Department of Environmental Conservation

Division of Environmental Remediation

Environmental Restoration
Record of Decision
Bush Terminal Landfill Piers 1-4 Site
Brooklyn, Kings County, New York
Site Number B00031-2

March 2004

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* ERIN M. CROTTY, *Commissioner*

DECLARATION STATEMENT
ENVIRONMENTAL RESTORATION RECORD OF DECISION

Bush Terminal Landfill Piers 1-4 Environmental Restoration Site
Brooklyn, Kings County, New York
Site No. B00031-2

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Bush Terminal Landfill Piers 1-4 site, an environmental restoration site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Bush Terminal Landfill Piers 1-4 environmental restoration site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, present a current or potential significant threat to public health and/or the environment.

Description of Selected Remedy

Based on the results of the Site Investigation/Remedial Alternatives Report (SI/RAR) for the Bush Terminal Landfill Piers 1-4 site and the criteria identified for evaluation of alternatives, the NYSDEC has selected a remedy consisting of containment measures combined with institutional and site use controls. The components of the remedy are as follows:

- Placement of a two-foot soil cover over the landfill to prevent exposures to surface soils and underlying waste materials, except in an existing wooded area, where a six-inch soil cover will be provided to minimize exposures while retaining the existing mature trees;
- Combined passive and active landfill gas management to control landfill gas migration, and landfill gas monitoring to ensure that unsafe conditions do not develop in the future;
- Groundwater monitoring;
- Excavation and covering of shallow pond area sediments, filling and covering of deeper pond area sediments, and shoreline stabilization to minimize potential ecological exposures to contaminated sediments; and

- Institutional and site use controls (environmental easements, site inspections/certifications, access controls, engineered pathways and signage) to ensure the future integrity of the remedial measures that are taken at the site, to control public access in the existing wooded area with the six-inch soil cover, and to prevent future exposures to site-related contamination.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective.

Date	Dale A. Desnoyers, Director Division of Environmental Remediation

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Environmental Restoration
RECORD OF DECISION

Bush Terminal Landfill Piers 1-4 Site
Brooklyn, Kings County, New York
Site No. B00031-2
March 2004

SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the Bush Terminal Landfill Piers 1-4 site. The presence of hazardous substances has created a threat to human health and/or the environment that is addressed by this remedy.

The 1996 Clean Water/ Clean Air Bond Act provides funding to municipalities for the investigation and cleanup of brownfields. Under the Environmental Restoration (Brownfields) Program, the state provides grants to municipalities to reimburse up to 90 percent of eligible costs for site investigation and remediation activities. Investigations at this site were conducted under the original Bond Act 75 percent reimbursement level. The City plans to pursue a remediation State Assistance Contract for implementation of the remedy, at a 90 percent reimbursement level. Once remediated, the property can then be reused.

As more fully described in Sections 3 and 5 of this document, the site was historically used as an active landfill that was permitted to accept construction-related fill materials. During that period, hazardous substances, including oils, oil sludges, and wastewaters containing metals, plating wastes, lacquers and solvents, were reportedly disposed at the site. These hazardous substances have contaminated the soil, groundwater, and sediments at the site. These contaminants and the presence of landfill-related gasses have resulted in:

- a threat to human health associated with potential exposure to surface soil, subsurface soil, sediment, and landfill gas; and

- an environmental threat associated with the impacts of contaminants in soils and sediments.

To eliminate or mitigate these threats, the NYSDEC has selected the following remedy to allow for the proposed recreational use of the site as a public park:

- Placement of a two-foot soil cover over the landfill to prevent exposures to surface soils and underlying waste materials, except in an existing wooded area, where a six-inch soil cover will be provided to minimize exposures while retaining the existing mature trees;
- Combined passive and active landfill gas management to control landfill gas migration, and landfill gas monitoring to ensure that unsafe conditions do not develop in the future;

- Groundwater monitoring;
- Excavation and covering of shallow pond area sediments, filling and covering of deeper pond area sediments, and shoreline stabilization to minimize potential ecological exposures to contaminated sediments; and
- Institutional and site use controls (environmental easements, site inspections/certifications, access controls, engineered pathways and signage) to ensure the future integrity of the remedial measures that are taken at the site, to control public access in the existing wooded area with the six-inch soil cover, and to prevent future exposures to site-related contamination.

