart O, 1926.600 through 1926.602. In particular, the following precautions will be utilized to help prevent injuries/accidents.

- Brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked at the beginning of each shift.

- Large construction motor vehicles will not be backed up unless:
  - The vehicle has a reverse signal alarm audible above the surrounding noise level; or
  - The vehicle is backed up only when an observer signals that it is safe to do so.
- Heavy equipment or motor vehicle cable will be kept free of all nonessential items, and all loose items will be secured.
- Large construction motor vehicles and heavy equipment will be provided with necessary safety equipment (such as seat belts, roll-over protection, emergency shut-off in case of roll-over, backup warning lights and audible alarms).
- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment or vehicles.

6.2 Spill Control Plan

All personnel must take every precaution to minimize the potential for spills during site operations. Any spill shall be reported immediately to the emergency contacts listed in Table 6-1 of this HASP. Spill control apparatus (sorbent materials) will be located on-site. All materials used for the clean up of spills will be containerized and labeled separately from other wastes.

6.3 Contingency Plan

This contingency plan describes procedures to be utilized in the event of an emergency, such as a fire, severe weather or vandalism, which are designed to protect and/or maintain the operation of the institutional and engineering controls implemented at the site. The Property Manager and an Alternate Emergency Contact will be designated to implement this Contingency Plan. These individuals are available on a 24-hour basis to respond to emergency conditions at the site. A copy of the contingency plan has been provided to the Emergency Contact and the Property Manager, as well as the Security Department at River Place and the security associated with the redevelopment of Tax Lots 3 and 1.

Table 6-1

EMERGENCY TELEPHONE NUMBERS

Redeveloped Property Associated with Remediated Areas of Tax Lots 3 and 1 Property Manager [TBD]		[TBD]
Alternate Emergency Contact [TBD]		[TBD]
NY State 24-hour Oil & Hazardous Material Notification		(800) 457-7362
	(callers outside New York State)	(518) 457-7362
National Response Center	(800) 424-8802	
USEPA	(732) 548-8730	
NYC Department of Environmental Protection		311
	(callers outside New York City)	(212) 639-9675
New York City Fire Department		911
New York City Police Department		911
	(Switchboard)	(646) 610-5000
Ambulance		911
St. Lukes-Roosevelt Hospital Center 428 West 59th Street New York, NY		(212) 523-4000

6.3.1 Emergency Response

Any staff discovering a condition or situation that impacts or has the potential to impact the engineering and/or institutional controls at the site shall immediately contact the Property Manager or in his/her absence, the Alternate Emergency Contact to report the following information:

- Employee's name,
- Location of the incident (i.e., the area where the incident occurred),
- Time of the incident,
- Type and magnitude of the incident or situation,
- Whether personnel have been injured, and
- The portion of the site involved.

The Property Manager or Alternate Emergency Contact will, if necessary, immediately inspect the affected area to identify the character and extent of the incident. The Property Manager/Alternate Emergency Contact will then coordinate with all personnel to initiate appropriate response activities.

The Property Manager/Alternate Emergency Contact will assess possible hazards to human health or the environment that may result from the incident and shall determine appropriate personal protective equipment for essential personnel. The Property Manager/ Alternate Emergency Contact shall ensure that those employees responding to a medical emergency are trained in CPR/first aid and blood borne pathogens.

If the Property Manager/Alternate Emergency Contact determines that additional assistance is required, he or his designated agent shall contact the appropriate authorities. The telephone numbers of outside emergency assistance (i.e., local fire department, local police department and hospital) are listed in Table 6-1.

The Property Manager/Alternate Emergency Contact shall notify all appropriate organizations and federal, state and local agencies, so that necessary measures can be implemented to minimize and/or contain releases of any hazardous materials and/or constituent in order to minimize any threat to human health or the environment. In an emergency that impacts or has the potential to impact the engineering and/or institutional controls, NYSDEC project management will be notified. If the spill response hotline is notified, the caller will state that the site is an inactive hazardous waste site. The caller will also provide the site identification numbers (C2-31-024 and C2-31-012) and the NYSDEC Project Manager name.

The Property Manager/Alternate Emergency Contact or designated agent shall keep a chronological record of the times of visits (if any) by the fire and/or police departments, governmental regulatory agencies and personnel. Names, titles and organizations represented by these personnel shall be recorded.

6.3.2 Emergency Procedures

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below.

6.3.3 Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the Field Team Leader (via voice and hand signals) of the chemical exposure. The Field Team Leader should contact the appropriate emergency response agency.

- Precautions should be taken to avoid exposure of other individuals to the chemical.

- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.

- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.

- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.

- All chemical exposure incidents must be reported in writing to the Office Health and Safety Representative. The Site Health and Safety Officer or Field Team Leader is responsible for completing the accident report.

6.3.4 Personal Injury

In case of personal injury at the site, the following procedures should be followed:

- Another team member (buddy) should signal the Field Operations Manager that an injury has occurred.

- A field team member trained in first aid and bloodborne pathogen exposure can administer treatment to an injured worker.

- The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

- The Field Operations Manager or Site Health and Safety Officer is responsible for making certain that an Accident Report Form is completed. This form is to be submitted to the Office Health and Safety Representative. Follow-up action should be taken to correct the situation that caused the accident.

- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

A first-aid kit and blood-born pathogens kit will be kept on-site during the field activities.

6.3.5 Evacuation Procedures

- The Field Team Leader will initiate evacuation procedure by signaling to leave the site.
- All personnel in the work area should evacuate the area and meet in the common designated area.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately.
- Further instruction will then be given by the Field Team Leader.

6.3.6 Procedures Implemented in the Event of a Major Fire, Explosion, or On-site Health Emergency Crisis

- Notify the paramedics and/or fire department, as necessary;
- Signal the evacuation procedure previously outlined and implement the entire procedure;
- Isolate the area;
- Stay upwind of any fire;
- Keep the area surrounding the problem source clear after the incident occurs;
- Complete accident report for and distribute to appropriate personnel.

ATTACHMENT A

FORMS FOR HEALTH AND SAFETY-RELATED ACTIVITIES

NOTE: The OSHA Job Safety and Health Protection Poster must be posted prominently during field activities. The following page is an example of the poster to be used in the field. The actual poster must be an 11-inch by 17-inch size version of this page. The OSHA 300 Log of injuries and illnesses is maintained in the home office of each employee.

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA
www.osha.gov

U.S. Department of Labor • **Occupational Safety and Health Administration** • **OSHA 3165**

ACCIDENT REPORT FORM

Project Name:_____

INJURED OR ILL EMPLOYEE

1. Name _____ Social Security #_____
   (First) (Middle) (Last)

2. Home Address _____
   (No. and Street) (City or Town) (State and Zip)

3. Age _____

4. Sex: Male ( )Female ( )

5. Occupation _____
   (Specific job title, not the specific activity employee was performing at time of injury)

6. Department _____
   (Enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

EMPLOYER

7. Name _____

8. Mailing Address _____
   (No. and Street) (City or Town) (State and Zip)

9. Location (if different from mailing address):_____
   _____

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure _____
    (No. and Street) (City or Town) (State and Zip)

11. Was place of accident or exposure on employer's premises? _____(Yes/No)

12. What was the employee doing when injured?_____
    _____
    (Be specific - was employee using tools or equipment or handling material?)
    _____

13. How did the accident occur?
    _____
    (Describe fully the events that resulted in the injury or occupational illness.
    _____
    Tell what happened and how. Name objects and substances involved.
    _____
    Give details on all factors that led to accident. Use separate sheet if needed)

ACCIDENT REPORT FORM

14. Time of accident: _____

15. Date of injury or initial diagnosis of occupational illness: _____
(Date)

16. **WITNESS TO ACCIDENT**

(Name)	(Affiliation)	(Phone No.)
(Name)	(Affiliation)	(Phone No.)
(Name)	(Affiliation)	(Phone No.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

17. Describe the injury or illness in detail; indicate part of body affected.

_____

_____

18. Name the object or substance which directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

_____

_____

19. Did the accident result in employee fatality? _____ (Yes or No)

20. Number of lost workdays _____/restricted workdays _____ resulting from injury or illness?

OTHER

21. Did you see a physician for treatment? _____ (Yes or No) _____ (Date)

22. Name and address of physician _____

_____
(No. and Street) (City or Town) (State and Zip)

23. If hospitalized, name and address of hospital _____

_____
(No. and Street) (City or Town) (State and Zip)

Date of report _____ Prepared by _____

Official position _____

PROJECT HEALTH AND SAFETY PLAN

AND WORK PLAN ACCEPTANCE FORM

(For _____ Employees Only)

I have read and agree to abide by the contents of the Work Plan and Health and Safety Plan for the following project:

_____ _____

(Project Title) (Project Number)

Furthermore, I have read and am familiar with the work plan or proposal which describes the field work to be conducted and the procedures to be utilized in the conduct of this work.

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible

SITE-SPECIFIC HEALTH AND SAFETY TRAINING

(For <u>All</u> _____ and Subcontract Employees On-site)

I hereby confirm that site-specific health and safety training has been conducted by the site health and safety officer which included:

- Names of personnel responsible for site safety and health
- Safety, health, and other hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures

For the following project:

_____ _____

(Project Title) (Project Number)

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible

ATTACHMENT B

MATERIAL SAFETY DATA SHEETS

NIOSH Pocket Guide to Chemical Hazards

Benzene	**CAS** 71-43-2
C_6H_6	**RTECS** CY1400000
Synonyms & Trade Names Benzol, Phenyl hydride	**DOT ID & Guide** 1114 130

Exposure Limits	NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
	OSHA PEL: [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F

IDLH Ca [500 ppm] See: 71432	**Conversion** 1 ppm = 3.19 mg/m^3

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

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

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

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

Measurement Methods
NIOSH 1500, 1501, 3700, 3800; OSHA 12, 1005
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash, Quick drench	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

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

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

Cancer Site [leukemia]

See also: INTRODUCTION See ICSC CARD: 0015 See MEDICAL TESTS: 0022

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

Toluene	**CAS** 108-88-3
$C_6H_5CH_3$	**RTECS** XS5250000
Synonyms & Trade Names Methyl benzene, Methyl benzol, Phenyl methane, Toluol	**DOT ID & Guide** 1294 130

Exposure Limits	NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)
	OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)
IDLH 500 ppm See: 108883	**Conversion** 1 ppm = 3.77 mg/m^3

Physical Description
Colorless liquid with a sweet, pungent, benzene-like odor.

