HIGHLINE 131410

42-46 10TH AVENUE & 449-451 WEST 13TH STREET

MANHATTAN, NEW YORK

Remedial Action Work Plan

Block: 646

Lot 1 (formerly Lots 1, 5, 6, 7, 8 and 9)

NYC BCP Site Number: 12CBCP027M

Prepared for:

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer

PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

CERTIFICATION

I, Joel Landes, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the Highline 131410 Site.

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Joel B Landes

Name

076348

NYS PE License Number

Signature

9/18/11

Date

EXECUTIVE SUMMARY

William Gottlieb Real Estate/Tenth Avenue, LLC has applied to enroll in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate the 23,500 square-foot Highline 131410 site located at 42-46 10th Avenue and 449-451 West 13th Street in the Greenwich Village section of Manhattan, New York (the "Site"). A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 42-46 10th Avenue and 449-451 West 13th Street in the Greenwich Village section of Manhattan, New York and is identified as Block 646, Lot 1 on the New York City Tax Map. The Site is a 23,500 square-foot "L"-shaped lot and is bounded by West 14th Street to the north, Washington Street to the east, West 13th Street to the south, and 10th Avenue to the west. A map of the Site location and Site boundary is shown on Figures 1 and 2, respectively.

The southern portion of the Site is improved with several interconnected 3-story buildings encompassing approximately 15,800 square feet. The northern portion of the Site is vacant and surrounded by wooden construction fencing with a locked gate on 10th Avenue. The three–story buildings that were previously located in the northern portion of the Site were destroyed by fire in approximately 2003. The elevated Highline Park runs northwest to southeast above the easternmost portion of the Site.

The applicant is proposing to make the Site protective of human health and the environment consistent with the contemplated end use as a mixed commercial/retail development.

Proposed Redevelopment Plan

Detailed construction plans for the Site have not been finalized, but the proposed development consists of a 13-story mixed-use retail and office building with a single cellar level.

The first floor level will have a footprint of approximately 23,420 square feet with approximately 207 feet of frontage along Tenth Avenue and 153 feet of frontage along West 13th Street. The first floor building footprint will encompass the entire Site. The proposed cellar level will have a slightly smaller footprint of approximately 20,650 square feet; no cellar is proposed underneath the Highline in the eastern portion of the Site. Soil will be excavated to accommodate the proposed cellar and building foundation elements to about 15 feet below grade surface (bgs). The proposed elevator and sump pit excavations will extend to about 18 feet bgs. The approximate soil volume that will be excavated during development of the Site is 11,500 cubic yards.

Summary of Past Uses of Site and Areas of Concern

A September 2010 Phase I Environmental Site Assessment (ESA) for the Site reported that the Site was developed with several multi-story buildings and a lumber yard as early as 1895. The Site was redeveloped into a multi-building cold-storage facility in the early 1900s. Potential coal burning and coal storage associated with an independent electric power plant was partially located in the eastern portion of the Site from 1904 to 1921. On-site recognized environmental conditions (RECs) identified during the Phase I ESA included three aboveground fuel oil storage tanks (AST), a groundwater monitoring well located in the 14th Street sidewalk, historic industrial Site usage, and historic urban fill. Several off-site RECs, including a cross-gradient petroleum spill (Spill No. 09-11962), were also identified.

An RI was conducted to further investigate the RECs identified during the Phase I ESA and to identify features of environmental significance that define Areas of Concern (AOC). AOCs generally include areas where existing or former activities are known or suspected to have resulted in generation, manufacture, refinement, transport, storage, handling, treatment, discharge, release and/or disposal of hazardous materials. The AOCs identified for this Site include:

1. Historic urban fill with concentrations of metals above New York State Department of Environmental Conservation (NYSDEC) Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs); and

2. Off-site historic petroleum release (NYSDEC Spill No. 10-09353) identified beneath the sidewalk along 10th Avenue adjacent to the Site. Petroleum-related VOCs were detected at concentrations that marginally exceed their Class GA standards in groundwater sampled near NYSDEC Spill No. 10-09353.

Summary of the Work Performed Under the Remedial Investigation

RI activities included the following:

1. Geophysical survey;
2. Advancement of 17 soil boring and the collection of 17 grab soil samples and one composite soil sample for laboratory analyses;
3. Installation of three permanent monitoring wells and seven temporary monitoring wells, and the collection of 12 groundwater samples for laboratory analyses;
4. Installation of three sub-surface soil vapor points and the collection of three sub-surface soil vapor samples for laboratory analyses;
5. Collection of two liquid samples from on-site 55-gallon drums for laboratory analyses;
6. Collection of two liquid samples from historic refrigerant piping for laboratory analyses; and
7. Review of historical data pertaining to cross-gradient NYSDEC Spill No. 09-11962.

Summary of Environmental Findings

1. Groundwater depth at the Site ranges from 10 to 12 feet bgs and flows southwest toward the Hudson River;
2. The Site is underlain by urban fill consisting of fine to coarse gravel with some concrete, brick, construction debris and some fine to coarse sand. The fill layer generally extends to approximately 12 feet bgs and is underlain by successive strata of organic soil, gravel, sand, silt, and sand overlying bedrock. Based on the findings of a geotechnical investigation conducted by Langan in 2010, depth to bedrock at the Site is approximately 66 to 80 feet bgs;

3. Five metals (arsenic, copper, lead, nickel, and zinc) were detected in several soil samples above NYSDEC Part 375 Unrestricted Use SCOs. One sample marginally exceeds Track 2 Commercial SCOs for arsenic. A variety of SVOCs were identified in soil samples but none exceeded Track 1 Unrestricted SCOs. These SVOCs were primarily PAH compounds. The occurrence of metals and SVOCs is consistent with findings of urban fill beneath the property. PCBs did not exceed Track 1 Unrestricted SCOs in any soil samples. No VOCs were identified in soil samples above Track 1 Unrestricted SCOs except acetone which was found in most soil samples and total xylenes (on the west side of the site near the off-site USTs). No VOC exceeded Track 2 Commercial SCOs in any soil sample. Methylene chloride was also found commonly in soil samples below Track 1 SCOs. Acetone and methylene chloride are commonly used in chemical labs to extract samples and both parameters were identified in lab blanks. Their occurrence is attributed to lab impacts and not to site contamination. Low levels of individual xylenes and ethylbenzene were detected in several samples but below Track 1 SCOs. Chlorinated hydrocarbons PCE and TCE were not identified in soil samples.

4. Groundwater samples contained concentrations of several parameters above Part 703.5 Class GA groundwater quality standards (GQS). The metals mercury and selenium were marginally above GQS in one and two samples, respectively. Elevated sodium concentrations suggest low level saline intrusion effects or influence of road salt application. Total PCB aroclors exceed GQS in one of 12 groundwater samples and is not detected in all others. BTEX and associated petroleum compounds were identified in groundwater samples in the vicinity of an off-site petroleum spill on the west side of the property. Exceedances of GQS were limited to benzene and toluene which marginally exceeded GQS in one of twelve groundwater samples, and chloroform in three samples. Chloroform was identified in three wells on the northern, cross-gradient perimeter of the property. Runoff from an up-gradient, off-site car wash in this area may be the source of chloroform in groundwater. PCE and TCE were not detected in groundwater samples. One SVOC (naphthalene) was identified above GQS in one sample in the vicinity of the off-site sidewalk petroleum spill.

5. The geophysical survey revealed evidence of two off-site underground storage tanks (UST) beneath the sidewalk along 10th Avenue, adjacent to the Site;
6. An off-site historic petroleum release was identified in the vicinity of the USTs along 10th Avenue and NYSDEC Spill No. 10-09353 was assigned. Approximately 125 cubic yards of petroleum-impacted soil associated with the spill was identified over an approximate area of 600 square feet. Petroleum impacts extend to the west to 10th Avenue; the western extent of the off-site spill was not determined; and
7. Soil vapor samples showed a variety of BTEX and associated VOCs at relatively low concentrations. PCE was identified at low concentration (below 3 $\mu g/m^3$) in one of three soil vapor samples. TCE and other chlorinated hydrocarbons were not detected.

Summary of the Remedy

The preferred remedy listed below achieves protection of public health and the environment for the intended use of the property. The preferred remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance (SCG); is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective, implementable; and uses standard methods that are well established in the industry. The preferred remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC BCP citizen participation activities according to an approved Citizen Participation Plan (CPP). The CPP is included as Appendix 3.
2. Performance of a Community Air Monitoring Plan (CAMP) for particulates and VOCs.
3. Establishment of Track 1 Unrestricted Use SCOs for approximately 90% of the site and Track 4 SCOs for the remainder of the property. Excavation and removal of soil/fill to a depth of approximately 15 feet bgs in Track 1 SCO attainment areas (not underneath the High Line Park). Establishment of Track 4 SCOs for the remainder of the property (underneath the High Line Park) and excavation of 2 feet bgs in this area.
4. Screening of excavated soil/fill for indications of contamination by visual means, odor and monitoring with a photo-ionization detector (PID) during all intrusive work.

5. Collection and analysis of endpoint samples to evaluate the performance of the remedy with respect to attainment of Track 1 and Track 4 SCOs.

6. Removal of USTs and closure of petroleum spills (if any) in compliance with applicable City, State and Federal laws and requirements.

7. Construction and maintenance of an engineering composite cover consisting of the building foundation slab and walls and concrete or asphalt pavement covered sidewalks as an additional measure to prevent human exposure to any residual soil/fill material remaining under the Site if Track 1 SCOs cannot be achieved.

8. Installation of a vapor barrier system beneath the proposed building slab to address migration of off-site soil vapors.

9. Transportation and off-site disposal of all soil/fill material at permitted facilities in accordance with all applicable City, State and Federal laws and requirements for handling, transport, and disposal.

10. Sampling and analysis of excavated media as required by disposal facilities.

11. Appropriate segregation of excavated media for off-site disposal.

12. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking and staking excavation areas.

13. Implementation of storm-water pollution prevention measures.

14. Performance of all activities associated with the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable Federal, State, and city laws and regulations.

15. Import of materials to be used for backfill and cover, as needed, in compliance with OER-approved plan and in accordance with all Federal, State, and city laws and regulations.

16. Submission of a Remedial Action Report (RAR) that describes the remedial activities including any changes from this RAWP, certifies that the remedial requirements have or

will be achieved, defines the Site boundaries, and describes any Engineering and Institutional Controls to be implemented at the Site.

17. Submission of an approved Site Management Plan (SMP) in the RAR for long-term site management, including plans for operation, maintenance, monitoring, inspection and certification of engineering controls and reporting at a specified frequency.

18. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) use of groundwater without treatment rendering it safe for the intended use; (2) disturbance of residual contaminated material (where Track 1 SCOs are not achieved) unless it is conducted in accordance with the SMP; and (3) higher level of land usage without OER-approval (unless Track 1 is achieved).

COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation created the New York City Brownfield Cleanup Program (NYC BCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan ("cleanup plan") describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities. This cleanup plan also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Remedial Investigation and Cleanup Plan. Under the NYC BCP, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses. Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment. An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan. This cleanup plan includes a Health and Safety Plan that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration. This plan includes many protective elements including those discussed below.

Site Safety Coordinator. This project has a designated Site safety coordinator to implement the Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Sean Lowes and can be reached at 917-561-1746.

Worker Training. Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan. Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). Results will be regularly reported to the NYC Office of Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the on-site Project Manager Michael Burke at (212) 479-5413 or through email (mburke@langan.com) or NYC Office of Environmental Remediation Project Manager Michael Mandac at (212) 788-8841 or through email (mmandac@dep.nyc.gov).

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be

summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Storm-Water Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project information sheet that states that the project is in the NYC BCP, provides project contact names and numbers, and locations where project documents can be viewed.

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Michael Burke at (212) 479-5413 or through email (mburke@langan.com), the NYC Office of Environmental Remediation Project Manager Michael Mandac at (212) 788-8841 or through email (mmandac@dep.nyc.gov), or call 311 and mention the Site is in the NYC BCP.

Utility Mark-outs. To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal. All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

Soil Chemical Testing and Screening. All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held

instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

Trucks and Covers. Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material. All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination. All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping. Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing. Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repository located at The Jefferson Market branch of the New York Public Library at 425 Avenue of the Americas, New York, NY.

Long-Term Site Management. To provide long-term protection after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined in the property's deed. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

1.0 REMEDIAL ACTION WORK PLAN

1.1 Site Background

William Gottlieb Real Estate/Tenth Avenue, LLC has applied to enroll in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate the 23,500-square feet Highline 131410 site located at 42-46 10th Avenue and 449-451 West 13th Street in the Greenwich Village section of Manhattan, New York (the "Site"). Mixed commercial/retail use is proposed for the property. A Remedial Investigation (RI) was performed between November 22, 2010 and December 27, 2010 to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP summarizes the nature and extent of contamination at the Site and establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a Track 1 and Track 4 cleanup, and a description of the preferred remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance (SCG) and applicable laws and regulations.

1.2 Site Location and Current Usage

The Site is located at 42-46 10th Avenue and 449-451 West 13th Street in the Greenwich Village section of Manhattan, New York and is identified as Block 646, Lot 1 on the New York City Tax Map. Figure 1 shows the Site location. The Site was formerly defined as Lots 1, 5, 6, 7, 8 and 9; each of these lots were merged into one (Lot 1) on August 4, 2011. The Site is "L"-shaped, occupies an approximate area of 23,500-square feet, and is bounded by West 14th Street and a gasoline filling station to the north, a multi-story building under construction and an abandoned commercial building to the east, West 13th Street and a multi-story hotel to the south, and the intersection of 10th and 11th Avenues, a 3-story hotel, and a river-front park to the west. Figure 2 shows the Site boundary and surrounding property usage.

The southern portion of the Site is improved with several interconnected 3-story buildings (referred to as the building) encompassing approximately 15,800 square feet. The northern

portion of the Site is vacant and surrounded by wooden construction fencing with a locked gate on 10th Avenue. The three–story buildings that were previously located in the northern portion of the Site were destroyed by fire in approximately 2003. The elevated Highline Park runs northwest to southeast above the easternmost portion of the Site.

1.3 Proposed Redevelopment Plan

Detailed construction plans for the Site have not been finalized, but the proposed development consists of a 13-story mixed-use retail and office building with a single cellar level. The first floor level will have a footprint of approximately 23,420 square feet with approximately 207 feet of frontage along Tenth Avenue and 153 feet of frontage along West 13th Street. The first floor building footprint will encompass the entire Site. The proposed cellar level will have a slightly smaller footprint of approximately 20,650 square feet; no cellar is proposed underneath the Highline in the eastern portion of the Site. Soil will be excavated to accommodate the proposed cellar and building foundation elements to about 15 feet below grade surface (bgs). The proposed elevator and sump pit excavations will extend to about 18 feet bgs. The approximate soil volume that will be excavated during development of the Site is 11,500 cubic yards. The remedial action described under this RAWP will be implemented in conjunction with the proposed construction plans. Proposed redevelopment plans are presented as Appendix 1.

1.4 Description of Surrounding Property

The surrounding area is zoned for commercial, industrial, and manufacturing uses and is comprised primarily of multi-story commercial and residential buildings with ground-level retail space and restaurants. Adjacent property usage includes a gasoline filling station to the north, a multi-story building under construction, an abandoned commercial building with two roll-up garage doors, and Highline Park to the east, a multi-story hotel to the south, and a 3-story hotel and a river front park to the west.

According to the New York City Office of Environmental Remediation (NYC OER) Searchable Property Environmental Database (SPEED), no day-care facilities, schools, or hospitals are located within 500 feet of the Site. The elevated Highline Park is located above the eastern portion of the Site. The Hudson River is located approximately 250 feet west of the Site.

1.5 Remedial Investigation

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, Highline 131410*", dated September 2011 (RIR).

Summary of Past Uses of Site and Areas of Concern

Langan completed a Phase I Environmental Site Assessment (ESA) for the Site in September 2010. Based on the findings of the Phase I ESA, the Site was developed with several multi-story buildings and a lumber yard as early as 1895. The Site was redeveloped into a multi-building cold-storage facility in the early 1900s. Potential coal burning and storage associated with an independent electric plant was partially located in the eastern portion of the Site from 1904 to 1921. On-site recognized environmental conditions (REC) identified during the Phase I ESA included three aboveground storage tanks (AST), a groundwater monitoring well located in the 14th Street sidewalk, historic Site usage, and the presence of historic urban fill. Several off-site RECs, including a cross-gradient petroleum spill (Spill No. 09-11962), were also identified.

An RI was conducted to further investigate the RECs identified during the Phase I ESA and to identify features of environmental significance that define Areas of Concern (AOC). AOCs generally include areas where existing or former activities are known or suspected to have resulted in generation, manufacture, refinement, transport, storage, handling, treatment, discharge, release and/or disposal of a hazardous material. The AOCs identified for this Site include:

1. Historic urban fill beneath the Site, with concentrations of metals above New York State Department of Environmental Conservation (NYSDEC) Part 375 Unrestricted Use Soil Cleanup Objectives (SCO); and
2. Off-site historic petroleum release (NYSDEC Spill No. 10-09353) identified beneath the sidewalk along 10th Avenue adjacent to the Site. Petroleum-related VOCs were detected at concentrations that marginally exceed their Class GA standards in groundwater sampled at the Site, near NYSDEC Spill No. 10-09353.

Summary of the Work Performed under the Remedial Investigation

RI activities included the following:

1. Geophysical survey;
2. Advancement of 17 soil boring and the collection of 17 grab soil samples and one composite soil sample for laboratory analyses;
3. Installation of three permanent monitoring wells and seven temporary monitoring wells, and the collection of 12 groundwater samples for laboratory analyses;
4. Installation of three sub-surface soil vapor points and the collection of three sub-surface soil vapor samples for laboratory analyses;
5. Collection of two liquid samples from on-site 55-gallon drums for laboratory analyses;
6. Collection of two liquid samples from historic refrigerant piping for laboratory analyses; and
7. Review of historical data pertaining to cross-gradient NYSDEC Spill No. 09-11962 at the adjoining gasoline station adjacent (north) of the Site.

Summary of Environmental Findings

1. Groundwater depth at the Site ranges from 10 to 12 feet bgs and flows southwest toward the Hudson River;
2. The Site is underlain by urban fill consisting of fine to coarse gravel with some concrete, brick, construction debris and some fine to coarse sand. The fill layer generally extends to approximately 12 feet bgs and is underlain by successive strata of organic soil, gravel, sand, silt, and sand overlying bedrock. Based on the findings of a geotechnical investigation conducted by Langan in 2010, depth to bedrock at the Site is approximately 66 to 80 feet bgs;
3. Five metals (arsenic, copper, lead, nickel, and zinc) were detected in several soil samples above NYSDEC Part 375 Unrestricted Use SCOs. One sample marginally exceeds Track 2 Commercial SCOs for arsenic. A variety of SVOCs were identified in soil samples but none exceeded Track 1 Unrestricted SCOs. These SVOCs were primarily PAH compounds. The occurrence of metals and SVOCs is consistent with findings of urban fill

beneath the property. PCBs did not exceed Track 1 Unrestricted SCOs in any soil samples. No VOCs were identified in soil samples above Track 1 Unrestricted SCOs except acetone which was found in most soil samples and total xylenes (on the west side of the site near the off-site USTs). No VOC exceeded Track 2 Commercial SCOs in any soil sample. Methylene chloride was also found commonly in soil samples below Track 1 SCOs. Acetone and methylene chloride are commonly used in chemical labs to extract samples and both parameters were identified in lab blanks. Their occurrence is attributed to lab impacts and not to site contamination. Low levels of individual xylenes and ethylbenzene were detected in several samples but below Track 1 SCOs. Chlorinated hydrocarbons PCE and TCE were not identified in soil samples.

4. Groundwater samples contained concentrations of several parameters above Part 703.5 Class GA groundwater quality standards (GQS). Metals mercury and selenium were marginally above GQS in one and two samples, respectively. Elevated sodium concentrations suggest low level saline intrusion effects or influence of road salt application. Total PCB aroclors exceed GQS in one of 12 groundwater samples and is not detected in all others. BTEX and associated petroleum compounds were identified in groundwater samples in the vicinity of an off-site petroleum spill on the west side of the property. Exceedances of GQS were limited to benzene and toluene which marginally exceeded GQS in one of twelve groundwater samples, and chloroform in three samples. Chloroform was identified in three wells on the northern, cross-gradient perimeter of the property. Runoff from an up-gradient, off-site car wash in this area may be the source of chloroform in groundwater. PCE and TCE were not detected in groundwater samples. One SVOC (naphthalene) was identified above GQS in one sample in the vicinity of the off-site sidewalk petroleum spill.

5. The geophysical survey revealed evidence of two off-site USTs off-site beneath the sidewalk along 10th Avenue, adjacent to the Site;

6. An off-site historic petroleum release was identified in the vicinity of the USTs along 10th Avenue and NYSDEC Spill No. 10-09353 was assigned. Approximately 125 cubic yards of petroleum-impacted soil associated with the spill was identified over an approximate

area of 600 square feet. Petroleum impacts extend to the west to 10th Avenue; the western extent of the off-site spill was not determined; and

7. Soil vapor samples showed a variety of BTEX and associated VOCs at relatively low concentrations. PCE was identified at low concentration (below 3 $\mu g/m^3$) in one of three soil vapor samples. TCE and other chlorinated hydrocarbons were not detected.

With the exception of the removal of residual petroleum-impacted soil to accommodate the construction of the new building, this RAWP does not address off-site spill No. 10-09353. The remediation of the USTs and associated petroleum spill will be addressed separately.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Groundwater

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

Two remedial action alternatives, one achieving Track 1 SCOs for 90% of the property and Track 4 SCOs for the remainder (Alternative 1) and one achieving Track 4 SCOs for the entire site (Alternative 2), are considered in this analysis. Alternative 1 involves removal of all soil and fill material that exceeds the unrestricted Track 1 SCOs to approximately 15 feet bgs (approximately 3 to 5 feet below the water table) over 90 % of the site except for the area directly beneath the Highline Park, where only several feet of soil will be removed. A Track 1 remedial action for the entire site would require removal of approximately 10-14 feet of soil beneath Highline Park and is not feasible due to the threat of undermining and collapse of this elevated park structure and associated safety danger to the general public.

Alternative 2 would include establishment of Track 4 SCOs and removal of soil above these Track 4 SCOs. Under this alternative, approximately 11,500 cubic yards of soil will be removed to accommodate the proposed construction.

Due to the presence of off-site impacts for soil vapor, both Alternatives will also include placement of a soil vapor barrier beneath the building slab and along foundation side walls. Both alternatives involve a Track 4 remedial action component on at least a portion of the property and the following remedial elements would be required in both cases:

- Placement of final cover including the new building concrete slab or other impervious surface to eliminate exposure to fill in excess of Track 1 SCOs;
- Establishment of a Site Management Plan to ensure long term management of Institutional and Engineering Controls to ensure that all Engineering and Institutional controls are inspected periodically and require certification that the remedy continues to perform as it was designed, thus ensuring that the protections achieved for public health and the environment remain in perpetuity; and
- Placement of a deed restriction to memorialize the remedial action and the existence of Engineering and Institutional Controls to ensure that these controls will be appropriately managed by future owners of the Site.

3.1 Threshold Criteria

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would result in removal of soil and fill with contaminant concentrations above Track 1 SCOs to a depth of 15 feet bgs over 90% of the property. Track 4 SCOs would be achieved on the remainder of the property. This remedial action is consistent with the RAOs and would provide overall protection of public health and the environment in consideration of current and potential future land use by eliminating the following:

- Risk of ingestion exposures or other direct contact with contaminated on-Site soils consistent with remedial action objectives;
- Risk of leaching into groundwater and ingestion exposures or direct contact with groundwater with contamination derived from the Site consistent with remedial action objectives; and
- Potential sources for on-Site production of soil vapors, and prevent migration of on-Site derived vapors into occupied structures and eliminate associated inhalation exposures consistent with remedial action objectives.

Alternative 2 alternative would achieve comparable protections by:

- Establish Track 4 SCOs for the entire site;
- Removal of 11,500 cu. yds. of soil to achieve depths of approximately 15 feet over 90% of the property for development purposes;

In both Alternatives, a vapor barrier system and composite cover system would eliminate any potential exposures to remaining soils. A Site Management Plan would provide long term management of Institutional and Engineering Controls to ensure that all Engineering and

Institutional controls are inspected periodically and require certification that the remedy continues to perform as it was designed, thus ensuring that the protections achieved for public health and the environment remain in perpetuity. Placement of a deed restriction would memorialize these controls in order to decrease the risk of future exposures with contaminated media consistent with remedial action objectives.

3.2 Balancing Criteria

Compliance with Standards, Criteria and Guidance (SCGs)

Alternative 1 would address the chemical-specific SCGs, as soil/fill in excess of Track 1 SCOs to a depth of 15 feet bgs would be removed over 90% of the property. All soil/fill excavated from the Site would be managed and disposed of in accordance with applicable regulations.

Alternative 2 would address the chemical-specific SCGs for soil, groundwater and soil vapor by establishment of Track 4 SCOs. Similar to the Track 1 alternative, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs.

Short-Term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

Both Alternative 1 and 2 would result in short-term impacts associated with excavation, handling, load out of materials, and truck traffic. However, focused attention to means and methods during the remedial action during the removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

Long-Term Effectiveness and Permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of Engineering Controls.

Alternative 1 would provide long-term effectiveness with the removal of soil/fill above Track 1 SCOs to a depth of 15 feet bgs over 90% of the property and would eliminate any potential on-Site sources of soil vapors and groundwater contamination consistent with remedial action objectives. Composite cover, a deed notice, and site management would provide long term protections for the area that achieves Track 4 SCOs. The installation of a vapor barrier will also prevent the migration of soil gas from off-site sources into the new building.

Alternative 2 would also be effective over the long-term by removing soil/fill above Track 4 SCOs to a depth of 15 feet bgs, placement of a vapor barrier and concrete or other impervious cover over the Site, establishment of a Site Management Plan to ensure long-term management of Institutional and Engineering Controls, and placement of a deed restriction to memorialize these controls for the long term. Establishment of an SMP and a deed restriction will ensure that this protection remains effective for the long-term (in perpetuity). The SMP will ensure long-term effectiveness of all Engineering and Institutional Controls by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and functioning as they were intended.

Reduction of Toxicity, Mobility, or Volume of Contaminated Material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce

the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Both alternatives will provide maximum reduction of toxicity, mobility and volume of contaminated material on-Site by excavation and removal of soil to a depth of 15 feet bgs over 90% of the property, the installation of a vapor barrier, and the placement of the new buildings concrete slab.

Since both alternatives have a Track 4 component on at least a portion of the property, they will both include the establishment of a Site Management Plan and placement of a deed restriction to memorialize these controls will ensure long-term management of these Engineering and Institutional Controls and provide assurance that protective levels of toxicity and mobility will continue in perpetuity.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

Both alternatives are both feasible and implementable. They use standard materials and services and well established technology. The reliability of these remedies is also high. There are no specific difficulties associated with any of the activities proposed, which utilize standard industry methods.

Cost Effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

The capital costs associated with both alternatives are approximately equal. In both cases, appropriate public health and environmental protections are achieved. Both alternatives satisfy the threshold balancing criterion and other criterion listed here, and each is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduce both mobility and toxicity.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial observations by the project team, both alternatives are acceptable to the community. This RAWP will be subject to and undergo public review under the NYC BCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan.

Land Use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

Both alternatives for remedial action at the site are comparable with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing

zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial property and both alternatives provide comprehensive protection of public health and the environment for these uses. Improvements in the current brownfield condition of the property achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. Both alternatives are equally protective of natural resources and cultural resources. This RAWP will be subject to undergo public review under the NYC BCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

Both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. A complete list of green remedial activities considered as part of the BCP is included in the Sustainability Statement, included as Appendix 2.

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

Alternative 1 is the preferred alternative and will achieve protection of public health and the environment for the intended use of the property. Alternative 1 will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standard methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC BCP citizen participation activities according to an approved Citizen Participation Plan (CPP). The CPP is included as Appendix 3.

2. Performance of a Community Air Monitoring Plan (CAMP) for particulates and VOCs.

3. Establishment of Track 1 Unrestricted Use SCOs for approximately 90% of the site and Track 4 SCOs for the remainder of the property. Excavation and removal of soil/fill to a depth of approximately 15 feet bgs in Track 1 SCO attainment areas. Establishment of Track 4 SCOs for the remainder of the property and excavation of several feet of soil in this area (under the Highline Park).

4. Screening of excavated soil/fill for indications of contamination by visual means, odor and monitoring with a photo-ionization detector (PID) during all intrusive work.

5. Collection and analysis of endpoint samples to evaluate the performance of the remedy with respect to attainment of Track 1 and Track 4 SCOs.

6. Removal of USTs and closure of petroleum spills (if any) in compliance with applicable City, State and Federal laws and requirements.

7. Construction and maintenance of an engineering composite cover consisting of the building foundation slab and walls and concrete or asphalt pavement covered sidewalks

as an additional measure to prevent human exposure to any resideual soil/fill material remaining under the Site if Track 1 SCOs cannot be achieved.

8. Installation of a vapor barrier system beneath the proposed building slab to address migration of off-site soil vapors.
9. Transportation and off-site disposal of all soil/fill material at permitted facilities in accordance with all applicable City, State and Federal laws and requirements for handling, transport, and disposal.
10. Sampling and analysis of excavated media as required by disposal facilities.
11. Appropriate segregation of excavated media for off-site disposal.
12. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking and staking excavation areas.
13. Implementation of storm-water pollution prevention measures.
14. Performance of all activities associated with the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable Federal, State, and city laws and regulations.
15. Import of materials to be used for backfill and cover, as needed, in compliance with OER-approved plan and in accordance with all Federal, State, and city laws and regulations.
16. Submission of a Remedial Action Report (RAR) that describes the remedial activities including any changes from this RAWP, certifies that the remedial requirements have or will be achieved, defines the Site boundaries, and describes any Engineering and Institutional Controls to be implemented at the Site.
17. Submission of an approved Site Management Plan (SMP) in the RAR for long-term site management, including plans for operation, maintenance, monitoring, inspection and certification of engineering controls and reporting at a specified frequency.

18. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) use of groundwater without treatment rendering it safe for the intended use; (2) disturbance of residual contaminated material (where Track 1 SCOs are not achieved) unless it is conducted in accordance with the SMP; and (3) higher level of land usage without OER-approval (unless Track 1 is achieved).

4.2 Soil Cleanup Objectives and Soil/Fill management

Track 1 Unrestricted Use SCOs are proposed for 90% of the property and Track 4 SCOs for the remaining property area (under the Highline Park). The SCOs for this Site are listed in Table 1 and 2. Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 4. As part of the proposed remediation effort, approximately 90% of the Site will be excavated to a depth of 15 feet bgs and the remaining area will be excavated approximately 2 feet.

If Track 1 SCOs cannot be achieved during the remedial action, Track 4 SCOs will be used.

Discrete contaminant sources (such as hotspots), if identified during the remedial action, will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

4.3 Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 11,500 cubic yards (15,000 tons). Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

4.4 End-Point Sampling

Removal actions under this plan will be performed in conjunction with remedial end-point sampling. End-point sampling frequency will consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.

2. For excavations 20 to 300 feet in perimeter:
    - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
    - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for trigger analytes (those for which SCO exceedance is identified) utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Target Analyte List metals; and

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and "finger print analysis" and required regulatory reporting (i.e. spills hotline) will be performed.

4.5 Quality Assurance/Quality Control

Quality Assurance/Quality Control for chemical analytical program and assessment of usability of the data will be provided by York Analytical. Quality control samples will include at a minimum one duplicate sample per 20 field samples collected and one field blank and one trip blank for each sampling event.

4.6 Import and Reuse of Soils

Import of soils onto the Site and reuse of soils already on site is not planned but will be performed in conformance with the Soil/Materials Management Plan in Appendix 4. The estimated quantity of soil to be imported into the Site for backfill and cover soil is less than 100 tons. The estimated quantity of on-site soil/fill expected to be reused/relocated on Site is less than 100 tons.

4.7 Engineering Controls

Engineering controls consisting of a composite cover system will be used in the vicinity of Highline Park for soils that meet Track 4 SCOs. Since excavation efforts will remove impacted soils at the site and achieve Track 1 Unrestricted Use Soil Cleanup Objectives over the remainder of the site, those areas will contain no residual soil contamination and engineering controls will not be required. However, as a precautionary measure, a vapor barrier will be installed beneath the building slab to address potential soil vapors migrating from off-site sources.

4.8 Composite Cover System

For the area that will achieve Track 4 SCOs, and the remaining area of the site if the Track 1 remedy is not achieved, exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system is comprised of:

- Concrete or asphalt pavement covered sidewalks; and

- Concrete building foundation slab.

Figure 6 and 7 show the typical design for each remedial cover type used on this Site. The proposed building will cover the entire footprint of the Site.

The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

4.9 Vapor Barrier

Although a Track 1 remedy is proposed for the Site, installation of a vapor barrier is proposed to prevent contaminated soil vapors from migrating into the building from an off-site source. The barrier/membrane system will be installed along the entire footprint of the Site beneath the foundation slab, and will extend along the sides of the foundation slab from the base of the excavation to surface grade level. The vapor barrier will be a minimum of 20 mil thickness and will be installed as a continuous sub-slab membrane. The system will provide complete protection against vapor infiltration into the building. Figure 7 shows the typical design and layout of the vapor barrier to be installed at the site, as well as the manufacturer's specifications.

4.10 Institutional Controls

The goal of the excavation effort is to remove impacted soils at the Site and achieve Track 1 Unrestricted Use SCOs where excavation is feasible (most of the property). Where Track 1 Unrestricted Use SCOs are met, no institutional controls will be required to address residual contamination at the Site.

Where Track 4 SCOs have been achieved but Track 1 SCOs have not, institutional controls will be incorporated in the remedy to manage residual historic fill material and render the Site protective of public health and the environment. Long-term employment of institutional controls will be established in a Declaration of Covenant and Restrictions (DCR) assigned to the Site by

the title holder and will be implemented under a Site Management Plan that will be included in the RAR. Institutional Controls will include the following:

- Recording of an OER-approved DCR with the City Register or county clerk, as appropriate. The DCR will include a description of all engineering and institutional controls, will summarize the requirements of the Site Management Plan, and will note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. The SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall comply with RCNY §43-1407(l)(3).
- Vegetable gardens and farming on the Site are prohibited;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for its approved usage type and will not be used for a higher level of use without prior approval by OER.

4.11 Site Management Plan

Site Management is the last phase of remediation and begins with the approval of the RAR and issuance of the Notice of Completion (NOC) for the Remedial Action. An SMP describes appropriate methods and procedures to ensure implementation of all Engineering and Institutional Controls that are required by the DCR and this RAWP. If the Track 1 Unrestricted Use goal is achieved, an SMP will not be required. If end point sampling indicates that the Track 1 goal has not been achieved, a Site Management Plan will be required. The Site Management Plan will be submitted along with the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The Site owner is responsible to ensure that all Site management responsibilities defined in the DCR and the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action, in accordance with the Brownfield Cleanup Agreement with OER. This includes a plan for: (1) implementation of engineering and institutional controls; (2) implementation of monitoring programs; (3) operation and maintenance of engineering controls; (4) inspection and certification of engineering controls; and (5) reporting.

Site management activities, reporting and EC/IC certification will be scheduled on a periodic basis to be established in the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by March 31 of the year following the reporting period.

4.12 Qualitative Human Health Exposure Assessment

Conceptual Site Model

A conceptual site model (CSM) has been developed based on the finding from the subsurface investigations performed at the Site. The purpose of the CSM is to develop a simplified framework for understanding the distribution of impacted materials, potential migration pathways, and potentially complete exposure pathways.

Known and Potential Sources

The Remedial Investigation identified the elevated concentrations of metals in soil at the Site exceeding Track 1 SCOs, which includes arsenic, copper, lead, nickel, zinc. These contaminants appear to be a constituent of the heterogeneous historic fill material and are not related to a spill or separate contaminant source. The RI also identified elevated concentrations of VOCs in soil exceeding Track 1 SCOs, which includes acetone and xylenes. The source of the VOCs in soil appears to be an off-site historic petroleum release (NYSDEC Spill No. 10-09353) to the west of the Site.

The RI identified elevated concentrations of VOCs (benzene, chloroform, and toluene) and SVOCs (naphthalene) in groundwater at the Site exceeding the TOGS 1.1.1 GA standards. The source of the VOCs and SVOCs in groundwater appears to be an off-site historic petroleum release (NYSDEC Spill No. 10-09353) to the west of the Site. Elevated concentrations of PCBs (Aroclor 1248 and 1260) and metals (mercury and selenium) in unfiltered samples were detected in groundwater at the Site exceeding the TOGS 1.1.1 GA standards.

The RI identified elevated concentrations of VOCs (1,2,4-trimethyl benzene, acetone, benzene, cyclohexane, ethylbenzene, n-hexane, o-xylene, m,p-xylene, tetrahydrofuran, and toluene) in soil vapor. The source of the VOCs in soil vapor appear to be from an off-site historic petroleum release (NYSDEC Spill No. 10-09353) to the west of the Site.

Nature, Extent, Fate and Transport of Contaminants

Concentrations of metals exceeding the Track 1 SCOs are present within the historic fill at the Site. These contaminants are a constituent of the historic fill material that was used to fill the land for development purposes and is present to a depth of approximately 12 feet bgs. Based on the findings of the RI and current Site conditions, these contaminants are not mobile or migrating within or from the site.

Concentrations of VOCs, SVOCs, PCBs, and metals exceeding TOGS 1.1.1 GA standards are present in groundwater at the Site. The depth of groundwater is approximately 10 feet at the site. The source of the VOC and SVOC contamination appears to from an off-site historic petroleum release (NYSDEC Spill No. 10-09353) to the west of the Site, with the exception of

the chloroform. Runoff from an up-gradient and off-site car was may be the source of the chloroform in groundwater.

There were elevated concentrations of VOCs in soil vapor. The source of the VOC soil vapors appears to be from an off-site historic petroleum release (NYSDEC Spill No. 10-09353) to the west of the site. It is expected that soil vapors would accumulate underneath the proposed building foundation. An engineered composite cover slab, consisting of the building foundation and a vapor barrier, will act as a vertical barrier to the soil vapor coming into the building.

Potential Routes of Exposure

Currently, there are no potential migration pathways for absorptions or ingestion, since there the Site is covered with buildings on approximately 60% of the site, with the remaining 40% of the site covered with pavement, and there are no human receptors at the site. The soil at the site is primarily contaminated with VOCs and metals. The groundwater at the site is primarily contaminated with VOCs, SVOCs, and PCBs. And there are VOC-contaminated soil vapors at the site.

The work performed at the site will include excavation of soil/fill material, dewatering, and general construction activities, and will affect the on-site construction/remediation works and the off-site local population. The construction and remediation work at the site will expose the contaminants to the on-site workers in a variety of ways, including direct contact to the soil and groundwater (during dewatering), and ingestion or inhalation of the soil (by means of dust), groundwater, and soil vapors. These exposures will be limited to short durations through the intrusive work. The construction and remediation work at the site may expose the contaminants to off-site local residents in a variety of ways, including inhalation of soil (by means of dust) and soil vapors.

A Construction Health and Safety Plan will be implemented during construction and remediation work for the safety of the on-site workers and off-site local workers. Some measures include conducting a community air monitoring programs (CAMP) for dust and VOCs to track on-site and off-site conditions, requiring personal protective equipment, provisions for upgrading the level of personal protective equipment when needed, and applying dust and vapor

suppression measures where applicable and needed, for on-site workers and the off-site local population.

Upon the completion of remediation and construction activities, the majority of the site will be covered by the engineering composite cover (i.e. building footprint and vapor barrier). The remainder of the area will be a landscaped area will be capped with two feet of certified clean cover material. The clean fill material capping capping and the engineered composite cover will prevent direct exposure humans to the impacted soil, groundwater, and soil vapors at the site.

Existence of Human Health Exposure

An exposure pathway begins with a source and mechanism of contaminant release, resulting in the contamination of a receiving matrix (environmental medium). A complete exposure pathway also requires a point of potential contact with the contaminated matrix (i.e., exposure point), an exposure route (i.e., inhalation, ingestion, or dermal contact), and a receptor population. If an exposure pathway is not complete because it does not include a contaminated matrix, a point of potential contact, an exposure route, or a receptor, then no risk exists.

On-site sources of metals and VOCs will be removed over approximately 90% of the property during soil excavation; therefore, no pathway to exposure will exist. Any residual metals or VOCs contaminated soil that is not excavated will be covered with an engineering composite cover (i.e. the building slab and vapor barrier), thereby eliminating the exposure pathway.

The groundwater at the site is contaminated with VOCs, SVOCs, and PCBs. The source of VOCs and SVOCs in groundwater, as well as the resulting soil vapors from the groundwater contamination, will be addressed through the remediation of the off-site historic petroleum release in the NYSDEC Spills Program. Any residual groundwater contamination will be addressed through the vapor barrier, which is part of the engineered composite cover. The vapor barrier will also prevent against any residual soil vapors trying to infiltrate the building. Additionally, the building will receive water from a municipal source not from the groundwater at the site.

Receptor Populations

The receptors identified under the proposed remedy include:

- On-site workers: adult (remediation and construction workers), and
- Temporary worker: adult (utility worker/inspector, subcontractors, sampler/remediation inspector).

The receptors identified under the proposed remedy and future site use as mixed-use commercial/retail development include:

- Adult and child patrons of commercial and retail properties,
- On-site workers: adult retail/commercial office/maintenance workers, and
- Temporary worker: adult (utility worker/inspector, landscape worker, construction worker).

The receptors identified above are believed to be the primary receptors of interest.

Overall Human Health Exposure Assessment

The proposed development requires excavation which will remove 90% of the contaminated soil/fill material on-site which exceeds the Track 1 SCOs. The Site will also be fully covered with an engineering composite cover (i.e. the building foundation and the vapor barrier) or two feet of certified clean cover material, eliminating any threat to human health or the environment. The groundwater at the site is not a source of drinking water, and a vapor barrier will implemented at the site to address any residual and off-site sources of soil vapor.

Exposure to the contaminated media (soil, groundwater, and soil vapor) is must likely to occur during the remedial and construction work to both the on-site workers and the off-site local population. In order to eliminate or greatly reduce the possible exposure levels, a CHASP will be implemented in order to monitoring dust and vapor emissions, set personal protective equipment requirements for on-site personnel, have provisions to increase the level of personal protective equipment as needed, and apply dust and vapor suppression measures where applicable and needed, for on-site workers and the off-site local population.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Sean Lowes, Senior Staff Geologist and Anthony Moffa, Health and Safety Officer. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Joel Landes and Michael Burke, respectively.

5.2 Site Security

Site access will be controlled through gated entrances to the fenced property.

5.3 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency.

5.4 Construction Health and Safety Plan

The Construction Health and Safety Plan is included in Appendix 5. The Site Safety Coordinator will be Sean Lowes. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. The Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the Site before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency.

5.5 Community Air Monitoring Plan

Real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed 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, for instance, will 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. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street or adjacent to a school or residence. Exceedances of action levels observed during performance of the CAMP will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment 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 exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

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 should be visually assessed during all work activities.

If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 Agency Approvals

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 Site Preparation

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all

sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with working with excavation equipment in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and excavating equipment.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

Dewatering

Excavation is anticipated to extend below the water table and will require dewatering. Submersible pumps will be used to extract groundwater from gravel lined sumps in the excavations or a system of well points will be used for groundwater extraction. Extracted groundwater will be conveyed to a storage tank or treatment system.

Depending on the selected discharge option, a NYC DEP sewer use permit will be obtained prior to discharge treated groundwater to the sewer system.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed equipment and material staging areas, truck

inspection station, stockpile areas, and other pertinent remedial management features has not been determined.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils fill and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC BCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

5.8 Traffic Control

Drivers of trucks leaving the NYC BCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on Figure 5.

5.9 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access areas);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (*e.g.*, soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 Reporting and Record Keeping

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site that day and an updated record of the total quantity of material imported and exported;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with the OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 Complaint Management

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 Deviations from the Remedial Action Work Plan

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

5.13 Data Usability Summary Report

The primary objective of a Data Usability Summary Report (DUSR) is to determine whether or not data meets the site specific criteria for data quality and data use. The DUSR provides an evaluation of analytical data without third party data validation. The DUSR for post-remedial samples collected during implementation of this RAWP will be included in the Remedial Action Report (RAR).

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan (for areas where Track 1 SCOs are not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Recorded Declaration of Covenants and Restrictions.
- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

I, Joel Landes, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the Highline 131410 Site (NYC BCP Site No. #12CBCP027M).

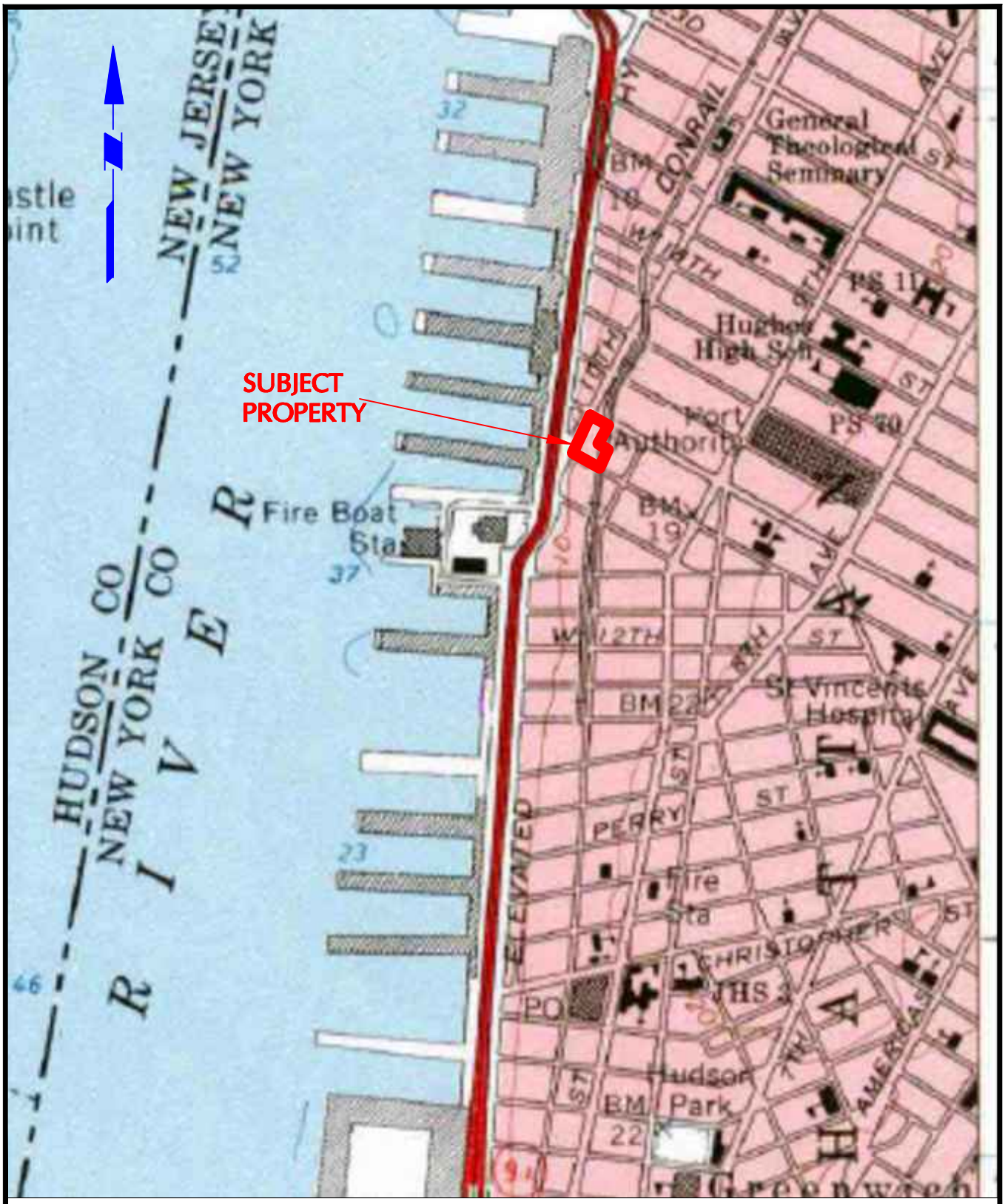
I certify that the OER-approved Remedial Action Work Plan dated October 2011 and Stipulations in a letter dated TBD; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 24 month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	52	-
Fact Sheet 2 announcing start of remedy	12	-
Mobilization	1	1
Remedial Excavation	1 week after start	16
Demobilization	20 weeks after start	1
Record Declaration of Covenants and Restrictions	40 weeks after start	-
Submit Remedial Action Report	52 weeks after start	-

Figure 1
Site Location Map



MAP REFERENCED: UNITED STATES GEOLOGICAL SURVEY (USGS), JERSEY CITY TOPOGRAPHIC QUADRANGLE MAP, DATED 1981, REVISED 1967

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HIGHLINE 13, 14, 10
42-56 10TH AVENUE AND 449-451 WEST 13TH STREET
REMEDIAL INVESTIGATION
NEW YORK, NEW YORK

SITE LOCATION MAP

Project No.	Date	Scale	Dwg. No.
170119302	08/30/2011	NTS	1

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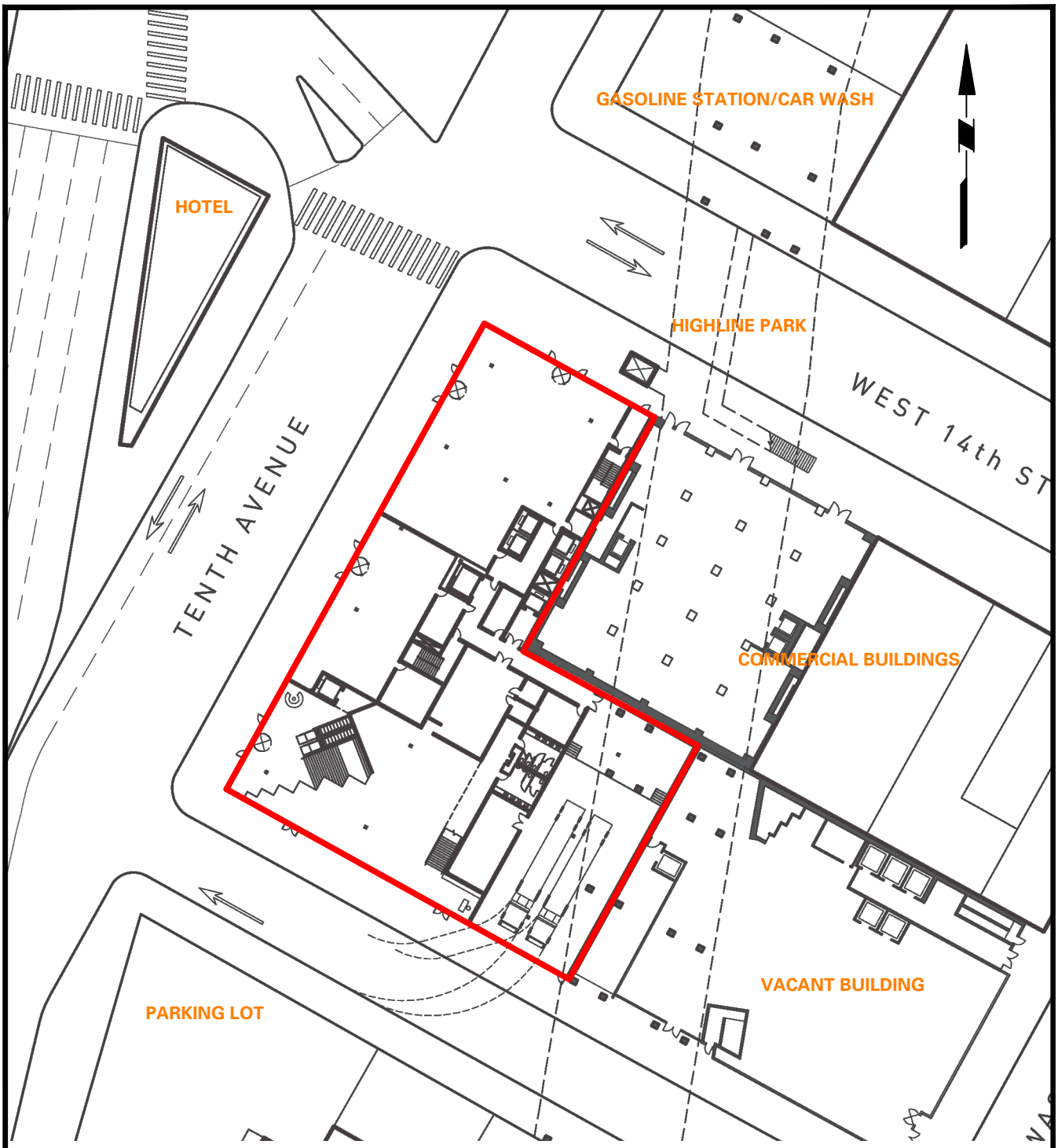
Figure 2
Site Plan and Surrounding Properties



LEGEND

— SITE BOUNDARY

NOTES

1. BASE MAP TAKEN FROM SITE PLAN DATED 2010.08.27 BY STUDIO/GANG/ARCHITECTS.

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Project

SURROUNDING LAND USAGE MAP

HIGHLINE 131410

MANHATTAN NEW YORK

Project No.	Date	Scale	Fig. No.
170119302	08/24/2011	1" = 100'	2

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ename: \\langan.com\data\NY\data3\170119302\Cadd Data – 170119302\Dwg\Environmental\RAWP\FIGURE 2 – SURROUNDING LAND USAGE.dwg Date: 8/24/2011 Time: 10:59 User: slowes Style Table: Langan.stb Layout: A Size Sheet (Bottom)

Figure 3
Excavation Diagram

LEGEND

- SITE BOUNDARY
- BASEMENT EXCAVATION AREA (APPROXIMATELY 15 FT BGS)
- ELEVATOR PIT (APPROXIMATELY 18 to 20 FT BGS)
- HIGHLINE ENCROACHMENT AREA (APPROXIMATELY 2 FT BGS)

NOTES

1. BASE MAP IS DRAWING A100 CELLAR LEVEL PLAN OBTAINED FROM STUDIO/GANG/ARCHITECTS AND DATED 02/22/2011.
2. HIGHLINE ENCROACHMENT AREA WILL BE EXCAVATED TO DEPTHS REQUIRED FOR THE FOUNDATION ELEMENTS AND ON GRADE FLOOR SLAB.
3. LOCATIONS OF SUMP PITS HAVE NOT BEEN DETERMINED.
4. FT BGS = FEET BELOW GRADE SURFACE

30 0 15 30

SCALE IN FEET

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HIGHLINE 131410

EXCAVATION DIAGRAM

MANHATTAN NEW YORK

Project No.	Date	Scale	Dwg. No.
170119302	10/05/11	1" = 30'	3

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Filename: \\langan.com\data\NY\data3\170119302\Cadd Data – 170119302\Dwg\Environmental\RAWP\Figure 3 Excavation Diagram.dwg Date: 10/5/2011 Time: 15:06 User: ebourbon Style Table: Langan.stb Layout: B Size Sheet (Bottom)

Figure 4
End Point Sampling Map

LEGEND

- SITE BOUNDARY
- SW-1 — PROPOSED SIDEWALL END POINT SAMPLE LOCATION (SVOCs AND METALS
- SW-1 — PROPOSED SIDEWALL END POINT SAMPLE LOCATION (VOCs, SVOCs, PESTICIDES, PCBS, AND METALS
- SW-1 — PROPOSED SIDEWALL END POINT SAMPLE LOCATION (VOCs)
- BOT-1 — PROPOSED BOTTOM END POINT SAMPLE LOCATION (SVOCs and METALS)
- BOT-1 — PROPOSED BOTTOM END POINT SAMPLE LOCATION (VOCs, SVOCs, PESTICIDES, PCBS, AND METALS

NOTES

1. BASE MAP IS DRAWING A100 CELLAR LEVEL PLAN OBTAINED FROM STUDIO/GANG/ARCHITECTS AND DATED 02/22/2011.
2. END POINT SAMPLES SHALL BE COLLECTED IN ACCORDANCE WITH THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) DIVISION OF ENVIRONMENTAL REMEDIATION (DER)–10 TECHNICAL GUIDANCE FOR SITE INVESTIGATION AND REMEDIATION DOCUMENT DATED MAY 2010.
3. END POINT SAMPLES WILL BE ANALYZED FOR SEMI–VOLATILE ORGANIC COMPOUNDS (SVOC) AND TOTAL METALS USING EPA METHODS, WITH THE FOLLOWING EXCEPTIONS: SIDEWALL SAMPLES SW–9 THROUGH SW–11 WILL BE ANALYZED FOR VOLATILE ORGANIC COMPOUNDS (VOC) ONLY; AND SIDEWALL SAMPLES SW–4 AND SW–5 AND BOTTOM SAMPLES BOT–1, BOT–2, BOT–4, BOT–7, BOT–8, BOT–11, AND BOT–14 THROUGH BOT–16 WILL BE ANALYZED FOR VOCS, SVOCS, PESTICIDES, POLYCHLORINATED BIPHENYLS (PCB), AND METALS.
4. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH SECTION 4.5 OF THE REMEDIAL ACTION WORK PLAN (RAWP) DATED OCTOBER 2011.