The selected remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

The site is located along the Upper New York Bay (the Bay), in the Sunset Park section of Brooklyn, in the western part of Kings County, New York. A site location map is provided in Figure 1. The site borders an access road referred to as Marginal Street (which parallels 1st Avenue), between 45th Street and 50th Street. The land immediately adjacent to the site is used for commercial/industrial purposes, although residential housing areas are present within approximately 1,500 to 2,000 feet of the site.

The 17.3-acre site includes approximately 14 acres of urban land that was created by landfilling between four piers (Piers 1-4) that were part of the former Bush Terminal warehouse complex. The remaining pier structures are dilapidated and extend 600 to 800 feet into the Bay from the existing fill areas. An aerial photo of the site taken in 1990 is presented as Figure 2 and a site plan is provided as Figure 3. The site is currently fenced to prevent public access.

The total landfill area is approximately 14 acres in size. Partial filling between two piers (Piers 3 and 4) has resulted in the presence of two ponded areas in the northeastern portion of the site. These ponds are clearly visible in Figure 2. While most of the landfilled areas are covered with grasses or barren soils, the westernmost fill area between Piers 2 and 3 supports an area of mature trees (referred to in this document as the existing wooded area). Debris piles are present in some areas, especially along the edge of the site bordering Marginal Road.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

Prior to 1974, the site was an active port facility, with vessels that docked between its piers. In 1974, the City of New York Department of Ports and Terminals contracted with a private company to fill in the areas between the four piers with clean construction-related fill. In 1978, the private fill contractor was cited for violations related to the quality of the construction-related fill, in

particular, the presence of wood that was not authorized for disposal. Filling operations at the landfill were halted at the request of New York City. During testimony presented before New York State Legislators in 1982, the City learned of alleged illegal disposal of liquid wastes at the landfill including oils, oil sludges, and wastewaters. The City subsequently secured the property with perimeter fencing, cooperated with NYSDEC in its investigations to confirm the contamination, and in 1997, applied for Clean Water/Clean Air Bond Act funds to further characterize and delineate the site's contamination.

3.2: Remedial History

Phase I and Phase II investigations were conducted in 1985 and 1990 under the NYSDEC Inactive Hazardous Waste Program. The Phase II investigation was conducted in 1990 and included the installation of six monitoring wells and the collection and analysis of soil/fill, groundwater, surface water and sediment samples. In the fall of 1997, a soil and groundwater investigation was conducted in preparation of the rehabilitation of the Gowanus Bay storm sewer line that crosses the southern portion of the site (see Figure 3). Subsequent to the investigation, NYSDEC reclassified the site from a Class 2a to a Class 3 inactive hazardous waste site (i.e., a site where hazardous waste does not present a significant threat to public health or the environment).

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past owners and operators, waste generators, and haulers. Since no viable PRPs have been identified, there are currently no ongoing enforcement actions. However, legal action may be initiated at a future date by the state to recover state response costs should PRPs be identified. The City of New York will assist the state in these efforts by providing all information to the state which identifies PRPs. The City of New York will also not enter into any agreement regarding response costs without the approval of the NYSDEC.

SECTION 5: SITE CONTAMINATION

The New York City Economic Development Corporation (NYCEDC) has recently completed a Site Investigation (SI) / Remedial Alternatives Report (RAR) to determine the nature and extent of any contamination by hazardous substances at this environmental restoration site.

