CHAPTER 11. HAZARDOUS MATERIALS

11.1 INTRODUCTION

11.1.1 CONTEXT

Each of the Twin Towers was struck on September 11 by an airline jet hijacked by terrorists. Within hours, the Twin Towers collapsed onto the World Trade Center (WTC) Site and surrounding areas, causing massive death and devastation in Lower Manhattan. The collapse of the Twin Towers resulted in the release of hazardous materials into air, nearby buildings, soil, and groundwater. Search and rescue efforts began immediately and recovery efforts continued until June 30, 2002. Under the Federal Emergency Management Agency (FEMA) mission assignments, the U.S. Environmental Protection Agency (EPA), New York State Department of Environmental Conservation (NYSDEC), and New York City Department of Environmental Protection (NYCDEP) immediately began assessing the hazardous materials impacts and developed a response to protect public health and the environment.

The EPA, supported by the U.S. Coast Guard, assumed lead responsibility for the collection and disposal of hazardous materials at the WTC Site and in the surrounding area. During the response, the EPA performed ambient environmental monitoring activities to assess health risks for the workers and for those who work and live in Lower Manhattan. As the rescue and recovery continued, federal, state, and city agencies took action to clean many of the streets, sidewalks, façades, and rooftops in the surrounding area that may have been impacted by the release of hazardous materials. Cleanup activities continue with the EPA testing and cleaning residential spaces and the NYCDEP cleaning building exteriors.

This chapter examines hazardous materials that may be found in soil and groundwater, building materials, and in air. Hazardous materials are commonly found in the soil and groundwater in urban environments. Soils typically exhibit impacts such as metals and polycyclic aromatic hydrocarbons (PAHs) from the placement of fill and deposition of vehicle emissions. Some hazardous materials are transported through groundwater, and groundwater quality in an urban environment may be degraded from sources that are not located near or associated with the area being evaluated. These impacts to soil and groundwater are not generally subject to remediation requirements; however, measures to prevent exposure to workers, the general public and the environment during construction activities are frequently employed during construction.

Currently, the Project Site consists of previously disturbed and developed areas, including paved surfaces and buildings. The eastern portion of the WTC Site also contains unpaved surfaces due to the importation of fill material to grade the site during cleanup operations. Irrespective of the current conditions, the soil and groundwater underlying the Project Site also have the potential for contamination due to historic usage, and asbestos-containing materials (ACMs), lead-based paint (LBP), and mold may be present in building materials. Contamination from off-site petroleum releases also has the potential to impact soil and groundwater at the Project Site, and impact the construction activities.

This chapter considers the presence of hazardous materials that may affect or be affected by the Proposed Action, including hazardous materials that may have been released or created as a result of the events of September 11. The analyses focus on the portions of the Project Site where proposed construction activities would occur, including excavation of soil or dewatering, demolition, and construction techniques since hazardous materials would be identified prior to or during construction, and would be abated, managed, or remediated prior to or during construction (see Chapter 1, "Project Description").

Potential sources of hazardous materials are identified and would be remediated prior to or during construction, thus reducing the potential for significant adverse impacts to public health and the environment during both the construction and operational phases of the Proposed Action.

11.1.2 CONCLUSIONS

The evaluation of hazardous materials at the Project Site revealed that no significant adverse impacts related to hazardous materials are anticipated due to the Proposed Action. Hazardous materials identified at the Project Site include PAHs and metals in soil, asbestos and dust from the events of September 11 adhered to the surfaces of structures and low concentrations of volatile organic compounds (VOCs) present in groundwater. During construction they would be managed or isolated to protect public health and the environment. Construction measures, including the implementation of site-specific Health and Safety Plans (HASPs), dust control measures, contaminated soil and groundwater management plans, and abatement of hazardous building materials prior to construction, would aid in the avoidance of adverse health impacts to workers and the general public. Because hazardous materials would be abated, managed or remediated during construction, no significant adverse impacts are expected during either the construction or operational phases of the Proposed Action.

In connection with the acquisition of 130 Liberty Street as part of the Proposed Action, further testing for hazardous materials would be conducted at the site, contaminated dust, debris and materials would be removed from the building on that site, and the building would be deconstructed. The deconstruction plan would provide site-specific protocols to be followed during the removal of any contaminated dust, debris, and materials from the interior of the building. Although it is not anticipated that the building would contain structural ACM or hazardous concentrations of contaminants, materials within the building would be evaluated further and disposed of in accordance with all applicable federal, state, and local regulations. In addition, a site-specific HASP would also be implemented at all times.

11.2 METHODOLOGY

To assess the potential for adverse impacts from contaminated areas, the type and extent of contaminants that may be disturbed during construction are evaluated in this chapter. Construction activities are considered with respect to those contaminants in order to assess potential risks to public health and the environment. This assessment is based on a review of the degree of toxicity of the contaminants, the likelihood of exposure for workers and the public, and the potential extent of exposure. Additionally, actions that would reduce or mitigate exposure are identified. *The hazardous materials assessment considers the probable impacts of the Proposed Action relative to the Current Conditions Scenario, rather than the Pre-September 11 Scenario. The assessment was performed in this manner since hazardous materials currently at the Project Site would require management during the construction and*

operational phases of the Proposed Action, irrespective of whether they were present before or after September 11.

11.2.1 HAZARDOUS MATERIALS SCREENING STUDY

To perform the evaluation, a Hazardous Materials Screening Study (HMSS) of the Project Site was completed. The HMSS consisted of the following tasks:

- Review of the Project Site's physical setting, including topography, geology, and groundwater conditions;
- Review of the Project Site's historical use through the examination of historic fire insurance maps, aerial photographs, United States Geological Survey (USGS) topographic maps, and prior reports prepared for nearby projects;
- Reconnaissance of the Project Site;
- Review of regulatory agency correspondence and reports pertaining to the post-September 11 cleanup operations; and
- Review of federal and state regulatory databases and records.

The HMSS revealed the potential for hazardous material impacts to subsurface soil and groundwater; dust and materials generated from the events of September 11; asbestos, lead-based paints, polychlorinated biphenyls (PCBs); and mold.

11.2.2 ENVIRONMENTAL *SAMPLING* PLAN

To determine the presence of contaminants identified by the HMSS as possibly impacting the Proposed Action, an Environmental Sampling Plan was developed and implemented (see Figure 11-1 and Appendix D). The Environmental Sampling Plan included the following:

- *Geophysical Survey*—to identify subsurface utilities or structures that may interfere with investigation activities or be potential sources of contamination.
- *Surficial and Subsurface Soil Sampling and Analyses*—to assess physical and chemical characteristics of representative samples of soil that would be excavated from: eastern portion of the WTC Site; Cedar Street and intersection of Washington and Albany Streets rights-of-way; a portion of 140 Liberty Street; and the northern portion of 130 Liberty Street. Surficial soil samples were collected from the eastern portion of the WTC Site, from former grade at 140 Liberty Street, and at former grade at the intersection of Washington and Albany Streets. The surficial soil sampling locations were selected to characterize soils that may have been impacted by the events of September 11 or previously contaminated and that are expected to be excavated and disposed of as a result of the Proposed Action. Since the Proposed Action does not include excavation in the western portion of the WTC Site, no surficial or subsurface soil samples were collected.
- *Groundwater Sampling and Analyses*—to assess physical and chemical characteristics of groundwater present at: eastern portion of the WTC Site; Cedar Street and intersection of Washington and Albany Streets rights-of-way; and the northern portion of 130 Liberty Street.

- *Dust and Material Sampling and Analyses*—to assess physical and chemical characteristics of pollutants potentially deposited in the eastern portion of the WTC Site as a result of the events of September 11.

SOIL AND GROUNDWATER ANALYSES

Figure 11-2 presents the soil and groundwater sampling locations and Figure 11-3 presents the dust and material sampling locations. The results of the sampling and analyses were compared to the regulatory limits and regulations (refer to section 11.2.3) and industry standards to assess the need for, and type of, mitigation measures during both the construction and operational phases.