MW: 92.1	BP: 232°F	FRZ: -139°F	Sol(74°F): 0.07%
VP: 21 mmHg	IP: 8.82 eV		Sp.Gr: 0.87
Fl.P: 40°F	UEL: 7.1%	LEL: 1.1%	

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

Incompatibilities & Reactivities
Strong oxidizers

Measurement Methods
NIOSH 1500, 1501, 3800, 4000; OSHA 111
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

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

Important additional information about respirator selection
Respirator Recommendations NIOSH
Up to 500 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/(APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage

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

See also: INTRODUCTION See ICSC CARD: 0078 See MEDICAL TESTS: 0232

NIOSH Pocket Guide to Chemical Hazards

Ethyl benzene

CAS 100-41-4

$CH_3CH_2C_6H_5$

RTECS DA0700000

Synonyms & Trade Names
Ethylbenzol, Phenylethane

DOT ID & Guide
1175 129

Exposure Limits

NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3)

OSHA PEL†: TWA 100 ppm (435 mg/m^3)

IDLH 800 ppm [10%LEL] See: 100414

Conversion 1 ppm = 4.34 mg/m^3

Physical Description
Colorless liquid with an aromatic odor.

MW: 106.2	BP: 277°F	FRZ: -139°F	Sol: 0.01%
VP: 7 mmHg	IP: 8.76 eV		Sp.Gr: 0.87
Fl.P: 55°F	UEL: 6.7%	LEL: 0.8%	

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

Incompatibilities & Reactivities
Strong oxidizers

Measurement Methods
NIOSH 1501; OSHA 7, 1002
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

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

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 800 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma

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

See also: INTRODUCTION See ICSC CARD: 0268 See MEDICAL TESTS: 0098

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

p-Xylene	**CAS** 106-42-3
$C_6H_4(CH_3)_2$	**RTECS** ZE2625000
Synonyms & Trade Names 1,4-Dimethylbenzene; para-Xylene; p-Xylol	**DOT ID & Guide** 1307 130

Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
	OSHA PEL†: TWA 100 ppm (435 mg/m^3)

IDLH 900 ppm See: 95476	**Conversion** 1 ppm = 4.41 mg/m^3

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

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

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

Incompatibilities & Reactivities
Strong oxidizers, strong acids

Measurement Methods
NIOSH 1501, 3800; OSHA 1002
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 900 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

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

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

See also: INTRODUCTION See ICSC CARD: 0086 See MEDICAL TESTS: 0243

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

m-Xylene	**CAS** 108-38-3
$C_6H_4(CH_3)_2$	**RTECS** ZE2275000
Synonyms & Trade Names 1,3-Dimethylbenzene; meta-Xylene; m-Xylol	**DOT ID & Guide** 1307 130

Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
	OSHA PEL†: TWA 100 ppm (435 mg/m^3)

IDLH 900 ppm See: 95476	**Conversion** 1 ppm = 4.34 mg/m^3

Physical Description
Colorless liquid with an aromatic odor.

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

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

Incompatibilities & Reactivities
Strong oxidizers, strong acids

Measurement Methods
NIOSH 1501, 3800; OSHA 1002
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 900 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

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

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

See also: INTRODUCTION See ICSC CARD: 0085 See MEDICAL TESTS: 0243

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

o-Xylene	**CAS** 95-47-6
$C_6H_4(CH_3)_2$	**RTECS** ZE2450000
Synonyms & Trade Names 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol	**DOT ID & Guide** 1307 130

Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
	OSHA PEL†: TWA 100 ppm (435 mg/m^3)

IDLH 900 ppm See: 95476	**Conversion** 1 ppm = 4.34 mg/m^3

Physical Description
Colorless liquid with an aromatic odor.

MW: 106.2	BP: 292°F	FRZ: -13°F	Sol: 0.02%
VP: 7 mmHg	IP: 8.56 eV		Sp.Gr: 0.88
Fl.P: 90°F	UEL: 6.7%	LEL: 0.9%	

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

Incompatibilities & Reactivities
Strong oxidizers, strong acids

Measurement Methods
NIOSH 1501, 3800; OSHA 1002
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 900 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

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

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

See also: INTRODUCTION See ICSC CARD: 0084 See MEDICAL TESTS: 0243

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

Naphthalene

CAS 91-20-3

$C_{10}H_8$

RTECS QJ0525000

Synonyms & Trade Names
Naphthalin, Tar camphor, White tar

DOT ID & Guide
1334 133 (crude or refined)
2304 133 (molten)

Exposure Limits

NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3)

OSHA PEL†: TWA 10 ppm (50 mg/m^3)

IDLH 250 ppm See: 91203

Conversion 1 ppm = 5.24 mg/m^3

Physical Description
Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]

MW: 128.2	BP: 424°F	MLT: 176°F	Sol: 0.003%
VP: 0.08 mmHg	IP: 8.12 eV		Sp.Gr: 1.15
Fl.P: 174°F	UEL: 5.9%	LEL: 0.9%	

Combustible Solid, but will take some effort to ignite.

Incompatibilities & Reactivities
Strong oxidizers, chromic anhydride

Measurement Methods
NIOSH 1501; OSHA 35
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Molten flush immediately/solid-liquid soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 100 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter*/(APF = 10) Any supplied-air respirator*
Up to 250 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist filter*/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage

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

See also: INTRODUCTION See ICSC CARD: 0667 See MEDICAL TESTS: 0152

NIOSH Pocket Guide to Chemical Hazards

Fluorine

CAS 7782-41-4

F_2

RTECS LM6475000

Synonyms & Trade Names
Fluorine-19

DOT ID & Guide
9192 167 (cryogenic liquid)
1045 124 (compressed)

Exposure Limits

NIOSH REL: TWA 0.1 ppm (0.2 mg/m^3)

OSHA PEL: TWA 0.1 ppm (0.2 mg/m^3)

IDLH 25 ppm See: 7782414

Conversion 1 ppm = 1.55 mg/m^3

Physical Description
Pale-yellow to greenish gas with a pungent, irritating odor.

MW: 38.0	BP: -307°F	FRZ: -363°F	Sol: Reacts
VP: >1 atm	IP: 15.70 eV	RGasD: 1.31	
Fl.P: NA	UEL: NA	LEL: NA	

Nonflammable Gas, but an extremely strong oxidizer.

Incompatibilities & Reactivities
Water, nitric acid, oxidizers, organic compounds [Note: Reacts violently with all combustible materials, except the metal containers in which it is shipped. Reacts with H_2O to form hydrofluoric acid.]

Measurement Methods
None available
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contaminated (liquid)
Remove: When wet or contaminated (liquid)
Change: No recommendation
Provide: Eyewash (liquid), Quick drench (liquid)

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Water flush immediately
Breathing: Respiratory support

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 1 ppm: (APF = 10) Any supplied-air respirator*
Up to 2.5 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
Up to 5 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 25 ppm: (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern¿/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, nose, respiratory system; laryngeal spasm, wheezing; pulmonary edema; eye, skin burns; in animals: liver, kidney damage

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

See also: INTRODUCTION See ICSC CARD: 0046 See MEDICAL TESTS: 0109

NIOSH Pocket Guide to Chemical Hazards

Arsenic (inorganic compounds, as As)

CAS 7440-38-2 (metal)

As (metal)

RTECS CG0525000 (metal)

Synonyms & Trade Names
Arsenic metal: Arsenia
Other synonyms vary depending upon the specific As compound.
[Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite & all inorganic compounds containing arsenic except ARSINE.]

DOT ID & Guide
1558 152 (metal)
1562 152 (dust)

Exposure Limits

NIOSH REL: Ca C 0.002 mg/m^3 [15-minute] See Appendix A

OSHA PEL: [1910.1018] TWA 0.010 mg/m^3

IDLH Ca [5 mg/m^3 (as As)] See: 7440382

Conversion

Physical Description
Metal: Silver-gray or tin-white, brittle, odorless solid.

MW: 74.9	BP: Sublimes	MLT: 1135°F (Sublimes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 5.73 (metal)
Fl.P: NA	UEL: NA	LEL: NA	

Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.

Incompatibilities & Reactivities
Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]

Measurement Methods
NIOSH 7300, 7900; OSHA ID105
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated/Daily
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

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

Important additional information about respirator selection
Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]

Target Organs Liver, kidneys, skin, lungs, lymphatic system

Cancer Site [lung & lymphatic cancer]

See also: INTRODUCTION See ICSC CARD: 0013 See MEDICAL TESTS: 0017

NIOSH Pocket Guide to Chemical Hazards

Barium chloride (as Ba)

CAS 10361-37-2

$BaCl_2$

RTECS CQ8750000

Synonyms & Trade Names
Barium dichloride

DOT ID & Guide
1564 154 (barium compounds, n.o.s.)

Exposure Limits

NIOSH REL*: TWA 0.5 mg/m^3 [*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]

OSHA PEL*: TWA 0.5 mg/m^3 [*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]

IDLH 50 mg/m^3 (as Ba) See: IDLH INDEX

Conversion

Physical Description
White, odorless solid.

MW: 208.2	BP: 2840°F	MLT: 1765°F	Sol: 38%
VP: Low	IP: ?		Sp.Gr: 3.86
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Solid

Incompatibilities & Reactivities
Acids, oxidizers

Measurement Methods
NIOSH 7056; OSHA ID121
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

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

Important additional information about respirator selection

Respirator Recommendations NIOSH/OSHA

Up to 5 mg/m^3: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator

Up to 12.5 mg/m^3: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter

Up to 25 mg/m^3: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m^3: (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

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

Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

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

See also: INTRODUCTION See ICSC CARD: 0614 See MEDICAL TESTS: 0021

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

Cadmium dust (as Cd)

CAS 7440-43-9 (metal)

Cd (metal)

RTECS EU9800000 (metal)

Synonyms & Trade Names
Cadmium metal: Cadmium
Other synonyms vary depending upon the specific cadmium compound.

DOT ID & Guide
2570 154 (compounds)

Exposure Limits

NIOSH REL*: Ca See Appendix A [*Note: The REL applies to all Cadmium compounds (as Cd).]

OSHA PEL*: [1910.1027] TWA 0.005 mg/m^3 [*Note: The PEL applies to all Cadmium compounds (as Cd).]

IDLH Ca [9 mg/m^3 (as Cd)] See: IDLH INDEX

Conversion

Physical Description
Metal: Silver-white, blue-tinged lustrous, odorless solid.

MW: 112.4	BP: 1409°F	MLT: 610°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 8.65 (metal)
Fl.P: NA	UEL: NA	LEL: NA	

Metal: Noncombustible Solid in bulk form, but will burn in powder form.