5.1: Summary of the Site Investigation

The purpose of the SI was to define the nature and extent of any contamination resulting from previous activities at the site. The SI was conducted between May 1999 and May 2001. The field activities and findings of the investigation are described in the SI report. Additional studies were conducted between March and July 2002 to support the evaluation of remedial alternatives and are described in the RAR report.

The following activities were conducted during the SI:

- Soil gas surveys to locate volatile organic compound (VOC)-contaminated soils (including "hot-spots") and evaluate landfill gas quality; the surveys also included the collection of soil gas samples for laboratory analysis to confirm that hydrogen cyanide was not present in the soil gas;

- Collection of 32 surface soil samples to characterize the surficial materials at the site;

- Excavation of 5 test pits to evaluate the depth and composition of waste and investigate areas of elevated soil gas results;

- Installation of 16 soil borings and 18 monitoring wells for analysis of soils/fill and groundwater, the physical properties of the soil/fill, and hydrogeologic conditions;

- Collection of groundwater samples from 21 new and existing monitoring wells;

- Collection of surface water samples from 9 surface water stations; and

- Collection of 41 aquatic sediment/shoreline samples.

To determine whether the soils, groundwater, surface water and sediments contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater and surface water SCGs are based on NYSDEC "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations". Because groundwater at this site is saline in quality, rather than fresh, and has the potential to discharge directly into the Bay, SCGs used to evaluate groundwater quality included both standards and guidance based on use of groundwater as a source of drinking water (GA criteria) and standards and guidance for surface water (Class I criteria).

- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels".

- Sediment SCGs are based on the NYSDEC "Technical Guidance for Screening Contaminated Sediments."

Based on the SI results, including comparisons of collected data to the SCGs, and assessment of potential public exposure routes and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the SI report.

5.1.1: Site Geology and Hydrogeology

Subsurface investigations indicated that three stratigraphic units exist beneath the site. The uppermost unit consists of fill material which ranges in thickness from 30 feet in the northern portion of the site to 60 feet in the southern portion. The fill material consists of fine to coarse sand

and cobbles, brick, concrete rubble, ash, and wood debris. The fill material contains many void spaces, consistent with the characteristics of a construction and demolition (C&D) landfill. Brown or black staining that exhibited a petroleum odor was observed at some locations at depths of greater than five feet. A brown silt unit, believed to be native material, underlies the fill layer and is approximately 30 feet thick. The silt is not present in the southern portion of the site. Beneath the silt unit, fine sand was found at depths of greater than 60 feet. The sand is believed to be the beginning of the Upper Glacial aquifer and is thought to be about 40 feet thick beneath the site. In the southern portion of the site, the sand unit is in direct contact with the fill layer.

Monitoring wells were screened in each of three distinct depth intervals: a 10-foot interval within the fill materials and across the water table (between depths of 5 and approximately 30 feet below grade (ftbg)); a 10-foot interval typically within the deeper fill or in the silt layer (between depths of 41 and 58 ftbg); and a 5-foot interval in the deep sands (between depths of 72 and 86 ftbg). At most locations, fill material is present in the saturated zone below the water table. The base of fill ranges as deep as 60 feet below the water table. Horizontal groundwater flow direction at low tide in all three zones is generally westward, toward the Bay. With the exception of one well (MW-10S), all of the monitoring wells exhibited water level fluctuations attributable to the tides in the Bay. In some of the wells, the tidal fluctuations caused temporary horizontal gradient direction reversals. Vertical gradients varied across the site and were most significant in the central portion of the northern landfill area. The direction of the vertical gradients at some locations may change due to tidal fluctuations.