30 0 15 30
SCALE IN FEET

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HIGHLINE 131410

END POINT SAMPLING MAP

MANHATTAN NEW YORK

Project No.	Date	Scale	Dwg. No.
170119302	11/01/11	1" = 30'	4

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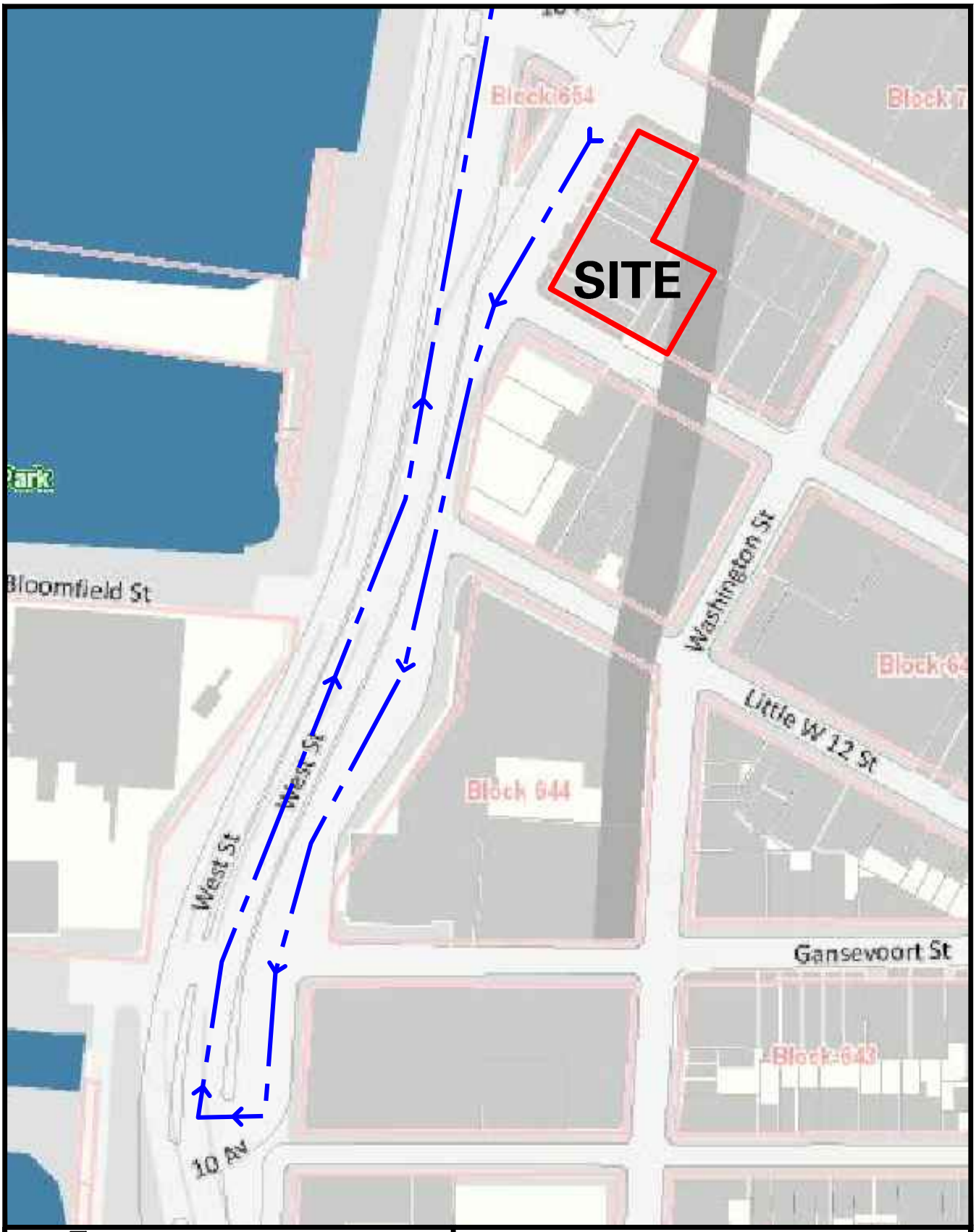
Figure 5
Truck Route Map



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HIGHLINE 131410

TRUCK ROUTE MAP

MANHATTAN NEW YORK

Project No.	Date	Scale	Fig. No.
170119302	10/05/2011	NTS	5

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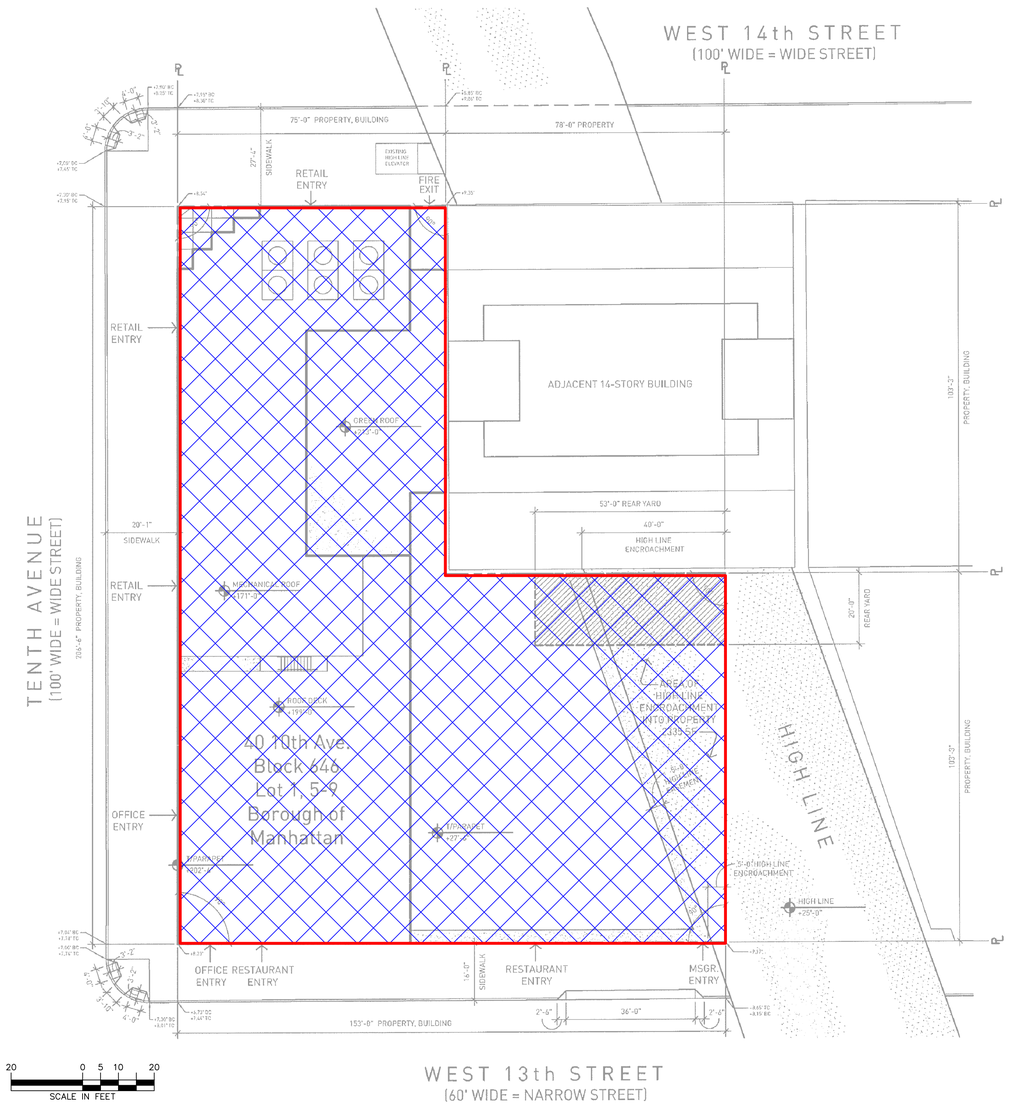
Filename: \\langan.com\data\NY\data3\170119302\Cadd Data - 170119302\Dwg\Environmental\RAWP\FIGURE 2 - SURROUNDING LAND USAGE.dwg Date: 10/5/2011 Time: 15:53 User: ebourbon Style Table: Langan.stb Layout: FIGURE 3 - TRUCK ROUTE MAP

Figure 6
Composite Cover System



SITE PLAN
(SCALE: 1" = 20')

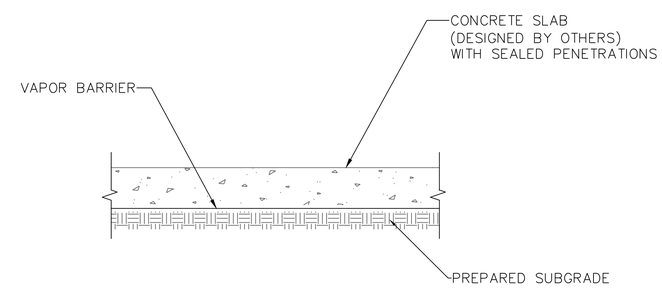
LEGEND

SITE BOUNDARY

CONCRETE BUILDING SLAB COVER
(TYP. DETAIL 1)

NOTES

1. BASE MAP IS DRAWING A010 SITE PLAN OBTAINED FROM STUDIO/GANG/ARCHITECTS AND DATED 02/22/2011.



DETAIL 1: TYPICAL SECTION THROUGH SUB-SLAB
(NOT TO SCALE)

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NJ Certificate of Authorization No: 24GA27996400

Project
HIGHLINE 131410
MANHATTAN NEW YORK

Drawing Title
COMPOSITE COVER SYSTEM

Project No. 170119302	Drawing No. 6
Date 10/05/2011	
Scale NTS	
Drn. By EB	
Last Revised	Of

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Filename: \\langan.com\data\NY\data3\170119302\Cadd Data - 170119302\Dwg\Environmental\RAWP\Figure 6 - Composite Cover System.dwg Date: 10/5/2011 Time: 15:07 User: ebourbon Style Table: Langan.stb Layout: D Size Sheet (Bottom)

Figure 7
Vapor Barrier System

LEGEND

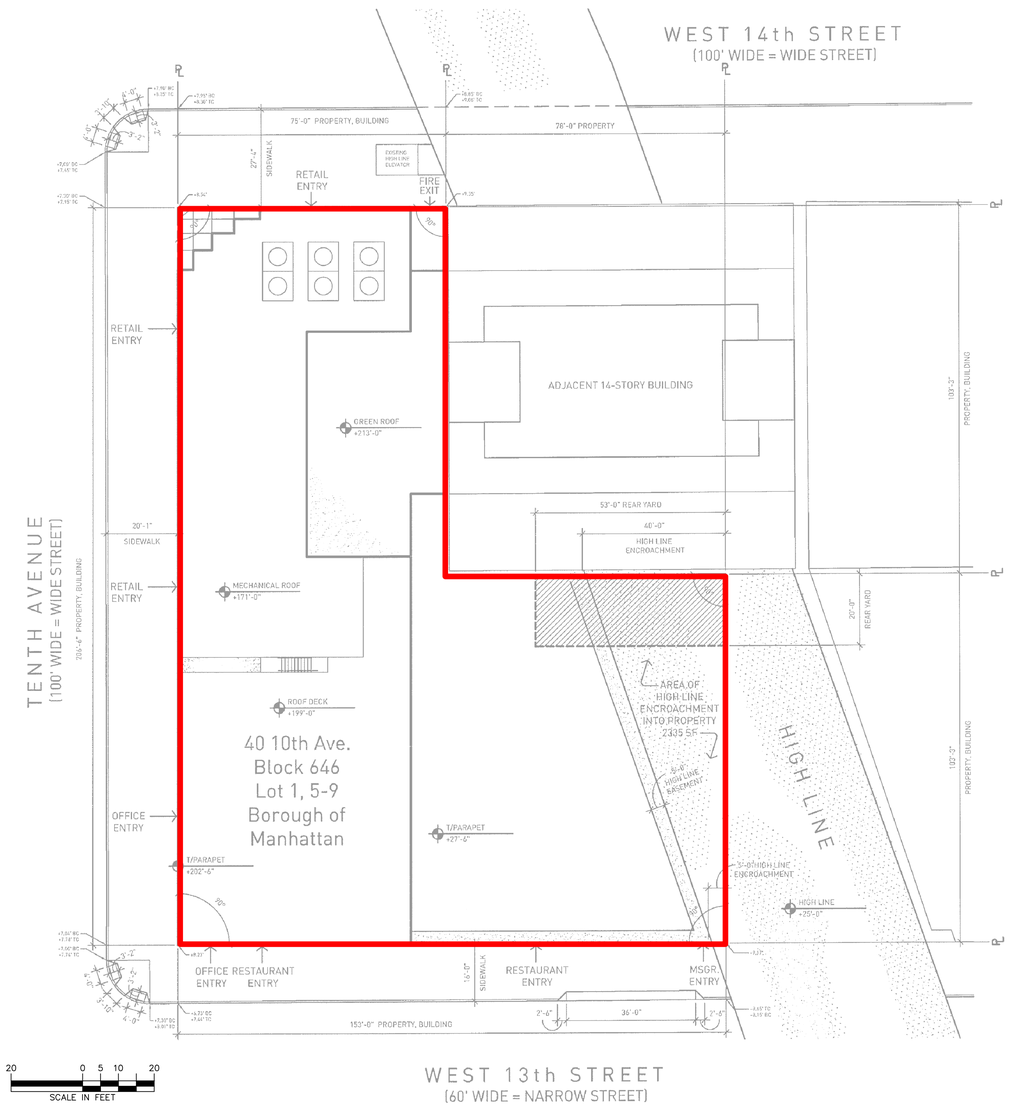
BUILDING OUTLINE AND APPROXIMATE LATERAL EXTENT OF VAPOR BARRIER

GENERAL NOTES

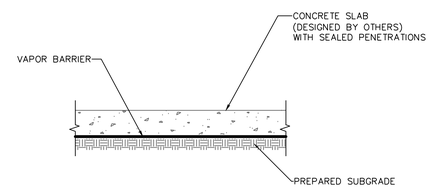
1. BASE MAP IS DRAWING A010 SITE PLAN OBTAINED FROM STUDIO/GANG/ARCHITECTS AND DATED 02/22/2011.

VAPOR BARRIER NOTES:

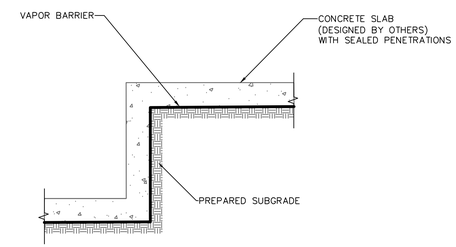
1. VAPOR BARRIER SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE MANUFACTURER GUIDELINES AND DETAILS.
2. VAPOR BARRIER SHALL BE INSTALLED BY A MANUFACTURER-CERTIFIED INSTALLER.
3. VAPOR BARRIER SHALL BE INSPECTED IMMEDIATELY BEFORE CONCRETE IS PLACED. ALL PENETRATIONS, HOLES, OR TEARS SHALL BE SEALED BEFORE CONCRETE IS PLACED.



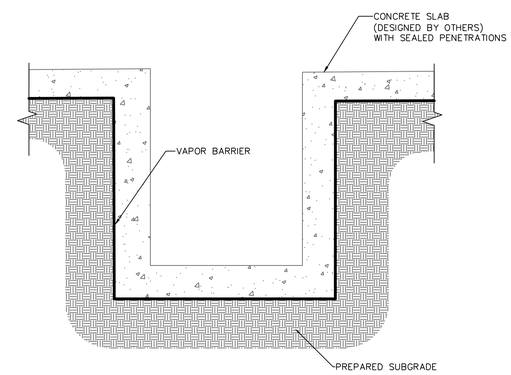
SITE PLAN
(SCALE: 1" = 20')



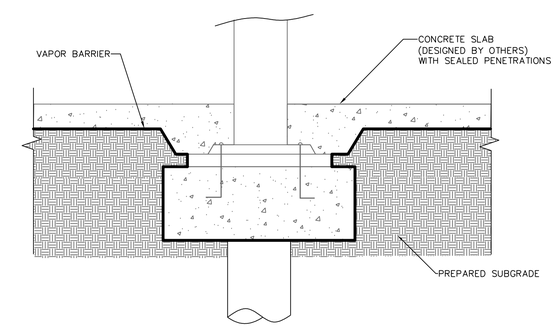
DETAIL 1: TYPICAL SECTION THROUGH SUB-SLAB
(NOT TO SCALE)



DETAIL 2: TYPICAL SECTION FOR ELEVATION CHANGE BETWEEN TWO SLABS
(NOT TO SCALE)



DETAIL 3: TYPICAL ELEVATOR AND SUMP PIT SECTION
(NOT TO SCALE)



DETAIL 4: TYPICAL DETAIL FOR INTERIOR PILE CAP
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VAPOR BARRIER SYSTEM

Project No. 170119302	Drawing No. 7
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Filename: \\langan.com\data\NY\data3\170119302\Cadd Data - 170119302\Dwg\Environmental\RAWP\Figure 7 - Vapor Barrier.dwg Date: 10/5/2011 Time: 15:09 User: ebourbon Style Table: Langan.stb Layout: D Size Sheet (Bottom)

Table 1

Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs)

Table 1
Track 1, Soil Cleanup Objectives (SCOs)
Highline 13, 14, 10
New York, NY
Langan Job No. 170119302

Constituent	Unrestricted Use
VOCs (mg/Kg)	
Xylenes, total	0.26
Metals (mg/kg)	
Arsenic	13
Copper	50
Lead	63
Nickel	30

Source: This table is derived from soil cleanup objective (SCO) tables in 6 NYCRR 375. Table 375-6.8(a) is the source for unrestricted use.

mg/kg = milligrams per kilogram.

Table 2

Track 4 Soil Cleanup Objectives (SCOs)

Table 2
Track 4 Soil Cleanup Objectives* (SCOs)
Highline 13, 14, 10
New York, NY
Langan Job No. 170119302

Constituent	Track 4 SCOs
Metals (mg/kg)	
Arsenic	**21**
Copper	**300**
Lead	**1,200**

*Track 4 SCOs use Track 2 Restricted Use – Commercial Soil Cleanup Objectives (SCOs) as a starting point for developing Track 4 SCOs. This table adjusts the values for arsenic, copper, and lead, creating Track 4 SCOs which OER finds acceptable.

Table 3
Analytical Results for Soil

Table 3
Analytical Results for Soil
Highline, 13, 14 10
New York, NY
Langan Job No. 170119302

LOCATION	NYSDEC PART 375 UNRESTRICTED USE SOIL CLEANUP OBJECTIVE	NYSDEC PART 375 RESTRICTED COMMERCIAL USE SOIL CLEANUP OBJECTIVE	SB-1	SB-1	SB-2	SB-3	SB-4	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-17	SB-14/15/16
SAMPLING DATE			11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/23/2010	11/24/2010	11/29/2010	11/30/2010	11/29/2010	12/1/2010	11/30/2010	11/30/2010	12/29/2010	11/29/2010	12/29/2010	12/29/2010
LAB SAMPLE ID			10K0809-02	10K0809-01	10K0908-04	10K0809-05	10K0809-07	10K0809-06	10K0809-08	10K0874-01	10L0036-04	10L0147-05	10L0036-05	10L0147-01	10L0147-06	10L0147-07	11A0044-01	11A0044-03	11A0044-02	11A0044-04
SAMPLE TYPE			GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	Composite
SAMPLE DEPTH (ft.)			6-8	10-12	10-12	10-12	6-8	10-12	10-12	10-12	0-2	0-2	0-2	0-2	0-2	0-2	6-8	10-12	10-12	
Volatile Organics, Target Compound List (mg/kg dry)																				
1,2-Dichloroethane	0.02	30	0.0016 U	0.0016 U	0.0016 U	0.0016 U	0.0017 U	0.0016 U	0.0018 U	0.0016 U	*0.086 U*	0.0017 U	0.0018 U	0.0018 U	0.0016 U	0.0016 U	0.0016 U	0.0081 U	0.0016 U	NA
2-Butanone	0.12	~	0.0063 U	0.0063 U	0.0064 U	0.0065 U	0.012 J	0.0064 U	0.0071 U	0.0062 U	*0.34 U*	0.0067 U	0.0073 U	0.0071 U	0.0064 U	0.0065 U	0.0064 U	0.032 U	0.0064 U	NA
Acetone	0.05	500	**0.055 B**	0.037	**0.068 B**	**0.057 B**	**0.10 B**	**0.096 B**	**0.089 B**	0.025 D	0.0058 JB	0.028 B	**0.059**	**0.085 B**	0.028 B	0.016 JB	**0.083 B**	0.023 B	**0.094 B**	NA
Ethyl Benzene	1	390	0.00085 U	0.00086 U	0.00087 U	0.00088 U	0.00090 U	0.00087 U	0.00096 U	0.00084 U	0.21 J	0.00091 U	0.00098 U	0.00096 U	0.00087 U	0.00088 U	0.00087 U	0.015 J	0.00087 U	NA
Methylene chloride	0.05	500	0.021 JB	0.012 JB	0.019 JB	0.025 B	0.027 B	0.021 JB	0.032 B	0.011 JB	0.0095 JB	0.0064 JB	0.019 JB	0.0068 JB	0.0058 JB	0.0052 JB	0.029 B	0.0071 JB	0.014 JB	NA
o-Xylene	~	~	0.0012 U	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0012 U	0.0014 U	0.0012 U	0.22 J	0.0013 U	0.0014 U	0.0014 U	0.0012 U	0.0013 U	0.0012 U	0.028 J	0.0012 U	NA
p- & m- Xylenes	~	~	0.0013 U	0.0013 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0015 U	0.0013 U	0.30 J	0.0014 U	0.0015 U	0.0015 U	0.0014 U	0.0014 U	0.0014 U	0.046 J	0.0014 U	NA
Vinyl Chloride	0.02	13	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0025 U	0.0024 U	0.0027 U	0.0023 U	*0.13 U*	0.0025 U	0.0027 U	0.0027 U	0.0024 U	0.0024 U	0.0024 U	0.012 U	0.0024 U	NA
Xylenes, Total	0.26	500	0.0026 U	0.0026 U	0.0026 U	0.0027 U	0.0027 U	0.0026 U	0.0029 U	0.0025 U	**0.51** J	0.0027 U	0.0030 U	0.0029 U	0.0026 U	0.0026 U	0.0026 U	0.074 J	0.0026 U	NA
Total VOCs	~	~	0.076	0.049	0.087	0.082	0.139	0.117	0.1236	0.036	1.2553	0.0344	0.078	0.0948	0.0338	0.0212	0.112	0.1931	0.108	NA
Semi-Volatiles, EPA TCL List (mg/kg dry)																				
2-Methylnaphthalene	~	~	0.0656 U	0.0659 U	0.0665 U	0.0679 U	0.0692 U	0.0668 U	0.0737 U	0.0648 U	0.0709 U	0.0701 U	0.853	0.130 J	0.0670 U	0.0675 U	0.0672 U	NA	0.0667 U	1.47
Acenaphthene	20	500	0.109 U	0.110 U	0.111 U	0.113 U	0.115 U	0.111 U	0.123 U	0.108 U	0.118 U	0.117 U	0.196 J	0.123 U	0.111 U	0.112 U	0.112 U	NA	0.111 U	0.303
Anthracene	100	500	0.0674 J	0.0469 U	0.0473 U	0.0483 U	0.0493 U	0.0476 U	0.0525 U	0.0461 U	0.0505 U	0.0499 U	0.0842 J	0.0526 U	0.0477 U	0.0480 U	0.0478 U	NA	0.113 J	0.230
Benzo(a)anthracene	~	5.6	0.104 J	0.153 J	0.0738 U	0.0754 U	0.0769 U	0.0742 U	0.0818 U	0.0720 U	0.0788 U	0.0778 U	0.0840 U	0.131 J	0.0744 U	0.0750 U	0.0746 U	NA	0.198	0.0736 U
Benzo(a)pyrene	1	1	0.0927 J	0.0795 J	0.0498 U	0.0508 U	0.0518 U	0.0500 U	0.0552 U	0.0485 U	0.0531 U	0.0524 U	0.0566 U	0.192 J	0.0823 J	0.0505 U	0.0503 U	NA	0.208	0.0496 U
Benzo(b)fluoranthene	1	5.6	0.0717 U	0.0720 U	0.0726 U	0.0742 U	0.0756 U	0.0730 U	0.0805 U	0.0708 U	0.0775 U	0.0765 U	0.0826 U	0.160 J	0.0732 U	0.0737 U	0.0734 U	NA	0.194	0.0724 U
Benzo(k)fluoranthene	0.8	56	0.0729 U	0.0757 J	0.0739 U	0.0754 U	0.0769 U	0.0743 U	0.0819 U	0.0721 U	0.0788 U	0.0779 U	0.0841 U	0.134 J	0.0745 U	0.0750 U	0.0747 U	NA	0.144 J	0.0736 U
Chrysene	1	56	0.108 J	0.152 J	0.0769 U	0.0785 U	0.0801 U	0.0773 U	0.0853 U	0.0750 U	0.0820 U	0.0811 U	0.0875 U	0.117 J	0.0775 U	0.0781 U	0.0777 U	NA	0.220	0.0767 U
Di-n-butyl phthalate	~	~	0.0563 U	0.0565 U	0.0570 U	0.0582 U	0.0593 U	0.0573 U	0.0632 U	0.0556 U	0.0608 U	0.0601 U	0.0649 U	0.0633 U	0.0575 U	0.0579 U	0.0576 U	NA	0.0572 U	0.0568 U
Fluoranthene	100	500	0.119 J	0.180 J	0.111 U	0.113 U	0.115 U	0.111 U	0.123 U	0.108 U	0.118 U	0.117 U	0.126 U	0.255	0.175 J	0.112 U	0.112 U	NA	0.376	0.110 U
Fluorene	30	500	0.0573 J	0.0530 U	0.0535 U	0.0546 U	0.0557 U	0.0537 U	0.0593 U	0.0522 U	0.0570 U	0.0564 U	0.0608 U	0.0594 U	0.0539 U	0.0543 U	0.0540 U	NA	0.0537 U	0.312
Isophorone	~	~	0.0700 U	0.0703 U	0.0709 U	0.0724 U	0.0738 U	0.0713 U	0.0786 U	0.0691 U	0.0756 U	0.0747 U	0.0807 U	0.0788 U	0.0714 U	0.0720 U	0.0716 U	NA	0.0712 U	0.114 J
Naphthalene	12	500	0.0563 U	0.0565 U	0.0570 U	0.0582 U	0.0593 U	0.0573 U	0.0632 U	0.0556 U	0.0608 U	0.0601 U	0.188 J	0.0633 U	0.0575 U	0.0579 U	0.0576 U	NA	0.0572 U	0.138 J
Phenanthrene	100	500	0.107 J	0.114 J	0.0704 U	0.0719 U	0.121 J	0.0708 U	0.149 J	0.0687 U	0.0751 U	0.0742 U	0.346	0.0782 U	0.176 J	0.0715 U	0.0712 U	NA	0.475	1.46
Pyrene	100	500	0.121 J	0.206	0.0685 U	0.0699 U	0.128 J	0.0688 U	0.144 J	0.0668 U	0.0730 U	0.0722 U	0.0779 U	0.209 J	0.160 J	0.0695 U	0.0692 U	NA	0.489	0.0682 U
Total SVOCs	~	~	0.6837	1.0249	ND	ND	0.249	ND	0.293	ND	ND	ND	1.6672	1.4183	0.5933	ND	ND	NA	2.417	3.913
Polychlorinated Biphenyls (PCB-mg/kg dry)																				
Aroclor 1254	~	~	0.00768 U	0.00772 U	0.00779 U	0.00795 U	0.00810 U	0.00783 U	0.00863 U	0.00759 U	0.00830 U	0.00821 U	0.00886 U	0.00865 U	0.00785 U	0.00790 U	0.00787 U	NA	0.00782 U	NA
Aroclor 1262	~	~	0.00768 U	0.00772 U	0.00779 U	0.00795 U	0.00810 U	0.00783 U	0.00863 U	0.00759 U	0.00830 U	0.00821 U	0.00886 U	0.0403	0.00785 U	0.00790 U	0.00787 U	NA	0.00782 U	NA
Total PCBs	0.1	1	0.00768 U	0.00772 U	0.00779 U	0.00795 U	0.00810 U	0.00783 U	0.00863 U	0.00759 U	0.0445	0.00821 U	0.00886 U	0.0403	0.00785 U	0.00790 U	0.00787 U	NA	0.00782 U	NA
Metals, Target Analyte (mg/kg dry)																				
Aluminum	~	~	11,100	8,690	10,200	15,500	11,300	16,300	7,180	3,990	6,700	5,120	18,000	6,510	8,490	6,590	7580	NA	8830	NA
Antimony	~	~	1.01	0.370	2.14	0.164 U	0.167 U	0.161 U	2.40	0.156 U	0.595	0.394	0.594	0.466	0.162 U	0.163 U	1.30	NA	0.351	NA
Arsenic	13	16	4.20	3.00	3.84	3.56	4.18	3.18	4.86	2.66	2.01	1.78	4.48	4.20	3.83	2.77	**16.5**	NA	3.59	NA
Barium	350	400	62.9	58.7	91.7	64.9	89.4	66.6	348	40.6	42.9	49.3	108	93.4	66.4	42.7	62.8	NA	60.1	NA
Calcium	~	~	81,400	28,500	29,900	8,430	44,100	1,960	31,300	20,100	4,550	18,300	2,240	22,200	23,000	7,010	11500	NA	13800	NA
Chromium	~	~	16.3	15.2	35.9	19.8	18.1	20.8	16.9	10.7	17.8	11.4	29.5	20.0	19.6	8.90	23.6	NA	16.9	NA
Cobalt	~	~	5.66	5.21	7.80	8.59	6.38	8.54	4.14	4.00	4.48	4.63	13.1	6.02	6.88	6.14	8.70	NA	7.10	NA
Copper	50	270	21.2	23.6	28.2	25.3	24.4	21.4	**139**	13.7	14.3	14.2	26.4	37.1	30.5	**234**	31.5	NA	**60.6**	NA
Iron	~	~	11,200	12,000	14,800	15,300	16,100	14,500	8,460	7,860	11,300	10,300	20,700	18,600	14,500	11,400	34500	NA	14600	NA
Lead	63	1000	29.9	41.5	**615**	23.1	**95.8**	22.0	**957**	31.7	47.6	21.5	14.1	**159**	32.4	**71.9**	**554**	NA	**146**	NA
Magnesium	~	~	19,000	4,150	6,290	4,120	8,690	2,870	5,550	5,010	1,810	3,070	3,820	2,990	4,030	5,710	2690	NA	5780	NA
Manganese	1600	10000	215	188	651	634	444	234	313	319	238	480	220	292	554	262	490	NA	348	NA
Nickel	30	310	23.4	14.9	**48.0**	18.5	23.8	15.8	17.4	11.4	11.9	12.2	23.3	20.6	21.7	15.6	24.6	NA	28.1	NA
Potassium	~	~	1,340	1,090	1,680	1,350	1,750	1,190	1,080	871	650	834	913	1,050	917	590	927	NA	1230	NA
Selenium	3.9	1500	1.55	2.33	2.56	2.42	2.98	2.88	2.14	0.236 U	1.85	0.814	2.89	1.65	0.727	0.838	2.45 B	NA	1.86 B	NA
Sodium	~	~	477	303	596	361	647	341	477	220	465	474	778	558	462	476	586 B	NA	365 B	NA
Vanadium	~	~	26.3	17.0	30.3	24.7	21.7	22.5	15.0	12.2	14.3	16.2	34.6	20.0	26.3	16.7	28.6	NA	19.1	NA
Zinc	109	10000	46.8	77.3	65.4	**559**	94.6	35.8	**191**	51.7	35.7	27.3	44.1	**113**	43.3	59.6	28.9	NA	64.3	NA
Solids, Total (%)	~	~	88.5	88.1	87.3	85.5	83.9	86.9	78.8	89.6	81.9	82.9	76.8	78.6	86.7	86.0	86.4	86.3	87.0	87.6
TCLP Metals (mg/L)																				
Lead	5*	5*	NA	NA	0.0218	NA	NA	NA	0.0300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (mg/kg)																				
	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,400	NA	NA
Pesticides/PCBs, EPA TCL List (mg/kg)																				
	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND
Herbicides, Target List																				
	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND
Metals, RCRA																				
Arsenic	13	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.53
Barium	350	350	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	70.4
Chromium	~	~	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21.2
Lead	63	63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	58.9
Selenium	3.9	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.48 B

Notes
Soil sample results were compared to New York State Department of Environmental Conservation (NYSDEC) 6 NYCRR PART 375-6 Unrestricted Use Soil Cleanup Objectives (SCOs)
Results exceeding NYSDEC Part 375 Unrestricted Use SCOs are in BOLD.
Results exceeding NYSDEC Part 375 Restricted Commercial Use SCOs are highlighted.
Only detected compounds are presented
Method Detection Limits Exceeding Part 375 Unrestricted Use SCOs are *italicized*
mg/kg: milligrams per kilogram

Qualifiers
D = Results for a diluted sample.
U = Analyte was not detected at or above the reporting limit.
B= Analyte is found in the associated analysis batch blank.
J= Result is estimated concentration.
* = Value is a NYSDEC Draft Supplemental Residential SCO
~ = No NYSDEC Part 375 SCO or Supplemental Residential SCO is established for this analyte
NA = Not analyzed.

Table 4
Analytical Results for Groundwater

Table 4
Analytical Results for Groundwater
Highline 13,14, 10
New York, NY
Langan Job No. 170119302

LOCATION	NYSDEC TOGS 1.1.1	TMW-1		TMW-2		TMW-3		TMW-4		TMW-5		TMW-6		TMW-7		TMW-8		TMW-9		B2-OW		B3-OW		B7-OW	
SAMPLING DATE	AMBIENT WATER	11/23/2010		11/24/2010		11/23/2010		11/29/2010		11/30/2010		11/29/2010		12/1/2010		11/30/2010		11/29/2010		11/12/2009		11/23/2010		11/23/2010	
LAB SAMPLE ID	QUALITY STANDARDS	10K0809-03		L0916586-08		L0916439-05		10L0036-06		10L0147-08		10L0036-07		10L0147-02		10L0147-09		11A0044-05		L0916439-08		10K0809-09		10K0809-10	
Volatile Organics, Target Compound List (ug/L)																									
1,2-Dichloroethane	0.6	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*	*0.65*	*U*
Acetone	50	3.2	JB	3.1	U	3.1	U	4.0	JB	3.1	U	8.1	JB	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U
Benzene	1	0.48	U	0.48	U	0.48	U	0.48	U	0.48	U	**1.5**	**J**	0.48	U	0.98	J	0.48	U	0.48	U	0.48	U	0.48	U
Bromodichloromethane	~	3.5	J	2.7	J	0.62	U	0.62	U	0.62	U	0.62	U	0.62	U	0.62	U	0.62	U	0.62	U	1.8	J	0.62	U
Chlorobenzene	5	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	1.2	J	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U	0.35	U
Chloroform	7	**27**		**21**		0.36	U	0.36	U	0.36	U	0.36	U	0.66	J	0.36	U	0.36	U	0.36	U	**21**		0.36	U
Isopropylbenzene	5	0.39	U	0.39	U	0.39	U	0.39	U	0.39	U	1.2	J	0.39	U	0.39	U	0.39	U	0.39	U	0.39	U	0.39	U
Methylene chloride	5	2.9	JB	1.2	J	1.1	U	2.2	JB	1.1	U	1.8	JB	1.1	U	1.1	U	1.1	U	1.1	U	3.2	JB	3.2	JB
p- & m- Xylenes	5	0.55	U	0.55	U	0.55	U	0.55	U	0.55	U	0.96	J	0.55	U	1.1	J	0.55	U	0.55	U	0.55	U	0.55	U
Toluene	5	0.23	U	0.28	J	1.5	J	0.23	U	0.23	U	0.23	U	0.23	U	1.2	J	**5.9**		0.23	U	0.23	U	0.23	U
trans-1,2-Dichloroethylene	5	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U
Xylenes, Total	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.9	J	1.0	U	1.9	J	1.0	U	1.0	U	1.0	U	1.0	U
Total VOCs	--	33.1		25.18		1.5		6.2		ND		17.57		0.66		6.52		5.9		ND		26		3.2	
Semi-Volatiles, EPA TCL List (ug/L)																									
2-Methylnaphthalene	~	3.15	U	3.07	U	3.07	U	3.15	U	3.15	U	24.4		3.15	U	3.07	U	3.24	U	3.07	U	3.07	U	3.07	U
Acenaphthene	20	3.32	U	3.24	U	3.24	U	3.32	U	3.32	U	7.48		3.32	U	3.24	U	3.41	U	3.24	U	3.24	U	3.24	U
Dimethyl phthalate	50	4.97	U	6.00		4.85	U	4.97	U	4.97	U	4.85	U	4.97	U	4.85	U	5.10	U	4.85	U	4.85	U	4.85	U
Naphthalene	10	3.96	U	3.86	U	3.86	U	3.96	U	3.96	U	**15.9**		3.96	U	3.86	U	4.07	U	3.86	U	3.86	U	3.86	U
Total SVOCs	--	ND		6.00		ND		ND		ND		47.78		ND		ND		ND		ND		ND		ND	
Polychlorinated Biphenyls (PCB) (ug/L)	~																								
Aroclor 1248	~	0.0372	U	0.0363	U	0.0363	U	0.0382	U	**0.154**		0.0363	U	0.0363	U	0.0372	U	0.0382	U	0.0363	U	0.0372	U	0.0363	U
Aroclor 1260	~	0.0433	U	0.0422	U	0.0422	U	0.0444	U	**0.348**		0.0422	U	0.0422	U	0.0433	U	0.0444	U	0.0422	U	0.0433	U	0.0422	U
Total PCBs	~	0.0372	U	0.0363	U	0.0363	U	0.0382	U	**0.503**		0.0363	U	0.0363	U	0.0372	U	0.0382	U	0.0363	U	0.0372	U	0.0363	U
Metals, Target Analyte (ug/L)																									
Aluminum	~	760		23		171		7	U	408		7	U	100		14		87		7	U	838		522	
Antimony	~	2	U	2	U	2	U	2	U	2	U	6		2	U	2	U	2	U	2	U	2	U	2	U
Barium	1000	4	U	13		13		98		87		359		68		268		266		196		25		4	U
Calcium	~	10,800		15200		15000		83,500		121,000		149,000		122,000		169,000		147000		119000		12,400		12,400	
Chromium	50	0.9	U	0.9	U	0.9	U	0.9	U	5		0.9	U	11		0.9	U	0.9	U	0.9	U	6		0.9	U
Copper	~	6		2	U	10		2	U	20		2	U	5		2	U	2	U	2	U	9		2	U
Iron	~	386		41		120		16		735		9,510		234		1,040		93		14		940		483	
Lead	25	5		3		1	U	1	U	21		1	U	4		1	U	3		1	U	17		1	U
Magnesium	~	1,140		1380		3010		11,200		13,500		28,800		15,400		22,200		25800		15400		2,240		4,780	
Manganese	~	18		81		55		1,550		248		5,470		11		2,920		1680		1990		49		160	
Mercury	0.7	0.03900	U	0.03900	U	0.03900	U	0.03900	U	**1.4**		0.03900	U	0.03900	U	0.03900	U	0.03900	U	0.03900	U	0.03900	U	0.03900	U
Nickel	~	0.8	U	6		0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
Potassium	~	1,170		2270		6870		16,600		14,000		32,500		8,920		41,300		30000		18600		9,780		13,900	
Selenium	10	2	U	2	U	2	U	10		2	U	**16**		2	U	2	U	**11**		2	U	2	U	2	U
Sodium	~	10,300		9230		56200		219,000		75,600		444,000		78,500		435,000		454000		104000		21,500		81,800	
Zinc	~	0.9	U	0.9	U	0.9	U	0.9	U	49		0.9	U	0.9	U	0.9	U	0.9	U	0.9	U	31		0.9	U

Notes and Qualifiers

Groundwater samples were compared to New York State Department of Environmental Conservation (NYSDEC) Ambient Water Quality Standards (AWQS) or Guidance Values
Results exceeding NYSDEC AWQS or Guidance Values are highlighted and in **BOLD**
Only detected compounds are presented
Method Detection Limits Exceeding NYSDEC AWQS or Guidance Values are *italicized*
VOCs: Volatile Organic Compounds
SVOCs: Semivolatile Organic Compounds
PCBs: polychlorinated biphenyls
µg/L: Micrograms per Liter
U = Analyte was not detected at or above the reporting limit.
J= Result is an estimated concentration.
B = Analyte is found in the associated analysis batch blank.
ND = Not detected
* = Value is a TOGS Guidance Value and not a standard
~ = No TOGS AWQS or Guidance Value is established for this analyte

Table 5
Analytical Results for Soil Vapor

Table 5
Analytical Results for Soil Vapor
Highline 13, 14, 10
New York, NY
Langan Job No. 170119302

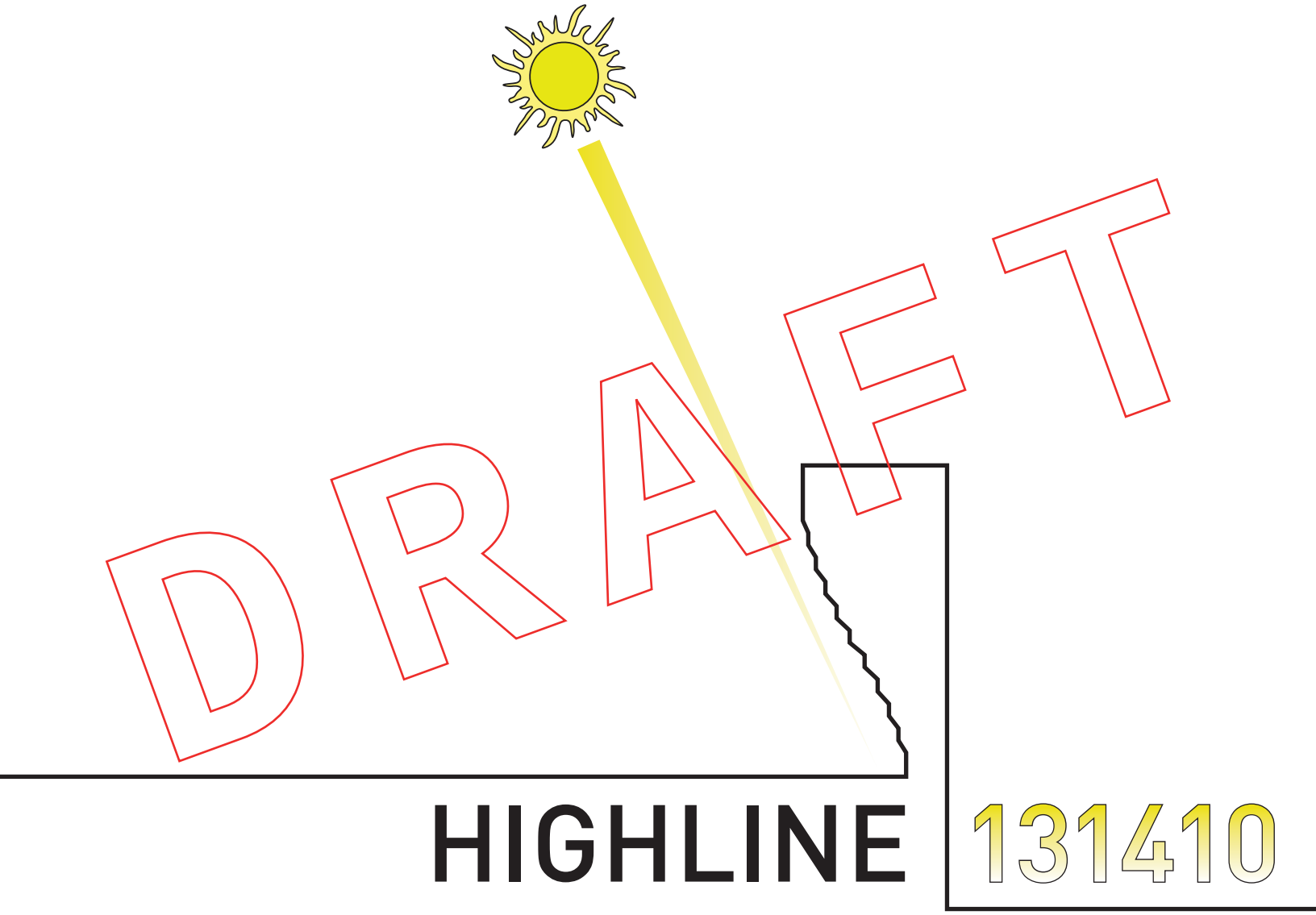
LOCATION SAMPLING DATE LAB SAMPLE ID	NYSDOH AGV	NYSDOH 2003 FUEL OIL OUTDOOR AIR UPPER FENCE VALUE	USEPA 2001 BASE DATABASE: 90 PERCENTILE OUTDOOR AIR	HEI 2005 95 PERCENTILE OUTDOOR AIR	AA-1 11/29/2010 10L0036-03	
VOCs (ug/m^3)						
Benzene					1.7	
Ethylbenzene		1	1.1		1.4	J
Methylene chloride	60	1.6	1.6	2.46	0.99	J
o-Xylene		1.2	1.7	3.23	1.6	J
m,p-Xylene		1	1.4	10	4.4	
Toluene		5.1	5.9	19.6	3.3	

Notes and Qualifiers

Results exceeding the New York State Department of Health (NYSDOH) Air Guideline Value (AGV) Exceedances are highlighted and **BOLD**.
Ambient air sample results are less than all of the following background databases: NYSDOH Fuel Oil 2003
Upper Fence Value, U.S. Environmental Protection Agency (USEPA) Base Database 90th Percentile Indoor Air, and Health Effects Institute (HEI)
Only detected compounds are presented.
VOC = Volatile Organic Compound
µg/m^3: micrograms per cubic meter
U = Analyte was not detected at or above the reporting limit
B = Analyte is found in the associated analysis batch blank.

J = Analyte was detected below the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL), and therefore is an estimated concentration.

Appendix 1
Proposed Redevelopment Plans



HIGHLINE 131410

Feasibilty / Program / Concept Study for

WILLIAM GOTTLIEB REAL ESTATE

2010.08.27

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Surprisingly, the building mass grows larger at the top to the great advantage of upper-floor occupants. The smaller chiseled footprint below throws much-needed light and air to the High Line public park as it passes by to the east.

TABLE OF CONTENTS

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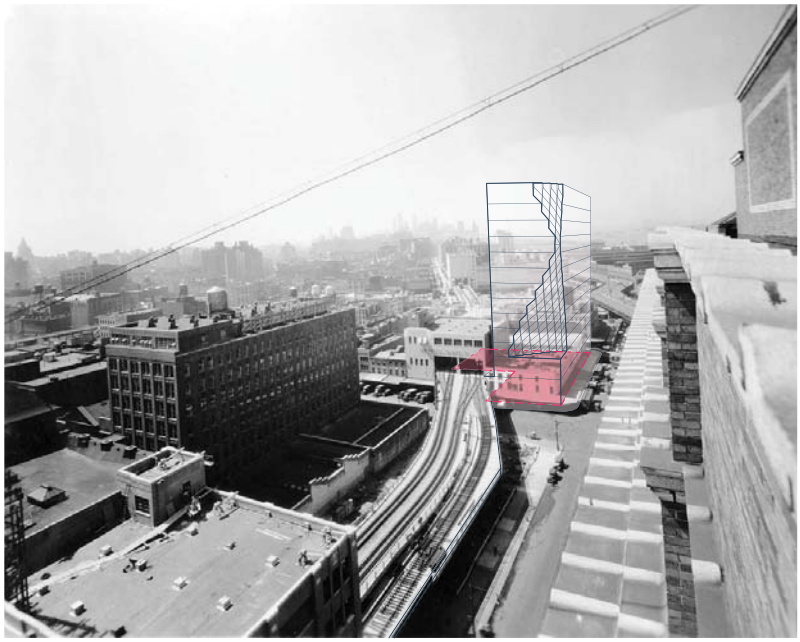
01 RESEARCH

HISTORICAL BACKGROUND

The project site occupies a location in Lower Manhattan that is rich in history. Over half of the site area was in the Hudson River until the 1830's, when the river's edge was expanded using city garbage as fill material. By the 1900's the district housed over 200 slaughterhouses and packing plants. The 1930's saw the construction of the High Line, an elevated railroad transporting milk, meat, produce, raw and manufactured goods.

Today the neighborhood has once again undergone a metamorphosis. The Meatpacking District is a booming residential, office, leisure and fashion district with a significant historical fabric. To wide acclaim, the High Line has been repurposed as an elevated urban park: a 21st Century conveyor of fun. The Highline 131410 site, nestled between this unique park and the vast Hudson River, is ideally positioned to add to the neighborhood's continuing evolution.



