West 34th Street Development
555 West 34th Street
New York, New York
Block 706, Lot 1

BCP Site #C231049

REMEDIAL ACTION WORK PLAN

Prepared For:
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c/o The Moinian Group
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FLS Project Number: 10090-001

Submitted to:
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Division of Environmental Remediation
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Professional Engineer's Certification

I, Arnold F. Fleming, certify that this Remedial Action Work Plan was prepared under my direct supervision.

REMEDIAL ACTION WORK PLAN
(RAWP)
West 34th Street Development
New York, NY

Brownfield Site
C231049

June 2007

It is a violation of New York State Law for any person, unless acting under the direction of a licensed professional engineer or land surveyor, to alter any item in any way. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer or land surveyor shall affix to the item his seal and notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration.

Date

Arnold F. Fleming, P.E.
NYS Professional Engineer
License Number 050411

1.0 INTRODUCTION

Pursuant to the Brownfield Cleanup Agreement fully executed as of February 21, 2007, between Meushar 34th Street, LLC and the New York State Department of Environmental Conservation (NYSDEC), and on behalf of the Applicant, Arnold F. Fleming, P.E./Fleming-Lee Shue, Inc. (collectively FLS) has prepared the following Remedial Action Work Plan (RAWP) for the parcel of land known as the "West 34th Street Development" (hereafter referred to as "the Site"). The legal description of the Site is Block 706, Lot 1 (555 West 34th Street). The Site is located on the western portion of the city block bounded by West 34th Street to the south, 11th Avenue to the west and West 35th Street to the north, in the borough of Manhattan, City of New York, New York. A Site Location Map and a Site Plan are included as Figures 1 and 2, respectively. The RAWP is written in compliance with the Division of Environmental Remediation (DER) Draft Brownfield Cleanup Program (BCP) Guide and DER-10, Sections 4 and 5.

1.1 Site Description and Proposed Development

The Site consists of a two story building, which was last operated by Verizon as part of their installation and maintenance division. The Amtrak Empire Line is present beneath the northwest corner of the site (Figure 2) within an easement. The western bulkhead wall of the basement reflects the presence of the track.

The Applicant intends to demolish the existing Site structure in order to both create access for the construction of the 34th Street station of the No. 7 subway extension and construct a high-rise mixed-use building.

The No. 7 line tunnel will be located within the bedrock zone outside the site boundaries. The subway tunnel waiting area will be constructed under 11th Avenue starting approximately 90 feet below grade (ft-bg), which is approximately 60 feet into bedrock. Access for construction will be provided through a 38 feet by 24 feet shaft located within the Site's boundaries. The shaft will extend to a depth of approximately 120 feet below grade (approximately 90 feet into rock), proceeding west to the location of the subway tunnel and the 34th Street Station. This shaft will be used to remove rock from the tunnel and waiting area beyond the Site, as well as to bring in construction materials to construct the tunnel and station. The subway station, which will contain the main entrance and ticketing level, will be present on-Site to a depth of approximately 40 feet below grade with a portion approximately 50 feet below grade to allow for escalator operation. This is approximately 10 to 20 feet into bedrock. Proposed development plans for the No. 7 station are included in Attachment A.

Due to the construction of the No. 7 line station, the proposed building will be constructed approximately seven years after the Site excavation is completed. Details of the proposed building are based on the results of two zoning studies of the Site. The proposed 79-story building will occupy the entire Site, as well as the adjacent Lot 55, with a footprint of approximately 46,900-square feet. One to two below-grade floors will be constructed for parking, storage or mechanical rooms. The first floor will likely include lobbies, retail, loading docks and entrances to the No. 7 line ticketing level. Parking entry or mechanical use may also be present on the first floor. The upper floors are contemplated to be used for a combination of office, residential, hotel, retail, parking and support spaces. The bulkhead wall separating the basement from the Amtrak line will remain. Proposed development plans for the mixed-use building are under development. The anticipated use is mixed use with residential included in the development.

The Site appears on the City of New York Department of City Planning Zoning Map 8b. According to this map, the property is designated C6-3, which is designated as a general central commercial district. The New York City Department of Environmental Protection (NYCDEP) has placed an “e” designation on this Site. Development of an “e” designation site requires NYCDEP approval prior to issuance of a permit by the New York City Department of Buildings (NYCDOB).

The parcel of land was previously zoned for general commercial use and was rezoned as part of a larger, City-led, rezoning project for the Hudson Yards District in Manhattan, New York. The Site is located within the Large-Scale Plan Sub-district in the Four Corners Sub-area. The rezoning was designed to allow the area to be developed for commercial and residential uses. The Hudson Yards District Rezoning was completed in January 2005.

1.2 Purpose and Goal of RAWP

The purpose of this RAWP is to describe the proposed remedy of removing all soil from the surface down to bedrock, including urban fill and native soils, from the Site. This proposed remediation would also remove the source of the on-Site petroleum-contaminated groundwater identified in remedial investigations of the Site, as summarized in Section 2.3.

The physical location and associated easement rights of the Amtrak railroad track limit the remediation activities that will occur in the northwestern portion of the Site. Removal of all soil and groundwater in this area will be conducted approximately two years after the soil in the area east of the bulkhead wall is removed. Although removal of any contaminated soil beneath the Amtrak railroad track is not possible, the track is believed to be constructed into bedrock. Drawings prepared by Parsons Brinckerhoff (PB) indicate that the base of the railroad track is located below the inferred depth of bedrock based on geotechnical borings conducted for the No. 7 subway line extension. Therefore, all contaminated soil would be removed from the Site, including soils within the easement. Side views of this area of the Site are included as the first and third drawings, Numbers AR-50240 and AR-50231, respectively, in Attachment A.

The proposed excavation across the Site will extend to a minimum of 40 feet below grade (ft-bg) in order to prepare the site for the No. 7 subway station and construction shaft. Bedrock has been encountered between 13 and 40 ft-bg, but most likely extends deeper at the western part of the Site. The remedial action entails excavating to bedrock across the Site.

Site preparation for the construction of the No. 7 subway station will occur concurrently with the remediation east of the bulkhead wall. On the eastern portion of this area, after the remedial excavation has been completed, some bedrock will be removed, crushed on-Site and used to bring the western portion of this area up to the foundation grade for the subway station. As detailed above the cut into bedrock will be approximately 10 to 20 feet to allow for the subway station and the escalator operations. The bedrock surface will be inspected by a representative of FLS before the bedrock is used for construction grading. Rock crushing for grading will be done under a dust suppression program.

Groundwater is located between 17 and 32 ft-bg, so dewatering will be required to allow the contaminated soil/fill excavation and the subsequent construction of the basement. Based on the similar depths to both groundwater and bedrock, the perceived groundwater table may be perched groundwater.

The Remedial Investigation (RI) of the Site, summarized in Section 2.3, indicated that up to 17 feet of soil on the Site is urban fill. The fill consists of brown, black grey and tan sands with some silts, gravel, concrete, brick fragments, rocks and cinders. A number of the fill constituents exceed regulatory guidance levels and the fill material will be removed entirely from the Site. At the groundwater level, there is petroleum contamination remaining from the historic use of the Site for fueling operations and the operation of a hydraulic elevator.

Any off-Site migration of contaminants identified in Site groundwater will be addressed by a Supplemental Remedial Investigation. Because remediation of the Site will draw off-Site groundwater into the excavation, the off-Site conditions will be established after all source soils have been removed and groundwater stabilizes during subway construction.

All soil will be removed from the Site; therefore, all contaminated soils (urban fill, petroleum-contaminated urban fill and native soil) will be removed from the Site. Groundwater will be treated by the construction dewatering system that will lower the groundwater level to the bottom of the excavation for the access shaft, estimated at approximately 30 feet below grade. Any groundwater generated by dewatering will be treated prior to discharge to the New York City sewers under a permit from and in accordance with the requirements of NYCDEP.

At completion of the remediation east of the bulkhead wall, the Site will be turned over to the MTA for subway construction. The access shaft and the horizontal shaft leading to the tunnel under 11th Avenue will be completed as part of the construction of the building. Approximately two years after the commencement of remediation activities, the

Applicant will remove all soil and groundwater within the Amtrak easement. This schedule reflects the time needed to gain approval from Amtrak to work within the easement. An access agreement will address the schedule, work-to-be-performed, insurance, site-specific Health and Safety Plan, etc. This agreement is expected to take one to one-and-a-half years to obtain. Following the removal of the soil and groundwater, the Applicant will drill caissons within the easement to support the future building. These caissons need to be installed prior to the drilling of the tunnel under 11th Avenue to avoid damage to the tunnel.

1.3 Summary of Historical Documentation and Reports

FLS reviewed available documentation regarding historical environmental and geotechnical investigations at the Site. The following reports regarding 555 West 34th Street were available for review:

- Phase I Environmental Site Assessment, prepared by Parsons Brinckerhoff, dated June 8, 2004.

- Phase I Environmental Site Assessment, prepared by EnviroTrac, Ltd., dated June 28, 2004.

- Subsurface Investigation Report, prepared by EnviroTrac, Ltd., dated September 9, 2005.

- Underground Storage Tank Removal Report, prepared by EnviroTrac, Ltd., dated March 9, 2006.

- Phase II Environmental Site Investigation Report, prepared by Parsons Brinckerhoff, dated April 2006.

The following Site description presents the results of the Site investigations contained in these reports.

2.0 SITE BACKGROUND

The Site is located very close to the original shoreline of the Hudson River, which was just across what is now 11th Avenue; however, the Hudson River has since been filled in to the West Side Highway. The Site has been developed with a variety of commercial, residential, and manufacturing facilities since approximately 1890.

2.1 Geology

The Site is mapped on the *40074-G1 Weehawken, NJ-NY* Quadrant 7.5 Minute Topographic Map, published by the United States Geological Survey (USGS) (Figure 1). Review of the topographic map revealed that the site is located approximately 20 feet above sea level (ft-msl, USGS).

The following geologic information was obtained from EnviroTrac, Ltd. (EnviroTrac) and PB.

The generalized subsurface profile consists of fill overlying sand and silt deposits, with bedrock at depths between 5 and 24 feet below grade (ft-bg). Descriptions of each soil stratum are given below.

Fill
Fill material was encountered in twenty-three of a total twenty-five borings conducted at the Site. The fill consists of brown, black grey and tan sands with some silts, gravel, concrete, brick fragments, rocks and cinders. The fill thickness ranges from about five to seventeen feet.

Sand and Silt
Sand was generally encountered below the fill with some instances of silts and clay. The sand layer consists of brown, reddish brown, black and grey, coarse to fine sand with varying amounts of silt and clay. The thickness of the native Holocene epoch soils ranged from 0 to 32 feet. In one geotechnical boring, PE-19, completed by PB in 2003, this layer was considered to be fill material by the geologist.

Bedrock
Bedrock was encountered in each boring. Bedrock consisted of wide-fractured, hard mica schist with some layers of pegmatite and amphibolite. Bedrock was found at depths ranging from about 13 to 40 ft-bg. In the one geotechnical boring, the bedrock was reported as weathered to 59 ft-bg. Core recoveries ranged from 96 to 100 percent, averaging 99.6 percent. Rock Quality Designation (RQD) values ranged from 80 to 100 percent, averaging 97 percent, indicating good to excellent quality rock. As expected, bedrock appears to be shallowest at the east end of the Site and slopes downward to the west toward the Hudson River.

2.2 Hydrogeology

The Site-specific hydrogeologic information was obtained from EnviroTrac's Subsurface Investigation Report, dated September 9, 2006 and PB's Phase II Environmental Site Investigation, dated April 2006. Further discussion of groundwater monitoring conducted as part of this RI is provided in Section 4.2.

General Hydrology

Groundwater is generally contained within the unconsolidated geologic materials and the fractured bedrock. The upper surface of the groundwater reservoir is marked by the groundwater-table surface, which fluctuates seasonally in response to precipitation events, local usage demands and tidally along the shorelines. Based on similar depths measured to both groundwater and bedrock, the groundwater detected in the unconsolidated zone may be perched water and not reflective of the true groundwater-table surface.

In most locations throughout Manhattan, the configuration of the water-table surface generally follows the local topography. Groundwater generally flows from areas of higher to lower topographic elevation or from inland areas to the shorelines. The topography of the Site dips from the west to the east; however, the Site topography has been altered to line up with the bridge structure that supports 11th Avenue. Therefore, the topography of the Site cannot be used to determine the groundwater flow direction. The bedrock at the Site is a better indicator of the original topography at the Site. As detailed in Section 2.1, the bedrock slopes westward towards the Hudson River. The topography of the surrounding area also slopes towards the Hudson River. Therefore, the groundwater flow direction, on average, beneath the Site can be inferred to flow in a westerly direction towards the Hudson River. Underground utilities, such as sewer, water and steam pipes, and other subsurface manmade objects may locally impede and redirect the natural groundwater flow, or if the water or sewer lines leak, may cause localized mounding of the groundwater-table.

Groundwater flow directions were measured as part of the EnviroTrac Phase II as flowing to the west towards the Amtrak tunnel locally and the Hudson River generally.

Infiltration of incident precipitation to the water table in the project area is likely minimal due the extensive paving and structures that cover most of the ground surface. The vast majority of incident precipitation drains to City combined sewers and eventually to the North River wastewater treatment plant that serves this area of the City, or directly to tidal surface waters during overflow events. Rainwater that does infiltrate the ground percolates downwards towards the water table, where it enters the groundwater reservoir and flows towards the Hudson River.

Groundwater in the New York City area is not used as a potable (drinking) water source. New York City residents receive their drinking water supply from surface reservoirs located in upstate New York.

Site Groundwater Elevations

EnviroTrac and PB measured groundwater at depths between 17 and 32 ft-bg. Due to the altered Site topography, depth-to-water measurements do not accurately represent the Site groundwater elevations. Groundwater table elevations, which account for changes in Site topography, vary approximately 20 feet across the Site. One monitoring well, MW-4, appears to have an anomalously low reading which may be due to groundwater depression or a measurement error (e.g., an incorrect survey reading). The groundwater table elevations vary approximately 13 feet across the Site. The groundwater table elevations confirm that the net groundwater flow is generally towards the west and northwest.

Surface Water

No surface water bodies exist on the Site. The closest surface water body is the Hudson River, located approximately 1,100 feet west of the Site.

2.3 Previous Investigations

Previous Site investigations performed by PB and EnviroTrac are summarized below. These investigations have also been detailed in FLS' Remedial Investigation Report (RIR).

2.3.1 PB Investigations

In a June 8, 2004 Phase I Environmental Site Assessment (ESA), PB identified three types of recognized environmental conditions (RECs) at the Site:

1. Historic uses of the Site and surrounding sites that may have impacted the subsurface environment. Based on historic Sanborn Fire Insurance maps, PB identified the following uses of the Site as RECs: unknown type of factory, a garage (with buried gasoline tanks), a blacksmith, a welding facility and a motor freight station. The following uses on surrounding properties were identified as RECs: a factory, a machine shop, a U.S. Post Office with buried gasoline tanks, a motor freight station and a Federal Express facility with fuel oil and gasoline tanks across 34th Street; a paper imaging company and an iron works adjacent to the east of the Site; and a foundry, multiple factories, a garage with buried gasoline tanks and a used auto parts facility across 35th Street.

2. Open spills identified by review of the state databases (NY Spills/LTANKS), which may have impacted the Site. The following five sites are located upgradient of and close to the Site and have a confirmed release of petroleum:
    - **538 West 34th Street**

- 534 West 34th Street
- 432 10th Avenue
- **436 10th Avenue** (Amoco station)

The two bolded properties also appeared on the Resource Conservation and Recover Information System (RCRIS) for Generators and Transporters.

In addition, PB identified an underground storage tank (UST) at 527 West 34th Street, which was reported to be leaking and which may not have been removed in compliance with NYSDEC regulations.

3. Storage tanks located at the Site. PB was not given full access to the Site; however, evidence of two 2,900-gallon capacity tanks containing unleaded gasoline was identified. In addition, four possible former remote fill ports were identified. Because these tanks were not listed in the Petroleum Bulk Storage (PBS) database, it is probable that they are not in compliance with NYSDEC regulations.

PB recommended a program of soil and groundwater sampling to determine if any of the RECs affected the Site. The PBS database was updated by EnviroTrac after removing the USTs in January 2006.

Subsequent to PB's Phase I ESA, additional environmental investigations were conducted by EnviroTrac, as detailed in Section 2.3.2, below. PB conducted soil and groundwater sampling in September and November 2005. PB detailed the sampling in an April 2006 Phase II Environmental Site Investigation Report. The findings of the remedial investigation sampling are summarized in Section 2.3.3. Additional information regarding the remedial investigation soil and groundwater sampling is included in FLS's RIR.

2.3.2 EnviroTrac Investigations

In a June 28, 2004 Phase I ESA, EnviroTrac identified six recognized environmental conditions (RECs) on the Site:

1. Soil and groundwater sampling was recommended in the area of the in-ground hydraulic piston associated with a truck elevator.

2. Eight 550 gallon underground storage tanks (USTs) of unknown contents had been closed in place by Lexicon Environmental Associates (Lexicon) in 1996. While residual contamination was present in the post-excavation samples, NYSDEC closed the spill.

The residual contamination is summarized in Lexicon's Underground Storage Tank Closures report, dated March 27, 1996 (not reviewed by FLS) EnviroTrac reports that semi-volatile organic compounds (SVOCs) were detected above the

NYSDEC Toxicity Characteristic Leaching Procedure (TCLP) Alternative Guidance Values for fuel oil contaminated soils. Lexicon also removed two leaking 4,000 gallon gasoline USTs and approximately 105 tons of contaminated soil. Post-excavation samples indicated that all gasoline-contaminated soil was removed from this area.

3. An active spill associated with the installation of a soil boring by the New York City Transit Authority.

The soil boring identified in REC 4 is a geophysical boring, PE-19, installed by PB in 2003 (not in association with the Phase I ESA or Phase II investigation).

4. A geophysical survey and subsurface investigation were recommended to investigate USTs shown on historical Sanborn Fire Insurance maps in the southeast corner of the Site.

The review of the Sanborn Fire Insurance maps also indicated multiple commercial uses, as well as residential use, at the Site. The maps are dated from 1890 to 1996. Commercial uses included a building materials facility, a wagon house, a hay and feed company, the Fleischman Company, a garage, a blacksmith and welding company, a laundry, an electrical supply, general warehousing facilities, the Empire Carriers Corporation and the New York Telephone Company, which was later renamed Verizon (the current tenant).

5. The NYSDEC Petroleum Bulk Storage sites database contained incorrect data on the Site. In addition, two 2,000 gallon capacity USTs were reportedly removed from the Site, but the location is unknown.

The database incorrectly listed only five 550-gallon USTs. As summarized in Lexicon's March 27, 1996 Underground Storage Tank Closures report, eight 550-gallon USTs were removed from the Site. In addition, EnviroTrac states that the listed installation date, June 1, 1994, is incorrect. The correct installation date is not noted in the EnviroTrac report. The PBS database was updated by EnviroTrac after removing the USTs in January 2006.

6. Possible presence of lead-based paint (LBP), asbestos-containing materials (ACMs) and polychlorinated biphenyls (PCBs).

Based on the recommendations in their Phase I ESA, EnviroTrac conducted a geophysical survey of the Site, as well as a soil and groundwater sampling program. The results of these activities are detailed in EnviroTrac's September 9, 2005 Subsurface Investigation Report. The geophysical survey did not indicate the presence of any USTs in the southeastern corner of the Site. However, a sub-cellar was located which housed an out-of-service boiler and an oil-water separator. Approximately 75 gallons of liquids were removed from the oil-water separator when it was cleaned out. The findings of the remedial investigation sampling are summarized in Section 2.3.3. Additional information regarding the remedial investigation soil and groundwater sampling is included in FLS's RIR.

EnviroTrac's March 9, 2006 Underground Storage Tank Removal Report details the removal of two 3,000 gallon gasoline USTs as well as the appurtenant dispensers and remote fill ports. The remote fill ports associated with the previously-removed leaking 4,000 gallon gasoline USTs were also removed. Elevated levels of benzene were detected in one post-excavation sample west of the 3,000 gallon USTs. Excavations conducted to remove the remote fill ports were extended to remove associated contaminated soil. With the exception of SVOCs associated with fill material, not petroleum contamination, elevated levels of contaminants were not present.

2.3.3 Conclusions from Previous Investigations

As detailed in FLS' RIR, soil and groundwater sampling was conducted by PB and EnviroTrac. Soil sampling indicated that elevated levels of petroleum-related volatile organic compounds (VOCs) are present in the area of the hydraulic piston associated with the truck elevator and in the area of the removed gasoline USTs. Soil sampling also indicated that SVOCs and metals typical of historic fill material are present at concentrations above NYSDEC standards. Low levels of pesticides were also detected.

Groundwater samples collected from temporary and permanent monitoring wells in these two areas, as well as a monitoring well located in the sidewalk north of the Site, contained elevated levels of petroleum-related VOCs and SVOCs. Fill-related SVOCs and metals were also detected in groundwater samples collected from the Site. The detected concentrations of metals may be biased high as the samples were not filtered and metals can be bound with silt.

2.4 Proposed Soil and Groundwater Sampling

In order to more completely delineate soil and groundwater contamination detected both on- and off-Site, one groundwater monitoring well in the sidewalk northeast of the Site, as shown on Figure 4. During installation of the monitoring well, one soil sample will be collected from the location of highest suspected contamination, based on visual, olfactory and photionization detector (PID) readings. At least two weeks after installation of the monitoring well, it will be developed and sampled.

The soil sample will be collected for the following parameters:

- Target Compound List (TCL) Volatile Organic Compounds (VOCs)
- TCL Semivolatile Organic Compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)

- TCL Metals
- TCL Pesticides

The groundwater sample will be collected for the following parameters:

- TCL VOCs
- TCL SVOCs
- PCBs
- TCL Metals
- TCL Pesticides

Both soil and groundwater sampling will be conducted in accordance with the Quality Assurance/Quality Control (QA/QC) – Field Sampling Plan, included as Appendix B. This includes sampling procedures and blank and duplicate samples

3.0 REMEDY SELECTION

As per NYSDEC's DER-10, Section 4.1, the goals of the Remedial Action (RA) are to protect public health and the environment and to remove the source of contamination to the extent feasible. When selecting the proposed RA for the Site, the following criteria are also considered: the intended use of the Site; the cost-effectiveness of the remedy; the implementability of the remedy; community acceptance of the plan; and the short and long-term effectiveness of the remedy. Because the proposed development would eliminate all of the contamination identified in the Remedial Investigation Report (RIR), no alternatives analysis is presented.

3.1 Remedy Selection

The selected remedy for the soil and groundwater are as follows:

Soil	Excavation
Groundwater	No Action/Construction Dewatering

According to the NYSDEC Draft BCP Guidance, source removal should be the goal of all BCP remedies. The remedial action selected for soil beneath the building footprint satisfies that goal.

While excavation below the Amtrak Empire Line is not feasible, based on information obtained from geotechnical borings, the track is likely constructed into the bedrock, and, therefore, contaminated soil would not be present beneath the track.

For groundwater contaminant plumes, the remedial goal of the BCP is to prevent plume migration from the boundaries of the Site to the extent practicable. This will be achieved through complete source removal and construction dewatering.

3.2 Institutional Controls/Engineering Controls (ICs/ECs)

All contaminated soils and groundwater will be removed from the Site, thereby requiring no institutional or engineering controls.

4.0 PROPOSED REMEDIAL ACTION

As per NYSDEC's DER-10, Section 4, the goals of the RA are to protect public health and the environment and to remove the source of contamination to the extent feasible. The proposed RA was chosen to meet these goals, as well as to bring the Site into compliance with NYSDEC Standards, Criteria and Guidance (SCG). Source removal will be accomplished across the Site via excavation and proper disposal of all contaminated soils and the removal and treatment of the groundwater.

4.1 Proposed Site-Specific Soil Cleanup Objectives

The site-specific soil cleanup objectives (SSSCOs) proposed for the Site will be the Unrestricted Use Soil Cleanup Objectives (UUSCOs) listed in Table 375-6.8(a) of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (NYCRR).

4.2 Proposed Groundwater Cleanup Objectives

The cleanup objectives for Site groundwater are the NYSDEC Class GA standards for groundwater on the Site. The groundwater contaminants of concern are petroleum-related VOCs and SVOCs [benzene, toluene, ethylbenzene and xylenes (BTEX); methyl tertiary-butyl ether (MTBE); naphthalene; 2-methylnaphthalene; 1,2-dichlorobenzene and 1,2,4-trimethylbenzene]. The following metals may also be contaminants of concern: antimony, beryllium, cadmium, chromium, lead, selenium and thallium; however, the samples were not filtered and the exceedances were most likely due to metals bound to the silt and not dissolved metals.

4.3 Scope of RAWP

The proposed scope of the soil remediation is removal of all soil beneath the entire Site down to bedrock. To accomplish this remediation in a safe manner, the following methods will be used:

1) Classification of soils for disposal,
2) Installation of sheeting and shoring,
3) Excavation of contaminated fill,
4) Dewatering,
5) Site management, and
6) Reporting.

Groundwater beneath the building will be treated and disposed of off-Site through a construction dewatering program.

4.4 Soil Classification and Disposal

Up to 40 feet of soil on the Site is a mixture of urban fill and native sand and silt. This includes all soil above bedrock. Soil excavation will be conducted under the Soil Management Plan (SMP, see Appendix A). After excavating to bedrock, the preparation of the Site, including construction of the access shaft for the 34th Street station of the No. 7 subway line extension and installation of building caissons within the Amtrak easement, will be conducted as part of the construction of the building.

For disposal purposes, all soils to be removed from the site will be classified as petroleum-contaminated to facilitate the excavation and meet the Subway construction schedule.

Based on the RIR, there should not be any hazardous soil found on-Site. Disposing of all of the soils as petroleum-contaminated will allow direct load-out of Site soils. A manifest system will be used to track all soils leaving the Site. The manifests will identify the details of the truck and driver and the disposal facility(ies).

The eight 550-gallon USTs and appurtenant lines, as well as any other underground tanks or other previously unidentified contaminant sources found during on-Site remedial excavation or development related construction, will be removed and decommissioned in accordance with the methodologies outlined in DER-10 [Section 5.5].

The soils within the Amtrak easement will be removed after the removal of the soils from the rest of the site due to Site constraints and the time necessary to obtain Amtrak approval to remove the soil while maintaining the tunnel structure. It is anticipated that these soils will be removed after the rest of the site is under development by the MTA, approximately 2 years after commencement of the remediation. As detailed above, this schedule is necessary to obtain an access agreement from Amtrak. These soils will be removed down to bedrock.

Once an area has been excavated, DER-10 [Section 5.4(a)2ii(2)] requires post-excavation soil samples to be collected at the following intervals: sidewall samples to be collected from the perimeter of the excavation at 30-foot intervals and samples from the base of the excavation to be collected every 900 square feet. However, post-excavation samples can not be collected from bedrock or the tunnel walls. Based on the proposed development, the base of the excavation and portions of the sidewalls will be composed of bedrock. Therefore, samples from the base of the excavation will not be collected. Sidewall samples will be collected from the soil present above the bedrock. The excavation will extend to the property border in every direction and therefore, sidewall samples will be taken from the soil immediately off-Site.

Post-excavation sidewall samples will be collected from the location exhibiting the highest PID reading to evaluate the highest concentration of contaminated soil, if any, that will remain at the exterior boundary of the Site excavation. In the event that elevated PID readings are not recorded, the sidewall samples will be collected immediately above the bedrock interface, as RI sampling indicated that the soil immediately above the bedrock contained the highest concentration of contaminants.

Photos will be taken of each post-excavation sample location to record the visible condition of the sidewall. Category B deliverables will be provided for all post-excavation samples.

Sampling will be conducted in accordance with the Quality Assurance/Quality Control (QA/QC) – Field Sampling Plan, included as Appendix B.

NYSDEC will inspect each grid after it has been excavated to bedrock. After a grid has been inspected, contaminated soil will not be staged in that grid. In the event that contaminated soil is staged in an already inspected grid, the NYSDEC will be notified and the grid will be reinspected after the contaminated soil has been removed from that grid.

4.5 Installation of Sheeting, Shoring and Underpinning

H-Beams (soldier beams) and lagging will be installed along the northern and southern property lines defined by 35th and 34th Streets, respectively. The lagging will be constructed of either timber or concrete. The soldier beams will be tied back into bedrock where necessary. The adjacent six-story residential building to the east, 539 West 34th Street, will be underpinned with a pit and concrete pier system. The underpinning system will be installed below the existing foundation walls. The bulkhead wall separating the current basement from the Amtrak line is assumed to be tied into bedrock and will not require sheeting or shoring.