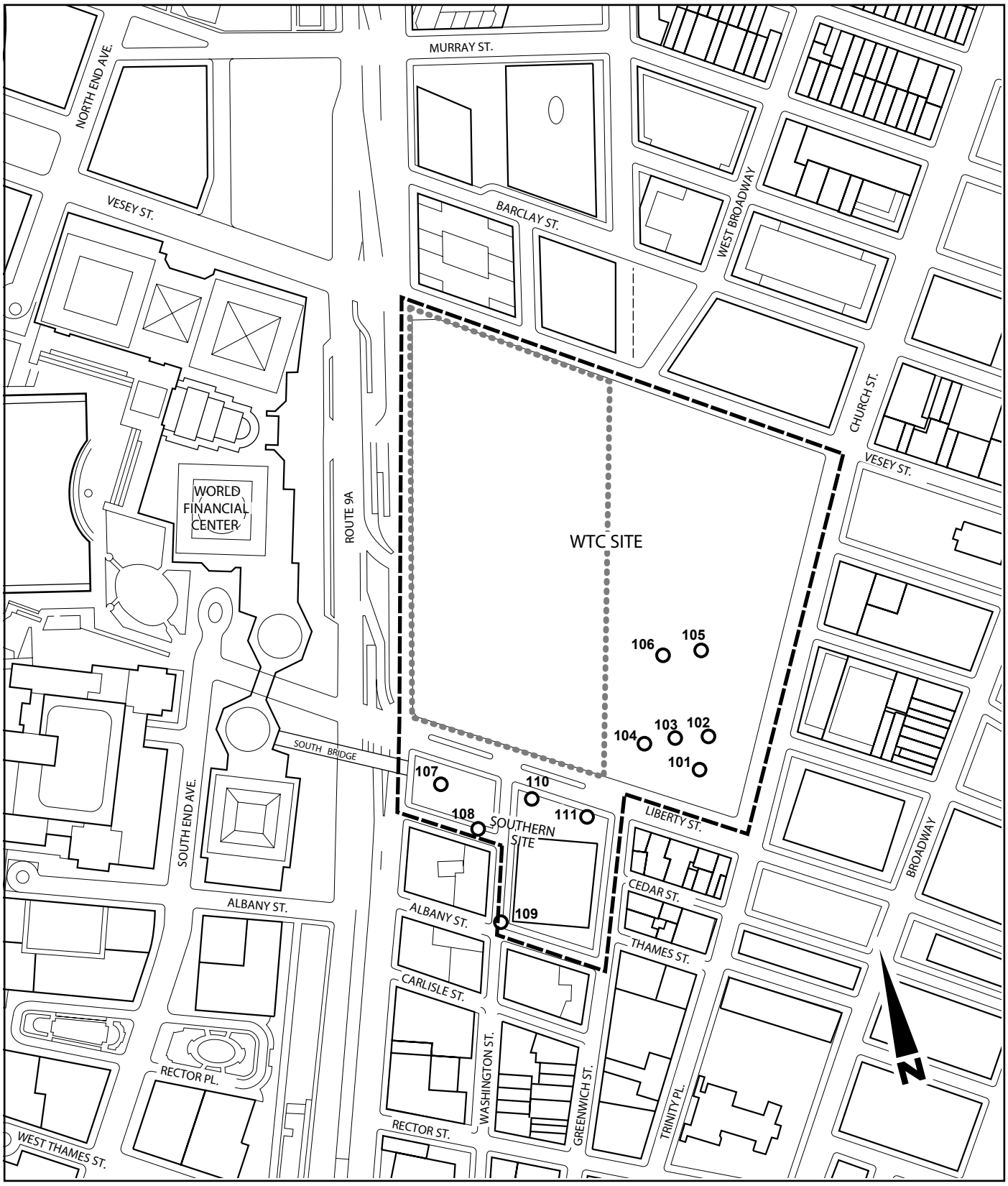
The soil and groundwater beneath and adjacent to the Project Site may contain contaminants associated with historical uses. Contaminants, such as petroleum products, may have been released during surface spills or from leaking petroleum storage tanks. Others, such as PAHs, metals, and/or PCBs may have resulted from coal usage and train maintenance and operational activities at the former railroad terminus located along Church Street. *To provide a thorough evaluation of soil and groundwater conditions at the Project Site, a wide range of contaminants of concern was developed and tested. Even in the absence of releases or historic usage, many contaminants are commonly found in urban environments at concentrations that may exceed the NYSDEC and EPA standards. It should be noted that not all of these contaminants are present at the Project Site; however*, the characteristics of these contaminants are presented below:

- Metals, including arsenic, cadmium, chromium, cobalt, lead, mercury, selenium, and silver. Metals were used in smelting, foundries, and metal works, and can be present in paint, ink, petroleum products, coal ash, and mechanical waste fluids. Vanadium and sulfur may be present in conjunction with spills of heavy oils, such as No. 6 fuel oil. Metals can be toxic at elevated concentrations.
- Volatile organic compounds (VOCs). These include aromatic compounds such as benzene, toluene, ethylbenzene, and xylenes, which are found in petroleum products; and, chlorinated compounds, such as trichloroethene and tetrachloroethene, common ingredients in solvents and commercial cleansers. Inhaling VOC vapors can be hazardous, and some VOCs are flammable if the circumstances are suitable for combustion.
- Semi-volatile organic compounds (SVOCs). These include PAHs, which are common constituents of partially combusted coal or petroleum-derived products, such as waste oils, creosote, coal and coal ash, wood ash, and asphalt. Exposure to SVOCs can result in health risks.
- PCBs are commonly found in the dielectric fluid associated with electrical transformers and feeder cables, and are often associated with electrical substations and train yards.

In addition to metals, VOCs, SVOCs, and PCBs, dust, and materials released from the collapse of the Twin Towers were suspected of containing asbestos, fiberglass, silica, dioxins, and pesticides. The source of these materials is discussed in the next section.

DUST AND MATERIALS ANALYSES

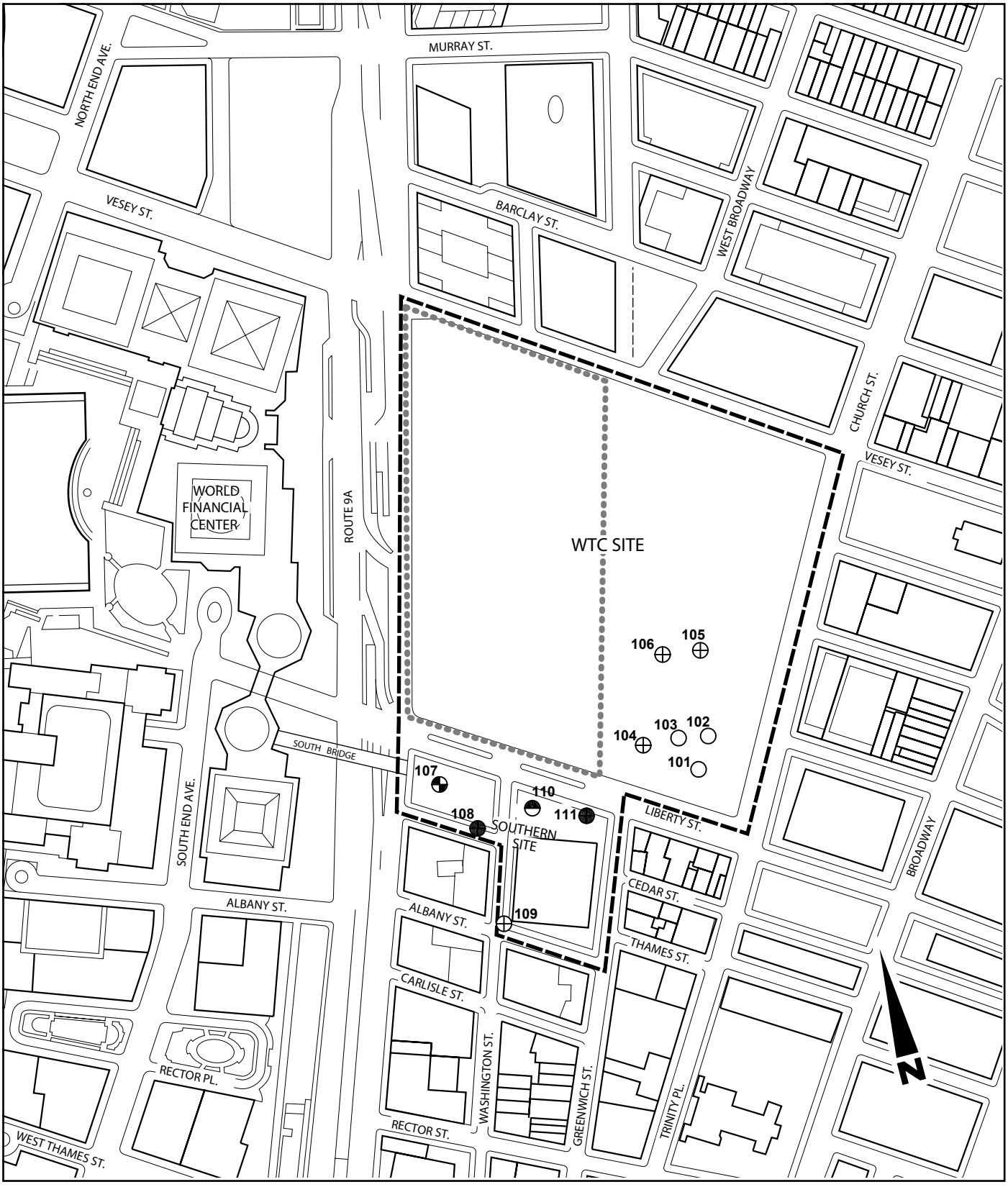
Laboratory testing by the EPA of dust and materials generated by the events of September 11 indicated that these materials potentially contained contaminants such as asbestos, fiberglass, silica, VOCs and SVOCs, dioxins, PCBs, pesticides, and metals, including mercury. The