Historical photo ca. 1940, overlaid with proposed design

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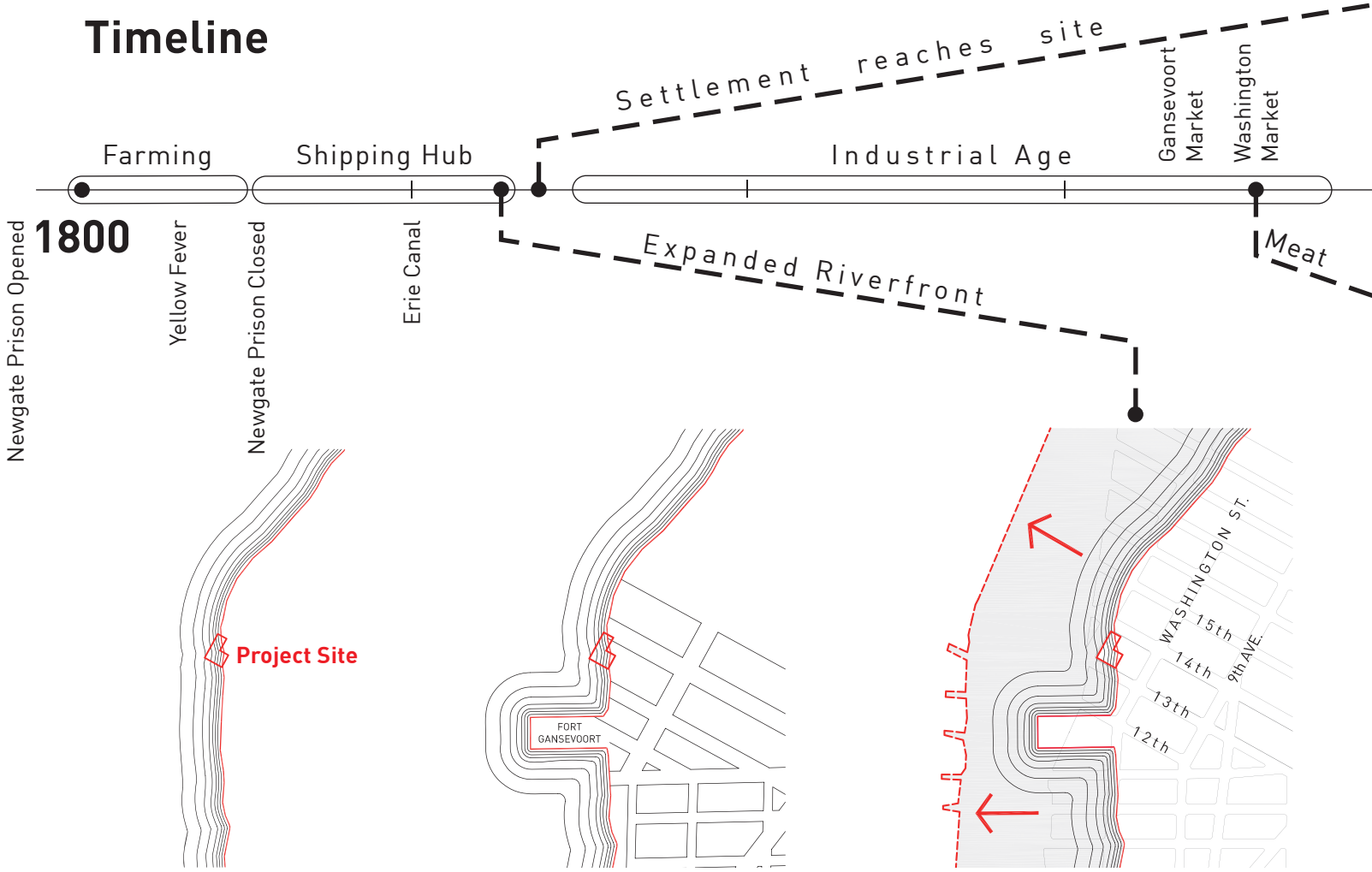
The Settlement of Lower Manhattan Superimposed with

1642

1728

1782

Timeline



Pre-Settlement

ca. 1820

ca. 1834

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Modern City Map

1836

Industrial Decline

High Line

Westside Highway Completed

Bohemian Phase of MPD

Revival

Westside Highway Demolished

Meatpacking District Gentrifies

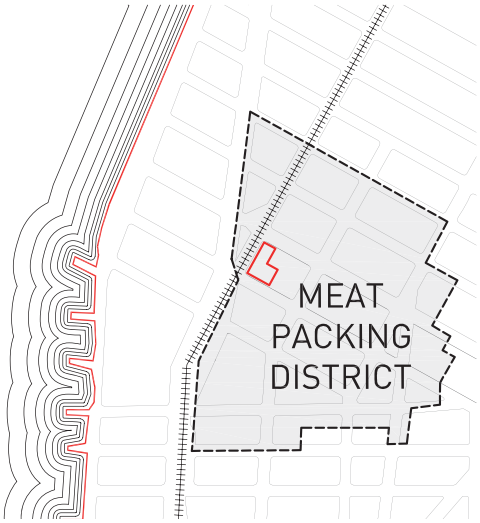
Fashin District Established

1900

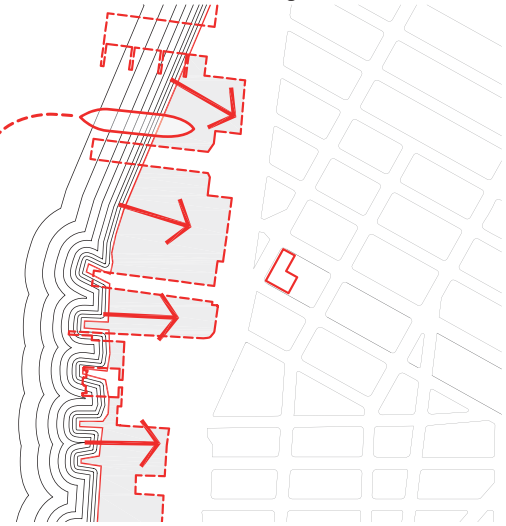
2000

Riverfront cut back

Packing District



ca. 1886



ca. 1890s

TODAY

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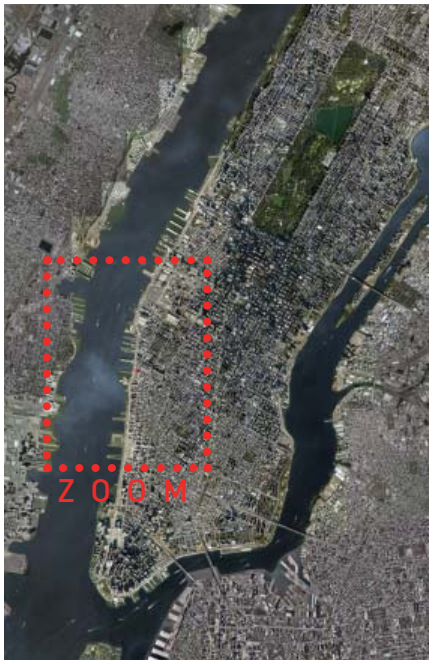
SITE
HUDSON RIVER



Manhattan between rivers
Zoom area: Meatpacking District
and Chelsea (left)

Lower Manhattan and Hudson River
ca. 1934

HUDSON RIVERFRONT ACTIVITY

01 Pier 79 Ferry Terminal / Lincoln Tunnel entrance
02 Pier 76 NYPD tow pound
03 Jacob K. Javits Convention Center
04 West Side Rail Yards
05 Pier 66
06 Pier 64 Passive green recreation
07 Chelsea Waterside Park
08 Pier 62 Skate park & carousel
09 Chelsea Piers Sports & entertainment complex
10 Pier 57 Proposed rooftop park and open-air market (LOT-EK)
11 14th Street Park
12 Pier 54 Event / performance space
13 Piers 53 & 52 FDNY / NYC Dept. of Sanitation
14 Piers 51 Playground / water features
15 Pier 46 Synthetic turf play area
16 Pier 45 Sunbathing, event space, cafe, water taxi
17 Pier 40 Sports fields, parking, moorings,
18 Holland Tunnel
19 Weehawken Cove
20 Shipyard Pier
21 Elysian Park
22 Stevens Institute of Technology
23 Sinatra Park
24 Hoboken Pier A Park
25 Hoboken Ferry
26 Harsimus Cove
27 Hudson River ferry routes

HIGH LINE DEVELOPMENT SITES

28 Related Companies Mixed use
29 L&M Development Partners/
Ekstein Development Residential
30 Hampshire Companies (KPF) Retail / office
31 245 10th Avenue (Grasso Holdings) Residential
32 HL23 (Alf Naman, Neil Denari) Residential
33 Equity Residential
34 100 11th Street
(Cape Advisors, Jean Nouvel) Residential
35 511 West 21st Street Office
36 IAC (Frank Gehry) Office
37 Edison Properties
(Robert A.M. Stern)Mixed use / public plaza
38 450 W 14th (CB Developers) Retail / office
39 437 W 13th (Romanoff) Retail / office
40 The Standard Hotel
41 Downtown Whitney Museum

High Line Phase 1 (complete)
High Line Phase 2 (under construction)
High Line Phase 3
Greenway + bike path
Site

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MEATPACKING HOTSPOTS

HOTEL

01 The Maritime Hotel
02 Standard Hotel
03 SOHO House
04 Hotel Gansevoort
05 Rooms To Let

OFFICE

06 L-3 Communications
07 Lehman Brothers
08 College Sports Television
09 Milk Studios
10 Todds
11 MLB
12 Oxygen Media
13 Google
14 Food Network
15 Tudor Investment Corp.
16 Hoya Holdings
17 Alexander McQueen
18 Bumble and Bumble
19 Box
20 Vitra
21 Theory

SHOPPING

22 Nicole Farhi
23 Chelsea Market
24 Jeffrey
25 Jean Shop
26 Massimo Bizzocchi
27 Stella Mccartney
28 Doclab
29 Ten Thousand Things
30 PUMA
31 Alexander McQueen
32 Boss
33 Apple
34 Diane Von Furstenburg
35 Artsee Eyewear
36 Dernier Cri
37 Rubin Chapelle
38 Carlos Miele
39 Design Within Reach
40 Yigal Azrouel
41 Catriona Mackechnie
42 Ed Hardy
43 Adam
44 Henry Beguelin
45 Boucher Jewelry
46 Jussaralee
47 Helmut Lang
48 Destination
49 Trina Turk
50 Catherine Malandrino
51 Rebecca & Drew Manufacturing
52 Calypso
53 Yoyamart
54 Yohji Yamamoto
55 Space 107
56 Banchet Flowers
57 Lars Bolander
58 Auto
59 Theory
60 Shelly Steffee
61 Poleci
62 Charles Nolan
63 Christian Louboutin
64 Elizabeth Charles

DINING

65 Del Posto
66 The John Dory
67 Craftsteak
68 Morimoto
69 Bar Suzette
70 Bowery Kitchen Supply
71 Chelsea Wine Vault
72 Eleni's
73 Dickson's Farmstand
74 Chelsea Market
75 La Bottega
76 Hiro Lounge and Ballroom
77 Matsuri
78 Lotus
79 Son Cuband
80 Old Homestead
81 Pop Burger
82 The Diner
83 Scarpetta
84 Comix
85 Hogs & Heifers
86 Apt
87 Valbella
88 Aer
89 Spice Market
90 Gaslight
91 VENTO
92 Ara
93 Brass Monkey
94 Fig & Olive
95 Highline Restaurant
96 Arium
97 Pastis
98 Sno
99 One
100 Stk
101 CIELD
102 Tenjune
103 Los Dados
104 Merkato 22
105 5 Ninth
106 The Inn LW12
107 PM

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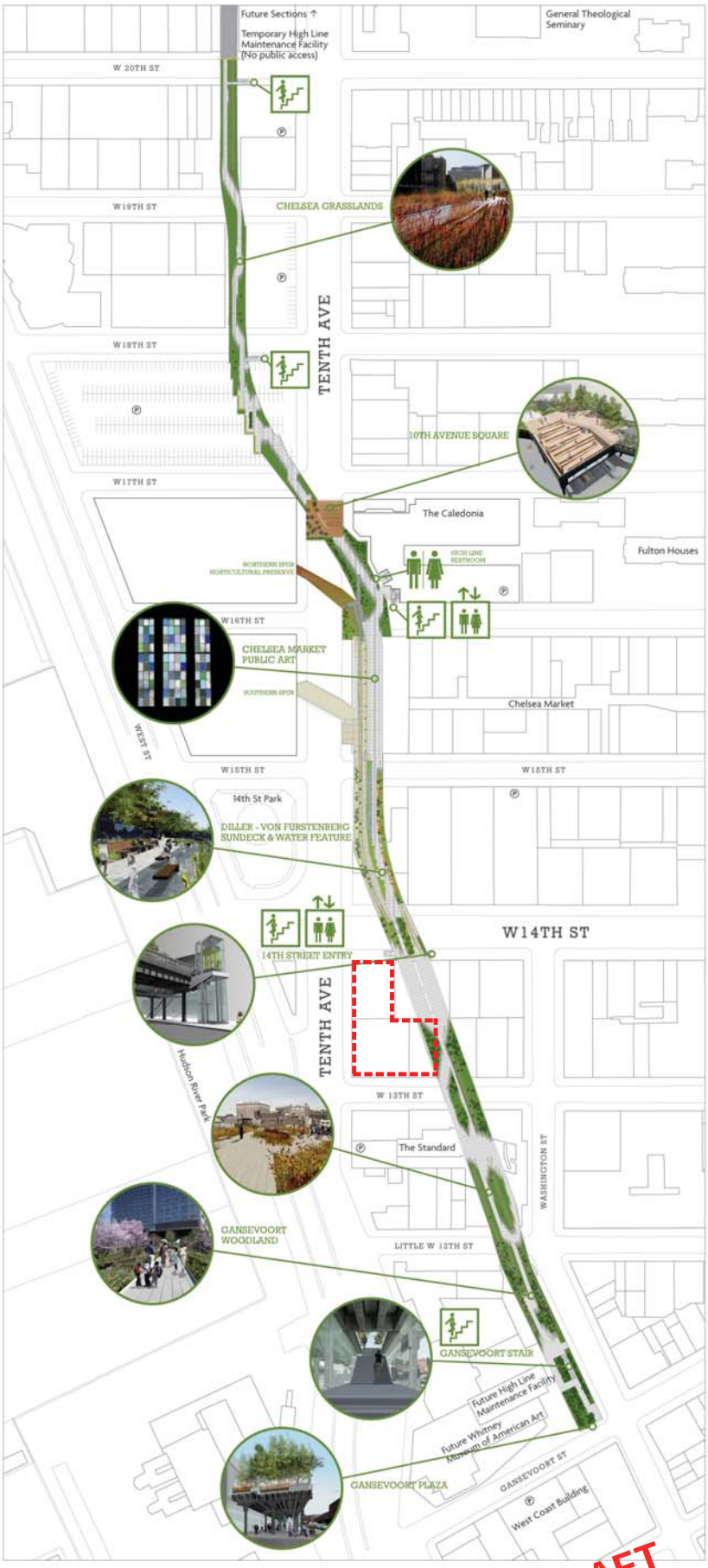
THE HIGH LINE PARK

Urban Theater at 10th Avenue Square

Yoga at Chelsea Passage

The High Line Sundeck

Washington Grasslands, aerial view



High Line Phase I Master Plan and project site

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CLIMATE

Temperature

Manhattan has a humid subtropical climate, averaging 234 days with at least some sunshine annually (2680 hours of bright sunshine per year). The average temperature in January, the area's coldest month, is 32.1°F; however, temperatures in winter can climb to 55°F or drop to 10°F. Spring and autumn are unpredictable and can range from chilly to warm, although they are predominantly pleasant and mild with low humidity. Summers are typically hot and humid with a July average high of 84.2°F and low of 68.8°F. Nighttime conditions are greatly affected by the urban heat island phenomenon. Temperatures can exceed 90°F on an average of 16 to 19 days each summer, and can exceed 100°F every 4 to 6 years.

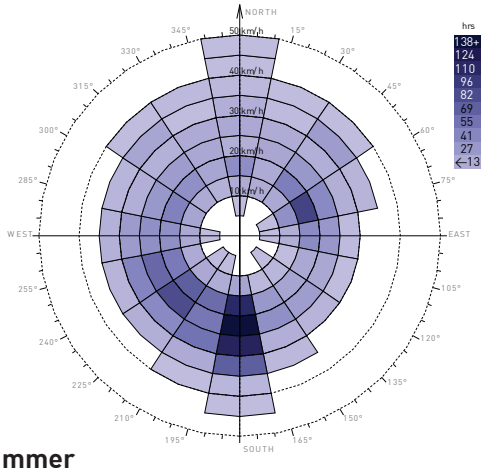
Precipitation

Manhattan receives 49.7 inches of precipitation annually, which is evenly distributed throughout the year. Average winter snowfall is about 28 inches, but this usually varies considerably from year to year and cover usually melts quickly. Hurricanes and tropical storms are rare but possible.

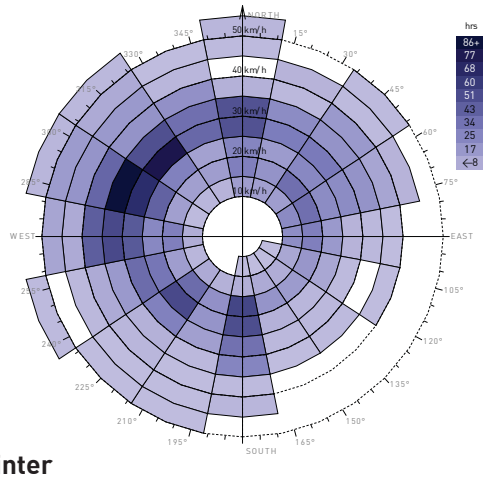
Hudson River microclimate

Besides the obvious benefit of fantastic panoramic views, adjacency to the Hudson will influence the micro-climate of the site in ways not felt even a few blocks away from the river's edge. Exposure to the river means that the site benefits from unimpeded southerly summer winds, but must be protected from strong late-day sun exposure from the west. Inversely, the site is also exposed to strong northerly and northwesterly winter winds coming off of the river corridor, but benefits from heat gained from generous afternoon sun exposure.

Prevailing Winds, Manhattan, NY

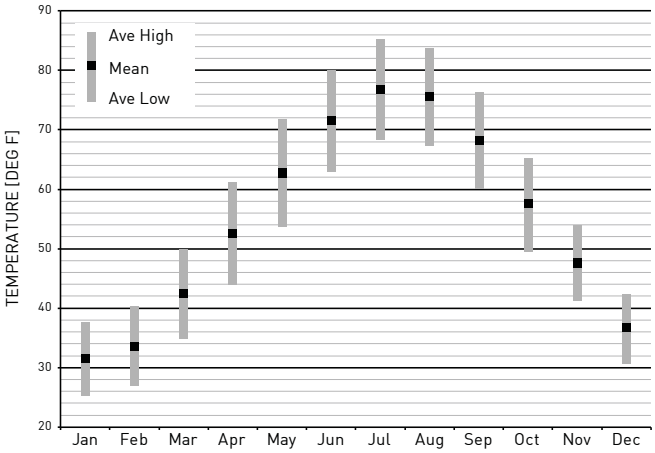


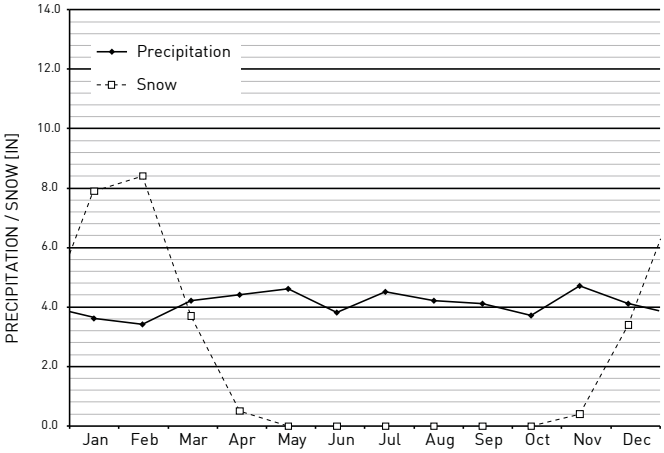
Summer
Strong winds from the south and southwest



Winter
Strong winds from all points on compass
fron north to west, with some wind from south

Monthly Temperature + Precipitation, Manhattan, NY

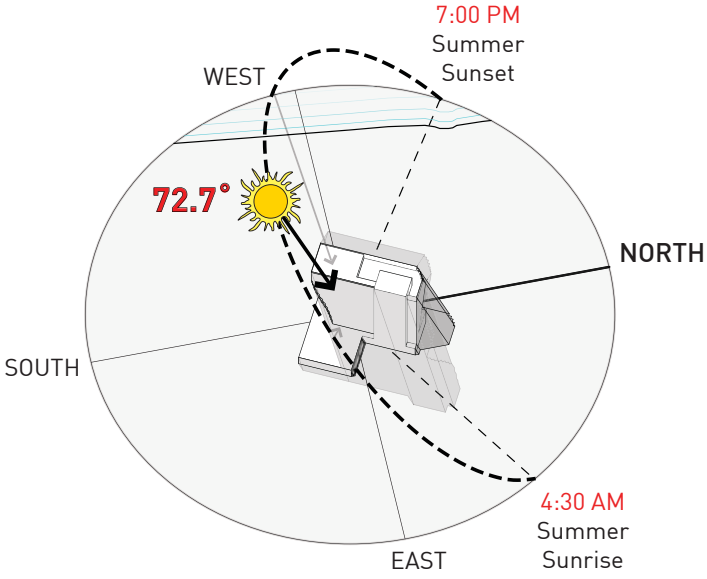




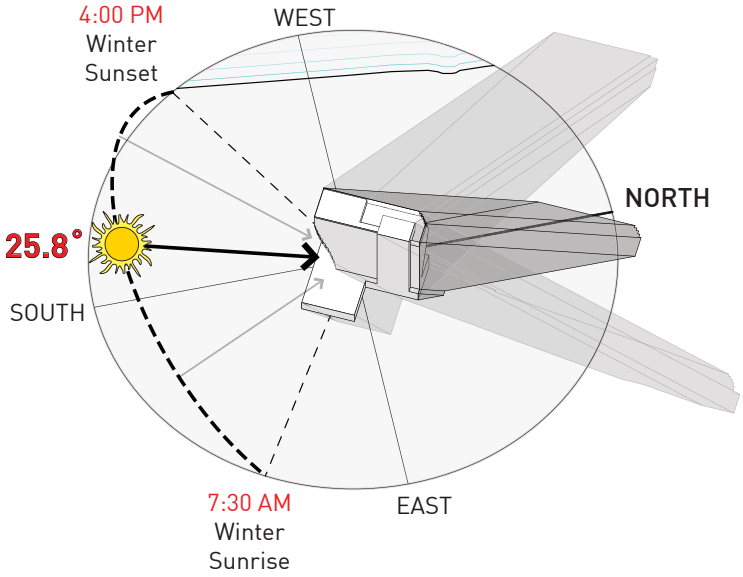
The exposure of the site to the Hudson River is obvious in this overlay of the Highline 131410 building mass.

Sun Paths, Manhattan, NY

Latitude 40° 43' N



Summer Solstice, June 21
Noon sun angle = 72.7°



Winter Solstice, December 21
Noon sun angle = 25.8°

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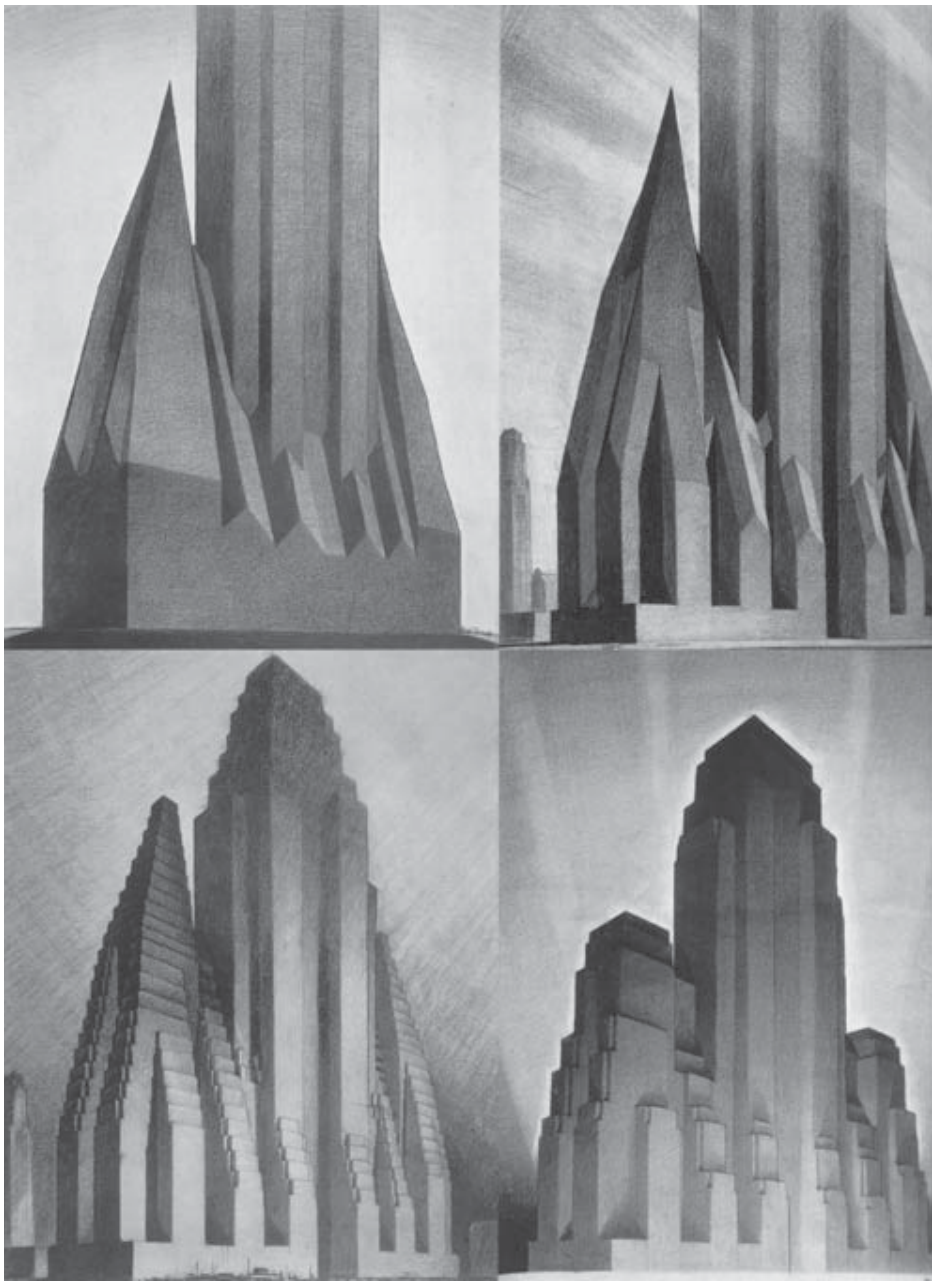
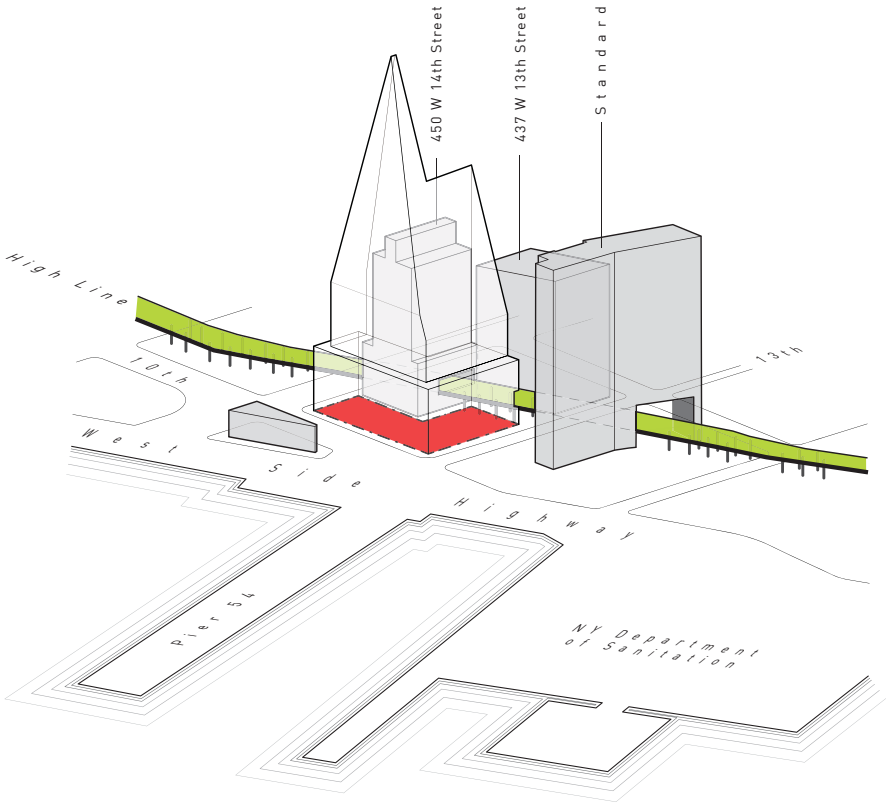
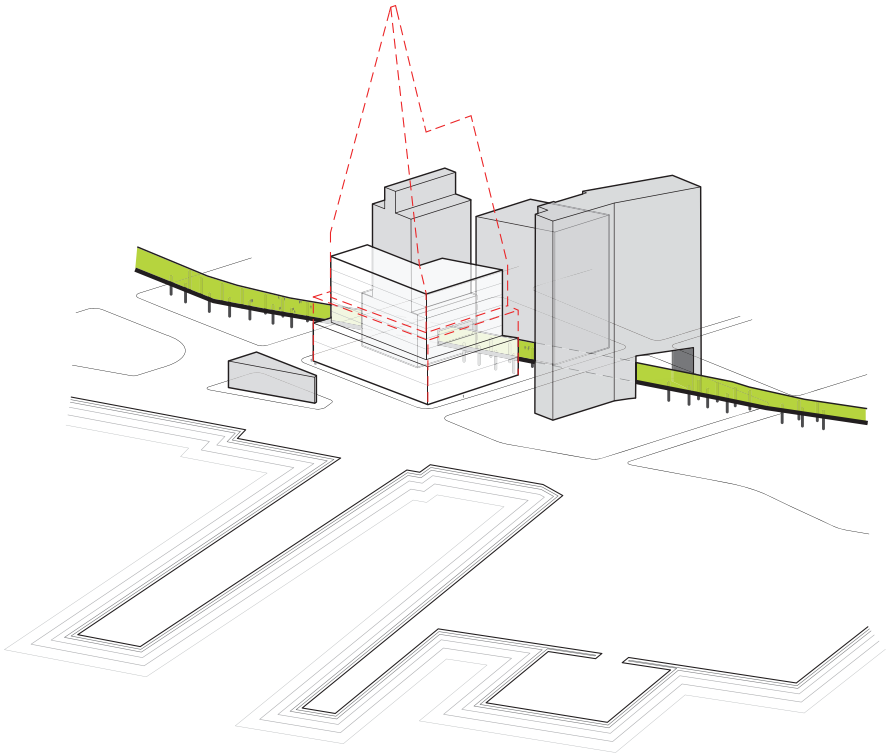


NYC ZONING: Bulk Regulation

New York City's landmark 1916 Zoning Resolution was enacted to preserve **light and air** to city streets in response to Manhattan's rapid development. The resolution limits a building's area to a certain percentage of the lot area (F.A.R.), and also limits its bulk based on a series of setbacks at specific heights above street level (Sky Exposure Planes). These innovative regulations produced the "Setback Skyscraper", a tiered building form that is native to New York but has reached international ubiquity. The 1922 renderings of Hugh Ferriss (above) depict possible building forms according to the 1916 resolution.



Bulk Regulation Envelope (without regard to F.A.R.)
When applied to the project site, NYC zoning produces a characteristic pyramidal building envelope that is designed to maintain light and air to the surrounding streets (13th Street, 14th Street, and 10th Avenue). Paradoxically, this is where light and air are <u>not</u> needed due to the site's expusure to the Hudson River.



Floor Area Ratio (F.A.R.)
The site is located in an M1-5 district with a F.A.R. of 5.0. Full buildout within the Bulk Regulation Envelope produces a building that steps back from the surrounding streets, but is not required to be set back from the High Line (where the light and air protections for 13th, 14th, and 10th would be better applied).

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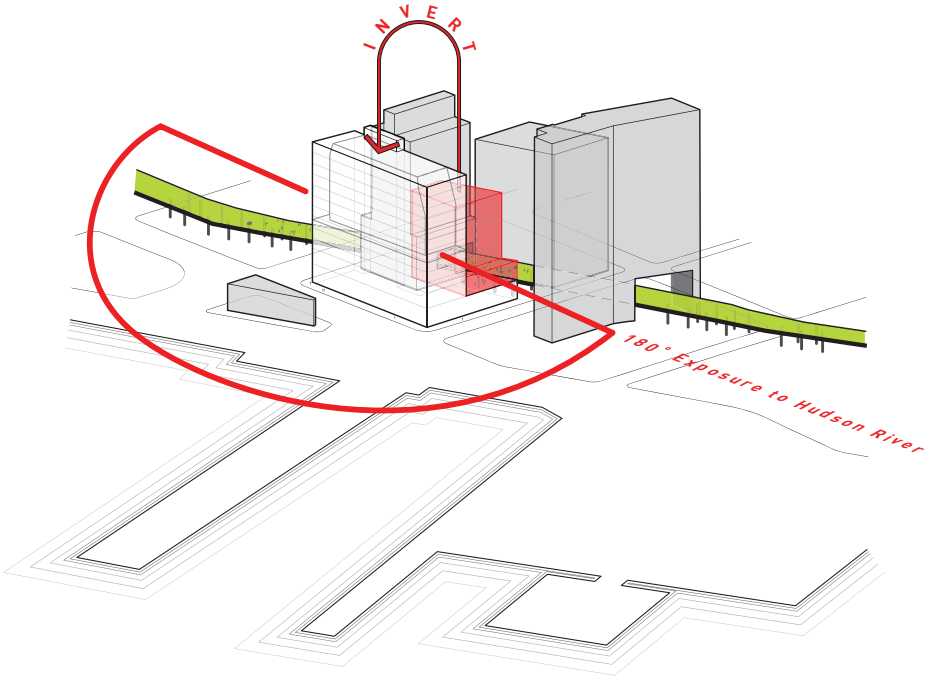
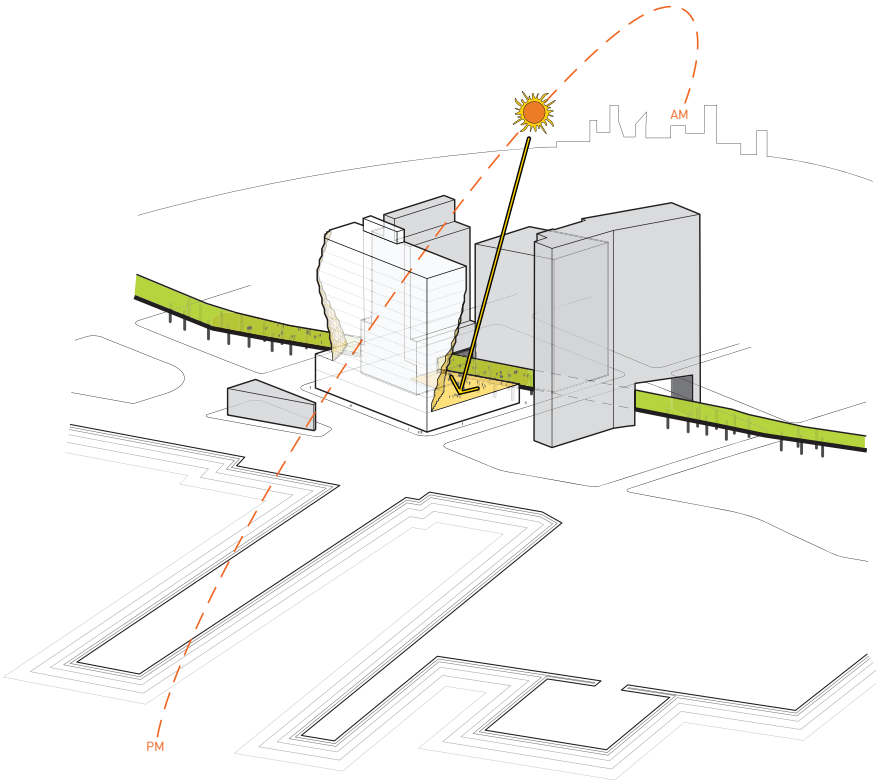
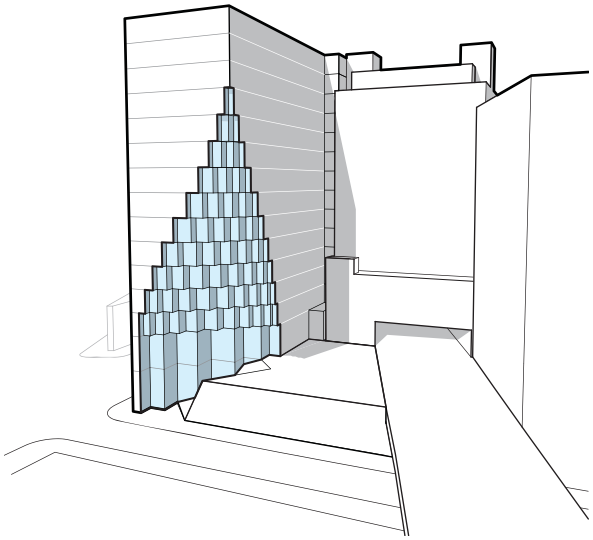


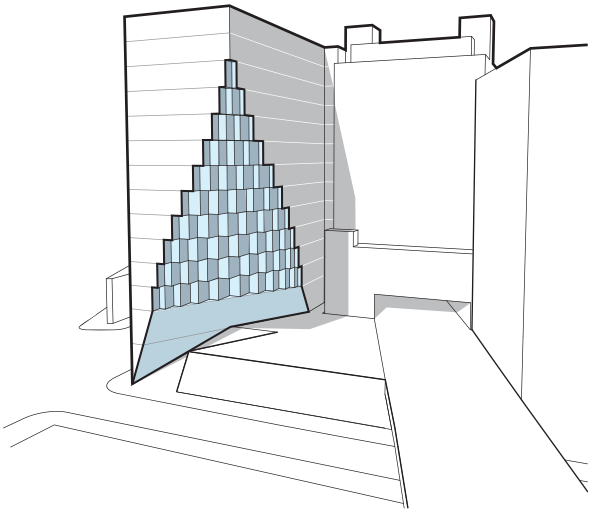
Inverting the Setbacks: Giving light and air to the High Line park.
The site is located at the edge of Manhattan, between the Hudson River and the High Line park. NYC zoning regulations impose setbacks along the 3 street frontages, but these serve little purpose because there are no effective buildable sites opposite the project site on those 3 streets. Thus, plenty of light and air will reach 13th, 14th, and 10th even without the required setbacks; but if the project site were built within its rights, the High Line would be in constant shadow and suffer obstructed views. "Inverting" the light and air setback from the street to the High Line park (by shifting the building mass to the west) offers the greatest benefit to the neighborhood and the public.



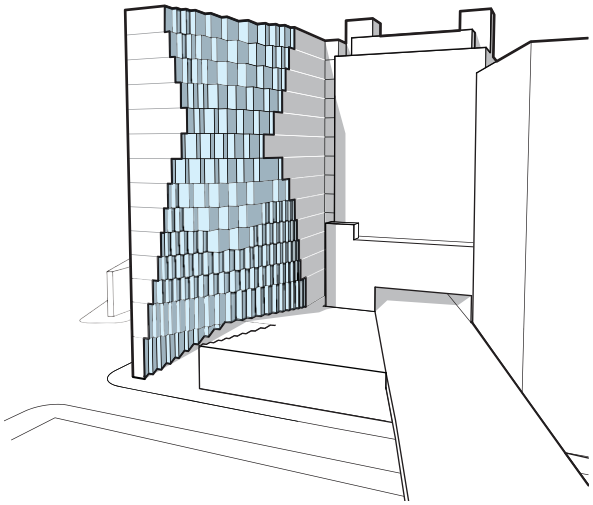
Solar Carving: Even <u>more</u> light and air to the High Line park!
To further improve the High Line's qualities of light, air, and views, the building mass is strategically carved in response to the movement of the sun. This results in a striking building volume and a great park.



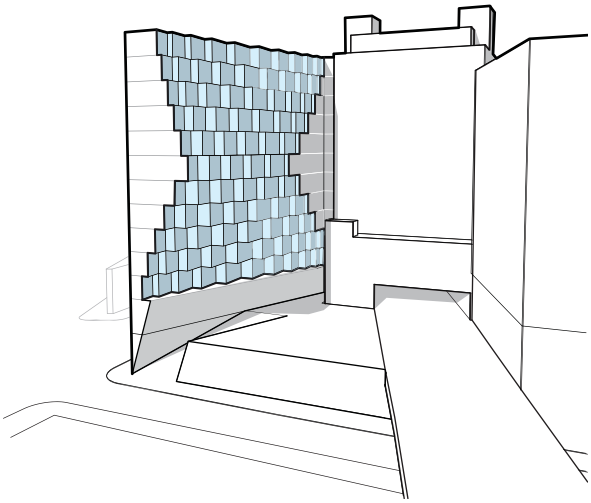
"Alpha"
F.A.R. = 8.0



"Beta"
F.A.R. = 7.5



"Gamma"
F.A.R. = 7.0



"Delta"
F.A.R. = 6.5

"Solar Carving": A massing strategy that offers amazing flexibility.
In addition to responding to the site's specific solar needs, the "solar carving" concept lends flexibility to the design. Varying the degree of carving can accommodate a wide range of F.A.R. targets while maintaining the overall building height, which is at a premium for spectacular views. The 4 schemes studied above range from F.A.R 6.5 to F.A.R. 8.0

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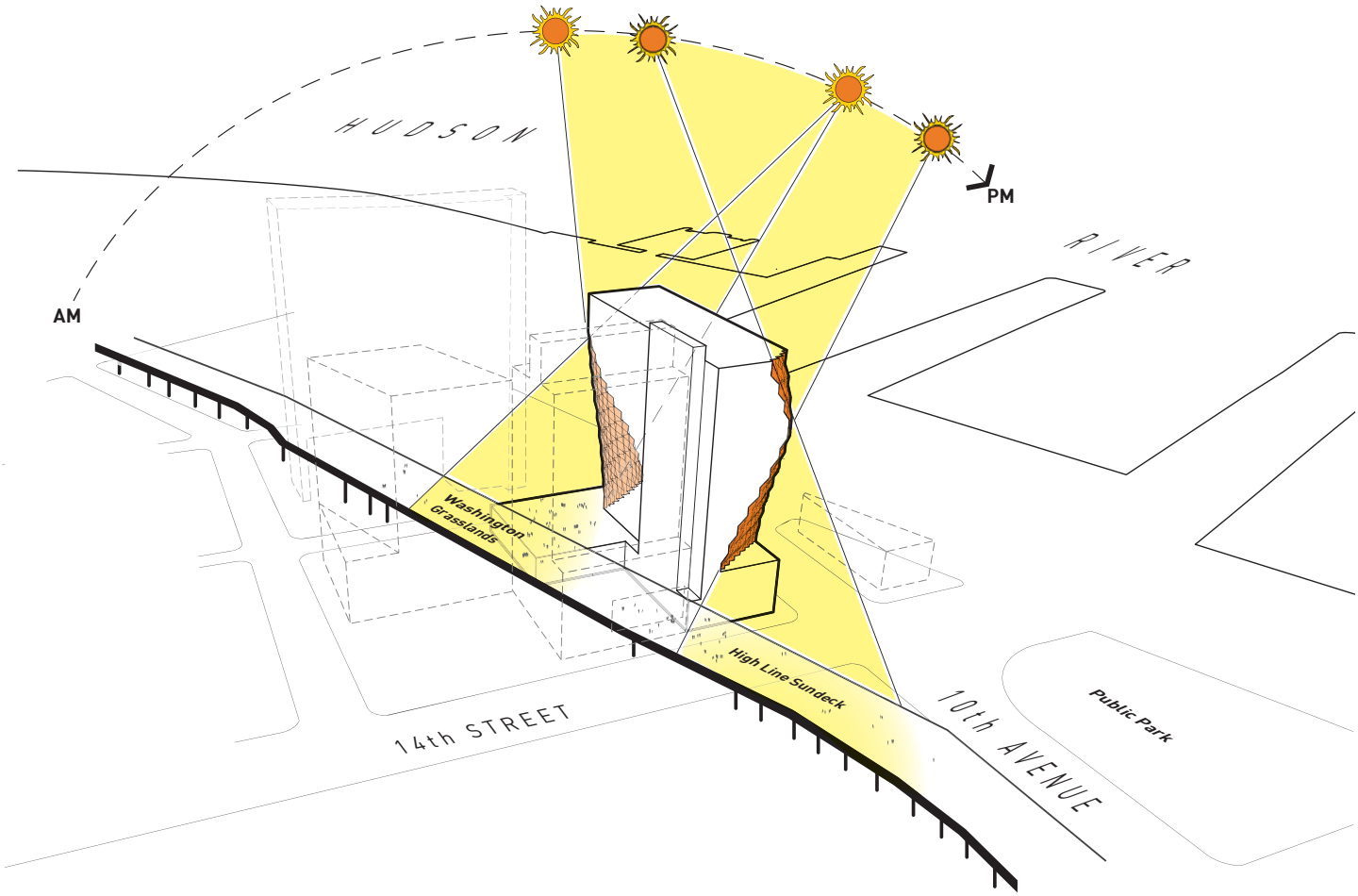
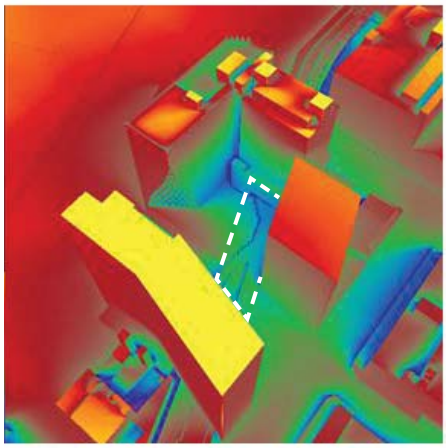


A Friendly Neighbor...
Compared to a tower mass extruded vertically from the property line, the solar-carved tower yields a significant increase in yearly sunlight hours to two key areas on the High Line park: The Washington Grasslands to the east of the site, and the High Line Sundeck to the north.

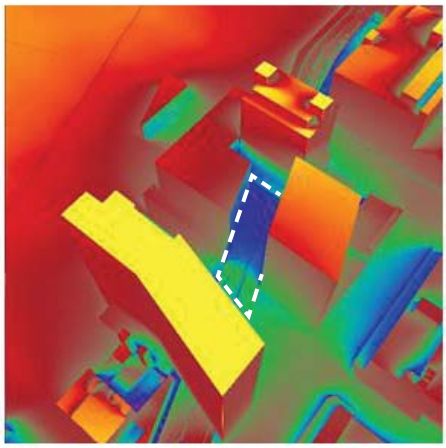
light blue
green
=
LIGHT!

annual
sun hours



Solar Carve design
(F.A.R. = 7.5)

VS.



As-of-right design
(F.A.R. = 5)

dark
blue
=
No Light

...and double the daylight!
A daylight model demonstrates that compared to an as-of-right scheme, the proposed tower's shape and position significantly increase the natural light and air to the High Line. In particular, the area directly to the east of the site will see about **twice the amount of possible sun hours!**

The building magnificently reveals its strategy for light and air through a gem-like carving toward the High Line park:
A diamond in the rough.

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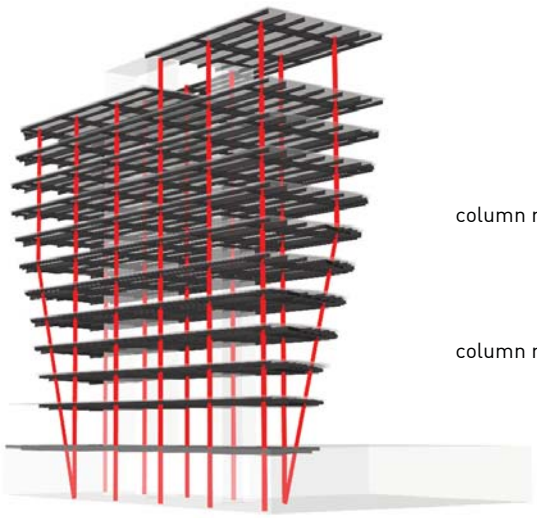
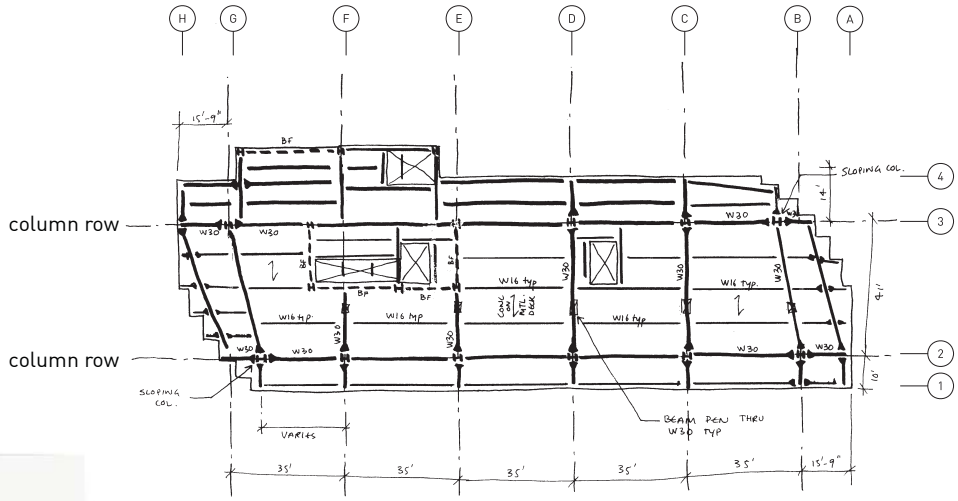
GANG
/ARCHITECTS



View of steel structure



Typical steel framing plan with 2 column rows (tower office floor)

STRUCTURE

Although office buildings in New York are commonly constructed with steel framing, there are several reasons why this project may be more efficient as a concrete structure (particularly with respect to the building services strategy). Nevertheless, without preconceptions, steel and concrete options are compared here.

STEEL

For the steel-framed scheme only two row of columns are required. Steel framing spans between and cantilevers to the east and west sides, which allows the columns to pull back from the east and west façades.

To create the sloping "carved regions" on the façade, two columns in opposite corners are canted. This generates additional lateral forces on the building, but because these columns slope in opposite directions, most of these forces balance out. Therefore additional lateral loading on the core is thus minimized.

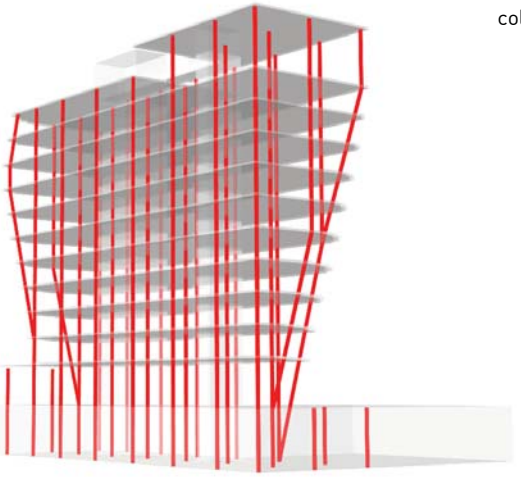
The framing consists of W30 beams (30" deep) running east-west at each gridline, with W16 beams running north-south between. By putting a line of penetrations into the W30 beams, services can continuously distribute north-south, and then distribute east and west within the depth of the W30 beams. Additional W30 beams are required to carry the cantilevers at the north and south ends of the building.

Advantages

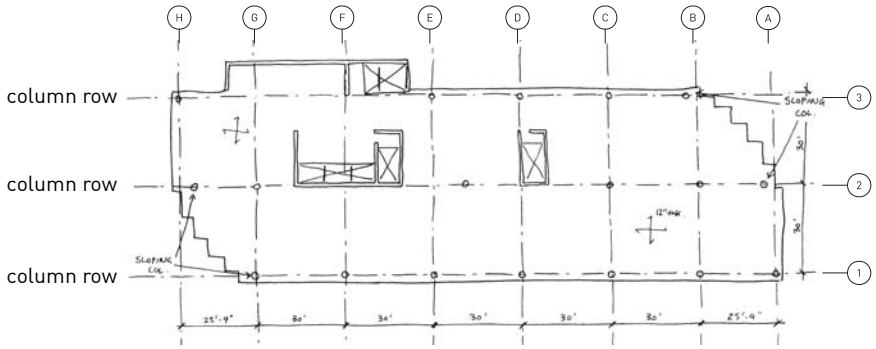
Steel framing is lighter than concrete construction and requires fewer footings, minimizing foundation costs. Steel beams can have standardized penetrations, allowing for services to be efficiently integrated into the structural depth. A steel structure can accommodate long spans and cantilevers, and thus allow the number and location of columns to be minimized and flexible. Typically, steel structures are erected more quickly.

Disadvantages

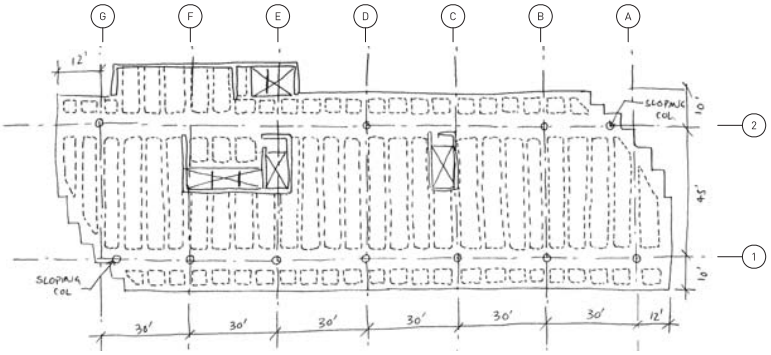
Steel framing may require a deeper overall ceiling plenum than will concrete, particularly if a raised floor air distribution system is employed (which reduces the overhead services). Steel structure also requires fire protection.



View of concrete structure



Typical concrete column layout with 3 column rows (tower office floor)



Alternate: typical pan-joist layout (tower office floor)

CONCRETE

The concrete scheme requires an additional line of columns compared to the steel scheme. The cantilevers are significantly reduced to allow an efficient 30'x30' grid. Thus, a 2-way structural slab can be employed.

As with a steel structure, sloping columns are required. Again like steel, the sloped columns at opposite ends of the building minimize the additional loads on the cores.

The floor system consists of a structural concrete slab (either a 10" slab with drop panels, or a 12" flat slab). By using a flat slab without beams, the soffit is completely unobstructed service distribution. An under-floor air distribution system with very limited services overhead can further minimize the ceiling plenum, or potentially allow the structural slab to be exposed as the finish ceiling. This can minimize the floor-to-floor height and, accordingly, the cost of construction.

Advantages

The concrete flat slab has very simple formwork, and with the additional middle line of columns, can easily accommodate the changing profile at the north and south ends. The overall structural depth is minimized (since there are no beams), thus minimizing the floor to floor height. This is particularly true for an under-floor distribution system, where there are few overhead services. An exposed concrete ceiling design eliminates the cost of an additional finish ceiling, but requires more care in rough construction.

Disadvantages

The concrete scheme requires more columns, which may impact functional flexibility. Concrete is heavier than steel, and thus has increased foundation costs. Cast-in-place concrete typically takes longer to erect than steel.

ALTERNATE SCHEMES

There are many other feasible schemes, including long-span concrete (such as the pan joist layout shown above). These can be efficiently integrated with an under-floor air distribution system, which would be particularly beneficial if there is a desire to expose the slab as the finish ceiling. Although there might be more cost and more material associated with such systems, there are potential savings in eliminating the ceiling and visual interest created by exposing the structural coffers.