5.1.2: Nature of Contamination

As described in the SI report, many soil gas, soil, groundwater, surface water and sediment samples were collected to characterize the nature and extent of contamination. Table 1 presents a summary of the main contaminants by environmental medium (surface soil, unsaturated subsurface soil, saturated subsurface soil, shoreline soil (soil-like material sampled along the shoreline slope of the landfill that was evaluated as sediment), shoreline sediment, pier sediment, pond sediment, on-site shallow, intermediate and deep groundwater, off-site shallow, intermediate and deep groundwater and surface water). As summarized in Table 1, the main categories of contaminants in groundwater, soils and sediments that exceed their SCGs are semivolatile organic compounds (SVOCs) and inorganics (metals). VOCs, the pesticide 4,4-DDT, and PCBs were also detected at levels exceeding SCGs, but to a much lesser extent than the SVOCs and metals. The general nature of these contaminants is described in the following paragraphs. The extent of contamination is discussed in more detail in Section 5.1.3.

The identified VOCs consist mainly of petroleum compounds and solvents (chlorinated hydrocarbons) and were detected at levels exceeding SCGs in some groundwater samples. VOCs are relatively mobile in the environment, so they would be expected to leach into the groundwater. However, they typically volatilize from surface water and the low source concentrations in groundwater and low rates of groundwater discharge indicate that it is unlikely that they would pose a significant environmental threat, should the groundwater discharge to the adjacent Bay.

The other potential VOC of concern is methane, which was detected in soil gas (i.e., landfill gas) samples collected at the site. Standards for landfill gas (methane) in soil are based on the lower

explosive limit (LEL). The LEL was exceeded at some soil gas measurement locations. The field-measured soil gas readings indicate the potential for methane accumulation to result in explosive levels in surface and/or subsurface structures along migration pathways if protections are not implemented.

The SVOCs of concern mainly consist of polycyclic aromatic hydrocarbons (PAHs) such as benzo(a)pyrene, benzo(a)anthracene and others. These compounds were detected above SCGs mainly in the soils and sediments, with lesser frequency of exceedances detected in the shallow and deep groundwater samples. PAHs are known to persist in the soils and sediments and do not tend to leach into the surface water or groundwater.

The pesticides and PCBs detected at levels exceeding SCGs are limited to 4,4-DDT, which exceeded SCGs in the shoreline soils, and the PCB Aroclor 1260, which exceeded SCGs in one pond sediment sample. Both of these compounds would also tend to persist within soils/sediments and would not be expected to adversely impact surface water or groundwater quality.

Elevated levels of metals were detected in soils, sediments and groundwater. The mobility of metals in the environment is dependent upon many factors, including pH. The presence of metals in the soils, sediments and groundwater has not resulted in measurable impacts to surface water quality. Zinc is the only metal detected above SCGs in surface water and its presence at elevated levels at all surface water sample locations indicates that it is representative of Bay water quality, rather than site-related impacts.

The inorganic compound hydrogen cyanide was also identified as a potential contaminant of concern within the landfill gas during the SI. However, subsequent investigations reported in the RAR determined that the identification of hydrogen cyanide was attributable to a sensor cross-sensitivity problem (instrument error) associated with the landfill gas field instrument. Laboratory analyses of soil gas samples did not detect any hydrogen cyanide in the landfill gas. Therefore, hydrogen cyanide is not considered to be a contaminant of concern in the landfill gas.

As a whole, the petroleum-related compounds, solvents, PAHs, and metals detected in the environmental media at the site are consistent with the alleged dumping of plating wastes and oil sludges at the site during the1970s. Some PAHs may also be associated with demolition-type wastes, such as asphalt and roofing materials. The presence of methane within the soil gas at the site is typical of landfill conditions.

5.1.3: <u>Extent of Contamination</u>

This section describes the findings of the investigation for all environmental media that were investigated.

Chemical concentrations are reported in parts per billion (ppb, or micrograms per liter) for water and parts per million (ppm, or milligrams per kilogram) for soil and sediment. For comparison purposes, where applicable, SCGs are provided for each medium.

Table 1 summarizes the degree of contamination for the contaminants of concern in surface soil, subsurface soil, shoreline soils, sediments, groundwater and surface water and compares the data with the SCGs for the site. Figures 4 through 15 indicate, by sample location, the analytes that were identified as constituents of concern in the SI report risk analysis and which exceed SCGs for each environmental medium. For those media for which constituents of concern were not identified in the SI report risk analysis (due to a lack of potential receptors), all analytes present at levels exceeding SCGs are indicated for each sample location. The following are the media which were investigated and a summary of the findings of the investigation.