Any petroleum-contaminated soil that is encountered while installing the sheeting, shoring, or underpinning will be segregated and stockpiled for later removal and proper disposal. Stockpiling is likely for these soils because of the small volumes anticipated.

4.6 Site Operations Plan

The Site Operations Plan (SOP) will be finalized once the contractor is selected and the site access needs are established. The SOP will describe storm water management, equipment access, groundwater management, construction dewatering, the Community Air Monitoring Plan (CAMP, see Appendix C), the Health and Safety Plan (HASP, see Appendix D) and a construction schedule. The majority of these documents are also included as appendices to this report. A summary of the sections of SOP is included below:

4.6.1 Storm Water Management

The entire Site is currently occupied with buildings. Therefore, infiltration of incident precipitation to the water table in the project area is minimal. Precipitation flows to the New York City combined sewer system.

Site demolition and initial excavation will remove the existing buildings and storm sewer system. Rain water and construction-generated water will infiltrate the fill material and soils below the Site until it reaches groundwater. During demolition and initial excavation activities, prior to disconnecting the sewer connection, the contractor will provide an inlet screen made of staked hay bales wrapped in silt fencing around the sewer inlets. This will prevent any excavated soil from entering the City's combined sewer system. A Sedimentation and Erosion Control Plan is included as Appendix E.

It is anticipated that the dewatering system will consist of perimeter well points placed outside the site boundaries but within the sheeting and shoring. The well points would be connected to a header to collect the water and direct it to a treatment system as required by the NYCDEP. The treatment system would be designed to meet the requirements of the NYC Sewer Use Ordinance. Once the construction dewatering system is operational, rain water and construction-generated water entering the Site will infiltrate down to the groundwater and then be pumped into the City's combined sewer system under an NYCDEP dewatering discharge permit. Dewatering is discussed below.

4.6.2 Equipment Access

A single truck entrance will be used for access to the Site for earth-moving equipment and dump trucks. Most likely, the entrance will be located in the northwest corner of the Site on 35th Street. The truck entrance will have a ramp incorporated to bring the equipment from bedrock grade to surrounding grade. To prevent soil from being deposited on public streets, this entrance will be provided with a truck washing station to clean adhered soil from exiting trucks.

The following design guidelines will be used for construction of the truck washing station:

- a rectangular area approximately 10-feet wide by 20-feet long,
- a minimum of 6 inches of ¾-inch crushed stone to remove any loose soil or mud before the trucks depart the Site, and
- a wheel wash and a power washer to rinse excess soil from the trucks and truck tires.

A detail of the truck washing station is included in the Sediment and Erosion Control Plan (Appendix E). The location of the truck entrance, ramping details and materials storage locations will be provided once the final construction documents are completed and contractors selected. According to the New York City Department of Transportation's (NYCDOT) 2007 Truck Route Map, both 34th Street and 11th Avenue are truck through-routes adjacent to the Site. South of the Site, 11th Avenue is a local truck route, as is 10th Avenue. A copy of the NYCDOT truck routes is provided on Figure 3. Trucks may enter the Site by traveling north on 10th Avenue and turning onto 35th Street. Trucks may exit the Site by turning south onto 11th Avenue from 35th Street. The transporter name, address, state permit number, driver name, license number and truck number will be recorded for trucks entering the Site as part of the manifest system described above.

4.6.3 Dewatering/Groundwater Management

Dewatering will occur during Site excavation and advancement of the sheeting and shoring beyond the depth to groundwater. The dewatering system, once in operation, will be used as necessary to maintain a dry excavation.

Details of any required treatment system will be designed to meet the requirements of the NYCDEP for discharge to the city sewer system under a NYCDEP discharge permit. The discharge rate to the sewer will be calculated by the dewatering contractor. Treatment requirements will be determined by the NYCDEP as part of the permit process.

The groundwater discharge will be monitored a minimum of one time per day for the presence of free-phase product and sampled in accordance with the city permit requirements.

In conjunction with the installation of the building foundation, a waterproofing/vapor barrier will be installed at the Site to mitigate groundwater from entering the building when constructed.

4.6.4 Community Air Monitoring

The Community Air Monitoring Plan (CAMP) for the Site, included in Appendix C, entails continuous upwind and downwind perimeter monitoring during remediation-phase ground-intrusive activities, including the activities performed under this RAWP. At both the upwind and downwind end of the Site, air monitoring will include real-time air monitoring for dust/aerosol using dedicated air monitoring stations placed at the beginning of each day. A PID will be used to measure total VOC readings in the air in the upwind and downwind positions relative to the excavation operations, as well as the breathing space of the equipment operators, and the Site perimeter during the operations described above. The concentrations of VOCs detected in soil and groundwater does not suggest significant airborne VOCs will be encountered. For non-intrusive activities, such as the collection of groundwater samples from monitoring wells or soil sampling for disposal characterization, periodic monitoring will be conducted.

4.6.5 Site Security Plan

Security of the Site during remediation is necessary to prevent any unauthorized access to and disturbance of the Site. The security measures will serve multiple purposes – to prevent any vandalism/theft at the Site, to prevent exposure of people to Site contamination and to prevent unauthorized vehicles and equipment from entering the Site.

A secure fence will be erected along the perimeter of the Site. 24-hour security personnel will monitor and control access to the Site through a gate specifically designated as the Site entrance. The security personnel will be positioned on the Site in a way that allows the best practicable monitoring of the Site perimeter.

The Contractor is will be responsible to install and maintain all Site security measures in accordance with all applicable regulations.

5.0 REPORTING

5.1 Progress Reports

The Applicant's representative will provide the NYSDEC Site Manager with weekly e-mail progress reports on the Site activities. The weekly progress report will present the status of Site remedial or construction activities and the anticipated work for the next week. If there are any major problems or unforeseen event that occur which may require a deviation from the RAWP, then the NYSDEC Site Manager will be notified by email daily. Photos will be taken of Site activities and sent to the NYSDEC Site Manager on a weekly basis. The NYSDEC Site Manager will be notified in advance of all meetings regarding the remediation at the Site.

All project-related materials will be provided in the proper format. Digital submittals will include PDF format files for all documents. Data in tabular format will also be submitted in active source files format (such as Excel) to enable direct evaluation by the NYSDEC.

5.2 Final Remediation Report

After completion of the RAWP, a Final Engineers Report will be prepared, which includes the compilation of all information provided in the weekly reports for the entire time period of the operation of the RAWP. Additionally, copies of the documentation relating to off-Site transportation of wastes will be included. The contents of the Remediation Report will include:

- Records of all material removed from the Site, including excavated soil, solid waste, and fluids.
- Documentation associated with the disposal of the aforementioned materials, which shows the requisite approvals for receipt of the materials.
- Bill of lading system or equivalent for the off-Site transportation of non-hazardous wastes and soil.
- Waste manifests for the transportation of petroleum-contaminated soils.
- Post-excavation sampling results and documentation.
- Community Air Monitoring Plan results.
- Quality Assurance Project Plan results.
- Community Participation Plan and Fact Sheets.
- Clean Fill Certification, if required.
- Laboratory analysis of soils, groundwater and soil gas collected as part of the project.
- Data Usability Summary Reports.
- Photographic documentation of the remediation.
- Tank Closure Documentation, if required.

If, as anticipated, a Track I remediation is achieved, no Site Management Plan (SMP) will be required. However, if a Track I remediation is not achieved, a SMP will be prepared to specify future soil handling requirements, operations and maintenance procedures and Site Use Restrictions, if necessary. An Environmental Easement will also be prepared if a Track I remediation is not achieved, which will contain any engineering and/or institutional controls.

6.0 Costs and Schedule

Estimated costs for remediation are provided in Table 1. A preliminary schedule for implementation of remedial activities is presented on page 20.

Table 1
Estimated Remediation Costs
West 34th Street Site

Engineering Costs	**Quantity**	**Units**	**Unit Rate**	**Cost**
Remedial Investigation	1	LS	$250,000	$250,000
Off-Site Investigation	1	LS	$65,000	$65,000
In-situ Disposal Characterization	1	LS	$185,000	$185,000
Preparation of Plans/BCP Submittals	1	LS	$125,000	$125,000
Subcontractor Coordination	1	LS	$2,000	$2,000
Post-Excavation Sampling	1	LS	$20,000	$20,000
Reporting				
Progress Reports	1	LS	$25,000	$25,000
Final Remediation Report	1	LS	$25,000	$25,000
Permitting	1	LS	$25,000	$25,000
Subtotal Engineering Costs				$722,000
Construction and Remediation Costs				
Admin & Mobilization	1	LS	$30,000	$30,000
Bonds	1	LS	$50,000	$50,000
Site Prep and Restoration	1	LS	$200,000	$200,000
Site Management and Security	1	LS	$400,000	$400,000
Health & Safety monitoring + PID / Dust Monitor	110	DAY	$1,300	$143,000
CAMP Implementation + PID/Dust Monitor	110	DAY	$1,300	$143,000
Sheeting and Shoring (includes tiedowns/tiebacks) and Underpinning	1	LS	$1,200,000	$1,200,000
Closeout and Demobilization	1	LS	$30,000	$30,000
Excavation including Transportation and Disposal				

General Earth Excavation - Machine (CY)	34957	CY	$35	$1,223,495
Excavation - Rubble / Existing foundations (CY)	3885	CY	$125	$485,625
Transport and dispose of petroleum-contaminated material	52436	TON	$54	$2,831,544
Table 1, continued				
Dewatering (Includes WP Installation, Electricity, Hardware, Wastewater Treatment, and Temporary Sewer Connection)	5	MO	$15,000	$75,000
Waterproofing				
F/I Preprufe 300 for slabs	44438	SF	$8	$355,504
F/I Waterproofing face walls	16900	SF	$12.50	$211,250
F/I Dampproofing	61338	SF	$3.50	$214,683
F/I Waterstop	845	LF	$10	$8,450
Subtotal Construction and Remediation Costs				$7,601,551
Subtotal - All Costs				$8,323,551
20% contingency				$1,664,710
TOTAL				$9,988,261

West 34th Street Development
Preliminary Schedule of Remediation and Construction Activities

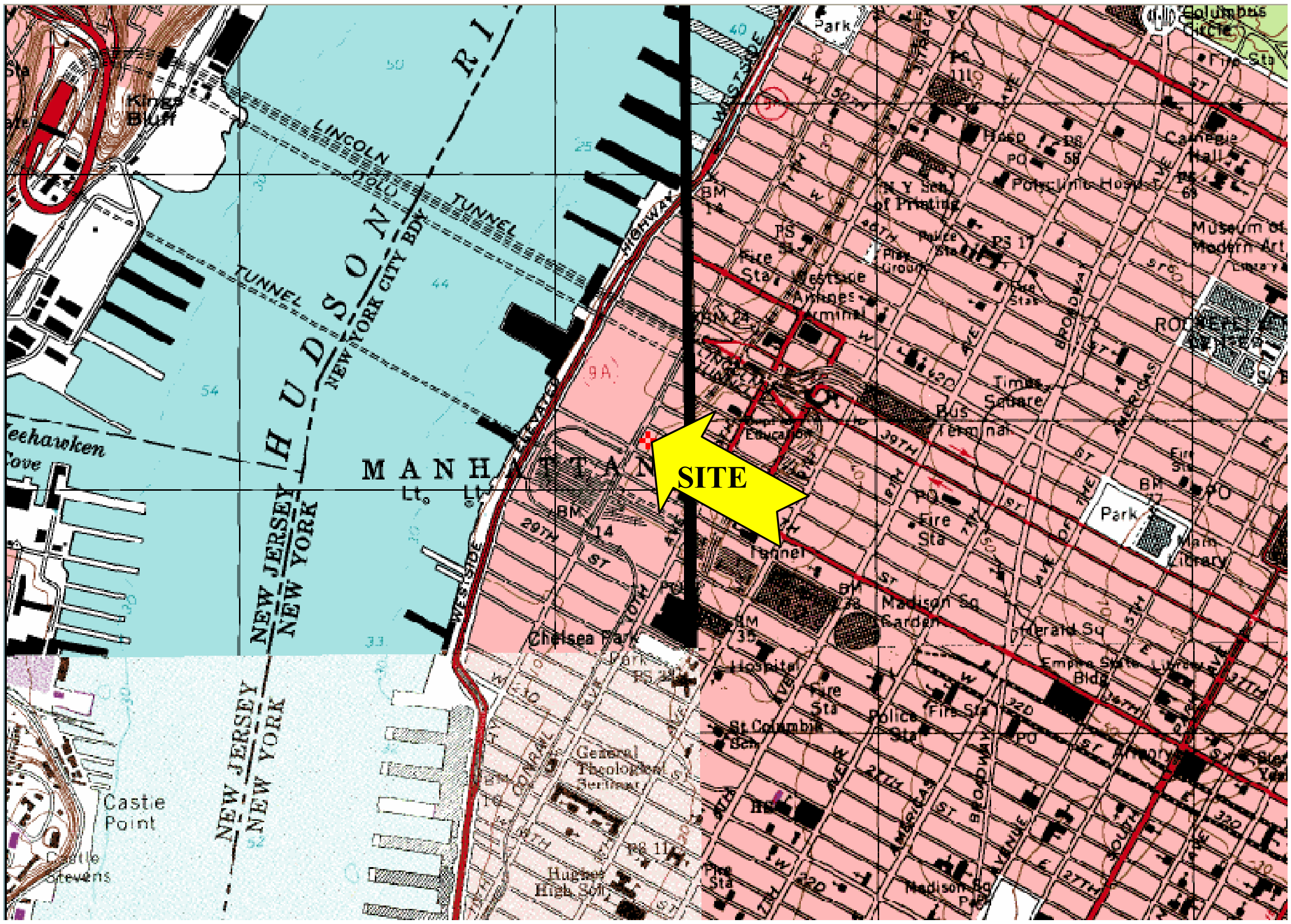
Activity	Duration (months from start/year)																						
Month:	1	2	3	4	5		9	10	11	12	1		6		11	12	1	2	3	4		10	11	12
Year:	1	1	1	1	1	..	2	2	2	2	3	..	3	…	7	7	8	8	8	8	..	9	9	9
Total Months:	1	2	3	4	5		31	32	33	34	35		42		71	72	73	74	75	76		94	95	96
Excavation (East of Bulkhead Wall)	■	■																						
Supplemental Remedial Investigation				■																				
Construction Dewatering if necessary		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Construction of No. 7 Subway Station			■	■	■	■	■	■	■	■	■	■	■	■	■	■								
Excavation (West of Bulkhead Wall, in Amtrak Easement)								■	■	■														
Installation of Caissons, in Amtrak Easement										■	■													
Anticipated Certificate of Completion													■											
Construction of Foundation for Proposed Mixed-Use Building																	■	■	■					
Install Moisture/Vapor Barrier																		■	■					
Construction of Mixed-Use Building																	■	■	■	■	■	■	■	■
Reporting [1]	■	■	■	■	■	■	■	■	■	■	■	■	■											

[1] Monthly reporting will continue through receipt of the Certificate of Completion

7.0 GLOSSARY

BCP	Brownfield Cleanup Program
BTEX	benzene, toluene, ethylbenzene and xylenes
CAMP	Community Air Monitoring Program
DER	Division of Environmental Remediation
ft-bg	feet below grade
ft-msl	feet relative to mean sea level
HASP	Health and Safety Plan
ICs/ECs	Institutional Controls/Engineering Controls
MTBE	methyl tertiary-butyl ether
NYCDEP	New York City Department of Environmental Protection
NYCDOT	New York City Department of Transportation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAHs	poly-aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PID	photoionization detector
RA	Remedial Action
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
RIR	Remedial Investigation Report
SCG	standards, criteria and guidance
SMP	Site Management Plan
SOP	Site Operations Plan
SSSCOs	Site-specific soil cleanup objectives
SVOCs	semi-volatile organic compounds
TCLP	toxicity characteristic leachate procedure
VOCs	volatile organic compounds

FIGURES



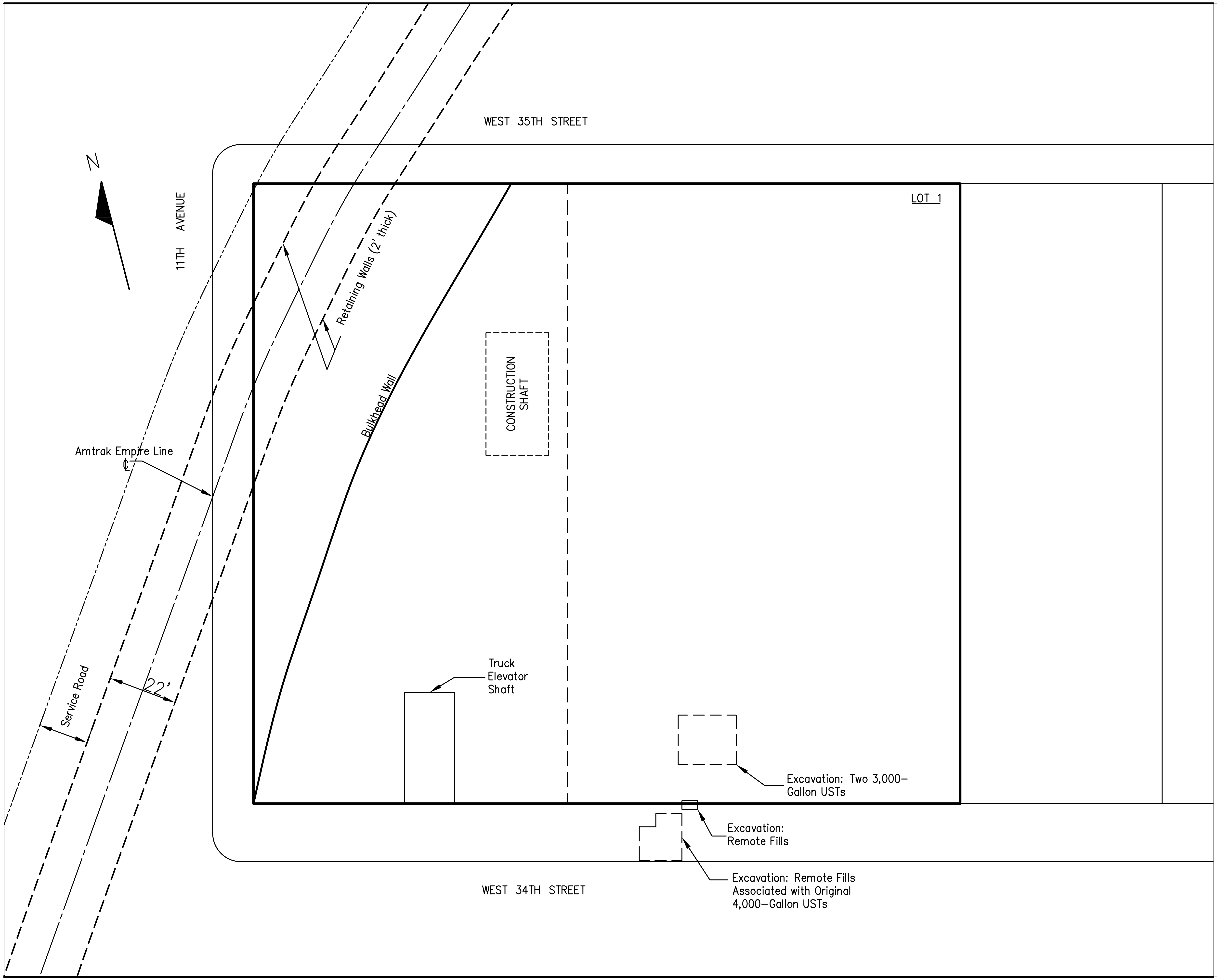
Site: *Weehawken USGS Topographic Map (79287)*
Also shown: *Central Park USGS Topographic Map (84573)*
Brooklyn USGS Topographic Map (84524)
Jersey City USGS Topographic Map (79210)
Obtained from: *topozone.com ©1999-2006*

FIGURE 1: SITE LOCATION MAP

SITE: W 34th Street Development
New York, New York
CLIENT: Meushar 34th Street, LLC c/o The Moinian Group

Fleming
Lee Shue

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001



Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Floor
New York, NY 10001

FIGURE 2

West 34th Street Development
New York, NY

SITE MAP

Date
April 19, 2007

Project Number
10090-001

LEGEND

— — APPROXIMATE EXTENT OF EXCAVATIONS

30 15 0 30

Obtained from: *New York City Department of Transportation (NYCDOT) 2007 Truck Route Map*

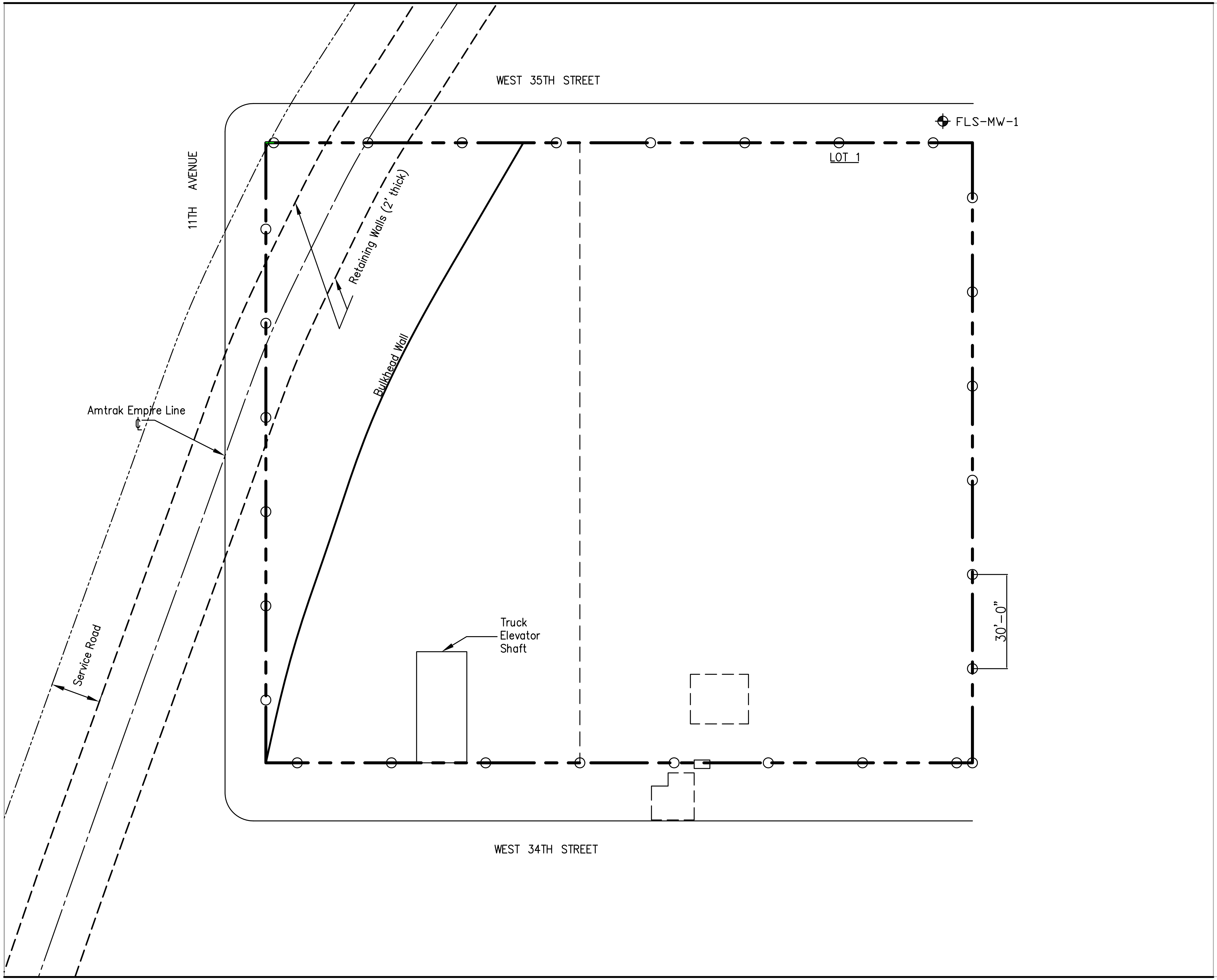
Fleming
Lee Shue

FIGURE 3: TRUCK ROUTE MAP

SITE: West 34th Street Development
New York, New York

CLIENT: Meushar 34th Street, LLC c/o The Moinian Group

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001



Fleming Lee Shue
Environmental Management & Consulting

158 West 29th Street, 9th Floor
New York, NY 10001

FIGURE 4

West 34th Street Development
New York, NY

PROPOSED SOIL AND GROUNDWATER SAMPLE LOCATIONS

Date
JUNE 2007

Project Number
10090-001

LEGEND

—-·-—-·- PROPERTY BORDER

⊕ PROPOSED MONITORING WELL

○ PROPOSED POST-EXCAVATION SOIL SAMPLE
(Collected @ location of highest suspected contamination or above bedrock. Depth of bedrock varies, therefore depth of soil sample will be determined in field.)

30 15 0 30

Attachment A

Proposed Site Development Plans

APPENDIX A

Soil Management Plan

West 34th Street Development

555 West 34th Street
New York, New York
Block 706, Lot 1

BCP Site #C231049

SOIL MANAGEMENT PLAN

Prepared For:
Meushar 34th Street, LLC
c/o The Moinian Group
530 Fifth Avenue, Suite 1800
New York, NY 10036

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, N.Y. 12233-7016

Fleming-Lee Shue Project Number: 10090-001

Prepared by:
Fleming-Lee Shue, Inc.
158 West 29th Street, 9th Floor
New York, New York 10001

Arnold F. Fleming, P.E. &

Fleming
Lee Shue

Environmental Management & Consulting

June 2007

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1.0 Introduction

On behalf of Meushar 34th Street, LLC (the "Applicant") under Brownfield Cleanup Agreement (BCA) Index Number A2-0577-1106, Arnold F. Fleming, P.E./Fleming-Lee Shue, Inc. (collectively FLS) has prepared the following Soil Management Plan (SMP) for the parcel of land known as the "West 34th Street Development" (hereafter referred to as "the Site"). The legal description of the Site is Block 706, Lot 1 (555 West 34th Street). The Site is located on the western portion of the city block bounded by West 34th Street to the south, 11th Avenue to the west and West 35th Street to the north, in the borough of Manhattan, City of New York, New York. This SAMP is done in accordance with generally accepted practices of the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP).

The Site consists of a two story building, which was last operated by Verizon as part of their installation and maintenance division. The Amtrak Empire Line is present beneath the northwest corner of the site within an easement. The Applicant intends to demolish the existing Site structure in order to both create access for the construction of the 34th Street station of the No. 7 subway extension and construct a high-rise mixed-use building.

The selected remedial action consists of removing all soil from the surface down to bedrock, including urban fill and native soils (both petroleum-contaminated and non-petroleum-contaminated) from the Site. This proposed remediation would also remove the source of the on-Site petroleum-contaminated groundwater identified in remedial investigations of the Site.

Remediation of the soil will be through excavation and removal of all contaminated soil for off-Site disposal at approved facilities.

1.1 Purpose

The purpose of the SMP is to present the methods, procedures, and guidance for handling all aspects of soil connected with the remediation. The SMP specifies the means and methods for dealing with soil and provides overall soil management goals.

1.2 Goals

The goals of the SMP are to handle all contaminated soil and manage activities associated with soil in a manner that prevents contamination from reaching the community, workers, future occupants and workers, and the environment. Contaminated soil must be kept from escaping off the Site, and all soil must be managed in a manner that ensures removal, transport, and disposal such that it fulfills applicable regulatory requirements. Another goal is to keep objectionable odors from reaching the community. At the conclusion of remediation, the Site must be secured and stable and left in a condition ready for construction.

2.0 Site Description and Remedy

The Site remedy is remediation via soil excavation to bedrock across the Site. The generalized subsurface profile consists of fill overlying sand and silt deposits, with bedrock at depths between 30 to 50 feet below grade (ft-bg). Depth to groundwater is approximately 17 to 32 ft-bg requiring Site-wide dewatering to enable soil below the water table to be removed. The construction dewatering system will provide Site drainage once operational. At the start of construction, the Site will be isolated from the surrounding streets and properties and lowered so that all rainwater will be infiltrated on the Site and removed with the construction dewatering system.

Excavation serves the dual purpose of removing contamination while simultaneously excavating for construction. The preferred method is to excavate and load directly into trucks for disposal at off-Site facilities because there is insufficient space to stockpile and segregate large volumes of soil and because direct loading is the most effective means to meet the construction schedule. Some provision will be made for stockpiling and staging soil because of delays, traffic, holidays, weather, and unforeseen events. Therefore, it is necessary to plan for soil stockpiling. There are different types of contaminated soil and debris that may be expected during remediation as follows:

Historic Fill

This is historically imported soil often mixed with debris that is free of gross hydrocarbon contamination, but which contains metals and elevated concentrations of polyaromatic hydrocarbons (PAHs). However, for disposal purposes, all soils to be removed from the site will be classified as petroleum-contaminated (detailed below) to facilitate the excavation and meet the Subway construction schedule.