Incompatibilities & Reactivities
Strong oxidizers; elemental sulfur, selenium & tellurium

Measurement Methods
NIOSH 7048; OSHA ID121, ID125G, ID189, ID206
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: No recommendation
Eyes: No recommendation
Wash skin: Daily
Remove: No recommendation
Change: Daily

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

Important additional information about respirator selection
Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, ingestion

Symptoms Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]

Target Organs respiratory system, kidneys, prostate, blood

Cancer Site [prostatic & lung cancer]

See also: INTRODUCTION See ICSC CARD: 0020 See MEDICAL TESTS: 0035

NIOSH Pocket Guide to Chemical Hazards

Chromium metal

CAS 7440-47-3

Cr

RTECS GB4200000

Synonyms & Trade Names
Chrome, Chromium

DOT ID & Guide

Exposure Limits

NIOSH REL: TWA 0.5 mg/m^3 See Appendix C

OSHA PEL*: TWA 1 mg/m^3 See Appendix C [*Note: The PEL also applies to insoluble chromium salts.]

IDLH 250 mg/m^3 (as Cr) See: 7440473

Conversion

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

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

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

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

Measurement Methods
NIOSH 7024; OSHA ID121, ID125G
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: No recommendation
Eyes: No recommendation
Wash skin: No recommendation
Remove: No recommendation
Change: No recommendation

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

Important additional information about respirator selection

Respirator Recommendations NIOSH

Up to 2.5 mg/m^3: (APF = 5) Any dust and mist respirator*

Up to 5 mg/m^3: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator*

Up to 12.5 mg/m^3: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*

Up to 25 mg/m^3: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece

Up to 250 mg/m^3: (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

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

Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; lung fibrosis (histologic)

Target Organs Eyes, skin, respiratory system

See also: INTRODUCTION See ICSC CARD: 0029 See MEDICAL TESTS: 0052

NIOSH Pocket Guide to Chemical Hazards

Lead	**CAS** 7439-92-1
Pb	**RTECS** OF7525000
Synonyms & Trade Names Lead metal, Plumbum	**DOT ID & Guide**

Exposure Limits	NIOSH REL*: TWA 0.050 mg/m^3 See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]
	OSHA PEL*: [1910.1025] TWA 0.050 mg/m^3 See Appendix C [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

IDLH 100 mg/m^3 (as Pb) See: 7439921	**Conversion**

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

MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 11.34
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Solid in bulk form.

Incompatibilities & Reactivities
Strong oxidizers, hydrogen peroxide, acids

Measurement Methods
NIOSH 7082, 7105, 7300, 7700, 7701, 7702; OSHA ID121, ID125G, ID206
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 0.5 mg/m^3: (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator
Up to 1.25 mg/m^3: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter
Up to 2.5 mg/m^3: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 50 mg/m^3: (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Up to 100 mg/m^3: (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

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

eyes; hypotension
Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue
See also: INTRODUCTION See ICSC CARD: 0052 See MEDICAL TESTS: 0127

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

NIOSH Pocket Guide to Chemical Hazards

Mercury (organo) alkyl compounds (as Hg)

CAS

RTECS

DOT ID & Guide

Synonyms & Trade Names
Synonyms vary depending upon the specific (organo) alkyl mercury compound.

Exposure Limits

NIOSH REL: TWA 0.01 mg/m^3 ST 0.03 mg/m^3 [skin]

OSHA PEL†: TWA 0.01 mg/m^3 C 0.04 mg/m^3

IDLH 2 mg/m^3 (as Hg) See: merc-hg

Conversion

Physical Description
Appearance and odor vary depending upon the specific (organo) alkyl mercury compound.

Properties vary depending upon the specific (organo) alkyl mercury compound.			

Incompatibilities & Reactivities
Strong oxidizers such as chlorine

Measurement Methods
None available
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

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

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 0.1 mg/m^3: (APF = 10) Any supplied-air respirator
Up to 0.25 mg/m^3: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode
Up to 0.5 mg/m^3: (APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 2 mg/m^3: (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects

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

NIOSH Pocket Guide to Chemical Hazards

Selenium	**CAS** 7782-49-2
Se	**RTECS** VS7700000
Synonyms & Trade Names Elemental selenium, Selenium alloy	**DOT ID & Guide** 2658 152 (powder)

Exposure Limits	NIOSH REL*: TWA 0.2 mg/m^3 [*Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]
	OSHA PEL*: TWA 0.2 mg/m^3 [*Note: The PEL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]

IDLH 1 mg/m^3 (as Se) See: 7782492	**Conversion**

Physical Description
Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.]

MW: 79.0	BP: 1265°F	MLT: 392°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.28
Fl.P: NA	UEL: NA	LEL: NA	

Combustible Solid

Incompatibilities & Reactivities
Acids, strong oxidizers, chromium trioxide, potassium bromate, cadmium

Measurement Methods
NIOSH 7300, S190 (II-7); OSHA ID121
See: NMAM or OSHA Methods

Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench	**First Aid** (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 1 mg/m^3: (APF = 5) Any dust and mist respirator^*/(APF = 10) Any dust, mist, and fume respirator*/(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^*/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter*/(APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage

Target Organs Eyes, skin, respiratory system, liver, kidneys, blood, spleen

See also: INTRODUCTION See ICSC CARD: 0072 See MEDICAL TESTS: 0202

NIOSH Pocket Guide to Chemical Hazards

Silver (metal dust and soluble compounds, as Ag)

CAS 7440-22-4 (metal)

Ag (metal)

RTECS VW3500000 (metal)

Synonyms & Trade Names
Silver metal: Argentum
Synonyms of soluble silver compounds such as Silver nitrate ($AgNO_3$) vary depending upon the specific compound.

DOT ID & Guide

Exposure Limits

NIOSH REL: TWA 0.01 mg/m^3

OSHA PEL: TWA 0.01 mg/m^3

IDLH 10 mg/m^3 (as Ag) See: IDLH INDEX

Conversion

Physical Description
Metal: White, lustrous solid.

MW: 107.9	BP: 3632°F	MLT: 1761°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 10.49 (metal)
Fl.P: NA	UEL: NA	LEL: NA	

Metal: Noncombustible Solid, but flammable in form of dust or powder.

Incompatibilities & Reactivities
Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid

Measurement Methods
NIOSH 7300; OSHA ID121
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated ($AgNO_3$)
Change: Daily
Provide: Eyewash

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

Important additional information about respirator selection
Respirator Recommendations NIOSH/OSHA
Up to 0.25 mg/m^3: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode£/(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter£
Up to 0.5 mg/m^3: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 10 mg/m^3: (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance

Target Organs Nasal septum, skin, eyes

ATTACHMENT C

COMMUNITY AIR MONITORING PLAN

APPENDIX 1A

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

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

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

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

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

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

ATTACHMENT D

AIR MONITORING EQUIPMENT CALIBRATION AND MAINTENANCE

AIR MONITORING EQUIPMENT
CALIBRATION AND MAINTENANCE

All monitoring instruments must be calibrated and maintained periodically. Calibration and on-site maintenance records will be kept in the field log book. The limitations and possible sources of errors for each instrument must be understood by the operator. It is important that the operator ensures that the instrument responds properly to the substances it was designed to monitor. Portable air quality monitoring equipment that measures total ionizables present such as the Photovac MicroTip HL-2000 (or equivalent) photoionization detector (PID) must be calibrated at least once each day. Combustible gas/oxygen meters (explosimeters) such as the MSA Model 360 monitor must be calibrated at least once a week. The specific instructions for calibration and maintenance provided for each instrument should be followed.

APPENDIX D

STANDARD OPERATING PROCEDURES

SITE INSPECTION SOP

West 42nd Street - Manhattan, New York
Site ID # C231024 & C231012
Monthly Site Inspection Form

Exterior inspection problems noted: (Check all that apply)

- ❑ None
- ❑ Stained or discolored soil
- ❑ Staining or discoloration on exterior façade of building
- ❑ Distressed vegetation
- ❑ Damaged monitoring well
- ❑ Unauthorized digging or other disturbance of soil on property
- ❑ Odor (describe) _____
- ❑ Other (specify)_____

Provide an attached site map or sketch showing location of any problems noted above

Copy of SMP available and information current?

❑ yes ❑ no Date that plan was last updated _____

Reporting on groundwater data, including emergency contacts, current?

❑ yes ❑ no Date that monitoring reports were last submitted to NYSDEC _____

Attachments: (Check all that apply)

- ❑ None
- ❑ Follow up status report
- ❑ Photographs
- ❑ Site Map

Other documentation (specify) _____

Inspected by

SM staff _____ _____ _____
Name Title Date

Reviewed by

SM Site Manager _____ _____ _____
Name Title Date

Comments:

West 42nd Street - Manhattan, New York
Site ID # C231024 & C231012
Incident Follow up Status Report

Follow up to monthly site inspection report dated _____

Original inspection conducted by _____ on _____ (date)

Describe incident or problem:

Describe action taken:

Is problem/incident resolved?

Follow up required:

Comments:

Inspected by

SM staff _____ _____ _____

Name Title Date

Reviewed by

SM Site Manager _____ _____ _____

Name Title Date

NOTIFICATION OF GROUND-INTRUSIVE WORK SOP

West 42nd Street - Manhattan, New York
Site ID # C231024 & C231012
Notification of Ground-Intrusive Work

This form is to be completed and submitted to the NYSDEC for review at least ten days prior to the start of any ground-intrusive work at the site.

Type of proposed work:

- ❑ Landscaping, other than mowing or spreading mulch or treatments on the surface of the ground of Tax Lot 1
- ❑ Paving or resurfacing of the roadways or parking areas on Tax Lot 1
- ❑ Underground utility work
- ❑ Soil sampling
- ❑ Puncture or demolition of the concrete foundation in the underground parking garage
- ❑ Other projects that break or penetrate the ground surface (specify)

_____

Provide an attached site map or sketch showing location of the work area noted above

Provide a brief description of the proposed work including the nature of the work, who will be conducting the work, the location and the anticipated duration.

Will proposed work impact or have the potential to impact the engineering controls installed on the site?

❑ yes ❑ no

Will soil sampling be required before undertaking this work? ❑ yes ❑ no

If yes, date that analytical data from soil sampling will be provided to the NYSDEC _____

Will work require oversight by a Professional Engineer?

❑ yes ❑ no

Attachments:(Check all that apply)

- ❑ None
- ❑ Follow up report
- ❑ Photographs
- ❑ Site Map

Other documentation (specify)

_____

SM Site Manager _____ _____ _____

Name Title Date

Submit form and attachments to:

NYSDEC

Division of Environmental Remediation

Remedial Action Bureau C
625 Broadway
Albany, NY 12233-7017

West 42nd Street - Manhattan, New York
Site ID # C231024 & C231012
Procedures for Contaminated Soil Management

This form is to be completed and submitted to the NYSDEC for review at least ten days prior to the start of any ground-intrusive work at the site.