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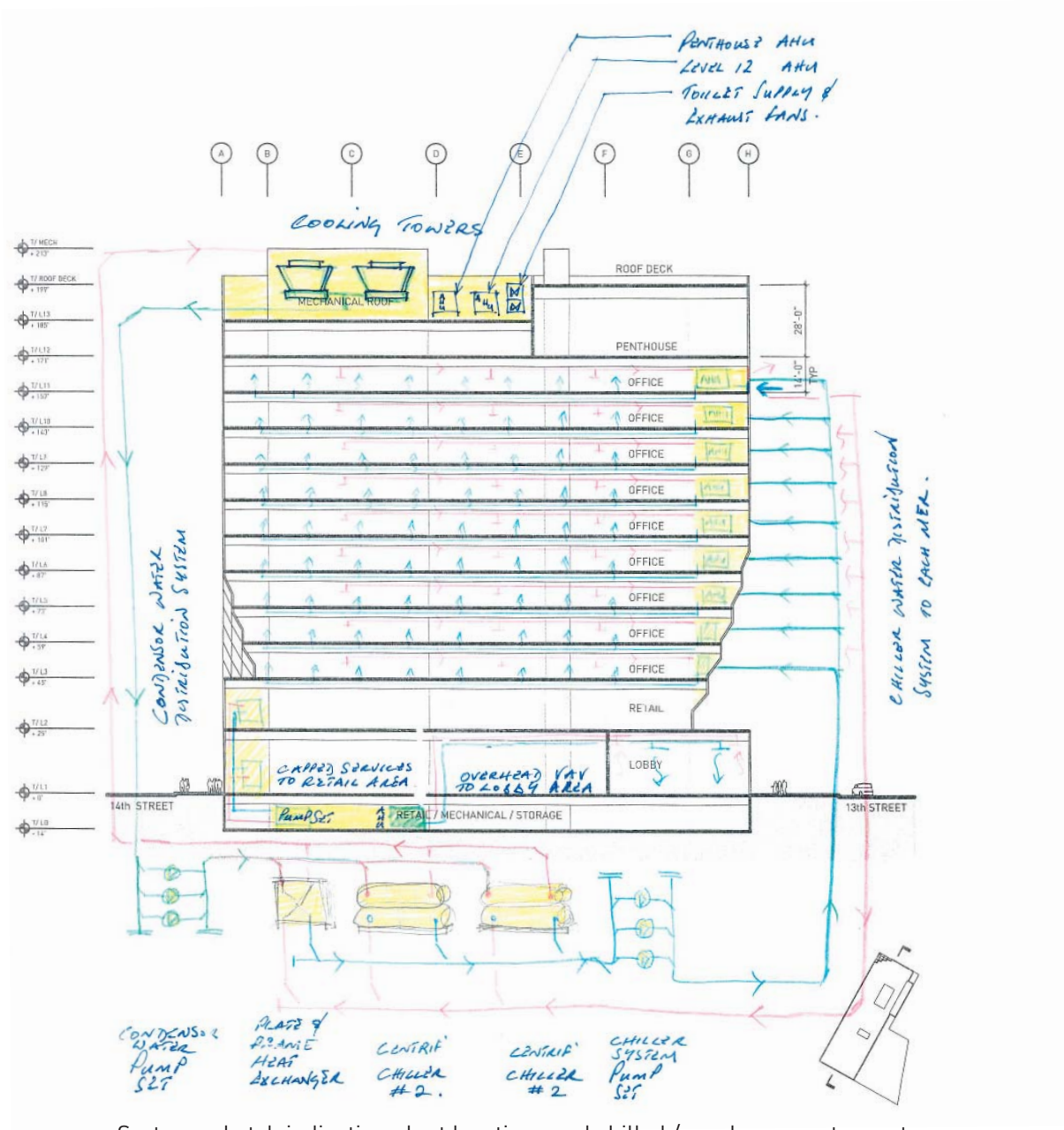
Mechanical Systems

The design of Highline 131410's mechanical systems will play a major role in ensuring that the project is both economically viable and environmentally responsible. The proposed design will comply with all applicable codes and regulations, of course, but it has the further potential to achieve LEED Gold or Platinum certification. The project is envisioned as a leading example of sustainable development in the 21st century.

System selection

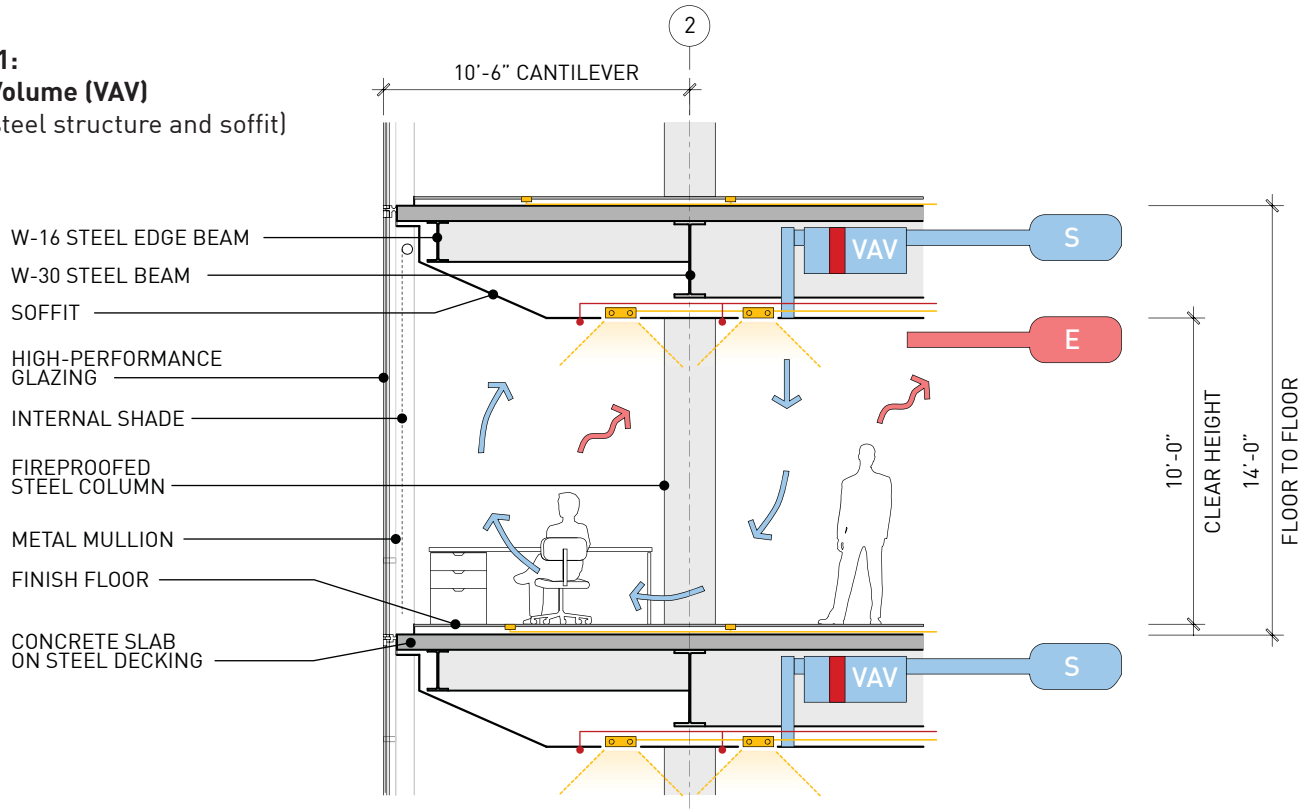
The following systems are planned for the building. Together they will constitute a mechanical design that is fully integrated into the architecture, and that optimizes cost (both initial and long-term), occupant comfort, environmental performance, and efficiency:

- -Chilled water / heat rejection
- -Heating
- -Air conditioning and ventilation
- -Electrical (with landlord / tenant metering)
- -Plumbing
- -Fire protection
- -Rainwater and graywater collection
- -Building management system

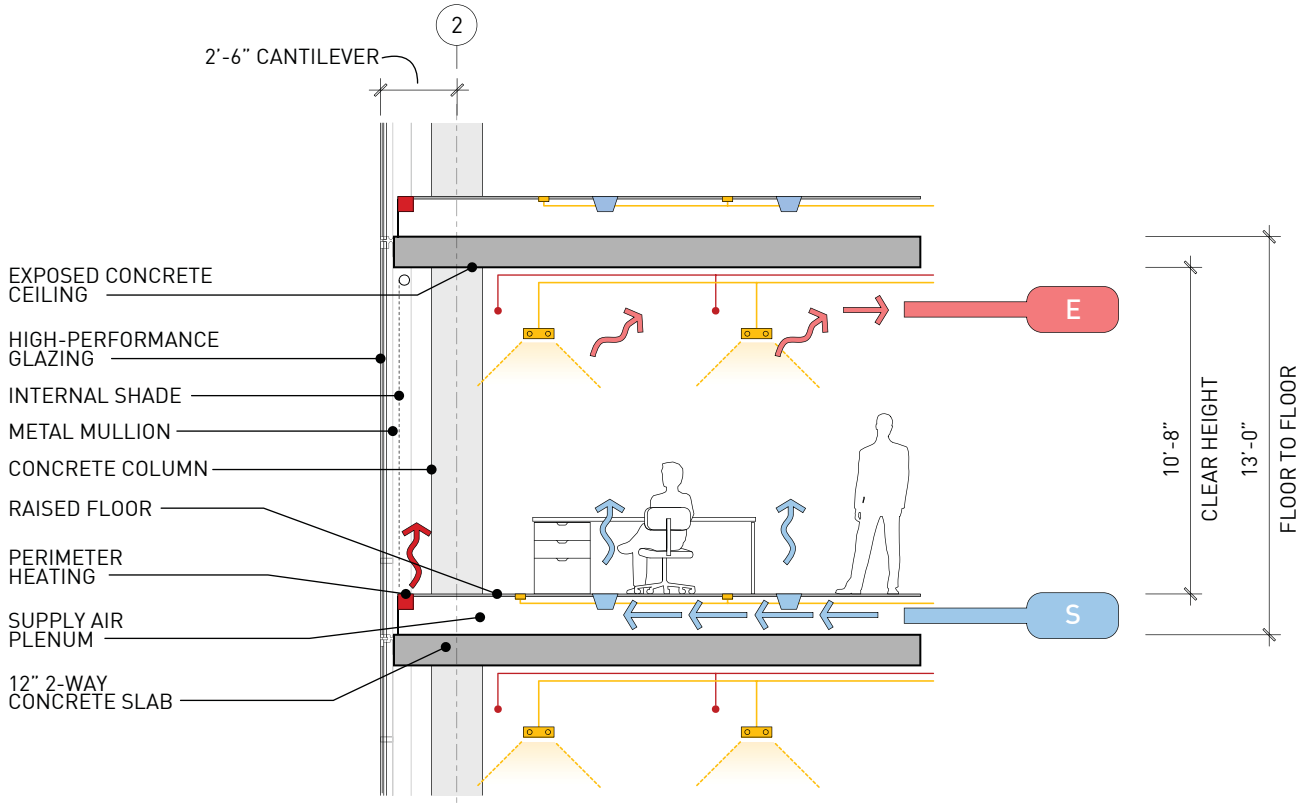


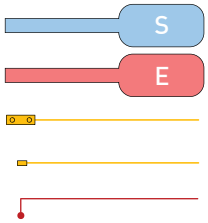
Systems sketch indicating plant locations and chilled / condenser water systems.

HVAC Option 1:
Variable Air Volume (VAV)
(Shown with steel structure and soffit)



HVAC Option 2:
Displacement ventilation system (raised floor)
(Shown with exposed concrete structure)





SUPPLY AIR
EXTRACT AIR
LIGHTING
ELECTRICAL
AUTOMATIC SPRINKLER

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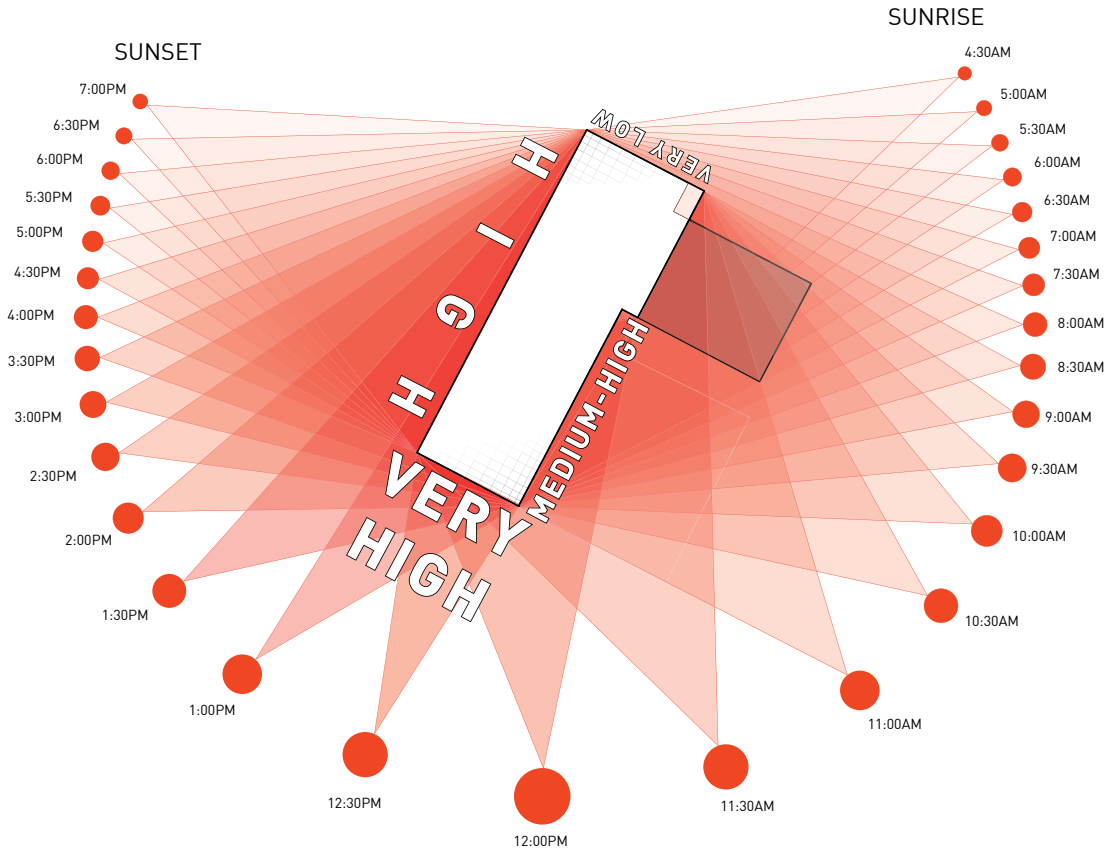
BUILDING ENVELOPE

The exposure and openness of the project site make possible several key opportunities for the exterior envelope design. They are: energy efficiency from daylight; unobstructed views in all directions; and a strong visual relationship with adjacent buildings and the High Line park. These factors suggest glass as the most logical exterior envelope cladding, which as a material presents further opportunities and challenges.



Solar Exposure for Building Elevations by Sun Angle, June 21

Energy, Comfort, and Bird Safety in All-Glass Buildings

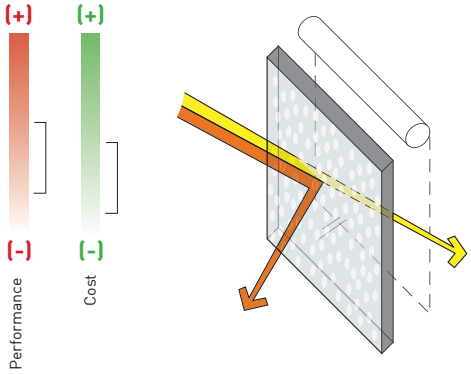
Many buildings have solid, insulated cladding materials for a large portion of their exterior, affording them greater energy efficiency at the expense of daylight and views. On this site, the opportunity exists to open up all floors to magnificent views both near and far: the High Line park at the foot of the building, and vistas of the Hudson River and New Jersey beyond. The wide variety and luxury of these views suggests a floor-to-ceiling glass building design.

The same exposure to views that creates these benefits also brings with it certain challenges, such as solar heat gain and glare from direct sunlight. Buildings clad completely in glass can also create dangerous conditions for birds, especially important here due to the site's proximity to the Hudson River migratory flyway.

The site's solar exposure will require a design response, especially in the south and west exposures. Fortunately, our response to protecting the building from excessive solar exposure may also offer protection from bird strikes.

CURTAIN WALL GLAZING

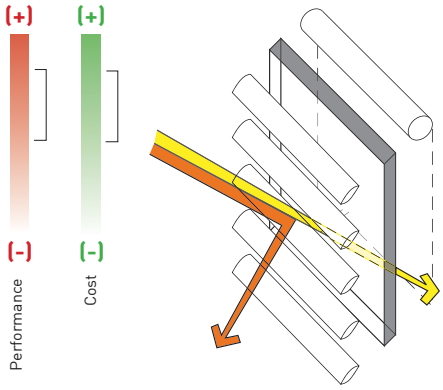
The myriad of possible glazing systems typically have levels of energy efficiency and visual clarity that are commensurate with their costs. The more visual clarity desired, the more solar energy must be blocked or reflected, whether through increased performance (tinting, coatings) or the introduction of a shading system. Below are four categories of glass façade technology, which have been researched and catalogued for future consideration by the project team as the design develops:



1. Coated Perfomance Glass

In flat, non-shaded façades, the glazing is engineered to allow maximum light transmittance while blocking long-wave solar radiation (heat). Solar heat gain is typically mitigated with Low-E and reflective coatings, tinted shade glass, and ceramic frit patterning. This option allows for a completely flat curtain wall and maximized floor area, and usually is the most cost-effective group of options. One drawback to using non-shaded glass is the lower energy efficiency due to solar heat gain, coupled with the resulting reduced clarity of the glass.

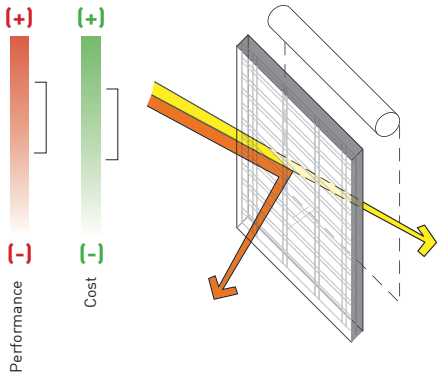
Most common option, inverse relationship between energy efficiency & visual clarity



2. Exterior Shade Systems

External shading is the most efficient method of dealing with solar heat gain when using clear glazing because it keeps radiation off of the building completely. External shades can also act as daylight reflectors, bringing indirect light (but not heat) deeper into the building. They can be fixed in place, or mechanized/operable. Concerns with external shade systems include potential difficulties associated with cleaning the glass, differing orientations of shade for each elevation, and possible loss of floor area at the perimeter of the building/ property line.

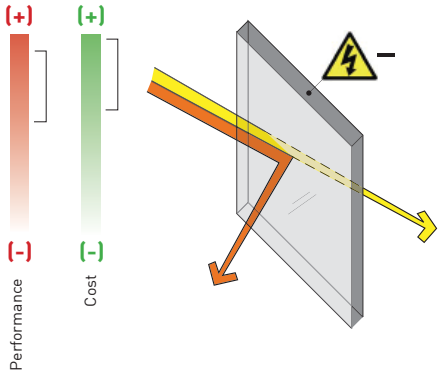
Highly efficient option, which must be fully integrated into building design



3. Integrated Shade Systems

This group of shading options combines fixed or operable shades within the depth of the performance glass. The shade system in this case is included within the glazing unit, keeping it maintenance-free and allowing it to block solar radiation before entering the building. In general, integrated shading systems perform about as well as exterior shade systems. The shade can be fixed in place, or mechanized/operable. Drawbacks of integral shade systems include loss of visibility through the shade (in the fixed option), limited sizes, and higher cost.

Highly efficient option, higher initial cost, can impact views



4. High-Tech Glazing Systems

Includes dichromic (auto-tinting) glass, automated sun shades, and integrated photovoltaic sensors. As a category of façade system options, this is the most energy-efficient group but has the highest initial cost. Intriguing possibilities exist for lowering long-term lifecycle cost and interesting design, but they have typically not been tested on a large scale.

Most energy-efficient options, but come with highest initial cost

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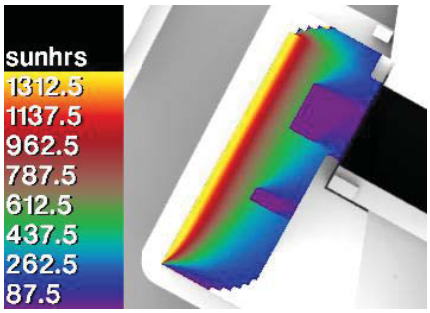
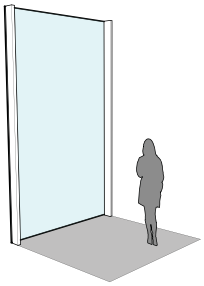
EXTERNAL SHADING

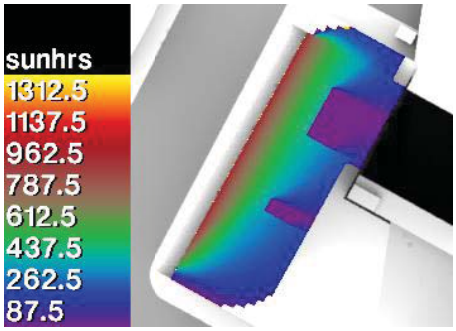
The Highline 131410 tower is rotated 29° from true north to align with the city grid of Manhattan. In solar shading terms, this rotation means that neither vertical nor horizontal shades are most efficient in reducing solar heat gain. The daylight models below demonstrate that a diagonal shading system is best suited to minimize heat gain at the facade.

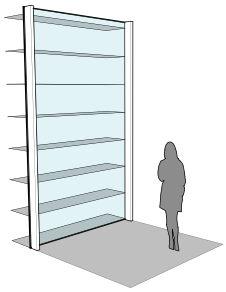
LEAST EFFICIENT



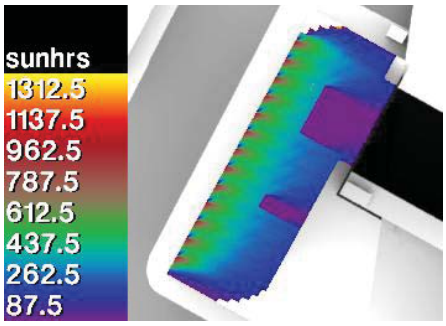


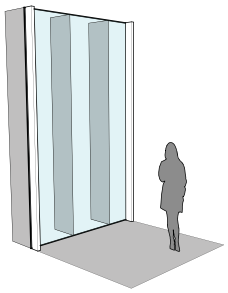
No external shade, untreated glass





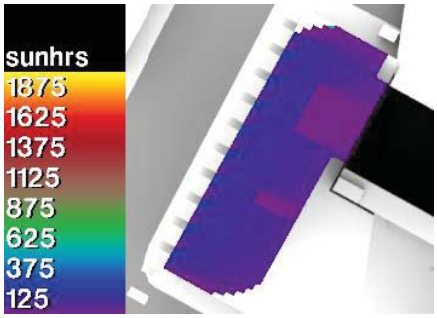
Horizontal shades

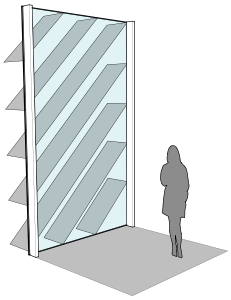




Vertical shades

MOST EFFICIENT

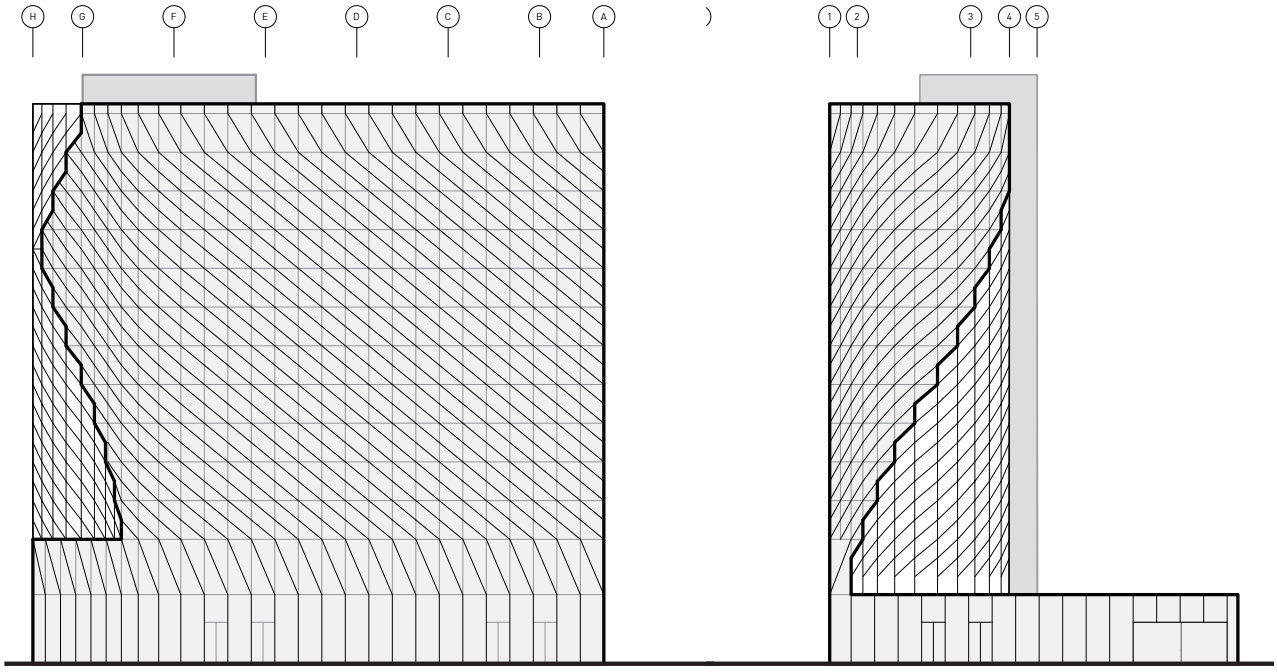




Diagonal shades (45°)

FACADE DESIGN

There are two primary glazing systems in the design: a curtain wall cladding for the broad, flat expanses of the facade; and a unitized, faceted glazing system for the "solar carve" zones. The smooth expanses of flat glass contrast with the faceted areas, emphasizing the difference between the simple rectangular form of the building mass and the gem-like solar carved areas.

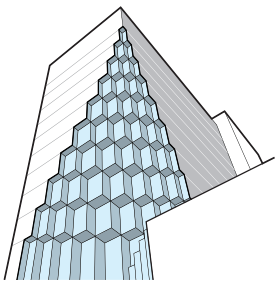


West Elevation

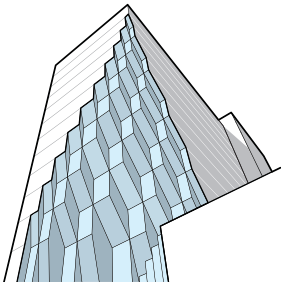
South Elevation

Solar Carve Glazing Options

There are many interesting geometric and patterned ways to glaze the "solar carve" areas of the facade. These can be studied and evaluated for efficiency, standardization, self-shading, exposure to good views, and of course, aesthetics.



"Cubic"



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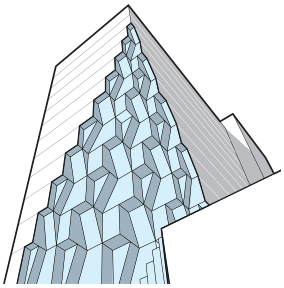

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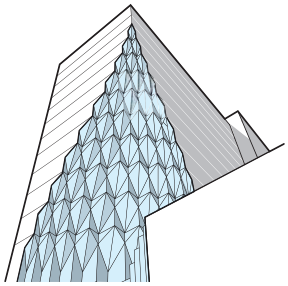

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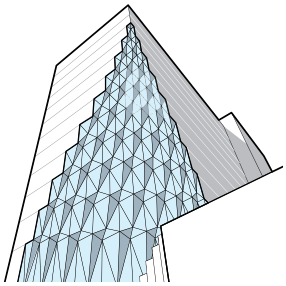

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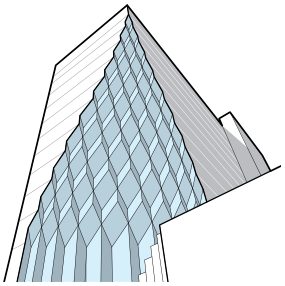

"Diamond"

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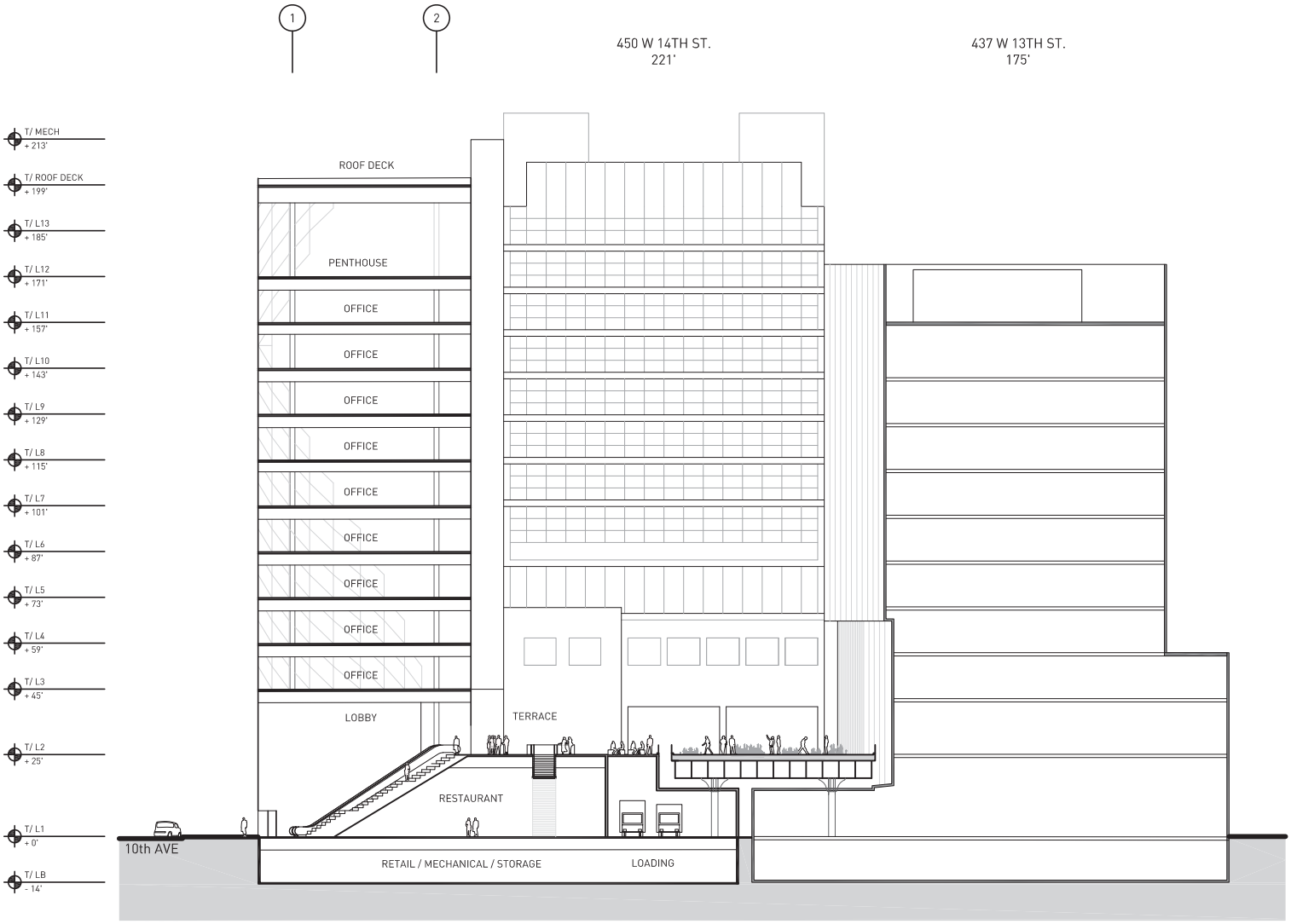
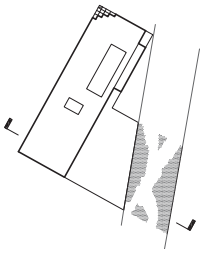
04
DRAWINGS



SECTION A
1" = 50'-0"

0 ft 10 20 40 60 100



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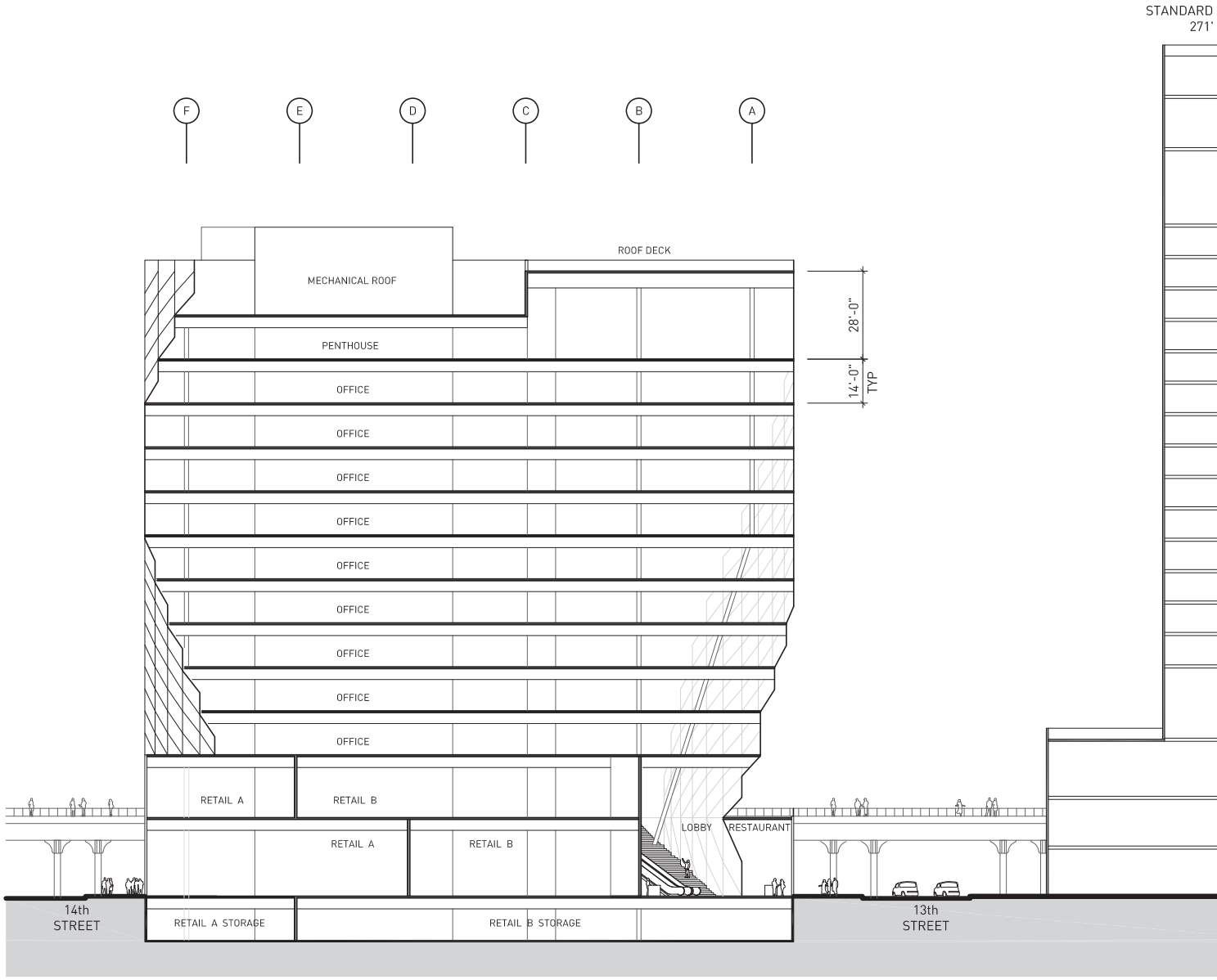
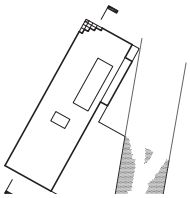


SECTION B

1" = 50'-0"

0 ft 10 20 40 60 100



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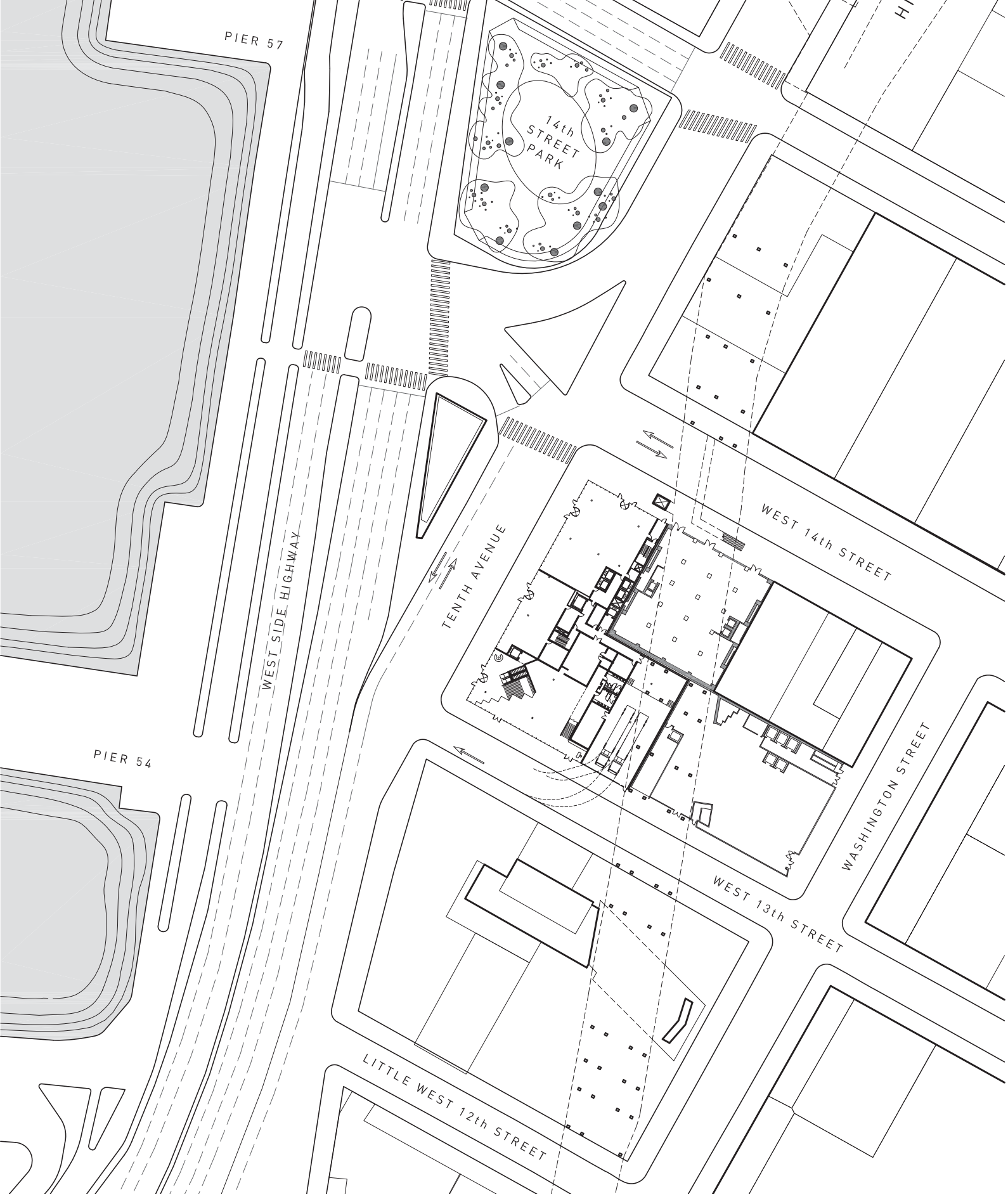

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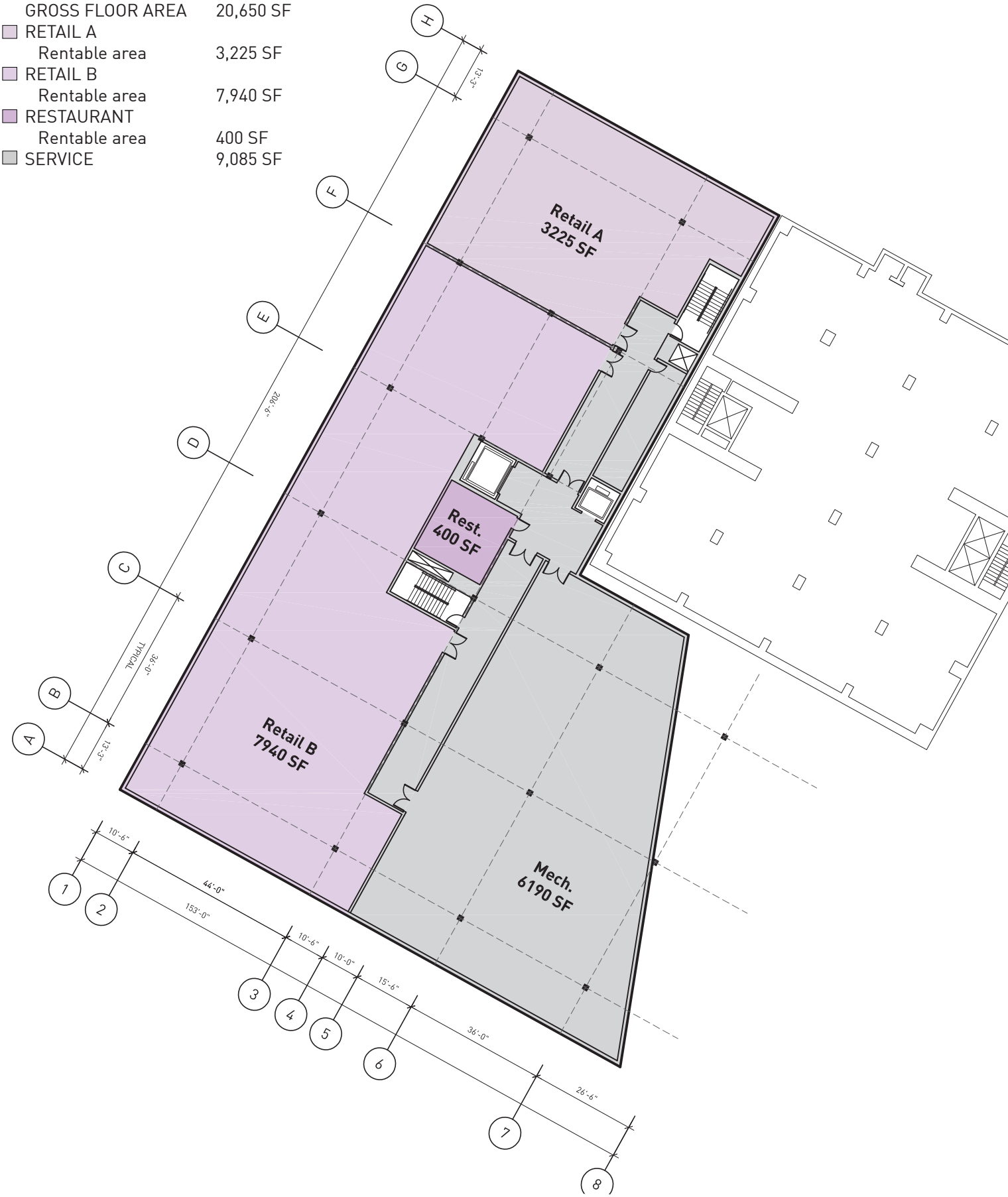
SITE PLAN +0'

1" = 100'-0"

0 ft 25 50 100 200

HIGHLINE 131410

FINISH FLOOR HEIGHT	-14'
GROSS FLOOR AREA	20,650 SF
RETAIL A	
Rentable area	3,225 SF
RETAIL B	
Rentable area	7,940 SF
RESTAURANT	
Rentable area	400 SF
SERVICE	9,085 SF



CELLAR PLAN -14'

1/32" = 1'-0"

0 ft 10 20 40 60

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GANG
/ARCHITECTS

FINISH FLOOR HEIGHT	+0'
GROSS FLOOR AREA	23,420 SF
RETAIL A	
Rentable area	5,025 SF
RETAIL B	
Rentable area	2,950 SF
RETAIL C	
Rentable area	5,740 SF
LOWER LOBBY	1,663 SF
SERVICE	8,042 SF

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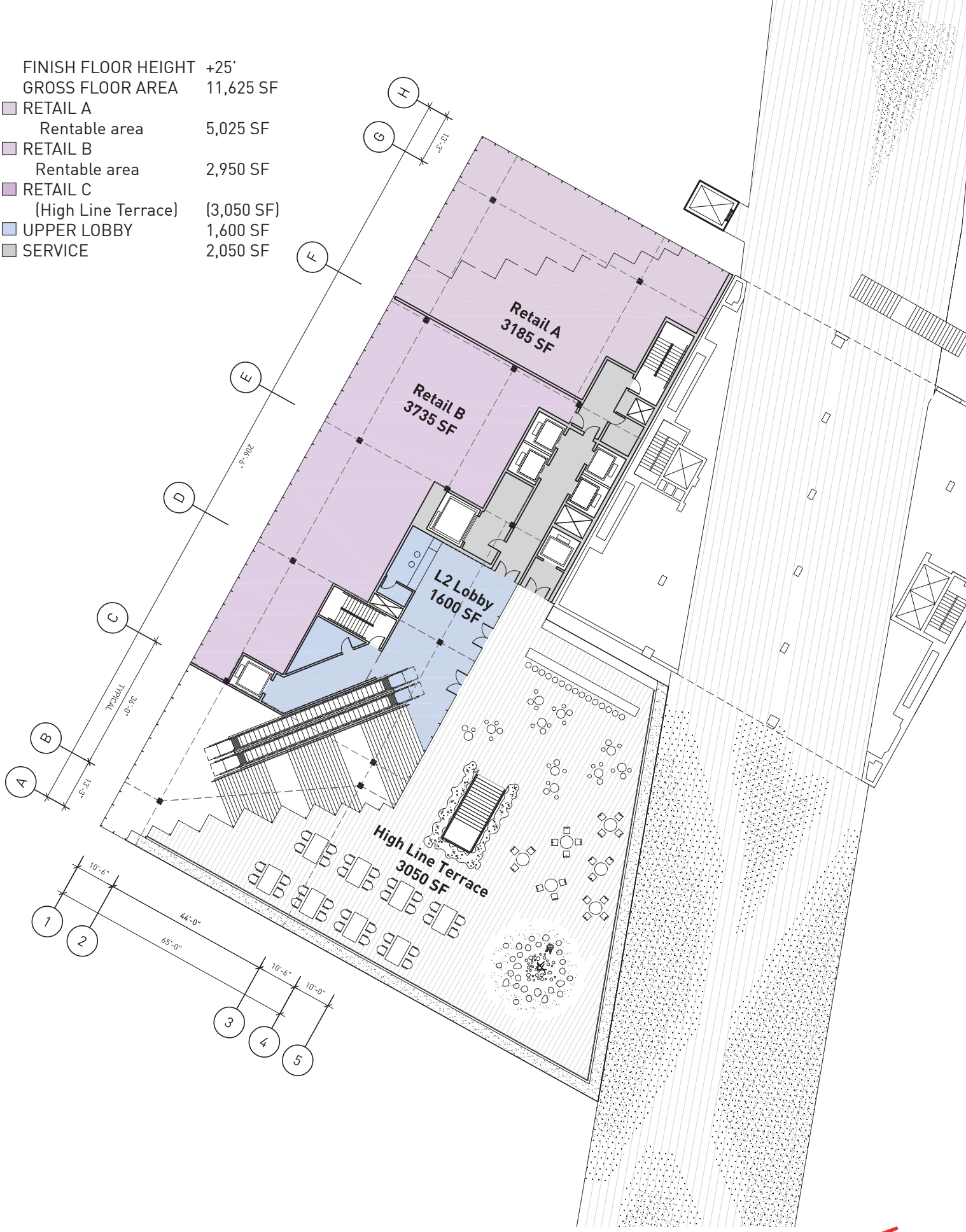
L1 PLAN +0'

1/32" = 1'-0"

0 ft 10 20 40 60

HIGHLINE 131410

FINISH FLOOR HEIGHT	+25'
GROSS FLOOR AREA	11,625 SF
RETAIL A	
Rentable area	5,025 SF
RETAIL B	
Rentable area	2,950 SF
RETAIL C	
(High Line Terrace)	(3,050 SF)
UPPER LOBBY	1,600 SF
SERVICE	2,050 SF



L2 PLAN +25'

1/32" = 1'-0"

0 ft 10 20 40 60

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FINISH FLOOR HEIGHT	+59'
GROSS FLOOR AREA	12,535 SF
TENANT 1	
Usable area	10,991 SF
Rentable area	15,058 SF
Private offices	6
Open workstations	75
SF / worker	136
SERVICE	1,544 SF

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L4 PLAN, SINGLE TENANT +59'

1/32" = 1'-0"

0 ft 10 20 40 60

FINISH FLOOR HEIGHT	+59'
GROSS FLOOR AREA	12,535 SF
TENANT 1	
Usable area	5,371 SF
Rentable area	7,358 SF
Private offices	9
Open worskstations	20
SF / worker	185
TENANT 2:	
Usable area	5,584 SF
Rentable area	7,650 SF
Private offices	4
Open workstations	33
SF / worker	151
SERVICE	1,544 SF

L4 PLAN, DOUBLE TENANT +59'

1/32" = 1'-0"

0 ft 10 20 40 60

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STUDIO/ GANG /ARCHITECTS

FINISH FLOOR HEIGHT	+59'
GROSS FLOOR AREA	12,535 SF
TENANT 1	
Usable area	10,991 SF
Rentable area	15,058 SF
Private offices	20
Open workstations	43
SF / worker	174
SERVICE	1,544 SF

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L4 PLAN, PERIMETER OFFICES +59'

1/32" = 1'-0"

0 ft 10 20 40 60

FINISH FLOOR HEIGHT	+171'
GROSS FLOOR AREA	14,000 SF
TENANT 1	
Usable area	12,456 SF
Rentable area	17,065 SF
Private offices	9
Open workstations	102
SF / worker	112
SERVICE	1,544 SF

L12 PLAN, SINGLE TENANT +171'

1/32" = 1'-0"

0 ft 10 20 40 60

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FINISH FLOOR HEIGHT	171'
GROSS FLOOR AREA	14,000 SF
TENANT 1	
Usable area	6,002 SF
Rentable area	8,223 SF
Private offices	8
Open workstations	27
SF / worker	171
TENANT 2	
Usable area	6,674 SF
Rentable area	9,143 SF
Private offices	4
Open workstations	55
SF / worker	103
SERVICE	1,544 SF

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L12 PLAN, DOUBLE TENANT +171'

1/32" = 1'-0"

0 ft 10 20 40 60

HIGHLINE 131410

FINISH FLOOR HEIGHT	+171'
GROSS FLOOR AREA	14,000 SF
TENANT 1	
Usable area	12,456F
Rentable area	17,065SF
Private offices	29
Open workstations	49
SF / worker	160
SERVICE	1,544 SF

L12 PLAN, PERIMETER OFFICES +171'

1/32" = 1'-0"

0 ft 10 20 40 80

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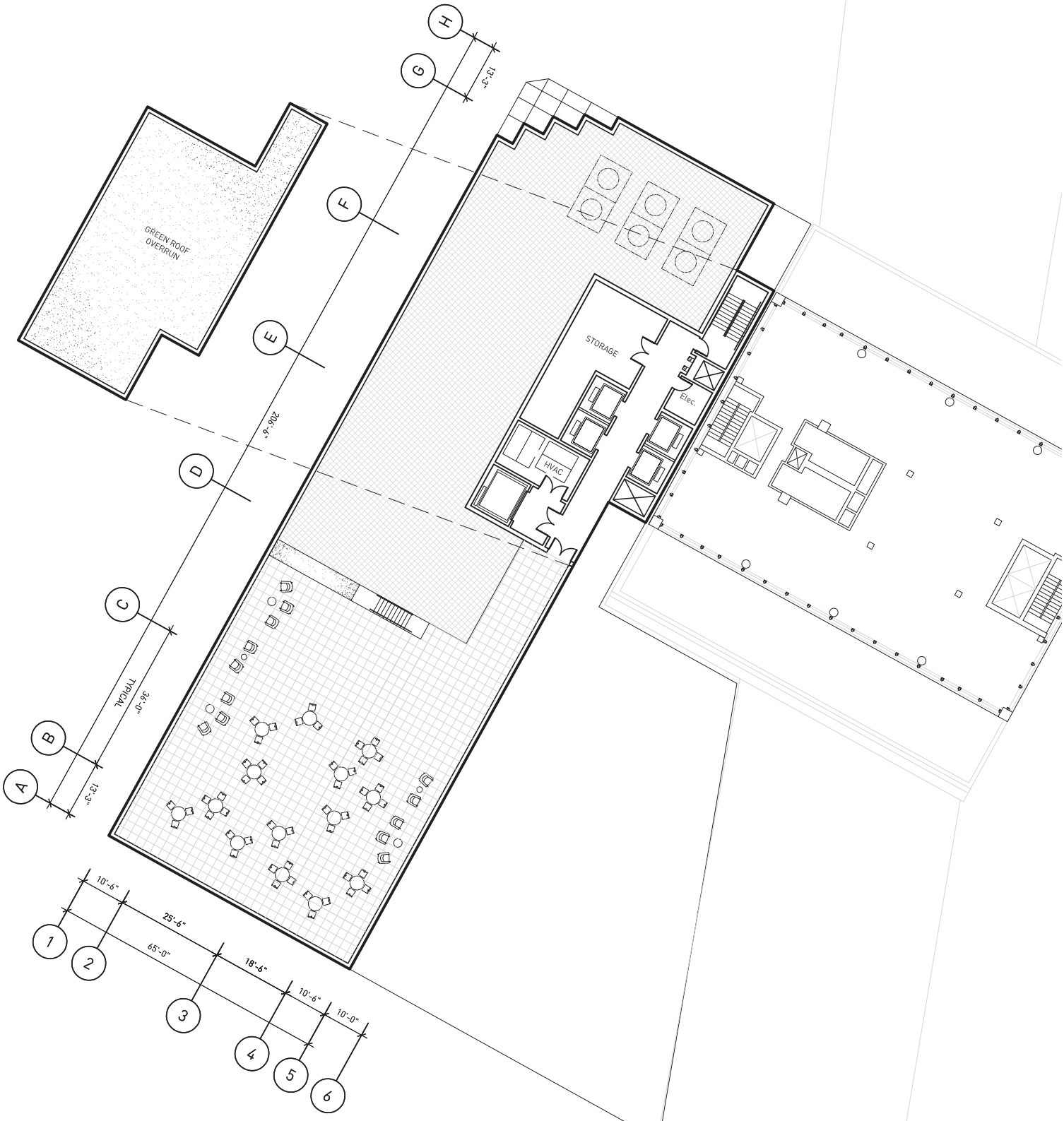
FINISH FLOOR HEIGHT +199'
GROSS FLOOR AREA 2,220 SF



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ROOF PLAN +199'

1/32" = 1'-0"

0 ft 10 20 40 60

05 APPENDIX

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A ZONING REVIEW

SITE + BUILDING AREA

Zoning Area M1-5
FAR Ratio = 5.0
Site Area = 23,541 SF

(Sites Areas based on provided by NYC.gov tax lot information, and confirmed by complete site survey)

Total FAR Area 23,541 x 5.0 = 117,705 GSF
(See table below)

Area excluded from FAR calculations:
-Cellars (space with over half its height below grade)
-Elevator/stair bulkheads
-Water tanks
-Cooling towers
-Open terraces and balconies
-Loading berths, up to 200% required area
-Mechanical equipment spaces
-Bicycle Parking (max 15 GSF for each space, max 1 space per 10,000 GSF of floor area)

SITE ENCROACHMENTS

High Line = 2870 GSF
(Area below and easement for access)

450w14 = 210 GSF
(Technical offset area for proper and complete installation of 3hr Concrete Party wall up against existing glass façade)

LOADING DOCK REQUIREMENTS

Office Use up to 100,00 GSF:
No Berth Required

Retail, Service up to 25,000 GSF:
No Berth Required

Commercial Use 25,001 to 40,000 GSF:
1 Berth required

Commercial Use 40,001 to 100,000 GSF:
2 Berths required

Minimum Berth Size = L 33ft x W 12ft x H 14ft

Curb Cuts = Not less than 50 ft from intersection of any two streets

SETBACKS

13th Street (narrow):

Street Wall = 85 feet max height or 6 stories, whichever less
Initial Setback = 20 feet (@ 85 ft or below)
Sky plane = 1:2.7 (H to V ratio)

Alternate Skyplane:
Lot Line Setback = 15 feet
Height @ Street = 85 feet
Sky plane = 1:3.7 (H to V ratio)

10th Avenue and 14th Street (wide):

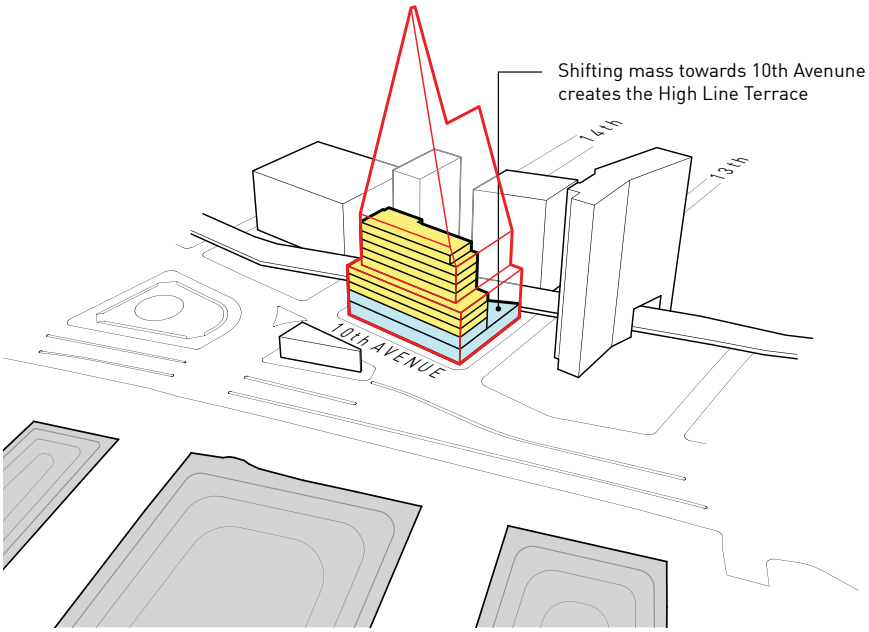
Street Wall = 85 feet max height or 6 stories, whichever less
Initial Setback = 15 feet (@ 85 ft or below)
Sky plane = 1:5.6 (H to V ratio)

Alternate Sky Plane
Lot Line Setback = 15 feet
Height @ Street = 85 feet
Sky plane = 1:7.6 (H to V ratio)

Elevator, stair towers and mechanical space can extend past sky plane if aggregate wall width of 30ft max AND aggregate area (width x avg height) of wall does not exceed 4x width of facing street frontage.