World Trade Center Memorial
and Redevelopment Plan

Soil Boring Locations

Figure 11-1



Project Site

Slurry Wall

Surficial Soil Samples

Surficial Soil, Subsurface Soil, and Groundwater Samples

Surficial and Subsurface Soil Samples

Subsurface Soil Samples

Subsurface Soil and Groundwater Samples

0 200 400 FEET

SCALE

World Trade Center Memorial
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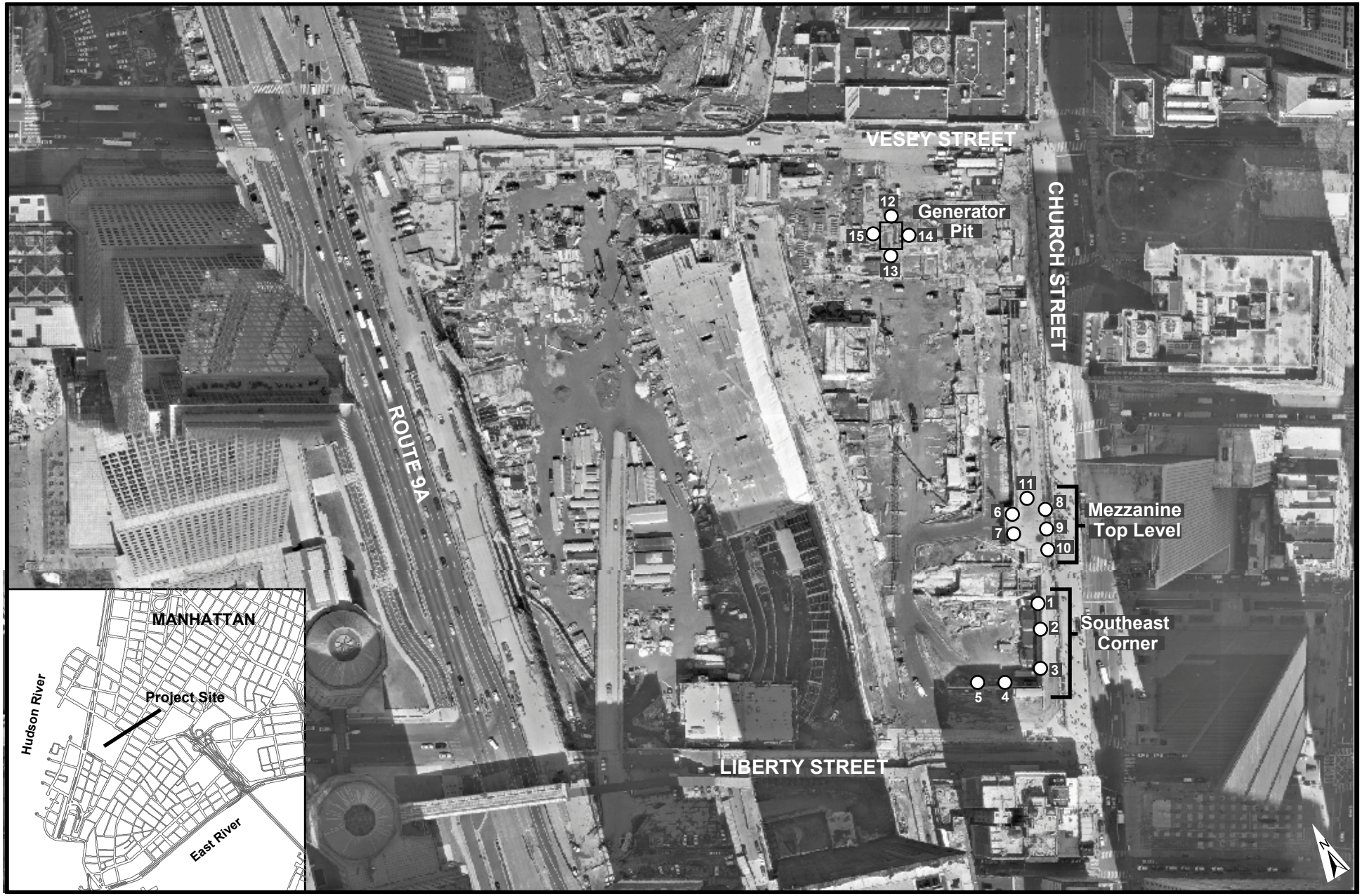
Sample Location Plan

Figure 11-2



World Trade Center Memorial
and Redevelopment Plan

Dust and Material Sampling Locations
Fig. 11-3

suspected sources of these materials are related to the presence of traditional building structural and finishing materials, and mechanical systems known to be on-site prior to the events of September 11.

Asbestos may be present as a result of the destruction of materials comprising original structural spray-on fireproofing and pipe insulation. Fiberglass related to original fiberglass insulation may also be present. Silica (total quartz) is a component of concrete that may have been deposited in the Project Site. VOCs, SVOCs, dioxins, and metals are associated with the combustion of building materials including support structures, office equipment, partitions, and carpeting. PCBs may be present from electrical transformers, electrical feeder cables, hydraulic oil, and fluorescent light ballasts manufactured prior to 1978. Pesticides have been reported in the literature as being present on site, and as such have been included in this investigation.

ASBESTOS AND LEAD-BASED PAINTS SURVEY

Asbestos is a silicate mineral that has been separated into commercially usable fibers and ACMs are any materials that contain more than 1 percent asbestos. Building materials used in the construction of existing buildings, as well as insulated steam pipes present beneath some of the city's streets, may contain asbestos. Asbestos fibers are potentially harmful if they become airborne and are inhaled. EPA prohibited the use of asbestos in spray-on fire proofing in 1972 and in thermal insulation in 1978. In addition, normally non-friable asbestos-containing products that are typically stable may be damaged during the abatement process, and will be considered friable ACM thereafter. *Damaged building materials that contain asbestos may release asbestos fibers that contaminate other materials.* The use of lead-based paint in residences was banned by the Consumer Products Safety Commission in 1978 and by New York City in 1960. Prior to these dates, the use of asbestos and lead-based paint was common in New York City. It has been determined that dust from lead-based paints may cause potential learning disorders and other adverse health effects when inhaled or ingested.

A visual preliminary survey for ACM of selected remaining, below-grade areas of the WTC Site was completed.

MOLD

Molds (fungi) are ubiquitous in indoor and outdoor environments. When building materials are water damaged or are in areas of elevated humidity, they have the potential to become reservoirs of moisture, which can result in elevated concentrations fungi. The most common symptoms of fungal exposure are upper respiratory symptoms including runny nose, cough, congestion, eye irritation, and aggravation of asthma. Although there is evidence documenting severe health effects of fungi in humans, the vast majority of this evidence was gathered by studying the ingestion of contaminated foods (i.e., grain and peanut products) and occupational exposures in agricultural settings where inhalation exposures were high. Many fungi (e.g., species of stachybotrys, aspergillus, penicillium, fusarium, trichoderma, and memnoniella) have the ability to produce potent mycotoxins. Mycotoxins are fungal metabolites that have been identified as potential "toxic agents" which have the ability to elicit these health effects in susceptible individuals. (EPA and NYCDOH).

11.2.3 REGULATORY LIMITS AND REGULATIONS

The Federal Occupational Safety and Health Administration (OSHA) has established permissible exposure limits for concentrations of dust containing contaminants and for levels of certain chemical vapors in the air. Other agencies, such as the NYCDEP, NYSDEC, and EPA, have established enforceable criteria for concentrations of various chemical compounds in different uses. Some formal guidance documents have been developed for various uses. These standards and reference values are generally based on the risks associated with routes of exposure, such as direct contact (ingestion, inhalation, or dermal contact) or the use of groundwater as a source of drinking water. Relevant standards and guidelines are summarized below. These include federal hazardous waste regulations, soil reference values promulgated by New York State agencies, New York State groundwater standards, and relevant regulations, standards, and guidelines for the removal of fuel storage tanks, asbestos, lead-based paint, and mold.