Surface Soil

SVOCs (mainly PAHs) and metals are the main contaminants of concern in surface soil. As indicated in Figure 4, PAHs and iron are present at elevated levels throughout the site surface soils, with arsenic, cadmium, and/or lead also present at elevated levels at select locations. As indicated in Table 1, individual PAHs were detected at levels as high as 100 ppm (pyrene). Iron was detected at levels ranging from 7,920 ppm to 59,500 ppm. Other metals commonly detected at elevated levels but not identified as constituents of concern within the SI report include chromium, copper, mercury, nickel and zinc.

Subsurface Soil

SVOCs and metals are the main contaminants of concern in both the unsaturated and saturated soils. As indicated in Figures 5 and 6, PAHs are present at elevated levels throughout the subsurface soils, with arsenic and/or lead also present at elevated levels at select locations. Individual PAHs were detected at levels as high as 140 ppm (fluoranthene in a saturated soil sample). The detection of 31,900 ppm lead at soil boring SB-7 (see Figure 5) prompted the subsequent installation of three additional borings, which did not confirm the presence of a lead hot spot in this area. In general, higher levels of contamination were detected in the saturated subsurface soils than in the unsaturated subsurface soils. Other metals commonly detected at elevated levels in the subsurface soils but not identified as constituents of concern within the SI report include beryllium, cadmium, chromium, copper, iron, mercury, nickel and zinc.

Background subsurface soil samples were collected at two locations to the east of the site (MW-1S and B-13). The presence of VOCs, PAHs and metals at one location (MW-1S) resulted in its elimination from further consideration as being representative of background conditions. While no organic compounds were detected at the second sample location (B-13), aluminum, beryllium, cadmium, iron, and zinc were detected at levels exceeding SCGs.

Sediments

Sediments sampled during the investigations included shoreline sediments (of which three of the 21 samples were more representative of soils than sediments and are therefore described as shoreline soils), pier sediments and pond sediments. Effects Range - Low (ERL) and Effects Range - Median (ERM) levels were the SCGs used in evaluating the sediment contaminant levels, as described in more detail in a footnote to Table 1.

As indicated in Figure 7 (based on ERLs) and Figure 8 (based on ERMs), SVOCs and metals were the main contaminants of concern in the sediments. In general, the highest SVOC concentrations were detected in the shoreline soil samples while the highest metals levels were generally detected in the pier sediment samples. The maximum concentration of an individual PAH was 4,200 ppm for fluoranthene in a shoreline soil sample. PAH levels in shoreline, pier and pond sediments were significantly less (i.e., less than 100 ppm for individual compounds). All of the metals detected in the sediments were generally present at levels less than 400 ppm, with the exception of 4,840 ppm lead in one pond sediment sample. Other constituents detected at elevated levels included 4,4-DDT in shoreline soil samples (concentrations ranged from 0.03 to 0.064 ppm) and PCBs in one pond sample (at a concentration of 0.92 ppm).

Two pier sediment sample locations (SD-9 and SD-10) were intended to represent background conditions, but the sediments present at these locations were more representative of pier construction materials (i.e., quartz sand) than naturally occurring sediment. Therefore, they were not considered as being representative of background sediment quality. The Bay sediments in the vicinity of the site have been characterized through various other studies, however. Sampling of sediments from the Bay near the site indicate that SVOCs, PCBs and metals are commonly detected at elevated levels in the Bay sediments.

Groundwater

The groundwater was evaluated with respect to both groundwater criteria based on use of the water as a drinking water supply (GA criteria) (even though the water is saline and is not used as a source of drinking water) and surface water criteria (Class I criteria), due to the potential discharge of groundwater directly into the Bay.