POSSIBLE MASSING SCENARIOS

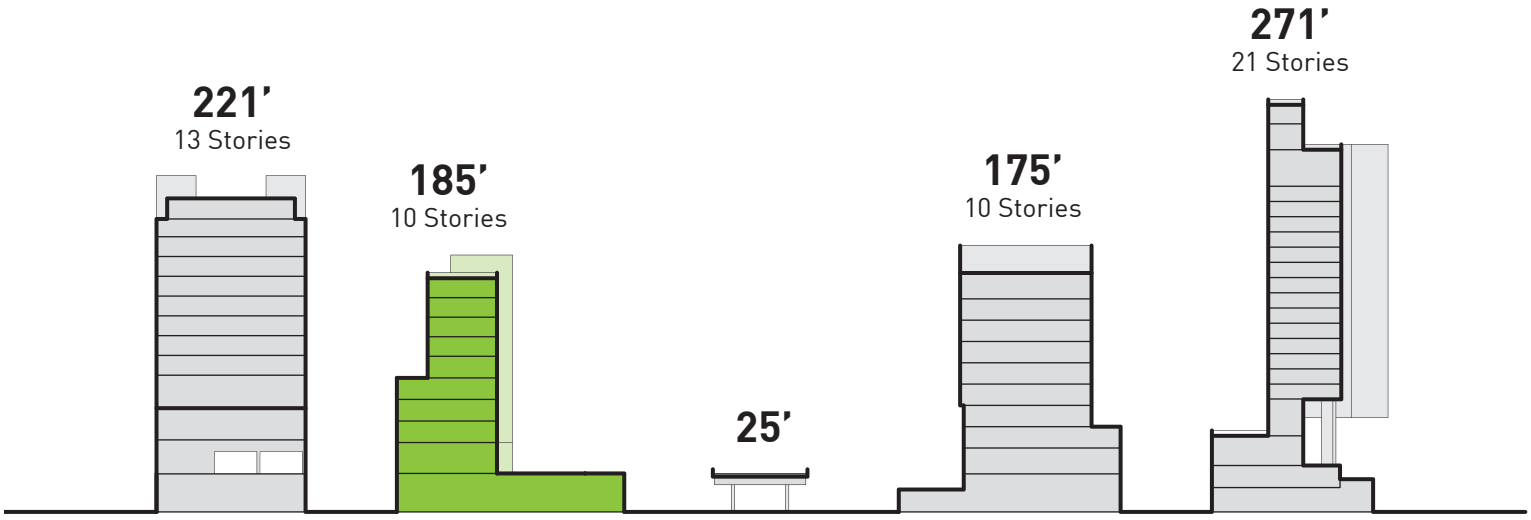
The New York City Zoning Resolution deeply impacts the programmatic, environmental, economic and aesthetic aspects of the design. Multiple as-of-right massing scenarios were studied to gain an understanding of the limitiations imposed by the zoning in comparison with the proposed design. A floor area analysis was completed for each (see following 3 pages).



As-of-right Case 1: **TOP CARVE**

Height: 10 levels (185 ft)
Office: 8 levels
Retail: 3 levels (-1 +2)
F.A.R.: 5.0

This option approximates the proposed design, but the mass is adjusted to comply with zoning setbacks and FAR requirements. The light and air setbacks dictate smaller floors at the top of the tower. If no variance is granted, this represents the best-case scenario (useful for financial modeling).



F.A.R. = 5.5	F.A.R. = 5.0		F.A.R. = 6.19	F.A.R. = 5.0
450 W 14th ST.	HIGHLINE 131410	THE HIGH LINE	437 W. 13th ST.	THE STANDARD

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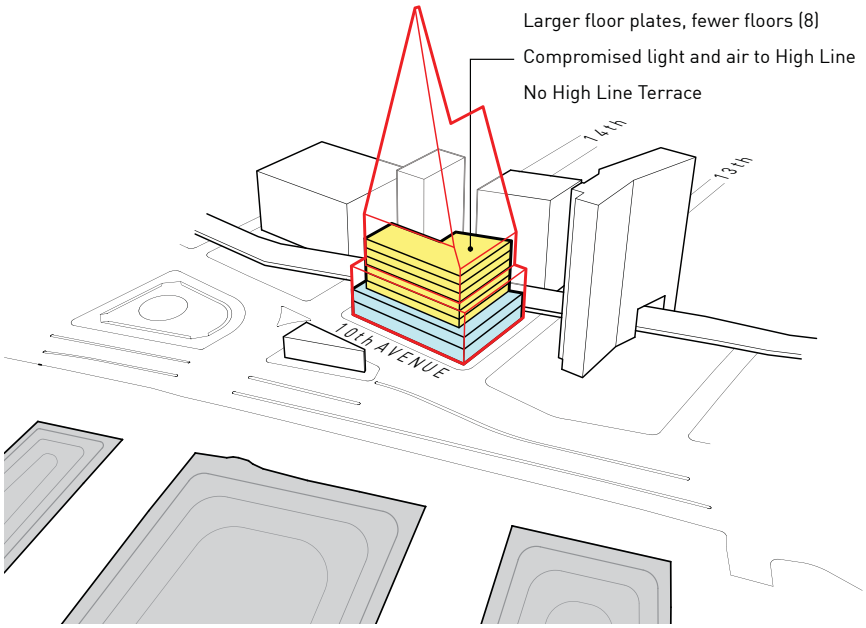
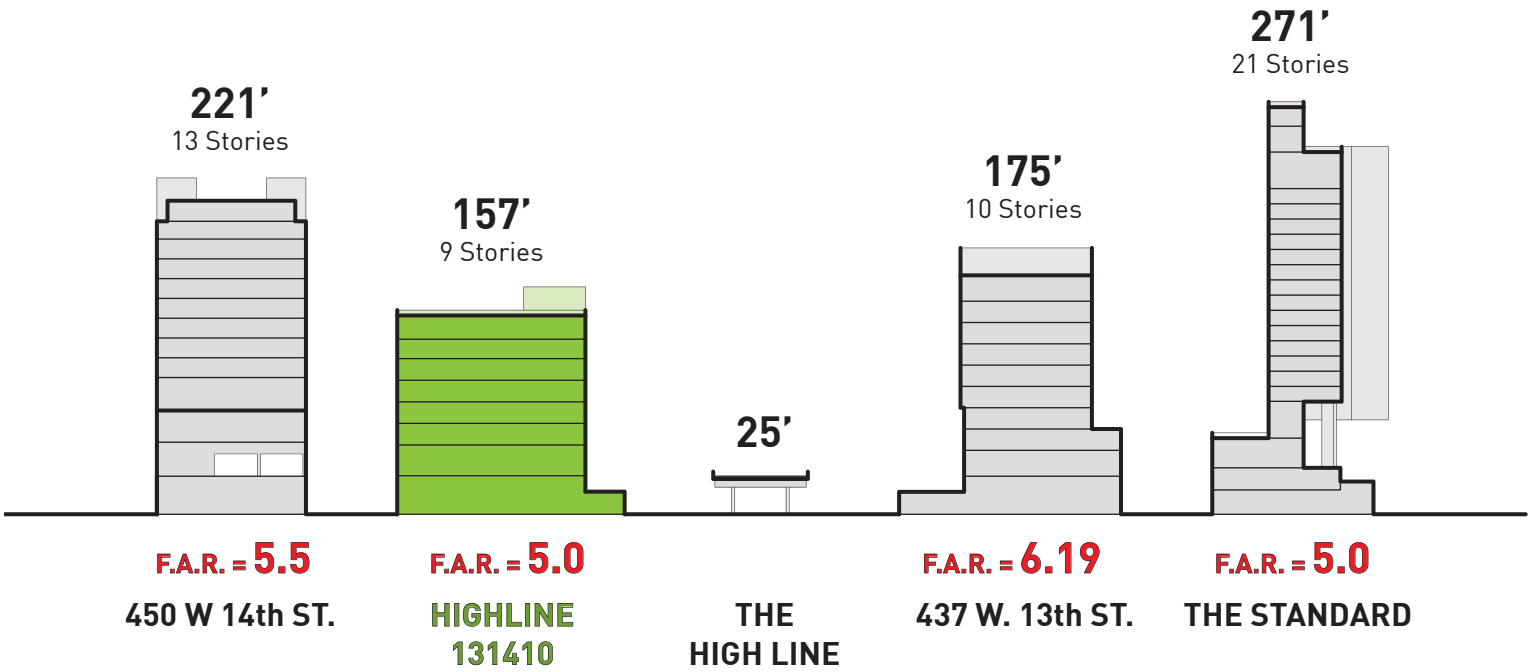


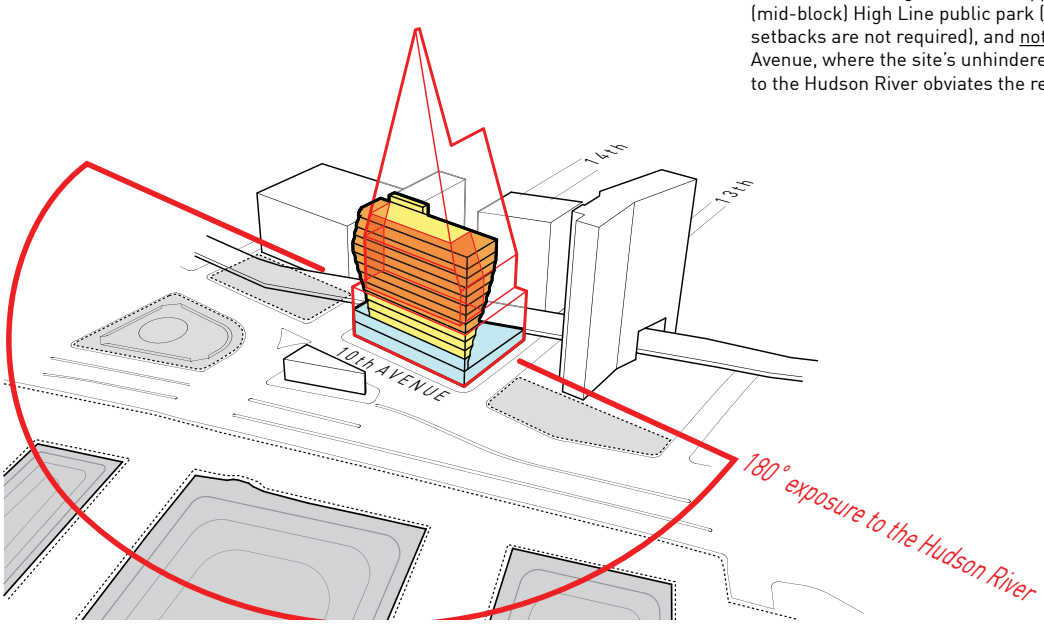
As-of-right Case 2: **SHORT + STOUT**

Height: **8 levels (157 ft)**
Office: **6 levels**
Retail: **3 levels (-1 +2)**
F.A.R.: **5.0**

This option also complies with zoning setbacks and FAR requirements, but if built to the extent of all setbacks, it has a negative impact upon the light and air of the High Line park. This represents a worst-case massing scenario (useful to best highlight the advantages of the proposed design).



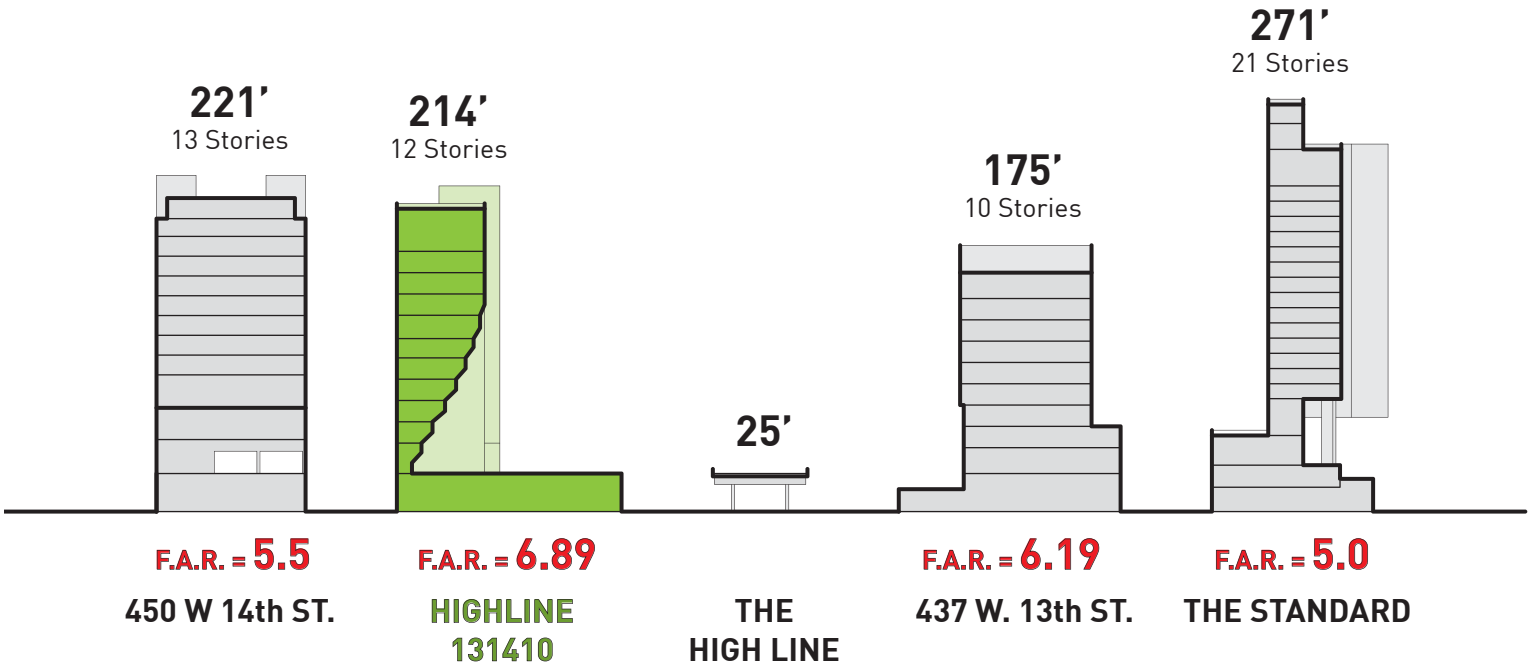
The concept is simple and logical. The light and air setback regulations are applied to the (mid-block) High Line public park (where setbacks are not required), and not to 10th Avenue, where the site's unhindered exposure to the Hudson River obviates the regulation.



As-of-right Case 1: **TOP CARVE**

Height: **12 levels (213 ft)**
Office: **10 levels**
Retail: **3 levels (-1 +2)**
F.A.R.: **6.89**

The proposed design requires a variance for both increased FAR and relaxed setback requirements, justified in 2 ways: 1) The tower is shifted away from the High Line, towards 10th Avenue and the Hudson River where there are no adjacent buildings and no need to preserve light and air to the vast western exposure; 2) The tower is carved at its base to enhance light, air, and views to and from the High Line public park, both north and east of the building.



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FLOOR AREA SUMMARIES
FOR AS-OF-RIGHT AND PROPOSED DESIGNS

TOP CARVE

As-of-right case 1, FAR = 5.0**

	Height above grade	Floor to floor height	Gross floor area (SF)	F.A.R. area (SF)	Non-F.A.R. area (SF)	Usable area (SF)	Rentable area (SF, 27% loss factor)
Roof	+171'	-	0	0	0	0	0
L10	+143'	14'	8900	8600	300	7356	10078
L9	+129'	14'	9300	9000	300	7756	10626
L8	+115'	14'	9300	9000	300	7756	10626
L7	+101'	14'	9300	9000	300	7756	10626
L6	+87'	14'	9300	9000	300	7756	10626
L5	+73'	14'	14100	13800	300	12556	17202
L4	+59'	14'	14100	13800	300	12556	17202
L3	+45'	14'	14100	13800	300	12556	17202
L2*	+25'	20'	14100	13200	900	8000	8000
L1*	+0'	25'	23420	18420	5000	13715	13715
Cellar*	-14'	14'	20650	0	20650	11265	11265
TOTAL			146570	117620	28950	109028	137166

Site area (sf)	23541
FAR area (sf)	117620
FAR	5.00

= Roof
= Office floor
= Retail floor

SHORT + STOUT

As-of-right case 2, FAR = 5.0**

	Height above grade	Floor to floor height	Gross floor area (SF)	F.A.R. area (SF)	Non-F.A.R. area (SF)	Usable area (SF)	Rentable area (SF, 27% loss factor)
Roof	+143'	-	0	0	0	0	0
L8	+115'	14'	13100	12800	300	11556	15832
L7	+101'	14'	13100	12800	300	11556	15832
L6	+87'	14'	13100	12800	300	11556	15832
L5	+73'	14'	13100	12800	300	11556	15832
L4	+59'	14'	13100	12800	300	11556	15832
L3	+45'	14'	13100	12800	300	11556	15832
L2*	+25'	20'	23420	22420	1000	13715	13715
L1*	+0'	25'	23420	18420	5000	13715	13715
Cellar*	-14'	14'	20650	0	20650	11265	11265
TOTAL			146090	117640	28450	108031	133685

Site area (sf)	23541
FAR area (sf)	117640
FAR	5.00

= Roof
= Office floor
= Retail floor

BASE CARVE

Variance Case, FAR = 6.96**

	Height above grade	Floor to floor height	Gross floor area (SF)	F.A.R. area (SF)	Non-F.A.R. area (SF)	Usable area (SF)	Rentable area (SF, 27% loss factor)
Roof	+199'	-	0	0	0	0	0
L12	+171'	14' / 28'	14000	13700	300	12456	17065
L11	+157'	14'	14030	13730	300	12486	17106
L10	+143'	14'	14000	13700	300	12456	17065
L9	+129'	14'	13920	13620	300	12376	16955
L8	+115'	14'	13790	13490	300	12246	16777
L7	+101'	14'	13580	13280	300	12036	16489
L6	+87'	14'	13300	13000	300	11756	16106
L5	+73'	14'	12950	12650	300	11406	15626
L4	+59'	14'	12535	12235	300	10991	15058
L3	+45'	14'	12080	11780	300	10536	14434
L2*	+25'	20'	11625	11525	100	6920	6920
L1*	+0'	25'	23420	21240	2180	13715	13715
Cellar*	-14'	14'	20650	0	20650	11265	11265
TOTAL			189880	163950	25930	150645	194581

Site area (sf)	23541
FAR area (sf)	163950
FAR	6.96

= Roof
= Office floor
= Retail floor

*For retail space, no loss factor is assumed (USF = RSF)

**Calculations based on the following assumptions:

300 SF mechanical per office floor
5000 SF mechanical + loading @ L1
1325 SF loss from GSF to USF (includes stairs, elevators, HVAC)
All RSF values are for single-tenant occupancy
No FAR area @ roof
Steel structure w/ 14' floor to floor height
High Line Terrace (outdoor restaurant) area not included

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B CODE REVIEW

APPLICABLE CODE: NYCBC 2008

Chapter 3 – Use and Occupancy Classification

Section BC 303 – Assembly Group A-2 (restaurants)
Section BC 304 – Business Group B (offices)
Section BC 309 – Mercantile Group M (retail stores)

Chapter 4 – Special Detailed Requirements Based on Use and Occupancy

Section BC 403 – High-Rise Buildings
403.1 – Applicability
Buildings having occupied floors located more than 75 feet above the lowest level of fire department vehicle access.
403.2 – Automatic Sprinkler System
Buildings and structures shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1
403.9 – Elevators
403.9.1 – Elevator Lobbies
403.9.1.1 - Applicability
1. Elevators opening onto a fire-rated corridor
2. Elevators serving Group B occupancies.
Elevators that serve 4 or more stories require an elevator lobby.
403.9.1.2 – Construction
1. Lobbies to be constructed as smoke partition complying with Section 710.
2. Lobbies to separate the elevator from all other spaces on the story.
3. Lobbies to have at least one means of egress complying with Chapter 10.
4. Access to an exit on any story through an elevator lobby is permitted provided access to at least one other required exit does not pass through the elevator lobby.
403.9.2 – Impact resistant Elevator Shafts
Elevator shafts to be constructed of impact resistant walls.
403.13 – Smokeproof Exit Enclosures
Every required stairway serving occupied floors more than 75 feet above the lowest level of fire department vehicle access shall comply with Sections 909.20 and 1019.1.8.
403.15 – Impact Resistant Stair Enclosures
Exit stair enclosures shall be constructed of impact resistant walls.
403.17 – Outdoor Air Intakes
Outdoor air intakes serving spaces above the second story and serving spaces greater than 10,000 SF shall be located in accordance with Section 401.5 of the NYCMC.
403.18 – Open Web Steel Joists
Use of open web steel joists is prohibited in high-rise buildings until the commissioner promulgates rules establishing minimum acceptable fireproofing methods.

Chapter 5 – General Building Heights and Areas; Separation of Occupancies

Table 503 – Allowable Height and building Areas
Type IA Construction

Group A-2	UL height, UL area
Group B	UL height, UL area
Group M	UL height, UL area

Table 508.3.3 – Required Separation of Occupancies
A-2, B = 2hr*
A-2, M = 2hr*
B, M = 2hr*

*Can be reduced by 1 hr if automatic sprinkler is provided, but shall be no less than that required for floor construction according to construction type, or 1 hr, whichever is greater.

Chapter 6 – Types of Construction
602.2 – Type IA: Noncombustible materials

Table 601
Structural Frame (including columns, girders, trusses) = 3hr (supporting roof only can be 2hr)
Exterior bearing Walls = 3hr
Interior bearing Walls = 3hr (supporting roof only can be 2hr)

Exterior Non-bearing walls and partitions:
Less than 5' fire separation distance
Group M = 2hr, Group B = 1hr
Greater than 5' to less than 10'
Group M = 2hr, Group B = 1hr
Greater than 10' to less than 30'
Group M = 1hr, Group B = 1hr
Greater than 30' = No requirement

Interior Non-bearing walls and partitions = 0hrs (see other sections of code for other requirement)
Floor Construction = 2hr
Roof Construction = 1.5hr

Chapter 7 – Fire-Resistance Rated Construction

Section BC 704 – Exterior Walls
704.8.1 – Automatic Sprinkler System
Maximum allowable shall be the same as the tabulated limitations for protected openings
Table 704.8 – Maximum Area of Exterior Wall Openings
Protected Openings based on distance from other buildings or tax lot line
Less than 3' = not permitted
3'-5' = 15%
5'-10' = 25%
10'-15' = 45%
15'-20' = 75%
Greater than 20' = no limit

Section BC 705 – Fire Walls
705.1.1 – Party Walls
Any wall located on a property line between adjacent buildings

Table 705.4 – Fire Wall Fire-Resistance Ratings
Group A, B = 3hr
Group M = 3hr

Section BC 710 – Smoke Partitions
710.2 – Materials
Noncombustible materials to be used. Glazing is permitted provided it is heat-strengthened or tempered glazing complying and shall comply with Chapter 24. Glazing shall also be protected by sprinkler heads installed in a maximum of 6 feet on center on each side of the smoke partition
710.3 – Fire-Resistance Rating
Not required unless stated elsewhere in the code.

Chapter 9 – Fire Protection Systems

903.2.13 – Other buildings, occupancies and areas
High-rise buildings require additional suppression system
903.3.1.1 – NFPA 13 sprinkler systems
Required
Section BC 905 – Standpipe Systems
905.3.1 – Applicability
Class III system required, can use Class I if criteria is met.

Chapter 10 – Means of Egress

Section BC 1003 – General Means of Egress
1003.2 – Ceiling Height
Means of egress shall have a ceiling height of not less than 7'-6"
Exceptions:
See section 1208.2
Objects can protrude up to 50% of ceiling area providing a minimum of 7'-0" headroom
Stairway headroom can be 7'-0"

Section BC 1004 – Occupant Load
Table 1004.1.2 – Maximum Floor Area Allowances per Occupant
Assembly without fixed seats (restaurant) =15 net
Kitchens (commercial) = 200 gross
Business = 100 gross
Mercantile:
Areas on other floors = 60 gross
Basement and grade floors = 30 gross
Storage, stock, shipping areas = 300 gross
Accessory storage, mechanical, equipment = 300 gross

1004.8 – Outdoor Areas
Means of egress must be provided. Occupant load of outdoor area is summed with occupant load of floor it is located. Occupant load is determined by design professional and approved by commissioner.

Section BC 1005 – Egress Width
Table 1005.1 – Egress Width per Occupant Served
Stairways = 0.3 in./occupant
Other = 0.2 in./occupant

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1005.2 – Door Encroachment
Doors opening not to reduce egress width to less than ½ during the course of the swing. When fully open the door shall not project more than 7" into the required egress width.

Section BC 1013 – Exit Access
1013.3 – Common Path of Egress Travel (note: it is included in the total allowable travel distance) shall not exceed 75'
Exceptions:
Groups B shall not exceed 100' when building is sprinklered

Section BC 1014 – Exit and Exit Access Doorways

Table 1014.1 – Spaces with One Means of Egress
Occupancy A,B,M = 74 persons maximum

1014.2.1 – Two Exits or Exit Access Doorways
Shall be placed a distance not less than ½ of the diagonal length of building or area being served.
Exception:
When sprinklered the distance shall not be less than 1/3 the diagonal length of the area being served.

Section BC 1015 – Exit Access Travel Distance

Table 1015.1 – Exit Access Travel Distance
Occupancy A = see section 1024.7
Occupancy M = 150' w/o, 200' w/sprinklers
Occupancy B = 200' w/o, 300' w/sprinklers

Section BC 1016 – Corridors
Table 1016.1.1 – Interior Corridor Fire-Resistance Rating
Occupancy A,B,M = 0hrs when sprinklered
Table 1016.1.2 – Public Corridor Fire-Resistance Rating
Occupancy A,M = 1hr
Occupancy B = 1hr (0hrs if fully sprinklered and stairway is smokeproof tower)

1016.2 – Corridor Width
Minimum width to be 44"
1016.3 – Dead Ends
No dead ends in corridors more than 20' in length.
Exceptions:
Group B dead end allowed to be 50' length if sprinklered.

Section BC 1018 – Number of Exits and Continuity
Table 1018.1 – Minimum Number of Exits for Occupant Load
1-500 occupants = 2 exits
501-1000 occupants = 3 exits
More than 1000 occupants = 4 exits

Section BC 1019 – Vertical Exit Enclosures
1019.1 – Enclosures Required
Exit enclosures to have minimum 2hr fire rating (stairs and ramps included)

1019.1.8 – Smokeproof Enclosures
Stairs required to be smokeproof enclosure or pressurized stairway

1019.1.8.1 – Enclosure Exit
Shall exit into a public way or exit passageway, no openings and to be 2hr rated

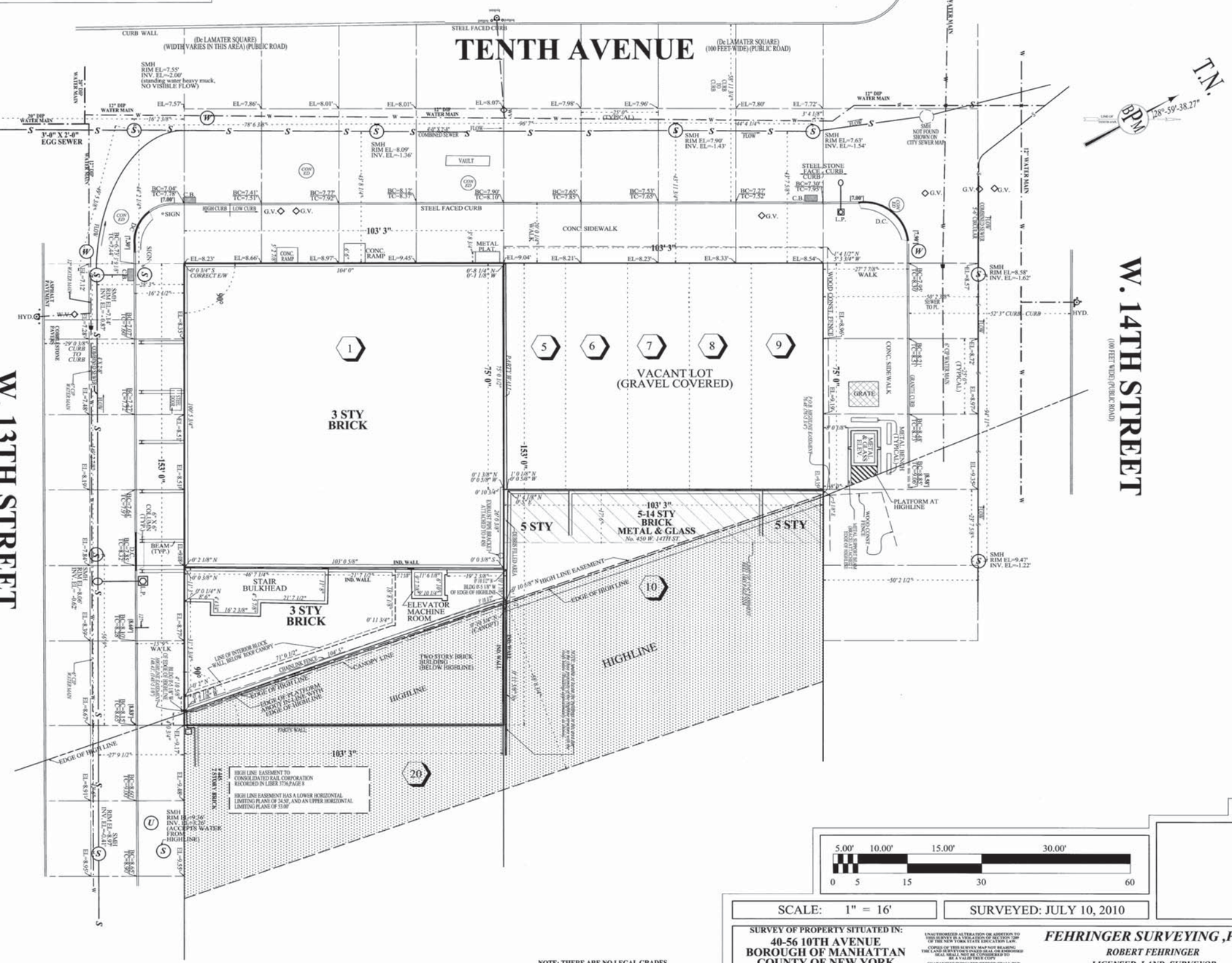
© SURVEY

BLOCK: 646
LOTS: 1, 5-9

TOTAL LOT AREA:
SQ. FT.: 23,541.00
ACRES: 0.5404

ARCHITECTURAL SURVEY

TITLE NO.



NOTE: Prior to the date of this survey of 40-56 10th Avenue there was an existing MARQUEE attached to the buildings on West 13th St., West 14th St and 10th Avenue which was temporarily removed. It is the intention of the developer to replace that Marquee with a new one as part of the new construction. Approval for the replacement of the Marquee was given by Borough Commissioner, Christopher M. Santulli, P.E. of the NYC Department of Buildings,in a letter dated August 14, 2008, with the stipulation that the new Marquee be in compliance with the Administrative Code Section 27-313 (4).

NOTES:
THIS IS TO CERTIFY THAT THERE ARE NO STREAMS OR NATURAL WATER COURSES IN THE PROPERTY AS SHOWN ON THIS SURVEY.

ALL ELEVATIONS ARE IN MANHATTAN HIGHWAY DATUM, WHICH IS 2.75 FEET ABOVE THE NATIONAL GEODETIC SURVEY DATUM OF 1929, (US COAST AND GEODETIC SURVEY DATUM) MEAN SEA LEVEL, SANDY HOOK, NEW JERSEY.

ALL UNDERGROUND UTILITIES INDICATED HEREON HAVE BEEN PLOTTED FROM MAPS AS PROVIDED BY THE RESPECTIVE UTILITY COMPANIES AND/OR GOVERNMENTAL AGENCIES. WE BEAR NO RESPONSIBILITY FOR THEIR ACCURACY OR COMPLETENESS. IT IS THE OWNERS RESPONSIBILITY TO CONTACT THE APPROPRIATE UTILITY COMPANY PRIOR TO ANY EXCAVATION IN ORDER TO VERIFY ALL UTILITY LOCATIONS.

ALL MANHOLE COVERS PLOTTED FROM ACTUAL FIELD MEASUREMENTS.

INVERT ELEVATIONS FIELD VERIFIED.

CAUTION:
BEFORE DOING ANY DIGGING OR DRILLING ON THIS SITE IT IS REQUIRED THAT SUB-SURFACE SERVICE, INCLUDING THE UNDERGROUND MAINS, DUCTS & CABLES BE MARKED AND IDENTIFIED BY THE UTILITY INVOLVED. THIS SHOULD BE DONE BY PROVIDING THE AFFECTED UTILITY WITH THE NOTICE REFERRED TO IN THE STATE OF NEW YORK INDUSTRIAL CODE 53.

LEGEND

CON ED MANHOLE COVER	TAX LOT
ELECTRIC MANHOLE COVER	OVERHEAD UTILITY WIRES
UNDERGROUND ELECTRIC DUCTS	UTILITY COMPANY POLE
DEPARTMENT OF WATER SUPPLY MANHOLE COVER	STREET LIGHT
WATER MAIN	METAL LIGHT POLE
SEWER MANHOLE COVER	METAL TRAFFIC LIGHT POLE
SANITARY SEWER	TRAFFIC SIGN POLE
STEAM MAIN	FIRE HYDRANT
DEPARTMENT OF WATER SUPPLY WATER GATE	PARKING METER
WATER VALVE	CATCH BASIN
GAS MAIN	OIL FILL
GAS CO. MANHOLE	TREE PIT
GAS VALVE	DROP CURB
CLEAN OUT MANHOLE COVER	STAND PIPE
TELEPHONE MANHOLE COVER	CHAIN LINK FENCE
TELEPHONE LINES	WROUGHT IRON FENCE
	WOOD STOCKADE FENCE
	POST AND RAIL FENCE

NOTE: THERE ARE NO LEGAL GRADES ESTABLISHED IN THIS AREA, ELEVATIONS INDICATED THUS [7.90'] REPRESENT THE EXISTING GRADES AS SHOWN ON THE FINAL MAP FOR BLOCK 646.

FS5

5.00' 10.00' 15.00' 30.00'
0 5 15 30 60

SCALE: 1" = 16'

SURVEYED: JULY 10, 2010

SURVEY OF PROPERTY SITUATED IN:
40-56 10TH AVENUE
BOROUGH OF MANHATTAN
COUNTY OF NEW YORK
CITY OF NEW YORK
STATE OF NEW YORK

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW.

COPIES OF THIS SURVEY MAP NOT BEARING THE LICENSED LAND SURVEYOR'S EMBOSSED SEAL SHALL NOT BE CONSIDERED TO BE A VALID TRUE COPY.

GUARANTEED INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND TO THE TITLE INSURANCE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS OR GUARANTEES ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.

FEHRINGER SURVEYING ,P.C.
ROBERT FEHRINGER
LICENSED LAND SURVEYOR
2200 JACKSON AVENUE
SEAFORD , N.Y. 11783
(516) 763 - 5515 FAX NO. (516) 763 - 5525

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Appendix 2
Sustainability Statement

APPENDIX 2

SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials. Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the Remedial Action Report (RAR).

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency. Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the RAR. Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

Recontamination Control. Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Storm-water Retention. Storm-water retention improves water quality by lowering the rate of combined storm-water and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

Linkage with Green Building. Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Brownfield Cleanup Program. William Gottlieb Real Estate/Tenth Avenue LLC is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. William Gottlieb Real Estate/Tenth Avenue LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings. Trees and other plantings provide habitat and add toNYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

Appendix 3
Citizen Participation Plan

APPENDIX 3

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation (OER) and William Gottlieb Real Estate/Tenth Avenue LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Brownfield Cleanup Program (NYC BCP). This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC BCP, William Gottlieb Real Estate/Tenth Avenue LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the OER until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project managerassigned to this Site, (TBD) who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841

Project Contact List.OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories.A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. William Gottlieb Real Estate/Tenth Avenue, LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Jefferson Market Branch of the New York Public Library
425 Avenue of the Americas
New York, NY 10011
(212) 243-4334

Sunday – Closed
Monday – 10:00 AM to 8:00 PM
Tuesday – 11:00 AM to 6:00 PM
Wednesday – 10:00 AM to 8:00 PM
Thursday – 11:00 AM to 6:00 PM
Friday – 10:00 AM to 5:00 PM
Saturday – 10:00 AM to 5:00 PM

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by William Gottlieb Real Estate/Tenth Avenue, LLC, reviewed and approved by OER prior to distribution and mailed by William Gottlieb Real Estate/Tenth Avenue, LLC. Public comment is solicited in public notices for all work plans developed under the NYC Brownfield Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC BCP project. See flow chart on the following page, which identifies when during the NYC BCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

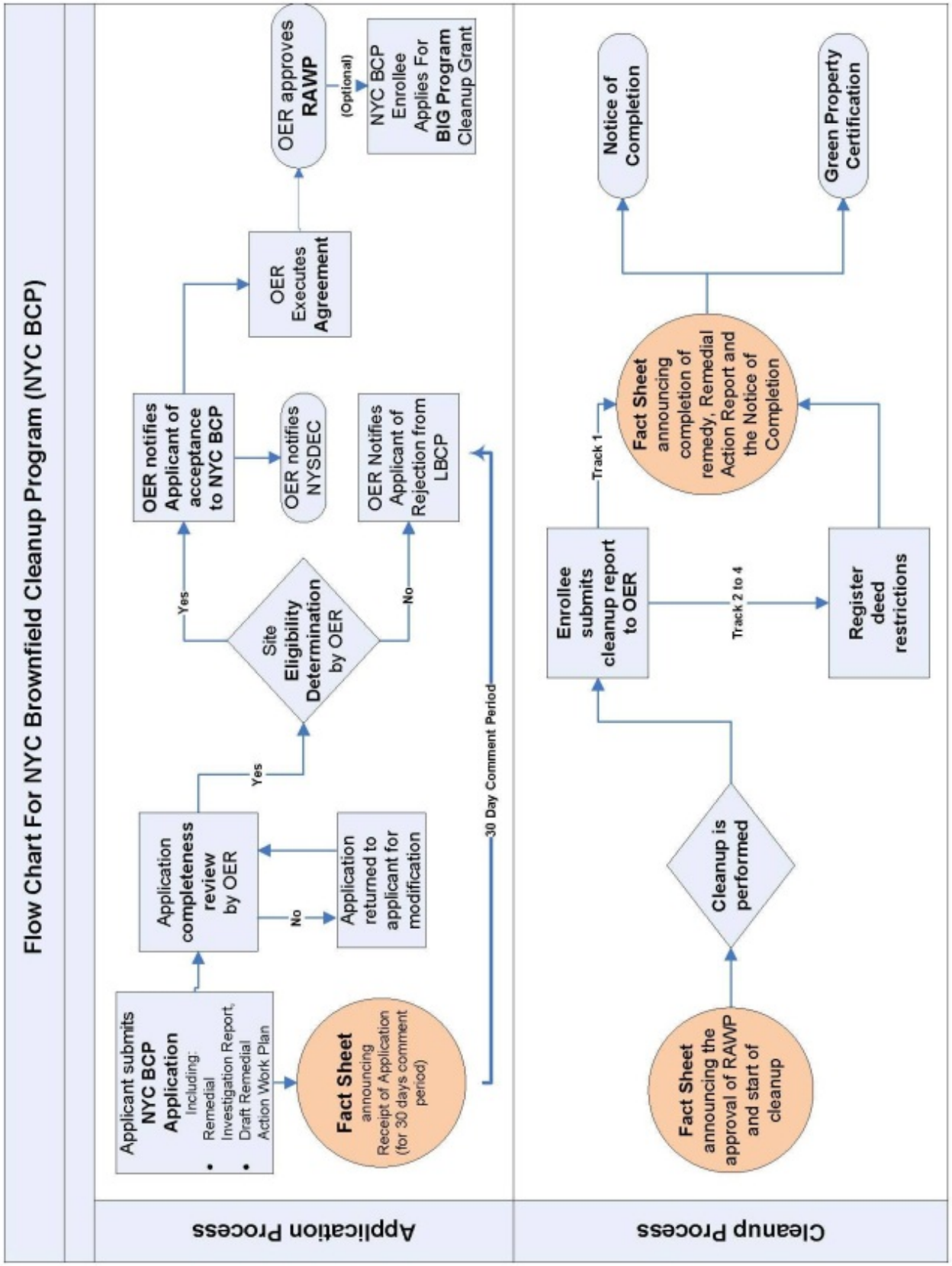
  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- **Public Notice announcing the approval of the RAWP and the start of remediation**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.


Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)
Application Process
Applicant submits NYC BCP Application
Including:
• Remedial Investigation Report,
• Draft Remedial Action Work Plan
Fact Sheet
announcing
Receipt of Application
(for 30 days comment period)
Application completeness review by OER
No
Application returned to applicant for modification
Yes
Site Eligibility Determination by OER
Yes
No
OER notifies Applicant of acceptance to NYC BCP
OER notifies NYSDEC
OER Notifies Applicant of Rejection from LBCP
30 Day Comment Period
OER Executes Agreement
OER approves RAWP
(Optional)
NYC BCP Enrollee Applies For BIG Program Cleanup Grant
Cleanup Process
Fact Sheet
announcing the
approval of RAWP
and start of
cleanup
Cleanup is performed
Enrollee submits cleanup report to OER
Track 1
Track 2 to 4
Fact Sheet
announcing
completion of
remedy, Remedial
Action Report and
the Notice of
Completion
Register deed restrictions
Notice of Completion
Green Property Certification

Appendix 4
Soils/Materials Management Plan

APPENDIX 4

SOIL/MATERIALS MANAGEMENT PLAN

1.1 SOIL SCREENING METHODS

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 STOCKPILE METHODS

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 CHARACTERIZATION OF EXCAVATED MATERIALS

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 MATERIALS EXCAVATION, LOAD-OUT AND DEPARTURE

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 OFF-SITE MATERIALS TRANSPORT

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Sitequeuing will be minimized.

Outbound truck transport routes are shown in Figure 3. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 MATERIALS DISPOSAL OFF-SITE

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Manhattan, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization

sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Sitewill be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 MATERIALS REUSE ON-SITE

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in Table 1. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC BCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 DEMARCATION

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three

methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. \

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the

groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 STORM-WATER POLLUTION PREVENTION

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 CONTINGENCY PLAN

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER.

Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 ODOR, DUST AND NUISANCE CONTROL

Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and

corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

Appendix 5

Construction Health and Safety Plan (CHASP)

CONSTRUCTION HEALTH AND SAFETY PLAN
FOR
REMEDIAL ACTION WORK PLAN
HIGHLINE 131410
42-46 10TH AVENUE & 449-451 WEST 13TH STREET
MANHATTAN, NEW YORK

Prepared For:

NEW YORK CITY OFFICE OF ENVIRONMENTAL REMEDIATION
NYC Brownfield Cleanup Program
253 Broadway, 14th Floor
New York, NY 10007

Prepared By:

Langan Engineering and Environmental Services, P.C.
360 West 31st Street, 8th Floor
New York, New York 10001

Joel B. Landes, P.E.
Senior Associate

September 2011

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SECTION 1 HEALTH AND SAFETY PLAN (HASP) SUMMARY

Emergency Contacts

Emergency contacts are listed on Table 1.

Emergency Procedures

Emergency procedures are described in Section 6.

Site Specific Hazards and Training

Site Specific Hazards are described in Section 2.

The Field Safety Officer (FSO) will be responsible for providing site-specific training to all personnel that work at the site. This training will cover the following topics:

- Names of personnel responsible for site safety and health.
- Hazards potentially present at the site.
- Proper use of personal protective equipment.
- Work practices by which the employee can minimize risk from hazards.
- Acute effects of compounds at the site.
- Decontamination procedures.

Personnel will be required to sign and date the Site-Specific Training Form provided in Attachment B prior to working on-site.

General Health and Safety Requirements

Personnel will be required to sign and date the Construction Health and Safety Plan and Work Plan Acceptance Form provided in Attachment B prior to working on-site.

Personnel Protective Equipment

Level D protection will be worn for initial entry on-site and for all activities except as noted in Section 3. Level D protection will consist of:

- Standard work clothes
- Steel-toe safety boots

- Safety glasses or goggles must be worn when splash hazard is present
- Hard hat

Modified Level D protection may be required under conditions where potential contact of the skin or clothes with significant contamination occurs. Modified Level D is the same as Level D but includes Tyvek coveralls and disposable polyethylene overboots.

Level C protection, unless otherwise specified in Section 3, will consist of Level D equipment and the following additional equipment:

- Full-face or half-mask air-purifying respirator (APR)
- Combination dust/organic vapor cartridges
- Tyvek coveralls if particulate hazard present
- PE-Coated Tyvek coverall if liquid contamination present
- PVC or nitrile inner and nitrile outer gloves
- 5-minute escape SCBA
- Medical surveillance monitoring will be required if respirators are worn on a daily basis

Level B protection, unless otherwise specified in Section 3, will consist of Level D equipment and the following additional equipment:

- Hard hat
- Positive Pressure SCBA or positive pressure air line and respirator with escape SCBA
- PE-Coated Tyvek coverall
- Nitrile outer and PVC or nitrile inner gloves
- Nitrile boot covers

Air Monitoring

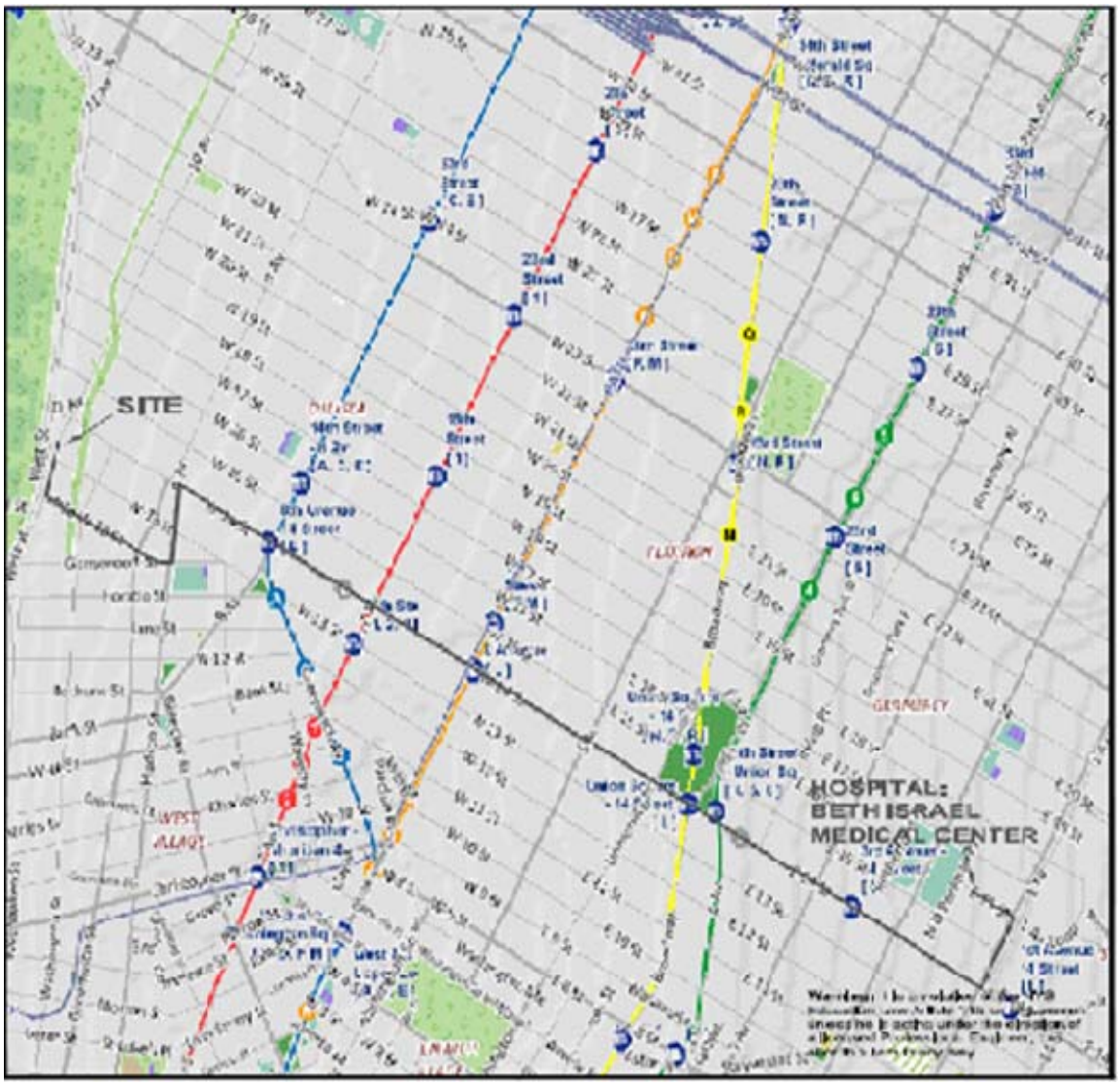
A summary of the action levels and restrictions is presented on Table 2.

FIGURE 1-HOSPITAL ROUTE PLAN (Beth Israel Medical Center in New York, NY)

Site Location: **42-46 10th Avenue, Manhattan, NY**

Hospital Location: **286 1st Avenue, Manhattan, NY**

Information Line (212) 420-2000



Route to Hospital

From 42-46 10th Avenue, Manhattan, NY to Beth Israel Medical Center, located at 286 1ST Avenue, Manhattan, NY.

1: Head SOUTHWEST on 10th AVENUE toward WEST 13TH STREET

2: Turn LEFT on LITTLE WEST 12TH STREET.

3: Turn LEFT onto 9TH AVENUE.

4: Turn RIGHT onto WEST 14TH STREET.

5: Turn LEFT onto 1ST AVENUE

6: Take the 2ND LEFT onto EAST 16th STREET. End at **286 1st Avenue**
New York, NY 10003, US.

Total Est. Time: 8 minutes **Total Est. Distance:** 1.8 miles

TABLE 1

EMERGENCY CONTACTS

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the Field Team Leader (or designee) and the Site Safety Officer, who will notify emergency personnel who will then contact the appropriate response teams. This emergency contacts list must be in an easily accessible location at the site.

Emergency Contacts	**Phone Number**
Fire Department:	911
Police:	911
New York City-Long Island One Call Center: (3 day notice required for utility mark-outs)	(800) 272-4480
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
Medical Emergency	
Ambulance Service:	911
Hospital Name:	Beth Israel Medical Center
Hospital Telephone Number:	(212) 420-2000
Hospital Address:	286 1st Avenue Manhattan , New York 10003
Route to Hospital:	See Page 3 and 4
Travel Time From Site:	8 minutes

Langan Contacts		
Principal/Associate:	Joel Landes, P.E.	(212) 479-5404
Program Manager:	Michael Burke	(212) 479-5413
Health & Safety Officer:	Tony Moffa (cell)	(215) 756-2523
Field Safety Officer	Jen Armstrong (cell)	(646) 315-4613
Field Team Leader	Sean Lowes (cell)	(917) 561-1746
Quality Assurance Officer	John Gavras, P.G.	(212) 479-5406
General Contractor/Superintendent	TBD	

TABLE 2
SUMMARY OF ACTION LEVELS AND RESTRICTIONS

Conditions for Level D:

All areas

- PID readings < 25 ppm
- No visible fugitive dust emissions from site activities

Conditions for Level C:

All areas

- Where PID readings > 25 ppm (sustained for 15 minutes in the breathing zone) to 200 ppm and/or
- Any visible fugitive dust emissions from site activities that disturb contaminated soil.