Petroleum-Contaminated Soil

This is either native soil or historic fill containing elevated concentrations of benzene, toluene, ethylbenzene, and xylene concentrations (collectively BTEX), PAHs, naphthalene and 2-methylnaphthalene concentrations. BTEX concentrations in petroleum-contaminated soil normally exceed PAH and naphthalene concentrations. The soil may be stained and have a petroleum odor.

Contaminated Concrete and Debris

This is concrete, wood, or other material contaminated with petroleum and/or creosote. Depending on disposal facility requirements, this material may have to be segregated from soil and disposed separately.

Non-Contaminated Concrete and Debris

This is concrete, wood, or other material free of petroleum and/or creosote staining and odors. This material may be disposed as construction and demolition (C&D) and separated from contaminated soils.

3.0 Soil Management

This section describes the procedures for managing soil on the Site.

3.1 Pre-Characterization

Where soil will be excavated and directly loaded into trucks or is otherwise slated for disposal, it must first be pre-characterized and accepted by the disposal facility(ies). To provide disposal facilities with characterization data prior to excavation to allow direct load out, a sampling and analysis plan for soil pre-characterization plan prepared by an independent soil agent will be implemented. The sampling plan will specify soil sample collection procedures that comply with the requirements of licensed disposal facilities. Based on previous sampling results, it is expected that all soil will be disposed as non-hazardous material.

In general, the pre-characterization sampling and analysis plan specifies that the area be divided into sampling grids and that the individual grid cells be sampled using test pits, or borings. Each grid cell is then sampled in accordance with the frequency required by the disposal facility(ies). The discreet sub samples are collected so as to be representative of the soils in each grid cell within the vertical zone of interest. Pre-characterization sampling, because it covers a range of potential disposal facilities in several states, may include full NYSDEC’s Technical and Administrative Guidance Memorandum (TAGM) 4046 and Part 375 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (NYCRR) analyses, full New Jersey residential analyses, ignitability, reactivity, full Toxicity Characteristic Leachate Procedure (TCLP), paint filter, pH, corrosivity, moisture, and total sulfur. Contaminated concrete and debris will also be sampled according to the requirements established by the independent soil agent.

3.2 Site Preparation

The Site will first be prepared for remediation and soil management. Decontamination pad(s) will be built at the truck exit location(s) and will consist of a gravel pad sufficiently large to accommodate the largest truck and with enough space to allow workers to clean the vehicles before leaving the Site. The pad will have the means to collect wash water. Cleaning will take the form of brushing off gross soil followed by spraying with potable water to remove dust or soil residue on both the truck body and undercarriage. The rinse water will be disposed through the dewatering treatment before being discharged to the New York City combined sewer system.

Protective fencing and/or barriers will be installed along the Site perimeter to protect the public from Site work and to control vehicle movement. The barriers will comply with New York City Building Code. Internal barriers for Site control and traffic management may also be added as necessary.

3.3 Soil Stockpiling

Although the preferred approach is to directly load excavated soil onto trucks, it may be necessary to temporarily stockpile soil. Soil stockpiling areas will be prepared by selecting locations that are sufficiently large to hold soil not directly loaded onto trucks. There should be enough area to accommodate the soil to be staged and to accommodate segregating soil into different types of piles. Since disposal options and costs differ appreciably depending on the type of soil contaminant, pending the results of pre-characterization sampling, enough space must be available to segregate soils into separate piles as the disposal facility(ies) require, where feasible and if space permits:

Each area must be prepared such that it is either lined at a minimum with a double layer of 8-mil plastic or is atop an area to be excavated at a later time. The stockpile area must be such that stormwater cannot transport contaminated soil off the Site or onto other areas on the Site. Stormwater control may be accomplished by either encircling the piles with hay bales and silt fencing or equivalent, directing run-off to a point where it can be collected and disposed, or other similar means (refer to the Sediment and Erosion Control Plan in Appendix E). All soil piles must be covered by plastic sheeting when inactive and the sheeting weighed down to prevent uncovering. Stockpile areas may be inside the containment structure if handling petroleum or creosote-contaminated soil or outside the containment structure if handling urban fill or native uncontaminated soils.

Some soil will be excavated from below the water table. In this case, the preferred approach is to allow the soil to drain through the sitewide dewatering system prior to excavation. If this is not possible, then either local dewatering or the use of stockpile areas such that drainage is either controlled or directed to a sediment trap and then onto the on- Site water treatment unit before being discharged to the city sanitary sewer, or employ an inert material such as ground corn cobs or kiln dust to absorb excess water.

3.4 Soil Segregation

All soil will be disposed of as petroleum-contaminated soil. In the event that contaminated or non-contaminated concrete and debris will not be accepted by the soil disposal facility(ies), it will be disposed of at an alternate off-Site licensed disposal facility.

However, for the purposes of determining which type of trucks can be used for transportation (see Section 3.5), soil will be segregated on the basis of the pre-characterization results, prior soil sampling results, Site knowledge, and direct observations during excavation. Direct observations include visual observations of staining and sheen, odors, and photoionization detector (PID) readings. Segregation decisions will be made by an on- Site qualified environmental professional with Site knowledge representing the Applicant. The environmental professional will direct the contractor to place soil directly into the proper trucks or into various pre-determined stockpiling areas.

3.5 Soil Loading, Transport, and Documentation

Soil loading must be tracked and monitored. Each truckload should be recorded with the name of the transporter and the intended disposal facility. The type of material should be described (e.g., contaminated concrete, heavily contaminated soil etc.) and the bill of lading or non-hazardous manifest number recorded in the logbook. A copy of all manifests, bills of lading, or other transport documentation will be retained on Site and a copy made for the project file. After disposal, the disposal facility will send a certificate of disposal to the Applicant's agent as part of the Site records.

Soil loaded from stockpiles must be monitored to control dust. A water spray should be available to wet soil if necessary to control dust, and a foam machine available to control odors, as necessary.

All trucks transporting petroleum-contaminated soil will be placed in trucks with gasketed unloading gates and covered with a tightly sealed cover to minimize vapor or odor emissions from the truck during transport. Trucks transporting urban fill will be non-gasketed but covered with a tight fitting cover to prevent dust emissions from the trucks during transport.

3.6 Excavation

Soil excavated as part of remediation will be either directly loaded into trucks or stockpiled for later loading and disposal. All stockpiles will have dust controlled by means of water mist, if necessary. A source of water and means of applying water spray will be available and within easy access.

At the end of each work day the excavation will be secured in a manner that controls odors. If odors become objectionable or have the potential to adversely affect the neighborhood, then an odor control will be employed, Control measures may include covering the bottom or excavation sidewalls with tarps, plastic, foam encapsulant, soil or gravel, or some combination that is effective.

3.7 Imported Backfill

Off-Site material brought in as backfill must be certified that it is free of contamination as virgin source material with written documentation from the supplier certifying that the soil is from a source not known to have been contaminated or have received hazardous materials, petroleum or other hydrocarbon-derived, toxic, or radioactive materials. If the material is not virgin, then the material will be tested at a frequency of one sample/250 yd^3 of soil for full TAGM analyses from each source area. This requirement is necessary to fulfill New York City Department of Environmental Protection "e" Designation status. The tested material will be considered acceptable for reuse on Site if it meets the requirements for Track 1 unrestricted residential use as set forth in NYCRR Table 375-6.8(a).

If more than 1,000 yd^3 are imported from a given off- Site non-virgin source, and each of the four samples for the first 1,000 yd^3 meet the stated reuse criteria, then the sample frequency will reduce to one composite sample/2,500 yd^3 for additional soil from the same source up to 5,000 yd^3. For volumes greater than 5,000 yd^3, the sampling frequency will be reduced to one sample/5,000 yd^3, provided that all previous samples met the established limits.

All imported soil must be free of organic material, debris, cinders, combustibles, wood, roots, and staining. All imported soils must be approved by NYSDEC before being brought to the Site. Imported backfill will be visually inspected and screened for volatile organic compounds with a PID by the Site environmental professional. Backfill placement on-Site must be approved by the Site environmental professional.

4.0 Demobilization

The Site must be stabilized and secured at the conclusion of remediation. This means removing all equipment and materials used for remediation and ensuring that all former soil staging areas and cleaning apparatus have been decommissioned and cleaned and that no contaminated soil or debris remains on Site. Since construction will proceed immediately following remediation, the excavation will remain open and the Site will transition directly to normal construction activity.

APPENDIX B

Quality Assurance/Quality Control (QA/QC) – Field Sampling Plan

West 34th Street Development

555 West 34th Street
New York, New York
Block 706, Lot 1

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) – FIELD SAMPLING PLAN

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FLS Project Number: 10090-001

Submitted to:
New York State Department of Environmental Conservation
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Environmental Management & Consulting

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1.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

The Quality Assurance Project Plan (QAPP) outlines the protocols and procedures that will be followed during any ensuing Remedial Action on the Brownfield Site. The QAPP has been prepared in order to ensure Quality Assurance (QA) and Quality Control (QC) for the environmental sampling that will take place under the Remedial Action Work Plan (RAWP) to ensure the acquisition of defensible data that fulfill the stated objectives.

Project Team

The project team will consist of FLS personnel and subcontractors. All field personnel and subcontractors will have completed a 40-hour HAZWOPER training course and the annual HAZWOPER 8-hour refresher in accordance with the Occupational Safety and Health Administration (OSHA) regulations and will have the training required for their respective duties as outlined for this investigation.

Project Director

The general oversight of all aspects of the project will be conducted by the project director. Tasks will include the scheduling, budgeting, data management and decision-making for the field program. Mr. Arnold F. Fleming, P.E., will act as the Project Director for the RAWP.

Project Manager

All components of the Remedial Action will be directed and coordinated by the Project Manager. He/she will ensure a smooth flow of information between all parties involved in the investigation by communicating regularly with professionals from the New York State Department of Environmental Conservation (NYSDEC), the Brownfield Site management personnel, and all members of the FLS project team. Mr. Mohamed Ahmed, CPG, will act as the Project Manager.

Field Team Leader

Daily on-site sampling and health and safety activities will be supervised by a Field Team Leader. The team leader's responsibilities will include ensuring adherence to the work plan and HASP and regularly reporting daily progress and deviations from the work plan to the Project Manager. Upon approval of the RAWP, FLS will assign the role of Field Team Leader to appropriate FLS personnel.

Project Quality Assurance / Quality Control Officer

Adherence to the QAPP will be ensured by a FLS QA/QC Officer. Tasks will include reviewing the QA procedures with all personnel before any fieldwork is conducted on-site as well as completing periodic Brownfield Site visits in order to assess the implementation of these procedures. Ms. Mindy Horowitz, Environmental Engineer, will act as the QA/QC officer for the investigation.

Ms. Horowitz is a Project Engineer with over 13 years experience in environmental consulting and is familiar with QA/QC requirements of the Brownfield Cleanup Program (BCP).

Laboratory Quality Assurance / Quality Control Officer

Quality control procedures will be ensured by a laboratory QA/QC officer in the designated laboratory. This officer will be responsible for the adherence to laboratory protocols, quality control procedures, and checks in the laboratory. The officer will track the movement of the samples from check in to issue of the analytical results, conducting a final check on the analytical calculations, and signing off on the laboratory reports. The laboratory QA/QC Officer will be assigned by the laboratory for the investigation.

The sample analytical reports will undergo a third party review of the analyses conducted. The third party (yet to be chosen) will produce a Data Usability Summary Report (DUSR) in accordance with Appendix 2B of the NYSDEC's draft DER-10 guidance document. The DUSR will be submitted to the NYSDEC. Both the soil and groundwater sample collected from the proposed boring on Figure 1 and five percent of the post-excavation soil samples will undergo third party data review.

2.0 LABORATORY PROCEDURES

The sample container type, preservation, applicable holding time, and laboratory methods of analysis of the field samples have been included as Table 1. Sample analyses will be completed in a New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) certified laboratory and reported using Category B deliverables. Accutest Laboratories of Dayton, New Jersey will be the laboratory analyzing samples for NYSDEC-regulated compounds (soil and groundwater). Accutest is a NYSDOH-ELAP certified laboratory (Laboratory ID 10983).

Table 1
Summary of Analytical Methods/Quality Assurance

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Soil	TCL VOCs	Post-Ex. Grab	29	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	TCL PCBs/ Pesticides	Post-Ex. Grab	29	SW-846 Method 8082 & 8081	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	TCL SVOCs	Post-Ex. Grab	29	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	TCL Metals	Post-Ex. Grab	29	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Soil	TCL VOCs	Soil Boring	1	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	TCL PCBs/ Pesticides	Soil Boring	1	SW-846 Method 8082 & 8081	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	TCL SVOCs	Soil Boring	1	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	TCL Metals	Soil Boring	1	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Aqueous	TCL VOCs	Monitoring Well	1	SW-846 Method 8260B	HCl, Cool to 4^0 C	14 days to analysis	(3) 40 mL glass jars
Aqueous	TCL PCBs/ Pesticides	Monitoring Well	1	SW-846 Method 8082 & 8081	Cool to 4^0 C	7 days to analysis	(2) 1 L amber glass jars
Aqueous	TCL SVOCs	Monitoring Well	1	SW-846 Method 8270C	Cool to 4^0 C	7 days to analysis	(2) 1 L amber glass jars
Aqueous	TCL Metals, Filtered and Unfiltered	Monitoring Well	1	SW-846 Method 6010B/7000 Series	HNO_3 for filtered, Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(2) 500 mL poly
Solid Waste	TCLP SVOCs	Grab	TBD	SW-846 Methods 1311/ 8270C	Cool to 4^0 C	14 days to TCLP extraction; 7 days from TCLP extraction to SVOC extraction; 40 days from SVOC extraction to analysis	(1) 950 mL amber glass jar

Table 1
Summary of Analytical Methods/Quality Assurance

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Solid Waste	TCLP Pesticides	Grab	TBD	SW-846 Methods 1311/8081A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to pesticide extraction; 40 days from pesticide extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Herbicides	Grab	TBD	SW-846 Methods 1311/8151A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to herbicide extraction; 40 days from herbicide extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Metals	Grab	TBD	SW 846 Methods 1311/ 6010B/7000 Series	Cool to 4^0 C	Hg: 28 days to TCLP extraction; 28 days from TCLP extraction to analysis Other Metals: 6 months to TCLP extraction; 6 months from TCLP extraction to analysis	(1) 500 mL amber glass jar
Solid Waste	Ignitability	Grab	TBD	SW-846 Method 1010	Cool to 4^0 C	None specified	(1) 500 mL amber glass jar
Solid Waste	Corrosivity	Grab	TBD	SW-846 Method 9045C	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Solid Waste	Reactive cyanide	Grab	TBD	SW-846 Chapter 7, Section 7.3.3	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Solid Waste	Reactive sulfide	Grab	TBD	SW-846 Chapter 7, Section 7.3.4	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar

[1] Actual number of samples may vary depending on field conditions, sample material availability, and field observations

[2] From date of sample collection

[3] MS/MSDs require duplicate volume for all parameters for solid matrices; MS/MSDs require triplicate volume for organic parameters for aqueous matrices and duplicate volume for inorganic parameters for aqueous matrices

TBD - To Be Determined
TCLP – Toxicity Characteristic Leachate Procedure
SVOC – semivolatile organic compounds
TCL – Target Compound List
VOCs – volatile organic compounds
PBCs – polychlorinated biphenyls

3.0 QUALITY CONTROL SAMPLING

Additional analysis will be conducted for QC assurance in addition to the laboratory analysis of the field soil and groundwater samples. QC samples will include: one equipment rinsate blank and one set of duplicate samples per twenty field samples, and one trip blank per sample shipment. The quantities of field samples and quality control samples have been summarized in Table 2.

The equipment blank and duplicate samples will be analyzed for the same parameters as the soil and groundwater samples, whereas trip blanks will be analyzed solely for VOCs.

Table 2
Summary of Quality Control Samples

Sample Matrix	Analytical Parameter	Sample Type	No. of QA/QC Samples
Water.	VOCs	Trip Blank	1 per shipment
Soil, Post-Ex.	VOC, SVOC, Metals	Duplicate	1 per 20 samples
Water	VOC, SVOC, Metals	Equipment Blank	1 per 20 samples

4.0 STANDARD OPERATING PROCEDURES

The standard operating procedures (SOPs) for monitoring well installation and development and sampling equipment decontamination are described in the following sections.

Soil Borings

Where soil borings will be installed by means of hollow stem augers, soil samples will be collected on a continuous basis by means of a two-foot long, 2-inch diameter, stainless steel split spoon samplers. The augers will be advanced to the top of the desired sampling interval depth and the split spoon and connected rods will be lowered through the auger and driven into the soil another two-feet using a 140-pound weight dropped through a 30-inch interval. The split spoon and rods will be withdrawn to obtain the soil sample.

Where subsurface materials consist mostly of sand mixed with fill material smaller than cobble-size, FLS may obtain soil samples using a smaller direct push Geoprobe® sampling rig. In this case, a macrocore sampler with plastic liners and end plug, as necessary, will collect undisturbed soil cores down to the required depth. The four-foot long macrocore with end plug, as necessary, is pushed into the soil using the hydraulic pressure generated by the Geoprobe® rig. If resistance is encountered the Geoprobe® unit has a vibrating unit that either breaks up the resisting object or vibrates it aside. When the sampling depth is reached, the end plug is removed and the macrocore is then advanced through the sampling interval to collect the soil sample. Plastic acetate liners are placed within the core barrel of the macro core to store the soil/sediment sample, and to prevent any cross-contamination between soil borings. To further reduce the chance of cross-contamination during sampling, the macrocores and equipment will be decontaminated between uses with a non-phosphate detergent wash followed by a clean water rinse, followed by a final rinse with deionized water. Once the macrocore is retrieved from its desired depth, the cutting end of the core barrel is removed, and the plastic core liner is removed. The acetate liner is then cut length-wise with a special knife. Photoionization detector (PID) readings are taken from the soil while still in the core and undisturbed.

The following procedures will be used to complete all soil sampling:

- Identify that the staked-out sampling location is consistent with the location designated on the soil boring location plan, and in a safe location relative to overhead and underground utilities.
- Cleaning/decontamination of the split spoon samplers/macrocores
- The driller will push the sampler, and end plug as necessary, through the overlying strata to the top of the desired sampling interval.
- Recover the sampler and open to retrieve soil core. Split/cut the sample lengthwise for inspection.

- The end plug will be removed at the top of the desired sampling interval and the sampler will then be pushed through the sampling interval.
- Observe the soil core for visual evidence of contamination (i.e., staining, sheens, odor and/or oil-like/ creosote-like material).
- Using a sampling utensil (i.e., sampling spoon), burrow small holes in the core at one-foot intervals, placing the PID probe in the holes along the way to retrieve measurements of organic vapor concentrations.
- Using the modified Burmister soil classification system to describe visual observations of the soil sample.
- Retrieve an aliquot from each one-foot interval soil samples and seal in a plastic bag in an ice-filled cooler until sample selection for laboratory analysis.
- Choose which samples will be analyzed at the laboratory and label and fill the laboratory-supplied sample jars with the selected soil aliquots from their respective depth intervals. Seal the sample jars and store in a cooler at 4º Celsius.
- Decontaminate soil sampling equipment between sample locations
- Record field observations in the field log book and/or boring log data sheet, including: boring number, sample depth and sample observations (PID readings, evidence of contamination, and soil classification).

Monitoring Well Installation

Borings will be advanced to the desired depths by means of hollow stem augers and a truck-mounted or skid-mounted drill rig for the installation of monitoring wells. The monitoring wells will be constructed of two-inch diameter PVC in accordance with the following procedures:

- Using an oil/water interface probe, measure and record the depth to water in the open hole.

- Lower a PVC riser with a 10-foot to 15-foot length of PVC slotted screen to the bottom of the borehole. Approximately seven feet of the screen will be placed below the water table.

- If dense non-aqueous phase liquids (DNAPL) (such as tetrachloroethene) are suspected, a two-foot sump of steel casing will be attached to the bottom of the screen.

- The PVC screen slot size will be selected based on the sediment grain size observed in the soil. A slot opening of 0.020 inches will be chosen when medium to coarse sand is the dominant grain size. If silty sands or fine sand is dominant, then a 0.010-inch slot size will be chosen.

- In the annular space around the well screen, install the sand filter pack (about one to two feet above the top of the screen).

- For the one to two feet above the filter pack, a bentonite seal will be installed in the annular space.

- The remaining annular space will be filled with a bentonite-cement grout.

- Install a locking cap, flush-with-grade, curb box that has been set in cement. Set up a cement apron around the curb box to direct run-off away from the well.

- Decontaminate the hollow stem augers prior to and following each well installation

- Record data regarding the well installation in the field logbook and/or field data sheets (i.e., location, depth, construction details, water level measurements).

Temporary Well Point Installation

In specific instances where a permanent or semi-permanent monitoring well is not planned or called for, but the field geologist or project manager makes a field decision to collect a groundwater sample; or the location of the boring does not allow the use of a larger hollow-stem auger drill rig, a temporary well point will need to be installed using a Geoprobe® drill rig to collect a groundwater sample. The temporary well point consists of a five to ten-foot length of approximately 1 ¼-inch-diameter PVC well screen placed into a borehole already produced by the Geoprobe® macrocore. A gravel pack consisting of pre-sized sand will be placed in the annular space between the screen and the borehole wall. A groundwater sample will then be collected following the procedures outlined below, except that in a temporary well the 14-day equilibration period will not apply. When the groundwater sample has been collected the PVC well screen and riser pipe will be retrieved and placed in plastic garbage bags for later disposal. The borehole is then backfilled with Bentonite hole plug, and the surface repaired with concrete or asphalt patch.

Monitoring Well Development

The following procedure illustrates the development of all new and existing wells:

- Measure, using a water-level meter or an oil/water interface probe, the depth to the water and, using a weighted tape, the total depth of the well. From these measurements, calculate the length of the water column (total depth minus depth to water). The volume of water in the well is calculated using the following conversion factors:

Well Diameter (Inches)	**Volume per Foot of Water Column (gallons)**
1	0.041
1 ¼	0.064
2	0.163
4	0.653
6	1.469

- Discharge the water to 5-gallon buckets using a submersible pump. Transfer water from the buckets to 55-gallon drums designated for well development water.

- When the turbidity is less than 50 nephelometric turbidity units (NTUs) (three successive readings), the well is close to being developed. If after one hour of steady pumping, the turbidity remains high, additional methods of surging and jetting may need to be considered.

- In the field logbook or on field data sheets, record the volume of water removal and any other observations made.

- The equipment must be decontaminated before and after development for each well location

Groundwater Sampling

No sooner than 14 days following development groundwater samples may be collected from the monitoring wells applying the following procedures:

- Place a plastic sheet over the well with a hole cut in it to provide access to the well manhole.
- As the well plug is removed, measure the vapor concentrations in the well using a PID.
- Ensure that any pressure in the well dissipates and that water levels have stabilized before measuring fluid levels.
- Measure depth to water and check for LNAPL or DNAPL utilizing an oil/water interface probe, if applicable. If the NAPL is measurable, groundwater samples will not be collected from such a well.
- During the well development, calculate the mid-point of the water column length within the screen, using the water level and the total well depth measured. [For example, if the total depth is 40 feet, the screened interval is 30 to 40 feet, and the depth to water is 15 feet, the mid-point of the water column within the screened interval would be 35 feet.].
- Connect dedicated polyethylene or Teflon tubing to either a submersible or peristaltic pump and lower such that the intake of the pump is set at the mid-point of the water column within the screened interval of the well. The intake should be

a minimum of 1 foot above the bottom of the well screen. Record the depth of the intake in the field notes. Connect the discharge end of the tubing to the flow-through cell of a multi-parameter (or equivalent) meter, such as a Hydrolab Quanta or a Horiba U-10 or U-22. Connect tubing to the output of the cell and place the discharge end of the tubing in a 5-gallon bucket.

- At its lowest flow rate setting, activate the pump.
- Measure the depth to water within the well. Increase the pump flow rate such that the water level a measurement does not deviate more than 0.3 feet compared to the initial static reading.
- Transfer discharged water from the 5-gallon buckets to 55-gallons drums designated for well-purge water.
- During purging, collect periodic samples (every five minutes) and analyze for water quality indicators (e.g., turbidity, pH, temperature, dissolved oxygen, oxidation-reduction potential and specific conductivity).
- Continue purging the well until water quality indicators have stabilized (three successive readings) for the following parameters and criteria:

Parameter	**Stabilization Criteria**
pH	+/- 0.1 pH units
Specific Conductance	+/- 3% S / cm
ORP / Eh	+/- 10 mV
Turbidity	+/- 10% NTUs (< 50 NTUs,)
Dissolved Oxygen	+/- 0.3 mg/l

- Discontinue purging after three well volumes have been removed and water quality parameters do not stabilize. Strive to reduce turbidity to the lowest practical limit. Record all efforts to stabilize the water quality for the well in the field book and then collect samples as described below.
- After purging, disconnect the tubing to the inlet of the flow-through cell. Collect groundwater samples directly from the discharge end of the tubing (first VOCs then SVOCs) and place into the required sample containers. Containers are to be labeled and put in an ice-filled cooler.

  All sample bottles shall be filled to the top to minimize aeration and immediately placed on ice and in the dark to minimize temperature or photo-induced changes to the groundwater samples.
- Collect one final field sample and analyze for water quality parameters (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity) and record the final readings in the field notes.

- Once sampling is complete, remove the pump and tubing from the well. Disconnect the tubing and place it back in the well for reuse during the next sampling event. Dispose of any sample filters in a 55-gallon drum designated for disposable sampling materials and PPE.
- Decontaminate the pump, oil/water interface probe and flow-through cell
- In the project logbook and field data sheet, record all measurements (depth to water, depth to NAPL, water quality parameters, turbidity), calculations (well volume) and observations.

Decontamination Procedures

Decontamination will be performed on plastic sheeting or in another containment area that is deemed to prevent runoff to the ground. Prior to use on-site and between sampling locations, the macrocore sampler, probe rods, pump, oil/water interface probe, and other non-disposable sampling equipment will be decontaminated using the following protocol:

1. Scrub using tap water / non-phosphate detergent mixture and bristle brush.
2. Rinse with tap water.
3. Repeat step 1 and 2
4. Final rinse with distilled water.
5. Air-dry the equipment.

The solid stem augers and hollow stem augers will be decontaminated with a steam cleaner or pressure washer using a tap water/non-phosphate detergent solution to remove any loose soil and petroleum.

Sample Identification

All samples will be identified using a format that provides the essential information on the use, tracking, location, and media sampled (groundwater, soil, sediment, soil gas, surface water, waste, etc.), date, time, location, and depth interval.

Examples are as follows:

Soil: B-10, 5.5-6.0’, indicates that the soil sample was collected from the 5.5 - 6.0-foot interval in boring B-10. Post-excavation samples will be keyed to a Site grid.

Groundwater: MW-1 indicates that the sample is a groundwater sample collected in monitoring well 1.

Duplicate samples will be labeled as blind duplicates by giving them sample numbers indistinguishable from a normal sample.

Blanks should be spelled out and identify the associated matrix, e.g., Field (Rinsate) Blank (FB)-Soil; Field Blank-Groundwater. Trip Blanks should be labeled with the prefix TB.

Sample Labeling and Shipping

All sample containers must contain the following information—written in waterproof indelible ink (Sharpie)—on the label:

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Samplers initials
- Media Sampled

Collected and labeled samples will be placed in ice-filled coolers away from direct sunlight to await shipment/delivery to the laboratory.

To prepare the samples for shipment place each sample in a resealable plastic bag, then wrap each container in bubble wrap, only if being shipped, to prevent breakage. Finally, add fresh ice in two sealable plastic bags, or "blue ice" blocks, and the chain-of-custody form. Samples may be shipped overnight (e.g., via Federal Express or transported by a laboratory courier). All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the coolers remain sealed during delivery. C*oolers must be heavily iced to bring the entire sample contents to* 4^0 *C.*

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured area until arrival at the laboratory or laboratory pick up. Sample possession record from the time of obtainment in the field to the time of delivery to the laboratory or shipping off-site will be documented on chain-of-custody (COC) forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; media sampled; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times of transfers. Laboratory personnel will examine the custody seal's condition at sample check-in.