Volume of soil requiring excavation and off-site disposal:

Number of samples to be analyzed for parameters listed below:

Category of Analysis	Analytical Method	Analytes	Frequency
Semivolatile	USEPA Method 8270	Benzyl Alcohol; Bis(2-chloroethyl) ether; Bis(2-chloroisopropyl)ether; Diethylphthalate; and Methoxychlor.	1, 4-point composite sample per 2,000 cubic yards
Organochloride Pesticides and PCBs	USEPA Method 8081	All analytes	1, 4-point composite sample per 2,000 cubic yards
Metals	USEPA Methods 6010 and 7471	Chromium - hexavalent (VI); and Chromium - trivalent (III).	1, 4-point composite sample per 2,000 cubic yards
RCRA Characteristics	USEPA Methods 1030, 1110 and 9010/9030	Ignitability; corrosivity; and reactivity.	1, 4-point composite sample per 2,000 cubic yards
Asbestos	Polarized Light Microscopy	Asbestos content	1, 4-point composite sample per 2,000 cubic yards
VOCs	USEPA Method 8260	All analytes	A portion of each grab sample

Additional analysis to be performed as required by disposal facility.

Name and permit number of off-site transporter:

Name: _____ **Permit Number:** _____

Name and permit number of off-site facility:

Name: _____ **Permit Number:** _____

Generator of record/EPA Generator Identification Number:

_____

Will work require oversight by a Professional Engineer?

❑ yes ❑ no

West 42nd Street - Manhattan, New York
Site ID # C231024 & C231012
Procedures for Contaminated Soil Management

Attachments:(Check all that apply)

- ❑ None
- ❑ Manifest
- ❑ Analytical Results
- ❑ Bills of Lading
- ❑ Certificates of Disposal

Other documentation (specify)
_____

SM Site Manager _____ _____ _____
Name Title Date

Submit form and attachments to:

NYSDEC

Division of Environmental Remediation

Remedial Action Bureau C
625 Broadway
Albany, NY 12233-7017

APPENDIX E

WATER/VAPOR BARRIER INSTALLATION
SPECIFICATIONS AND PRODUCT INFORMATION

SECTION 07130

FOUNDATION WATERPROOFING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The work of this Section includes, but is not necessarily limited to, the following:

1. Below-grade foundation waterproofing of horizontal (pile caps including pile penetrations, foundation mats and slabs) and vertical surfaces (foundation walls), as indicated.

2. Installation accessories, including sealers, flashings, fasteners, tapes, reglets, liquid membranes and similar accessories.

3. Installation of concrete working surface below horizontal surfaces.

B. Related Work Specified Elsewhere

1. Excavation, Filling and Grading - Section 02200

2. Cast-in-Place Concrete - Section 03300.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide waterproofing that prevents the passage of water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet membrane.

1.3 REFERENCES

A. Latest version of the American Society for Testing and Materials (ASTM) Standards:

ASTM C 836	Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
ASTM D 412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
ASTM D 570	Standard Test Method for Water Absorption of Plastics
ASTM D 903	Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D 1876	Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D 1970	Self-Adhering Polymer Modified Bituminous Sheet Material Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D 3767	Standard Practice for Rubber-Measurement of Dimensions
ASTM D 5385	Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes

ASTM E 96	Water Vapor Transmission of Materials
ASTM E 154	Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.4 SUBMITTALS

A. Submit the following information for review by the Architect and Engineer:

1. Manufacturer's product data, specifications, installation instructions, product samples;

2. Laboratory test results demonstrating the properties of the product meet or exceed the required values in Part 2.02 of this Section;

3. Written certification that the Installer has been actively installing the submitted product (or similar product) for at least three years; and the names, addresses and contact names for three previous waterproofing projects completed by the installer (both supervisor and lead technician);

4. Project-specific shop drawings containing:

   a. Penetrations, curbs, drains, and projections.

   b. Flashing details, including inside and outside corner reinforcement and terminations.

   c. Crack and joint treatments, including expansion joints.

   d. Interface with contiguous materials.

B. Prior to commencing work, submit the following:

1. Contractor's Review: Before commencing work submit written statement signed by the Contractor and the Installer stating that the Contract Documents have been reviewed with a qualified representative of the Manufacturer of the waterproofing system, and that he is in agreement that the selected materials are proper, compatible with contiguous materials and adequate for the application shown. Indicate by transmittal form that a copy of the statement has been sent to the Manufacturer.

2. Substrate Acceptability: Submit a certified statement issued by the Manufacturer of the waterproofing materials, and countersigned by the Installer, attesting that all areas and surfaces designated to receive waterproofing have been inspected and found satisfactory for the reception of the Work covered under this Section; and are not in conflict with the "Warranty" requirements. Installation of materials will be construed as acceptance of surfaces.

C. Upon project closeout, submit the following:

1. Statement of Supervision: Upon completion of Work submit a written statement signed by the Manufacturer stating that the field supervision by the Manufacturer's representative was sufficient to insure proper application of the materials, that the Work was installed in accordance with the Contract Documents and that the installation is acceptable to the Manufacturer.

2. Warranty: Submit Manufacturer's and Installer's five-year warranty upon acceptance of completed work, further described later in this Part.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer, who is certified in writing by waterproofing manufacturer as qualified, to install specified waterproofing systems.

B. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings".

1. Before installing waterproofing, meet with owner, architect, consultants, independent testing agency, waterproofing manufacturer, waterproofing subcontractor, and other concerned entities.

2. Review requirements for waterproofing, including surface preparation specified under other Sections waterproofing manufacturer's requirements, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.

3. Notify participants at least 7 days before pre-installation conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packaging with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. The general subsurface conditions consist of 20 ft of surficial fill underlain by 10 to 15 ft of organic materials of Building Code Class 11-65, overlying soil materials of

Building Code Class 7-65 to Class 4-65 and finally bedrock. In the southeast quadrant of the site, there is 10 to 15 ft of very dense Building Code class 4-65 and 5-65 soil materials directly overlying the sound rock. The thickness of very dense overburden soil is reduced to less than 5 ft to the westerly half of the site.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Special Warranty: Submit a written warranty signed by waterproofing manufacturer and installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight during the specified warranty period. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1.6 mm in width.

1. Warranty Period: 10 years after date of "Substantial Completion".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Product: Provide foundation waterproofing systems, as manufactured by W. R. Grace & Co. Construction Products, Inc. or approved equivalent subject to compliance with the requirements herein.

1. Horizontal Application: "Preprufe 300"

2. Vertical Applications, "Blind side" Conditions: "Preprufe 160".

3. Vertical Applications to constructed walls: "Bituthene 4000" Waterproofing Membrane.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) COMPOSITE SHEET

A. Adhesive-Coated HDPE Composite Sheet, Horizontal Applications: 1.42-mm-thick (nominal), uniform, flexible sheet consisting of 0.75-mm-thick high density polyethylene sheet coated with a pressure sensitive rubber adhesive, a protective adhesive coating, a detackifying surface treatment, an undercoated self-adhering side lap strip and a release liner.

B. Adhesive-Coated HDPE Composite Sheet, Vertical Applications: 1.07-mm-thick (nominal), uniform, flexible sheeting consisting of 0.4-mm-thick high-density polyethylene sheet coated with pressure sensitive rubber adhesive, a protective coating, and a release liner.

C. Physical Properties: Provide waterproofing complying with the following:

1. Tensile Strength, Film: 4,000 psi minimum; ASTM D412
2. Low-Temperature Flexibility: Unaffected at minus –10 deg F; MOAT 31:6D.
3. Peel Adhesion to Concrete: 5 lbs/in; MOAT 27:5.1.3.
4. Lap Adhesion: 2.5 lbs/in minimum; ASTM D1876, modified.
5. Hydrostatic-Head Resistance: 231 feet; ASTM D5385, modified.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane.

1. Auxiliary materials shall be compatible with hydrocarbon-contaminated soils.

B. Furnish liquid-type auxiliary materials that meet VOC limits of authority having jurisdiction.

C. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.

D. Sheet Flashing: Self-adhering, rubberized asphalt composite sheet of same material, construction and thickness as waterproofing sheet membrane.

E. Liquid Membrane: Elastomeric, 2-component, liquid, cold fluid applied, trowel grade or low viscosity, as recommended by waterproofing manufacturer for application.

F. Patching Membrane: Low-viscosity, 2-component, asphalt modified coating.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

H. Penetration Seal: Self-adhering reinforced membrane, 2 ½-inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

I. Metal Termination Bars: Aluminum bars, approximately 1-inch by 1/8-inch thick, predrilled at 22-mm-centers.

J. Joint Tape: 1/16 inches felt reinforced self-adhesive tape, 6-inches wide, with a release film on adhesive side.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.

C. Verify substrate is visibly dry and free of moisture. Test for capillary moisture for plastic sheet method according to ASTM D4263.

D. Notify Architect in writing of anticipated problems using waterproofing over substrate.

3.2 CONCRETE SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.

C. Remove grease, oil, form release agents, and other penetrating contaminants from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D4258.

F. Install membrane strip and center over construction and control joints and cracks exceeding a width of 1/16-inch.

G. Inside Corners: Prepare, prime, and treat inside corners according to waterproofing manufacturer's written instructions.

H. Install membrane strip centered over vertical inside corners. Install 19-mm-fillets of liquid membrane on horizontal inside corners as follows:

1. All footing-to-wall intersections extend liquid membrane each direction from corner or install membrane strip centered over corner.

2. All deck-to-wall intersections extend liquid membrane or sheet membrane flashing onto deck waterproofing and to finished height of sheet flashing.

I. Outside Corners: Prepare and treat outside corners according to waterproofing manufacturer's written instructions.

1. Install strip of membrane 12-inches-wide, centered over corner.

J. Prepare, treat, and seal horizontal and vertical surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.

1. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge and cover with sheet membrane strips.

3.3 PREPARATION FOR VERTICAL BLIND-SIDE APPLICATIONS

A. Provide a continuous smooth rigid vertical facing to receive the waterproofing material. The material may consist of plywood or rigid insulation.

B. Steel sheet piles must be treated with a rigid facing.

C. Timber lagging may be used, but it must be close-butted to provide support and to be more than 0.5 inch out of plumb.

3.4 SOIL SUBGRADE PREPARATION

A. Install a minimum 3-inch-thick concrete working slab beneath all building slabs.

B. Prepare surface of concrete working slab in accordance with paragraph 3.02 above.

C. Place membrane waterproofing directly on top of concrete working slab, in accordance with paragraph 3.04, herein.

3.5 INSTALLATION

A. Install adhesive-coated HDPE composite sheet according to waterproofing manufacturer's written instructions. The Bituthene Edgeguard hydrocarbon resistant tape shall be used to cover all exposed edges.

B. Place and secure drainage panels over substrates. Lap edges and ends of geotextile to maintain continuity.

C. Install sheet membrane with high density polyethylene face against substrate and fasten in accordance with the manufacturer's recommendations.