As indicated in Figures 9, 10, and 11, VOCs, SVOCs and metals are the main contaminants of concern in shallow, intermediate and deep groundwater when compared to the GA criteria. As indicated in Figures 12, 13, and 14, when groundwater quality is compared to surface water criteria, the same groups of contaminants are present at levels exceeding SCGs, but to a lesser extent than when the data are compared to the GA criteria. Individual VOC concentrations are generally less than 100 ppb and individual SVOC concentrations are generally less than 150 ppb. While numerous metals are present in unfiltered samples at levels exceeding the SCGs, a smaller subset of metals is present at elevated levels in the filtered groundwater samples. Few metals were detected at levels exceeding SCGs when groundwater samples were collected using low flow sampling methods. Such sampling methods reduce the amount of suspended particles in the groundwater samples. Given the reduction in metals levels in both the filtered samples and the samples collected using low flow methodologies, it can be concluded that the majority of the elevated metals concentrations are attributable to the presence of suspended soil particles, rather than dissolved metals.

Surface Water

Zinc was the only constituent present in the surface water samples at a level exceeding SCGs, as indicated in Figure 15. Surface water samples SW-9 and SW-10, collected at the outer reaches of the piers and thought to be representative of background Bay conditions, also contained zinc at

elevated levels. Therefore, the presence of elevated zinc levels in the surface water samples is considered to be attributable to general Bay conditions, rather than being site-related.

Soil Gas

Methane, a common landfill gas component, was detected in on-site soil gas samples. Landfill operating requirements require that methane and other explosive gases must not exceed 25% of the LEL within structures and must not exceed the LEL at or beyond the property line. While these criteria were not exceeded under current site conditions, the detection of explosive soil gases at levels exceeding 25% of the LEL in site soil gas samples indicates a potential for future exceedances of these criteria once the site is covered and developed for future use.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the SI/RAR. There were no IRMs performed at this site during the SI/RAR.

5.3: Summary of Human Exposure Pathways

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 6 of the SI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

Since the site is currently fenced to prevent access, the primary exposure pathways of concern at the site are associated with the proposed future use, where park employees, construction workers and/or park visitors could potentially be exposed to vapors and dust through inhalation, surface soils through ingestion and direct contact, and biota (such as fish and shellfish) through ingestion. These exposure pathways could present potential risks to future park visitors and workers if the site is not

remediated. Although the groundwater at the site is impacted above standards based on drinking water quality, the presence of saline conditions at the site, the proximity of the Bay, and the availability of public water supplies in the area make it highly unlikely that groundwater will be used as a source of drinking water and, therefore, groundwater is not considered to present a potential risk to future park visitors or workers.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands. Potential impacts to macrobenthic invertebrates, fish, birds, and small mammals via soil/sediment ingestion, ingestion of food (plants or animals) containing accumulated chemicals from the soil, surface water or sediment, and ingestion of or dermal contact with surface water were evaluated. While the presence of PAHs and metals in soils were found to present a potential risk to terrestrial receptors, it is difficult to separate site-related contaminants from contaminants normally prevalent in highly urbanized areas. Similarly, potential risks were associated with exposures to metals, PAHs, DDT, and PCBs in sediments, but the presence of similar contaminants in adjacent areas of the Bay makes it difficult to separate site-related contaminants from contaminants originating from other sources.

While groundwater quality at the site has been impacted, it is unlikely that surface water quality criteria will be exceeded when groundwater discharges to the Bay, due to the low rates of groundwater discharge and the relatively low concentrations of contaminants in groundwater. Therefore, groundwater is not expected to present a potential environmental impact.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS AND THE PROPOSED USE OF THE SITE

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous substances disposed at the site through the proper application of scientific and engineering principles.

The proposed future use for the Bush Terminal Landfill Piers 1-4 site is as recreational space. Specifically, the site is to be developed as a park, with soccer/softball fields, an indoor hockey facility, a community building and enhanced natural areas (an existing area of mature trees as a bird conservancy zone and enhanced wetland areas).