Field Instrumentation

Equipment will be calibrated at the start of each day of field work in accordance with the manufacturer's specifications. In the instance that an instrument fails calibration, the Project Manager or QA/QC Officer must be contacted immediately so as to arrange repairs or obtain a replacement instrument. A calibration log will be maintained in the field log book in order to record specific details regarding instrument calibration, including: dates, problems, and corrective actions. The PID will be calibrated each day using a standard of 100 parts per million (ppm) isobutylene, zeroed as per manufacturer specifications.

Field personnel will be trained in the proper operation of all field instruments at the start of the field program; however, instruction manuals for all equipment will be stored on-site as a reference of the proper procedures for operation, maintenance and calibration.

5.0 FIELD SAMPLING PLAN

Post-Excavation Sampling

Post-excavation samples will be collected at the end of remediation per the NYSDEC draft DER-10 guidance document [Section 5.4(a)2ii(2)]. The guidance document requires post-excavation soil samples to be collected at the following intervals: sidewall samples to be collected from the perimeter of the excavation at 30-foot intervals and samples from the base of the excavation to be collected every 900 square feet. However, the remedial action will remove soil to bedrock where post-excavation samples can not be collected. Therefore, samples from the base of the excavation will not be collected.

Sidewall samples will be collected from the soil present above the bedrock at the locations indicated in Figure 1. The excavation will extend to the property border in every direction and therefore, sidewall samples will be taken from the soil immediately off-Site.

Post-excavation sidewall samples will be collected from the location exhibiting the highest PID reading to evaluate the highest concentration of contaminated soil, if any, that will remain at the exterior boundary of the Site excavation. In the event that elevated PID readings are not recorded, the sidewall samples will be collected immediately above the bedrock interface, as RI sampling indicated that the soil immediately above the bedrock contained the highest concentration of contaminants.

Photos will be taken of each post-excavation sample location to record the visible condition of the sidewall. The post-excavation samples will be analyzed for the full scan parameters detailed in Table 1. Category B deliverables will be provided for all post-excavation samples.

Soil Boring Sampling

During the installation of a monitoring well northwest of the Site (as shown on Figure 1), one soil sample will be collected. The soil sample will be collected from the location of highest suspected contamination, based on visual, olfactory and PID readings. The soil sample will be analyzed for the full scan parameters detailed in Table 1.

Monitoring Well Sampling

At least two weeks after installation of the monitoring well, it will be developed and sampled, in accordance with the protocols listed above. The groundwater sample will be analyzed for the full scan parameters detailed in Table 1.

APPENDIX C

Community Air Monitoring Plan

West 34th Street Development
555 West 34th Street
New York, New York
Block 706, Lot 1

BCP Site #C231049

COMMUNITY AIR MONITORING PLAN

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1.0 INTRODUCTION

On behalf of Meushar 34th Street, LLC (the "Applicant") under Brownfield Cleanup Agreement (BCA) Index Number A2-0577-1106, Arnold F. Fleming, P.E./Fleming-Lee Shue, Inc. (collectively FLS) has prepared the following Community Air Monitoring Plan (CAMP) for the parcel of land known as the "West 34th Street Development" (hereafter referred to as "the Site"). The legal description of the Site is Block 706, Lot 1 (555 West 34th Street). The Site is located on the western portion of the city block bounded by West 34th Street to the south, 11th Avenue to the west and West 35th Street to the north, in the borough of Manhattan, City of New York, New York. This CAMP is done in accordance with the guidance provided in Section 1.9 and Appendix 1A of the New York State Department of Environmental Conservation's (NYSDEC) Draft DER-10 guidance document.

1.1 Purpose

The purpose 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 directly involved with the subject work activities) from potential airborne contaminants released as a direct result of the proposed remedial activities. Additionally, the CAMP helps to confirm that remedial activities did not spread air-borne contamination off-site. This CAMP provides real-time monitoring protocols for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of the Site while remedial activities are in progress. The CAMP does not establish action levels for worker respiratory protection, which are given in the construction Health and Safety Plan (HASP), provided under separate cover (Attachment D of the June 2007 Remedial Action Work Plan) and developed in accordance with 40 CFR 1910 and 1920.

The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

1.2 Contaminant Source

Elevated levels of petroleum-related volatile organic compounds (VOCs) are present in the area of the hydraulic piston associated with the truck elevator and in the area of the removed gasoline USTs. Semi-volatile organic compounds (SVOCs) and metals typical of historic fill material are present at concentrations above NYSDEC standards in on-site urban fill, which composes up to 17 feet of top soil on the Site. Low levels of pesticides were also detected.

At the groundwater level, there is petroleum contamination remaining from the historic use of the Site for fueling operations and the operation of a hydraulic elevator. Groundwater contains elevated concentrations of petroleum-related VOCs and SVOCs. Fill-related SVOCs and metals were also detected in groundwater samples collected from the Site.

1.3 Remedial Activities

The June 2007 Remedial Action Work Plan (RAWP) details the remediation strategy for the Site. All soil will be removed from the Site via excavation; therefore, all contaminated soils (urban fill, petroleum-contaminated urban fill and petroleum-contaminated native soil) will be removed from the Site. Groundwater will be treated by the construction dewatering system that will lower the groundwater level to the bottom of the excavation for the access shaft, estimated at approximately 30 feet below grade. Any groundwater generated by dewatering will be treated prior to discharge to the New York City sewers under a permit from and in accordance with the requirements of NYCDEP.

1.4 Receptor Population

Potentially exposed receptors during remediation include Site workers and, to a lesser degree, individuals living, working and shopping in the vicinity of the project. This CAMP is designed to protect the off-site receptors including residences and businesses, and on-site workers not directly involved with the subject work activities.

2.0 MONITORING PLAN

During construction remediation activities, the proposed CAMP, entailing upwind and downwind perimeter monitoring, will be implemented as described in the following sections. Special care will be taken to monitor and control fugitive odors and dust emissions from the Site, minimizing the risk of exposure to the surrounding receptor population during the construction activities.

2.1 Continuous Monitoring

Continuous monitoring will be conducted for all ground-intrusive activities and during the demolition of on-Site 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.

2.2 Periodic Monitoring

Periodic monitoring for VOCs will be conducted 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, such as groundwater sampling at wells on the curb of one of the streets surrounding the Site.

2.3 VOC Monitoring, Response Levels, and Actions

VOCs will be continually monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) using a photo-ionization detector (PID). Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The PID will be calibrated at least daily, or more often if needed. The PID will 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 sustains a concentration of between 5 parts per million (ppm) and 10 ppm above background for 5 minutes, the Health and Safety Officer will be notified and the vapor emission response plan (detailed below) will be implemented. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone sustains a concentration above 10 ppm above background for 5 minutes, work will be temporarily halted and the vapor emission response plan will be implemented.

Vapor Emission Response Plan

When vapor concentrations at the downwind perimeter of the Site trigger the vapor emission response plan, additional measurements are required. Work may continue (or resume) if:

- Concentrations measured with the PID at the downwind edge of the Site fall below 5 ppm over background

  OR
- Concentrations measured with the PID at a location 200 feet downwind from the Site (or at half the distance to the nearest residential or commercial structure, whichever is less) is below 5 ppm over background.

If the downwind concentrations measured 200 feet downwind or at half the distance to the nearest downwind residential or commercial structure, whichever is less, exceed 5 ppm over background, then all work will be halted, the source of vapors identified, corrective actions taken to abate emissions. Monitoring will be continued. If the concentrations measured at the downwind location persist above 5 ppm over background after the cessation of work, then monitoring will be performed within 20 feet of the nearest downwind residential or commercial structure.

The major vapor emission response plan will be implemented if concentrations measured within 20 feet of the nearest downwind residential or commercial structure either:

- exceed 10 ppm over background

  OR
- exceed 5 ppm over background for a period greater than 30 minutes.

Major Vapor Emission Response Plan

The HSO will contact the local police and all contacts listed on Table 1 of the HASP (Appendix D of the June 2007 RAWP) to inform them of the situation. Air monitoring will be conducted within 20 feet of the nearest downwind residential or commercial structure at 30-minute intervals. Air monitoring may be halted or modified if two successive readings are below 5 ppm.

All 15-minute readings will be recorded and be available for State [NYSDEC and New York State Department of Health (NYSDOH)] personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

2.4 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will 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 will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 150 micrograms per cubic meter (ug/m^3) greater than background (upwind perimeter) for a 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 ug/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 ug/m^3 above the upwind level, work will 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 ug/m^3 of the upwind level and in preventing visible dust migration. All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

APPENDIX D

Health and Safety Plan

West 34th Street Development
555 West 34th Street
New York, New York
Block 706, Lot 1

HEALTH AND SAFETY PLAN

Prepared For:
Meushar 34th Street, LLC
c/o The Moinian Group
530 5th Ave, Suite 1800
New York, NY 10036
FLS Project Number: 10090-001

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
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Arnold F. Fleming, P.E. &

Fleming
Lee Shue

Environmental Management & Consulting

June 2007

PROJECT INFORMATION SHEET

PROJECT/SITE NAME: West 34th Street Development

SITE ADDRESS: 555 West 34th Street
New York (Manhattan), NY 10001

PROJECT NO: 10090-001

CLIENT: Meushar 34th Street, LLC

FLS PROJECT MANAGER: Mohamed Ahmed

DATE HEALTH AND
SAFETY PLAN PREPARED: 06/01/2007

DATE(S) OF SITE WORK: Summer/Fall 2007

SITE ACCESS: Prior Notification Required

SITE SIZE: 46,900 square feet (sf) or approximately 1.08 acres

SITE TOPOGRAPHY: Sloping downwards towards the east

PREVAILING WEATHER: Prevailing weather is characterized by warm to hot summers and cold winters. The work will be completed in the summer and/or fall season, which is characterized by both hot and cool temperatures.

SITE DESCRIPTION AND HISTORY: The Site consists of a two story building located on the western portion of the city block bounded by West 34th Street to the south, 11th Avenue to the west and West 35th Street to the north.

> Current Operations
>
> The Site consists of a two story building, which was last operated by Verizon as part of their installation and maintenance division. The Amtrak Empire Line is present beneath the northwest corner of the site within an easement. The western bulkhead wall of the basement reflects the presence of the track.
>
> Historical Operations
>
> The Site has been developed with a variety of commercial, residential, and manufacturing facilities since approximately 1890. Specific on-site operations included a factory, a garage (with buried gasoline tanks), a blacksmith, a welding facility and a motor freight station.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED: This project involves soil excavation and management oversight, classification of soils for disposal, installation of sheeting and shoring, dewatering, dust control, and monitoring of particulates and volatile organic compounds (VOCs).

SPECIAL CONDITIONS: There are two distinct environmental operations governed by the health and safety plan. Due to the nature of the site and the planned development, there will be

- localized discreet excavations in contaminated soil to facilitate necessary shoring and similar structural features for new construction, and
- large scale removal of contaminated soil to accommodate new construction and to establish the overall environmental remediation goals for the site

The work at the site will entail various trades simultaneously; thus, work involving disturbance and/or removal of contaminated soil will occur in some locations of the site in conjunction with other general construction work at other locations. Segregation of environmental work (i.e., disturbance and/or handling of contaminated soils) from other general construction work will be implemented by establishing and management of exclusion zones (further discussed herein).

LIMITATIONS: This health and safety plan governs the hazards specific to the environmental work at the site (i.e., exposure to environmental contaminants). The Construction Manager's site-specific health and safety plan governs the general safety hazards of the project.

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Attachment 1 Profiles of Chemicals of Concern/Material Safety Data Sheets

1.0 INTRODUCTION

Fleming-Lee Shue, Inc. (FLS) prepared this Health and Safety Plan (HASP) on behalf of Meushar 34th Street, LLC for the parcel of land known as the West 34th Street Development (the "Site") located at 555 West 34th Street, New York, New York, for use and implementation by FLS employees, their representatives and remediation personnel during the proposed construction on the Site. The Site is located on the western portion of the city block bounded by West 34th Street to the south, 11th Avenue to the west and West 35th Street to the north (Figure 1).

The purpose of this HASP is to identify the hazards associated with environmental activities related to and conducted during the planned construction and to establish appropriate health and safety procedures to prevent/minimize exposure to environmental contaminants at the site.

The procedures described in this document are consistent with the provisions of Occupational Safety and Health Administration (OSHA) rule 29 CFR 1910.120. All workers who will contact, handle, and or disturb contaminated soil must read and comprehend this HASP. The Health and Safety Officer (HSO) or designee has the overall responsibility to enforce the provisions of the HASP. The health and safety requirements in this document may be modified, if warranted, by additional information obtained prior to, or during the work.

1.1 Site Development Plan

The Site consists of a two story building, which was last operated by Verizon as part of their installation and maintenance division. The Amtrak Empire Line is present beneath the northwest corner of the site (Figure 2) within an easement. The western bulkhead wall of the basement reflects the presence of the track.

The Applicant intends to demolish the existing Site structure in order to both create access for the construction of the 34th Street station of the No. 7 subway extension and construct a high-rise mixed-use building.

The No. 7 line tunnel will be located within the bedrock zone outside the site boundaries. The subway tunnel waiting area will be constructed under 11th Avenue starting approximately 90 feet below grade (ft-bg), which is approximately 60 feet into bedrock. Access for construction will be provided through a 38 feet by 24 feet shaft located within the Site's boundaries. The shaft will extend to a depth of approximately 120 feet below grade (approximately 90 feet into rock), proceeding west to the location of the subway tunnel and the 34th Street Station. This shaft will be used to remove rock from the tunnel and waiting area beyond the Site, as well as to bring in construction materials to construct the tunnel and station. The subway station, which will contain the main entrance and ticketing level, will be present on-Site to a depth of approximately 40 feet below grade with a portion approximately 50 feet below grade to allow for escalator operation. This is approximately 10 to 20 feet into bedrock. Proposed development plans for the No. 7 station are included in Attachment A.

Due to the construction of the No. 7 line station, the proposed building will be constructed approximately five years after the Site excavation is completed. Details of the proposed building are based on the results of two zoning studies of the Site. The proposed 79-story building will occupy the entire Site, as well as the adjacent Lot 55, with a footprint of approximately 46,900-square feet. One to two below-grade floors will be constructed for parking, storage or mechanical rooms. The first floor will likely include lobbies, retail, loading docks and entrances to the No. 7 line ticketing level. Parking entry or mechanical use may also be present on the first floor. The upper floors are contemplated to be used for a combination of office, residential, hotel, retail, parking and support spaces. The bulkhead wall separating the basement from the Amtrak line will remain. Proposed development plans for the mixed-use building are under development. The anticipated use is mixed use with residential included in the development.

The Site appears on the City of New York Department of City Planning Zoning Map 8b. According to this map, the property is designated C6-3, which is designated as a general central commercial district. The New York City Department of Environmental Protection (NYCDEP) has placed an “e” designation on this Site. Development of an “e” designation site requires NYCDEP approval prior to issuance of a permit by the New York City Department of Buildings (NYCDOB).

The parcel of land was previously zoned for general commercial use and was rezoned as part of a larger, City-led, rezoning project for the Hudson Yards District in Manhattan, New York. The Site is located within the Large-Scale Plan Sub-district in the Four Corners Sub-area. The rezoning was designed to allow the area to be developed for commercial and residential uses. The Hudson Yards District Rezoning was completed in January 2005.

1.2 Site Background and Previous Investigation Results

1.2.1 Site History

The Site is located very close to the original shoreline of the Hudson River, which was just across what is now 11th Avenue; however, the Hudson River has since been filled in to the West Side Highway. The Site has been developed with a variety of commercial, residential, and manufacturing facilities since approximately 1890. Specific on-site operations included a factory, a garage (with buried gasoline tanks), a blacksmith, a welding facility and a motor freight station.

The Site is currently developed with a two story building, which was last operated by Verizon as part of their installation and maintenance division. The Amtrak Empire Line is present beneath the northwest corner of the site within an easement. The western bulkhead wall of the basement reflects the presence of the track.

1.2.2 Previous Site Investigation Results

FLS submitted a Remedial Investigation Report (RIR) to the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation in June 2007 to satisfy Brownfield Cleanup Program requirements for the site.

As detailed in FLS' RIR, soil and groundwater sampling was conducted by PB and EnviroTrac. Soil sampling indicated that elevated levels of petroleum-related volatile organic compounds (VOCs) are present in the area of the hydraulic piston associated with the truck elevator and in the area of the removed gasoline USTs. Soil sampling also indicated that SVOCs and metals typical of historic fill material are present at concentrations above NYSDEC standards. Low levels of pesticides were also detected.

Groundwater samples collected from temporary and permanent monitoring wells in these two areas, as well as a monitoring well located in the sidewalk north of the Site, contained elevated levels of petroleum-related VOCs and SVOCs. Fill-related SVOCs and metals were also detected in groundwater samples collected from the Site. The detected concentrations of metals may be biased high as the samples were not filtered and metals can be bound with silt.

2.0 POTENTIAL CHEMICAL AND PHYSICAL HAZARDS

2.1 Potential Chemical Hazards

This HASP focuses on the following chemicals:

- Petroleum Hydrocarbons, including gasoline and hydraulic oil
- PAHs
- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Mercury
- Zinc
- 4-4'-DDD
- 4-4'-DDE
- 4,4'-DDT

Attachment 1 lists the symptoms of exposure to the chemicals known to be present at the site as well as profiles of these chemicals/Material Safety Data Sheets (MSDS). The chemical hazards will be minimized by limiting exposure of personnel to hazardous conditions and by the use of personnel protective equipment (PPE).

2.2 Physical Hazards

Physical hazards potentially present at the site include, but are not limited to, the following:

- Slip, trip and fall (uneven terrain and slippery surfaces) hazards;
- Environmental (heat/cold) stress;
- Noise hazards; and
- Use of heavy equipment.

Physical hazards associated with lockout/tag-out, scaffolds, confined spaces and other construction equipment are addressed in the Construction Manager's site-specific health and safety plan (hereafter "Construction HASP"). Before construction commences at the site, the Construction HASP will be finalized based on information submitted by trade contractors. A copy of the Construction HASP will be provided under separate cover.

2.3 Biological Hazards

General biological hazards present at the site include, but are not limited to, the following:

- Bites or stings from insects (particularly ticks) resulting in skin inflammation, disease, or allergic response; and
- Allergens and toxins from plants and animals, producing dermatitis, rhinitis, or asthma.

Biological hazards associated with the site are addressed in the Construction HASP

3.0 HEALTH AND SAFETY PROTOCOL

3.1 Site/Work Hazard Evaluation

Upon review of contaminant levels and the nature of the environmental remediation tasks, it has been determined that Level D protection is sufficient. Upgrade to Level C protection will occur if total organic compound concentrations in, or at the boundary of an exclusion zone consistently reach or exceed 10 parts per million (ppm) as measured with a photoionization detector (PID). If PID readings in the exclusion zone consistently reach or exceed 25 ppm, work will be stopped and the Site HSO and Project Manager contacted. Protection levels are described in more detail in Section 3.6 and air monitoring is discussed in Section 5.

3.2 Project Team Organization

All personnel who participate in field activities will be required to attend a Health and Safety meeting prior to the commencement of field activities. The project team organization is shown on Table 1, and the roles are described below.

Health and Safety Officer (HSO)

- Administers all aspects of the occupational health and safety program;
- Develops programs and technical guidance to identify and control hazards;
- Assists management and supervisors in the health and safety training of employees;
- Conducts monitoring and inspections to identify hazardous conditions or work practices;
- Determines the protection levels and equipment required to ensure the safety of personnel;

- Evaluates on-site conditions and implements modifications to the work plan and personnel protection levels;
- Monitors performance of all personnel to ensure compliance with the required safety procedures;
- Ensures that all personnel have been trained in proper site-safety procedures including the use of PPE;
- Conducts daily briefings as necessary;
- Halts work if necessary based on results of air monitoring;
- Ensures strict adherence to the Site HASP; and
- Reviews personnel medical monitoring participation.

Project Manager

- Familiar with health and safety regulations related to area of responsibility;
- Directs and coordinates health and safety activities within area of responsibility;
- Ensures arrangements for prompt medical attention in case of serious injury;
- Requires all employees supervised to use individual protective equipment and safety devices;
- Ensures that safety equipment is available, maintained, used and stored correctly;
- Instructs and trains all persons within area of responsibility in health and safety requirements;
- Conducts frequent and regular health and safety inspections. Directs correction of unsafe conditions;
- Conducts weekly safety briefings with all supervisors and/or workers, and
- Requires all subcontractors and subcontractor personnel to comply with health and safety regulations and this HASP.

All Employees

The minimum personnel qualifications for each individual participating in environmental activities are:

- OSHA-specific medical examinations and medical approval for the use of respirators;

- Successful completion of the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and current 8-hour refresher training (29 CFR 1910.120[e][4]);
- Additionally, it is strongly recommended that all field personnel be trained in first aid and Cardio-Pulmonary Resuscitation (CPR);
- Be familiar with and comply with this HASP and the Construction HASP;
- Use the required personnel protective safety equipment; and
- Notify HSO/supervisor immediately of unsafe conditions/acts, accidents, and injuries.

3.3 Training

Workers who will disturb, contact, or handle contaminated soil have successfully completed the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and be current with 8-hour refresher training (29 CFR 1910.120[e][4]).

Prior to beginning work on-Site, and weekly thereafter, the HSO will lead safety training sessions and/or "tailgate" training meetings. These meetings will be conducted to provide information and training on new equipment, new procedures, new chemicals, refresher/remedial training in specific areas, or meet annual requirements. Such training may be held in conjunction with the safety briefings/meetings addressed elsewhere in this program.

If necessary, the HSO will ensure that workers are scheduled and provided specialized training as required. Examples of specified training include (but are not limited to):

- Respirator care/use;
- Hazard communication (hazardous chemicals).

3.4 Subcontractor Compliance

The provisions of these health and safety responsibilities apply to subcontractors and their employees who will disturb, contact, or handle contaminated soil.

3.5 Personal Hygiene

Eating, drinking and the use of tobacco products in the exclusion zone is prohibited. The use of alcohol or other non-prescription drugs by personnel that could impair the ability to function at the work site is prohibited. The use of some prescription drugs may impair the ability to function and can create safety problems on-site. Field personnel taking prescription medication should alert the HSO in case of an emergency. Beards or facial hair that could interfere with the use of a respirator are not permitted. Dermal contact with soil and groundwater should be avoided. This includes avoiding walking through puddles, pools, and mud, sitting or leaning on or against drums, equipment, or on the ground. Field personnel should wash their hands before eating, smoking, using the toilet, etc. Field personnel should wash their hands and face and shower (daily) as soon as possible after leaving the site.

3.6 Levels of Personnel Protection

Personnel protective equipment (PPE) must be worn as described below for all individuals who disturb, contact, or handle contaminated soil.

3.6.1 Level D

Level D applies to work in areas where the possibility of contact with potentially contaminated groundwater and soil exists. The protective equipment required for Level D includes, but is not limited to, the following:

- Work clothes or coveralls;
- Safety boots, with steel toe;
- Safety glasses;
- Hard hat;
- Reflective vest;
- Disposable latex gloves.

3.6.2 Level C

Level C is required when PID levels in the exclusion zone indicate a consistent level of 10 ppm or greater. Level C protection will include, but is not limited to, the following:

- Protective clothing and other equipment required for Level D;
- Half-face air purifying respirator (APR) with high efficiency particulate/organic vapor cartridges (ultra-twin with GMCH cartridges);
- Saranex-coated disposable coveralls with hoods; and
- Boot covers.

3.7 General Workplace Safety Rules

General Workplace Safety Rules are governed by the Construction HASP

3.8 Housekeeping

Housekeeping requirements for the site are governed by the Construction HASP.

3.9 Fire Prevention

Fire Prevention protocols for the site are governed by the Construction HASP.

3.10 Personal Hygiene

- Toilet facilities shall be provided as required for the number of workers.
- A first aid kit and portable eyewash station shall be kept on site.
- An adequate supply of potable water shall be provided.
- The use of a common drinking cup is prohibited.

3.11 Construction Equipment Safety Rules

Construction Equipment and Safety Rules are governed by the Construction HASP.

4.0 INDIVIDUAL SAFETY AND HEALTH PROGRAMS LISTING

OSHA standards specify various individual programs that may be applicable to work performed on environmental sites. Highlights of these programs are provided below, and specific written programs or procedures may be included into this written program, attached, or developed separately.

4.1 Hazard Communication Program

If employees are exposed to or work with hazardous chemicals at the job site, this program is required. Important elements of the written program are required to include a master listing of chemicals; maintaining material safety data sheets on each chemical; and training of employees on the program, the chemicals exposed to, and material safety data sheets.

4.2 Confined Space Entry Program

If employees enter a confined space that contains or has the potential to contain an atmospheric or physical hazard, this program is required. Either the ANSI Z117.1-1989

Safety Requirements for Confined Spaces program or the OSHA General Industry Permit Require Confined Spaces program must be used as guidance to develop the company's program. Primary elements of the program are identification of applicable confined spaces, testing/ monitoring, control or elimination of hazards, protective equipment, entry authorization, attendants, training, and rescue. No employee is authorized to enter a confined space without the above training and notification to the project manager or HSO.

4.3 Respiratory Protection Program

If employees are exposed to hazardous/toxic chemical, paint or other gases, vapors, fumes, dusts, or mists above the permissible exposure limit, and/or employees wear respirators, this program is required. Program elements are written program for the selection, maintenance, care, and use of respirators; fit testing, training, and employee evaluation for use.

4.4 Occupational Noise Exposure / Hearing Conservation Program

If employees are exposed to noise levels above the permissible noise exposures, protection against the effects of noise and an effective hearing conservation program are required. Such a program would include elements such as written program, noise monitoring, hearing evaluations and follow-on testing, personnel protective equipment (hearing protection), and maintenance of medical records.

Requirements for protection against exposure to noise are governed by the Construction HASP.

4.5 Lockout/Tagout Program

Requirements for Lockout/Tagout program and equipment deenergization are governed by the Construction HASP.

4.6 Assured Equipment Grounding Conductor Program

Requirements for equipment grounding are governed by the Construction HASP.

4.7 Fire Protection and Prevention

Requirements for Fire Protection and Protection are governed by the Construction HASP.

4.8 Emergency Response Plan

Emergency Response Plan procedures are governed by the Construction HASP.

4.9 Lead Exposure Program

If employees are exposed to lead in the workplace, then an initial monitoring for lead exposure must be made. If the monitoring results are above the permissible exposure limit (PEL), this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, personnel protective equipment, and training.

4.10 Dust Suppression Plan

The following techniques will be utilized to control and minimize release of dust into the ambient environment during remediation activities:

1. Site roads will be maintained in a damp condition through periodic spraying.
2. Trucks carrying soil will be tarped immediately after loading.
3. Vehicle speeds shall not exceed 10 mph.

To evaluate the effectiveness of the dust suppression measures, air monitoring utilizing real-time dust-monitoring equipment will be performed. The requirements for air monitoring during soil disturbance activities are presented in Section 5.

5.0 AIR MONITORING

Continuous air monitoring will be performed during all soil disturbance activities, including sampling and excavation work. A dust monitor will be used to measure concentrations of total airborne particulate matter. A PID will be used to measure airborne VOC concentrations. The purpose of the air monitoring program is to avoid or minimize exposure of the field personnel and the public to potential airborne environmental hazards created during soil disturbance activities. Results of the air monitoring will be used to determine the appropriate response action, if needed. The equipment will be calibrated daily and the results noted in the project field book.

5.1 Exclusion Zone Monitoring – Volatile Organic Compounds

As described in Section 3.1, the following response actions will be taken based on PID readings in the exclusion zone. All work will be performed in level D PPE unless volatile organic concentrations exceed 10 ppm.

PARAMETER	INSTRUMENT	PID READING/ TIMING	ACTION LEVELS/ RESPONSE
Volatile organics	photoionization detector (PID)	> 10 ppm / Sustained for 5 minutes	Temporarily halt work activities, and monitor to identify the source. Contact the HSO to continue work, depending upon detected levels. Upgrade to Level C should levels remain at 10 ppm or greater
		10 ppm - <25 ppm / Sustained for 5 minutes	Work continues in Level C; continue monitoring to locate the source.
		25 ppm + / Sustained for 5 minutes	Contact HSO; shut down work activities

5.2 Community Air Monitoring – Volatile Organic Compounds

VOCs will be continuously monitored at the downwind perimeter of the exclusion zone while soil-disturbing activities are occurring. The following response actions will be taken based on PID readings at the boundary of the Site:

PARAMETER	INSTRUMENT	PID READING/ TIMING	ACTION LEVELS/ RESPONSE
Volatile organics	photoionization detector (PID)	5 ppm - <10 ppm / Sustained for 5 minutes	Contact the HSO and implement vapor emission response plan detailed below.
		10 ppm + / Sustained for 5 minutes	Temporarily halt work activities, and monitor to identify the source. Contact the HSO and implement vapor emission response plan detailed below.