SOIL AND GROUNDWATER

Hazardous Waste Regulations

As defined by the Federal Resource Conservation and Recovery Act (RCRA), solid waste (e.g., excavated soil or building materials removed during demolition activities) can be classified as "hazardous waste" if it is one of the federal "listed wastes" or it possesses one of four hazardous characteristics ("D" wastes): ignitability, reactivity, corrosivity, or toxicity. The EPA has developed standard tests to measure these four characteristics. Three tests measure physical characteristics—ignitability, reactivity, and corrosivity—using numerical standards. The fourth, toxicity, the one most frequently exceeded by contaminated soils, is tested using the Toxicity Characteristic Leaching Procedure (TCLP), which provides a conservative estimate of the concentrations of contaminants that would leach into the groundwater if the material were disposed of in an environmentally unsecured landfill. The RCRA toxicity characteristic regulatory limits are listed in Table 11-1.

Contaminated Soils

NYSDEC's Division of Hazardous Waste Remediation issued Technical and Administrative Guidance Memorandum (TAGM) #4046, "Determination of Soil Cleanup Objectives and Cleanup Levels," in January 1994 (amended in December 2000). TAGM #4046 addresses contaminants in soil from any potential source, includes guidance values for chemicals of concern and establishes Recommended Soil Cleanup Objectives (RSCOs).

Water Standards and Regulations

The NYSDEC has promulgated drinking water standards and uses them as reference values for groundwater. These potable groundwater standards (also known as Class GA Standards) are among the most stringent in the nation. Although these standards are intended for public drinking water supplies, they are generally applied by NYSDEC to other nonsaline groundwater and are also used to evaluate overall water quality. New York State has also established the State Pollutant Discharge Elimination System (SPDES), which includes permit requirements and effluent limitations for wastewater discharges to the waters of the State. In addition, NYCDEP's Bureau of Wastewater Pollution Control has regulations limiting the concentrations of certain materials in waters discharged into the municipal sewer system. NYCDEP's regulations are based, for the most part, on the effect of the contaminants on the receiving waters or treatment plant and, prior to discharging to the sewer, a permit is required.

Table 11-1
RCRA Toxicity Characteristic Regulatory Limits

Volatile Organics	mg/l	Pesticides	mg/l
Benzene	0.5	Chlordane	0.03
Carbon Tetrachloride	0.5	Endrin	0.02
Chlorobenzene	100.0	Heptachlor	0.008
Chloroform	6.0	Heptachlor epoxide	0.008
1,2 Dichloroethane	0.5	Lindane	0.4
1,1 Dichloroethylene	0.7	Methoxychlor	10.0
Methyl ethyl ketone	200.0	Toxaphene	0.5
Tetrachloroethylene	0.7	**Herbicides**	**mg/l**
Trichloroethylene	0.5	2,4-D (Dichlorophenoxyacetic acid)	10.0
Vinyl chloride	0.2	2,4,5-TP (Silvex)	1.0
Acid Extractables	**mg/l**	**Metals**	**mg/l**
Ortho-cresol	200.0	Arsenic	5.0
Meta-cresol	200.0	Barium	100.0
Para-cresol	200.0	Cadmium	1.0
Cresol	200.0	Chromium	5.0
Pentachlorophenol	100.0	Lead	5.0
2,4,5-Trichlorophenol	400.0	Mercury	0.2
2,4,6- Trichlorophenol	2.0	Selenium	1.0
		Silver	5.0
Base Neutrals	**mg/l**	**Physical Characteristics**	
1,4 Dichlorobenzene	7.5	Ignitability (ºF)	140
2,4 Dinitrotoluene	0.13	Corrosivity (pH units)	2.0 – 12.5
Hexachlorobenzene	0.13	Reactivity to cyanide (mg/l)	250
Hexachlorobutadiene	0.5	Reactivity to sulfide (mg/l)	500
Hexachloroethane	3.0		
Nitrobenzene	2.0		
Pyridine	5.0		

Note: mg/l = milligrams per liter in leachate generated from toxicity characteristic leaching procedure.
Source: 40 CFR § 261

Petroleum Storage Tanks

The removal of petroleum storage tanks is regulated by NYSDEC under 6 NYCRR § 613.9, which requires that tanks no longer in use be closed in place or removed. Contaminated soils surrounding the tanks, separate phase product on the water table, or contaminants dissolved in the ground water must be remediated (6 NYCRR § 611.6).

Asbestos-Containing Building Materials (ACM)

Prior to building demolition, which has the potential to impact ACM, the proper removal and disposal of such material would be performed in accordance with the requirements under 12 NYCRR-Part 56 Asbestos. As part of their customary practice, the Port Authority of New York and New Jersey (the Port Authority) also would perform the work in accordance with the requirements of NYCDEP Title 15.

Lead-Based Paints

Surfaces coated with lead-based paints require proper removal of the paint prior to disturbance that would generate lead-containing dust or vapors. Lead dust could be generated through mechanical processes (e.g., scraping, demolition, scarification, etc.) that disturb surfaces coated with lead-based paint (e.g., plaster, brick, etc.). Lead fumes may be generated through the heating of materials that are coated with lead-based paint, such as structural steel.

In all cases, an exposure assessment would be performed to determine whether lead exposure would be likely to occur. If the exposure assessment indicates the potential to generate airborne dust or fume lead levels exceeding health-based standards, a higher personal protection equipment standard would be employed to counteract the exposure. In addition, a different application of work practices may be required to protect workers and the public.

Polychlorinated Biphenyls (PCBs)

Suspect PCB-containing equipment would be surveyed and evaluated prior to building demolition or utility relocation. PCB-containing equipment that will be disturbed by the work would be removed and disposed of in accordance with applicable federal, state, and local regulations.

Mold

Suspect mold impacted materials would be surveyed and evaluated prior to building demolition. Mold-impacted materials would be abated prior to demolition and moisture sources for future mold growth would be eliminated during construction. During the operational phase, building management practices would monitor indoor air quality and conditions to prevent mold from occurring.

Dust and Materials

Surfaces containing residual dust or materials containing pollutants would be surveyed and evaluated prior to demolition activities. Depending on the nature of the contaminants, residual dust on structures to be demolished would be removed *through cleaning* or managed during demolition activities.

11.3 PROJECT SITE

The Project Site includes the WTC Site and the *Southern* Site. The WTC Site is an approximately 16-acre parcel bounded by Liberty Street, Church Street, Vesey Street, and Route 9A. The Southern Site comprises two adjacent blocks south of the WTC Site—one bounded by Liberty, Washington, Albany, and Greenwich Streets, and the other bounded by Liberty, Cedar, and Washington Streets and Route 9A—and portions of two streets: Liberty Street between those blocks and the WTC Site and Washington Street between Cedar and Liberty Streets. Figure 11-1 presents the Project Site and vicinity.

11.3.1 GEOLOGY

The geology of the Project Site consists of surficial, unconsolidated deposits of the Holocene and Pleistocene Epochs that overlie Early to Middle Cambrian crystalline bedrock. The general soil profile expected includes a stratum of fill underlain by glacial sand, varved silt, glacial till,

and bedrock. Based on historic land maps, the Project Site is within the limits of the original shorelines of Manhattan Island. Therefore, the presence of organic soil deposits may be discontinuous and infrequent.

SURFICIAL GEOLOGY

Surficial deposits in the Project Site consist of Holocene deposits overlying sediments associated with the most recent glacial advance in the region—Upper Pleistocene glaciers of the Wisconsin stage. New York County was subjected to multiple stages of glaciation during the Pleistocene Epoch and Wisconsin Glacial Age, which occurred approximately 10,000 to 15,000 years ago. The advance and retreat of the Wisconsin ice sheet deposited a variety of sediments over the bedrock in the Project Site. These unconsolidated formations are primarily comprised of ground moraine (till) and, in some areas, stratified glacial drift deposits. Soil boring logs provided by the Port Authority reveal that ground moraine, boulder zones, sand and gravel, and clay deposits overlie bedrock in the Project Site. The expected Glacial Sand stratum underlying the fill is a glacial lake deposit and typically consists of fine sands and silts. It may range in thickness from 25 to 50 feet, extending to a maximum depth of 70 feet below grade.