Conditions for Level B (or retreat):

All areas

- Where PID readings > 500 ppm
- Visible fugitive dust emissions from site activities cloud the surrounding air.

SECTION 2 INTRODUCTION

2.1 PURPOSE AND POLICY

The purpose of this site-specific construction health and safety plan (CHASP) is to establish personnel protection standards and mandatory safety practices and procedures for potential encounters with non-hazardous soil or groundwater during construction at the Site. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted during pile installation.

The provisions of the plan are the minimum for all on-site personnel. Contractor and subcontractors are required to prepare and adhere to their own HASP that conforms to this plan at a minimum. All Langan personnel who engage in project activities must be familiar with this plan, comply with its requirements, and sign the Plan Acceptance Form (Attachment B), page number B-5, prior to working on the site. The Plan Acceptance Form must be submitted to the Langan Health and Safety Officer (HSO). In addition to this plan, all work shall be performed in accordance with all applicable federal, state and local regulations.

2.2 SITE DESCRIPTION

The Site is located in the Greenwich Village area of the borough of Manhattan, New York and is identified as Block 646, Lot 1 (formerly Lots 1, 5, 6, 7, 8 and 9) on the New York City Tax Map. Figure 1 shows the Site location. The Site is an "L"-shaped lot and occupies an approximate area of 23,500-square feet and is bounded by West 14th Street to the north, Washington Street to the east, West 13th Street to the south, and 10th Avenue to the west. A map of the site boundary is also shown in Figure 1.

Lot 1 is improved with two abandoned 3-story buildings encompassing an approximate area of 15,800 square feet. Lots 5-9 are vacant and surrounded by wood construction fencing with a locked gate on 10th Avenue; the three–story buildings that were previously located on Lots 5-9 were destroyed in a fire in approximately 2003. The Highline Park runs northwest-southeast above the easternmost portion of the Site.

Redevelopment plans for the Site have not been finalized, but it is assumed that at least one basement level will be incorporated into the project design. The proposed development consists of a 13-story mixed-use building with a single cellar level. The cellar and first floor levels will span approximately 20,750 square feet and floors 2-13 will extend beyond the eastern property line approximately 40 feet and hang over the Highline Park. Soil will be excavated to accommodate the proposed cellar and building foundation elements to about 15 feet below grade surface (bgs). The proposed elevator pit and sump pit excavations will extend to about 18-20 feet bgs. The approximate soil volume that will be excavated during development of the Site is 11,500 cubic yards.

2.3 SCOPE OF WORK

The remediation will consist of the removal of material exceeding 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives for a Track 1 cleanup under the New York City Brownfield Cleanup

Program for 90% of the site. Track 4 SCOs will be used for remainder of the site. Remediation activities will be completed concurrently with the construction redevelopment activity at the Site. Approximately 11,500 cubic yards (cy) of fill material will be excavated. Dewatering may be required.

2.4 LANGAN PROJECT TEAM ORGANIZATION

Table 2.1 describes the responsibilities of Langan personnel associated with this project. The names of principal personnel associated with this project are:

Principal/Associate:	Joel Landes, P.E.	(212) 479-5404
Program Manager/Project Manager:	Michael Burke	(212) 479-5413
Health & Safety Officer:	Tony Moffa (cell)	(215) 756-2523
Field Safety Officer	Jen Armstrong (cell)	(646) 315-4613
Field Team Leader	Sean Lowes (cell)	(917) 561-1746
Quality Assurance Officer	John Gavras, P.G.	(212) 479 5406

All Langan personnel have been appropriately trained in first aid and hazardous waste safety procedures, including the operating and fitting of personal protective equipment, and are experienced with the field operations planned for this site.

TABLE 2.1
ON-SITE PERSONNEL AND RESPONSIBILITIES

PROJECT MANAGER - Assumes total control over site activities. Reports to upper-level management. Has authority to direct response operations.

Responsibilities:

- Prepares and organizes the background review of the situation, the Work Plan, the Site Health and Safety Plan, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Ensures that the Work Plan is executed and on schedule.
- Briefs the field team on their specific assignments.
- Coordinates with the site Health and Safety Officer (HSO) to ensure that health and safety requirements are met.
- Prepares the final report and support files on the response activities.
- Serves as the liaison with public officials.

FIELD SAFETY OFFICER (FSO) - Advises the HSO and Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety.

Responsibilities:

- Ensures that all necessary Health and Safety Equipment is available on-site. Ensures that all equipment is functional.
- Periodically inspects protective clothing and equipment.
- Ensures that protective clothing and equipment are properly stored and maintained.
- Controls entry and exit at the Access Control Points.
- Coordinates health and safety program activities with the Project HSO.
- Confirms each team member's suitability for work based on a physician's recommendation.
- Monitors the work parties for signs of stress, such as cold exposure, heat stress, and fatigue.
- Implements the Site Health and Safety Plan.
- Conducts periodic inspections to determine if the Site Health and Safety Plan is being followed.
- Enforces the "buddy" system.

TABLE 2.1 - CONTINUED
ON-SITE PERSONNEL AND RESPONSIBILITIES

Field Safety Officer Responsibilities (continued)

- Knows emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Notifies, when necessary, local public emergency officials.
- Coordinates emergency medical care.
- Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on the site.
- Controls the decontamination of all equipment, personnel, and samples from the contaminated areas.
- Assures proper disposal of contaminated clothing and materials.
- Ensures that all required equipment is available.
- Advises medical personnel of potential exposures and consequences.
- Notifies emergency response personnel by telephone or radio in the event of an emergency.

FIELD TEAM LEADER - Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety. Is directly responsible for the field team and the safety of site operations.

Responsibilities:

- Manages field operations.
- Executes the Work Plan and schedule.
- Enforces safety procedures.
- Coordinates with the Site Safety Officer in determining protection level.
- Enforces site control.
- Documents field activities and sample collection.
- Serves as a liaison with public officials.

WORK TEAM – Operators, laborers, samplers. The work party must consist of at least two people.

Responsibilities:

- Safely completes the on-site tasks required to fulfill the Work Plan.
- Complies with Site Safety Plan.
- Notifies Site Safety Officer or supervisor of suspected unsafe condition

SECTION 3 RISK ANALYSIS

3.1 CHEMICAL HAZARDS

Based on the remedial investigation performed at the site, the contaminants of concern include the following:

- VOCs
- SVOCs
- PCBs
- Metals

Volatile organic compounds (VOC's) were found in soil, groundwater, and soil vapor. One semi-volatile organic compound (SVOCs) was found in groundwater. Metals were found in soil and groundwater. A summary of the health hazards associated with the contaminant of concerns are shown below.

3.1.1 VOCs

The remedial investigation performed at the site has identified VOC's in soil, groundwater, and soil vapor. Some of the specific VOCs identified include: acetone, total xylenes, o-xylene, m,p-xylene, benzene, chloroform, toluene, 1, 2, 4-trimethylbenzene, cyclohexane, ethylbenzene, n-hexane, and tetrahydrofuran. Possible routes of exposure include inhalation, ingestion, and absorption. Prolonged exposure to VOCs above their respective OSHA permissible exposure limits may result in irritation of the mucous membranes of the respiratory system, eyes, and mouth. Overexposure to VOCs may also result in the depression of the central nervous system. Symptoms may include drowsiness, headache, and fatigue.

3.1.2 SVOCs

The remedial investigation performed at the site has identified one SVOC in groundwater, naphthalene. Possible routes of exposure include inhalation, ingestion, and absorption. The redevelopment of the Site calls for dewatering. Based on the media containing SVOCs (groundwater), the possibility of exposure is unlikely but possible. Repeated exposure to SVOCs may cause skin irritation. Certain SVOCs are considered human carcinogens.

3.1.3 PCBs

The remedial investigation performed at the site identified PCB contamination in groundwater. Some of the specific PCBs include: Aroclor 1248 and Aroclor 1260. PCBs are most commonly found in electrical transformers or capacitors as a dielectric fluid. Possible routes of exposure include inhalation, ingestion, and absorption. The redevelopment of the Site calls for dewatering. Based on the media containing SVOCs (groundwater), the possibility of

exposure is unlikely but possible. Exposure to PCBs may can skin irritation, eye irritation, dermal rash, and possibly liver damage.

3.1.4 Metals

The remedial investigation performed at the site has identified the metals in soil and groundwater. Some of the specific metals identified include: arsenic, copper, lead, nickel, zinc, mercury, and selenium. Possible routes of exposure include inhalation and ingestion. Metals exposure, generally in the form of soil/fill material dust, may cause skin, eye, or mucous membrane irritation. Exposure symptoms may include headaches, nausea, vomiting, abdominal pain, aches, and dizziness.

3.1.5 Control Measures

During the remedial work performed at the site, the chemical hazards described above can be controlled in the following ways:

- Air monitoring will be performed around the work areas (test pits, mass excavation, hotspot removal, etc.) to determine the level of VOCs and dust exposure to the workers. If the exposure levels exceed the standards set in **Section 4.4 – Community Air Monitoring Program**, the appropriate measures will be taken, including but not limited to stopping work, wetting down the work area, donning personal protective equipment.

- Level D personal protective equipment (PPE) will be required at all times on the site. If the on-site conditions require additional PPE, the procedure for upgrading PPE is set forth in **Section 4 – Personal Protective Equipment**.

- The decontamination procedures set forth in **Section 5.2 – Decontamination Plan** must be followed at all times.

- While it is unlikely that ingestion may occur, good housekeeping practices will be implemented to reduce the possibilities of ingesting the contaminants of concern.

3.2 RADIATION HAZARDS

No radiation hazards are known or expected at the site.

3.3 BIOLOGICAL HAZARDS

3.3.1 Animals

During site operations, animals such as dogs, pigeons, sea gulls, mice, and rats may be encountered. Workers will use discretion and avoid all contact with animals. Bites and scratches from dogs can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis; crytococcosis and histoplasmosis are also diseases

associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

TABLE 2.2
RELEVANT PROPERTIES OF VOLATILES (PETROLEUM [GASOLINE, DIESEL, ETC.]), METALS AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE SITE

Compound (Synonym)	OSHA PEL[1] (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold[2] (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/ 10.6 eV lamp PID (I.P. eV)
Benzo (a) anthracene	0.2	NA	NA	NA	NA	0 (approx)	NA	NA
Benzo (a) pyrene	0.2	NA	NA	NA	NA	0 (approx)	NA	NA
Benzo (b) fluoranthene	NA	NA	NA	NA	NA	0 (approx)	NA	NA
Benzo (k) fluoranthene	NA	NA	NA	NA	NA	0 (approx)	NA	NA
Chrysene	0.2	80	NA	NA	NA	0 (approx)	NA	NA
Dibenzo (a,h) anthracene	NA	NA	NA	NA	NA	0 (approx)	NA	NA
Carbazole	NA	NA	NA	NA	NA	0 (approx)	Noncombustible	NA
Beryllium	.002	4	NA	NA	NA	0 (approx)	Noncombustible	NA
Chromium (Cr)	0.1	250	NA	NA	NA	0 (approx)	Noncombustible	NA
Copper	1	100	NA	NA	NA	0 (approx)	Noncombustible	NA
Lead (Pb)	0.05	100	NA	NA	NA	0 (approx)	Noncombustible	NA

TABLE 2.2
RELEVANT PROPERTIES OF VOLATILES (PETROLEUM [GASOLINE, DIESEL, ETC.]), METALS AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE SITE

Compound (Synonym)	OSHA PEL[1] (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold[2] (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/ 10.6 eV lamp PID (I.P. eV)
Iron	5	NA	NA	NA	NA	NA	Noncombustible	NA
Magnesium (Mg)	5	500	NA	NA	NA	0 (approx)	Combustible	NA
Mercury(Hg)	0.01	1.22	NA	NA	NA	0.0012	Noncombustible	NA
Manganese	5	500	NA	NA	NA	0 (approx)	Combustible	NA
Nickel (Ni)	1	10	NA	NA	NA	0 (approx)	Combustible	NA
Zinc (Zn)	5	50	NA	NA	NA	0 (approx)	Combustible	NA
MTBE	NA	NA	1.6	NA	Minty	0 (approx)	Combustible	NA
Benzene	1	500	1.2	NA	NA	75	Combustible	Yes
Ethyl Benzene	100	800	0.8	NA	NA	7	Combustible	Yes

TABLE 2.2
RELEVANT PROPERTIES OF VOLATILES (PETROLEUM [GASOLINE, DIESEL, ETC.]), METALS AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE SITE

Compound (Synonym)	OSHA PEL[1] (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold[2] (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/ 10.6 eV lamp PID
Toluene	200	500	1.1	NA	sweet	21	Combustible	Yes
Xylene	100	900	0.9	NA	NA	7	Combustible	Yes
Arsenic	0.01	5	NA	NA	NA	0 (approx)	Noncombustible	NA
Mercury	0.1	10	NA	NA	NA	0.0012	Noncombustible	NA
Chlordane	0.5	100	2.5	NA	Sweet	0 (approx	Noncombustible	NA
Dieldrin	0.25	50	NA	0.041	Mild chemical	0 (approx)	Noncombustible	NA

(1) 29 CFR 1910, June 30, 1993 (8-hour Time weighted average unless otherwise specified.)
(2) ACGIH 1989 Highest reported value of acceptable odor threshold range.
(4) Sponge catalyst may ignite spontaneously in the air.
(5) Powder may ignite spontaneously in the air, and can continue burning under water.
[IDLH] Immediately dangerous to life or health
[CA] Suspect carcinogen - Minimize all possible exposures

3.3.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, and spiders, may be present at this site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis. Personnel that have been bitten or stung by an insect at the Site should notify the HSO or FSO of such immediately. The following is a list of preventive measures:

- Wear proper protective clothing (work boots, socks and light colored pants).

- Field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on Site.

The HSO or FSO will instruct the project personnel in the recognition and procedures for encountering potentially hazardous insects at the Site.

3.4 PHYSICAL HAZARDS

3.4.1 Explosion

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

3.4.2 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 2.3 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 2.4 below to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the Field Safety Officer, who shall be able to recognize symptoms related to heat stress.

Table 2.3
Suggested Frequency of Physiological Monitoring
For Fit and Acclimated Workers[a]

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

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ^{o}F = ta ^{o}F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Table 2.4 - HEAT INDEX

ENVIRONMENTAL TEMPERATURE (Fahrenheit)

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

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

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

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

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

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

- **Prickly Heat** (Heat rash)
  - Painful, itchy red rash. Occurs during sweating, on skin covered by clothing.
- **Heat Cramps**
  - Painful spasm of arm, leg or abdominal muscles, during or after work.
- **Heat Exhaustion**
  - Headache, nausea, dizziness. Cool, clammy, moist skin. Heavy sweating. Weak, fast pulse. Shallow respiration, normal temperature.
- **Heat Fatigue**
  - Weariness, irritability, loss of skill for fine or precision work. Decreased ability to concentrate. No loss of temperature control.
- **Heat Syncope** (Heat Collapse)
  - Fainting while standing in a hot environment.
- **Heat Stroke**
  - Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. **This is a life threatening condition.**

  Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

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

- Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

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

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
    - Maintain water temperature 50° to 60°F (10° to 16.6°C).
    - Provide small disposal cups that hold about four ounces (0.1 liter).
    - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
    - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
    - Train workers to recognize the symptoms of heat related illness.

3.4.3 Cold-Related Illness

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

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

Frostbite - Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

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

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

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

3.4.4 Noise

Work activities during the proposed demolition and remediation activities may be conducted at locations with high noise levels from the operation of equipment. Hearing protection will be used as necessary.

3.4.5 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Ground Fault Circuit Interrupters (GFCIs) are required for all portable tools.

3.4.6 Slips, Trips and Fall Hazards

Care should be exercised when walking at the site, especially when carrying equipment. The presence of surface debris, uneven surfaces, pits, facility equipment, and soil piles contribute to tripping hazards and fall hazards. To the extent possible, all hazards should be identified and marked on the Site, with hazards communicated to all workers in the area.

3.4.7 Utilities (Electrocution and Fire Hazards)

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One Call Center. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

3.5 TASK HAZARD ANALYSIS

3.5.1 Soil Excavation and Soil Sampling

Excavation and soil sampling activities are inherently dangerous. Special attention should be given to establishing the location of any underground utilities prior to excavating.

Chemical exposure may occur as these activities progress across the site, where workers may be exposed to contaminants in the excavated soils, encountered groundwater, or products used on-site including gasoline, diesel, and motor oil. Also, sampling of both in-situ and stockpiled soils presents similar potential exposure hazard. Activities will be conducted initially in Level D but may be upgraded to Modified Level D. Although not anticipated, there will be a Level C and B contingency should pockets of contaminants be brought to the surface and breathing zone air becomes contaminated.

If evidence of historic or unknown contamination is encountered during remediation activities or other contaminated materials, such as oily materials, high PID readings, etc., the FSO will make a determination of the appropriate level of personnel protection.

SECTION 4 PERSONNEL PROTECTION AND MONITORING

4.1 OSHA TRAINING

All on-site personnel who will be actively involved in excavation activities involving potentially hazardous waste must have completed hazardous waste operations-related training, as required by OSHA Regulations 29 CFR 1910.120. Working involved in non-hazardous materials will not be required to have the 40-hour hazwoper training. All site workers will be required to have OSHA 10-hour Construction Health and Safety certifications. Personnel who completed the 40-hour training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. Documentation of OSHA training for project personnel must be provided to Langan prior to starting work.

4.2 SITE-SPECIFIC TRAINING

The Site Safety Officer will be responsible for developing a site-specific occupational hazard training program and providing training to all personnel that are to work at the site. This training will be conducted prior to starting fieldwork and will consist of the following topics:

- Names of personnel responsible for site safety and health.
- Hazards potentially present at the site.
- Proper use of personal protective equipment.
- Requirements of this HASP.
- Work practices by which the employee can minimize risk from hazards. This may include a specific review of heavy equipment safety, safety during inclement weather, changes in common escape rendezvous point, site security measures, or other site-specific issues that need to be addressed before work begins.
- Safe use of engineering controls and equipment on the site.
- Acute effects of compounds present at the site.
- Decontamination procedures.

Upon completion of site-specific training, workers will sign the Site-Specific-Training Form provided in Attachment B. A copy of the completed Site-Specific Training Form will be included in the project files for future reference.

4.3 ODOR, VAPOR AND DUST MONITORING AND RESPONSE

4.3.1 Work Zone Area Monitoring

The contractor is responsible for completing their own health and safety plan. General contractor and sub-contractor site worker monitoring will be the responsibility of the respective contractor.

<u>VOC</u>

Continuous monitoring for VOCs will be conducted during all ground intrusive activities (i.e., excavation). The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 ppm above background for the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor outside the hot zone is below 5 ppm above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the hot zone, activities will be shutdown.

Dust

Particulate or dust will be monitoring continuously with real-time field instrumentation during earthwork operations. NYSDEC issues a 1989 memorandum on controlling fugitive dust emissions during "ground intrusive activities" (e.g. excavation, drilling). The National Ambient Air Quality Standard for Respirable Particulates, which are defined as particles 10ug (PM10) in diameter or less, is 150 ug/m3. Based on this standard, dust exposure from excavation activities should not exceed 150 ug/m3 above background and monitoring should be within the work area if exceedances of this standard are anticipated.

The NYSDEC defines fugitive dust as particulate matter that is not from a specific source and could include discrete particles, droplets, and solids over a wide range of sizes. Most continuous dust monitors are designed to provide maximum response to PM10 particulate, since these particles are considered respirable.

Based on the air monitoring results, dust suppression may need to be implemented. This could include the following:

- Appling water to the excavation surface
- Wetting equipment
- Spraying work area
- Utilizing alternate work methods
- Implementing site speed restrictions

Background dust monitoring shall be performed prior to the start of the workday. Sampling shall be performed outside of the work zone for a minimum of fifteen minutes. Sampling shall be performed continuously within the work zone. Monitoring results shall be kept in a logbook and used to initiate additional dust control measures as necessary.

4.4 COMMUNITY AIR MONITORING PLAN (CAMP)

This CAMP was developed in accordance with the NYSDOH Generic Community Air Monitoring Plan.

VOC Monitoring, Response Levels, and Actions

VOCs must be monitored at the downwind perimeter of an active work zone on a continuous basis during remediation and construction activities until the ground is completely capped with clean soil or impervious barrier. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to the known VOC contaminants on the Site. This equipment should be calibrated daily and should be capable of calculating 15-minute running averages. All 15-minute readings will be recorded and be available for State personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded. The measured 15-minute averages will be compared to the levels below:

1. If the ambient air concentration of total VOCs at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15 minute average, work activities must be halted until the levels readily decreases below 5 ppm (per instantaneous readings).
2. If the total VOCs at the downwind perimeter of the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work must be halted. The source of vapors must be identified and corrective actions must be taken to abate the emissions. Work activities can only resume provided that the concentration is less than 5 ppm over a 15 minute average period.
3. If the total VOC level is above 25 ppm at the perimeter of the work area, all activities must be shut down and work methods and controls will be re-evaluated.

Particulate Monitoring, Response Levels, and Actions

Dust or particulate concentrations should be monitored continuously at the upwind and downwind perimeters at the site perimeter and active work zones. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes or less for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities. All readings will be recorded and be available for state personnel review. Corrective action is determined by the following levels:

1. If the downwind PM-10 at a site perimeter location is 100 micrograms per cubic meter (µg/m3) greater than background for the 15 minute period of if airborne dust is observed at the site perimeter from excavation activity, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that the downwind PM-10 particulate level does not exceed 150 µg/m3 above the upwind level and provided that no visible dust is migrating from the excavation work area.
2. If, after implementing dust suppression techniques, downwind PM-10 particulate levels are greater than 150 µg/m3 above the upwind level, work must be stopped and re-evaluation of work 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 µg/m3 of the upwind level and in preventing visible dust migration.

4.4.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the hot zone, work activities will be halted or odor controls will be employed, and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume, provided:

- The organic vapor level outside the hot zone is below 1 ppm over background, and
- More frequent intervals of monitoring, as directed by the Site Health and Safety Officer, are conducted.

If the organic vapor level is greater than 5 ppm above background at the perimeter of the hot zone, work activities must be shut down or odor controls must be employed. When work shut-down occurs, downwind air monitoring as directed by the Site Health and Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

4.4.2 Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the hot zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented.

- Sustained organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes, or
- Organic vapor levels greater than 5 ppm above background for any time period.

4.4.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation;
2. Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer; and

All Emergency contacts will go into effect as appropriate.

4.5 SUMMARY OF ACTION LEVELS AND RESTRICTIONS

A PID such as the RaeSystems MiniRae 2000, equipped with a 10.6 eV lamp shall be used to screen for total VOCs. All readings pertain to sustained readings for 15 minutes in the worker breathing zone. The following conditions shall apply to each level of protection.

Conditions for Level D:

All areas where PID readings < 25 ppm

Conditions for Level C:

- All areas where PID readings > 25 ppm (sustained for 15 minutes in the breathing zone) to 200 ppm

Conditions for Level B (or retreat):

All areas where PID readings > 500 ppm

4.5.1 Level D and Modified Level D

Level D protection will be worn for initial entry on-site and initially for all activities. Level D protection will consist of:

- Standard work clothes
- Steel-toe safety boots
- Safety glasses (goggles must be worn when splash hazard is present)
- Nitrile gloves must be worn during all activities requiring contact with saturated soils.
- Hard hat (must be worn during all site activities)

Modified Level D is the same as Level D but includes Tyvek coveralls and disposable polyethylene overboots to contact with the skin or clothes if significant contamination is present in subsurface materials.

4.5.2 Level C (Not Anticipated)

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

- Full-face or half-mask air-purifying respirator (APR) or powered air purifier (PAPR), depending on presence and abundance of airborne toxic constituents of concern
- Combination HEPA filter/organic vapor cartridges
- Tyvek coveralls must be worn if particulate hazard present
- PE-coated Tyvek coveralls if liquid contamination present

- Steel-toe safety boots
- Nitrile outer gloves must be worn during all activities requiring contact with saturated soil.
- Hard hat (must be worn during all site activities)

Cartridges will be disposed at the end of each day's use.

4.5.3 Level B (Retreat)

If the concentration of volatile organics which can be detected with a PID equals or exceeds the specified action levels, all field personnel associated with the project will immediately retreat to a location up-wind of the source of contamination. At this point the Site Safety Officer must consult with the Langan HSO to discuss appropriate actions.

4.5.4 OSHA Requirements for Personal Protective Equipment

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

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

ANSI = American National Standards Institute

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

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

- Oxygen deficiency;
- Immediately Dangerous to Life or Health (IDLH) concentrations;
- High relative humidity; and
- If contaminant levels exceed designated use concentrations.

SECTION 5 WORK ZONES AND DECONTAMINATION

5.1 SITE WORK ZONES

To reduce the spread of hazardous materials by workers from potentially contaminated areas to the clean areas, work zones will be delineated at the site. The flow of personnel between the zones should be controlled. The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, and ensure that work activities and contamination are confined to the appropriate areas. The work zones described below may be modified in the field depending on field conditions.

5.1.1 Hot Zone

Hot zones will be established within the delineated hazardous lead area in the western portion of the site. Unprotected onlookers should not be located within the hazardous area during intrusive activities. All personnel within the hot zone must don the appropriate levels of personal protection as set forth by the FSO. It is not anticipated that Level C or higher will be required for this site.

All personnel within the hot zone will be required to use the specified level of protection. No food, drink, or smoking will be allowed in the hot or warm zones.

5.1.2 Warm Zone

Should PID action levels be exceeded or obvious indications of contamination (by sight or odor) be encountered, a warm zone will be established and utilized during the field activities. This zone will be established between the hot zone and the cold zone (discussed below), and will include the personnel and equipment necessary for decontamination of equipment and personnel exiting the hot zone. Personnel and equipment in the hot zone must pass through this zone before entering the cold zone. This zone should always be located upwind of the hot zone.

5.1.3 Cold Zone

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

5.2 DECONTAMINATION

Any water used in decontamination procedures will be placed in containers, temporarily stored on-site, and properly characterized and disposed.

5.2.1 Decontamination of Personnel

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

5.2.2 Decontamination of Field Equipment

Decontamination of field equipment will be necessary for all equipment in contact with contaminated materials (if encountered). Decontamination activities shall be performed in a designated area lined with polyethylene sheeting designed to collect the decontamination rinse liquid. Equipment to be decontaminated includes, but is not limited to, excavators, sampling and pumping equipment.

5.3 REMEDIAL ACTIVITY-DERIVED WASTE

All PPE related remedial activity-derived waste materials (PPE, decontamination waste) will be placed in labeled containers and appropriately disposed. If encountered, soil from previously unknown hot spot will be kept moist, properly characterized and disposed off-site. Stockpiling of contaminated materials will only occur temporarily and if adequate space exists.

SECTION 6 ACCIDENT PREVENTION AND CONTINGENCY PLAN

6.1 ACCIDENT PREVENTION

6.1.1 Site-Specific Training

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

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

6.1.2 Vehicles and Heavy Equipment

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

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

6.1.3 Excavation and Trenching

The principal hazards associated with excavation/trenching are:

- Suffocation, crushing, or other injury from falling material;
- Damage/failure of installed underground services and consequent hazards;
- Tripping, slipping, or falling; and
- Possibility of explosive, flammable, toxic, or oxygen-deficient atmosphere in excavation.

Prior to excavating, the presence of any underground installation will be identified by surface stakes or markers and underground services will be de-energized or isolated. Any standing water will be removed from the excavation and surface water will be diverted from the excavation. Shoring and/or bracing and structural ramps that are used as a means of access or egress will be designed by a competent person, as defined by OSHA.

The following procedures will apply while conducting the excavation:

- Shoring and sloping requirements will be defined in accordance with Appendices A,B, C, D, and F of the OSHA Excavation Regulation, 29 CFR 1926 Subpart P;
- Excavated material shall be stored at a distance from the edge, as determined by the competent person, but not less than 2 feet;
- All trench excavations greater than 4 feet in depth shall be shored;
- Ladders or other means of access to/exit from excavations shall be provided at a maximum spacing of 100 feet on the perimeter of excavations. Trenches require a fixed means of egress, and ladders secured and extended a minimum of 36-inches above the landing and spaced not more than 25 feet laterally to the nearest means of egress;
- If the excavation is deemed a confined space, appropriate monitoring for hazardous atmosphere will be conducted to evaluate the need for respiratory protection or ventilation;
- Adequate dewatering;

Employees are required to stand away from vehicles being loaded or unloaded and shall not be permitted underneath loads handled by lifting or dragging equipment.

6.2 SPILL CONTROL PLAN

All personnel must take every precaution to minimize the potential for spills during site operations. Any spill shall be reported immediately to the FSO. Spill control apparatus (sorbent materials) will be located on-site. All materials used for the clean up of spills will be containerized and labeled separately from other wastes. The NYSDEC will immediately be notified in the event of a spill.

6.3 CONTINGENCY PLAN

6.3.1 Emergency Procedures

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

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

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

6.3.2 Chemical Exposure

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

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the Field Team Leader (via voice and hand signals) of the chemical exposure. The Field Team Leader should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- All chemical exposure incidents must be reported in writing to the Langan Health and Safety Officer. The Field Safety Officer or Field Team Leader is responsible for completing the accident report.

6.3.3 Personal Injury

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

- Another team member (buddy) should signal the Field Team Leader that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- For less severe cases, the individual can be taken to the site dispensary.

- The Field Team Leader or Field Safety Officer is responsible for making certain that an Accident Report Form is completed. This form is to be submitted to the Langan Health and Safety Officer. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

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

6.3.4 Evacuation Procedures

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

6.3.5 Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency

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

ATTACHMENT A

Air Monitoring Equipment Calibration and Maintenance

All monitoring instruments must be calibrated and maintained periodically. Calibration and on-site maintenance records will be kept in the field log book. The operator must understand the limitations and possible sources of errors for each instrument. It is important that the operator checks that the instrument responds properly to the substances it was designed to monitor. Portable air quality monitoring equipment that measures total ionizables present such as the RaeSystems MiniRae 2000 (or equivalent) photoionization detector (PID) must be calibrated at least once each day. Combustible gas/oxygen meters (explosimeter) such as the MSA Model 360 monitor must be calibrated at least once a week. The specific instructions for calibration and maintenance provided for each instrument should be followed.

ATTACHMENT B

Forms for Health and Safety Related Activity

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

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

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

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

1-800-321-OSHA

www.osha.gov

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

Project Name:_____

Injured or Ill Employee

1. Name _____ Social Security #_____
   (First) (Middle) (Last)
2. Home Address _____
   (No. and Street) (City or Town) (State and Zip)
3. Age _____ 4. Sex: Male ( ) Female ( )
5. Occupation _____
   (Specific job title, not the specific activity employee was performing at time of injury)
6. Department _____
   (Enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

Employer

7. Name _____
8. Mailing Address _____
   (No. and Street) (City or Town) (State and Zip)
9. Location (if different from mailing address):_____
   _____

The Accident or Exposure to Occupational Illness

10. Place of accident or exposure _____
    (No. and Street) (City or Town) (State and Zip)
11. Was place of accident or exposure on employer's premises? _____(Yes/No)
12. What was the employee doing when injured?_____
    _____
    (Be specific - was employee using tools or equipment or handling material?)
    _____
13. How did the accident occur? _____
    (Describe fully the events that resulted in the injury or
    _____
    occupational illness. Tell what happened and how. Name objects and substances involved.
    _____
    Give details on all factors that led to accident. Use separate sheet if needed)
14. Time of accident: _____
15. Date of injury or initial diagnosis of occupational illness _____

16. WITNESS TO ACCIDENT

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

Occupational Injury or Occupational Illness

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

_____

_____

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

_____

_____

19. Did the accident result in employee fatality? _____ (Yes or No)
20. Number of lost workdays ____/restricted workdays _____ resulting from injury or illness?

Other

21. Did you see a physician for treatment? _____ (Yes or No) _____ (Date)
22. Name and address of physician _____

_____

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

23. If hospitalized, name and address of hospital _____

_____

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

Date of report _____ Prepared by _____

Official position _____

Project Health and Safety Plan and Work plan Acceptance Form

(For Langan employees only)

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

Highline 13,14,&10, Manhattan, NY _____ 170119302 _____

(Project Title) (Project Number)

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

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible

Site-Specific Health and Safety Training

(For all Langan and subcontract employees on site)

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

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

For the following project:

Highline 13,14,&10, Manhattan, NY 170119302

(Project Title) (Project Number)

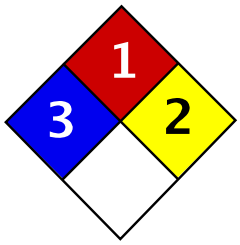
Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible

ATTACHMENT C

Material Safety Data Sheets

- Arsenic
- Copper
- Nickel
- Zinc
- Lead
- Mercury
- Selenium
- Chloroform
- Naphthalene
- Unleaded Gasoline
- Diesel Fuel
- Motor Oil, 10W-40
- Isobutylene Gas in Air, 100 ppm
- Benzene
- Toluene
- PCBs



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

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
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, the nervous system, mucous membranes.
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:
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 unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

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:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly 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:
Use a shovel to put the material into a convenient waste disposal container. 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:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. 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, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

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: 0.01 from ACGIH (TLV) [United States] [1995]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

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

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (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: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

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): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH.
Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

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

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: Not available.

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 as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic
Pennsylvania RTK: Arsenic
Massachusetts RTK: Arsenic
TSCA 8(b) inventory: Arsenic

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

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 1

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.
Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec.
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-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 04:16 PM

Last Updated: 11/06/2008 12:00 PM

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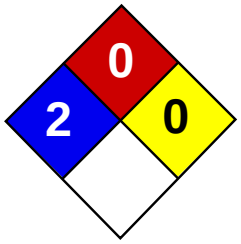

Health	2
Fire	0
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Chloroform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chloroform

Catalog Codes: SLC1888, SLC5044

CAS#: 67-66-3

RTECS: FS9100000

TSCA: TSCA 8(b) inventory: Chloroform

CI#: Not available.

Synonym: Trichloromethane; Methane, trichlor-

Chemical Name: Chloroform

Chemical Formula: CHCl3

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
Chloroform	67-66-3	100

Toxicological Data on Ingredients: Chloroform: ORAL (LD50): Acute: 695 mg/kg [Rat]. 36 mg/kg [Mouse]. 820 mg/kg [Guinea pig]. DERMAL (LD50): Acute: >20000 mg/kg [Rabbit]. VAPOR (LC50): Acute: 47702 mg/m 4 hours [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, heart. 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. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

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: Not available.

Special Remarks on Explosion Hazards: May explode if it comes in contact with aluminum powder, lithium, perchlorate, pentoxide, bis(dimethylamino)dimethylstannane, potassium, potassium-sodium alloy, sodium (or sodium hydroxide or sodium methoxide), and methanol

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal. 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 gas/fumes/ vapor/spray. 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. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

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

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor 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: 10 (ppm) [Australia] Inhalation TWA: 2 (ppm) from OSHA (PEL) [United States] Inhalation STEL: 9.78 (mg/m3) from NIOSH Inhalation STEL: 2 (ppm) from NIOSH Inhalation TWA: 9.78 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 10 (ppm) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 2 (ppm) [United Kingdom (UK)] Inhalation TWA: 9.9 (mg/m3) [United Kingdom (UK)] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pleasant. Sweetish. Etheric. Non-irritating

Taste: Burning. Sweet.

Molecular Weight: 119.38 g/mole

Color: Colorless. Clear

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

Boiling Point: 61°C (141.8°F)

Melting Point: -63.5°C (-82.3°F)

Critical Temperature: 263.33°C (506°F)

Specific Gravity: 1.484 (Water = 1)

Vapor Pressure: 21.1 kPa (@ 20°C)

Vapor Density: 4.36 (Air = 1)

Volatility: Not available.

Odor Threshold: 85 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, Light

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Light Sensitive. Incompatible with triisopropyl phosphine, acetone, disilane, fluorine, strong bases and reactive metals (aluminum, magnesium in powdered form), light.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, and coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 36 mg/kg [Mouse]. Acute dermal toxicity (LD50): >20000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 47702 mg/m 4 hours [Rat]. 3

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, heart.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (possible mutangen) and cause adverse reproductive effects(embryotoxicity and fetotoxicity) Suspected carcinogen (tumorigenic) and teratogen based on animal data. Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes skin irritation and may cause chemical burns. Eye: Causes eye irritation, burning pain and reversible injury to corneal epithelium. Inhalation: Causes irritation of the respiratory system (mucous membranes). May affect behavior/Nervous system (CNS depressant, fatigue, dizziness, nervousness, giddiness, euphoria, loss of coordination and judgement, weakness, hallucinations, muscle contraction/spasticity, general anesthetic, spastic paralysis, headache), anorexia (neurological and gastrointestinal symtoms resembling chronic alcoholism), and possibly coma and death. May affect the liver, kidneys and gastrointestinal tract (nausea, vomiting). Ingestion: Causes gastrointestinal tract irritation (nausea, vomiting). May affect the liver, urinary system (kidneys), respiration, behavior/nervous system (symptoms similar to inhalation),and heart. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect the liver (hepatitis, jaundice, hepatocellular necrosis), metabolism (weight loss), respiration (fibrosis, pneumoconoisis), behavior/central nervous system (symptoms similar to acute inhalation), blood, musculoskeletal system, and kidneys. Ingestion: Prolonged or repeated ingestion may affect the liver, kidneys, metabolism (weight loss), endocrine system (spleen), blood (changes in cell count).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 43.8 mg/l 96 hours [Trout].

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 as toxic as the product itself.

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: CLASS 6.1: Poisonous material.

Identification: : Chloroform UNNA: UN1888 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Chloroform California prop. 65 (no significant risk level): Chloroform: 0.02 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Chloroform New York release reporting list: Chloroform Rhode Island RTK hazardous substances: Chloroform Pennsylvania RTK: Chloroform Massachusetts RTK: Chloroform New Jersey: Chloroform California Director's List of Hazardous Subtances (8 CCR 339): Chloroform Tennessee: Chloroform TSCA 8(b) inventory: Chloroform TSCA 8(d) H and S data reporting: Chloroform: effective: 6/1/87; sunset: 6/1/97 SARA 302/304/311/312 extremely hazardous substances: Chloroform SARA 313 toxic chemical notification and release reporting: Chloroform CERCLA: Hazardous substances.: Chloroform: 10 lbs. (4.536 kg)

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): CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R40- Possible risks of irreversible effects. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Vapor 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: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 11/01/2010 12:00 PM

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

101/102/110 COPPER/COPPER ALLOYS

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

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Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
101/102/110 COPPER/COPPER ALLOYS

Product Identification: 101/102/110 COPPER/COPPER ALLOYS
Date of MSDS: 09/01/1989 **Technical Review Date:** 08/18/1993
FSC: 3439 **NIIN: LIIN:** 00F029170
Submitter: F BT
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: ANSONIA COPPER & BRASS INC
Post Office Box: 109
Manufacturer's Address1: 75 LIBERTY ST
Manufacturer's Address2: ANSONIA, CT 06401
Manufacturer's Country: US
General Information Telephone: 203-732-6600/800-521-17038
Emergency Telephone: 203-732-6600/800-521-1703
Emergency Telephone: 203-732-6600/800-521-1703
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 40518
Special Project Code: N

Preparer Information

Preparer's Name: ANSONIA COPPER & BRASS INC
Preparer's Address1: 75 LIBERTY ST
Preparer's Address2: ANSONIA, CT 06401
Preparer's CAGE: 40518
Assigned Individual: N

Contractor Information

Contractor's Name: ANSONIA COPPER & BRASS INC
Contractor's Address1: 75 LIBERTY ST
Contractor's Address2: ANSONIA, CT 06401
Contractor's Telephone: 203-732-6600/800-521-17038
Contractor's CAGE: 40518

Section 2 - Compositon/Information on Ingredients
101/102/110 COPPER/COPPER ALLOYS

Ingredient Name: COPPER (DUST & MIST), BRONZE POWDER
Ingredient CAS Number: 7440-50-8 **Ingredient CAS Code:** M
RTECS Number: GL5325000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100
% Enviromental Weight:

Other REC Limits: 1 MG(CU)/M3 (DUST)
OSHA PEL: 0.1 MG(CU)/M3 (FUME) **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 0.2 MG/M3 (FUME) **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 5000 LBS
DOT Reporting Quantity: 5000 LBS
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
101/102/110 COPPER/COPPER ALLOYS

Health Hazards Acute & Chronic: RESPIRATORY TRACT IRRITATION, METAL FUME FEVER, EYE IRRITATION. LEAD INTOXICATION INCLUDING KIDNEY DISEASE, ANEMIA, NERVOUS DISORDERS, REPRODUCTIVE EFFECTS, BIRTH DEFECTS & KIDNEY CANCER. COPPER FUMES CAUSES METAL FUME FEVER, SKIN/HAIR DISCOLORATION, KERATINIZATION OF HANDS/FEET SOLES, & RESPIRATORY TRACT IRRITATION.

Signs & Symptoms of Overexposure:
METAL FUME FEVER SYMPTOMS INCLUDE: SWEET OR METALLIC TASTE IN MOUTH, DRYNESS & IRRITATION OF THROAT, COUGH, SHORTNESS OF BREATH, CHEST PAIN, NAUSEA, VOMITING, WEAKNESS, FATIGUE, MUSCLE & JOINT PAIN, C HILLS, SWEATING & FEVER. COPPER: METALLIC TASTE IN MOUTH & NAUSEA. SEE SUPP.

Medical Conditions Aggravated by Exposure:
N/K

LD50 LC50 Mixture: N/K

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NONE

Section 4 - First Aid Measures
101/102/110 COPPER/COPPER ALLOYS

First Aid:
EYES: FLUSH W/WATER. SKIN: VACUUM OFF EXCESS DUST. WASH W/SOAP & WATER. INHALATION: REMOVE TO FRESH AIR. METAL FUME FEVER MAY BE TREATED SYMPTOMATICALLY. INGESTION: OBTAIN MEDICAL ATTENTION IF LARGE Q UANTITIES HAVE BEEN INGESTED. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Section 5 - Fire Fighting Measures
101/102/110 COPPER/COPPER ALLOYS

Fire Fighting Procedures:
SOLID MASSIVE FORM ISN'T COMBUSTIBLE. WEAR SELF-CONTAINED BREATHING APPARATUS & PROTECTIVE CLOTHING. WHEN IN DUST FORM USE DRY CHEMICAL/SAND.
Unusual Fire or Explosion Hazard:
FIRE & EXPLOSION HAZARDS ARE MODERATE WHEN MATERIAL IS IN THE FORM OF DUST & EXPOSED TO HEAT, FLAMES, CHEMICAL REACTION OR IN CONTACT W/POWDERFUL OXIDIZERS.
Extinguishing Media:
N/K
Flash Point: Flash Point Text: N/R

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
101/102/110 COPPER/COPPER ALLOYS

Spill Release Procedures:
LARGE QUANTITIES OF DUST: VACUUM/WET SWEEP. LIQUIDS W/SOLID METAL: EVACUATE AREA. ABSORB W/VERMICULATE/DRY SAND/SIMILAR MATERIAL.

Section 7 - Handling and Storage
101/102/110 COPPER/COPPER ALLOYS

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
101/102/110 COPPER/COPPER ALLOYS

Repiratory Protection:
USE NIOSH/OSHA APPROVED RESPIRATORY PROTECTION IF EXPOSURE EXCEEDS THE PEL/TLV LIMITS.
Ventilation:
LOCAL EXHAUST/MECHANICAL (GENERAL): REQUIRED IF DUST/FUME CREATED IN HANDLING OR WORKING ON THIS MATERIAL
Protective Gloves:
REQUIRED FOR MELT/GRIND/CUT/WELD JOBS
Eye Protection: SAFETY GLASSES W/SIDE SHIELDS
Other Protective Equipment: GRINDING OPERATIONS MAY REQUIRED FACE SHIELDS. MELTING/WELDING REQUIRE FACE SHIELDS W/SPECIALTY TINTED GLASS.
Work Hygenic Practices: USE GOOD PERSONAL HYGIENE. WASH HANDS BEFORE

EATING/DRINKING/SMOKING/LEAVING WORK AFTER CONTACT W/METAL DUST OR FUME.
Supplemental Health & Safety Information: UNDER NORMAL CONDITIONS THE SOLID ALLOY PRESENTS NO SIGNIFICANT HEALTH HAZARDS. PROCESSSING OF THE ALLOY BY DUST/FUME PRODUCING OPERATION (GRINDING/BUFFING/HEATING/WELDING) MAY RESULT IN POTENTIAL FOR EXPOSURE TO AIRBORNE METAL PARTICULATES/FUME.

Section 9 - Physical & Chemical Properties
101/102/110 COPPER/COPPER ALLOYS

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/R
Melting/Freezing Point: Melting/Freezing Text: 1500-2260F
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/R **Vapor Density:** N/R
Percent Volatile Organic Content:
Specific Gravity: 7.4-9
Volatile Organic Content Pounds per Gallon:
pH: N/K
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/R
Solubility in Water: INSOLUBLE
Appearance and Odor: SILVER OR YELLOW TO RED SOLID
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
101/102/110 COPPER/COPPER ALLOYS

Stability Indicator: YES
Materials to Avoid:
STRONG ACIDS, BASES & OXIDERS. MAY REACT VIOLENTLY W/WATER. MERCURY, AMMONIA & ACETYLENE.
Stability Condition to Avoid:
HEAT, FLAMES
Hazardous Decomposition Products:
METAL FUME
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/K

Section 11 - Toxicological Information
101/102/110 COPPER/COPPER ALLOYS

Toxicological Information:
N/P

Section 12 - Ecological Information
101/102/110 COPPER/COPPER ALLOYS

Ecological Information:
N/P

Section 13 - Disposal Considerations
101/102/110 COPPER/COPPER ALLOYS

Waste Disposal Methods:
MAXIMIZE PRODUCT RECOVERY FOR REUSE OR RECYCLING. CONDITIONS MAY CAUSE THIS MATERIAL TO BECOME A SOLID HAZARDOUS WASTE. SOLID WASTE LEACHATE TESTING MAY INDICATE THE NEED FOR PROPERLY PERMITTED DISPOS AL IN ACCORDANCE W/FEDERAL, STATE, & LOCAL LAWS.

Section 14 - MSDS Transport Information
101/102/110 COPPER/COPPER ALLOYS

Transport Information:
N/P

Section 15 - Regulatory Information
101/102/110 COPPER/COPPER ALLOYS

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
101/102/110 COPPER/COPPER ALLOYS

Other Information:
N/P

HAZCOM Label Information

Product Identification: 101/102/110 COPPER/COPPER ALLOYS
CAGE: 40518
Assigned Individual: N
Company Name: ANSONIA COPPER & BRASS INC
Company PO Box:
Company Street Address1: 75 LIBERTY ST
Company Street Address2: ANSONIA, CT 06401 US
Health Emergency Telephone: 203-732-6600/800-521-1703
Label Required Indicator: N
Date Label Reviewed: 08/18/1993
Status Code: C
Manufacturer's Label Number: N/R
Date of Label: 08/18/1993
Year Procured: N/K
Organization Code: N
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P

Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
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Cornell University does not in any way warrant or imply the applicability, viability or use of this information to any person or for use in any situation.

Section 1 - Product and Company Identification
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Product Identification: PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD
Date of MSDS: 12/09/1985 **Technical Review Date:** 10/26/1988
FSC: 5910 **NIIN: LIIN:** 00F007527
Submitter: F BT
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: WESCO ELECTRICAL CO
Post Office Box: N/K
Manufacturer's Address1: 201 MUNSON ST
Manufacturer's Address2: GREENVILLE, MA 01301-9605
Manufacturer's Country: NK
General Information Telephone: (413) 774-4358
Emergency Telephone: (413) 774-4358
Emergency Telephone: (413) 774-4358
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 12673
Special Project Code: N

Preparer Information

Preparer's Name: WESCO ELECTRICAL
Preparer's Address1: 201 MUNSON ST
Preparer's Address2: GREENVILLE, MA 01301
Preparer's CAGE: 12673
Assigned Individual: N

Contractor Information

Contractor's Name: WESCO ELECTRICAL
Contractor's Address1: 201 MUNSON ST
Contractor's Address2: GREENVILLE, MA 01301
Contractor's Telephone: (413) 774-4358
Contractor's CAGE: 12673

Section 2 - Compositon/Information on Ingredients
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Ingredient Name: LEAD (SARA III)
Ingredient CAS Number: 7439-92-1 **Ingredient CAS Code:** M
RTECS Number: OF7525000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 99.9%
% Enviromental Weight:

Other REC Limits: N/K
OSHA PEL: 0.05 MG/M3;1910.1025 **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 0.15 MG/M3;DUST 9192 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Health Hazards Acute & Chronic: IRRITATING TO THE RESPIRATORY SYSTEM, SKIN, & EYES, WEAKNESS, VOMITING, LOSS OF APPETITE,UNCOORDINATION, CONVULSIONS, STUPOR, COMA.

Signs & Symptoms of Overexposure:
IF LEFT UNTREATED: WEAKNESS, INSOMINIA, HYERTENSION, IRRITATION TO SKIN & EYE, ANEMIA, METALIC TASTE, CONSTIPATION, HEADACHE, MUSCLE & JOINT PAIN, NEUROMUSCULAR DYSFUNCTION, PARALYSIS, ENCEPHALOPATHY. LEAD & ITS INORGANIC COMPOUNDS ARE NEUROTOXINS WHICH MAY PRODUCE PERIPHERAL NEUOPATHY.

Medical Conditions Aggravated by Exposure:
N/K

LD50 LC50 Mixture: N/K

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** YES

Carcenogenicity Indicators
- **NTP:** NO
- **IARC:** NO
- **OSHA:** NO

Carcinogenicity Explanation: NONE

Section 4 - First Aid Measures
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

First Aid:
EYES: FLUSH WITH COPIOUS QUANTITIES OF WATER. GET MEDICAL ATTENTION. SKIN: WASH THOROUGHLY WITH SOAP & WATER. INHALATION: REMOVE FROM EXPOSURE. GET MEDICAL ATTENTION. INGESTION: GET MEDICAL ATTENTION.

Section 5 - Fire Fighting Measures
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Fire Fighting Procedures:
WEAR SELF-CONTAINED BREATHING APPARATUS (SCBA) AND FULL PROTECTIVE CLOTHING.
Unusual Fire or Explosion Hazard:
MOLTEN METALS PRODUCE FUME, VAPOR & DUST THAT MAY BE TOXIC & RESPIRATORY IRRITANTS.
Extinguishing Media:
DRY CHEMICAL, CO2. DON'T USE WATER ON FIRES WHERE MOLTEN METAL IS PRESENT.
Flash Point: Flash Point Text: N/R

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Spill Release Procedures:
DUST MATERIAL SHOULD BE VACUUMED, OR WET SWEPT WHERE VACUUMING ISN'T FEASIBLE. PARTICULATE MATTER SHOULD BE STORED IN DRY CONTAINERS FOR LATER DISPOSAL. DON'T USE COMPRESSED AIR OR DRY SWEEPING AS A M EANS OF CLEANING.

Section 7 - Handling and Storage
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Repiratory Protection:
N/K
Ventilation:
PROVIDE LOCAL EXHAUST VENTILATION TO KEEP **Protective Gloves:**
SHOULD BE WORN
Eye Protection: FACE SHIELD, GOGGLES
Other Protective Equipment: COVERALLS, FULL BODY CLOTHING. HAT, SAFETY BOOTS, & SHOES SHOULD BE PROTECTED FROM CONTAMINATION WITH THIS PRODUCT.
Work Hygenic Practices: ALWAYS EXERCISE NORMAL, GOOD PERSONAL HYGIENE PRIOR TO SMOKING OR EATING.
Supplemental Health & Safety Information: N/P

Section 9 - Physical & Chemical Properties
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: 3164F
Melting/Freezing Point: Melting/Freezing Text: 621F
Decomposition Point: Decomposition Text: N/R
Vapor Pressure: N/R **Vapor Density:** N/R
Percent Volatile Organic Content:
Specific Gravity: 11.3
Volatile Organic Content Pounds per Gallon:
pH: N/R
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/R
Solubility in Water: NEGLIGIBLE
Appearance and Odor: SILVER-GRAY METAL, TARNISHES; NO APPARENT ODOR.
Percent Volatiles by Volume: N/R
Corrosion Rate: N/R

Section 10 - Stability & Reactivity Data
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Stability Indicator: YES
Materials to Avoid:
CAN REACT VIGOROUSLY WITH STRONG OXIDIZING AGENTS & THIS PRODUCT MAY LIBERATE HYDROGEN GAS.
Stability Condition to Avoid:
N/R
Hazardous Decomposition Products:
HIGH TEMPERATURESS MAY PRODUCE HEAVY METAL FUME, VAPOR & DUST.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/R

Section 11 - Toxicological Information
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Toxicological Information:
N/P

Section 12 - Ecological Information
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Ecological Information:
N/P

Section 13 - Disposal Considerations
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Waste Disposal Methods:
DISPOSE OF TOXIC SUBSTANCES & HAZARDOUS WASTES IN ACCORDANCE WITH LOCAL, STATE & FEDERAL REGULATIONS.