Vapor Emission Response Plan

When vapor concentrations at the downwind perimeter of the Site trigger the vapor emission response plan, additional measurements are required. Work may continue (or resume) if:

- Concentrations measured with the PID at the downwind edge of the Site fall below 5 ppm over background
  OR
- Concentrations measured with the PID at a location 200 feet downwind from the Site (or at half the distance to the nearest residential or commercial structure, whichever is less) is below 5 ppm over background.

If the downwind concentrations measured 200 feet downwind or at half the distance to the nearest downwind residential or commercial structure, whichever is less, exceed 5 ppm over background, then all work will be halted. If the concentrations measured at the downwind location persist above 5 ppm over background after the cessation of work, then monitoring will be performed within 20 feet of the nearest downwind residential or commercial structure.

The major vapor emission response plan will be implemented if concentrations measured within 20 feet of the nearest downwind residential or commercial structure either:

- exceed 10 ppm over background
  OR
- exceed 5 ppm over background for a period greater than 30 minutes.

Major Vapor Emission Response Plan

The HSO will contact the local police and all contacts listed on Table 1 to inform them of the situation. Air monitoring will be conducted within 20 feet of the nearest downwind residential or commercial structure at 30-minute intervals. Air monitoring may be halted or modified if two successive readings are below 5 ppm.

5.3 Community Air Monitoring – Particulates

During soil excavation, particulate monitoring will be performed using a real time airborne (light scattering) particulate monitor, with a range encompassing respirable dust.

Object to be measured: Dust, Mists, Aerosols
Size range: <0.1 to 10 microns
Sensitivity: 0.001 mg/m^3
Range: 0.001 to 10 mg/m^3
Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust.

Particulate levels will be monitored at the upwind and downwind boundaries of the Site and integrated over a period not to exceed 15 minutes. The action level will be established at 150 ug/m^3 above the upwind (background levels) concentration, with both measurements integrated a period not to exceed 15 minutes. The action level and response are summarized below.

PARAMETER	INSTRUMENT	LEVELS/ TIMING	ACTION LEVELS/ RESPONSE
Particulates	Nephelometric (light scattering)	> 150 ug/m^3 downwind measurement above upwind measurement / 15 minute average	Temporarily halt work activities, and monitor to identify the source. Contact the HSO to continue work, depending upon detected levels. Increase dust control measures.

6.0 DECONTAMINATION

6.1 Site Organization

The exclusion zone is an area defined by a distance of 5 feet off the perimeter of any disturbance to the surface (i.e., excavation) with elevated levels of PAH's and metals documented in soils as described herein. The site work area will consist of an exclusion zone where the actual field activity will take place, and a decontamination zone located beyond the exclusion zone(s).

Levels of personnel protection in the exclusion zone will vary depending upon air monitoring data, and will be specified/upgraded as necessary by the Site HSO.

6.2 Personnel Decontamination

Decontamination (decon) of personnel consists of physically removing soil or contaminants using the correct procedures for washing and removal of PPE. Decon will take place in the designated decontamination zone using the following steps, as applicable:

- Soap and potable water wash and potable water rinse of gloves;
- Tyvek removal;
- Glove removal; and
- Field wash of hands and face.

7.0 EMERGENCY AND CONTINGENCY PLAN

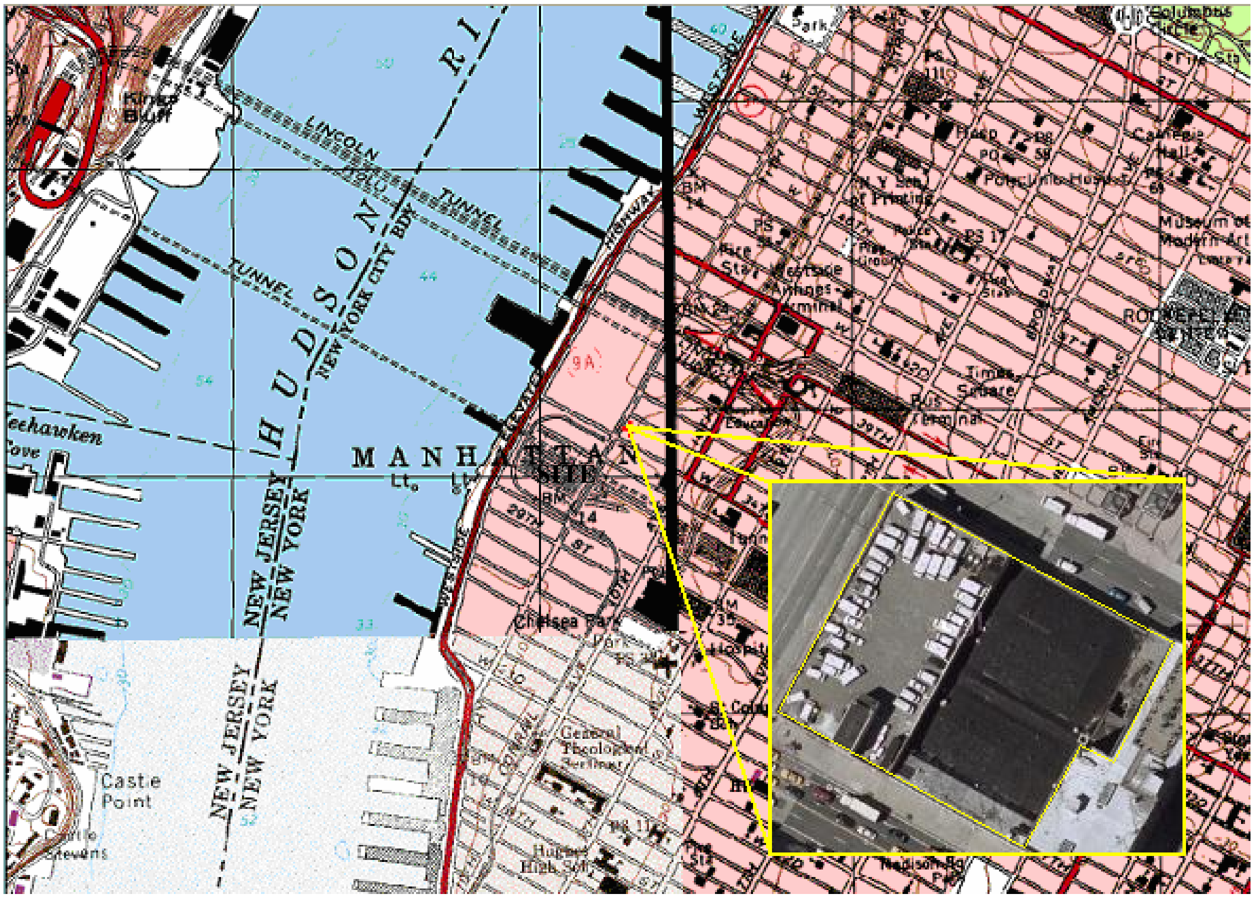
Emergency communications will be maintained during all on-site field activities. The emergency route to the hospital is depicted on Figure 2 and emergency contacts and their phone numbers are presented in Table 1.

A first aid kit will be available on-site at all times for any minor on-site injuries. Emergency medical assistance or ambulance can be reached by calling 911 for more severe injuries.

General emergency response procedures are governed by the Construction HASP.

FIGURES

Figure 1
Site Location Map



Site: *Weehawken USGS Topographic Map (79287)*
Also shown: *Central Park USGS Topographic Map (84573)*
Brooklyn USGS Topographic Map (84524)
Jersey City USGS Topographic Map (79210)
Obtained from: *topozone.com* ©1999-2006

Fleming Lee Shue

Approximate Scale: 1” ≈ 1,650’

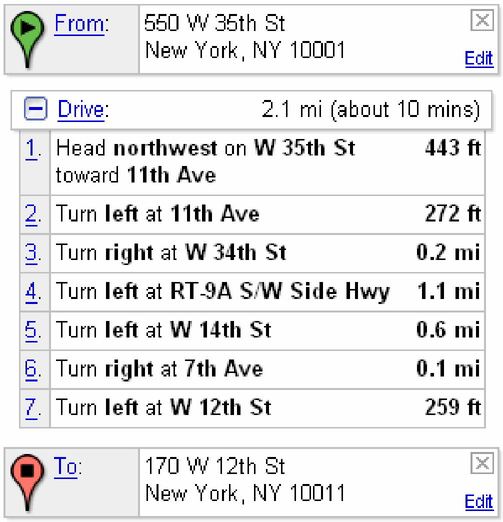
SITE: W 34th Street Development
New York, New York
CLIENT: Meushar 34th Street, LLC c/o The Moinian Group

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001

FIGURE 2 – HOSPITAL ROUTE

West 34th Street Development
New York, NY

Hospital: St. Vincents Hospital
170 West 12th Street
New York, NY 10011
212-604-7000



From: 550 W 35th St
New York, NY 10001
Edit

Drive: 2.1 mi (about 10 mins)

1.	Head **northwest** on **W 35th St** toward **11th Ave**	**443 ft**
2.	Turn **left** at **11th Ave**	**272 ft**
3.	Turn **right** at **W 34th St**	**0.2 mi**
4.	Turn **left** at **RT-9A S/W Side Hwy**	**1.1 mi**
5.	Turn **left** at **W 14th St**	**0.6 mi**
6.	Turn **right** at **7th Ave**	**0.1 mi**
7.	Turn **left** at **W 12th St**	**259 ft**

To: 170 W 12th St
New York, NY 10011
Edit

TABLES

Table 1
Emergency Contacts and Project Team Organization
West 34th Street Development
New York, New York

Title	Name	Organization	Phone Number
Project Director	Arnold F. Fleming	Fleming Lee Shue, Inc.	212-675-3225
Technical Director	Mary S. Manto	Fleming Lee Shue, Inc.	212-675-3225
Project Manager	Mohamed Ahmed	Fleming Lee Shue, Inc.	212-675-3225 917-612-6018 Cell
HSO	Matthew Carroll	Fleming Lee Shue, Inc.	212-675-3225 201-344-8510 Cell
NYSDEC Project Managers		NYSDEC	
Client		Meushar 34th Street, LLC	
Police, Fire, Medical Emergency	**911**		
St. Vincents Hospital 170 West 12th Street New York, NY 10011	**212-604-7000**		
New York State Department of Environmental Conservation (NYSDEC) Emergency Response	**800-457-7362**		
New York City Department of Environmental Protection (NYCDEP)	**718-482-4996**		

ATTACHMENT 1

Profiles of Chemicals of Concern/Material Safety Data Sheets

METAL

2M

International Chemical Safety Cards

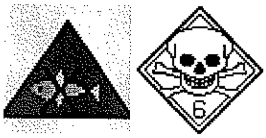
ARSENIC

ICSC: 0013

National Institute for Occupational Safety and Health

Grey arsenic
As
Atomic mass: 74.9

ICSC # 0013
CAS # 7440-38-2
RTECS # CG0525000
UN # 1558
EC # 033-001-00-X



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat. Shortness of breath. Weakness. (See Ingestion).	Closed system and ventilation.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Face shield, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for

	chest. Shock or collapse. Unconsciousness.		medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed.	Do not transport with food and feedstuffs. Marine pollutant. T symbol R: 23/25 S: 1/2-20/21-28-45 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0013

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1999. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ARSENIC

ICSC: 0013

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with strong oxidants halogens, causing fire and explosion hazard. Reacts with acids to produce **OCCUPATIONAL EXPOSURE LIMITS:** TLV: ppm; 0.01 mg/m^3 (as TWA) A1 (ACGIH 1999). NIOSH REL: Ca C 0.002 mg/m^3 15-minute See Appendix A NIOSH IDLH: Potential occupational carcinogen 5 mg/m^3 (as As)	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly, when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes the skin the respiratory tract. The substance may cause effects on the gastrointestinal tract cardiovascular system central nervous system kidneys resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders shock convulsions kidney impairment Exposure above OEL may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

		Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the mucous membranes, skin, peripheral nervous system liver bone marrow, resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment anaemia This substance is carcinogenic to humans. Animal tests show that this substance possibly causes malformations in human babies.
PHYSICAL PROPERTIES	Sublimation point: 613°C Density: 5.7 g/cm^3	Solubility in water: none
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it persists in the environment.	

NOTES

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is indicated. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC # 0377), Arsenic trichloride (ICSC # 0221), Arsenic trioxide (ICSC # 0378), Arsine (ICSC # 0222).

Transport Emergency Card: TEC (R)-61G64b

ADDITIONAL INFORMATION

ICSC: 0013 **ARSENIC**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

METAL

3 M

International Chemical Safety Cards

BARIUM

ICSC: 1052

BARIUM
Ba
Atomic mass: 137.3

CAS # 7440-39-3
RTECS # CQ8370000
ICSC # 1052
UN # 1400

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames.	Special powder, dry sand, NO hydrous agents, NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• **INHALATION**	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from halogenated solvents, strong oxidants, acids. Dry. Keep under inert gas, petroleum or oxygen-free liquid.	UN Hazard Class: 4.3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1052

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

BARIUM

ICSC: 1052

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOWISH TO WHITE LUSTROUS SOLID IN VARIOUS FORMS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance may spontaneously ignite on contact with air (if in powder form). The substance is a strong reducing agent and reacts violently with oxidants and acids. Reacts with water, forming combustible gas (hydrogen - see ICSC # 0001) and barium hydroxide. Reacts violently with halogenated solvents causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.5 mg/m^3 (as TWA) (ACGIH 1992-1993).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by ingestion. **INHALATION RISK:** **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes, the skin, and the respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 1640°C Melting point: 725°C Relative density (water = 1): 3.6	Solubility in water: reaction Vapour pressure, kPa at 1049°C: 1.3
ENVIRONMENTAL DATA		

NOTES

Reacts violently with fire extinguishing agents such as water, bicarbonate, powder, foam, and carbon dioxide. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-43G14

ADDITIONAL INFORMATION

ICSC: 1052 **BARIUM**

LEGAL NOTICE:	responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

4 M

International Chemical Safety Cards

CADMIUM

ICSC: 0020

National Institute for Occupational Safety and Health

NIOSH

Cd
Atomic mass: 112.4

ICSC # 0020
CAS # 7440-43-9
RTECS # EU9800000
UN #

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable in powder form. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with heat or acids.	Dry sand. Special powder. No other agents.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Headache. Symptoms may be delayed (see Notes).	Local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Extinguish ignition sources. Sweep spilled substance into containers; if	Fireproof. Separated from strong oxidants, strong acids, food and feedstuffs.	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not

appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: P3 filter respirator for toxic particles).		transport with food and feedstuffs. R: S: UN Hazard Class:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0020	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1999. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CADMIUM

ICSC: 0020

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C AND TARNISHES ON EXPOSURE TO MOIST AIR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts with acids giving off flammable hydrogen gas. Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium, causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as dust): ppm; 0.05 mg/m^3 as TWA (ACGIH 1991-1992). NIOSH REL: Ca See Appendix A *Note: The REL applies to all Cadmium compounds (as Cd). NIOSH IDLH: Potential occupational carcinogen 9 mg/m^3 (as Cd)	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes and the respiratory tract. Inhalation of fume may cause lung oedema (see Notes). Inhalation of fume may cause metal fever. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Lungs may be affected by repeated or prolonged exposure to dust particles. The substance may have effects on the kidneys , resulting in proteinuria and kidney dysfunction. This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 765°C Melting point: 321°C Relative density (water = 1): 8.6	Solubility in water: none Auto-ignition temperature: (cadmium metal dust) 250°C
ENVIRONMENTAL DATA		

NOTES

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxide and halons. Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0020 **CADMIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Material Safety Data Sheet

Science Stuff, Inc.
1104 Newport Ave
Austin, TX 78753

Phone (512) 837-6020
Chemtrec 800-424-9300
24 Hour Emergency Assistance

Section 1 Identification

Product Number:	C1411
Product Name:	Calcium Metal Reagent Grade
Trade/Chemical Synonyms	
Formula:	Ca
RTECS:	EV8040000
C.A.S	CAS# 7440-70-2

Health:	3
Flammability	3
Reactivity	2

Hazard Rating:

Least	Slight	Moderate	High	Extreme
0	1	2	3	4

NA = Not Applicable NE = Not Established

Section 2 Component Mixture

Sara 313	Component	CAS Number	%	Dim	Exposure Limits:
☑	Calcium Metal	CAS# 7440-70-2	100 %	W/W	None established

Section 3 Hazard Identification (Also see section 11)

Keep away from heat and ignition sources. Harmful if swallowed. Avoid breathing vapors. Use with adequate ventilation. Avoid contact with eyes, skin, and clothes. Wash thoroughly after handling. Keep container closed.

Section 4 First Aid Measures

Keep away from heat and ignition sources. Harmful if swallowed. Avoid breathing vapors. Use with adequate ventilation. Avoid contact with eyes, skin, and clothes. Wash thoroughly after handling. Keep container closed.

FIRST AID: CALL A PHYSICIAN. SKIN: In case of contact, immediately flush skin with water for at least 15 minutes while removing contaminated clothing and shoes. Thoroughly clean clothing and shoes before reuse.

EYES: Wash eyes with plenty of water for at least 15 minutes, lifting lids occasionally. Seek Medical Aid. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen

INGESTION: Give several glasses of milk or water. Vomiting may occur spontaneously, but DO NOT INDUCE! Never give anything by mouth to an unconscious person.

Section 5 Fire Fighting Measures

Fire Extinguisher Type:	G-1 powder, Pyrene, Dry lime(not limestone)
Fire/Explosion Hazards:	Evolves hydrogen gas when heated or in contact with acids, moisture. Finely divided calcium is considered pyrophoric and will explode if ignited.
Fire Fighting Procedure:	Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and clothing.

Section 6 Accidental Release Measures

Collect spilled material for reclamaion or disposal in sealed containers.

Section 7 Handling and Storage

Store in a cool dry well ventilated area. Keep away from heat and flame. Do not get in eyes, on skin, or on clothing.

Section 8 Exposure Controls & Personal Protection

Respiratory Protection:NIOSH/MSHA-approved respirator

Ventilation:	Mechanical: ☑ Local Exhaust: ☑	Hand Protection:	Wear appropriate gloves to prevent skin exposure
		Eye Protection:	Goggles and Face Shield

Other Protective Equipment: Wear appropriate clothing to prevent skin exposure

Section 9 Physical and Chemical Properties

Melting Point:	Information not available	Specific Gravity	1.55
Boiling Point:	2817 Deg F	Percent Volatile by Volume:	0
Vapor Pressure:	0	Evaporation Rate:	0
Vapor Density:	Information not available	Evaporation Standard:	
Solubility in Water:	Reacts with water	Auto ignition Temperature:	Not applicable
Appearance and Odor:	Gray metallic solid, no odor	Lower Flamm. Limit in Air:	Not applicable
Flash Point:	None	Upper Flamm. Limit in Air:	Not applicable

Section 10 Stability and Reactivity Information

Stability: Stable	Conditions to Avoid: Product is unstable when exposed to water. Moisture, water, high temperatures, sparks, and open flames

Materials to Avoid:
Water, Alali metal hydroxides and carbonates, acids.

Hazardous Decomposition Products:
Hydrogen and calcium hydroxide.

Hazardous Polymerization:Will Not Occur

Condition to Avoid:None known

Section 11 Additional Information

Contact with skin while moist or perspired may cause burns due to reactions. Eye contact can cause irritaiton. If inhaled can cause irritation to mucous membranes.If ingested can cause burns of mouth and esophogus.If comes in contact with skin or eyes wash with water. If inhaled rlemove to fresh air . If ingested, Do not induce vomiting . For all above situation get medical assistance immediately. Persons with pre-existing disorders may be more susceptible

DOT Classification: Calcium, 4.3, UN1401, PG II

DOT regulations may change from time to time. Please consult the most recent version of the relevant regulations.

Revision No:0 Date Entered: 9/1/2005 Approved by: WPF

METAL

5 M

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

Chrome
Cr (metal)
Atomic mass: 52.0

ICSC # 0029
CAS # 7440-47-3
RTECS # GB4200000

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible if in very fine powder. Gives off irritating or toxic fumes (or gases) in a fire.	No open flames if in powder form.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES	Redness.	Face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place (extra personal protection: P2 filter respirator for harmful	Fireproof. Separated from strong oxidants.	R: S:

particles).

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0029	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1999. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** STEEL GREY LUTROUS METAL. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts violently with strong oxidants such as hydrogen peroxide, causing fire and explosion hazard. Reacts with diluted hydrochloric and sulfuric acids. Incompatible with alkalis and alkali carbonates. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: ppm; 0.5 mg/m^3 (as TWA) (ACGIH 1994-1995). OSHA PEL*: TWA 1 mg/m^3 See Appendix C *Note: The PEL also applies to insoluble chromium salts. NIOSH REL: TWA 0.5 mg/m^3 See Appendix C NIOSH IDLH: 250 mg/m^3 (as Cr)	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization.
PHYSICAL PROPERTIES	Boiling point: 2642°C Melting point: 1900°C	Relative density (water = 1): 7.14 Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

Explosive limits are unknown in literature. Depending on the degree of exposure, periodic medical examination is indicated.

ADDITIONAL INFORMATION

ICSC: 0029 **CHROMIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

METAL

6 M

noranda

COPPER METAL

WHMIS (Classification)
Not controlled (Canada)

WHMIS (Pictograms)

SECTION 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name	**Copper metal**
Product Code	Not available
Supplier	FALCONBRIDGE LIMITED, Kidd Metallurgical Division P.O. Bag 2002 Timmins, Ontario, Canada, P4N 7K1
Information Contact	Tony Fontana
Phone Number (Business hours)	(705) 235-8121
Phone Number (Emergency)	**(705) 235-8121**
Synonyms	Cathode Copper Cathode de cuivre ; cuivre métallique (French)
DSL (Domestic Substance List)	Listed
Name / Chemical Formula	Copper / Cu
Chemical Family	Metal
Utilization	Copper wire ; Copper piping ; Alloying (Bronze, brass)

SECTION 2. COMPOSITION AND INFORMATIONS ON INGREDIENTS

			Exposure Limits		
			ACGIH (U.S.A.)	**OSHA (U.S.A.)**	**ONTARIO (CA)**
Name	**CAS #**	**Percentage (%)**	**TLV-TWA (mg/m^3)**	**PEL - TWA (mg/m^3)**	**TWAEV (mg/m^3)**
Copper	7440-50-8	99.99	1 (dust, mist) 0.2 (fume)	1 (dust, mist) 0.1 (fume)	1 (dust, mist) 0.2 (fume)

ACGIH : American Conference of Governmental Industrial Hygienists. OSHA : Occupational Safety and Health Administration. QUEBEC : Règlement sur la qualité du milieu de travail

Note : **Copper :** NIOSH REL (≤10 hour workday ; 40-hour workweek) : 1 mg/m^3 (Copper and copper compounds, as Cu, except fume) ; IDLH : 100 mg/m^3. ORAL acute (LD50) : 1 000 mg/kg (Rat) ; INTRAPERITONAL (LD 50) : 3.5 mg/kg (Mouse).

Consult local authorities for acceptable exposure limits

SECTION 3. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance	Solid	**Odour**	Odourless
Molecular Weight	63.546	**Taste**	Metallic
pH (1% soln/water)	Not applicable	**Colour**	Reddish
Boiling Point	2 324°C (4 215.2°F)	**Volatility**	Not available
Melting Point	1 083°C (1 981.4°F)	**% Moisture**	Not applicable
Critical Temperature	Not available	**Odour Threshold**	Not available
Specific Gravity	8.92 (Water = 1)	**Water/Oil Dist. Coeff.**	Not available
Vapour Pressure	Not available	**Ionicity (in Water)**	Not available
Vapour Density	Not available	**Dispersion**	Not available
Solubility	No (Water)		

SECTION 4. RISK IDENTIFICATION FOR HUMAN HEALTH

Routes of Entry	Ingestion. Inhalation.
Carcinogenicity	**Copper** : NOT CLASSIFIED.
Mutagenicity	Not applicable.
Tératogenicity	Not applicable.
Acute Effects	Plate form : No health hazards. Conditions and work practices which generate dust or fume should be avoided or controlled. Dust and fume can cause health effects.
Chronic Effects	No known effects from chronic exposure. **Copper :** Essential for human health. Exposure to fumes or extremely fine dusts (Concentrations of 0.075 to 0.12 mg/m^3) may cause **metal fume fever**, a delayed, generally benign, transient, reversible flu-like condition. Target organs for acute and chronic overexposure (NIOSH 90-117) : Respiratory system, skin, liver and kidneys.
Toxicity	Persons with the following pre-existing conditions warrant particular attention : **Copper :** Wilson's disease. *Eating, drinking and smoking must be prohibited in areas where this material is handled and processed. Wash hands and face before eating, drinking and smoking.*

SECTION 5. FIRST AID MEASURES

Eye Contact	Remove contact lenses if present. Immediately rinse eyes with plenty of water, while holding eyelids open for at least 20 minutes. Consult a physician.
Skin Contact	Wash skin with water and soap.
Inhalation	Remove the person from exposure. Bring to fresh air. Difficult breathing : give oxygen. Get **immediate** medical attention.

Ingestion	Rare in industry. Induce vomiting. **UNCONSCIOUS** person : **DO NOT** induce vomiting or give any liquid. **Immediately** obtain medical attention.

SECTION 6. FIRE AND EXPLOSION DATA

Flash Point	Not applicable
Flammable Limits	Not applicable
Auto-Ignition Temperature	Not applicable
Products of Combustion	Copper oxides.
Fire Hazard	Dusts : flammable when exposed to heat or flames.
Explosion Hazard	Not explosive (Mechanical impact ; Static discharge) **Copper (Liquid) :** Explodes on contact with water. Some chemical forms may explode with : Acetylene compounds, ammonium nitrate, 3-bromopropyne, ethylene oxide, lead azide.
Fire Fighting (Instructions)	NON-FLAMMABLE. Use fire fighting materials and procedures adapted to the immediate environment. Firefighters must wear full protective clothing and self-contained breathing apparatus (SCBA).

SECTION 7. HANDLING AND STORAGE / ENGINEERING CONTROLS AND PERSONAL PROTECTION

Handling	**DO NOT** ingest or inhale dusts. Wear adequate protective clothing. Wear approved respirators if adequate ventilation cannot be provided. Ingestion or inhalation : Seek medical advice immediately and provide medical personnel with a copy of this MSDS.
Storage	Away from : Moisture, incompatible (Acids) and oxidizing substances.
Engineering Controls	Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits.
Personal Protection	Safety glasses. Coveralls. Work gloves and boots. Dust respirator. Be sure to use a NIOSH approved respirator or equivalent when concentrations exceed occupational exposure limits.

SECTION 8. ACCIDENTAL RELEASE MEASURES / DISPOSAL ARRANGEMENTS

Spill	Recover, return to process. Wash down with water if in contact with acids.
Personal Protection	High concentrations of fumes or dusts : Use a self-contained breathing apparatus (SCBA) to avoid inhalation of material. Low concentrations : Use a NIOSH/OSHA approved full face cartridge respirator or the equivalent. Full protective clothing. Boots. Gloves.
Waste Disposal	Recycle to process, if possible. Consult local or regional authorities.

SECTION 9. STABILITY AND REACTIVITY DATA

Stability	Yes
Conditions of Instability	Not applicable
Incompatibilities	Reactive with : acids **Copper :** Violent reactions with : Bromates, chlorates, hydrogen peroxide, sulfuric acid, sodium peroxide, dipotassium peroxide, hydrazoic acid, combination of hydrogen sulfur and air.
Corrosivity	No

SECTION 10. ECOTOXICOLOGICAL INFORMATION

Ecotoxicity	Not available
Toxicity to Animals	**Copper :** INTRAPERITONEAL (LD50) : 3.5 mg/kg (Mouse).
Biodegradation Products	Not biodegradable
Biodegradation Products (Toxicity)	Not applicable
Remarks on Environment	No additional remarks
BOD5 and COD	Not available

SECTION 11. TRANSPORT INFORMATION / OTHER REGULATIONS

TDG (Pictograms)	Not regulated (Canada)
PIN	Not applicable
Special Provisions (Transport)	Not applicable
Other Regulations	EU (Existing Substances Annex I - Regulation (EC) 793/93) : listed. **Copper :** EU Consolidated Inventories : EC Number 2311596 CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) : on the Domestic Substances List (DSL) ; acceptable for use under the provisions of CEPA.