Subsequent to glaciation, a tidal marsh depositional environment resulted in the deposition of organic silts, clays, and sands overlying glacial sediments. This tidal marsh material may include peat and plant matter.

As early as the 1700s, the native tidal marshes in the region were systematically filled for purposes of urban development. The Project Site is, therefore, expected to include areas of artificial fill, underlying impervious surfaces such as concrete and asphalt. Soil boring logs reveal that soils beneath the Project Site consist of fill material and glacial deposits. The fill ranges in thickness from 0 to 20 feet and is characterized as containing sand, silt, clay, gravel, stone, macadam, "river mud," ash, cinders, and brick.

BEDROCK GEOLOGY

In the Project Site, crystalline bedrock is expected to be present approximately 70 to 100 feet below grade and consists of Manhattan Schist autochthonous member C, which is Early to Middle Cambrian in age. The Manhattan Schist is a gray, medium- to coarse-grained, layered schist and thin-banded gneiss that has been severely crumpled and folded and shows a marked foliation. Some foliation surfaces have lustrous white mica (Baskerville, 1989 and Perlmutter, 1953).

The Manhattan Schist is comprised of kyanite, biotite, muscovite, and sillimanite and the gneiss contains quartzofeldspathic bands alternating with biotite- and muscovite-bearing bands. The unit is interlayered with schist containing quartz, biotite, plagioclase, garnet, tourmaline, and gneiss having layers of black amphibolite, which is 3 or more feet thick. The sillimanite occurs as lenses and nodules, commonly with kyanite and also with magnetite or quartz. Locally, the Manhattan Schist contains magnetite abundant enough to affect compass readings (Baskerville, 1989 & New York State Museum and Science Service, 1970). Structural elements in the formation include joints, irregular fractures, and faults (Perlmutter, 1953).

SOILS

Most of the ground cover in the Project Site is classified as urban land, consisting of fill material and impervious surfaces. Natural soils underlying fill and impervious surfaces are derived from the glacial overburden.

U.S. Department of Agriculture soil surveys do not exist for New York County. The Natural Resources Conservation Service (NRCS) of the Department of Agriculture is currently conducting a Reconnaissance Soil Survey of New York City. In this ongoing work, NRCS has described general soil patterns and described basic soil types in New York County. These include fill soils, glacial outwash soils, and glacial till soils. Soil series are being identified for anthropogenic soils for the New York City Soil Survey. Available soils data provided by NRCS is subject to change.

GROUNDWATER

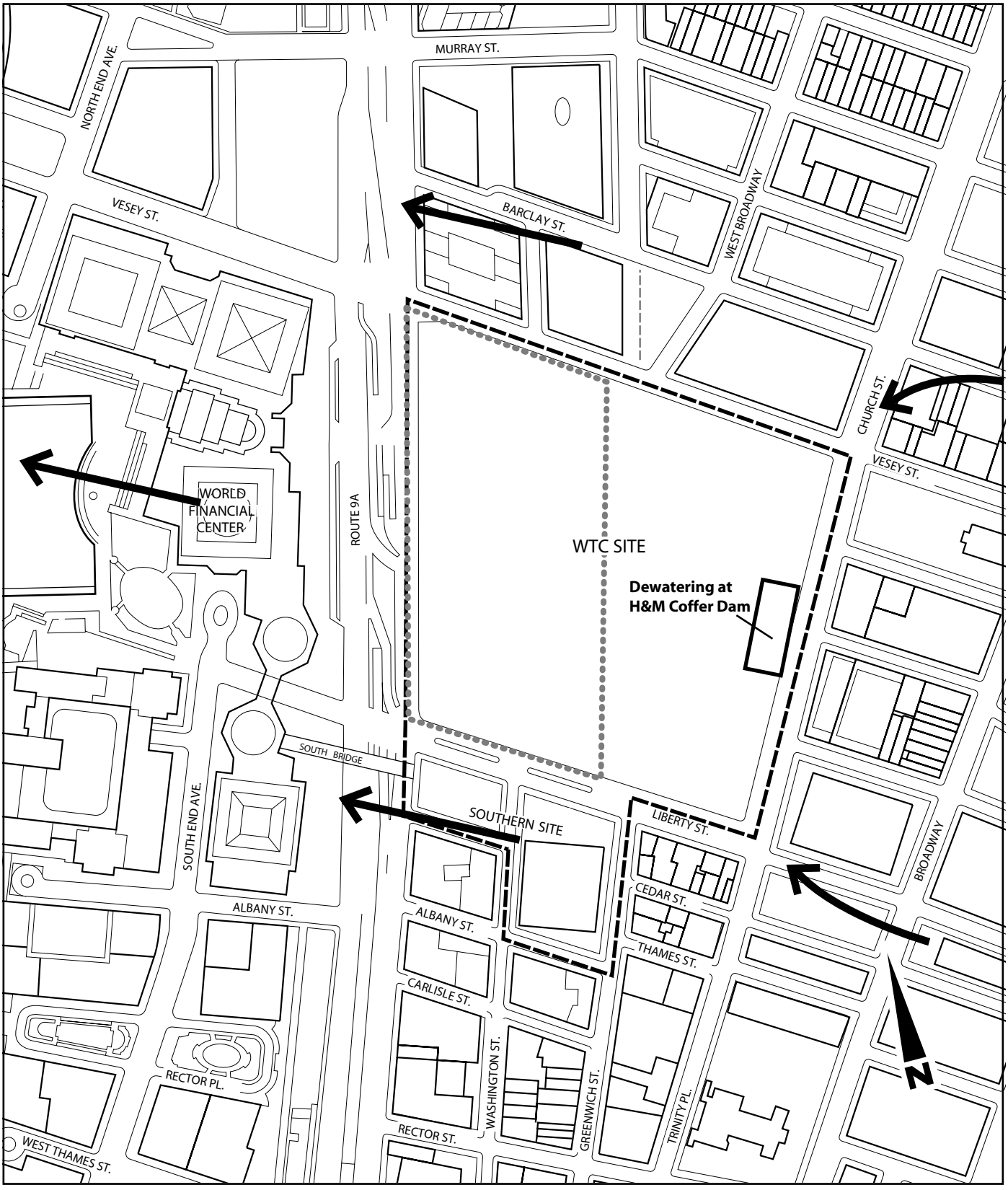
Groundwater within the Project Site is found in unconsolidated sediments and in voids that may be present in consolidated bedrock. In Manhattan, groundwater is found in highly fractured bedrock and in old stream channels and coastal deposits buried beneath artificial fill. The glacial till is relatively impermeable.

Fresh groundwater found in the Project Site is classified by the NYSDEC as GA (New York State Codes, Rules and Regulations, Title 6, Parts 700-706, revised March 1998), for which the best usage is as a source of potable water supply. Naturally occurring saline ground waters are classified as GSA or GSB depending on chloride and total dissolved solids concentrations. The best usages of Class GSA waters are as a source of potable mineral waters for conversion to fresh potable waters, or as raw material for the manufacture of sodium chloride, its derivatives, or similar products. The best usage of Class GSB waters is as receiving water for disposal of wastes.

The depth to groundwater in the vicinity of the Project Site is variable, ranging from approximately 6 feet below grade at the intersection of Washington and Albany Streets to nearly 40 feet below street level in the eastern portion of the WTC Site. The variability is due to dewatering activities performed at the Hudson & Manhattan coffer dam. Dewatering at the Hudson & Manhattan coffer dam, both prior to September 11 and presently, is performed to lower the groundwater table in the eastern portions of the WTC Site, which assists in preventing groundwater infiltration into the subgrade structures. This will continue permanently. Although Manhattan's groundwater is not used for potable supply, and non-potable use is limited, groundwater in the Project Site is classified as GA.

Lateral hydrologic recharge rates are expected to be high, due to soil conditions and proximity of the Project Site to nearby bodies of water. The Hudson River is approximately 1,000 feet west of the Project Site. Groundwater movement between the Project Site and the river within the Fill and Sand strata is expected to be relatively unrestricted with the exception that groundwater must circumvent the bathtub located in the western portion of the WTC Site. The permeability of the fill, sand, and varved silt strata is expected to be greater horizontally than vertically. See Figure 11-4.

Limited rainwater percolation is expected, as the ground surface in the Project Site is paved or developed. St. Paul's Church and Cemetery at the northwest corner of Broadway and Fulton Street and the lawn areas of Two and Three World Financial Center along Route 9A are the only permeable surfaces adjacent to the Project Site.