1. Walls: Accurately align sheets and maintain uniform 6 inch minimum lap widths and end laps, unless otherwise recommended by the manufacturer. Overlap and seal seams and stagger and tape end laps to ensure watertight installation.

2. Slabs: Accurately align sheets and maintain uniform 6 inches minimum lap widths and end laps, unless otherwise recommended by manufacturer. Overlap and seal seams and stagger and tape end laps to ensure watertight installation.

D. Securely fasten top termination of wall-mounted sheet membrane with continuous metal termination bar anchored into concrete substrate. Comply with the details indicated and the manufacturer" written instructions.

E. Seal penetrations through membrane to provide watertight seal with penetration seal patches or wrapping and liquid membrane fillet as recommended by the waterproofing system manufacturer.

F. Install sheet membrane and auxiliary materials to tie in adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not meeting requirements. Tape perimeter of damaged or non-confirming area extending 6 inches beyond repaired areas in all directions. Firmly apply a patch of sheet membrane.

3.6 PROTECTING AND CLEANING

A. Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.

1. Horizontal Application: Protect top surface of membrane from punctures, tears, or burns prior to placement of slab concrete.

2. Vertical Applications: Protect membrane waterproofing from damage during backfilling operations. This includes placement of a rigid barrier such as a plywood or rigid insulation between the membrane waterproofing and the soil backfill material.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07175

Below Grade Waterproofing

web www.graceconstruction.com
■PRODUCT DATA ■UPDATES ■TECH LETTERS ■DETAILS ■MSDS ■CONTACTS ■FAQS

Preprufe® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites.

Advantages

- Forms a unique integral seal to concrete poured against it – prevents water migration and makes it unaffected by ground settlement beneath slabs
- Fully-adhered watertight laps and detailing
- Provides a barrier to water, moisture and gas – physically isolates the structure from the surrounding ground
- BBA Certified for basement Grades 2, 3, & 4 to BS 8102:1990
- Zero permeance to moisture
- Solar reflective – reduced temperature gain
- Simple and quick to install – requiring no priming or fillets
- Can be applied to permanent formwork – allows maximum use of confined sites
- Self protecting – can be trafficked immediately after application and ready for immediate placing of reinforcement
- Unaffected by wet conditions – cannot activate prematurely
- Inherently waterproof, non-reactive system:
  - not reliant on confining pressures or hydration
  - unaffected by freeze/thaw, wet/dry cycling
- Chemical resistant – effective in all types of soils and waters, protects structure from salt or sulphate attack

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

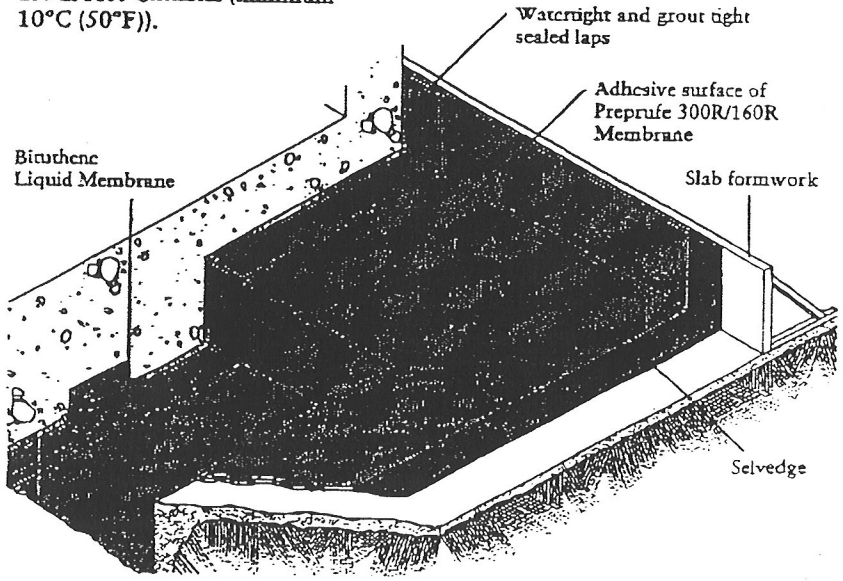
Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe seal to concrete prevents any ingress or migration of water around the structure.

The Preprufe R System includes:

- Preprufe 300R – heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- Preprufe 160R – thinner grade for lighter applications and blindside, zero property line applications against soil retention systems.
- Preprufe Tape LT – for covering cut edges, roll ends, penetrations and detailing (temperatures between -4°C (25°F) and +30°C (86°F)).
- Preprufe Tape HC – as above for use in Hot Climates (minimum 10°C (50°F)).
- Bituthene® Liquid Membrane – for sealing around penetrations, etc.

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete or well rolled and compacted sand or crushed stone blinding; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.



BBA BRITISH BOARD OF AGREMENT CERTIFICATE No. 97/3297

GRACE Construction Products

Installation

Preprufe 300R & 160R membranes are supplied in rolls 1.2 m (4 ft) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

All surfaces – It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 12 mm (0.5 in.). Grout around all penetrations such as utility conduits, etc. for stability.

Horizontal – The substrate must be free of loose aggregate and sharp protrusions. An angular profiled blinding is recommended rather than a sloping or rounded substrate. The surface does not need to be dry, but standing water must be removed.

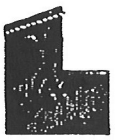
Vertical – Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 12 mm (0.5 in.) out of alignment.

Membrane Installation

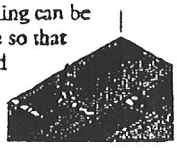
Preprufe can be applied at temperatures of -4°C (25°F) or above. When installing Preprufe in cold or marginal weather conditions (<13°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application.

Horizontal substrates – Place the membrane HDPE film side to the substrate with printed coated side up facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 75 mm (3 in.) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.



Vertical substrates – Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the printed coated side facing towards the concrete pour. The membrane may be installed in any convenient length. Secure the top of the membrane using a batten such as a termination bar or similar 50 mm (2 in.) below the top edge. Fastening can be made through the selvedge so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner. Any additional fasteners must be covered with a patch of Preprufe Tape.



Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges – Overlap all roll ends and cut edges by a minimum 75 mm (3 in.) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap and roll firmly. Immediately remove printed plastic release liner from the tape.

Penetrations

Use the following steps to seal around penetrations such as service pipes, piles, lightning conductors, etc.

Grout around the penetration if the penetration is not stable. Scribe membrane tight to the penetration. If the membrane is not within 12 mm (0.5 in.) of the penetration, apply Preprufe Tape to cover the gap.

Wrap the penetration with Preprufe Tape by positioning the tape 12 mm (0.5 in.) above the membrane.

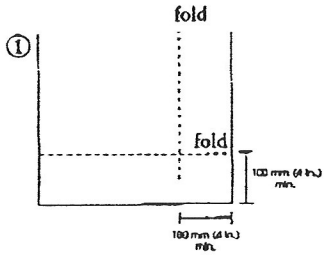
Mix and apply Bituthene Liquid Membrane around the penetrations using a fillet to provide a watertight seal between the Preprufe Membrane and Preprufe Tape.

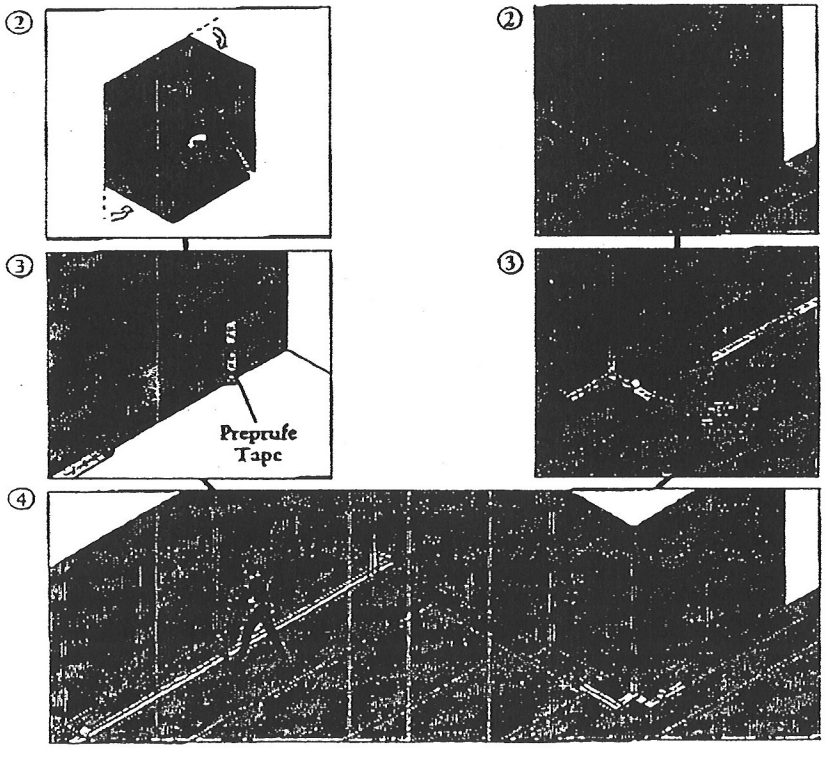
Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by jet washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Apply Preprufe Tape centered over the damaged area and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Corners

Internal and external corners should be formed as shown in the diagrams returning the membrane a minimum of 100 mm (4 in.) and sealing with Preprufe Tape. Ensure that the apex of the corner is covered and sealed with tape and roll firmly. Crease and fold the membrane to ensure a close fit to the substrate profile and avoid hollows.





Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe R Membrane and Tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

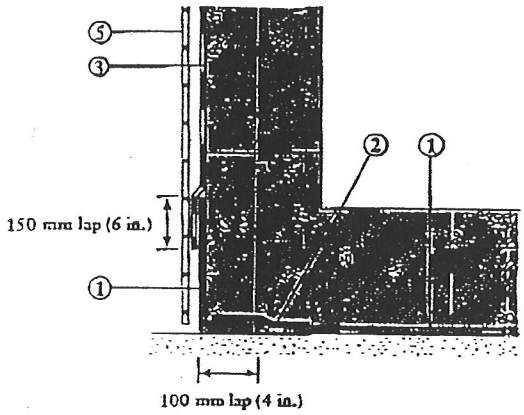
Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

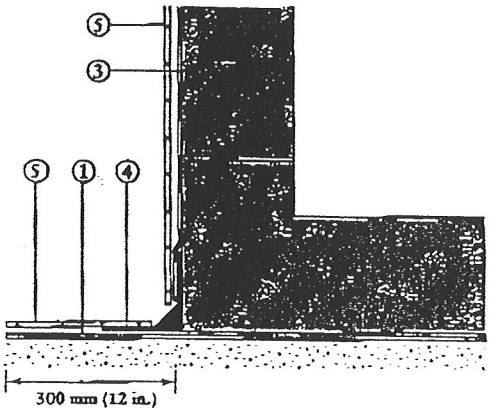
A minimum concrete compressive strength of 10 N/mm² (1500 psi) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

As a guide, to reach the minimum compressive strength stated above, a structural concrete mix with an ultimate strength of 40 N/mm² (6000 psi) will typically require a cure time of approximately 6 days at an average ambient temperature of -4°C (25°F), or 2 days at 21°C (70°F).