	CERCLA Section 103 Hazardous substances (40 CFR 302.4) ; SARA 110 ATSDR CERCLA Priority List : listed. SARA Section 313, Toxic Chemicals (40 CFR 372.65) : **Copper** (Final RQ) **:** *5 000 pounds (2 270 kg) US EPA TSCA Chemical Inventory : Listed. **Copper** * No declaration required if the diameter of the piece of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).
Classifications HCS (U.S.A.)	Not regulated
Classifications DSCL (EEC)	Not regulated

NFPA (National Fire Protection Association) (U.S.A.)

Fire Hazard	0	**Health**	1	**Special Hazard**	

DOT (U.S.A.) (Pictograms) **DSCL (Europe) (Pictograms)** **ADR (Europe) (Pictograms)**

SECTION 12. OTHER INFORMATION

References

- ACGIH, TLVs and BEIs. 2002
- Canadian Centre for Occupational Health and Safety (CCOHS). Database MSDS/FTSS. Network Version WWW, 2003
- CSST - Répertoire toxicologique, 2003
- IARC, Monographs on the Evaluation of Carcinogenic Risks to Humans (collection)
- Merck Index. Merck & CO., Inc, 12th edition, 1999
- NIOSH U.S.- Pocket Guide to Chemical Hazards - WWW database, 2003
- North American Emergency Response Guidebook Documents, Developed by the U.S. Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico. 2000
- Patty's Industrial Hygiene and Toxicology, 3rd Revised Edition
- Règlement sur les produits contrôlés (Canada)
- TOMES plus® by Micromedex inc. Environmental Health & Safety Series. WWW database, 2003
- Toxicologie Industrielle & Intoxication Professionnelle, 3e édition, Lauwerys

Glossary

CSST : Commission de la Santé et de la Sécurité du Travail (Québec).
IARC : International Agency for Research on Cancer.
NIOSH : National Institute of Occupational Safety and Health.
NTP : U.S. National Toxicology Program.

Written by : Groupe STEM Consultants / Noranda inc. **Date :** 2003-05-16 **Previous Date :** 2000-05-16

SECTION 13. MSDS REQUEST

Request Gina Daniel Tél. : (416) 982-7041 Fax : (416) 982-3514
NORANDA INC. Queen's Quay Terminal, 207 Queen's Quay West, Suite 800, Toronto (Ontario), Canada M5J 1A7

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METAL

7 M

International Chemical Safety Cards

FERROUS OXIDE

ICSC: 0793

Ferrous monoxide
Iron (II) oxide
FeO
Molecular mass: 71.9

ICSC # 0793
CAS # 1345-25-1
RTECS #

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Avoid inhalation of fine dust and mist. Local exhaust.	Fresh air, rest.
•SKIN		Protective gloves.	Rinse and then wash skin with water and soap.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.		R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0793	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1998. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

FERROUS OXIDE

ICSC: 0793

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** BLACK SOLID IN VARIOUS FORMS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance may spontaneously ignite on contact with air when heated above 200°C. The substance is easily oxidized by air and readily absorbs carbon dioxide. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK as respirable dust: ppm; 6 mg/m^3; (1995).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the lungs , resulting in siderosis.
PHYSICAL PROPERTIES	Melting point: 1360°C Relative density (water = 1): 5.7	Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

CI 77489 is a trade name.

ADDITIONAL INFORMATION

ICSC: 0793 **FERROUS OXIDE**

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METAL

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION

221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: LL0070 LL0079 LL0080 LL0081 LL0082 LL0085 LL0086
Effective Date: March 29, 2005

SECTION I NAME

Product	Lead Metal
Chemical Synonyms	N/A
Formula	Pb
Unit Size	up to 2.5 Kg.
C.A.S. No.	7439-92-1

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC
800-424-9300
Day 585-226-6177

NFPA

HMIS *	
Health	3
Fire	0
Reactivity	0

HAZARD RATING

MINIMAL	SLIGHT	MODERATE	SERIOUS	SEVERE
0	1	2	3	4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Lead metal, shot, granular, sheet, foil	99+%	See Section V.
CAUTION! MAY BE HARMFUL OR FATAL IF SWALLOWED		
OR INHALED AS FUMES OR DUST.		

SECTION III PHYSICAL DATA

Melting Point (°F)	Approx. 327.4°C (621°F)	Specific Gravity (H_2O = 1)	11.34 (20/4°C)
Boiling Point (°F)	1753°C (3187°F)	Percent Volatile by Volume (%)	0% at ambient temp.
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	Non-volatile (N/A).
Vapor Density (Air=1)	N/A		
Solubility in Water	Insoluble.		
Appearance & Odor	Bluish, silvery, gray soft metal, granular, shot, sheet, foil; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)		Flammable Limits in Air % by Volume	Lower	Upper
	Non-flammable (N/A).	N/A	---------	---------

Extinguisher Media Dry chemical or carbon dioxide should be used on surrounding fire. Do not use water on fires where molten metal is present.

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

When heated emits toxic fumes of lead which can react vigorously with oxidizing materials.

D.O.T. Non Regulated.

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA

LL0070

Threshold Limited Value Lead as inorganic compounds, as Pb: TWA 0.05 mg/m^3 (ACGIH 2001).

Effects of Overexposure **SKIN:** Not absorbed through skin. **EYES:** No specific hazard known. Contact may cause transient irritation. **INGESTION:** May produce anorexia, vomiting, malaise, convulsions due to increased intracranial pressure. **INHALATION:** Of dust or fumes can cause lead poisoning. Target organs: Lungs, kidneys.

Emergency and First Aid Procedures **INGESTION:** Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. **EYES:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. **SKIN:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. **INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability			Conditions to Avoid
	Unstable		High temperatures to produce fumes.
	Stable	X	

Incompatibility (Materials to Avoid) Strong oxidizing materials.

Hazardous Decomposition Products When heated, emits toxic fumes of lead.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled Carefully sweep up without producing dust and recycle for use or place in a suitable container for disposal.

Waste Disposal Method Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.

Dispose of in an approved chemical landfill or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None should be needed in normal laboratory use at room temperature. If dusty conditions prevail, work in ventilation hood or wear a NIOSH/MSHA-approved dust mask or respirator.

Ventilation				
	Local Exhaust	None needed.	Special	No.
	Mechanical (General)	None needed.	Other	No.

Protective Gloves	Recommended - leather.	**Eye Protection**	Chemical safety glasses.
Other Protective Equipment	Smock, apron, eye wash station, lab coat, ventilation hood.		

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing
Keep container tightly closed when not in use.

Store in a cool, dry place away from fire hazards. Wash thoroughly after handling. Remove and wash contaminated clothing.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals. For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Lead can react violently with oxidizing materials. Water may become trapped within surface cracks which may cause an explosion when the metal is molten.

Revision No. 9	Date 03/29/05	Approved	Michael Raszeja	Chemical Safety Coordinator	MR

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8M

Marathon Petroleum Company

MATERIAL SAFETY DATA SHEET PAGE 1 OF 5

PRODUCT NAME: REGULAR LEADED GASOLINE
MARATHON MSDS NO: 116MAR001

THE FOLLOWING INFORMATION IS FURNISHED SUBJECT TO THE DISCLAIMER ON THE BOTTOM OF THIS FORM

SECTION 1 - PRODUCT IDENTIFICATION

PRODUCT
NAME: REGULAR LEADED GASOLINE → taken off market in 1990

SYNONYMS:
GASOLINE, REGULAR LEADED; LEADED REGULAR GASOLINE; MILE-MAKER GASOLINE; REGULAR LEADED GASOLINE

MANUFACTURER / DISTRIBUTOR:
MARATHON PETROLEUM COMPANY
539 SOUTH MAIN STREET
FINDLAY, OH
45840

EMERGENCY PHONE NUMBERS:
(419) 422-2121 (MARATHON)
(800) 424-9300 (CHEMTREC)
or (419)421-3517

CHEMICAL FAMILY: PETROLEUM HYDROCARBON
CHEMICAL FORMULA: MIXTURE
CAS NO: MIXTURE
PRODUCT CODE:

SECTION 2 - PHYSICAL PROPERTIES

BOILING POINT 90-437 F	MELTING POINT N.A. F	SPECIFIC GRAVITY(H20=1) 0.71-0.77
% SOLUBILITY IN WATER NEGLIGIBLE	VAPOR DENSITY(AIR=1) 3-4	VAPOR PRESSURE 414-776 MM HG @ 100F

PH INFORMATION: PH: N.A. AT CONC.
APPEARANCE: AMBER LIQUID
ODOR: GASOLINE ODOR

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT -50 F	AUTOIGNITION TEMP C.A. 495 F	EXPLOSIVE LIMITS (% BY VOLUME IN AIR) LOWER/UPPER: 1.4/ 7.6

EXTINGUISHING MEDIA:

ONLY U.L. APPROVED CLASS B FIRE EXTINGUISHING MEDIA SUCH AS FOAM, CO2, HALON 1211, OR DRY CHEMICAL. WATER SPRAY SHOULD BE USED ONLY BY QUALIFIED FIRE FIGHTING PERSONNEL.

SPECIAL FIRE FIGHTING INSTRUCTIONS:

CAUTION MUST BE FOLLOWED AFTER EXTINGUISHMENT DUE TO EASE OF REIGNITION OF HOT GASOLINE VAPORS. WATER CAN BE USED TO COOL EXPOSED SURFACES.

STABILITY: THE MATERIAL IS STABLE AT 70 F, 760MM PRESSURE
CONDITIONS TO AVOID:

HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE, ALDEHYDES, AROMATIC HYDROCARBONS, LEAD COMPOUNDS.

INCOMPATIBLE MATERIALS:
OXIDIZERS.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION 4 - PRODUCT COMPOSITION AND EXPOSURE LIMITS

EXPOSURE LIMITS FOR PRODUCT:	TLV			SOURCE
REGULAR LEADED GASOLINE	300.00	PPM	(8 HR TWA)	ACGIH
	500.00	PPM	(STEL)	ACGIH

COMPONENTS:	PERCENT RANGE	TLV			SOURCE
SATURATED HYDROCARBONS (PARAFFINS & CYCLOPARAFFINS)	65.00- 70.00	0.00		( )	
UNSATURATED HYDROCARBONS (OLEFINS) -	2.00- 9.00	0.00		( )	
AROMATIC HYDROCARBONS (INCLUDING BENZENE, TOLUENE, XYLENES, ETHYLBENZENE & TRIMETHYL BENZENES)	23.00- 32.00	0.00		( )	
BENZENE	.50- 3.00	10.00	PPM	(8 HR TWA)	ACGIH
		1.00	PPM	(8 HR TWA)	OSHA
		5.00	PPM	(STEL)	OSHA

MARATHON ACTION LEVEL 0.50 PPM (8 HR TWA)

***

COMPLEX MIXTURE OF PARAFFINIC CYCLOPARAFFINIC, OLEFINIC AND AROMATIC HYDROCARBONS (PREDOMINANTLY C4 THROUGH C12).

***

CONTAINS SMALL AMOUNTS OF ORGANO-LEAD ADDITIVES (<0.1%) AND DYE AND OTHER ADDITIVES (<0.02%) WHICH ARE NOT CONSIDERED HAZARDOUS AT THE CONCENTRATIONS USED.

SECTION 5 - POTENTIAL HEALTH EFFECTS

EYE:

EYE IRRITATION MAY RESULT FROM CONTACT WITH THE LIQUID OR EXPOSURE TO VAPOR CONCENTRATIONS ABOVE THE TLV.

SKIN:

PROLONGED OR REPEATED LIQUID CONTACT CAN DEFAT THE SKIN AND LEAD TO IRRITATION AND/OR DERMATITIS.

INHALATION:

EXPOSURE TO VAPOR CONCENTRATIONS EXCEEDING 1000 PPM CAN CAUSE RESPIRATORY IRRITATION, HEADACHE, DIZZINESS, NAUSEA AND LOSS OF COORDINATION. HIGHER CONCENTRATIONS MAY CAUSE LOSS OF CONSCIOUSNESS, CARDIAC SENSITIZATION, COMA AND DEATH RESULTING FROM RESPIRATORY FAILURE.

INGESTION:

INGESTION MAY RESULT IN NAUSEA, VOMITING, DIARRHEA AND RESTLESSNESS. ASPIRATION (BREATHING) OF VOMITUS INTO THE LUNGS MUST BE AVOIDED AS EVEN SMALL QUANTITIES IN THE LUNGS CAN PRODUCE CHEMICAL PNEUMONITIS AND PULMONARY EDEMA/HEMORRHAGE.

SECTION 5 - POTENTIAL HEALTH EFFECTS (CON'T)

ADDITIONAL TOXICITY INFORMATION:

TWO YEAR INHALATION TOXICITY STUDIES WITH FULLY VAPORIZED GASOLINE (67,292 & 2056 PPM) PRODUCED KIDNEY DAMAGE & KIDNEY TUMORS IN MALE RATS BUT NOT IN FEMALE RATS OR MALE AND FEMALE MICE. FEMALE MICE DEVELOPED A SLIGHTLY HIGHER INCIDENCE OF LIVER TUMORS COMPARED TO CONTROLS AT THE HIGHEST EXPOSURE LEVEL. SINCE THESE RESPONSES ARE SPECIES SPECIFIC AND HAVE NOT BEEN OBSERVED IN HUMANS, THEIR BIOLOGIC SIGNIFICANCE AS IT RELATES TO HUMAN HEALTH IS DIFFICULT TO INTERPRET AT THIS TIME. THE AMERICAN PETROLEUM INSTITUTE IS CURRENTLY CONDUCTING STUDIES TO HELP ANSWER THESE QUESTIONS. CHRONIC HUMAN HEALTH EFFECTS WOULD NOT BE EXPECTED AS LONG AS GOOD PERSONAL HYGIENE AND PROPER SAFETY PRECAUTIONS ARE PRACTICED.

PROLONGED AND REPEATED OVEREXPOSURE TO BENZENE MAY PRODUCE INJURY TO THE BLOOD FORMING TISSUES CAUSING BLOOD ABNORMALITIES AND POSSIBLY LEUKEMIA; HOWEVER, EXPOSURES TO SUCH HIGH LEVELS ARE NOT LIKELY TO BE ENCOUNTERED IN TYPICAL GASOLINE HANDLING OPERATIONS DUE TO THE COMPARATIVELY LOW BENZENE CONTENT.

EMERGENCY FIRST AID PROCEDURES

EYE:

FLUSH EYES WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

SKIN:

WASH WITH SOAP AND LARGE AMOUNTS OF WATER. REMOVE CONTAMINATED CLOTHING. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

INHALATION:

MOVE PERSON TO FRESH AIR. IF NOT BREATHING OR IF NO HEARTBEAT, GIVE ARTIFICIAL RESPIRATION OR CARDIOPULMONARY RESUSCITATION (CPR). IMMEDIATELY CALL A PHYSICIAN.

INGESTION:

DO NOT INDUCE VOMITING. DO NOT GIVE LIQUIDS. CALL A PHYSICIAN.

SECTION 6 - SPECIAL PROTECTION INFORMATION

VENTILATION:

LOCAL OR GENERAL EXHAUST REQUIRED IN ENCLOSED AREAS OR WITH INADEQUATE VENTILATION.

SECTION 6 - SPECIAL PROTECTION INFORMATION (CON'T)

RESPIRATORY PROTECTION

APPROVED ORGANIC VAPOR CHEMICAL CARTRIDGE OR SUPPLIED AIR RESPIRATORS SHOULD BE WORN FOR EXPOSURES EXCEEDING THE TLV OR STEL. OBSERVE RESPIRATOR PROTECTION FACTOR CRITERIA CITED IN ANSI Z88.2 (1980).

PROTECTIVE GLOVES:

NEOPRENE, NITRILE OR PVA GLOVES FOR REPEATED OR PROLONGED SKIN EXPOSURE.

OTHER PROTECTIVE EQUIPMENT:

USE EXPLOSION-PROOF EQUIPMENT.

SECTION 7 - SPILL OR LEAK PROCEDURES

ENVIRONMENTAL EFFECTS:

LIQUID CAN BE TOXIC TO AQUATIC LIFE.

STEPS TO BE TAKEN IN CASE OF SPILL, LEAK OR RELEASE:

KEEP PUBLIC AWAY. SHUT OFF SOURCE OF LEAK IF POSSIBLE TO DO SO WITHOUT HAZARD. ELIMINATE ALL IGNITION SOURCES. ADVISE NATIONAL RESPONSE CENTER (800-424-8802) IF PRODUCT HAS ENTERED A WATER COURSE. ADVISE LOCAL AND STATE EMERGENCY SERVICES AGENCIES, IF APPROPRIATE. CONTAIN LIQUID WITH SAND OR SOIL. RECOVER AND RETURN FREE LIQUID TO SOURCE. USE SUITABLE SORBENTS TO CLEAN UP RESIDUAL LIQUID.

WASTE DISPOSAL METHOD:

DISPOSE OF CLEANUP MATERIALS IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION 8 - HANDLING AND STORAGE PRECAUTIONS

USE APPROPRIATELY GROUNDED DISPENSING PRACTICES. STORE IN A RELATIVELY COOL PLACE. DO NOT EXPOSE TO HEAT, OPEN FLAMES OR OXIDIZERS.

SECTION 9 - HAZARD WARNING

DANGER!

EXTREMELY FLAMMABLE

HARMFUL OR FATAL IF SWALLOWED

CONTAINS BENZENE WHICH MAY CAUSE CANCER OR BE TOXIC TO BLOOD-FORMING ORGANS.

SECTION 10 - COMMENTS

SECTION 11 - REGULATORY INFORMATION

SECTION 12 - REGULATIONS/COMMENTS CONTINUED

INFORMATION SUPPLIED BY: COORDINATOR TOXICOLOGY AND PRODUCT SAFETY
CRAIG M. PARKER PHONE: (419)422-2121

MSDS DATE: 04/10/87 DATE OF PREVIOUS MSDS: / /

*** DISCLAIMER ***

METAL

9 M

International Chemical Safety Cards

MAGNESIUM OXIDE

ICSC: 0504

National Institute for Occupational Safety and Health

UNEP

Calcined brucite
Calcined magnesia
Magnesia
MgO
Molecular mass: 40.3

ICSC # 0504
CAS # 1309-48-4
RTECS # OM3850000

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible.	NO contact with halogens or strong acids.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough. See Notes.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN			Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness. Pain.	Safety goggles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water (extra personal protection: P1 filter	Separated from strong acids, halogens. Dry.	R: S:

respirator for inert particles).

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0504	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1998. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

MAGNESIUM OXIDE

ICSC: 0504

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** HYGROSCOPIC, FINE, WHITE POWDER. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Reacts violently with halogens and strong acids. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as fume): ppm; 10 mg/m^3 (ACGIH 1996). MAK as fume: ppm; 6 mg/m^3; (1996). OSHA PEL: TWA 15 mg/m^3 NIOSH REL: See Appendix D NIOSH IDLH: 750 mg/m^3	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol or fume and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a nuisance-causing concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes and the nose. Inhalation of fume may cause metal fever. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 3600°C Melting point: 2800°C	Relative density (water = 1): 3.6 Solubility in water: poor
ENVIRONMENTAL DATA		

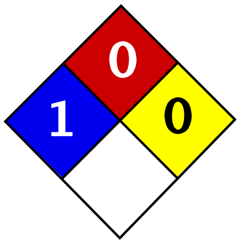
NOTES

Headache, cough, sweating, nausea and fever may be caused by exposure to freshly formed fumes. The symptoms of metal fume fever do not become manifest until 4-12 hours after exposure. Magcal, Maglite, Magox, Akro-Mag, Animag, Granmag, Magchem 100, Marmag are trade names.

ADDITIONAL INFORMATION

ICSC: 0504	**MAGNESIUM OXIDE**
	(C) IPCS, CEC, 1998

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, lungs, brain, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Moderate fire potential, in the form of dust or powder, when exposed to flame.
When manganese if heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence.
Concentrated nitric acid reacts with powdered manganese with incandescence and explosion.
Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to flame.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water

on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.1 (mg/m3) from ACGIH (TLV) [United States]
TWA: 5 (mg/m3) [Canada]
TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States]
TWA: 5 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

pH (1% soln/water): Not applicable.

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Superficially oxidized on exposure to air.
Reacts with aqueous solutions of sodium or potassium bicarbonate.
Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts.
Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively.
In the form of powder, it reduces most metallic oxides on heating.
On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic.
Also incompatible with hydroxides, cyanides, carbonates.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Manganese can cross the placenta.
May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritaiton
Eyes: Dust may cause mechanical irritation.

Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressivness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation).
Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism.
Ingestion: May cause digestive tract irritation. There is a low gastrointesitnal absorption of manganese.
Chronic Potential Health Effects:
Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degeneratiave changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice)
Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Manganese
Rhode Island RTK hazardous substances: Manganese
Pennsylvania RTK: Manganese
Minnesota: Manganese
Massachusetts RTK: Manganese
New Jersey: Manganese
New Jersey spill list: Manganese
Louisiana spill reporting: Manganese
California Director's List of Hazardous Substances: Manganese
TSCA 8(b) inventory: Manganese

SARA 313 toxic chemical notification and release reporting: Manganese

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:03 PM

Last Updated: 10/09/2005 06:03 PM

METAL

10 M

Material Safety Data Sheet
Mercury

ACC# 14020

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury
Catalog Numbers: S40672B, S41542, S41599, S41599B, S41599E, S41599G, S41599J, S41599K, S41599M, S41600P, S41600S, S41600W, S41630A, S41630B, S41630C, S41631, S41631A, S41631B, S41631C, S41645, S45245, S46981, S50443, S71966, S71967, S71968, S78777, 13501, M139-1LB, M139-5LB, M140-14LB, M140-1LB, M140-5LB, M141-1LB, M141-6LB, NC9534278
Synonyms: Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-97-6	Mercury	100	231-106-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid.
Danger! Corrosive. Harmful if inhaled. May be absorbed through intact skin. Causes eye and skin irritation and possible burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause central nervous system effects. Inhalation of fumes may cause metal-fume fever. May cause liver and kidney damage. Possible sensitizer. This substance has caused adverse reproductive and fetal effects in animals.
Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects
Eye: Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.
Ingestion: May cause severe and permanent damage to the digestive tract. May cause perforation

of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.
Inhalation: Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause respiratory sensitization.
Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.
Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store protected from azides.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	0.1 mg/m3 Ceiling (vapor)

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: silver
Odor: odorless
pH: Not available.

Vapor Pressure: 0.002 mm Hg @ 25C
Vapor Density: 7.0
Evaporation Rate: Not available.
Viscosity: 15.5 mP @ 25 deg C
Boiling Point: 356.72 deg C
Freezing/Melting Point:-38.87 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:13.59 (water=1)
Molecular Formula: Hg
Molecular Weight:200.59

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, incompatible materials.
Incompatibilities with Other Materials: Oxygen, sulfur, acetylene, ammonia, chlorine dioxide, azides, chlorates, nitrates, sulfuric acid, halogens, rubidium, calcium, 3-bromopropyne, ethylene oxide, lithium, methylsilane + oxygen, peroxyformic acid, tetracarbonylnickel + oxygen, copper, copper alloys, boron diiodophosphide, metals, nitromethane, sodium carbide, aluminum, lead, iron, metal oxides.
Hazardous Decomposition Products: Mercury/mercury oxides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-97-6: OV4550000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-97-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at site of application).
Teratogenicity: Inhalation, rat: TCLo = 1 mg/m3/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m3/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m3/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m3.
Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the brain cortex can occur as a late sequela to past exposure.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury cmpd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be a rapid process.
Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.
Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	**Canada TDG**
Shipping Name:	MERCURY	MERCURY
Hazard Class:	8	8
UN Number:	UN2809	UN2809
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-97-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs

CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7439-97-6: acute, chronic.

Section 313

This material contains Mercury (CAS# 7439-97-6, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7439-97-6 (listed as Mercury compounds) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains Mercury, a chemical known to the state of California to cause developmental reproductive toxicity.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 23 Toxic by inhalation.
R 33 Danger of cumulative effects.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 7 Keep container tightly closed.
S 60 This material and its container must be disposed of as hazardous waste.
S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 7439-97-6: 3

Canada - DSL/NDSL

CAS# 7439-97-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, E.

Canadian Ingredient Disclosure List

CAS# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999
Revision #7 Date: 1/20/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

11 M

International Chemical Safety Cards

NICKEL

ICSC: 0062

NICKEL
(powder)
Ni
Molecular mass: 58.7

CAS # 7440-02-0
RTECS # QR5950000
ICSC # 0062
EC # 028-002-00-7

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable as dust. Toxic fumes may be released in a fire.		Water in large amounts, foam, dry sand, NO carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Separated from strong acids.	Xn symbol R: 40-43 S: (2-)22-36

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0062

International Chemical Safety Cards

NICKEL

ICSC: 0062

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** ODOURLESS SILVERY METALLIC SOLID IN VARIOUS FORMS. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts violently, in powder form, with titanium powder and potassium perchlorate, and oxidants such as ammonium nitrate, causing fire and explosion hazard. Reacts slowly with non-oxidizing acids and more rapidly with oxidizing acids. Toxic gases and vapours (such as nickel carbonyl) may be released in a fire involving nickel. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 1 mg/m^3 (as TWA) (ACGIH 1993-1994).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of the dust and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of the fumes may cause pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma. Lungs may be affected by repeated or prolonged exposure. The substance may have effects on the nasal sinuses , resulting in inflammation and ulceration.
PHYSICAL PROPERTIES	Boiling point: 2730°C Melting point: 1455°C	Relative density (water = 1): 8.9 Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Anyone who has shown symptoms of asthma due to this substance should avoid all further contact with this substance.

ADDITIONAL INFORMATION

ICSC: 0062	**NICKEL**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

Material Safety Data Sheet

PAH Contaminated Soil

ACC# 17974

Section 1 - Chemical Product and Company Identification

MSDS Name: PAH Contaminated Soil
Catalog Numbers: SRS103100
Synonyms: API separator sludge
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
Not available	Soil	78-99	unlisted
120-12-7	Anthracene	0-2	204-371-1
129-00-0	Pyrene	0-2	204-927-3
132-64-9	Dibenzofuran	0-2	205-071-3
205-99-2	Benzo(b)fluoranthene	0-2	205-911-9
206-44-0	Fluoranthene	0-2	205-912-4
208-96-8	Acenaphthylene	0-2	205-917-1
218-01-9	1,2-benzphenanthrene	0-2	205-923-4
50-32-8	Benzo(a)pyrene	0-2	200-028-5
56-55-3	1,2-Benzanthracene	0-2	200-280-6
83-32-9	Acenaphthene	0-2	201-469-6
85-01-8	Phenanthrene	0-2	201-581-5
86-73-7	Fluorene	0-2	201-695-5
87-86-5	Pentachlorophenol	0-2	201-778-6
91-20-3	Naphthalene	0-2	202-049-5
91-57-6	2-methylnaphthalene	0-2	202-078-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: not available solid.
Warning! May cause allergic skin reaction. Causes eye and skin irritation. May cause cancer based on animal studies.
Target Organs: Eyes, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Naphthalene can cause cataracts, optical neuritis, and cornea injuries. Ingestion of large quantities may cause severe hemolytic anemia and
Inhalation: Causes respiratory tract irritation. May cause effects similar to those described for ingestion.
Chronic: May cause cancer according to animal studies. Prolonged exposure to respirable crystalline quartz may cause delayed lung injury/fibrosis (silicosis).