Inferred Groundwater Flow Direction Map

Figure 11-4

World Trade Center Memorial
and Redevelopment Plan

11.4 CURRENT CONDITIONS SCENARIO

11.4.1 EXISTING CONDITIONS 2003

The events of September 11 resulted in the damage, collapse and demolition of the structures that were present at the Project Site. The collapse of the buildings resulted in the release of petroleum products, dielectric fluid from transformers and feeder cables, and ACMs and LBP from building materials.

PROJECT SITE

Subsequent to the rescue and recovery efforts, cleanup of the Project Site was performed to remove materials and contaminants, with special attention made to the sensitive handling and removal of human remains. The materials, including hazardous materials, were removed to the depth of the lowest subgrade level in the eastern portion of the WTC Site (approximately 35 feet below street level), and to the concrete pad at a depth of approximately 70 feet in the western portion of the WTC Site. Ongoing testing and cleaning of building interiors, not associated with the Proposed Action, is being performed by the EPA and NYCDEP.

NYSDEC records indicate that up to 27,000 gallons of fuel oil was stored at the WTC Site in petroleum storage tanks in the subgrade levels prior to September 11. It is likely that the events of September 11 resulted in the rupture of these tanks and the release of their contents within the WTC Site. It is expected that some quantity of fuel oil was consumed by fire, while the remaining quantity was removed from the site during the cleanup operations. Surficial soils located within the eastern portion of the WTC Site and from the former grade at 140 Liberty Street did not exhibit evidence of petroleum impacts, although laboratory testing revealed the presence of PAHs at concentrations exceeding the NYSDEC *Technical and Administrative Guidance Memorandum #4046* (TAGM) *Recommended Soil Cleanup Objectives* (RSCOs) in the samples. Previous testing along Route 9A revealed the presence of elevated PAH concentrations in soil. Since PAHs are found in emissions from generators and motor vehicles, it is likely that the PAH concentrations detected are from the deposition of airborne particulates released from the WTC collapse, fires, and later cleanup efforts that released these substances into the air. Soil samples collected from depth intervals beneath the lowest subgrade level at the eastern portion of the WTC Site, below former grade in the Southern Site, *and in subsurface soils at 130 Liberty Street* revealed no PAH impacts. Samples collected from existing structures revealed no VOC or SVOC impacts. EPA air sampling has revealed that airborne concentrations of PAHs were not detectable in the vicinity of the WTC Site as of April 2002. (http://www.epa.gov/wtc/pah/).

Results of surficial soil samples collected from the eastern portion of the WTC Site and former grade at 140 Liberty Street revealed trace concentrations of asbestos. The concentrations are less than one percent by weight and are representative of background conditions present in urban environments (http://www.epa.gov/wtc/benchmarks.htm#dust). Micro-vacuum samples collected from existing structures along the perimeter of the eastern WTC Site revealed the presence of elevated concentrations of asbestos. The asbestos concentrations were above those commonly present in urban areas and are expected to be present as a result of the events of September 11. EPA air monitoring for asbestos in and around the WTC Site has revealed that airborne concentrations of asbestos are generally not detectable, and if present, well below screening levels. NYCDEP results indicate that between September 28, 2001, and August 3, 2002, the vast

majority of air sampling results were below the standards for asbestos in indoor air (http://www.nyc.gov/html/dep/html/airmonit.html).

Beryllium, chromium, copper, magnesium, lead, mercury, nickel, selenium, and zinc were detected at elevated concentrations in surficial soils collected from the eastern portion of the WTC Site as well as from soil present at the former grade at 140 Liberty Street and at intersection of Washington and Albany Streets. Comparable concentrations of these metals were also detected in subsurface soil samples of historic fill material and native deposits. Previous studies performed in the area have revealed elevated lead and zinc concentrations in samples collected from soils beneath Route 9A. EPA air monitoring data revealed that beryllium, mercury, and selenium were not detected in samples collected in the vicinity of WTC Site subsequent to September 11. Chromium, copper, magnesium, nickel, selenium, and zinc were detected, but at low concentrations (http://www.epa.gov/wtc/metal/detected.html). The EPA detected elevated concentrations of lead in air, but the concentrations fell below the EPA's benchmark within one month of September 11. Although elevated concentrations of these metals may be present in surficial and subsurface soils, their absence or low concentrations in the air subsequent to September 11 indicate that they are not an ongoing source of exposure. The lateral and vertical distribution of these metals throughout the Project Site indicates that they are not likely to be associated with historic releases; rather that these metals' concentrations are representative of background conditions in the vicinity of the Project Site.

Elevated concentrations of arsenic, chromium, lead, manganese, mercury, nickel, and selenium were detected in samples collected from the surfaces of existing structures located along the perimeter of the eastern portion of the WTC Site. The concentrations of these metals exceed the EPA's benchmarks for residences. Based on their distribution and concentrations, it is likely that these samples reflect material deposited as a result of September 11.

Surficial and subsurface soil samples collected during the environmental sampling revealed no detections of PCBs, and EPA air sampling data collected subsequent to September 11 indicates that airborne concentrations of PCBs have not been detected at concentrations exceeding the screening level. (http://www.epa.gov/wtc/benchmarks.htm#pcbs). Trace concentrations of dioxin were detected in surficial soil samples and in samples collected from the surfaces of existing structures, significantly below EPA remediation criterion.

Nine EPA RCRA Hazardous Waste Generators were formerly located at the Project Site. The types of hazardous wastes generated included flammable materials (e.g., solvents) and silver recovered from photograph development. Hazardous wastes stored at the Site on September 11 are expected to have been consumed by fires, while some were removed from the Site during the cleanup operations. Laboratory testing of surficial soil samples collected within the WTC Site and EPA air monitoring performed subsequent to September 11 confirmed the absence of residual impacts from the hazardous waste generators.

ACM is suspected to be present in the truck loading dock at the former Hudson & Manhattan (H&M) terminal, the H&M coffer dam, as well as building remnants located in the northeastern corner of the WTC Site.

At 130 Liberty Street, the events of September 11 resulted in the release of approximately 10,000 gallons of No. 2 fuel oil and 1,000 gallons of diesel oil from ruptured petroleum storage tanks. The No. 2 fuel oil storage tank was removed and the EPA established a collection system for the oil. Additionally, approximately 100 gallons of lube oil was released in an elevator shaft.

The interior of 130 Liberty Street was exposed to the elements by the collapse of the South Tower, which opened a large gash on the north side of the building. This reportedly permitted dust and pulverized building construction debris to enter the building and contaminate portions of the building's interior. Some sampling of the dust was performed by Deutsche Bank and its insurers and indicated detectable concentrations of asbestos, silica, PAHs, dioxin, PCBs, metals, and mercury. Although there was detectable levels of these contaminants in some of these samples, LMDC has been advised that such testing was not sufficient to determine whether any of such contaminants were present at levels that would render them hazardous. The presence of water in the structure at 130 Liberty Street reportedly resulted in mold growth *within* the building. *As discussed in section 11.4.3, further testing will be performed to determine whether any contaminants are present at levels that make them hazardous as defined by the NYSDEC or EPA criteria.*

Groundwater beneath the Project Site did not contain detectable concentrations of SVOCs or PCBs. Metals detected in groundwater samples collected beneath the Project Site did not exceed NYSDEC GA standards. VOCs in groundwater were detected in *three* locations, at the intersection of Washington and Albany Streets, in one sample collected from the eastern portion of the WTC Site, *and the eastern portion of 130 Liberty Street*. The VOC concentrations marginally exceeded the NYSDEC GA standards, but were below NYCDEP sewer discharge requirements, *except for the VOCs detected at 130 Liberty Street*. Benzene and toluene, constituents of petroleum, were noted in the groundwater sample collected at the intersection of Washington and Albany Streets. Their presence indicates that a petroleum release has likely occurred in the area and that petroleum-impacted soil and groundwater may be present. Chloroform was detected at this sample location, as well as in a sample collected from beneath the eastern portion of the WTC Site. Chloroform is generated as a by-product of chlorinating water and its presence is likely the result of leaks from buried water lines. *Tetrachloroethylene (perc), commonly associated with dry cleaning operations, was detected in the sample collected at 130 Liberty Street. The presence of perc indicates that a release has likely occurred in the area and that impacted soil and groundwater may be present.*

SURROUNDING AREA

The events of September 11 resulted in the release of more than 100,000 gallons of dielectric fluid from transformers and oil-filled electric feeders present in the former Con Edison substations located at 7 WTC. An unknown quantity of the oil was subsequently recovered from subsurface structures (trenches, basements, etc.). Since the release, Con Edison has performed site investigations and determined that an unknown quantity of separate phase product was present on the surface of groundwater in the vicinity of the former 7 WTC building. The investigations also indicated that oil-impacted soil did not have elevated levels of volatile hydrocarbons and would not be a potential source of vapors during construction or to occupants of the proposed 7 WTC building. The analytical results of soil and groundwater samples collected during the Con Edison investigations indicated that contaminated material excavated would be considered oil-impacted, not hazardous waste. Detectable concentrations of PCBs were not present in soil samples collected during the investigations.