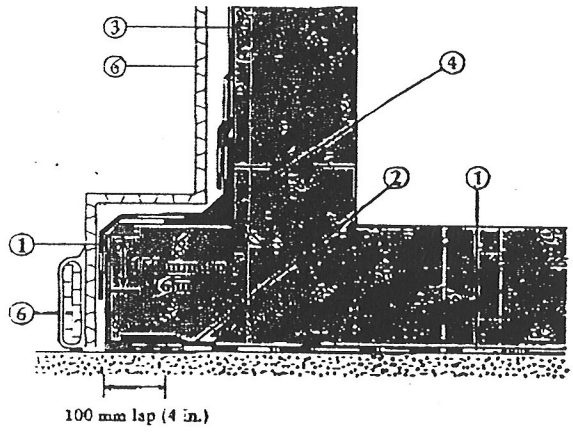
Wall base detail



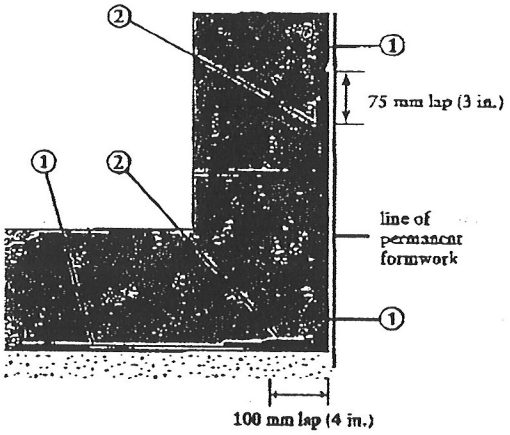
Alternative wall base detail for early form removal



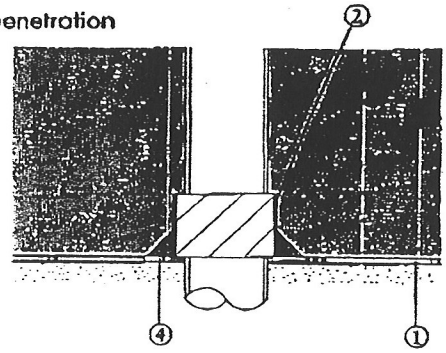
Wall base with toe detail showing drainage option



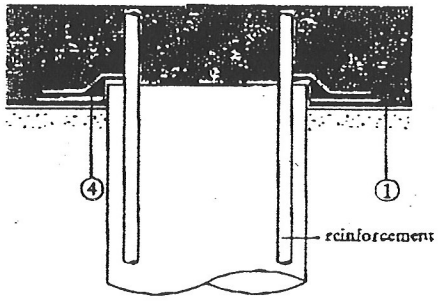
Wall base detail against permanent shutter



Pipe penetration



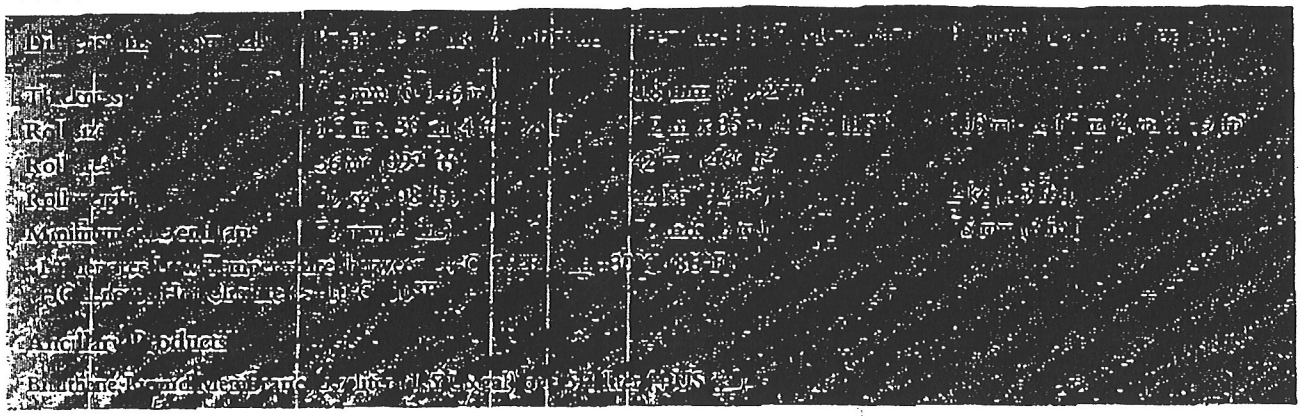
Pile detail



1 Preprufe
2 Preprufe Tape
3 Procor® (use Preprufe Tape to tie-in) or Bituthene® 4000
4 Bituthene Liquid Membrane
5 Protection
6 Hydroduct®

Details shown are typical illustrations and not working details. For assistance with detailing and problem solving please contact Grace Technical Department at 866-333-3SBM (3726).

Supply



Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
HDPE Thickness	0.75 mm (0.030 in.)	0.4 mm (0.016 in.)	
Peel Adhesion to Concrete	144 N per 50 mm 880 N/m (5 lbs/in.)	144 N per 50 mm 880 N/m (5 lbs/in.)	MOAT 27:5.1.3 ASTM D903 Modified[3]
Shear Strength of Joints	476 N per 50 mm	476 N per 50 mm	MOAT 27:5.2.2/3/4
Methane Permeability	9.1 mls/m²/day	N/A	University of London, QMW College[3]
Resistance to Hydrostatic Head	>6 m (>20 ft) >70 m (>230 ft)	>6 m (>20 ft) >70 m (>230 ft)	MOAT 27:5.1.4[5] ASTM D5385 Modified[2]
Low Temperature Flexibility	<-20°C (<0°F)	<-20°C (<0°F)	MOAT 31:6D
Puncture Resistance	990 N	445N	ASTM E154
Elongation (strain %)	long 826 trans 756	long 753 trans 825	BS 2782:320A (test speed 100 mm min.)
Elongation	300% minimum	300% minimum	ASTM D412 Modified[4]
Tensile Strength, Film	27.6 MPa (4000 lbs/in.)	27.6 MPa (4000 lbs/in.)	ASTM D412
Crack Cycling at -23°C (-10°F)	pass	pass	ASTM C836
Moisture Vapor Transmission	0 gm^{-2} per day	0 gm^{-2} per day	BBA Laboratories BS 3177:1959 (1995) (75% RH/25°C)
Permeability[1] (hydraulic conductivity)	$K=<1.4 \times 10^{-11} cm.s^{-1}$	$K=<1.4 \times 10^{-11} cm.s^{-1}$	ASTM D5084-90

Footnotes:
1. Result is lower limit of apparatus. Membrane therefore considered impermeable.
2. Hydrostatic head tests are performed by casting concrete against the membrane with a lap. The cured block is cracked and then placed in a chamber where water is introduced to the membrane surface including the lap up to a maximum of 70 m (231 ft) head.
3. Concrete is cast against the protective coating surface of the membrane and allowed to properly cure (7 days min.). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.
4. Elongation of membrane is run at 50 mm (2 in.) per minute.
5. Tested at laps. Result is limit of test.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

For Technical Assistance call us toll free at 866-333-3SBM (3726).

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GRACE Construction Products

Below Grade Waterproofing

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■PRODUCT DATA ■UPDATES ■TECH LETTERS ■DETAILS ■MSDS ■CONTACTS ■FAQS

Bituthene® System 4000

Self-adhesive HDPE waterproofing membrane with super tacky compound for use with patented, water-based System 4000 Surface Conditioner

Advantages

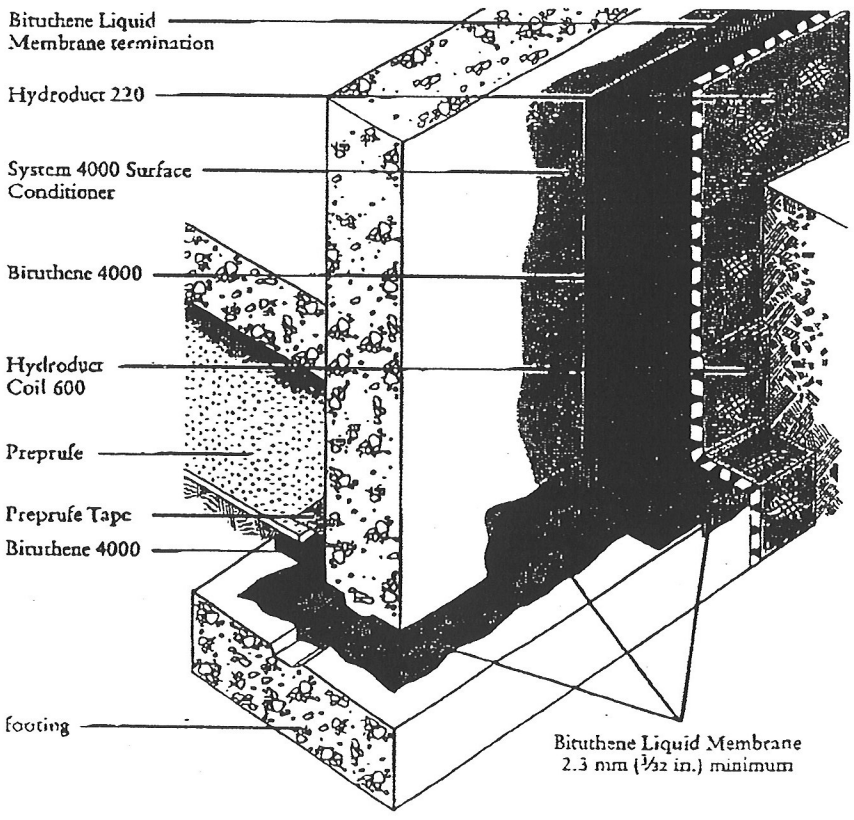
- **Excellent adhesion** – special adhesive compound engineered to work with high tack System 4000 Surface Conditioner
- **Cold applied** – simple application to substrates, especially at low temperatures
- **Reduced inventory and handling costs** – System 4000 Surface Conditioner is included with each roll of membrane
- **Wide application temperature range** – excellent bond to self and substrate from -4°C (25°F) and above
- **Overlap security** – minimizes margin for error under site conditions
- **Cross laminated, high density polyethylene carrier film** – provides high tear strength, puncture and impact resistance
- **Flexible** – accommodates minor structural movements and will bridge shrinkage cracks
- RIPCORD™ - This "split release on demand" feature allows the splitting of the membrane into two (2) pieces for ease of installation in detailed areas

Description

Bituthene® System 4000 is a 1.5 mm (1/16 in.) flexible, pre-formed waterproof membrane which combines a high performance, cross laminated, HDPE carrier film with a unique, super tacky, rubberized asphalt compound.