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: Not published.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling: Wash hands before eating. Use with adequate ventilation. Avoid contact with skin and eyes. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a cool, dry place.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Soil	none listed	none listed	none listed
Anthracene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Dibenzofuran	none listed	none listed	none listed
Benzo(b)fluoranthene	none listed	none listed	none listed
Fluoranthene	none listed	none listed	none listed
Acenaphthylene	none listed	none listed	none listed
1,2-benzphenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

Benzo(a)pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
1,2-Benzanthracene	none listed	none listed	none listed
Acenaphthene	none listed	none listed	none listed
Phenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Fluorene	none listed	none listed	none listed
Pentachlorophenol	0.5 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.5 mg/m3 TWA 2.5 mg/m3 IDLH	0.5 mg/m3 TWA
Naphthalene	10 ppm TWA; 15 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	10 ppm TWA; 50 mg/m3 TWA 250 ppm IDLH	10 ppm TWA; 50 mg/m3 TWA
2-methylnaphthalene	none listed	none listed	none listed

OSHA Vacated PELs: Soil: No OSHA Vacated PELs are listed for this chemical. Anthracene: No OSHA Vacated PELs are listed for this chemical. Pyrene: No OSHA Vacated PELs are listed for this chemical. Dibenzofuran: No OSHA Vacated PELs are listed for this chemical. Benzo(b)fluoranthene: No OSHA Vacated PELs are listed for this chemical. Fluoranthene: No OSHA Vacated PELs are listed for this chemical. Acenaphthylene: No OSHA Vacated PELs are listed for this chemical. 1,2-benzphenanthrene: No OSHA Vacated PELs are listed for this chemical. Benzo(a)pyrene: No OSHA Vacated PELs are listed for this chemical. 1,2-Benzanthracene: No OSHA Vacated PELs are listed for this chemical. Acenaphthene: No OSHA Vacated PELs are listed for this chemical. Phenanthrene: No OSHA Vacated PELs are listed for this chemical. Fluorene: No OSHA Vacated PELs are listed for this chemical. Pentachlorophenol: 0.5 mg/m3 TWA Naphthalene: 10 ppm TWA; 50 mg/m3 TWA 2-methylnaphthalene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: not available
Odor: none reported
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density: Not available.
Molecular Formula: Mixture
Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures.
Incompatibilities with Other Materials: None reported.
Hazardous Decomposition Products: No data available.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 120-12-7: CA9350000
CAS# 129-00-0: UR2450000; UR2450100
CAS# 132-64-9: HP4430000
CAS# 205-99-2: CU1400000
CAS# 206-44-0: LL4025000
CAS# 208-96-8: AB1254000; AB1254200
CAS# 218-01-9: GC0700000
CAS# 50-32-8: DJ3675000
CAS# 56-55-3: CV9275000
CAS# 83-32-9: AB1000000
CAS# 85-01-8: SF7175000
CAS# 86-73-7: LL5670000
CAS# 87-86-5: SM6300000; SM6314000; SM6321000
CAS# 91-20-3: QJ0525000
CAS# 91-57-6: QJ9635000
LD50/LC50:
CAS# 120-12-7:

Oral, mouse: LD50 = 4900 mg/kg;

CAS# 129-00-0:
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, rat: LC50 = 170 mg/m3;
Inhalation, rat: LC50 = 170 mg/m3;
Oral, mouse: LD50 = 800 mg/kg;
Oral, rat: LD50 = 2700 mg/kg;

CAS# 132-64-9:

CAS# 205-99-2:

CAS# 206-44-0:
Oral, rat: LD50 = 2 gm/kg;
Skin, rabbit: LD50 = 3180 mg/kg;

CAS# 208-96-8:
Oral, mouse: LD50 = 1760 mg/kg;

CAS# 218-01-9:

CAS# 50-32-8:

CAS# 56-55-3:

CAS# 83-32-9:

CAS# 85-01-8:
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1.8 gm/kg;

CAS# 86-73-7:

CAS# 87-86-5:
Draize test, rabbit, eye: 100 uL/24H Mild;
Inhalation, mouse: LC50 = 225 mg/m3;
Inhalation, mouse: LC50 = 225 mg/m3;
Inhalation, rat: LC50 = 355 mg/m3;
Inhalation, rat: LC50 = 200 mg/m3;
Inhalation, rat: LC50 = 335 mg/m3;
Oral, mouse: LD50 = 36 mg/kg;
Oral, mouse: LD50 = 117 mg/kg;
Oral, mouse: LD50 = 30 mg/kg;
Oral, rabbit: LD50 = 200 mg/kg;
Oral, rat: LD50 = 27 mg/kg;
Oral, rat: LD50 = 27 mg/kg;
Oral, rat: LD50 = 50 mg/kg;
Skin, rat: LD50 = 96
CAS# 91-20-3:
Draize test, rabbit, eye: 100 mg Mild;
Inhalation, rat: LC50 = >340 mg/m3/1H;
Oral, mouse: LD50 = 316 mg/kg;
Oral, rat: LD50 = 490 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rat: LD50 = >2500 mg/kg;

CAS# 91-57-6:
Oral, rat: LD50 = 1630 mg/kg;

Carcinogenicity:
CAS# 120-12-7:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 129-00-0:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 132-64-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 205-99-2:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 208-96-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 56-55-3:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

CAS# 83-32-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 85-01-8:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').

- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 86-73-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 87-86-5:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90
- **NTP:** Not listed.
- **IARC:** Not listed.

CAS# 91-20-3:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/19/02
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 91-57-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 206-44-0: waste number U120.
CAS# 218-01-9: waste number U050.
CAS# 50-32-8: waste number U022.
CAS# 56-55-3: waste number U018.
CAS# 91-20-3: waste

Section 14 - Transport Information

	US DOT	Canada TDG

Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

Soil is not listed on the TSCA inventory. It is for research and development use only.
CAS# 120-12-7 is listed on the TSCA inventory.
CAS# 129-00-0 is listed on the TSCA inventory.
CAS# 132-64-9 is listed on the TSCA inventory.
CAS# 205-99-2 is not listed on the TSCA inventory. It is for research and development use only.
CAS# 206-44-0 is listed on the TSCA inventory.
CAS# 208-96-8 is listed on the TSCA inventory.
CAS# 218-01-9 is listed on the TSCA inventory.
CAS# 50-32-8 is listed on the TSCA inventory.
CAS# 56-55-3 is listed on the TSCA inventory.
CAS# 83-32-9 is listed on the TSCA inventory.
CAS# 85-01-8 is listed on the TSCA inventory.
CAS# 86-73-7 is listed on the TSCA inventory.
CAS# 87-86-5 is listed on the TSCA inventory.
CAS# 91-20-3 is listed on the TSCA inventory.
CAS# 91-57-6 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 129-00-0: Effective 6/1/87, Sunset 6/1/97 CAS# 91-20-3: Effective 6/1/87, Sunset 6/1/97

Chemical Test Rules

CAS# 91-20-3: Testing required by manufacturers, processors

Section 12b

CAS# 91-20-3: Section 4

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 120-12-7: 5000 lb final RQ; 2270 kg final RQ CAS# 129-00-0: 5000 lb final RQ; 2270 kg final RQ CAS# 132-64-9: 100 lb final RQ; 45.4 kg final RQ CAS# 205-99-2: 1 lb final RQ; 0.454 kg final RQ CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ CAS# 208-96-8: 5000 lb final RQ; 2270 kg final RQ CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ CAS# 56-55-3: 10 lb final RQ; 4.54 kg final RQ CAS# 83-32-9: 100 lb final RQ; 45.4 kg final RQ CAS# 85-01-8: 5000 lb final RQ; 2270 kg final RQ CAS# 86-73-7: 5000 lb final RQ; 2270 kg final RQ CAS# 87-86-5: 10 lb final RQ; 4.54 kg final RQ CAS# 91-20-3: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 129-00-0: 1000 lb TPQ (lower threshold); 10000 lb TPQ (upper threshold)

SARA Codes

CAS # 120-12-7: acute.
CAS # 129-00-0: acute, chronic.
CAS # 206-44-0: acute.

CAS # 50-32-8: acute, chronic.
CAS # 56-55-3: chronic.
CAS # 83-32-9: acute.
CAS # 85-01-8: acute.
CAS # 91-20-3: acute, chronic, flammable.
CAS # 91-57-6: acute.

Section 313

This material contains Anthracene (CAS# 120-12-7, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Dibenzofuran (CAS# 132-64-9, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Benzo(b)fluoranthene (CAS# 205-99-2, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Fluoranthene (CAS# 206-44-0, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains 1,2-benzphenanthrene (CAS# 218-01-9, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Benzo(a)pyrene (CAS# 50-32-8, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains 1,2-Benzanthracene (CAS# 56-55-3, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Phenanthrene (CAS# 85-01-8, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Pentachlorophenol (CAS# 87-86-5, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Naphthalene (CAS# 91-20-3, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 132-64-9 is listed as a hazardous air pollutant (HAP).

CAS# 87-86-5 is listed as a hazardous air pollutant (HAP).
CAS# 91-20-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 87-86-5 is listed as a Hazardous Substance under the CWA. CAS# 91-20-3 is listed as a Hazardous Substance under the CWA. CAS# 120-12-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 129-00-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 205-99-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 208-96-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 56-55-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 83-32-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 85-01-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 86-73-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 87-86-5 is listed as a Priority Pollutant under the Clean Water Act. CAS# 91-20-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 83-32-9 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 87-86-5 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 91-20-3 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 120-12-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 129-00-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 132-64-9 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 205-99-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

CAS# 208-96-8 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 56-55-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 83-32-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

CAS# 85-01-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 86-73-7 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 87-86-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-20-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-57-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

WARNING: This product contains Benzo(b)fluoranthene, a chemical known to the state of California to cause cancer. WARNING: This product contains 1,2-benzphenanthrene, a chemical known to the state of California to cause cancer. WARNING: This product contains Benzo(a)pyrene, a chemical known to the state of California to cause cancer. WARNING: This product contains 1,2-Benzanthracene, a chemical known to the state of California to cause cancer. WARNING: This product contains Pentachlorophenol, a chemical known to the state of California to cause cancer. WARNING: This product contains Naphthalene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 205-99-2: 0.096 æg/day NSRL (oral) CAS# 218-01-9: 0.35 æg/day NSRL (oral) CAS# 50-32-8: 0.06 æg/day NSRL CAS# 56-55-3: 0.033 æg/day NSRL (oral) CAS# 87-86-5: 40 æg/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 120-12-7: 2
CAS# 129-00-0: No information available.
CAS# 132-64-9: No information available.
CAS# 205-99-2: No information available.
CAS# 206-44-0: No information available.
CAS# 208-96-8: No information available.
CAS# 218-01-9: No information available.
CAS# 50-32-8: No information available.
CAS# 56-55-3: No information available.
CAS# 83-32-9: No information available.
CAS# 85-01-8: No information available.
CAS# 86-73-7: No information available.
CAS# 87-86-5: 3
CAS# 91-20-3: 2
CAS# 91-57-6: No information available.

Canada - DSL/NDSL

CAS# 120-12-7 is listed on Canada's DSL List.
CAS# 129-00-0 is listed on Canada's DSL List.
CAS# 132-64-9 is listed on Canada's DSL List.
CAS# 218-01-9 is listed on Canada's DSL List.
CAS# 50-32-8 is listed on Canada's DSL List.
CAS# 83-32-9 is listed on Canada's DSL List.
CAS# 85-01-8 is listed on Canada's DSL List.
CAS# 86-73-7 is listed on Canada's DSL List.
CAS# 87-86-5 is listed on Canada's DSL List.
CAS# 91-20-3 is listed on Canada's DSL List.
CAS# 91-57-6 is listed on Canada's DSL List.
CAS# 206-44-0 is listed on Canada's NDSL List.
CAS# 208-96-8 is listed on Canada's NDSL List.
CAS# 56-55-3 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

Canadian Ingredient Disclosure List

CAS# 120-12-7 is listed on the Canadian Ingredient Disclosure List.
CAS# 129-00-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 205-99-2 is listed on the Canadian Ingredient Disclosure List.
CAS# 206-44-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 208-96-8 is not listed on the Canadian Ingredient Disclosure List.
CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.
CAS# 56-55-3 is listed on the Canadian Ingredient Disclosure List.
CAS# 83-32-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 85-01-8 is listed on the Canadian Ingredient Disclosure List.
CAS# 86-73-7 is not listed on the Canadian Ingredient Disclosure List.
CAS# 87-86-5 is not listed on the Canadian Ingredient Disclosure List.
CAS# 91-20-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #3 Date: 3/18/2003

METAL

12 M

International Chemical Safety Cards

SELENIUM

ICSC: 0072

Se
Atomic mass: 79.0
(powder)
Atomic mass: Atomic mass: 79.0

ICSC # 0072
CAS # 7782-49-2
RTECS # VS7700000
UN # 2658 (powder)
EC # 034-001-00-2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion with oxidants.		Use extinguishing media appropriate to surrounding fire conditions. NO contact with water.
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•INHALATION	Irritation of nose. Cough. Dizziness. Headache. Laboured breathing. Nausea. Sore throat. Vomiting. Weakness. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness. Skin burns. Pain. Discolouration.	Protective gloves. Protective clothing.	Rinse skin with plenty of water or shower. Refer for medical attention. Remove and isolate contaminated clothes.
•EYES	Redness. Pain. Blurred vision.	Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.

•INGESTION	Metallic taste. Diarrhoea. Chills. Fever (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	**STORAGE**	**PACKAGING & LABELLING**
Do NOT wash away into sewer. Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: P3 filter respirator for toxic particles).	Fireproof. Separated from strong oxidants, strong acids, food and feedstuffs. Dry.	Airtight. Do not transport with food and feedstuffs. T symbol R: 23/25-33 S: 1/2-20/21-28-45 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0072	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1998. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

SELENIUM

ICSC: 0072

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** ODOURLESS SOLID IN VARIOUS FORMS. DARK RED-BROWN TO BLUISH-BLACK AMORPHOUS SOLID OR RED TRANSPARENT CRYSTALS OR METALLIC GREY TO BLACK CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with oxidants and strong acids. Reacts with water at 50°C forming flammable hydrogen (see ICSC # 0001) and selenious acids. Reacts with incandescence on gentle heating with phosphorous and metals such as nickel, zinc, sodium, potassium, platinum. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: ppm; 0.2 mg/m^3 as TWA (ACGIH 1991-1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly by dispersion. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes and the respiratory tract. Inhalation of dust may cause lung oedema (see Notes). Inhalation of fume may cause symptoms of asphyxiation, chills and fever and bronchitis. The effects may be delayed. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the respiratory tract,

	OSHA PEL*: TWA 0.2 mg/m^3 *Note: The PEL also applies to other selenium compounds (as Se) except NIOSH REL: TWA 0.2 mg/m^3 *Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride. NIOSH IDLH: 1 mg/m^3 (as Se)	gastrointestinal tract, and skin , resulting in nausea, vomiting, cough, yellowish skin discolouration, loss of nails, garlic breath and bad teeth.
PHYSICAL PROPERTIES	Boiling point: 685°C Melting point: 170-217°C Relative density (water = 1): 4.8	Solubility in water: none Vapour pressure, Pa at 20°C: 0.1
ENVIRONMENTAL DATA		

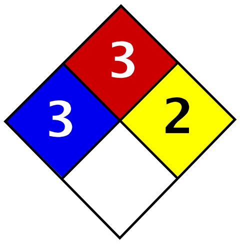
NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0072 **SELENIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.



Health	3
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet

Sodium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium

Catalog Codes: SLS3505

CAS#: 7440-23-5

RTECS: VY0686000

TSCA: TSCA 8(b) inventory: Sodium

CI#: Not applicable.

Synonym: Natrium

Chemical Name: Sodium

Chemical Formula: Na

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium	7440-23-5	100

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 115°C (239°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Extremely flammable in presence of moisture.
Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. Moisture reactive material.
SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Flammable solid that, in contact with water, emits flammable gases.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 22.99 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 881.4°C (1618.5°F)

Melting Point: 97.8°C (208°F)

Critical Temperature: Not available.

Specific Gravity: 0.97 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with oxidizing agents, acids, moisture.
The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant).
Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Sodium : UN1428 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium
Massachusetts RTK: Sodium
TSCA 8(b) inventory: Sodium
CERCLA: Hazardous substances.: Sodium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R17- Spontaneously flammable in air.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 06:28 PM

Last Updated: 10/09/2005 06:28 PM

CITGO Gasolines, All Grades Unleaded

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No.	UNLEAD
Revision Date	05/23/2005

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

Emergency Overview

Physical State	Liquid.		
Color	Transparent, clear to amber or red.	**Odor**	Pungent, characteristic gasoline.

DANGER:
Extremely flammable liquid; vapor may cause flash fire or explosion.
Vapor may travel considerable distance to source of ignition and flash back.
Use Only as a Motor Fuel. Do Not Siphon by Mouth.
Harmful or fatal if swallowed - Can enter lungs and cause damage.
High concentrations of vapor reduce oxygen available for breathing and may cause suffocation.
May be harmful if inhaled or absorbed through the skin.
Mist or vapor may irritate the eyes, mucous membranes, and respiratory tract.
Liquid contact may cause eye and skin irritation.
Overexposures may cause central nervous system (CNS) depression and target organ effects (See Section 3).
Harmful or fatal if swallowed - Can enter lung and cause damage.
Inhalation overexposure can increase the heart's susceptibility to arrhythmias (irregular beats).
Contains Benzene - Cancer Hazard.
Long term exposure to gasoline vapor has caused cancer in laboratory animals.
Avoid Spills. Spills may present both a physical and an environmental hazard.

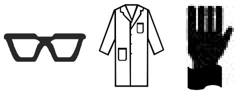
Hazard Rankings

	HMIS	NFPA
Health Hazard	* 2	1
Fire Hazard	3	3
Reactivity	0	0

*** = Chronic Health Hazard**

Protective Equipment

Minimum Recommended
See Section 8 for Details



SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO Gasolines, All Grades Unleaded	**Technical Contact**	(800) 248-4684
Product Number	Various	**Medical Emergency**	(832) 486-4700
CAS Number	Mixture.	**CHEMTREC Emergency (United States Only)**	(800) 424-9300

Product Family	Motor fuels.
Synonyms	Unleaded Gasolines; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated.

SECTION 2. COMPOSITION

Gasoline is a complex and variable mixture that originates from finished refinery streams. These streams can contain the hydrocarbons and oxygenated chemicals (oxygenates) listed below that are regulated or are associated with certain potential health effects. The typical concentration of oxygenates in gasoline does not exceed 18% (v/v).

Component Name(s)	CAS Registry No.	Concentration (%)
Methyl tertiary-Butyl Ether (MTBE)	1634-04-4	0 - 15
Tertiary-Amyl Methyl Ether (TAME)	994-05-8	0 - 15
Ethyl tertiary Butyl Ether (ETBE)	637-92-3	0 - 15
Tertiary-Amyl Ethyl Ether (TAEE)	919-94-8	0 - 15
Diisopropyl Ether (DIPE)	108-20-3	0 - 15
Ethanol	64-17-5	0 - 10
Toluene	108-88-3	<20
Xylene, all isomers	1330-20-7	<18
n-Hexane	110-54-3	<8
Trimethylbenzenes, all isomers	25551-13-7	<5
Benzene	71-43-2	<5
Cumene	98-82-8	<4
Ethylbenzene	100-41-4	<4
Cyclohexane	110-82-7	<3
Naphthalene	91-20-3	<2
Styrene	100-42-5	<1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Eye contact. Inhalation. Ingestion.

Signs and Symptoms of Acute Exposure

Inhalation	Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness. Breathing high concentrations of this material, for example, in an enclosed space or by intentional abuse, can cause irregular heartbeats which can cause death.
Eye Contact	This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.
Skin Contact	This material can cause skin irritation. The severity of irritation will depend on the amount of material that is applied to the skin and the speed and thoroughness that it is removed. It is likely that some components of this material are able to pass into the body through the skin and may cause similar effects as from breathing or swallowing it. If the skin is damaged, absorption increases.
Ingestion	

If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggered gait, drowsiness, loss of consciousness and delirium, as well as additional central nervous system (CNS) effects.

Due to its light viscosity, there is a danger of aspiration into the lungs during swallowing and subsequent vomiting. Aspiration can result in severe lung damage or death. Cardiovascular effects include shallow rapid pulse with pallor (loss of color in the face) followed by flushing (redness of the face). Also, progressive CNS depression, respiratory insufficiency and ventricular fibrillation leads to death.

Chronic Health Effects Summary

Intentional misuse by deliberately concentrating and inhaling gasoline can be harmful or fatal. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage ("Petrol Sniffers Encephalopathy"), delirium, seizures and sudden death are associated with repeated abuse of gasoline or naphtha.

Chronic effects of ingestion and subsequent aspiration into the lungs may include pneumatocele (lung cavity) formation and chronic lung dysfunction.

Benzene, a component of this product, causes blood disorders and damages the bone marrow (certain types of anemia, leukemia, and lymphoma). It is also capable of causing changes in living cells' genetic material (chromosomes). Benzene is considered to be a mutagen and a cancer-causing agent (leukemogen).

Repeated and prolonged overexposure to n-hexane has been associated with peripheral nerve tissue damage. Adverse effects include numbness, tingling, pain, and loss of muscle control in the extremities, disorientation, impaired vision and reflexes, decline in motor function and paralysis.

Prolonged or repeated overexposure to toluene, a component of this product, has been associated with reproductive effects in experimental animals and in long-term chemical abuse situations. Long-term overexposure to toluene has been associated with impaired color vision. Also, long-term overexposure to toluene in occupational environments have been associated with hearing damage.

Prolonged or repeated overexposure to xylene, a component of this product, has been associated with hearing damage in laboratory animals. Repeated overexposure may cause injury to bone marrow, blood cells, kidney, and liver.

Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS), Cardiovascular System, Blood-forming system

Target Organs

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, mucous membranes, heart, peripheral nervous system, cardiovascular system, upper respiratory tract, skin, auditory system, bone marrow, central nervous system (CNS), eye, lens or cornea.

Carcinogenic Potential

This material may contain benzene, ethylbenzene, naphthalene or styrene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has identified ethylbenzene, styrene, naphthalene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification				OSHA Physical Hazard Classification					
Irritant	☒	Sensitizer	☐	Combustible	☐	Explosive	☐	Pyrophoric	☐
Toxic	☐	Highly Toxic	☐	Flammable	☒	Oxidizer	☐	Water-reactive	☐
Corrosive	☐	Carcinogenic	☒	Compressed Gas	☐	Organic Peroxide	☐	Unstable	☐

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation	Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. If exposed to benzene in an emergency situation, a medical evaluation should be completed at the end of the work-shift in accordance with OSHA requirements.
Eye Contact	Flush eyes with cool, clean, low-pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. If easily accomplished, check for and remove contact lenses. If contact lenses cannot be removed, seek immediate medical attention. Do not use eye ointment. Seek medical attention.
Skin Contact	Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.
Ingestion	Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.
Notes to Physician	INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required. This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administion of sympathomimetic drugs should be avoided. INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-IB flammable liquid.
Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])
Lower Flammable Limit	AP 1.4 %
Upper Flammable Limit	AP 7.6 %
Autoignition Temperature	280°C (536°F)
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons, aldehydes and other products of incomplete combustion.
Special Properties	Flammable Liquid! This material releases vapors at or below ambient temperatures. When mixed with air in certain proportions and exposed to an ignition source, its vapor can cause a flash fire. Use only with adequate ventilation. Vapors are heavier than air and may travel long distances along the ground to an ignition source and flash back. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. If container is not properly cooled, it can rupture in the heat of a fire.
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, or inert gas (nitrogen). Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces. LARGE FIRE: Use foam, water fog, or water spray. Water May Be Ineffective. Water may not extinguish the fire. Water fog and spray are effective in cooling containers and adjacent structures. However, water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Flammable Liquid! Release causes an immediate fire or explosion hazard. Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security. A vapor-suppressing foam may be used to reduce vapors. Eliminate all ignition sources. All equipment used when handling this material must be grounded. Stop the leak if it can done without risk. Do not touch or walk through spilled material. Remove spillage immediately from hard, smooth walking areas. Prevent spilled material from entering waterways, sewers, basements, or confined areas. Absorb or cover with dry earth, sand, or other non-combustible material and transfer to appropriate waste containers. Use clean, non-sparking tools to collect absorbed material.

For large spills, secure the area and control access. Prevent spilled material from entering sewers, storm drains, other drainage systems, and natural waterways. Dike far ahead of a liquid spill to ensure complete collection. Water mist or spray may be used to reduce or disperse vapors; but, it may not prevent ignition in closed spaces. This material will float on water and its run-off may create an explosion or fire hazard. Verify that responders are properly HAZWOPER-trained and wearing appropriate respiratory equipment and fire-resistant protective clothing during cleanup operations. In an urban area, cleanup spill as soon as possible; in natural environments, cleanup on advice from specialists. Pick up free liquid for recycle and/or disposal if it can be accomplished safely with explosion-proof equipment. Collect any excess material with absorbant pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal. Comply with all applicable local, state and federal laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

FLAMMABLE LIQUID AND VAPOR. **USE ONLY as a motor fuel.** DO NOT siphon by mouth. DO NOT use as a lighter fluid, solvent or cleaning fluid. Prior to handling or refueling, stop all engines and auxillary equipment. Turn off all electronic equipment including cellular telephones. DO NOT leave nozzle unattended during filling or refueling a vehicle. DO NOT re-enter vehicle while refueling. Keep nozzle spout in contact with the container during the entire filling operations.

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained middle distillates or similar products).

A spill or leak can cause an immediate fire hazard. Keep containers closed and do not handle or store near heat, sparks, or any other potential ignition sources. Do not contact with oxidizable materials. Do not breathe vapor. Use only with adequate ventilation and personal protection. Never siphon by mouth. Avoid contact with eyes, skin, and clothing. Prevent contact with food and tobacco products. Do not take internally.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons away from the area. Eliminate all potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Follow proper entry procedures, including compliance with 29 CFR 1910.146 prior to entering confined spaces such as tanks or pits. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure limits. Use appropriate respiratory protection when concentrations exceed any established occupational exposure level (See Section 8). Promptly remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling, transfer and storage equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. **Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues.** Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

Storage

Store and transport in accordance with all applicable laws. Keep containers tightly closed. Store in a cool, dry, well-ventilated place. Clearly label all containers. Do not allow containers to be kept in enclosed vehicles. Keep away from all ignition sources. Ground all equipment containing this material. Containers must be able to withstand pressures that are created from changes in product temperature. Product samples and other small containers of this flammable liquid should be stored in a separate safety cabinet or room. All electrical equipment in areas where this material is stored or handled should be installed and operated in accordance with applicable regulatory requirements and the National Electrical Code.

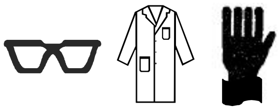
SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Hand Protection

Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use this material as a skin cleaner.

Body Protection

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respiratory Protection

For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

General Comments

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance	Applicable Workplace Exposure Levels

Gasoline	**ACGIH (United States).** TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Toluene	**ACGIH (United States). Skin** TWA: 50 ppm 8 hour(s). **OSHA (United States).** TWA: 200 ppm 8 hour(s). CEIL: 300 ppm PEAK: 500 ppm
Xylene, all isomers	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).
Tertiary-Amyl Methyl Ether (TAME)	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s).
Methyl tertiary-Butyl Ether (MTBE)	**ACGIH (United States).** TWA: 50 ppm 8 hour(s).
Ethyl tertiary Butyl Ether (ETBE)	**ACGIH TLV (United States).** TWA: 5 ppm 8 hour(s).
n-Hexane	**ACGIH (United States). Skin** TWA: 50 ppm 8 hour(s). **OSHA (United States).** TWA: 500 ppm 8 hour(s).
Cumene	**ACGIH (United States).** TWA: 50 ppm 8 hour(s). **OSHA (United States). Skin** TWA: 50 ppm 8 hour(s).
Trimethylbenzenes, all isomers	**ACGIH (United States).** TWA: 25 ppm 8 hour(s).
Benzene	**ACGIH (United States). Skin** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s). **OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL.** TWA: 1 ppm 8 hour(s). STEL: 5 ppm 15 minute(s).
Ethylbenzene	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).
Cyclohexane	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). **OSHA (United States).** TWA: 300 ppm 8 hour(s).
Naphthalene	**ACGIH (United States). Skin** TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). **OSHA (United States).** TWA: 10 ppm 8 hour(s).
Styrene	**ACGIH (United States).** TWA: 20 ppm 8 hour(s). STEL: 40 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s). STEL: 200 ppm 15 minute(s). PEAK: 600 ppm

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SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	**Color**	Transparent, clear to amber or red.	**Odor**	Pungent, characteristic gasoline.
Specific Gravity	0.72 - 0.77 (Water = 1)	**pH**	Not applicable	**Vapor Density**	3 to 4 (Air = 1)

Boiling Range	38 to 204°C (100 to 400°F)	**Melting/Freezing Point**	Not available.
Vapor Pressure	220 to 450 mm Hg at 20°C (68°F) or 6 to 15 Reid-psia at 37.8°C (100°F).	**Volatility**	720 to 770 g/l VOC (w/v)
Solubility in Water	Hydrocarbon components of gasoline are slightly soluble in water. Oxygenate components, such as MTBE, are more soluble than the hydrocarbon components. Ethanol has greater solubility in water than hydrocarbon components or other oxygenate components.	**Viscosity (cSt @ 40°C)**	<1
Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])		
Additional Properties	Average Density at 60°F = 6.0 to 6.4 lbs./gal. (ASTM D-2161)		

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	**Hazardous Polymerization**	Not expected to occur.
Conditions to Avoid	Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents.		
Materials Incompatibility	Strong acids, alkalies and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Gasoline:
VAPOR (TELo) Acute: 140 ppm (Human) (8 hours) - Mild eye irritant.
VAPOR (TELo) Acute: 500 ppm (Human) (1 hour) - Moderate eye irritant.
INHALATION (TCLo) Acute: 900 ppm (Human) (1 hour) - CNS and pulmonary effects.
DERMAL (TDLo) Acute: 53 mg/kg (Human) - Skin allergy effects.
INHALATION (LC50) Acute: 101,200 ppm (Rat, Mouse, & Guinea Pig) (5 minutes).