Numerous spills of petroleum products have been reported in the vicinity of the Project Site. These spills were reported to have occurred on paved surfaces and, in most instances, were immediately contained and cleaned up. The releases that were not contained may have resulted in localized impacts to soil *and groundwater, in the vicinity and within the Project Site*. As

discussed earlier, testing results indicate that petroleum releases may have impacted groundwater in the vicinity of the Southern Site and *a perc release from an unknown source may have impacted groundwater at 130 Liberty Street. As a result,* soil and groundwater, *contaminated from off-site sources,* may be encountered during construction activities.

11.4.2 FUTURE WITHOUT THE PROPOSED ACTION 2009—CURRENT CONDITIONS SCENARIO

The WTC Site's current form is as a construction pit, in some cases as deep as 70 feet below street level on the western side. As a result, it is likely that further site preparation work would be conducted on the site if the Proposed Action was not chosen and conducted. If the Proposed Action is not implemented, any contaminated soil and groundwater present at the WTC Site would be remediated or managed as necessary to protect public health and the environment and in accordance with the requirements and policies of the EPA, NYSDEC, and NYCDEP. It may be likely that some type of minimal work would be required for health and safety reasons. Although actions anticipated under this analysis would not be under the purview or responsibility of LMDC, it is anticipated that, if excavated, contaminated soil required remediation, the soil would be segregated from non-impacted soil and transported to a properly licensed disposal facility. The properties located at 130 and 140 Liberty Street would be developed by their owners, who would be responsible for remediation. *At 130 Liberty Street, all furnishings within the building would be removed and disposed of in accordance with all applicable federal, state, and local regulations. These materials would be tested prior to disposal to determine whether they would be considered asbestos-contaminated or hazardous waste under applicable NYSDEC or EPA criteria.* Any required remediation would be performed under appropriate regulatory supervision.

11.4.3 PROBABLE IMPACTS OF THE PROPOSED ACTION 2009—CURRENT CONDITIONS SCENARIO

If the Proposed Action is implemented according the schedule described in Chapter 1, "Project Description," contaminated materials (soil, groundwater, and building materials) present at the Project Site would be managed and/or remediated during the construction activities. Contaminated soil encountered during excavation of the Site would be segregated from non-impacted material, and disposed of in accordance with federal, state, and local regulations at properly licensed disposal facilities. *Any* contaminated groundwater would be treated on-site prior to discharge in accordance with NYSDEC and NYCDEP issued permits. Impacted or contaminated building materials would be abated or remediated prior to demolition activities *in accordance with applicable legal requirements*. Significant adverse impacts related to hazardous materials are not anticipated.

The following measures would be employed *in conformity with applicable legal requirements* to avoid potential exposure to hazardous materials prior to and during the construction phase:

- Prior to demolition activities, comprehensive asbestos, lead-paint, PCB-containing equipment, and mold surveys would be undertaken to identify the locations and quantities of such materials.
- Surfaces of existing structures *at the WTC Site* containing elevated asbestos and metals concentrations would be subjected to pre-construction cleaning. This cleaning would be performed through the removal of material through use of wetting and brushing, wet-wiping,

and/or by High-Efficiency Particulate Air (HEPA) vacuuming. The removed material would be containerized and sampled for disposal. Once the material is removed, the entire surface would be washed using a low pressure washing technique, moving from top to bottom.

- *Any ACM,* asbestos-contaminated materials *or* mold-impacted building materials would be properly removed from the structures *at the WTC Site and 130 Liberty Street* prior to demolition, therefore minimizing the potential for human exposure during the construction phase. *Any contaminants in dust located in the building at 130 Liberty Street would be removed and disposed of through cleaning prior to demolition.* Construction activities that have the potential to generate lead-containing dust or vapors would be evaluated through the performance of a lead exposure assessment and, if required, the affected surfaces would be de-leaded prior to construction. Air exposure monitoring for *contaminants* would be conducted during building demolition to monitor worker and public exposure to dust. Dust controls would be employed during demolition activities to limit public and worker exposure. PCB-containing equipment would be properly removed prior to building demolition.
- Based on the environmental sampling, a site-specific HASP would be developed to limit the potential for worker and public contact with any contamination found in either the soil or groundwater. Dust controls, will be employed as appropriate during excavation activity to prevent airborne migration of potentially contaminated material.
- Contaminated materials encountered during *construction activities* would be *analyzed,* handled, transported, and disposed of according to all applicable federal, state, and local rules and regulations, and in accordance with the Health and Safety and Soil Management Plans.
- Contaminated materials in soil or groundwater that are isolated during the construction phase would be separated from the public by impermeable barriers of concrete or asphalt constructed as part of the Proposed Action.

During the operational phase, the project would reduce the long-term risks associated with contaminated materials by removing the contaminated material prior to or during the construction phase.

HEALTH AND SAFETY PLAN

Site-specific HASPs would be prepared and implemented to protect construction workers and the general public from exposure to contaminants (e.g., PAHs and metals) present in soil, groundwater, and building materials. The HASPs would include worker safety training and monitoring requirements, the use of personal protective equipment, air monitoring equipment, and contaminant action levels. Proactive measures to mitigate potential exposure pathways would also be presented in the HASPs. If action levels established in the HASP were exceeded, construction would cease until mitigation measures were implemented.

Dust generated by construction activities or from excavations would be suppressed by spraying water *or chemical foam* during dry weather, by cleaning vehicles *(including tires)* and other equipment *at vehicle washing stations* prior to leaving the site, by placing gravel on areas of exposed soil used for vehicle activities, and by sequencing construction activities to minimize areas of exposed soil. *During winter months, provisions would be made to prevent freezing of water used in dust suppression and vehicle cleaning activities.*

SOIL MANAGEMENT PLAN

In general, the soil management plan would present the type of soil handling and disposal that would be used during the construction activities. For this project, contaminated soils present beneath the western portion of the WTC Site or outside of the Project Site would remain in place, and health and safety would be achieved through isolation. For contaminated soil that is excavated from the eastern portion of the WTC Site, off-site disposal would occur.

Isolation involves the construction of a barrier that prevents direct contact with, or migration of, contaminated soil. The use of impermeable barriers such as concrete and asphalt would also prevent percolation of surface water through subsurface soil, thus limiting the potential for contaminants to leach from soil to groundwater. The WTC Site and surrounding area, as presently configured, is paved with concrete and asphalt, which serves as an effective isolation barrier. In-place isolation is a useful method of addressing contaminants such as metals, PAHs, metals, and PCBs, which are generally immobile. A layer of clean soil fill could be used to construct an isolation barrier in landscaped areas that would not be covered by impervious materials.

To protect workers and the general public during the site preparation and construction activities, dust control measures will be taken. These include fine sprays of water, mist curtains, and some chemical foam. Tarpaulins can be used to cover stockpiled or staged soils.

Contaminated soil that is excavated during the Proposed Action would be removed from the Project Site and disposed of in permitted facilities approved to accept the material. These facilities would either treat the soils, so that the contaminants present would become immobile or reduced sufficiently so that the material no longer presents a public health concern, or dispose of them in permitted landfills that are constructed to contain the contaminants. For example, soil contaminated with petroleum could be treated by an asphalt batching plant. Representative samples of soil are analyzed by a laboratory prior to being taken off-site in order to document that they meet the facility's permit requirements. The off-site transport of petroleum-contaminated soils would be performed in accordance with federal, state, and local regulations.

If excavated soil contains contaminants that make it unsuitable for asphalt batching, the soil would be disposed of at an off-site permitted disposal site or landfill. The type of landfill would be determined by the type and concentrations of contaminants present in the soil. Landfill facilities include both hazardous and non-hazardous facilities; however, only facilities permitted to accept the contaminants identified would be used to handle the waste. To confirm the type and concentrations of contaminants, representative samples of soil are analyzed by a laboratory prior to being taken off-site.

Contaminated soil that is disposed of off-site would be transported in accordance with federal, state, and local regulations. These regulations pertain to types of vehicles and containers permitted to transport the waste, the preparation and maintenance of manifests that document the type and quantity of waste being transported, and the truck routes that may be used to transport the waste.