System 4000 Surface Conditioner is a unique, water-based, latex surface treatment which imparts an aggressive, high tack finish to the treated substrate. It is specifically formulated to bind site dust and concrete efflorescence, thereby providing a suitable surface for the Bituthene System 4000 Waterproofing Membrane.

Conveniently packaged in each roll of membrane, System 4000 Surface Conditioner promotes good initial adhesion and, more importantly, excellent permanent adhesion of the Bituthene System 4000 Waterproofing Membrane. The VOC (Volatile Organic Compound) content is 125 g/L.



GRACE
Construction Products

Use

Bituthene is ideal for waterproofing concrete, masonry and wood surfaces where in-service temperatures will not exceed 57°C (135°F). It can be applied to foundation walls, tunnels, earth sheltered structures and split slab construction, both above and below grade. (For above grade applications, see "Above Grade Waterproofing Bituthene System 4000.")

Bituthene is 1.5 mm (1/16 in.) thick, 0.9 m (3 ft) wide and 20 m (66.7 ft) long and is supplied in rolls. It is unrolled sticky side down onto concrete slabs or applied onto vertical concrete faces primed with System 4000 Surface Conditioner. Continuity is achieved by overlapping a minimum 50 mm (2 in.) and firmly rolling the joint.

Bituthene is extremely flexible. It is capable of bridging shrinkage cracks in the concrete and will accommodate minor differential movement throughout the service life of the structure.

Application Procedures

Safety, Storage and Handling Information

Bituthene products must be handled properly. Vapors from solvent-based primers and mastic are harmful and flammable. Grace Protection Board Adhesive is extremely flammable. For these products, the best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available at www.graceconstruction.com and users should acquaint themselves with this information. Carefully read detailed precaution statements on product labels and the MSDS before use.

Surface Preparation

Surfaces should be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Concrete must be properly dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete).

If time is critical, Bituthene Primer B2 may be used to allow priming and installation of membrane on damp surfaces or "green" concrete. Priming may begin in this case as soon as the concrete will maintain structural integrity. Use form release agents which will not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane. Cure concrete with clear, resin-based curing compounds which do not contain oil, wax or pigment. Except with Primer B2, allow concrete to thoroughly dry following rain. Do not apply any products to frozen concrete.

Repair defects such as spalled or poorly consolidated areas. Remove sharp protrusions and form match lines. On masonry surfaces, apply a parge coat to rough concrete block and brick walls or trowel cut mortar joints flush to the face of the concrete blocks.

Temperature

- Apply Bituthene System 4000 Membrane and Conditioner only in dry weather and when air and surface temperatures are -4°C (25°F) or above.
- Apply Bituthene Primer B2 in dry weather above -4°C (25°F). (See separate product information sheet.)

Conditioning

Bituthene System 4000 Surface Conditioner is ready to use and can be applied by spray or roller. For best results, use a pump-type air sprayer with fan tip nozzle, like the Bituthene System 4000 Surface Conditioner Sprayer, to apply the surface conditioner.

Apply Bituthene System 4000 Surface Conditioner to clean, dry, frost-free surfaces at a coverage rate of 7.4 m^2/L (300 ft^2/gal). Coverage should be uniform. Surface conditioner should not be applied so heavily that it puddles or runs. **Do not apply conditioner to Bituthene membrane.**

Allow Bituthene System 4000 Surface Conditioner to dry one hour or until substrate returns to its original color. At low temperatures or in high humidity conditions, dry time may be longer.

Bituthene System 4000 Surface Conditioner is clear when dry and may be slightly tacky. In general, conditioning should be limited to what can be covered within 24 hours. In situations where long dry times may prevail, substrates may be conditioned in advance. Substrates should be reconditioned if significant dirt or dust accumulates.

Before surface conditioner dries, tools should be cleaned with water. After surface conditioner dries, tools should be cleaned with mineral spirits. Mineral spirits is a combustible liquid which should be used only in accordance with manufacturer's recommendations. **Do not use solvents to clean hands or skin.**

Corner Details

The treatment of corners varies depending on the location of the corner. For detailed information on Bituthene Liquid Membrane, see separate product information sheet.

- At wall to footing inside corners –
  Option 1:
  Apply membrane to within 25 mm (1 in.) of base of wall. Treat the inside corner by installing a 20 mm (¾ in.) fillet of Bituthene Liquid Membrane. Extend Bituthene Liquid Membrane at least 65 mm (2½ in.) onto footing, and 65 mm (2½ in.) onto wall membrane.
  Option 2:
  Treat the inside corner by installing a 20 mm (¾ in.) fillet of Bituthene Liquid Membrane. Apply 300 mm (12 in.) wide strip of sheet membrane centered over fillet. Apply wall membrane over inside corner and extend 150 mm (6 in.) onto footing. Apply 25 mm (1 in.) wide troweling of Bituthene Liquid Membrane over all terminations and seams within 300 mm (12 in.) of corner.
- At footings where the elevation of the floor slab is 150 mm (6 in.) or more above the footing, treat the inside corner either by the above two methods or terminate the membrane at the base of the wall. Seal the termination with Bituthene Liquid Membrane.

Joints

Properly seal all joints with waterstop, joint filler and sealant as required. Bituthene membranes are not intended to function as the primary joint seal. Allow sealants to fully cure. Pre-strip all slab and wall cracks over 1.5 mm (1/16 in.) wide and all construction and control joints with 230 mm (9 in.) wide sheet membrane strip.

Application on Horizontal Surfaces

(Note: Preprufe® pre-applied membranes are strongly recommended for below slab or for any application where the membrane is applied before concreting. See Preprufe product information sheets.)

Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 50 mm (2 in.). Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 760 mm (30 in.) wide, weighing a minimum of 34 kg (75 lbs) when filled. Cover the face of the roller with a resilient material such as a 13 mm (½ in.) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene Liquid Membrane at the end of the day.

Protrusions and Drains

Apply membrane to within 25 mm (1 in.) of the base of the protrusion. Apply Bituthene Liquid Membrane 2.5 mm (0.1 in.) thick around protrusion. Bituthene Liquid Membrane should extend over the membrane a minimum of 65 mm (2½ in.) and up the penetration to just below the finished height of the wearing course.

Vertical Surfaces

Apply membrane in lengths up to 2.5 m (8 ft). Overlap all seams at least 50 mm (2 in.). On higher walls apply membrane in two or more sections with the upper overlapping the lower by at least 50 mm (2 in.). Roll all membrane with a hand roller.

Terminate the membrane at grade level. Press the membrane firmly to the wall with the butt end of a hardwood tool such as a hammer handle or secure into a reglet. Failure to use heavy pressure at terminations can result in a poor seal. A termination bar may be used to ensure a tight seal. Terminate the membrane at the base of the wall if the bottom of the interior floor slab is at least 150 mm (6 in.) above the footing. Otherwise, use appropriate inside corner detail where the wall and footing meet.

Membrane Repairs

Patch tears and inadequately lapped seams with membrane. Clean membrane with a damp cloth and dry. Slit fishmouths and repair with a patch extending 150 mm (6 in.) in all directions from the slit and seal edges of the patch with Bituthene Liquid Membrane. Inspect the membrane thoroughly before covering and make any repairs.

Drainage

Hydroduct® drainage composites are recommended for both active drainage and protection of the membrane. See Hydroduct product information sheets.

Protection of Membrane

Protect Bituthene membranes to avoid damage from other trades, construction materials or backfill. Place protection immediately in temperatures above 25°C (77°F) to avoid potential for blisters.

- On vertical applications, use Hydroduct 220 Drainage Composite. Adhere Hydroduct 220 Drainage Composite to membrane with Hydroduct Tape. Alternative methods of protection are to use 25 mm (1 in.) expanded polystyrene or 6 mm (¼ in.) extruded polystyrene that has a minimum compressive strength of 55 kN/m^2 (8 lbs/in.^{2}). Such alternatives do not provide positive drainage to the system.

If 6 mm (¼ in.) extruded polystyrene protection board is used, backfill should not contain sharp rock or aggregate over 50 mm (2 in.) in diameter. Adhere polystyrene protection board with Bituthene® Protection Board Adhesive or Hydroduct Tape.

- In mud slab waterproofing, or other applications where positive drainage is not desired and where reinforced concrete slabs are placed over the membrane, the use of 6 mm (¼ in.) hardboard or 2 layers of 3 mm (⅛ in.) hardboard is recommended.

Insulation

Always apply Bituthene membrane directly to primed or conditioned structural substrates. Insulation, if used, must be applied over the membrane. Do not apply Bituthene membranes over lightweight insulating concrete.

Backfill

Place backfill as soon as possible. Use care during backfill operation to avoid damage to the waterproofing system. Follow generally accepted practices for backfilling and compaction. Backfill should be added and compacted in 150 mm (6 in.) to 300 mm (12 in.) lifts.

For areas which cannot be fully compacted, a termination bar is recommended across the top termination of the membrane.

Placing Steel

When placing steel over properly protected membrane, use concrete bar supports (dobies) or chairs with plastic tips or rolled feet to prevent damage from sharp edges. Use special care when using wire mesh, especially if the mesh is curled.

Approvals

- City of Los Angeles Research Report RR 24386
- U.S. Department of Housing and Urban Development (HUD) HUD Materials Release 628E

Warranty

Five year material warranties covering Bituthene and Hydroduct products are available upon request. Contact your Grace sales representative for details.

Technical Services

Support is provided by full time, technically trained Grace representatives and technical service personnel, backed by a central research and development staff.

System 4000 Surface Conditioner Sprayer

The Bituthene System 4000 Surface Conditioner Sprayer is a professional grade, polyethylene, pump-type, compressed air sprayer with a brass fan tip nozzle. It has a 7.6 L (2 gal) capacity. The nozzle orifice and spray pattern have been specifically engineered for the optimum application of Bituthene System 4000 Surface Conditioner.