Section 14 - MSDS Transport Information
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Transport Information:
N/P

Section 15 - Regulatory Information
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD

Other Information:
N/P

HAZCOM Label Information

Product Identification: PURE LEAD PIG LEAD, PURE LEAD BLOCK LEAD
CAGE: 12673
Assigned Individual: N
Company Name: WESCO ELECTRICAL
Company PO Box:
Company Street Address1: 201 MUNSON ST
Company Street Address2: GREENVILLE, MA 01301 NK
Health Emergency Telephone: (413) 774-4358
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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BELMONT METALS INC -- NICKEL -- 9650-00N093372

========== Product Identification ==========

Product ID:NICKEL
MSDS Date:02/01/1995
FSC:9650
NIIN:00N093372
Status Code:A
MSDS Number: CJXVZ
=== Responsible Party ===
Company Name:BELMONT METALS INC
Address:330 BELMONT AVE
City:BROOKLYN
State:NY
ZIP:11207
Info Phone Num:718-342-4900
Emergency Phone Num:718-342-4900
Resp. Party Other MSDS Num.:9002
CAGE:70774
=== Contractor Identification ===
Company Name:BELMONT METALS INC
Address:330 BELMONT AVE
Box:City:BROOKLYN
State:NY
ZIP:11207
Phone:718-342-4900
Contract Num:N00406-99-P-F82
CAGE:70774

========== Composition/Information on Ingredients ==========

Ingred Name:NICKEL
CAS:7440-02-0
RTECS #:QR5950000
> Wt:99.9
OSHA PEL:1 MG/M3
ACGIH TLV:1 MG/M3

========== Hazards Identification ==========

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:NO
Health Hazards Acute and Chronic:INHALATION: SEE BELOW. INGESTION: MAY CAUSE IRRITATION OF STOMACH LINING. EYE: MAY CAUSE IRRITTION OF THE EYES. SKIN CONTACT/ABSORPTION: MAY CAUSE SKIN IRRITATION. SIGNS AND SYMPTOMS ASSOCIATED WITH E XPOSURE OVER TLV: NO ACUTE RESPIRATORY REACTION OR CONCLUSIVE CHRONIC EFFECTS FROM EXPOSURE TO NICKEL METAL HAVE BEEN OBSERVED BY PROPER INDUSTRIAL HYGIENE MAINTENANCE WORKING ATMOSPHERE AT CONCENTRAT IONS BELOW THE RECOMMENDED TLV. OVER HEATING OF ALLOY CAN PRODUCE METAL FUMES AND OXIDES. MACHINING OPERATIONS SUCH AS GRINDING, SAWING, BUFFING CAN GENERATE AIRBORNE PARTICULATE IN THE WORK AREA. THE EXPOSURE LEVELS (EFTS OF OVEREXP)
Explanation of Carcinogenicity:NICKEL: IARC MONOGRAPHS ON THE EVALUATION OF CARCINOGENIC RISK OF CHEMICALS TO MAN. VOLUME 49, PAGE 257, YEAR 1990: GROUP 2B. NTP 8TH ANNUAL REPORT ON CARCINOGENS, 1998: REASONABLY ANTICIAPATED TO BE HUMAN CARCINOGEN.
Effects of Overexposure:HLTH HAZ: INDICATED IN SECTION II ARE RELEVANT

TO THESE & OTHER OPERATIONS. CEILING LIMITS(C): ELEMENTS W/CEILING LIMITS(C) ARE AS FLOLLOWS: NONE: FOLLOWING ARE SYMPTOMS OF OVER EXPOSURE TO VARIOUS I NGREDIENTS: NICKEL: MOST COMMON AILMENT ARISING FROM CONTACT W/NICKEL/ITS COMPOUNDS IS ALLERGIC DERMATITIS KNOWN AS "NICKEL ITCH" WHICH USUALLY OCCURS WHEN SKIN IS MOIST. GENERALLY NICKEL & MOST SALTS OF NICKEL DO NOT CAUSE SYSTEMIC POISONING. IARC HAS DETERMINED THAT THERE IS AT LEAST LIMITED EVIDENCE THAT NICKEL AND CERTAIN NICKEL COMPOUNDS MAY BE HUMAN CARCINOGENS. (SUPDAT)

Medical Cond Aggravated by Exposure:NOT APPLICABLE.

First Aid Measures

First Aid:INHALATION: REMOVE TO FRESH AIR. CONSULT A PHYSICIAN. INGESTION: INDUCE VOMITING IF PATIENT IS CONSCIOUS. CONSULT A PHYSICIAN. EYE CONTACT: FLUSH WITH COPIOUS QUANTITIES OF WATER FOR AT LEAST 15 MINUT ES. SKIN CONTACT: WASH WELL WITH SOAP AND WATER. SKIN ABSORPTION: NOT APPLICABLE.

Fire Fighting Measures

Lower Limits:N.A.
Upper Limits:N.A.
Extinguishing Media:CO*2, SAND, DRY CHEMICAK. DO NOT USE WATER.
Fire Fighting Procedures:USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT .
Unusual Fire/Explosion Hazard:DO NOT USE WATER MOLTEN METAL WILL EXPLODE ON CONTACT WITH WATER.

Accidental Release Measures

Spill Release Procedures:ANY NORMAL CLEAN UP PROCEDURE IS APPLICABLE.

Handling and Storage

Handling and Storage Precautions:THIS PRODUCT MUST BE HANDLED ACCORDING TO THE SIZE, SHAPE AND QUANTITY OF MATERIAL INVOLVED. SOLID METAL MAY REQUIRE USE OF HOISTS CRANES ETC. POWDERS SHOULD BE MOVED OR TRANSPORTED TO MINIMIZE SPILL OR RELEASE POTENTIAL. IN SOLID FORM THIS MATERIAL POSES NO SPECIAL STORAGE PROBLEMS.
Other Precautions:DO NOT STORE ADJACENT TO MINERAL ACIDS. FINE METAL POWDER SHOULD BE KEPT AWAY FROM FLAMES AND SOURCES OF IGNITION.

Exposure Controls/Personal Protection

Respiratory Protection:NIOSH APPROVED RESPIRATOR FOR DUSTS AND FUMES.
Ventilation:PROVIDE GENERAL AND/OR LOCAL VENTILATION IF NECESSARY TO MAINTAIN CONCENTRATIONS BELOW TLV'S.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:ANSI APPROVED CHEMICAL WORKERS GOGGLES .
Other Protective Equipment:ANSI APPROVED EYE WASH AND DELUGE SHOWER . PROTECTIVE CLOTHING ADVISABLE DURING MELTING AND PURING.
Supplemental Safety and Health
EFTS OF OVEREXP: SEVERAL NICKEL COMPOUNDS ARE CARCINOGENIC TO LABORATORY ANIMALS BY VARIOUS ROUTES OF ENTRY.

Physical/Chemical Properties

Boiling Pt:=2732.2C, 4950.F
Decomp Temp:=1451.7C, 2645.F

Vapor Pres:N.A.
Vapor Density:N.A.
Spec Gravity:8.90
Evaporation Rate & Reference:N.A.
Solubility in Water:NEGLIGIBLE
Appearance and Odor:SILVERY GRAY METAL; NO ODOR.
Percent Volatiles by Volume:N.A.

Stability and Reactivity Data

Stability Indicator/Materials to Avoid:YES
REACTS WITH MINERAL ACIDS TO LIBERATE HYDROGEN.
Stability Condition to Avoid:STORAGE NEAR MINERAL ACIDS.
Hazardous Decomposition Products:EVOLVED HYDROGEN MAY BECOME AN EXPLOSION HAZARD.

Disposal Considerations

Waste Disposal Methods:DISPOSE OF IN ACCORDANCE WITH STATE, FEDERAL AND LOCAL REGULATIONS.

MSDS Transport Information

Transport Information:DOT REGULATED: NO. DOT PROPER SHIPPING NAME: NOT APPLICABLE. DOT HAZARD CLASS: NOT APLICABLE. DOT NUMBER: NOT APPLICABLE.

Regulatory Information

SARA Title III Information:NICKEL IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF TITLE III OF THE SUPERFUND AMENDMENT AND REAUTHORIZATION ACT OF 1986 IN 40 CFR PART 372.
Federal Regulatory Information:RCRA REGULATED: NO. RCRA NUMBER: NOT APPLICABLE. CERCLA (SUPERFUND) REPORTABLE QUANTITY: NOT APPLICABLE.

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E I DU PONT DE NEMOURS & CO INC -- ZINC METAL -- 9650-00N056501

========== Product Identification ==========

Product ID:ZINC METAL
MSDS Date:12/31/1985
FSC:9650
NIIN:00N056501
MSDS Number: BWGBT
=== Responsible Party ===
Company Name:E I DU PONT DE NEMOURS & CO INC
Address:1007 MARKET ST
City:WILMINGTON
State:DE
ZIP:19898
Country:US
Info Phone Num:800-962-9919
Emergency Phone Num:800-424-9300 (CHEMTREC)
CAGE:B0589
=== Contractor Identification ===
Company Name:E I DU PONT DE NEMOURS & CO
Address:RAKETSTRAAT, 100, RUE DE LA FUSEE
City:BRUSSEL
Country:BE
Phone:32-(0)15-401.505
CAGE:B0589
Company Name:E.I. DUPONT DE NEMOURS & CO
Address:1007 MARKET STREET
Box:City:WILMINGTON
State:DE
ZIP:19898
Country:US
Phone:800-441-7515;800-441-9442
CAGE:18873

========== Composition/Information on Ingredients ==========

Ingred Name:ZINC (SARA III)
CAS:7440-66-6
RTECS #:ZG8600000
OSHA PEL:10 MG/M3
ACGIH TLV:10 MG/M3
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

========== Hazards Identification ==========

LD50 LC50 Mixture:LD50 (MICE)=15 MG/KG (INTERPERITONEAL)
Routes of Entry: Inhalation:NO Skin:NO Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:TOXIC IF INGESTED.
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:SEE HEALTH HAZARDS.
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:INGEST: CALL MD IMMEDIATELY . INHAL: REMOVE TO FRESH AIR.
SUPPORT BREATHING (GIVE OXYGEN/ARTIFICIAL RESPIRATION) . EYES:

IMMEDIATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINUTES, SEEK ASSISTANCE FROM MD . SKIN: FLUSHW/COPIOUS AMOUNTS OF WATER. CALL MD .

Fire Fighting Measures

Extinguishing Media:DRY CHEMICAL.
Fire Fighting Procedures:USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT . NO SPECIAL PROCEDURES.
Unusual Fire/Explosion Hazard:EXPLOSIVE IF HIGH LEVELS OF DUST EXPOSED TO FIRE.

Accidental Release Measures

Spill Release Procedures:NO SPECIAL PROCEDURES.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

Handling and Storage

Handling and Storage Precautions:NO SPECIAL PROCEDURES.
Other Precautions:NONE SPECIFIED BY MANUFACTURER.

Exposure Controls/Personal Protection

Respiratory Protection:NONE. USE NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN .
Ventilation:LOCAL EXHAUST.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:ANSI APPROVED SAFETY GLASSES .
Other Protective Equipment:NONE SPECIFIED BY MANUFACTURER.
Work Hygienic Practices:NONE SPECIFIED BY MANUFACTURER.
Supplemental Safety and Health
NONE SPECIFIED BY MANUFACTURER.

Physical/Chemical Properties

Boiling Pt:B.P. Text:1665F,907C
Melt/Freeze Pt:M.P/F.P Text:788F,420C
Vapor Pres:1 @ 487C
Spec Gravity:7.13
Evaporation Rate & Reference:0
Solubility in Water:INSOLUBLE
Appearance and Odor:BLUISH-WHITE METAL.
Percent Volatiles by Volume:0

Stability and Reactivity Data

Stability Indicator/Materials to Avoid:YES
NONE.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:NONE.

Disposal Considerations

Waste Disposal Methods:SEPARATE FROM ACIDIC SOLUTIONS. DISPOSE OF BY MEANS AS TO COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS OR CONTACT AN APPROVED AND LICENSED DISPOSAL AGENCY.

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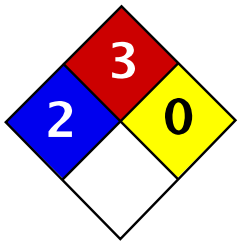

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

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
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC.
MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE].
The substance is toxic to blood, bone marrow, central nervous system (CNS).
The substance may be toxic to liver, Urinary System.
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. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

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

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 unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat.
Slightly flammable to flammable in presence of oxidizing materials.
Non-flammable in presence of shocks.

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.
Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire.
Reacts on contact with iodine heptafluoride gas.

Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition.
Contact with sodium peroxide with benzene causes ignition.
Benzene ignites in contact with powdered chromic anhydride.
Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion.
Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate.
Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion.
Interaction of nitryl perchlorate with benzene gave a slight explosion and flash.
The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene.
Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion.
Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. 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:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

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

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor 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: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States]
TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States]
TWA: 0.1 STEL: 1 from NIOSH
TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States]
TWA: 10 (ppm) from OSHA (PEL) [United States]
TWA: 3 (ppm) [United Kingdom (UK)]
TWA: 1.6 (mg/m3) [United Kingdom (UK)]
TWA: 1 (ppm) [Canada]
TWA: 3.2 (mg/m3) [Canada]
TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant.
(Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

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

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone.
Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion.
Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate.
Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion.
Interaction of nitryl perchlorate with benzene gave a slight explosion and flash.
The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene.
Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion.
Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 930 mg/kg [Rat].
Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC.
MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.
DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE].
Causes damage to the following organs: blood, bone marrow, central nervous system (CNS).
May cause damage to the following organs: liver, Urinary System.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects.
May affect genetic material (mutagenic).
May cause cancer (tumorigenic, leukemia))
Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system.
Eyes: Causes eye irritation.
Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and

other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system.
Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

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 less toxic than the product itself.

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: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene
California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value)
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene
Connecticut carcinogen reporting list.: Benzene
Connecticut hazardous material survey.: Benzene
Illinois toxic substances disclosure to employee act: Benzene
Illinois chemical safety act: Benzene
New York release reporting list: Benzene
Rhode Island RTK hazardous substances: Benzene
Pennsylvania RTK: Benzene
Minnesota: Benzene
Michigan critical material: Benzene
Massachusetts RTK: Benzene
Massachusetts spill list: Benzene
New Jersey: Benzene
New Jersey spill list: Benzene
Louisiana spill reporting: Benzene
California Director's list of Hazardous Substances: Benzene

TSCA 8(b) inventory: Benzene
SARA 313 toxic chemical notification and release reporting: Benzene
CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

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):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable.
R22- Harmful if swallowed.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R45- May cause cancer.
R62- Possible risk of impaired fertility.
S2- Keep out of the reach of children.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S39- Wear eye/face protection.
S46- If swallowed, seek medical advice immediately and show this container or label.
S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor 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: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:35 PM

Last Updated: 11/06/2008 12:00 PM

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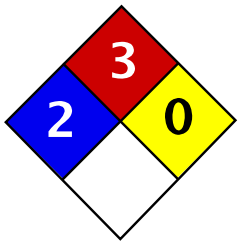

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

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
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, kidneys, the nervous system, liver, 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.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat.
Non-flammable in presence of shocks.

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 liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide;

concentrated nitric acid, sulfuric acid + nitric acid; N_2O_4; $AgClO_4$; BrF_3; Uranium hexafluoride; sulfur dichloride.
Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. 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:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. 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. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

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

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor 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: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States]
TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN
TWA: 100 STEL: 150 from NIOSH [United States]
TWA: 375 STEL: 560 (mg/m3) from NIOSH [United States]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

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

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Soluble in diethyl ether, acetone.
Practically insoluble in cold water.
Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide.
Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride.
Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C.
Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 636 mg/kg [Rat].
Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.
May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose:
LDL [Human] - Route: Oral; Dose: 50 mg/kg
LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin.
Eyes: Cauess mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abraisons. This usually resolves in 2 days.
Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite.
Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation.
Chronic Potential Health Effects:
Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophostatemia), severe, muscle weakness and Rhabdomyolysis.
Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

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 less toxic than the product itself.

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: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene
California prop. 65 (no significant risk level): Toluene: 7 mg/day (value)
California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value)
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene
Connecticut hazardous material survey.: Toluene
Illinois toxic substances disclosure to employee act: Toluene
Illinois chemical safety act: Toluene
New York release reporting list: Toluene
Rhode Island RTK hazardous substances: Toluene
Pennsylvania RTK: Toluene
Florida: Toluene
Minnesota: Toluene
Michigan critical material: Toluene
Massachusetts RTK: Toluene
Massachusetts spill list: Toluene
New Jersey: Toluene
New Jersey spill list: Toluene
Louisiana spill reporting: Toluene
California Director's List of Hazardous Substances.: Toluene
TSCA 8(b) inventory: Toluene
TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92
SARA 313 toxic chemical notification and release reporting: Toluene
CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

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):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable.
R20- Harmful by inhalation.
S16- Keep away from sources of ignition - No smoking.
S25- Avoid contact with eyes.
S29- Do not empty into drains.
S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor 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: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:30 PM

Last Updated: 11/06/2008 12:00 PM

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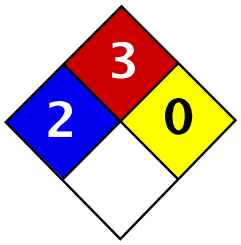

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

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
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, kidneys, the nervous system, liver, 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.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat.
Non-flammable in presence of shocks.

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 liquid, insoluble in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide;

concentrated nitric acid, sulfuric acid + nitric acid; N_2O_4; $AgClO_4$; BrF_3; Uranium hexafluoride; sulfur dichloride.
Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. 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:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. 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. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

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

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor 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: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States]
TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN
TWA: 100 STEL: 150 from NIOSH [United States]
TWA: 375 STEL: 560 (mg/m3) from NIOSH [United States]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

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

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Soluble in diethyl ether, acetone.
Practically insoluble in cold water.
Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide.
Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride.
Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C.
Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 636 mg/kg [Rat].
Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.
May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose:
LDL [Human] - Route: Oral; Dose: 50 mg/kg
LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin.
Eyes: Cauess mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abraisons. This usually resolves in 2 days.
Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite.
Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation.
Chronic Potential Health Effects:
Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophostatemia), severe, muscle weakness and Rhabdomyolysis.
Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

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 less toxic than the product itself.

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: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene
California prop. 65 (no significant risk level): Toluene: 7 mg/day (value)
California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value)
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene
Connecticut hazardous material survey.: Toluene
Illinois toxic substances disclosure to employee act: Toluene
Illinois chemical safety act: Toluene
New York release reporting list: Toluene
Rhode Island RTK hazardous substances: Toluene
Pennsylvania RTK: Toluene
Florida: Toluene
Minnesota: Toluene
Michigan critical material: Toluene
Massachusetts RTK: Toluene
Massachusetts spill list: Toluene
New Jersey: Toluene
New Jersey spill list: Toluene
Louisiana spill reporting: Toluene
California Director's List of Hazardous Substances.: Toluene
TSCA 8(b) inventory: Toluene
TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92
SARA 313 toxic chemical notification and release reporting: Toluene
CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

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):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable.
R20- Harmful by inhalation.
S16- Keep away from sources of ignition - No smoking.
S25- Avoid contact with eyes.
S29- Do not empty into drains.
S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor 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: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:30 PM

Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet

MSDS ID NO.: 0127MAR019
Revision date: 12/07/2010

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product name: Marathon Regular Unleaded Gasoline
Synonym: Conventional Regular Unleaded Gasoline
Chemical Family: Petroleum Hydrocarbon
Formula: Mixture

Manufacturer:
Marathon Petroleum Company LP
539 South Main Street
Findlay OH 45840

Other information: 419-421-3070
Emergency telephone number: 877-627-5463

2. COMPOSITION/INFORMATION ON INGREDIENTS

Gasoline is a complex combination of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons having carbon numbers predominantly greater than C3 and boiling in the range of 85-500 F. Can contain small amounts of dye and other additives (>0.02%) which are not considered hazardous at the concentrations used.

Product information:

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Marathon Regular Unleaded Gasoline	86290-81-5	100	300 ppm TWA 500 ppm STEL		

Component Information:

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Saturated Hydrocarbons	Mixture	55-85			

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Aromatic Hydrocarbons	Mixture	10-40			
Unsaturated Hydrocarbons	Mixture	1-15			
Toluene	108-88-3	1-15	20 ppm TWA	= 100 ppm TWA = 375 mg/m^3 TWA = 150 ppm STEL = 560 mg/m^3 STEL	
Xylene	1330-20-7	2-10	100 ppm TWA 150 ppm STEL	= 100 ppm TWA = 435 mg/m^3 TWA = 150 ppm STEL = 655 mg/m^3 STEL	
1,2,4-Trimethylbenzene	95-63-6	1-5	= 25 ppm TWA	= 125 mg/m^3 TWA = 25 ppm TWA	
Benzene	71-43-2	0.5-3.5	Skin - potential significant contribution to overall exposure by the cutaneous route 0.5 ppm TWA 2.5 ppm STEL	= 25 ppm Ceiling = 10 ppm TWA = 50 ppm STEL	OSHA Exposure Limit as specified in 1910.1028: =1.0 ppm TWA = 5 ppm STEL = 0.5 ppm Action Level
Hexane	110-54-3	0-3	Skin - potential significant contribution to overall exposure by the cutaneous route 50 ppm TWA	= 180 mg/m^3 TWA = 50 ppm TWA	
Ethyl Benzene	100-41-4	0.5-2.0	100 ppm TWA 125 ppm STEL	= 100 ppm TWA = 435 mg/m^3 TWA = 125 ppm STEL = 545 mg/m^3 STEL	
Naphthalene	91-20-3	0.1-0.5	Skin - potential significant contribution to overall exposure by the cutaneous route 10 ppm TWA 15 ppm STEL	= 10 ppm TWA = 50 mg/m^3 TWA = 15 ppm STEL = 75 mg/m^3 STEL	

Notes: The manufacturer has voluntarily elected to reflect exposure limits contained in OSHA's 1989 air contaminants standard in its MSDS's, even though certain of those exposure limits were vacated in 1992.

EMERGENCY OVERVIEW

DANGER!

FUMES MAY CAUSE EYE AND RESPIRATORY IRRITATION.
MAY BE HARMFUL OR FATAL IF SWALLOWED
MAY CAUSE LUNG DAMAGE
OVEREXPOSURE MAY CAUSE CNS DEPRESSION
BREATHING HIGH CONCENTRATIONS CAN CAUSE IRREGULAR HEARTBEATS WHICH MAY BE FATAL

DANGER - CONTAINS BENZENE - MAY CAUSE CANCER
CAN CAUSE LEUKEMIA AND OTHER BLOOD DISORDERS.
POTENTIAL REPRODUCTIVE HAZARD
SEE TOXICOLOGICAL INFORMATION SECTION FOR MORE INFORMATION

EXTREMELY FLAMMABLE LIQUID AND VAPOR
VAPOR MAY CAUSE FLASH FIRE OR EXPLOSION
MATERIAL MAY ACCUMULATE STATIC CHARGE

STABLE

Inhalation:

Breathing high concentrations may be harmful.
May cause central nervous system depression or effects. Symptoms may include headache, excitation, euphoria, dizziness, incoordination, drowsiness, light-headedness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death, depending on the concentration and duration of exposure.
Breathing high concentrations of this material, for example, in a confined space or by intentional abuse, can cause irregular heartbeats which can cause death. See Toxicological Effects (Section 11) for more information.

Ingestion:

Swallowing this material may be harmful.
May cause irritation of the mouth, throat and gastrointestinal tract.
May cause central nervous system depression or effects. Symptoms may include salivation, pain, nausea, vomiting and diarrhea. Exposure may also cause central nervous system symptoms similar to those listed under "Inhalation" (see Inhalation section).

Skin contact:

Contact may cause reddening, itching and inflammation.
Skin contact may cause harmful effects in other parts of the body.

Eye contact:

Contact may cause pain and severe reddening and inflammation of the conjunctiva.
Effects may become more serious with repeated or prolonged contact.

Carcinogenic Evaluation:

Product information:

Name	IARC Carcinogens:	NTP Carcinogens:	ACGIH - Carcinogens:	OSHA - Select Carcinogens:
Marathon Regular Unleaded Gasoline 86290-81-5	A2 - Possible Human Carcinogen		A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans	

Notes:

The International Agency for Research on Cancer (IARC) has determined that there is inadequate evidence for the carcinogenicity of gasoline in humans. IARC determined that limited evidence of carcinogenicity in animals exists. IARC`s overall evaluation of gasoline, in spite of limited carcinogenicity evidence, has resulted in the IARC designation of gasoline as possibly carcinogenic to humans (Group 2B) because gasoline contains benzene.

IARC has determined that there is inadequate evidence for the carcinogenicity of gasoline engine exhaust in humans or animals. However, IARC`s overall evaluation on gasoline engine exhaust, in spite of the absence of carcinogenicity data, has resulted in the IARC designation of gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) because of the presence of certain engine exhaust components.

Component Information:

Name	IARC Carcinogens:	NTP Carcinogens:	ACGIH - Carcinogens:	OSHA - Select Carcinogens:
Toluene 108-88-3		male rat-no evidence; female rat-no evidence; male mice-no evidence; female mice-no evidence	A4 - Not Classifiable as a Human Carcinogen	
Xylene 1330-20-7		male rat-no evidence; female rat-no evidence; male mice-no evidence; female mice-no evidence	A4 - Not Classifiable as a Human Carcinogen	
Benzene 71-43-2	Supplement 7 [1987], Monograph 29 [1982]	Known Human Carcinogen male rat-clear evidence; female rat-clear evidence; male mice-clear evidence; female mice-clear evidence	A1 - Confirmed Human Carcinogen	Present
Ethyl Benzene 100-41-4	Monograph 77 [2000]	male rat-clear evidence; female rat-some evidence; male mice-some evidence; female mice-some evidence	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans	Present
Naphthalene 91-20-3	Monograph 82 [2002]	Reasonably Anticipated To Be A Human Carcinogen male rat-clear evidence; female rat-clear evidence; male mice-no evidence; female mice-some evidence	A4 - Not Classifiable as a Human Carcinogen	Present

Notes:

The International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), and OSHA have determined that there is sufficient evidence for the carcinogenicity of benzene in humans (Group 1A).

The International Agency for Reasearch on Cancer (IARC) has determined that there is sufficient evidence for the carcinogenicity of alcoholic beverages (ethanol) in humans (Group 1).

The International Agency for Research on Cancer (IARC) has concluded that ethyl benzene is possibly carcinogenic to humans (Group 2B).

The International Agency for Research on Cancer (IARC) and the Environmental Protection Agency (EPA) have determined that naphthalene is a possible human carcinogen.

4. FIRST AID MEASURES

Eye Contact:

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. GET IMMEDIATE MEDICAL ATTENTION.

Skin Contact:

Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. Get medical attention if irritation persists.
Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties.

Ingestion:

Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty.
Never give anything by mouth to an unconscious person. Keep affected person warm and at rest.
GET IMMEDIATE MEDICAL ATTENTION.

Inhalation:

Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest.
GET IMMEDIATE MEDICAL ATTENTION.

NOTES TO PHYSICIAN:

INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: If ingested this material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

Medical Conditions Aggravated By Exposure:

blood (anemia), bone marrow,
blood-forming organs, skin, respiratory system, lungs, liver, kidney,

5. FIRE FIGHTING MEASURES

Suitable extinguishing media:

For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Fire fighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

5. FIRE FIGHTING MEASURES

Specific hazards: This product has been determined to be a flammable liquid per the OSHA Hazard Communication Standard, and should be handled accordingly. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the North American Emergency Response Guide 128.

Special protective equipment for firefighters: Avoid using straight water streams. Water may be ineffective in extinguishing low flash point fires, but can be used to cool exposed surfaces. Avoid excessive water spray application. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Keep run-off water out of sewers and water sources.

Flash point: -50 F
Autoignition temperature: CA 495 F
Flammable limits in air - lower (%): 1.4
Flammable limits in air - upper (%): 7.6

NFPA rating:
Health: 1
Flammability: 3
Instability: 0
Other: -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate. Contain liquid with sand or soil. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids.

7. HANDLING AND STORAGE

Handling:

Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements. Use appropriate grounding and bonding practices. Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Do not cut, drill, grind or weld on empty containers since they may contain explosive residues. Avoid skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

For use as a motor fuel only. Product should never be used as a solvent due to its flammable and potentially toxic properties. Siphoning by mouth can result in lung aspiration which can be harmful or fatal.

Portable containers of 12 gallons (45 liters) or less should never be filled while they are in or on a motor vehicle or marine craft. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. Containers should be placed on the ground. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers. A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling. Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

Engineering measures:	Local or general exhaust required in an enclosed area or when there is inadequate ventilation.
Respiratory protection:	Approved organic vapor chemical cartridge or supplied air respirators should be worn for exposures to any components exceeding the TWA or STEL. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 1910.134. Self-contained breathing apparatus should be used for fire fighting.
Skin and body protection:	Use nitrile rubber, viton or PVA gloves for repeated or prolonged skin exposure.
Eye protection:	No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields.
Hygiene measures:	No special protective clothing is normally required. Select protective clothing depending on industrial operations. Use mechanical ventilation equipment that is explosion-proof.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Appearance:	Clear Or Colored Liquid
Physical state (Solid/Liquid/Gas):	Liquid
Substance type (Pure/Mixture):	Mixture
Color:	Clear or Colored
Odor:	Strong Hydrocarbon
Molecular weight:	100
pH:	Neutral
Boiling point/range (5-95%):	90-437 F
Melting point/range:	Not determined.
Decomposition temperature:	Not applicable.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Specific gravity:	0.70-0.77
Density:	5.9-6.3 lbs/gal
Bulk density:	No data available.
Vapor density:	3-4
Vapor pressure:	Not determined.
Evaporation rate:	No data available.
Solubility:	Negligible
Solubility in other solvents:	No data available.
Partition coefficient (n-octanol/water):	2.13-4.5
VOC content(%):	100%
Viscosity:	No data available.

10. STABILITY AND REACTIVITY

Stability: The material is stable at 70 F, 760 mm pressure.

Polymerization: Will not occur.

Hazardous decomposition products: Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.

Materials to avoid: Strong oxidizers such as nitrates, chlorates, peroxides.

Conditions to avoid: Excessive heat, sources of ignition, open flame.

11. TOXICOLOGICAL INFORMATION

Acute toxicity:

Product information:

Name	CAS Number	Inhalation:	Dermal:	Oral:
Marathon Regular Unleaded Gasoline	86290-81-5	>10,000 ppm [Dog]	>5 ml/kg [Rabbit]	>14 ml/kg [Rat]

Toxicology Information:

BENZENE: Studies of Workers Overexposed to Benzene: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer and other diseases of the blood forming organs including Acute Myelogenous Leukemia (AML), and Aplastic Anemia (AA), an often fatal disease. Some studies suggest overexposure to benzene may also be associated with Myelodysplastic Syndrome (MDS). Findings from a Case-Control study of workers exposed to benzene was reported during the 2009 Benzene Symposium in Munich included an increase in Acute Myeloid Leukemias and Non-Hodgkins Lymphoid Neoplasms (NHLN) of the subtype follicular lymphoma (FL) in some occupational categories. 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 AA have been reported in the offspring of persons severely overexposed to benzene. 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 minor skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC.
The current proposed IARC classification for benzene is summarized as follows: Sufficient evidence for Acute Myeloid Leukemia; limited evidence for Acute Lymphatic Leukemia, Chronic Lymphatic Leukemia, Non-Hodgkin Lymphoma, and Multiple Myeloma.

NAPHTHAS: In a large epidemiological study on over 15,000 employees at several petroleum refineries and amongst residents located near these refineries, no increased risk of kidney cancer was observed in association with gasoline exposures (a similar material). In a similar study, no increased risk of kidney cancer was observed among petroleum refinery workers, but there was a slight trend in the incidence of kidney cancers among service station employees, especially after a 30-year latency period.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse 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. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm 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 longterm 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 have been 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. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

ETHYLBENZENE: 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). The incidence of tumors was also 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 have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

XYLENES, ALL ISOMERS: 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 overexposure. 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. The relevance of these observations to humans is not clear at this time. 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.

C9 AROMATIC HYDROCARBONS: A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure 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 been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. 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. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

N-HEXANE: Long-term or repeated exposure to n-hexane can cause 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. Testicular atrophy and partial to full loss of the germ cell line were observed in sub-chronic high-dose inhalation studies of laboratory rodents. These effects appeared irreversible. Rodent reproduction studies have shown evidence of reduced fetal weight but no frank malformations.

PENTANES: 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.

CARBON MONOXIDE: is a chemical asphyxiant with no warning properties (such as odor). At 400-500 ppm for 1 hour headache and dyspnea may occur. If activity is increased, symptoms of overexposure may include nausea, irritability, increased respiration, tinnitus, sweating, chest pain, confusion, impaired judgement, dizziness, weakness, drowsiness, ataxia, irregular heart beat, cyanosis and pallor. Levels in excess of 1000 ppm can result in collapse, loss of conciousness, respiratory failure and death. Extremely high concentrations (12,800 ppm) can cause immediate unconsciousness and death in 1-3 minutes. Repeated anoxia can lead to central nervous system damage and peripheral neuropathy, with loss of sensation in the fingers, amnesia, and mental deterioration and possible congestive heart failure. Damage may also occur to the fetus, lung, liver, kidney, spleen, cardiovascular system and other organs.

COMBUSTION ENGINE EXHAUST: Chronic inhalation studies of gasoline engine exhaust in mice, rats and hamsters did not produce any carcinogenic effects. Condensates/extracts of gasoline engine exhaust produced an increase in tumors compared to controls when testing by skin painting, subcutaneous injection, intratracheal instillation or implantation into the lungs.

Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffers Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

TARGET ORGANS:

central nervous system, brain, peripheral nervous system, auditory system, respiratory system, mucous membranes, lungs, skin, eyes, heart, blood blood-forming organs, bone marrow, reproductive organs, testes, immune system, lymphatics, thymus, thyroid, pituitary gland,

12. ECOTOXICOLOGICAL INFORMATION

Mobility:

May partition into air, soil and water.

Ecotoxicity:

Toxic to aquatic organisms.

Bioaccummulation:

Not expected to bioaccumulate in aquatic organisms.

Persistance/Biodegradation:

Readily biodegradable in the environment.

13. DISPOSAL CONSIDERATIONS

Cleanup Considerations:

This product as produced is not specifically listed as an EPA RCRA hazardous waste according to federal regulations (40 CFR 261). However, when discarded or disposed of, it may meet the criteria of an "characteristic" hazardous waste. This product could also contain benzene at >0.5 ppm and could exhibit the characteristics of "toxicity" as determined by the toxicity characteristic leaching procedure (TCLP). This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to determine if disposal material is hazardous according to federal, state and local regulations.

14. TRANSPORT INFORMATION

49 CFR 172.101:

DOT:

Transport Information: This material when transported via US commerce would be regulated by DOT Regulations.

Proper shipping name:	Gasoline
UN/Identification No:	UN 1203
Hazard Class:	3
Packing group:	II
DOT reportable quantity (lbs):	Not applicable.

Proper shipping name:	Gasoline
UN/Identification No:	UN 1203
Hazard Class:	3
Packing group:	II

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

OSHA Hazard Communication Standard: This product has been evaluated and determined to be hazardous as defined in OSHA's Hazard Communication Standard.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product contains the following component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Saturated Hydrocarbons	NA
Aromatic Hydrocarbons	NA
Unsaturated Hydrocarbons	NA
Toluene	NA
Xylene	NA
1,2,4-Trimethylbenzene	NA
Benzene	NA
Hexane	NA
Ethyl Benzene	NA
Naphthalene	NA

SARA Section 304: This product contains the following component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	CERCLA/SARA - Hazardous Substances and their Reportable Quantities
Saturated Hydrocarbons	NA
Aromatic Hydrocarbons	NA
Unsaturated Hydrocarbons	NA
Toluene	= 454 kg final RQ
Xylene	= 100 lb final RQ = 45.4 kg final RQ
1,2,4-Trimethylbenzene	NA
Benzene	= 10 lb final RQ = 4.54 kg final RQ
Hexane	= 2270 kg final RQ = 5000 lb final RQ
Ethyl Benzene	= 1000 lb final RQ = 454 kg final RQ
Naphthalene	= 100 lb final RQ = 45.4 kg final RQ

SARA Section 311/312 The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

SARA Section 313: This product contains the following component(s) that may be subject to reporting on the Toxic Release Inventory (TRI) From R:

Name	CERCLA/SARA 313 Emission reporting:
Saturated Hydrocarbons	None
Aromatic Hydrocarbons	None
Unsaturated Hydrocarbons	None

Name	CERCLA/SARA 313 Emission reporting:
Toluene	= 1.0 % de minimis concentration
Xylene	= 1.0 % de minimis concentration
1,2,4-Trimethylbenzene	= 1.0 % de minimis concentration
Benzene	= 0.1 % de minimis concentration
Hexane	= 1.0 % de minimis concentration
Ethyl Benzene	= 0.1 % de minimis concentration
Naphthalene	= 0.1 % de minimis concentration

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Saturated Hydrocarbons

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Aromatic Hydrocarbons

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Unsaturated Hydrocarbons

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed

Saturated Hydrocarbons

New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Toluene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	developmental toxicity, initial date 1/1/91
New Jersey Right-To-Know:	sn 1866
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan critical materials register list:	= 100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	flammable - third degree; teratogen
New Jersey - Environmental Hazardous Substances List:	SN 1866 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 1000 lb RQ air

Xylene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	sn 2014
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan critical materials register list:	= 100 lb Annual usage threshold all isomers
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	flammable - third degree

Saturated Hydrocarbons

New Jersey - Environmental Hazardous Substances List:	SN 2014 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 1000 lb RQ air

1,2,4-Trimethylbenzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	sn 2716
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	SN 2716 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Benzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	carcinogen, initial date 2/27/87 developmental toxicity, initial date 12/26/97 male reproductive toxicity, initial date 12/26/97
New Jersey Right-To-Know:	sn 0197
Pennsylvania Right-To-Know:	Environmental hazard; Special hazardous substance
Massachusetts Right-To Know:	Carcinogen; Extraordinarily hazardous
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin); Carcinogen (skin)
Michigan critical materials register list:	= 100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	carcinogen; extraordinarily hazardous
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Present
New Jersey - Special Hazardous Substances:	carcinogen; flammable - third degree; mutagen; teratogen
New Jersey - Environmental Hazardous Substances List:	SN 0197 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 10 lb RQ air

Hexane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	sn 1340
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present

Saturated Hydrocarbons

Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 1340 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ air = 1 lb RQ land/water

Ethyl Benzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	carcinogen, initial date 6/11/04
New Jersey Right-To-Know:	sn 0851
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	carcinogen; flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0851 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 1000 lb RQ air

Naphthalene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	sn 1322
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	carcinogen

Saturated Hydrocarbons

New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 100 lb RQ air

Canadian Regulatory Information:

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Toluene	B2, D2A, D2B	1 %
Xylene	B2, D2A, D2B	
1,2,4-Trimethylbenzene	B3	0.1 %
Benzene	B2, D2A, D2B	0.1 %
Hexane	B2, D2A	1 %
Ethyl Benzene	B2, D2A, D2B	0.1 %
Naphthalene	B4, D2A	1 %

NOTE: Not Applicable.

16. OTHER INFORMATION

Additional Information: No data available.

Prepared by: Mark S. Swanson, Manager, Toxicology and Product Safety

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End of Safety Data Sheet

AMERADA HESS CORP -- PREMIUM UNLEADED GASOLINE -- 9130-00N038435

========== Product Identification ==========

Product ID:PREMIUM UNLEADED GASOLINE
MSDS Date:01/13/1989
FSC:9130
NIIN:00N038435
MSDS Number: BQXMS
=== Responsible Party ===
Company Name:AMERADA HESS CORP
Address:1 HESS PLAZA
City:WOODBRIDGE
State:NJ
ZIP:07095
Country:US
Info Phone Num:201-750-6000
Emergency Phone Num:800-424-9300(CHEMTREC)
CAGE:4N717
=== Contractor Identification ===
Company Name:AMERADA HESS CORP
Address:1 HESS PLAZA
Box:City:WOODBRIDGE
State:NJ
ZIP:07095-1229
Country:US
Phone:908-750-6000, CHEMTREC 800-424-9300
CAGE:4N717

========== Composition/Information on Ingredients ==========

Ingred Name:ING 17:OPEN SPILLS MAY EMIT FLAMM VAPS. APPROACH FROM
UPWIND IF POSS. AVOID BRTHG EMITTED VAPS. WEAR NIOSH/MSHA (ING 19)
RTECS #:9999999ZZ

Ingred Name:ING 18:APPRVD SELF CNTND POSITIVE PRESS BRTHG APPARATUS, IF
REQD, TO PVNT INHAL OF VAPS.
RTECS #:9999999ZZ

Ingred Name:WASTE DISP METH:OF VOLATILE, FLAMMABLE, VAPORS.
RTECS #:9999999ZZ

Ingred Name:OTHER PREC: IGNIT. USE ONLY AS A MOTOR FUEL. HNDLE,
TRANSPORT & STORE I/A/W APPLIC LAWS & REGS. ELEC EQUIP (ING 22)
RTECS #:9999999ZZ

Ingred Name:ING 21:SHOULD BE APPRVD FOR CLASSIFIED AREA. REMOVE SOILED
CLTHG & LAUNDER BEFORE-REUSE. DISCARD OIL SOAKED (ING 23)
RTECS #:9999999ZZ

Ingred Name:ING 22:SHOES. WEAR FULL LNGTH CLTHG, & LAUNDER ON A REGULAR
& FREQ BASIS. VENT MUST BE SUFFICIENT TO PVNT (ING 24)
RTECS #:9999999ZZ

Ingred Name:ING 23:ACCUMULATION OF TOX/FLAMM CONC OF VAPOR IN AIR.
RTECS #:9999999ZZ

Ingred Name:HYGIENE PRACT: UPWIND OF VAPOR OR MIST RELEASE, SPILL OR
LEAK.

RTECS #:9999999ZZ

Ingred Name:ETHER, TERT-BUTYL METHYL; (METHYL TERT-BUTYL ETHER &/OR
TERT-AMYL METHYL ETHER, CAS # 994-05-8)
CAS:1634-04-4
RTECS #:KN5250000
Fraction by Wt: <15%
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:TOLUENE
CAS:108-88-3
RTECS #:XS5250000
Fraction by Wt: 15-<30%
OSHA PEL:200 PPM/150 STEL
ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:XYLENE (MIXED ISOMERS)
CAS:1330-20-7
RTECS #:ZE2100000
Fraction by Wt: 10-<15%
OSHA PEL:100 PPM;150 PPM STEL
ACGIH TLV:100 PPM;150 PPM STEL
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:BENZENE
CAS:71-43-2
RTECS #:CY1400000
Fraction by Wt: 0.1-<5%
OSHA PEL:10 PPM
ACGIH TLV:10 PPM
EPA Rpt Qty:10 LBS
DOT Rpt Qty:10 LBS

Ingred Name:BENZENE, ETHYL-; (ETHYL BENZENE)
CAS:100-41-4
RTECS #:DA0700000
Fraction by Wt: <3%
OSHA PEL:100 PPM;125 STEL
ACGIH TLV:100 PPM;125 STEL
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:BENZENE, 1,2,4-TRIMETHYL-; (1,2,4-TRIMETHYLBENZENE)
CAS:95-63-6
RTECS #:DC3325000
Fraction by Wt: <6%

Ingred Name:SUPP DATA: IGNIT. VAPS CAN READILY FORM EXPLOS MIXT IN AIR.
HVR/AIR VAPS CAN FLOW ALONG SURF TO DIST SOURCES (ING 9)
RTECS #:9999999ZZ

Ingred Name:ING 8:IGNIT & FLASH BACK. FLOWING GASOLINE CAN BE IGNITED
BY SELF-GENERATED STATIC ELEC. RUNOFF TO SEWERS (ING 10)
RTECS #:9999999ZZ

Ingred Name:ING 9: MAY CREATE FIRE &/OR EXPLOSION HAZARD.

RTECS #:9999999ZZ

Ingred Name:EFTS OF OVEREXP:DISEASE, INCL LEUKEMIA, AFTER RPTD & PRLNGD EXPOS @ HIGH CONC.INHAL TO 100 PPM MAY CAUSE SLIGHT (ING 12)
RTECS #:9999999ZZ

Ingred Name:ING 11:DROW & HDCH. 100-200 PPM MAY CAUSE FATG, NAUS, ITCH & WILL FATG OLFACTORY SENSES.IMMED DANGER TO HLTH/ (ING 13)
RTECS #:9999999ZZ

Ingred Name:ING 12:LIFE IS REPRESENTED BY 2,000 PPM. INGEST & INHAL OF LIQ &/OR EXCESS VAPS CAN HAVE AN ANESTH EFT, CAUSE (ING 14)
RTECS #:9999999ZZ

Ingred Name:ING 13:VERTIGO, BLURRED VISION, VOMIT & CYANOSIS. OVEREXP MAY CAUSE CNS DEPRESS. NOTE: TOLUENE CAS# 108-88-3 (ING 15)
RTECS #:9999999ZZ

Ingred Name:ING 14:APPEARS ON NAVY LIST OF OCCUP REPROD HAZ. SEEK CONSULTATION FROM APPROP HLTH PROFESSIONALS CONCERNING (ING 16)
RTECS #:9999999ZZ

Ingred Name:ING 15:LATEST HAZ LIST INFO & SAFE HANDLING AND EXPOSURE RECOMMENDATION .
RTECS #:9999999ZZ

Ingred Name:SPILL PROC: ANIMAL/AQUATIC LIFE. CAUTION-EVAC ALL NON-ESSENTIAL PERS. SPILLED MATL MAY CAUSE SLIPPERY CNDTNS. (ING 18)
RTECS #:9999999ZZ

Ingred Name:GASOLINE CONTAINING INGS 2-7
CAS:8006-61-9
RTECS #:LX3300000
Fraction by Wt: 100%
OSHA PEL:300 PPM;500 STEL
ACGIH TLV:300 PPM;500 STEL

========== Hazards Identification ==========

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:YES
Health Hazards Acute and Chronic:ACUTE/CHRONIC: HARMFUL/FATAL IF SWALLOWED/ASPIRATED. LONG TERM EXPOS TO VAPS HAS CAUSED CANCER IN SOME LAB ANIMALS. INGEST MAY CAUSE GI DISTURB. ASPIR INTO LUNGS MAY CAUSE PNEUM. PRLNGD CONT W/SKIN MA Y RSLT IN DEFAT/RED, ITCH, INFLAMM, CRACK & POSS SECONDARY INFECTION. HAS A LOW ORDER OF ACUTE ORAL TOX(EFTS OF OVEREXP)
Explanation of Carcinogenicity:BENZENE: OSHA REG 29 CFR 1910.1028, REV JUL 92; KNOWN CARCINOGEN (NTP) NTP 6TH ANN RPT, 1991; IARC 2B,VOL45,P159,1989.
Effects of Overexposure:HLTH HAZ:IF INGESTED, BUT MIN AMTS ASPIRATED DURING SUCH INGEST MAY CAUSE DEATH. HIGH PRESS SKIN INJECTIONS ARE SERIOUS MED EMER! RPTD/PRLNGD EXPOS TO VAPS CNTNG HIGH CONC OF BENZENE MAY CAUSE ANEMIA & OTHER BLOOD DISEASES, INCL LEUKEMIA. BENZENE IS RECOGNIZED AS HAVING POTNTL TO INDUCE ANEMIA & OTHER BLOOD (ING 11)
Medical Cond Aggravated by Exposure:OPEN WOUNDS, SKIN DISORDERS, CHRONIC RESPIRATORY DISEASE OR PRE-EXISTING CENTRAL NERVOUS SYSTEM

DISEASE.

First Aid Measures

First Aid:INHAL: REMOVE TO FRESH AIR, PROVIDE OXYGEN THERAPY &/OR RESUSCITATION AS INDICATED. SKIN: REMOVE CONTAMINATED CLOTHING & FLUSH WITH SOAP AND WATER. EYE: FLUSH WITH WATER FOR AT LEAST 15 MINUTES. INGES T: RINSE MOUTH W/WATER. KEEP CALM AND WARM. DO NOT INDUCE VOMIT! ASPIRATION OF MATERIAL INTO LUNGS MAY CAUSE CHEMICAL PNEUMONIA. CALL PHYSICIAN IMMEDIATELY.

Fire Fighting Measures

Flash Point Method:TCC
Flash Point:-40F,-40C
Lower Limits:1.4%
Upper Limits:7.4%
Extinguishing Media:ANY APPRVD EXTING AGENT FOR CLASS B FIRES, DRY CHEM, FOAM, CARBON DIOXIDE/HALON. WATER IS NOT ORD EFTIVE. (SUPP DATA)
Fire Fighting Procedures:NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP. AVOID INHAL OF VAPS. WATER SHOULD BE USED TO KEEP EXPOS CONTRS COOL. APPROACH FROM UPWIND IF POSSIBLE.
Unusual Fire/Explosion Hazard:CLASS 1A FLAMM LIQ. KEEP AWAY FROM HEAT, SOURCES OF IGNIT & OXIDIZERS. BURNING MAY CAUSE EMISSION OF TOX PROD OF COMBUST. EMPTY PROD CNTRS/VESSELS (SUPP DATA)

Accidental Release Measures

Spill Release Procedures:CNTN ALL SPILLS. ABSORB ALL FREE LIQ. REMOVE ALL IGNIT SOURCES & SAFELY STOP FLOW OF SPILL. PVNT FROM ENTERING ALL BODIES OF WATER. COMPLY W/ALL APPLIC LAWS & REGS. ABSORB MATL, PADS, SAND/EARTH MAY B E USED. CONTAM WATER/SOIL MAY BE HAZ TO(ING 17)
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

Handling and Storage

Handling and Storage Precautions:KEEP AWAY FROM HEAT, SPARKS & OPEN FLAME. AVOID BRTHG VAP/MIST. AVOID SKIN/EYE CONTACT. KEEP CONTAINERS CLOSED & PLAINLY LABELED.
Other Precautions:TRANSFER LINES MUST BE BONDED & GROUNDED TO PVNT POTNTL ACCUMULATION OF STATIC ELEC. NO SMOKING IN AREAS OF HNDLG/STOR. STOR SHOULD BE IN TIGHTLY CLSD CONTRS IN COOL, DRY, ISOLATED & WELL VENTD AREA A WAY FROM POTNTL SOURCE OF (ING 21)

Exposure Controls/Personal Protection

Respiratory Protection:NIOSH/MSHA APPRVD SELF CNTND, POSITIVE PRESSURE, BREATHING APPARATUS IN CONFINED SPACES/WHEN EXPOSED TO HEAVY MIST.
Ventilation:LOCAL EXHAUST: GENERALLY NOT REQD. MECH(GEN): EXPLOSION PROOF (APPROVED FOR CLASSIFIED AREA). SPECIAL: NONE REQUIRED.
Protective Gloves:IMPERVIOUS.
Eye Protection:CHEM WORK GOG OR FULL LNGTH FSHLD.
Other Protective Equipment:IMPERVIOUS CLOTHING AS REQUIRED TO PREVENT SKIN CONTACT. EYE WASH/BATH READILY AVAILABLE WHERE EYE CONTACT IS POSSIBLE.
Work Hygienic Practices:WASH SKIN THORO W/SOAP & WATER BEFORE EATING, DRINK/SMOKING. VENT MAY BE USED TO CTL/REDUCE AIRBORNE CONC. STAND(ING 25)

Supplemental Safety and Health
VP: 275-475@68F (VARIES SEASONALLY). APPEAR/ODOR: (CLEAR RED, BRONZE & YELLOW ARE TYPICAL). EXTING MEDIA: HOWEVER, WATER FOG MAY BE USED BY EXPER FIRE FIGHTERS FOR INTENSITY CTL, & TO COOL EXPOSED ARE AS. EXPLO HAZ: MAY CNTN EXPLOS VAPS. DONOT PRESSURIZE, CUT, HEAT, WELD/EXPOSE SUCH CONTRS/VESSELS TO SOURCE OF (ING 8)

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:>85F,>29.4C
Vapor Pres:SUPP DATA
Vapor Density:3-4
Spec Gravity:0.76(H*2O=1)
Evaporation Rate & Reference:10-11(BUTYL ACETATE=1)
Solubility in Water:SLIGHT
Appearance and Odor:CLEAR LIQ W/CHARACT AROMATIC ODOR.MAY BE DYED FOR IDENTIFICATION (SUPP DATA)
Percent Volatiles by Volume:100

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
OXIDIZING AGENTS. COMBINATION OF NITRIC AND SULFURIC ACIDS.
Stability Condition to Avoid:AVOID HANDLING OR STORING NEAR HEAT, SPARKS/OPEN FLAME.
Hazardous Decomposition Products:CONTACT WITH NITRIC AND SULFURIC ACIDS WILL FORM NITROCRESOLS THAT CAN DECOMPOSE VIOLENTLY.

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSE OF PROD & CONTAMD MATL AS EPA "IGNITABLE HAZ WASTE". USE ONLY APPRVD TRTMT TRANSPORTERS & DISP SITE IN COMPLIANCE W/ALL APPLIC FED, ST & LOC REGS . MAINTAIN SURVEILLANCE OF ABSORBED MATL UNTIL FINAL DISP TO OBSERVE FOR EMISSION (ING 20)

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PHIBRO ENERGY USA, INC. -- DIESEL FUEL -- 9140-00-000-0184

========== Product Identification ==========

Product ID:DIESEL FUEL
MSDS Date:01/31/1994
FSC:9140
NIIN:00-000-0184
MSDS Number: BVGFN
=== Responsible Party ===
Company Name:PHIBRO ENERGY USA, INC.
Address:500 DALLAS AVE, SUITE 3200
City:HOUSTON
State:TX
ZIP:77002
Country:US
Info Phone Num:713-646-5135
Emergency Phone Num:713-923-6641, CHEMTREC 800-424-9300
Preparer's Name:SUE BOTTOM
CAGE:0V310
=== Contractor Identification ===
Company Name:PHIBRO ENERGY USA INC
Address:500 DALLAS AVE SUITE 3200
Box:City:HOUSTON
State:TX
ZIP:77002
Country:US
Phone:713-923-6641, CHEMTREC800-424-9300
CAGE:0V310

========== Composition/Information on Ingredients ==========

Ingred Name:PETROLEUM DISTILLATE, ALIPHATIC AND AROMATIC HYDROCARBONS
(VARYING FROM C9 TO C20), CONTAING ALSO INGREDIENT #2 TO 7.
Fraction by Wt: BALANCE
Other REC Limits:NONE SPECIFIED
OSHA PEL:400 PPM NAPHTHA TWA

Ingred Name:N-OCTANE
CAS:111-65-9
RTECS #:RG8400000
Fraction by Wt: <1-2%
Other REC Limits:NONE SPECIFIED
OSHA PEL:300 PPM TWA 1989
ACGIH TLV:300 PPM/375STEL;9394

Ingred Name:N-NONANE
CAS:111-84-2
RTECS #:RA6115000
Fraction by Wt: <1-3%
Other REC Limits:NONE SPECIFIED
OSHA PEL:200 PPM
ACGIH TLV:200 PPM; 9192

Ingred Name:NAPHTHALENE (SARA III)
CAS:91-20-3
RTECS #:QJ0525000
Fraction by Wt: <1-3%
Other REC Limits:NONE RECOMMENDED

OSHA PEL:10 PPM
ACGIH TLV:10 PPM/15 STEL; 9394
EPA Rpt Qty:100 LBS
DOT Rpt Qty:100 LBS

Ingred Name:HEXANE ISOMERS (OTHER THAN N-HEXANE)
Fraction by Wt: <1-3%
Other REC Limits:NONE RECOMMENDED
OSHA PEL:500 PPM
ACGIH TLV:500 PPM

Ingred Name:N-HEXANE
CAS:110-54-3
RTECS #:MN9275000
Fraction by Wt: <1-2%
Other REC Limits:NONE RECOMMENDED
OSHA PEL:50 PPM 1989
ACGIH TLV:50 PPM; 9394
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:N-HEPTANE
CAS:142-82-5
RTECS #:MI7700000
Fraction by Wt: <1-2%
Other REC Limits:NONE RECOMMENDED
OSHA PEL:400 PPM TWA 1989
ACGIH TLV:400 PPM/500STEL;9394

Ingred Name:HYDROGEN SULFIDE (SARA III)
CAS:7783-06-4
RTECS #:MX1225000
Other REC Limits:NONE RECOMMENDED
OSHA PEL:C, 20 PPM
ACGIH TLV:10 PPM/15 STEL; 9394
EPA Rpt Qty:100 LBS
DOT Rpt Qty:100 LBS

Hazards Identification

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE-INHALATION:CNS EFFECTS, RESPIRATORY IRRITATION. EYES:SEVERE IRRITATION. INGESTION:HARMFUL OR FATAL, IRRITATION OF GI TRACT. ASPIRATION INTO THE LUNGS CAN CAUSE SEVERE CHEMICAL PNEUMONITIS, WHICH CAN BE FATAL. SKIN:REPEATED EXPOSURE MAY CAUSE IRRITATION. CHRONIC:DERMATITIS. TARGET ORGANS:SKIN, LUNG, CNS.
Explanation of Carcinogenicity:PER NIOSH BULLETIN 50 A POTENTIAL OCCUPATIONAL CARCINOGENIC HAZARD EXISTS DUE TO HUMAN EXPOSURE TO DIESEL EXHAUST.
Effects of Overexposure:EYE:IRRITATION, REDNESS, TEARING, BLURRED VISION, CONJUCTIVITIS. SKIN:IRRITATION, DRYNESS, REDNESS, ITCHING. INHAL:HEADACHE, DIZZINESS, DROWZINESS, NAUSEA, VOMITNING, TREMORS, CONVULSIONS, IRREGULAR H EART BEAT. INGESTION: G/I IRRITATION AND SYMPTOMS SIMILAR TO INHALATION.
Medical Cond Aggravated by Exposure:EYE, SKIN, HEART, CNS, AND RESPIRATORY DISORDERS MAY BE AGGARAVATED BY OVEREXPOSURE.