GROUNDWATER MANAGEMENT PLAN

The groundwater management plan would provide a description of the methods used to collect, store, and dispose of contaminated groundwater generated during the Proposed Action. Additionally, the groundwater management plan would identify the requirements of permits obtained from NYCDEP and/or NYSDEC to discharge the water to either the city's sewers or

surface waters, respectively. Prior to obtaining NYCDEP or NYSDEC discharge permits, groundwater would be sampled and analyzed to characterize its physical and chemical properties. Depending on the results of the analyses, the type of treatment prior to discharge, if required, would be determined.

The type of treatment selected is determined by the contaminants present in the groundwater. Both NYSDEC and NYCDEP permits require that contaminated sediments suspended in groundwater are removed prior to discharge. This would be achieved through the use of settling tanks and the injection of a flocculent, causing suspended sediments to settle out of the water. The sediments would be analyzed to determine what, if any, contaminants are present and, depending on the type and concentrations of contaminants, a disposal option would be selected as described in the soil management section. *VOCs, such as perc, benzene, and toluene, in groundwater could be treated on-site, prior to discharge, through the application of granulated activated carbon (GAC) or air stripping. GAC treatment is based on the principle of adsorption, which means that organic (carbon-based) compounds will bind to organic matter. In practice, water would be run through beds of GAC where the VOCs would adsorb. The GAC would be periodically replaced and regenerated to ensure effectiveness. Air stripping entails pumping water through a vessel that induces VOCs to volatilize. The air from the air stripper is treated to remove the VOCs and discharged to the atmosphere in accordance with NYSDEC and EPA permits. These treatment methods would reduce VOC concentrations in water to levels below NYSDEC and NYCDEP permit requirements.*

Prior to implementing any treatment system or discharge of groundwater, samples would be collected and analyzed, a treatment system would be designed, and the information would be included in the NYSDEC or NYCDEP permit applications. Approval from the responsible regulatory agency, in the form of a permit, would be obtained prior to construction activities. Depending on the quantity of water to be discharged, the permits require sampling on a regular basis to confirm that the treatment is effective. Discharging activities would be performed in accordance with the terms and conditions specified by the permit, including the discharge rate, the sampling frequency, and duration.

130 LIBERTY STREET DECONSTRUCTION PLAN

The 130 Liberty Street deconstruction plan would provide site-specific protocols to be followed during the removal of any contaminated dust, debris, and materials from the interior of the building, with special attention to the sensitive handling and removal of any human remains that might be found. Such protocols are expected to include: installation of isolation barriers over windows, doors, ceiling penetrations, etc.; establishment of negative air pressure; removal and cleaning of non-porous surfaces (e.g., built-in bookshelves); removal of flooring and subsequent cleaning of sub-flooring, where necessary, and all surfaces throughout the work area via HEPA vacuuming and wet wiping techniques; installation of hard barriers at elevator doors and stairwells to isolate cleaned areas; and clearance sampling to ensure adequate cleanliness levels have been achieved. Although it is not anticipated that the building would contain structural ACM or hazardous concentrations of contaminants, materials within the building would be evaluated further and disposed of in accordance with all applicable federal, state, and local regulations. In addition, a site-specific HASP would also be implemented at all times.

11.4.4 FUTURE WITHOUT THE PROPOSED ACTION 2015—CURRENT CONDITIONS SCENARIO

The same conditions would apply under this 2015 analysis year as described for 2009 in section 11.5.1. If the Proposed Action were not implemented, necessary remediation work would be conducted by the property owner or responsible agency to protect public heath and the environment.

In this scenario, the actions described in section 11.4.2 would be implemented to protect public health, and the environment, subject to oversight by relevant governmental agencies.

11.4.5 PROBABLE IMPACTS OF THE PROPOSED ACTION 2015—CURRENT CONDITIONS SCENARIO

Construction activities that would occur between 2009 and 2015 as part of the Proposed Action would primarily include the construction of floors above the two retail levels of Towers 2, 3, 4, and 5. In addition, landscaping and street level amenities would occur during this period. No further disturbance of soil or groundwater is anticipated. As a result, no significant impacts to or from hazardous materials are anticipated as a result of the Proposed Action.

Since hazardous materials would be remediated during the construction phase of the Proposed Action, the operations of the Proposed Action elements that would be constructed and in operation by 2015 are not anticipated to generate significant impacts related to hazardous materials.

11.5 PRE-SEPTEMBER 11 SCENARIO

11.5.1 BASELINE CONDITIONS

PROJECT SITE

A review of historic Sanborn Maps indicated that the eastern portion of the WTC Site, just west of Church Street, between Fulton and Cortlandt Streets, was operated as the Hudson Tubes by the Hudson & Manhattan Railroad Company. The railroad opened service to Lower Manhattan in 1909; the Port Authority assumed control of the operation of the tubes in 1962 and renamed the service to PATH. Construction of the WTC Site began in 1966 and was completed in the early 1970's.

Use of the eastern portion of the WTC Site by a railroad had the potential to result in contaminated soil and groundwater from the handling and disposal of petroleum products, metals, VOCs, SVOCs, and PCBs. The results of environmental sampling in the eastern portion of the WTC Site revealed that the former railroad operations have not significantly impacted subsurface soil and groundwater.

Previous laboratory analyses of soils located along Route 9A in the vicinity of the Project Site revealed the presence of elevated concentrations of lead zinc and PAHs. Based on the testing performed for this project, it is likely that soils within and near the Project Site contain elevated concentrations of metals and PAHs that are associated with the historic placement of fill material and from vehicle emissions.

A review of the regulatory databases indicated that an unknown quantity of dielectric fluid was released in 1999 from a break in a feeder cable located in a manhole present at the intersection of Fulton and Church Street, near the eastern boundary of the WTC Site. This spill may have impacted soil with petroleum and PCBs and the spill case is still open with the NYSDEC.

SURROUNDING AREA

A review of regulatory databases identified multiple spills that occurred at the Con Edison substations formerly located in the 7 WTC building, north of the WTC Site. The impacts to soil and groundwater from these releases were characterized by the Con Edison investigations discussed in the preceding section. Spills of petroleum products and transformer oil that my have resulted in localized impacts to soil were noted at properties located within 1/8 mile of the Project Site. As indicated in the previous section, marginal petroleum *and perc* impacts to groundwater *that may be associated with releases outside the Project Site* were noted at the intersection of Washington and Albany *S*treets *and 130 Liberty Street, respectively*. Based on the environmental sampling results, *contaminated* soil and groundwater *from releases* at *and in the vicinity of* the Project Site are expected to be limited in extent.

11.5.2 FUTURE WITHOUT THE PROPOSED ACTION 2009— PRE-SEPTEMBER 11 SCENARIO

Under this scenario, the Project Site would have been subject to only conditions as described in section 11.5.1. It is presumed that hazardous materials in soil, groundwater, or building materials, if present, would have been managed and/or remediated to protect public heath and the environment.

11.5.3 PROBABLE IMPACTS OF THE PROPOSED ACTION 2009— PRE-SEPTEMBER 11 SCENARIO

If the attacks of September 11 had not occurred, few hazardous materials would be present at the Project Site. Nonetheless, for purposes of the GEIS, the probable impacts of the Proposed Action in 2009, under the Pre-September 11 Scenario, are the same as described in the Current Conditions Scenario. The Proposed Action would provide for the removal and disposal of hazardous materials that existed prior to September 11. All measures during construction described in section 11.4.*3* to avoid potential exposures to hazardous materials would be employed under the Pre-September 11 Scenario. Accordingly, the Proposed Action would not result in any significant adverse impacts due to hazardous materials during both the construction and operational phases of the project.

11.5.4 FUTURE WITHOUT THE PROPOSED ACTION 2015— PRE-SEPTEMBER 11 SCENARIO

Under this scenario, the Project Site would have been subject to only the conditions as described in section 11.5.1. It is presumed that hazardous materials in soil, groundwater, or building materials, if present, would have been managed and/or remediated to protect public heath and the environment.

11.5.5 PROBABLE IMPACTS OF THE PROPOSED ACTION 2015— PRE-SEPTEMBER 11 SCENARIO

If the attacks of September 11 had not occurred, few hazardous materials would be present at the Project Site. As described in section 11.5.3, hazardous materials present prior to September 11 would be removed and disposed of during the construction phase of the Proposed Action; therefore, the Proposed Action would not result in any significant adverse impacts due to hazardous materials during the operational phase of the project. ✳