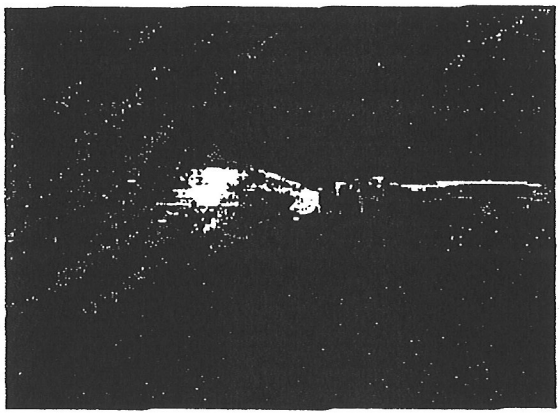
Hold nozzle 450 mm (18 in.) from substrate and squeeze handle to spray. Spray in a sweeping motion until substrate is uniformly covered.

Sprayer should be repressurized by pumping as needed. For best results, sprayer should be maintained at high pressure during spraying.

To release pressure, invert the sprayer and spray until all compressed air is released.

Maintenance

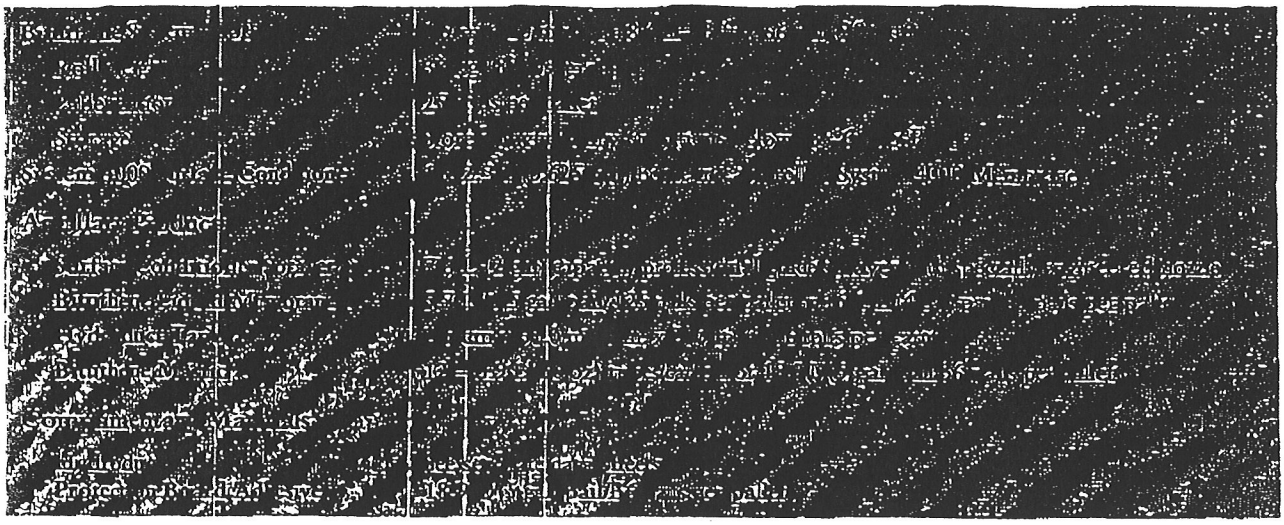
The Bituthene System 4000 Surface Conditioner Sprayer should perform without trouble for an extended period if maintained properly.



Sprayer should not be used to store Bituthene System 4000 Surface Conditioner. The sprayer should be flushed with clean water immediately after spraying. For breaks in the spray operation of one hour or less, invert the sprayer and squeeze the spray handle until only air comes from the nozzle. This will avoid clogging.

Should the sprayer need repairs or parts, call the maintenance telephone number on the sprayer tank (800-323-0620).

Supply



Equipment by Others: Soft broom, utility knife, brush or roller for priming

Physical Properties for Bituthene 4000 Membrane

Property	Typical Value	Test Method
Color	Dark gray-black	
Thickness	1.5 mm (1/16 in.) nominal	ASTM D3767 – Method A
Flexibility, 180° bend over 25 mm (1 in.) mandrel at -32°C (-25°F)	Unaffected	ASTM D1970
Tensile Strength, Membrane, Die C	2240 kPa (325 lbs/in.^{2}) minimum	ASTM D412 Modified[1]
Tensile Strength, Film	34.5 MPa (5,000 lbs/in.^{2}) minimum	ASTM D882 Modified[1]
Elongation, Ultimate Failure of Rubberized Asphalt	300% minimum	ASTM D412 Modified[1]
Crack Cycling at -32°C (-25°F), 100 Cycles	Unaffected	ASTM C836
Lap Adhesion at Minimum Application Temperature	880 N/m (5 lbs/in.)	ASTM D1876 Modified[2]
Peel Strength	1576 N/m (9 lbs/in.)	ASTM D903 Modified[3]
Puncture Resistance, Membrane	222 N (50 lbs) minimum	ASTM E154
Resistance to Hydrostatic Head	70 m (210 ft) of water	ASTM D5385
Permeance	2.9 ng/m^{2}sPa (0.05 perms) maximum	ASTM E96, Section 12 – Water Method
Water Absorption	0.1% maximum	ASTM D570

Footnotes:
1. The test is run at a rate of 50 mm (2 in.) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 50 mm (2 in.) per minute at 5°C (40°F).
3. The 180° peel strength is run at a rate of 300 mm (12 in.) per minute.

Physical Properties for System 4000 Surface Conditioner

Property	Typical Value
Solvent Type	Water
Flash Point	>60°C (>140°F)
VOC* Content	125 g/L
Application Temperature	-4°C (25°F) and above
Freeze Thaw Stability	5 cycles (minimum)
Freezing Point (as packaged)	-10°C (14°F)
Dry Time (hours)	1 hour**

* Volatile Organic Compound
** Dry time will vary with weather conditions

For Technical Assistance call toll free at 866-333-3SBM (3726).

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TECH LETTER 4

Chemical Resistance

Several series of tests have been conducted to define the chemical resistance of Preprufe® and Bituthene® waterproofing membranes. Both Preprufe and Bituthene membranes are highly resistant to normal ground water conditions which may range from alkaline to acidic. In addition, Preprufe and Bituthene waterproofing membranes are unaffected by exposure to salt water.

Occasionally, Preprufe and Bituthene membranes may be used in applications which will be subjected to intermittent or even continuous exposure to chemicals. The following guidelines can be used to evaluate the applicability of the Preprufe and Bituthene membrane system.

Exposure to:	Preprufe® and Bituthene® membrane Resistance rating
Sea water, de-icing salt	Excellent
Acids in solution e.g. sulfuric, acetic, hydrochloric, and nitric acid	Excellent
Alkalis e.g. Sodium hydroxide, ammonium hydroxide	Excellent
Alcohols	Very Good
Organic or fuel oils, solvents	Variable (see note below)

Note: Most solvents and fuels will not significantly affect the polyethylene film but may soften or dissolve the adhesive compounds exposed at the edge laps. Detailed information on the type of exposure is necessary to make recommendations.
For below slab and blind side applications, a concrete mud-slab or continuous soil retention system will reduce the exposure of the Preprufe membrane laps. For Bituthene wall applications, the use of Bituthene Edgeguard® or a solvent resistant tape, should be used over the membrane edges to protect the rubberized asphalt from prolonged exposure.

For Technical Assistance call us at 800-444-6459 (Option 3).

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GRACE Construction Products

Chemical Resistance Information

POLY-FLEX, INC.
Geomembrane Lining Systems

PREVIOUS PAGE

PRINTABLE PAGE

CHEMICAL RESISTANCE INFORMATION

CHEMICAL CLASS	CHEMICAL EFFECT	PRIMARY CONTAINMENT (LONG TERM CONTACT) HDPE	PRIMARY CONTAINMENT (LONG TERM CONTACT) LLDPE	SECONDARY CONTAINMENT (SHORT TERM CONTACT) HDPE	SECONDARY CONTAINMENT (SHORT TERM CONTACT) LLDPE
CARBOXYLIC ACID	1				
- Unsubstituted (e.g. Acetic acid)		B	C	A	C
- Substituted (e.g. Lactic acid)		A	B	A	A
- Aromatic (e.g. Benzoic acid)		A	B	A	A
ALDEHYDES	3				
- Aliphatic (e.g. Acetaldehyde)		B	C	B	C
- Hetrocyclic (e.g. Furfural)		C	C	B	C
AMINE	3				
- Primary (e.g. Ethylamine)		B	C	B	C
- Secondary (e.g. Diethylamine)		C	C	B	C
- Aromatic (e.g. Aniline)		B	C	B	C
CYANIDES (e.g. Sodium Cyanide)	1	A	A	A	A
ESTER (e.g. Ethyl acetate)	3	B	C	B	C
ETHER (e.g. Ethyl ether)		C	C	B	C
HYDROCARBONS	3				
- Aliphatic (e.g. Hexane)		C	C	B	C
- Aromatic (e.g. Benzene)		C	C	B	C
- Mixed (e.g. Crude oil)		C	C	B	C
HALOGENATED HYDROCARBONS	3				
- Aliphatic (e.g. Dichloroethane) +A4		C	C	B	C
- Aromatic (e.g. Chlorobenzene)		C	C	B	C
ALCOHOLS	1				
- Aliphatic (e.g. Ethyl alcohol)		A	A	A	A
- Aromatic (e.g. Phenol)		A	C	A	B
INORGANIC ACID					
- Non-Oxidizers (e.g. Hydrocloric acid)	1	A	A	A	A
- Oxidizers (e.g. Nitric Acid)	2	C	C	B	C
INORGANIC BASES (e.g. Sodium hydroxide)	1	A	A	A	A
SALTS (e.g. Calcium chloride)	1	A	A	A	A
METALS (e.g. Cadmium)	1	A	A	A	A
KETONES (e.g. Methyl ethyl ketone)	3	C	C	B	C

OXIDIZERS (e.g. Hydrogen Peroxide)	2	C	C	C	C

Chemical effect (see discussion on Chemical Resistance)

1. No Effect–Most chemicals of this class have no or minor effect.
2. Oxidizer–Chemicals of this class will cause irreversible degradaton.
3. Plasticizer–Chemicals of this class will cause a reversible change in physical properties.

Chart Rating

A. Most chemicals of this class have little or no effect on the liner.
Recommended regardless of concentration or temperature (below 150° F).

B. Chemicals of this class will effect the liner to various degrees.
Recommendations are based on the specific chemical, concentration and temperature.
Consult with Poly-Flex, Inc.

C. Chemicals of this class at high concentrations will have significant effect on the physical properties of the liner.
Generally not recommended but may be acceptable at low concentrations and with special design considerations.
Consult with Poly-Flex, Inc.

This data is provided for informational purposes only and is not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibility in connection with the use of this data. Consult with Poly-Flex, Inc. for specific chemical resistance information and liner selection.

<< PREVIOUS PAGE PRINTABLE PAGE

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Poly-Flex, Inc. • 2000 W. Marshall Dr. • Grand Prairie, TX 75051 U.S.A. • 888-765-9359