Gasoline Containing 15% MTBE:
ORAL (LD50) Acute: >5,000 mg/kg (Rat screen level).
DERMAL (LD50) Acute: >2,000 mg/kg (Rabbit screen level).
INHALATION (LC50) Acute: >5,200 ppm (Rat screen level) (8 hours).
DRAIZE EYE Acute: Mild eye irritant. (Rabbit).

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DRAIZE DERMAL Acute: Moderate skin irritant. (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL Sub-Chronic: Severe skin irritant. (Rabbit).

A major epidemiological study concluded that there was no increased risk of kidney cancer associated with gasoline exposures for petroleum refinery employees or neighboring residents. Another study identified a slight trend in kidney cancers among service station employees following a 30-year latency period. Two-year inhalation toxicity studies with fully vaporized unleaded gasoline (at concentrations of 67, 292 and 2,056 ppm in air) produced kidney damage and kidney tumors in male rats, but not in female rats or mice of either sex. Results from subsequent scientific studies suggest that the kidney damage, and probably the kidney tumor response, is limited to the male rat. The kidney tumors apparently were the result of the formation of alpha-2u-globulin, a protein unique to male rats. This finding is not considered relevant to human exposure. Under conditions of the study, there was no evidence that exposure to unleaded gasoline vapor is associated with developmental toxicity. Experimental studies with laboratory animals did suggest that overexposure to gasoline may adversely effect male reproductive performance. Also, in laboratory studies with rats, the maternal and developmental "no observable adverse effect level" (NOAEL) was determined to be 9,000 ppm (75% of the LEL value). Female mice developed a slightly higher incidence of liver tumors compared to controls at the highest concentration. In a four week inhalation study of Sprague Dawley® rats, gasoline vapor condensate was determined to induce sister chromatid exchanges in peripheral lymphocytes. IARC has listed gasoline as possibly carcinogenic to humans (Group 2B).

Pentanes, all isomers:
Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

Toluene:
Effects from Acute Exposure:
Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system and can cause CNS depression, cardiac arrhythmias and death. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects.

Effects from Repeated or Prolonged Exposure:
Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

Heptane, all isomers:
n-Heptane was not mutagenic in the Salmonella/microsome (Ames) assay and is not considered to be carcinogenic.

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Xylene, all isomers:
Effects from Acute Exposure:
ORAL (LD_{50}), Acute: 4,300 mg/kg [Rat].
INHALATION (LC_{50}), Acute: 4,550 ppm for four hours [Rat].
DERMAL (LD_{50}), Acute: 14,100 uL/kg [Rabbit].
Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Effects from Prolonged or Repeated Exposure:
Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

Ethyl tertiary Butyl Ether (ETBE):
ETBE can cause eye, skin and mucous membrane irritation. In a four week inhalation study, moderate ataxia was observed in rats at the highest dose level (4,000 ppm). The test animals appeared normal within 15 minutes of termination of exposure. A no observed adverse effect level (NOAEL) of 500 ppm was indicated by the study authors based on neurotoxic effects. In two unpublished 90 day inhalation studies, rats and mice were exposed six hour/day, five days/week at concentrations of 0, 500, 1750 and 5000 ppm of ETBE vapor. The male rats exhibited time and concentration-dependent nephropathy consistent with alpha-2µ-globulin formation. An ETBE NOAEL for male rats of 500 ppm was suggested based on a finding of testicular lesions. In human studies with eight males, slight, but significant ($p<0.05$) decreases in objective pulmonary function measures after exposure to ETBE at concentrations of 25 and 50 ppm for two hours.

Tertiary-Amyl Methyl Ether (TAME):
TAME was found to be negative for the induction of structural chromosome aberrations (both metabolically-activated and non-activated) in Chinese hamster ovary (CHO) cells. Inhalation of TAME vapors at concentrations above 250 ppm produced reversible CNS depression in rats and mice. In a four week inhalation study, increases in liver weights with no tissue injury were observed in rats exposed to a TAME concentration of 500 ppm. Birth defects in mice and fetotoxicity in both rats and mice were observed after inhalation exposures to maternally toxic concentrations of TAME.

Methyl tertiary-Butyl Ether (MTBE):
Acute symptoms associated with human exposure to MTBE appear to be mild and transient. In laboratory studies, rats and mice exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities. In laboratory studies, MTBE vapor exposure at the high dose concentration was associated with an increased incidence of liver tumors in female mice. Also, at high dose concentration exposures, MTBE was associated with an increased incidence of kidney and testicular (Leydig cell) tumors in male rats. Additional oncogenicity studies on rats resulted in testicular tumors following administration by ingestion. These data are not generally considered relevant to humans. NTP has not identified MTBE as either a known carcinogen or reasonably anticipated to be carcinogenic to humans. In animal studies, developmental and reproductive toxicity related to MTBE inhalation exposures was observed only at concentrations that were maternally toxic. MTBE was shown to be maternally toxic at 4,000 and 8,000 ppm levels when mice were exposed for six hours per day during their pregnancy. Also, a decrease in the number of successful pregnancies and a reduction in birth weights were observed at these exposure levels. Birth defects (cleft palate) were observed at the high dose level. These data suggest that the risk of developmental and reproductive toxicity in humans is negligible as a result of anticipated

exposures to MTBE.

Diisopropyl Ether (DIPE):
Increased kidney and liver weights were observed in rats and mice in subchronic and chronic inhalation studies of DIPE. Also, evidence of microscopic changes (hyaline droplets) were reported in liver tissue and kidney tubules of rabbits and male rats exposed to DIPE at concentrations of 7,100 ppm. These findings were similar those found in gasoline studies. Overexposure by inhalation of pregnant rats to DIPE at concentrations of 3,095 and 6,745 ppm increased the frequency of rudimentary 14th ribs in the offspring. This effect was not observed at exposure concentrations of 430 ppm. The significance of these findings to human exposure is unclear.

Ethanol:
Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.

Butane, all isomers:
Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

n-Hexane:
This material contains n-hexane. Long-term or repeated exposure to n-hexane can cause permanent peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Co-exposure to methylethyl ketone or methyl isobutyl ketone increases the neurotoxic properties of n-hexane. In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

Cumene:
Effects from Acute Exposure:
Overexposure to cumene may cause upper respiratory tract irritation and severe CNS depression.

Effects from Prolonged or Repeated Exposure:
Studies in laboratory animals indicate evidence of adverse effects on the kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time.

Trimethylbenzenes, all isomers:
Studies of Workers:
Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:
In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure

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for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Benzene:

ORAL (LD50):	Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse].
INHALATION (LC50):	
(VAPOR):	Acute: 10000 ppm 7 hour(s) [Rat]. 9980 ppm 8 hour(s) [Mouse].

Studies of Workers Over-Exposed to Benzene:
Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Studies also suggest over-exposure to benzene may be associated with other types of leukemia and other blood disorders. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene.

Studies in Laboratory Animals:
Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.

Ethylbenzene:
Effects from Acute Exposure:
ORAL (LD50), Acute: 3,500 mg/kg [Rat].
DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:
Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as “possibly carcinogenic to humans” (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

Cyclohexane:
Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane

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was reported in the 1980's. However, a careful re-evaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

Naphthalene:
Studies in Humans Overexposed to Naphthalene:
Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:
Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro.*

Styrene:
Neurological injury associated with chronic styrene exposure include distal hypesthesia, decreased nerve conduction velocity, and altered psychomotor performance. These effects did not occur with exposures to airborne concentrations that were less than 100 ppm. Increased deaths from degenerative neurological disorders were found in a comprehensive epidemiological study of Danish reinforced plastics workers. These workers were reported to have a 2.5-fold increased risk for myeloid leukemia with clonal chromosome aberrations. Also, there are several studies that suggest potential reproductive effects in humans and experimental animals from overexposure to styrene. Styrene was not mutagenic in the standard (liquid phase) Ames Salmonella/microsome assay, but was weakly positive when tested in the vapor phase. IARC has listed styrene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Unleaded gasoline is potentially toxic to freshwater and saltwater ecosystems. Various grades of gasoline exhibited range of lethal toxicity (LC_{100}) from 40 PPM to 100 PPM in ambient stream water with Rainbow Trout (*Salmo irideus*). A 24-hour TLm (Median Toxic Limit) was calculated to be 90 PPM with juvenile American Shad (*Squalius cephalus*). In Bluegill Sunfish (*Lepomis macrochirus*), Grey Mullet (*Chelon labrosus*) and Gulf Menhaden (*Brevoortia patronus*), gasoline exhibited a 96-hour LC_{50} of 8 PPM, 2 PPM, and 2 PPM, respectively.

The aquatic toxicity of Methyl tertiary-Butyl Ether (MTBE) is considered to be relatively low. In the crustacean Harpacticoid Copepods (*Nitrocra spinipes*), MTBE exhibited an LC_{50} (96-hour) of 1,000 PPM to 10,000 PPM depending upon various water temperatures. In Bleak Fish (*Alburnus alburnus*), MTBE exhibited an LC_{50} (24-hour) of 1,700 PPM and an LC_{50} (96-hour) of 1,000 PPM at 10° C. In Golden Orfe Fish (*Leuciscus idus melanotus*), MTBE exhibited an LC_{50} (48-hour) of 1,000 PPM and an LC_{100} of 2,000 PPM.

Environmental Fate

Continued on Next Page

Avoid spilling gasoline. Spilled gasoline can result in environmental damage. Spilled gasoline can penetrate soil and contaminate ground water. Although gasoline is biodegradable, it may persist for prolonged time periods, particularly where oxygen levels are reduced. The hydrocarbon components of gasoline are slightly soluble in water. Gasoline hydrocarbon components do not readily dissolve in water but can be adsorbed to soils.

Gasoline contains components that are potentially toxic to freshwater and saltwater ecosystems. It will normally float on water. The components of gasoline will evaporate rapidly. Evaporated hydrocarbon components may contribute to atmospheric smog.

MTBE and other oxygenates are more soluble than other gasoline components. In addition, oxygenates such as MTBE do not adsorb to soils, sediments or suspended particulate matter as readily as other gasoline components. MTBE does not degrade as readily as other gasoline components once in ground water or subsoil. MTBE is not expected to bioconcentrate in the aquatic environment.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specfic disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status	A U.S. Department of Transportation regulated material.
Proper Shipping Name	Gasoline, 3, UN 1203, PG II Gasohol, 3, NA 1203, PGII (Use only for gasoline blended with less than 20% ethanol)
Hazard Class	3 DOT Class: Flammable liquid.
Packing Group(s)	II
UN/NA Number	UN1203 or NA1203
Reportable Quantity	A Reportable Quantity (RQ) has not been established for this material.

Placard(s)

Emergency Response Guide No.	128
MARPOL III Status	Not a DOT "Marine Pollutant" per 49 CFR 171.8.

SECTION 15. REGULATORY INFORMATION

TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
SARA 302/304 Emergency Planning and Notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.
SARA 311/312 Hazard Identification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard
SARA 313 Toxic Chemical Notification and Release Reporting	This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Toluene [CAS No.: 108-88-3] Concentration: <20% Xylene, all isomers [CAS No.: 1330-20-7] Concentration: <18% Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] Concentration: <15% n-Hexane [CAS No.: 110-54-3] Concentration: <8% Cumene [CAS No.: 98-82-8] Concentration: <4% Benzene [CAS No.: 71-43-2] Concentration: <5% Ethylbenzene [CAS No.: 100-41-4] Concentration: <4% 1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: <4% Cyclohexane [CAS No.: 110-82-7] Concentration: <3% Naphthalene [CAS No.: 91-20-3] Concentration: <2% Styrene [CAS No.: 100-42-5] Concentration: <1%
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Toluene [CAS No.: 108-88-3] RQ = 1000 lbs. (453.6 kg) Concentration: <20% Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: <18% Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] RQ = 1000 lbs. (453.6 kg) Concentration: <15% n-Hexane [CAS No.: 110-54-3] RQ = 5000 lbs. (2268 kg) Concentration: <8% 2,2,4-Trimethylpentane [CAS No.: 540-84-1] RQ = 1000 lbs. (453.6 kg) Concentration: <5% Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <5% Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: <4% Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: <4% Cyclohexane [CAS No.: 110-82-7] RQ = 1000 lbs. (453.6 kg) Concentration: <3% Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: <2% Styrene [CAS No.: 100-42-5] RQ = 1000 lbs. (453.6 kg) Concentration: <1%
Clean Water Act (CWA)	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	

	This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Gasoline (Wholly Vaporized and Engine Exhaust), Benzene [CAS No. 71-43-3], Toluene [CAS No. 108-88-3], Ethylbenzene [CAS No.100-41-4] and Naphthalene [CAS No.91-20-3]
New Jersey Right-to-Know Label	Gasoline [NJDEP CAS No. 8006-61-9]
Additional Regulatory Remarks	As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense gasoline in motor vehicles. Additional warnings specified by various regulatory authorities may be required: "DANGER: Extremely Flammable. Use as a Motor Fuel Only. No Smoking. Stop Engine. Turn Off All Electronic Equipment including Cellular Telephones. Do Not Overfill Tank. Keep Away from Heat and Flames. Do Not leave nozzle unattended during refueling. **Static Sparks Can Cause a Fire, especially when filling portable containers.** Containers must be metal or other material approved for storing gasoline. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Keep nozzle spout in contact with the container during the entire filling operation. **Harmful or Fatal if Swallowed. Long-Exposure Has Caused Cancer in Laboratory Animals.** Avoid prolonged breathing of vapors. Keep face away from nozzle and gas tank. Never siphon by mouth." WHMIS Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). WHMIS Class D-2B: Material causing other toxic effects (TOXIC).

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number	7.0
Revision Date	05/23/2005
Print Date	Printed on 05/23/2005.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists
IARC: International Agency for Research on Cancer
NIOSH: National Institute of Occupational Safety and Health
NPCA: National Paint and Coating Manufacturers Association
NFPA: National Fire Protection Association
AIHA: American Industrial Hygiene Association
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
HMIS: Hazardous Materials Information System
EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

* * * * *   END OF MSDS   * * * * *

METAL

13 M

MSDS Number: **Z0858** * * * * * *Effective Date:* ***05/07/03*** * * * * * *Supercedes:* ***11/02/01***

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ZINC METAL POWDER

1. Product Identification

Synonyms: Powdered zinc; blue powder; CI77945; CI Pigment Black 16
CAS No.: 7440-66-6
Molecular Weight: 65.37
Chemical Formula: Zn
Product Codes:
J.T. Baker: 4282
Mallinckrodt: 8681

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Zinc	7440-66-6	96 - 97%	Yes
Zinc Oxide	1314-13-2	0 - 3%	Yes
Lead	7439-92-1	0 - 0.3%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR. WATER REACTIVE. MAY AFFECT THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM (lead component).

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 2 - Moderate

Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; CLASS D EXTINGUISHER
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
No adverse effects expected but dust may cause mechanical irritation. The effects may be expected to resemble those of inhaling an inert dust; possible difficulty in breathing, sneezing, coughing. When heated, the fumes are highly toxic and may cause fume fever.
Ingestion:
Extremely large oral dosages may produce gastrointestinal disturbances, due both to mechanical effects and the possibility of reaction with gastric juice to produce zinc chloride. Pain, stomach cramps and nausea could occur in aggravated cases.
Skin Contact:
May cause irritation.
Eye Contact:
May cause irritation.
Chronic Exposure:
No adverse health effects expected.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Skin Contact:
Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

5. Fire Fighting Measures

Fire:
Autoignition temperature: ca. 460C (ca. 860F)
The listed autoignition temperature is for Zinc powder (layer); dust cloud is ca. 680C (1255F). Zinc powder is not pyrophoric but will burn in air at elevated temperatures. Bulk dust in damp state may heat spontaneously and ignite on exposure to air. Releases flammable hydrogen gas upon contact with acids or alkali hydroxides. Contact with strong oxidizers may cause fire.
Explosion:
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Fire Extinguishing Media:
Smother with a suitable dry powder (sodium chloride, magnesium oxide, Met-L-X).
Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Remove all sources of ignition and provide mild ventilation in area of spill. Substance may be pyrophoric and self-ignite. Clean-up personnel require protective clothing, goggles and dust/mist respirators. Sweep or vacuum up the spill in a manner that does not disperse zinc powder in the air and place the zinc in a closed container for recovery or disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None for Zinc metal.
-OSHA Permissible Exposure Limit (PEL):
10 mg/m3 (TWA), for zinc oxide fume
-ACGIH Threshold Limit Value (TLV):
10 mg/m3 (TWA), Inhalable fraction, A4 Not classifiable as a human carcinogen for zinc oxide.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece particulate respirator (NIOSH type N100 filters) may be worn for up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids. glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Gray or bluish-gray powder.
Odor:
Odorless.

Solubility:
Insoluble in water.
Density:
7.14
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
907C (1665F)
Melting Point:
419C (786F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1 @ 487C (909F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Moist zinc dust can react exothermically and ignite spontaneously in air.
Hazardous Decomposition Products:
Hydrogen in moist air, zinc oxide with oxygen at high temperature. Zinc metal, when melted, produces zinc vapor which oxidizes and condenses in air to form zinc fume.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Zinc powder can react violently with water, sulfur and halogens. Dangerous or potentially dangerous with strong oxidizing agents, lower molecular weight chlorinated hydrocarbons, strong acids and alkalis.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Zinc: Irritation skin, human: 300 ug/3D-I mild; investigated as a mutagen.

\Cancer Lists\

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Zinc (7440-66-6)	No	No	None
Zinc Oxide (1314-13-2)	No	No	None
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Zinc (7440-66-6)	Yes	Yes	No	Yes
Zinc Oxide (1314-13-2)	Yes	Yes	Yes	Yes
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Zinc (7440-66-6)	Yes	Yes	No	Yes
Zinc Oxide (1314-13-2)	Yes	Yes	No	Yes
Lead (7439-92-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Zinc (7440-66-6)	No	No	Yes	No
Zinc Oxide (1314-13-2)	No	No	No	Zinc compoun
Lead (7439-92-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Zinc (7440-66-6)	1000	No	No
Zinc Oxide (1314-13-2)	No	No	No
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No   TSCA 12(b): No   CDTA: No
SARA 311/312: Acute: Yes   Chronic: No   Fire: Yes Pressure: No
Reactivity: Yes   (Mixture / Solid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 4Y
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 1 Reactivity: 1 Other: **Water reactive**

APPENDIX E

Sediment and Erosion Control Plan

West 34th Street Development

555 West 34th Street
New York, New York
Block 706, Lot 1

SEDIMENT AND EROSION CONTROL PLAN

BCP Site No. C231049

Prepared For:
Meushar 34th Street, LLC
c/o The Moinian Group
530 5th Ave, Suite 1800
New York, NY 10036
FLS Project Number: 10090-001

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, N.Y. 12233-7016

Prepared by:
Fleming-Lee Shue, Inc.
158 West 29th Street, 9th Floor
New York, New York 10001
http://www.flemingleeshue.com

Arnold F. Fleming, P.E. &

Fleming
Lee Shue

Environmental Management & Consulting

June 2007

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  - 1.2.2 Storm Drain Inlet Protection 2
  - 1.2.3 Silt Fence 2
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1.0 SEDIMENT AND EROSION CONTROL PLAN

A variety of measures will be implemented to mitigate and control erosion of sediment impacts during and after construction. All control measures are designed to meet or exceed the criteria set forth in the Empire State Chapter, Soil and Water Conservation Service, 2004 Draft "New York Guidelines for Urban Erosion and Sediment Control." The measures will consist of structural and vegetative stormwater controls.

Installation of all temporary and permanent soil erosion and water pollution controls will be in accordance with NYSDOT Standard Specifications, Section 209-3, Construction Details, in addition to USEPA's "Best Stormwater Management Practices". The Contractor will implement the controls and measures as described below and *as necessary* to prevent erosion and sedimentation.

The Contractor will be responsible to install and maintain all erosion controls necessary to prevent siltation of any affected collection basins, inlets, manholes, channels, combined sewers, or storm sewer systems or any public right-of-way or outside of contract limits in accordance with regulations.

1.1 Potential Pollution Sources

Unchecked, land disturbed by construction can produce a visible source of sediments (and contaminants) in runoff. The urban setting, the chosen construction method, and the effectiveness of the erosion/sediment control devices and practices will influence the quality as well as the quantity of stormwater leaving the Site.

Some typical components of urban or construction-related runoff could include the following:

- Discarded refuse or litter could end up in storm flows. This type of pollutant is often most visible.
- Fuels, lubricants, brake dust, particulates from exhaust emissions, corrosion products and exhaust could be stormwater pollutants in areas where motor vehicles are operated or maintained.
- Degradation of asphalt could be a stormwater pollutant at any site.
- Any accidental overfilling of construction vehicles could cause releases to stormwater flows.
- Leaking construction equipment (brake fluid, oil, gasoline, lubricants, transmission fluid, antifreeze, etc) could also potentially impact stormwater quality.
- Washout of sediments in unprotected, graded, excavated or otherwise unstable areas could be source of pollutant loading to the receiving waters from any construction site.

1.2 Pre-Construction Erosion and Sediment Control

The Contractor will be responsible for implementing the following additional measures *at a minimum* to control erosion and sedimentation prior to commencing major construction activities.

1.2.1 Stabilized Construction Entrances

A stabilized pad will be installed consisting of gravel underlain by filter cloth, as shown in Detail 1. This temporary measure will be used to reduce the tracking of sediments outside the work area onto adjacent pavements and public streets. A pad of gravel will be placed at the points where construction traffic exits from the Site. One ramp, located in the northwest portion of the Site on 35th Street, is currently anticipated be used for access to and from the Site. Tires will be washed before leaving the Site. The truck wash waste water will be collected by the dewatering system once operational, or prior to that, infiltrate into the ground. The dewatering system will ultimately be connected to the New York City combined sewer system. The dewatering system will be operated under a permit from the New York City Department of Environmental Protection (NYCDEP). If it is determined that treatment is required, an appropriate treatment system will be designed and installed to meet the applicable NYCDEP requirements.

1.2.2 Storm Drain Inlet Protection

Silt fencing (see Section 1.2.3) and hay bales (see Section 1.2.4) will be placed around storm drain inlets to reduce or eliminate sediment entering the storm drainage system. Inlet protection will be critical in reducing sediment content of water entering a storm drain system. The first phase of the remedial action will lower the grade of the Site to below the surrounding grade and the grade of the storm drain inlets.

1.2.3 Silt Fence

Temporary geotextile fabric barriers will be used to intercept sediment-laden runoff from small drainage areas (removes sediment from overland sheet flow), if necessary. These barriers will be placed strategically to capture sediments and reduce runoff velocity.

1.2.4 Hay Bales

Hay bales will be used as temporary controls suitable for sheet flow or minor channelized flow from small catchments.

1.3 Construction Phase Erosion and Sediment Control

Adequate erosion and sediment control methods (described in Section 1.2) will be provided prior to any grading, excavating, trenching or otherwise disturbing any areas. Construction will proceed such that exposed areas will be kept to the minimum practical size at all times. The exposed or disturbed areas will be restored or protected as quickly as possible upon completion of the work. Grading will begin immediately after clearing the asphalt cover at the Site. Grading will be a critical construction period with respect to erosion control. The following measures will be employed. In addition, those already in place (see Section 1.2), will be employed until the initial grading of three to five feet below grade (ft-bg), which is below the storm drain inlets, is completed.

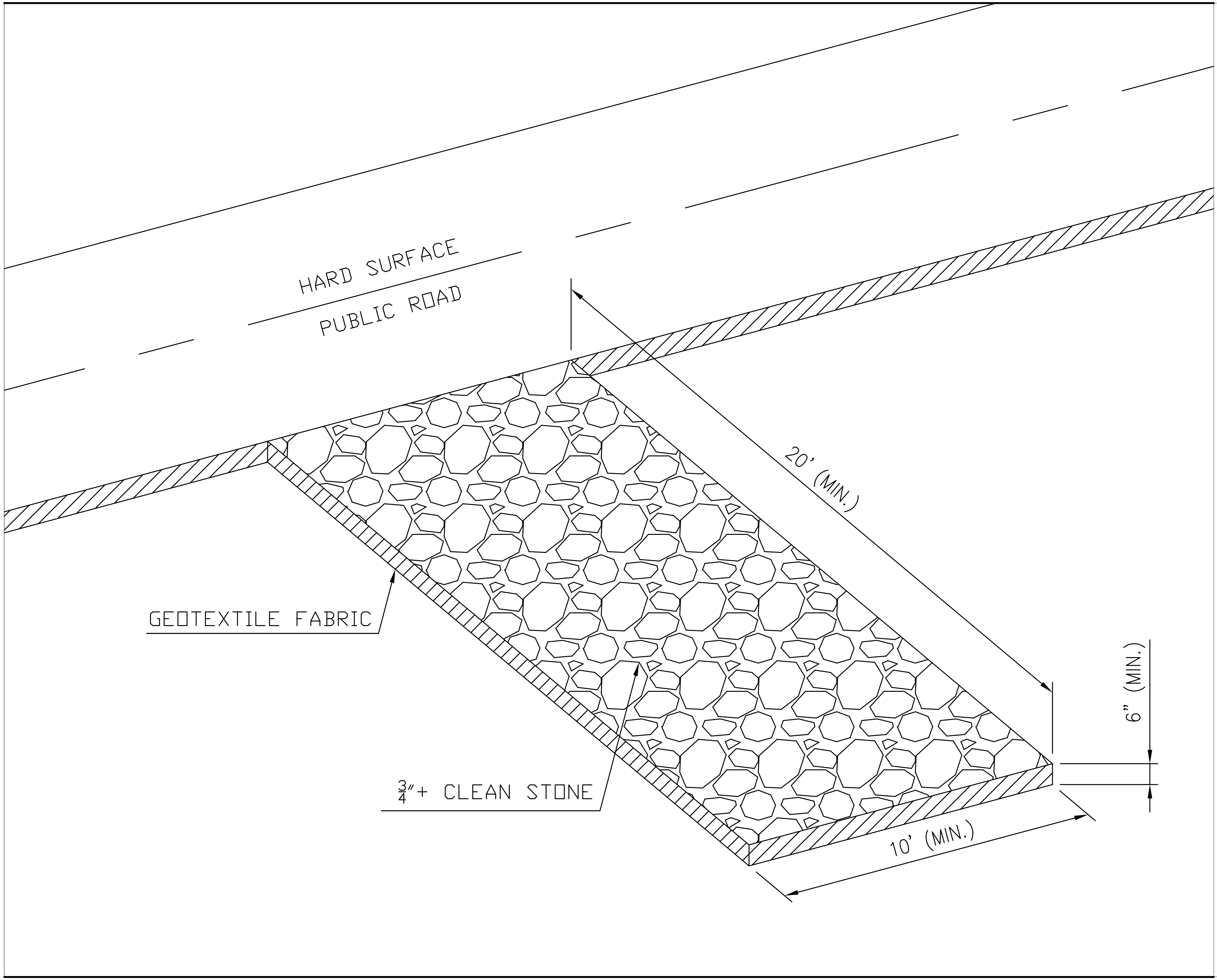
- Dust Control – Some methods of controlling dust, including covering all haul trucks carrying loose materials and speed restrictions on Site roads, will be utilized to reduce the amount of dust generated at the Site. Several other methods may be utilized as necessary, including sprinkling water or other moisture retaining agents on dirt roadways and covering the slopes on the edges of the excavations may with a dust and odor-suppressing foam, such as Geomar.
- Dewatering – Once the below grade building superstructure is in place and stabilized, the dewatering system will be shut down. At that point any stormwater will be directed to the combined sewer.
- Silt Fencing and Hay Bales – These temporary erosion control measures will be implemented, as necessary, before the Site has been graded to below the storm drain inlets around newly constructed inlets/catch basins for the duration of construction.

Listed below are several general practices that will be employed during construction:

- Any materials deposited onto public thoroughfares will be promptly removed and properly disposed.
- Captured liquids requiring disposal will be containerized and transported off-Site for treatment and/or proper disposal.
- The pavement will be swept as necessary to maintain a clean work area and prevent silt from entering stormwater runoff.
- Any stockpiles will be stabilized, leveled, and protected from wind and runoff erosion.

1.4 Post-Excavation Erosion and Sediment Control

At completion of construction, the Site will be completely covered by a building. No bare earth will be present at the completed Site.



Fleming Lee Shue
Environmental Management & Consulting

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DRAWING 1

West 34th Street Development
New York, NY

TYPICAL
CONSTRUCTION EXIT

Date
June 11, 2007

Project Number
10090-001

LEGEND

▨ $\frac{3}{4}$"+ CLEAN STONE