First Aid Measures

First Aid:SKIN:REMOVE CONTAMINATED CLOTHING. WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS. INHALATION:REMOVE TO FRESH AIR & RESTORE BREATHING IF NECESSARY. GET MEDICAL ATTENTION. EYE:I MMEDIATELY FLUSH WITH WATER FOR 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION. INGESTION:GET IMMEDIATE MEDICAL ATTENTION. DO NOT INDUCE VOMITING. NOTHING BY MOUTH IF UNCONSCIOUS.

Fire Fighting Measures

Flash Point:125F,52C
Lower Limits:0.4%
Upper Limits:8.0%
Extinguishing Media:CARBON DIOXIDE, FOAM, OR DRY CHEMICAL.
Fire Fighting Procedures:EVACUATE AREA. USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT TO FIGHT FIRE. USE WATER SPRAY TO COOL EXPOSED CONTAINERS. DIRECT WATER SPRAY MAY SPREAD FIRE
Unusual Fire/Explosion Hazard:VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG GROUND OR FLOOR, THEN 'FLASH BACK' FROM A DISTANT IGNITION SOURCE. TOXIC FUMES & GASES ARE PRODUCED BY FIRE.

Accidental Release Measures

Spill Release Procedures:EVACUATE AREA. WEAR PROTECTIVE EQUIPMENT. SHUT OFF SOURCE IF POSSIBLE & CONTAIN SPILL. REMOVE IGNITION SOURCES. KEEP OUT OF WATER RESOURCES AND SEWERS. ABSORB IN INERT MATERIAL OR RECOVER BY PUMPING. TRANSFER TO DISPOSAL DRUMS.
Neutralizing Agent:NONE

Handling and Storage

Handling and Storage Precautions:KEEP AWAY FROM HEAT, SPARKS, FLAME. STORE IN WELL VENTILATED AREA. GROUND CONTAINERS DURING TRANSFER. STORE IN CLOSED CONTAINER.
Other Precautions:EMPTY CONTAINERS RETAIN RESIDUE. DO NOT PRESSURIZE, CUT, WELD OR EXPOSE TO HEAT, FLAME, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY.

Exposure Controls/Personal Protection

Respiratory Protection:FOR CONCENTRATIONS EXCEEDING RECOMMENDED LEVEL, USE NIOSH/MSHA APPROVED AIR PURIFYING RESPIRATOR. FOR SPILL OR IF CONCENTRATION IS UNKNOWN, USE NIOSH/MSHA SUPPLIED AIR RESPIRATOR OR SCBA.
Ventilation:GENERAL OR MECHANICAL
Protective Gloves:NEOPRENE OR NITRILE
Eye Protection:SAFETY GLASSES OR CHEMICAL SPLASH GOGGLE
Other Protective Equipment:PROTECTIVE GARMENTS TO PREVENT SKIN CONTACT.
Work Hygienic Practices:DO NOT EAT, DRINK OR SMOKE WHILE WORKING WITH THIS PRODUCT.
Supplemental Safety and Health
DANGER! UNTREATED PRODUCT MAY CONTAIN OR RELEASE HYDROGEN SULFIDE. H2S IS A HIGHLY TOXIC AND FLAMMABLE GAS WHICH CAN BE FATAL IF INHALED AT CERTAIN CONCENTRATION.

Physical/Chemical Properties

HCC:F4
NRC/State Lic Num:NONE

Boiling Pt:B.P. Text:325F,163C
Vapor Pres:<0.1 PSI
Vapor Density:3-7
Spec Gravity:0.84 - 0.93
Viscosity:8 CST @ -4F
Solubility in Water:NEGLIGIBLE
Appearance and Odor:CLEAR TO STRAW COLORED LIQUID, KEROSENE ODOR.
Percent Volatiles by Volume:NEGLIG

Stability and Reactivity Data

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS, STRONG ACIDS, CAUSTICS AND HALOGENS.
Stability Condition to Avoid:OPEN FLAMES, SOURCES OF IGNITION, STATIC ELECTRICITY.
Hazardous Decomposition Products:CARBON MONOXIDE, CARBON DIOXIDE AND REACTIVE HYDROCARBONS (LDEHYDES, AROMATICS, ETC) COMPOUNDS.

Disposal Considerations

Waste Disposal Methods:DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

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CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

POLYCHLORINATED BIPHENYLS

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

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Section 1 - Product and Company Identification
POLYCHLORINATED BIPHENYLS

Product Identification: POLYCHLORINATED BIPHENYLS
Date of MSDS: 10/01/1988 **Technical Review Date:** 03/11/1999
FSC: 5910 **NIIN:** 00-903-2947
Submitter: D DG
Status Code: A
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: MONSANTO CO
Post Office Box: UNKNOW
Manufacturer's Address1: 800 N LINDBERGH BLVD
Manufacturer's Address2: ST LOUIS, MO 63167
Manufacturer's Country: US
General Information Telephone: 314-694-1000
Emergency Telephone: 314-694-1000
Emergency Telephone: 314-694-1000
MSDS Preparer's Name: PAUL R MICHAEL, SAFETY
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 3Y784
Special Project Code: N

Item Description

Item Name: CAPACITOR,FIXED,PAPER DIELECTRIC
Item Manager: S9E
Specification Number: NK
Type/Grade/Class: NK
Unit of Issue: EA
Unit of Issue Quantity: 1
Type of Container:

Contractor Information

Contractor's Name: GENERAL ELECTRIC CO CAPACITOR PRODUCTS DEPARTMENT
Contractor's Address1: JOHN ST
Contractor's Address2: HUDSON FALLS, NY 12839
Contractor's Telephone: 518-746-5750
Contractor's CAGE: 01002

Contractor Information

Contractor's Name: MONSANTO CO, FIBERS BUSINESS UNIT
Contractor's Address1: 800 N LINDBERGH BLVD
Contractor's Address2: SAINT LOUIS, MO 63167
Contractor's Telephone: 314-694-1000
Contractor's CAGE: 3Y784

Section 2 - Compositon/Information on Ingredients
POLYCHLORINATED BIPHENYLS

Ingredient Name: POLYCHLORINATED BIPHENYLS (PCBS) (SARA III)
Ingredient CAS Number: 1336-36-3 **Ingredient CAS Code:** M
RTECS Number: TQ1350000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:

>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/P
% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: NOT ESTABLISHED **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: NOT ESTABLISHED **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
POLYCHLORINATED BIPHENYLS

Health Hazards Acute & Chronic: EYES: MODERATELY IRRITATING TO EYE TISSUES. SKIN: CAN BE ABSORBED THROUGH INTACT SKIN. MAY CAUSE DEFATTING. A POTENTIAL FOR CONTACTING CHLORACNE. INHALATION: POSSIBLE LIVER INJURY. INGESTION: SLIGH TLY TOXIC.

Signs & Symptoms of Overexposure:
CAN CAUSE DERMATOLOGICAL SYMPTOMS; HOWEVER, THESE ARE REVERSIBLE UPON REMOVAL OF EXPOSURE SOURCE.

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
- **Inhalation:** YES
- **Skin:** YES
- **Ingestion:** N/P

Carcenogenicity Indicators
- **NTP:** YES
- **IARC:** YES
- **OSHA:** NO

Carcinogenicity Explanation: IARC: PROBABLE CARCINOGENIC. NTP: REASONABLY ANTICIPATED TO BE CARCINOGENIC.

Section 4 - First Aid Measures
POLYCHLORINATED BIPHENYLS

First Aid:
EYES: IRRIGATE IMMEDIATELY WITH COPIOUS QUANTITIES OF RUNNING WATER FOR AT LEAST 15 MIN IF LIQUID OR SOLID PCBS GET INTO THEM. SKIN:CONTAMINATED CLOTHING SHOULD BE REMOVED AND THE SKIN WASHED THOROUG HLY WITH SOAP AND WATER. HOT PCBS MAY CAUSE THERMAL BURNS. INHALATION: REMOVE TO FRESH AIR. IF SKIN RASH OR RESPIRATORY IRRITATION PERSISTS, CONSULT A PHYSICIAN. (IF ELECTRICAL EQUIPMENT ARCS OVER, P CBS MAY DECOMPOSE TO PRODUCE HYDROCHLORIC ACID). INGESTION: CONSULT A PHYSICIAN. DO NOT INDUCE VOMITING OR GIVE ANY OILY LAXATIVES. (IF LARGE AMOUNTS ARE INGESTED, GASTRIC LAVAGE IS SUGGESTED).

Section 5 - Fire Fighting Measures
POLYCHLORINATED BIPHENYLS

Fire Fighting Procedures:
STANDARD FIRE FIGHTING WEARING APPAREL AND SELF-CONTAINED BREATHING APPARATUS SHOULD BE WORN WHEN FIGHTING FIRES THAT INVOLVE POSSIBLE EXPOSURE TO CHEMICAL COMBUSTION PRODUCTS. FIRE FIGHTING EQUIPMEN T SHOULD BE THOROUGHLY CLEANED AND DECONTAMINATED AFTER USE.
Unusual Fire or Explosion Hazard:
IF A PCB TRANSFORMER IS INVOLVED IN A FIRE-RELATED INCIDENT, THE OWNER OF THE TRANSFORMER MAY BE REQUIRED TO REPORT THE INCIDENT. CONSULT AND FOLLOW APPROPRIATE FEDERAL, STATE, AND LOCAL REGULATIONS.
Extinguishing Media:
PCBS ARE FIRE-RESISTANT COMPOUNDS.
Flash Point: >141.C, 285.8F **Flash Point Text:** N/A

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s):
Upper Limit(s):

Section 6 - Accidental Release Measures
POLYCHLORINATED BIPHENYLS

Spill Release Procedures:
CLEANUP & DISPOSAL OF LIQUID PCBS ARE STRICTLY REGULATED BY THE FEDERAL GOVERNMENT. VENTILATE AREA. CONTAIN SPILL/LEAK. REMOVE SPILL BY MEANS OF ABSORPTIVE MATERIAL. SPILL CLEANUP PERSONNEL SHOULD USE PROPER PROTECTIVE CLOTHING. ALL WASTES AND RESIDUES CONTAINING PCBS SHOULD BE COLLECTED, CONTAINERIZED, MARKED AND DISPOSED OF IN THE MANNER PRESCRIBED BY EPA, & APPLICABLE STATE AND LOCAL LAWS.

Section 7 - Handling and Storage
POLYCHLORINATED BIPHENYLS

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection

POLYCHLORINATED BIPHENYLS

Repiratory Protection:
USE NIOSH/MSHA APPROVED EQUIPMENT WHEN AIRBORNE EXPOSURE LIMITS ARE EXCEEDED. FULL FACEPIECE EQUIPMENT IS RECOMMENDED AND, IF USED, REPLACES NEED FOR FACE SHIELD AND/OR CHEMICAL SPLASH GOGGLES. THE R ESPIRATOR USE LIMITATIONS SPECIFIED BY NIOSH/MSHA OR THE MANUFACTURER MUST BE OBSERVED.
Ventilation:
PROVIDE NATURAL OR MECHANICAL VENTILATION TO CONTROL EXPOSURE LEVELS BELOW AIRBORNE EXPOSURE LEVELS.
Protective Gloves:
WEAR APPROPRIATE CHEMICAL RESISTANT GLOVES TO PREVENT SKIN CONTACT.
Eye Protection: WEAR CHEMICAL SPLASH GOGGLES AND HAVE EYE BATHS AVAILABLE.
Other Protective Equipment: WEAR APPROPRIATE PROTECTIVE CLOTHING. PROVIDE A SAFETY SHOWER AT ANY LOCATION WHERE SKIN CONTACT CAN OCCUR.
Work Hygenic Practices: WASH THOROUGHLY AFTER HANDLING.
Supplemental Health & Safety Information: NONE

Section 9 - Physical & Chemical Properties
POLYCHLORINATED BIPHENYLS

HCC: Z3
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/A
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/A
Vapor Pressure: (MM HG @100F).005-.00006 **Vapor Density:** N/P
Percent Volatile Organic Content:
Specific Gravity: N/K
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: (CENTISTOKES)3.6-540
Evaporation Weight and Reference: N/P
Solubility in Water: N/P
Appearance and Odor: N/P
Percent Volatiles by Volume: N/P
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
POLYCHLORINATED BIPHENYLS

Stability Indicator: YES
Materials to Avoid:
N/P
Stability Condition to Avoid:
PCBS ARE VERY STABLE, FIRE-RESISTANT COMPOUNDS.
Hazardous Decomposition Products:
CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN CHLORIDE, PHENOLICS, ALDEHYDES AND OTHER TOXIC COMBUSTION PRODUCTS.
Hazardous Polymerization Indicator: N/P

Conditions to Avoid Polymerization:
N/P

Section 11 - Toxicological Information
POLYCHLORINATED BIPHENYLS

Toxicological Information:
N/P

Section 12 - Ecological Information
POLYCHLORINATED BIPHENYLS

Ecological Information:
N/P

Section 13 - Disposal Considerations
POLYCHLORINATED BIPHENYLS

Waste Disposal Methods:
CONSULT THE APPLICABLE STATE AND LOCAL REGULATIONS PRIOR TO ANY DISPOSAL OF PCBS OR PCB-CONTAMINATED ITEMS. CONSULT WITH 40 CFR PART 761 FOR FEDERAL REQUIREMENTS.

Section 14 - MSDS Transport Information
POLYCHLORINATED BIPHENYLS

Transport Information:
N/P

Section 15 - Regulatory Information
POLYCHLORINATED BIPHENYLS

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
POLYCHLORINATED BIPHENYLS

Other Information:
N/P

HMIS Transportation Information

Product Identification: POLYCHLORINATED BIPHENYLS
Transporation ID Number: 139624
Responsible Party CAGE: 3Y784
Date MSDS Prepared: 10/01/1988
Date MSDS Reviewed: 03/11/1999
MFN: 03/11/1999
Submitter: D DG

Status Code: A

Container Information
Unit of Issue: EA
Container Quantity: 1
Type of Container:
Net Unit Weight: U/K

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism:
AF MMAC Code:
DOD Exemption Number: N/A
Limited Quantity Indicator: N
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: N
Additional Data:
P/N (GENERAL ELECTRIC CO): 23F1071G202

Department of Transportation Information

DOT Proper Shipping Name: POLYCHLORINATED BIPHENYLS
DOT PSN Code: LWI
Symbols: AW
DOT PSN Modifier:
Hazard Class: 9
UN ID Number: UN2315
DOT Packaging Group: II
Label: CLASS 9
Special Provision(s): 9,81
Packaging Exception:
Non Bulk Packaging: 202
Bulk Packaging: 241
Maximimum Quanity in Passenger Area: 100 L
Maximimum Quanity in Cargo Area: 220 L
Stow in Vessel Requirements: A
Requirements Water/Sp/Other: 34

IMO Detail Information

IMO Proper Shipping Name: POLYCHLORINATED BIPHENYLS
IMO PSN Code: LZM
IMO PSN Modifier: PP
IMDG Page Number: 9034
UN Number: 2315
UN Hazard Class: 9
IMO Packaging Group: II
Subsidiary Risk Label: -
EMS Number: 6.1-02

Medical First Aid Guide Number: NON

IATA Detail Information

IATA Proper Shipping Name: POLYCHLORINATED BIPHENYLS, LIQUID
IATA PSN Code: UKT
IATA PSN Modifier:
IATA UN Id Number: 2315
IATA UN Class: 9
Subsidiary Risk Class:
UN Packaging Group: II
IATA Label: MISCELLANEOUS
Packaging Note for Passengers: 907
Maximum Quantity for Passengers: 100 L
Packaging Note for Cargo: 907
Maximum Quantity for Cargo: 220 L
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: POLYCHLORINATED BIPHENYLS
AFI Symbols:
AFI PSN Code: UKT
AFI PSN Modifier:
AFI UN Id Number: UN2315
AFI Hazard Class: 9
AFI Packing Group: II
AFI Label:
Special Provisions: P5, 9
Back Pack Reference: A13.3

HAZCOM Label Information

Product Identification: POLYCHLORINATED BIPHENYLS
CAGE: 3Y784
Assigned Individual: N
Company Name: MONSANTO CO, FIBERS BUSINESS UNIT
Company PO Box:
Company Street Address1: 800 N LINDBERGH BLVD
Company Street Address2: SAINT LOUIS, MO 63167 US
Health Emergency Telephone: 314-694-1000
Label Required Indicator: Y
Date Label Reviewed: 03/11/1999
Status Code: A
Manufacturer's Label Number:
Date of Label:
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: Y
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: YES
Signal Word: DANGER
Health Hazard: Severe
Contact Hazard: Moderate
Fire Hazard: None
Reactivity Hazard: None

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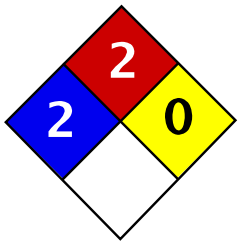

Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

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
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].
The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. 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: Not available.

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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. 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: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

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.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

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.
Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. 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:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes 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.

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:
Israel: TWA: 10 (ppm)
TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995]
TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995]
Australia: STEL: 15 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

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

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol.
Very slightly dispersed in cold water.
See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol.
Very slightly soluble 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.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 490 mg/kg [Rat].
Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].
The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

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

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: Not available.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

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 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene
Pennsylvania RTK: Naphthalene
Florida: Naphthalene
Minnesota: Naphthalene
Massachusetts RTK: Naphthalene
TSCA 8(b) inventory: Naphthalene
TSCA 8(a) PAIR: Naphthalene
TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87
SARA 313 toxic chemical notification and release reporting: Naphthalene: 1%
CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

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):
CLASS B-4: Flammable solid.
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes.
R40- Possible risks of irreversible effects.
R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed.
R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 2

Reactivity: 0

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: Not available.

Other Special Considerations: Not available.

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

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Section 1 - Product and Company Identification
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Product Identification: 02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40
Date of MSDS: 01/01/1987 **Technical Review Date:** 07/24/1995
FSC: 9150 **NIIN: LIIN:** 00F041173
Submitter: F BT
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: TEXACO LUBRICANTS CO DIV OF TEXACO REF & MKTG INC
Post Office Box: 4427
Manufacturer's Address1: N/K
Manufacturer's Address2: HOUSTON, TX 77210-4427
Manufacturer's Country: US
General Information Telephone: 914-838-7204/512-459-6543
Emergency Telephone: 914-831-3400/914-838-7336
Emergency Telephone: 914-831-3400/914-838-7336
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: Y
Published: Y
CAGE: OTTJ3
Special Project Code: N

Preparer Information

Preparer's Name: TEXACO LUBRICANTS
Post Office Box: 4427
Preparer's Address1: 4164 E INNSLAKE DR
Preparer's Address2: GLEN ALLEN, VA 23060
Preparer's CAGE: OTTJ3
Assigned Individual: Y

Contractor Information

Contractor's Name: TEXACO LUBRICANTS
Post Office Box: 4427
Contractor's Address1: 4164 E INNSLAKE DR
Contractor's Address2: GLEN ALLEN, VA 23060
Contractor's Telephone: 804-527-4311
Contractor's CAGE: OTTJ3

Section 2 - Compositon/Information on Ingredients
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Ingredient Name: OIL PETROLEUM DISTILLATES, SOLVENT-DEWAXED HEAVY PARAFFINIC
Ingredient CAS Number: 64742-65-0 **Ingredient CAS Code:** M
RTECS Number: PY8038500 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:

% High Volume: % High Volume Code:
% Text: 80-99
% Enviromental Weight:
Other REC Limits: 5 MG/CUM
OSHA PEL: N/K **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Ingredient Name: PHOSPHORODITHIOIC ACID, MIXED O,O'-BIS(1,3-DIMETHYLBUTYL AND 1-METHYL) ESTERS, ZINC SALTS *95-2*
Ingredient CAS Number: 84605-29-8 **Ingredient CAS Code:** M
RTECS Number: RTECS Code: X
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 0.1-1
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: VOLATILE ORGANIC CONTENT: 15 GM/L
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: 9999999VO **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: N/K

% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ZINC O,O-BISISODECYL DITHIOPHOSPHATE *95-2*
Ingredient CAS Number: 25103-54-2 **Ingredient CAS Code:** M
RTECS Number: RTECS Code: X
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 0.1-1
% Enviromental Weight:
Other REC Limits: N/K
OSHA PEL: N/K **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: N/K **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Section 3 - Hazards Identification, Including Emergency Overview
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Health Hazards Acute & Chronic: EYES: MAY CAUSE MINIMAL IRRITATION. SKIN: MAY CAUSE SLIGHT TO SEVERE IRRITATION. INHALATION: VAPORS/MIST MAY CAUSE IRRITATION OF THE NOSE & THROAT IN EXCESS OF PERMISSIBLE CONCENTRATIONS.

Signs & Symptoms of Overexposure:
IRRITATION, DISCOMFORT, REDNESS, SWELLING, HEADACHE, NAUSEA, DROWSINESS, ABDOMINAL DISCOMFORT, DIARRHEA.

Medical Conditions Aggravated by Exposure:
EXISTING DERMATITIS.

LD50 LC50 Mixture: ORAL LD50(RAT): >5 G/KG

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: NO

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NONE

Section 4 - First Aid Measures
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

First Aid:
EYES: FLUSH W/PLENTY OF WATER FOR SEVERAL MINS. SKIN: WASH W/PLENTY OF SOAP & WATER FOR SEVERAL MINS. INGESTION: GIVE 2 GLASSES OF WATER. INHALATION: REMOVE TO FRESH AIR. OBTAIN MEDICAL ATTENTION IN A LL CASES.

Section 5 - Fire Fighting Measures
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Fire Fighting Procedures:
USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS. WATER/FOAM MAY CAUSE FROTHING.
Unusual Fire or Explosion Hazard:
HYDROGEN SULFIDE GAS MAY BE RELEASED IF OVERHEATED.
Extinguishing Media:
WATER SPRAY, DRY CHEMICAL, FOAM/CO2.
Flash Point: Flash Point Text: >400F

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): N/K
Upper Limit(s): N/K

Section 6 - Accidental Release Measures
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Spill Release Procedures:
VENTILATE AREA. AVOID BREATHING VAPOR. WEAR APPROPRIATE PROTECTIVE EQUIPMENT. CONTAIN IF POSSIBLE. WIPE UP/ABSORB ON SUITABLE MATERIAL & SHOVEL UP. PREVENT ENTRY INTO SEWERS & WATERWAYS.

Section 7 - Handling and Storage
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Repiratory Protection:
IF EXPOSURE LIMIT OF THE PRODUCT IS EXCEEDED, USE APPROPRIATE NIOSH/MSHA APPROVED AIR PURIFYING/AIR SUPPLIED RESPIRATOR. AIR SUPPLIED RESPIRATORS SHOULD BE WORN WHEN AIRBORNE CONCENTRATION OF CONTAMIN ANT/OXYGEN CONTENT IS UNKOWN.
Ventilation:
ADEQUATE
Protective Gloves:
N/K
Eye Protection: N/K
Other Protective Equipment: SAFETY GLASSES, CHEMICAL TYPE GOGGLES/FACE SHIELD.
Work Hygenic Practices: REMOVE/DRY CLEAN/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. WASH THOROUGHLY AFTER HANDLING.
Supplemental Health & Safety Information: N/K

Section 9 - Physical & Chemical Properties
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

HCC:
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: Boiling Point Text: N/K
Melting/Freezing Point: Melting/Freezing Text: N/R
Decomposition Point: Decomposition Text: N/K
Vapor Pressure: N/K **Vapor Density:** N/K
Percent Volatile Organic Content:
Specific Gravity: 0.88
Volatile Organic Content Pounds per Gallon:
pH: N/R
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: N/K
Appearance and Odor: LIGHT RED LIQUID W/ADDITIVE ODOR
Percent Volatiles by Volume: N/K
Corrosion Rate: N/K

Section 10 - Stability & Reactivity Data
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Stability Indicator: YES
Materials to Avoid:
STRONG OXIDIZERS & WATER.
Stability Condition to Avoid:
EXTREME TEMPS & OVER HEATING.
Hazardous Decomposition Products:

CO, CO2, ALDEHYDES & KEYTONES/COMPOUNDS OF SULFUR, HYDROGEN SULFIDE & OTHER COMPOUNDS OF SULFUR.
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/K

Section 11 - Toxicological Information
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Toxicological Information:
N/P

Section 12 - Ecological Information
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Ecological Information:
N/P

Section 13 - Disposal Considerations
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Waste Disposal Methods:
DISPOSE OF IAW/FEDERAL, STATE & LOCAL REGULATIONS.

Section 14 - MSDS Transport Information
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Transport Information:
N/P

Section 15 - Regulatory Information
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40

Other Information:
N/P

HAZCOM Label Information

Product Identification: 02191 HAVOLINE FORMULA 3 MOTOR OIL SAE 10W-40
CAGE: OTTJ3
Assigned Individual: Y
Company Name: TEXACO LUBRICANTS
Company PO Box: 4427
Company Street Address1: 4164 E INNSLAKE DR

Company Street Address2: GLEN ALLEN, VA 23060 US
Health Emergency Telephone: 914-831-3400/914-838-7336
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: G
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

100 PPM ISOBUTYLENE IN AIR

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
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Section 1 - Product and Company Identification
100 PPM ISOBUTYLENE IN AIR

Product Identification: 100 PPM ISOBUTYLENE IN AIR
Date of MSDS: 06/04/1989 **Technical Review Date:** 07/28/2000
FSC: NIIN: EMPTY
Submitter: D DG
Status Code: A
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: LIQUID AIR CORP ALPHAGAZ DIVISION
Manufacturer's Address1: 2121 N CALIFORNIA BLVD
Manufacturer's Address2: WALNUT CREEK, CA 94596
Manufacturer's Country: US
General Information Telephone: 510-977-6500
Emergency Telephone: 800-231-1366
Emergency Telephone: 800-231-1366
MSDS Preparer's Name: N/P
Chemtec Telephone: (800)424-9300
Proprietary: N
Reviewed: Y
Published: Y
CAGE: 42568

Contractor Information

Contractor's Name: LIQUID AIR CORP ALPHAGAZ DIVISION
Contractor's Address1: 2121 N CALIFORNIA BLVD
Contractor's Address2: WALNUT CREEK, CA 94596
Contractor's Telephone: 510-977-6500
Contractor's CAGE: 42568

Section 2 - Compositon/Information on Ingredients
100 PPM ISOBUTYLENE IN AIR

Ingredient Name: AIR
Ingredient CAS Number: Ingredient CAS Code: X
RTECS Number: RTECS Code: X
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: UNK
% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: N/P **OSHA PEL Code:**
OSHA STEL: N/P **OSHA STEL Code:**
ACGIH TLV: N/P **ACGIH TLV Code:**
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical:

Ingredient Name: ISOBUTYLENE
Ingredient CAS Number: 115-11-7 **Ingredient CAS Code:** T
RTECS Number: UD0890000 **RTECS Code:** T
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100 PPM
% Enviromental Weight:
Other REC Limits: N/P
OSHA PEL: N/P **OSHA PEL Code:**
OSHA STEL: N/P **OSHA STEL Code:**
ACGIH TLV: N/P **ACGIH TLV Code:**
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity:
DOT Reporting Quantity:
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
100 PPM ISOBUTYLENE IN AIR

Health Hazards Acute & Chronic: AMOUNT OF ISO-BUTYLENE IN MIXTURE SHOULDN'T PRESENT ANY SYMPTOMS OF TOXICITY IF THIS MIXTURE IS BREATHED.AIR IS NONTOXIC & NECESSARY TO SUPPORT LIFE.INHALATION OF AIR IN HIGH PRESSURE ENVIRO-MEN SUCH AS UNDERWATER DIVING,CAISSONS OR HYPERBARIC CHAMBERS CAN RESULT IN SYMPTOMS SIMILAR TO OVEREXPO TO PURE OXYGEN.THESE INCLUDE TINGLING OF FINGERS & TOES,ABNORMAL SENSA-TIONS,IMPAIRED COORDINATION & CON FUSION.DECOMPRESSION SICKNESS PAINS OR BENDS ARE POSSIBLE FOLLOWING RAPID DECOMPRESION.HI PRESSURE EFFECTS(GREATER THAN 2 ATOMOSPHERES OF OXYGEN) ARE ON CENTRAL NERVOUS SYSTEM.IMPROPER DECOMPRESSION R ESULT IN ACCUMU OF NITROGEN IN BLOOD.

Signs & Symptoms of Overexposure:
INHALATION OF AIR IN HIGH PRESSURE ENVIRONMENT SUCH AS UNDERWATER DIVING, CAISSONS OR HYPERBARIC CHAMBERS CAN RESULT IN SYMPTOMS SIMILAR TO OVEREXPOSURE TO PURE OXYGEN. THESE INCLUDE TINGLING OF FINGE RS AND TOES, ABNORMAL SENSATIONS, IMPAIRED COORDINATION & CONFUSION. DECOMPRESSION SICKNESS PAINS OR BENDS ARE POSSIBLE FOLLOIWNG RAPID DECOMPRESSION.

Medical Conditions Aggravated by Exposure:
N/P

LD50 LC50 Mixture: N/P

Route of Entry Indicators:
Inhalation: YES
Skin: N/P
Ingestion: N/P

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: NEITHER ISOBUTYLENE OR AIR ARE LISTED IN IARC, NTP, OR BY OSHA AS A CARCINOGEN OR POTENTIAL CARCINOGEN.

Section 4 - First Aid Measures
100 PPM ISOBUTYLENE IN AIR

First Aid:
FACILITIES OR PRACTICES AT WHICH AIR IS BREATHED IN A HIGH PRESSURE ENVIRONMENT SHOULD BE PREPARED TO DEAL WITH THE ILLNESSES ASSOCIATED WITH DECOMPRESSION (BENDS OR CAISSON DISEASE). DECOMPRESSION EQ UIPMENT MAY BE REQUIRED.

Section 5 - Fire Fighting Measures
100 PPM ISOBUTYLENE IN AIR

Fire Fighting Procedures:
N/A
Unusual Fire or Explosion Hazard:
COMPRESSED AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.
Extinguishing Media:
NONFLAMMABLE GAS.
Flash Point: Flash Point Text: N/A

Autoignition Temperature:
Autoignition Temperature Text: N/P
Lower Limit(s): N/A
Upper Limit(s): N/A

Section 6 - Accidental Release Measures
100 PPM ISOBUTYLENE IN AIR

Spill Release Procedures:
N/A

Section 7 - Handling and Storage
100 PPM ISOBUTYLENE IN AIR

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
100 PPM ISOBUTYLENE IN AIR

Repiratory Protection:
N/A
Ventilation:
N/A
Protective Gloves:
ANY MATERIAL.
Eye Protection: SAFETY GOGGLES OR GLASSES
Other Protective Equipment: SAFETY SHOES.
Work Hygenic Practices: N/P
Supplemental Health & Safety Information: CONTD OTHER INFO:(RUST FORMATION).CONC OF SO2,CL2,SALT,ETC IN THE MOISTURE ENHANCES THE RUSTING OF METALS IN THIS MIXTURE.ADDN RECOMMENDATIONS CONSULT L'AIR LIQUIDE'S ENCYLOPEDIA DE GAZ OR COMPRESSED GAS ASSOC PAMPHLET P-1.

Section 9 - Physical & Chemical Properties
100 PPM ISOBUTYLENE IN AIR

HCC: G3
NRC/State License Number:
Net Property Weight for Ammo:
Boiling Point: =-194.4C, -317.9F **Boiling Point Text:**
Melting/Freezing Point: Melting/Freezing Text: N/A
Decomposition Point: Decomposition Text: N/P
Vapor Pressure: >-220.4F **Vapor Density:** 1.200KG/M3
Percent Volatile Organic Content:
Specific Gravity: N/P
Volatile Organic Content Pounds per Gallon:
pH: N/P
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/P
Solubility in Water: BUNSEN COEFF=.0183
Appearance and Odor: COLORLESS GAS WITH POSSIBLE VERY SLIGHT OLEFINIC ODOR
Percent Volatiles by Volume: N/P
Corrosion Rate: N/P

Section 10 - Stability & Reactivity Data
100 PPM ISOBUTYLENE IN AIR

Stability Indicator: YES
Materials to Avoid:
NONE
Stability Condition to Avoid:
N/A
Hazardous Decomposition Products:
NONE

Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/A

Section 11 - Toxicological Information
100 PPM ISOBUTYLENE IN AIR

Toxicological Information:
HIGH PRESSURE EFFECTS (GREATER THAN 2 ATMOSPHERES OF OXYGEN) ARE ON THE CENTRAL NERVOUS SYSTEM. IMPROPER DECOMPRESSION RESULTS IN THE ACCUMULATIONOF NITROGEN IN THE BLOOD. LIQUID DENSITY AT BOILING PO INT:54.70LB/FT3 (876.21 KG/M3). FREEZING POINT:N/A, BUBBLE POINT AT 1 ATM.=-317.8F (-194.35C).

Section 12 - Ecological Information
100 PPM ISOBUTYLENE IN AIR

Ecological Information:
N/P

Section 13 - Disposal Considerations
100 PPM ISOBUTYLENE IN AIR

Waste Disposal Methods:
N/A

Section 14 - MSDS Transport Information
100 PPM ISOBUTYLENE IN AIR

Transport Information:
COMPRESSED GAS, N.O.S., NONFLAMMABLE GAS, UN 1956.

Section 15 - Regulatory Information
100 PPM ISOBUTYLENE IN AIR

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
100 PPM ISOBUTYLENE IN AIR

Other Information:
CONTD OTHER PRECAUT:PROTECT CYL FROM PHYSICAL DMG.STORE IN COOL DRY WELL-VENTILATED AREA AWAY FROM HEAVILY TRAFFICKED AREAS & EMERGENCY EXITS.DON'T ALLOW TEMP WHERE CYL STORED TO EXCEED 130F(53C).CYL SHOULD BE STORED UPRIGHT & FIRMLY SECURED TO PREVENT FALLING OR BEING KNOCKED OVER.FULL & EMPTY CYL SHOULD BE SEGREGATED.USE A 1ST IN-1ST OUT INVENTORY SYSTEM TO PREVENT FULL CYL BEING STORED FOR EXCE SSIVE PERIODS OF TIME.IF

MIXTURE IS DRY ITS NONCORROSIVE & MAY BE USED W/ALL MATLS OF CONSTRUCTION.MOISTURE CAUSES METAL OXIDES WHICH ARE FORMED W/AIR TO BE HYDRATED SO THAT THEY INCR IN VOLUME &LOSE THEIR PROTECTIVE ROLE(CONTD SUPPLEMENT

HMIS Transportation Information

Product Identification: 100 PPM ISOBUTYLENE IN AIR
Transporation ID Number: 154224
Responsible Party CAGE: 42568
Date MSDS Prepared: 06/04/1989
Date MSDS Reviewed: 07/28/2000
MFN: 07/28/2000
Submitter: D DG
Status Code: A

Container Information

Unit of Issue: NK
Container Quantity: NK
Type of Container:
Net Unit Weight: UNK

Article without MSDS: N
Technical Entry NOS Shipping Number: 100PPM ISOBUTYLENE IN AIR.
Radioactivity:
Form:
Net Explosive Weight:
Coast Guard Ammunition Code:
Magnetism:
AF MMAC Code:
DOD Exemption Number: N/A
Limited Quantity Indicator: N
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: N
Additional Data:
PER MSDS:COMPRESSED GAS N.O.S, NONFLAMMABLE GAS, UN 1956.

Department of Transportation Information

DOT Proper Shipping Name: COMPRESSED GASES, N.O.S.
DOT PSN Code: DQQ
Symbols: G
DOT PSN Modifier:
Hazard Class: 2.2
UN ID Number: UN1956
DOT Packaging Group:
Label: NONFLAMMABLE GAS
Special Provision(s): B13
Packaging Exception:
Non Bulk Packaging: 302,305
Bulk Packaging: 314,315
Maximimum Quanity in Passenger Area: 75 KG

Maximimum Quanity in Cargo Area: 150 KG
Stow in Vessel Requirements: A
Requirements Water/Sp/Other:

IMO Detail Information

IMO Proper Shipping Name: COMPRESSED GAS, N.O.S. o
IMO PSN Code: EQH
IMO PSN Modifier:
IMDG Page Number: 2124
UN Number: 1956
UN Hazard Class: 2(2.2)
IMO Packaging Group: -
Subsidiary Risk Label: -
EMS Number: 2-04
Medical First Aid Guide Number: 620

IATA Detail Information

IATA Proper Shipping Name: COMPRESSED GAS, N.O.S. *
IATA PSN Code: HDO
IATA PSN Modifier:
IATA UN Id Number: 1956
IATA UN Class: 2.2
Subsidiary Risk Class:
UN Packaging Group:
IATA Label: NON-FLAMMABLE GAS
Packaging Note for Passengers: 200
Maximum Quantity for Passengers: 75KG
Packaging Note for Cargo: 200
Maximum Quantity for Cargo: 150KG
Exceptions:

AFI Detail Information

AFI Proper Shipping Name: COMPRESSED GAS, N.O.S.
AFI Symbols: *
AFI PSN Code: HDO
AFI PSN Modifier:
AFI UN Id Number: UN1956
AFI Hazard Class: 2.2
AFI Packing Group: N/A
AFI Label:
Special Provisions: P5
Back Pack Reference: A6.3, A6.5,A6.6

HAZCOM Label Information

Product Identification: 100 PPM ISOBUTYLENE IN AIR
CAGE: 42568
Assigned Individual: N
Company Name: LIQUID AIR CORP ALPHAGAZ DIVISION
Company PO Box:
Company Street Address1: 2121 N CALIFORNIA BLVD
Company Street Address2: WALNUT CREEK, CA 94596 US
Health Emergency Telephone: 800-231-1366
Label Required Indicator: Y
Date Label Reviewed: 07/28/2000
Status Code: A

Manufacturer's Label Number:
Date of Label:
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N
Eye Protection Indicator: YES
Skin Protection Indicator: YES
Respiratory Protection Indicator: NO
Signal Word: CAUTION
Health Hazard: Slight
Contact Hazard: None
Fire Hazard: None
Reactivity Hazard: None

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CORNELL

Material Safety Data Sheets

Division of Facilities Services

DOD Hazardous Material Information (ANSI Format)
For Cornell University Convenience Only

METALLIC MERCURY

Section 1 - Product and Company Identification	Section 9 - Physical & Chemical Properties
Section 2 - Compositon/Information on Ingredients	Section 10 - Stability & Reactivity Data
Section 3 - Hazards Identification Including Emergency Overview	Section 11 - Toxicological Information
Section 4 - First Aid Measures	Section 12 - Ecological Information
Section 5 - Fire Fighting Measures	Section 13 - Disposal Considerations
Section 6 - Accidental Release Measures	Section 14 - MSDS Transport Information
Section 7 - Handling and Storage	Section 15 - Regulatory Information
Section 8 - Exposure Controls & Personal Protection	Section 16 - Other Information

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Section 1 - Product and Company Identification
METALLIC MERCURY

Product Identification: METALLIC MERCURY
Date of MSDS: 06/01/1986 **Technical Review Date:** 02/23/2001
FSC: 6685 **NIIN:** 00-996-6864
Submitter: D DG
Status Code: C
MFN: 01
Article: N
Kit Part: N

Manufacturer's Information

Manufacturer's Name: BETHLEHEM APPARATUS COMPANY INC.
Manufacturer's Address1: 890 FRONT ST.
Manufacturer's Address2: HELLERTOWN, PA 18055
Manufacturer's Country: US
General Information Telephone: 215-838-7034
Emergency Telephone: (215)838-7034
Emergency Telephone: (215)838-7034
MSDS Preparer's Name: N/P
Proprietary: N
Reviewed: N
Published: Y
CAGE: 89399
Special Project Code: N

Item Description

Item Name: GAGE,VACUUM
Item Manager: S9G
Specification Number: NONE
Type/Grade/Class: NOT APPLICABLE
Unit of Issue: EA
Unit of Issue Quantity: 1
Type of Container: GAGE

Contractor Information

Contractor's Name: BETHLEHEM APPARATUS CO
Post Office Box: Y
Contractor's Address1: 890 FRONT ST
Contractor's Address2: HELLERTOWN, PA 18055-1507
Contractor's Telephone: 215-838-7034
Contractor's CAGE: 89399

Section 2 - Compositon/Information on Ingredients
METALLIC MERCURY

Ingredient Name: MERCURY (SARA III)
Ingredient CAS Number: 7439-97-6 **Ingredient CAS Code:** M
RTECS Number: OV4550000 **RTECS Code:** M
=WT: =WT Code:
=Volume: =Volume Code:
>WT: >WT Code:
>Volume: >Volume Code:
<WT: <WT Code:
<Volume: <Volume Code:
% Low WT: % Low WT Code:
% High WT: % High WT Code:
% Low Volume: % Low Volume Code:
% High Volume: % High Volume Code:
% Text: 100.
% Enviromental Weight:

Other REC Limits: N/P
OSHA PEL: S, C, 0.1 MG/M3 **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: S, 0.05 MG/M3; 9192 **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 1 LB
DOT Reporting Quantity: 1 LB
Ozone Depleting Chemical: N

Section 3 - Hazards Identification, Including Emergency Overview
METALLIC MERCURY

Health Hazards Acute & Chronic: ACUTE & CHRONIC : TREMORS, PARALYSIS, LOSS OF MEMORY, CHRONIC RENAL DISEASE, GUM DISEASE, CONSTRICTION OF VISUAL FIELD,MENTAL FATIGUE, IRRITABILITY, EXCITABILITY, HEADACHES, DIGESTIVE DISTURBANCES, LO SS OF APPETITE.

Signs & Symptoms of Overexposure:
SEE HEALTH HAZARDS.

Medical Conditions Aggravated by Exposure:
ALCOHOLISM, CHRONIC KIDNEY DISEASE OR KNOWN ALLERGY TO MERCURY.

LD50 LC50 Mixture: 44 MG/CUM/8 HOUR IHL-MAN TCLO

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Carcenogenicity Indicators
NTP: NO
IARC: NO
OSHA: NO

Carcinogenicity Explanation: N/R

Section 4 - First Aid Measures
METALLIC MERCURY

First Aid:
ALL EMERGENCY OR FIRST AID PROCEDURES SHOULD ONLY BE TAKEN UPON ADVICE FROM A QUALIFIED PHYICIAN, EVEN IF MERCURY IS INGESTED. DO NOT INDUCE VOMITIN.

Section 5 - Fire Fighting Measures
METALLIC MERCURY

Fire Fighting Procedures:
FIREFIGHTERS NEED TO USE A SELF-CONTAINED BREATHING APPARATUS.
Unusual Fire or Explosion Hazard:
MERCURY IS NONFLAMMABLE AND NOHEXPLOSIVE. WHEN EXPOSED TO HIGH

TEMPERATURES DURING A FIRE, THE MERCURY WIL VAPOTIZE AND FORM EXTREMELY TOXIC FUMES.
Extinguishing Media:
USE MEDIA SUITABLE FOR SURROUNDING FIRE.
Flash Point: Flash Point Text: N/R

Autoignition Temperature:
Autoignition Temperature Text: NONE
Lower Limit(s): N/R
Upper Limit(s): N/R

Section 6 - Accidental Release Measures
METALLIC MERCURY

Spill Release Procedures:
CLEAN UP SPILLS IMMEDIATELY, USE VACUUM CLEANERS OR PUMPS DESIGNED FOR MERCURY PICK-UP. AREAS CAN BE WASHED WITH DECONTAMINENT AFTER CLEAN-UP. USE MERCURY ONLY IN AREAS THAT HAVE NON-POROUS FLOORS AND COUNTERS TO FACILITATE CLEAN-UP.

Section 7 - Handling and Storage
METALLIC MERCURY

Handling and Storage Precautions:

Other Precautions:

Section 8 - Exposure Controls & Personal Protection
METALLIC MERCURY

Repiratory Protection:
FOR CONCENTRATIONS BELOW 0.5 MG/CUM A MERCURY VAPOR DUST MASK CAN BE USED. FOR HIGHER CONCENTRATIONS USE CARTRIDGE RESPIRATORS OR A SELF-CONTAINED BREATHING APPARATUS.
Ventilation:
LOCAL EXHAUST AT WORK STATIONS IS RECOMMENDED TO KEEP VAPOR IN THE BREATHING ZONE A MINIMUM.
Protective Gloves:
RUBBER
Eye Protection: SAFETY GLASSES
Other Protective Equipment: USE DISPOSABLE CLOTHING WHENEVER POSSIBLE. SHOES AND BOOTS WORN IN MERCURY AREAS SHOULD BE KEPT THERE AT ALL TIMES.
Work Hygenic Practices: NO EATING, DRINKING OR SMOKING IN MERCURY AREAS. WASH BEFORE EATING, DRINKING OR SMOKING, USE GOOD PERSONAL HYGIENE
Supplemental Health & Safety Information: STORE MERCURY IN SEALED CONTAINERS. USE WATER OR MINERAL OIL OVER MERCURY WHERE NORMAL LIDS OR CAPS CANNOT BE USED.

Section 9 - Physical & Chemical Properties
METALLIC MERCURY

HCC: Z2
NRC/State License Number: N/R
Net Property Weight for Ammo: N/R
Boiling Point: =356.7C, 674.F **Boiling Point Text:**
Melting/Freezing Point: =-38.7C, -38.F **Melting/Freezing Text:**
Decomposition Point: Decomposition Text: N/R
Vapor Pressure: 0.0012 **Vapor Density:** 6.9
Percent Volatile Organic Content:
Specific Gravity: 13.59
Volatile Organic Content Pounds per Gallon:
pH: N/R
Volatile Organic Content Grams per Liter:
Viscosity: N/P
Evaporation Weight and Reference: N/K
Solubility in Water: NEGLIGIBLE
Appearance and Odor: SILVER METALLIC LIQUID,NO ODOR.
Percent Volatiles by Volume: N/K
Corrosion Rate: N/R

Section 10 - Stability & Reactivity Data
METALLIC MERCURY

Stability Indicator: YES
Materials to Avoid:
OXIDIZING ACIDS SUCH AS NITRIC, ACETYLENE, AMMONIA, CHLORINE DIOXIDE, ETHANOL, AND METHYL AZIDE.
Stability Condition to Avoid:
HIGH TEMPERATURES
Hazardous Decomposition Products:
MERCURY DOES NOT DECOMPOSE
Hazardous Polymerization Indicator: NO
Conditions to Avoid Polymerization:
N/R

Section 11 - Toxicological Information
METALLIC MERCURY

Toxicological Information:
N/P

Section 12 - Ecological Information
METALLIC MERCURY

Ecological Information:
N/P

Section 13 - Disposal Considerations
METALLIC MERCURY

Waste Disposal Methods:
DO NOT INCINERATE.RETURN TO RECLAMATION CENTERS.

Section 14 - MSDS Transport Information
METALLIC MERCURY

Transport Information:
N/P

Section 15 - Regulatory Information
METALLIC MERCURY

SARA Title III Information:
N/P
Federal Regulatory Information:
N/P
State Regulatory Information:
N/P

Section 16 - Other Information
METALLIC MERCURY

Other Information:
N/P

HMIS Transportation Information

Product Identification: METALLIC MERCURY
Transporation ID Number: 97303
Responsible Party CAGE: 89399
Date MSDS Prepared: 06/01/1986
Date MSDS Reviewed: 02/23/2001
MFN: 02/23/2001
Submitter: D DG
Status Code: C

Container Information
- **Unit of Issue:** EA
- **Container Quantity:** 1
- **Type of Container:** GAGE
- **Net Unit Weight:** UNKNOWN

Article without MSDS: N
Technical Entry NOS Shipping Number:
Radioactivity:
Form:
Net Explosive Weight: N/P
Coast Guard Ammunition Code:
Magnetism: N/P
AF MMAC Code:
DOD Exemption Number: N/A
Limited Quantity Indicator: N
Multiple Kit Number: 0
Kit Indicator: N
Kit Part Indicator: N
Review Indicator: Y
Additional Data:

NOT REGULATED FOR WATER TRANSPORT FOR MNFR ARTICLES OR INSTRUMENTS CONTAINING UP TO AND INCLUDING 1K G(2.2LBS)MERCURY METAL IMDG CODE P.8182.

Department of Transportation Information

DOT Proper Shipping Name: MERCURY
DOT PSN Code: IZP
Symbols: A
DOT PSN Modifier: CONTAINED IN MANUFACTURED ARTICLES
Hazard Class: 8
UN ID Number: UN2809
DOT Packaging Group: III
Label: CORROSIVE
Special Provision(s):
Packaging Exception:
Non Bulk Packaging: 164
Bulk Packaging: NONE
Maximimum Quanity in Passenger Area: NO LIMIT
Maximimum Quanity in Cargo Area: NO LIMIT
Stow in Vessel Requirements: B
Requirements Water/Sp/Other: 40,97

IMO Detail Information

IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO PSN Modifier:
IMDG Page Number: N/R
UN Number: N/R
UN Hazard Class: N/R
IMO Packaging Group: N/R
Subsidiary Risk Label: N/R
EMS Number: N/R
Medical First Aid Guide Number: N/R

IATA Detail Information

IATA Proper Shipping Name: MERCURY CONTAINED IN MANUFACTURED ARTICLES
IATA PSN Code: QBQ
IATA PSN Modifier:
IATA UN Id Number: 2809
IATA UN Class: 8
Subsidiary Risk Class:
UN Packaging Group: III
IATA Label: CORROSIVE
Packaging Note for Passengers: SEE 805
Maximum Quantity for Passengers: SEE 805
Packaging Note for Cargo: SEE 805
Maximum Quantity for Cargo: SEE 805
Exceptions: A48, A69

AFI Detail Information

AFI Proper Shipping Name: MERCURY CONTAINED IN MANUFACTURED ARTICLES
AFI Symbols:
AFI PSN Code: PYK
AFI PSN Modifier:
AFI UN Id Number: UN2809

AFI Hazard Class: 8
AFI Packing Group: I
AFI Label:
Special Provisions: P5
Back Pack Reference: A12.10

HAZCOM Label Information

Product Identification: METALLIC MERCURY
CAGE: 89399
Assigned Individual: N
Company Name: BETHLEHEM APPARATUS CO
Company PO Box: Y
Company Street Address1: 890 FRONT ST
Company Street Address2: HELLERTOWN, PA 18055-1507 US
Health Emergency Telephone:
Label Required Indicator: Y
Date Label Reviewed: 12/16/1998
Status Code: C
Manufacturer's Label Number:
Date of Label: 12/16/1998
Year Procured: N/K
Organization Code: F
Chronic Hazard Indicator: N/P
Eye Protection Indicator: N/P
Skin Protection Indicator: N/P
Respiratory Protection Indicator: N/P
Signal Word: N/P
Health Hazard:
Contact Hazard:
Fire Hazard:
Reactivity Hazard:

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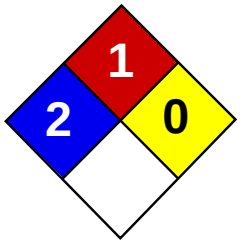

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Selenium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Selenium

Catalog Codes: SLS2629

CAS#: 7782-49-2

RTECS: VS7700000

TSCA: TSCA 8(b) inventory: Selenium

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Se

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
Selenium	7782-49-2	100

Toxicological Data on Ingredients: Selenium: ORAL (LD50): Acute: 6700 mg/kg [Rat].

Section 3: Hazards Identification

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

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: Not available.

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: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not available.

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:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion.

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:
Use a shovel to put the material into a convenient waste disposal container. 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:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes 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.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

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:
TWA: 0.2 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 78.96 g/mole

Color: Not available.

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

Boiling Point: 684.9°C (1264.8°F)

Melting Point: 217°C (422.6°F)

Critical Temperature: Not available.

Specific Gravity: 4.81 (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.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 6700 mg/kg [Rat].

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

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 6.1: Poisonous material.

Identification: : Selenium powder : UN2658 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Selenium Massachusetts RTK: Selenium TSCA 8(b) inventory: Selenium SARA 313 toxic chemical notification and release reporting: Selenium CERCLA: Hazardous substances.: Selenium

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

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

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: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:24 PM

Last Updated: 11/01/2010 12:00 PM

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ATTACHMENT D

Standard Safe Work Practices

1) Eating, drinking, chewing tobacco, smoking and carrying matches or lighters is prohibited in a contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.

2) Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.).

3) All field crew members should make use of their senses to alert them to potentially dangerous situations in which they should not become involved; i.e., presence of strong and irritating or nauseating odors.

4) Prevent, to the extent possible, spills. In the event that a spillage occurs, contain liquid if possible.

5) Field crew members shall be familiar with the physical characteristics of investigations, including:
   - Communication
   - Hot zone (areas of known or suspected contamination)
   - Site access
   - Nearest water sources

6) All wastes generated during activities on-site should be disposed of as directed by the project manager or his on-site representative.

7) Employees shall follow procedures to avoid at-risk behaviors that could result in an incident.