Therefore, the remediation goals for this site are to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to SVOCs and metals in surface and subsurface soils and sediments;

- environmental exposures of flora or fauna to SVOCs and metals in surface soils and sediments;

- the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards;

- the release of contaminants from surface soil into sediments and surface water through erosion; and

- the release of contaminants from soil gas into indoor air or confined spaces via soil vapor.

Further, the remediation goals for the site include attaining to the extent practicable:

- TAGM 4046 Soil Cleanup Objectives in the landfill area;

- ERM and/or ERL sediment levels, as defined in the NYSDEC "Technical Guidance for Screening Contaminated Sediments" in the pond and shoreline areas; and

- Conservation and enhancement of natural settings and habitat, such as the existing wooded area and wetlands.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, and comply with other statutory requirements. Potential remedial alternatives for the Bush Terminal Landfill Piers 1-4 site were identified, screened and evaluated in the RA report which is available at the document repositories identified in Section 1.

In identifying potential response actions for the site, guidelines presented in NYSDEC TAGM 4044, "Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills" were considered. These guidelines state that at landfill sites, engineering controls are typically appropriate for the long-term protection of human health and the environment, in combination with hot spot removals, where necessary, and the implementation of institutional controls. The complete removal or treatment of wastes from a landfill site is technically impracticable in most cases. Source control through the implementation of engineering controls is often the most appropriate means of addressing potential risks posed by a landfill site. Since no hot spot areas were identified during the SI, hot spot remediation was not included as a general response action.

A summary of the remedial alternatives that were considered for this site is presented below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soils, landfill gas, groundwater, and sediment at the site. The alternatives presented below include five sets of alternatives, each addressing a separate environmental medium at the site. The No Action alternative is presented in each set of alternatives. In each case, it is presented as a procedural requirement and as a baseline for comparison.

Specific details of the remedial alternatives are presented below. Because the soil and sediment remedial alternatives are inter-related (because pond filling activities could involve the reuse of excess material generated during construction of the soil cover), the final cost of each soil remedial alternative is dependent upon the sediment remedial alternative with which it is paired. Therefore, for each soil alternative (except the No Action alternative), a range in remedial costs is presented.

Soil Remedial Alternatives

Alternative SO-1: No Action

The No Action Alternative allows the site soils to remain in an unremediated state. This alternative would leave the site soils in their present condition and would not provide any additional protection to human health or the environment. There are no costs associated with this alternative.

Alternative SO-2: 2-Foot Soil Cover with 6-Inch Soil Cover in Wooded Area and Institutional Controls

Present Worth: . . . . . $5,900,000 to $11,000,000
Capital Cost: . . . . . $5,700,000 to $10,800,000
Annual OM&M (Years 1-30): $12,000

This alternative consists of the covering of landfill areas with a 2-foot thick soil cover, with the exception of the existing area of mature trees, where a 6-inch soil cover would be placed over the soils, allowing the existing trees to remain. Where alternate surface materials are used as required for park design (e.g., softball/soccer fields), their thickness would be considered to be part of the cover. A demarcation layer would be placed beneath the covers to provide a visual separation between the covers and the underlying landfill materials. The site would be restored by seeding. Fencing would be used to control public access in the area with the 6-inch soil cover. It is expected that this alternative could be implemented within a 10 to 12 month period following completion of design and permitting activities. Institutional controls would be implemented to ensure that future site use is limited to non-residential purposes and to require prior notification of NYSDEC of any activities expected to extend to or below the cover layer. Annual certification and inspection would be provided to insure the integrity of the cover. A maintenance plan would provide for necessary repairs, such as management of breaches in the cover caused by fallen trees.

Alternative SO-3: Part 360 Cap with 6-Inch Soil Cover in Wooded Area and Institutional Controls

Present Worth: . . . . . $13,700,000 to $20,300,000
Capital Cost: . . . . . $13,400,000 to $20,000,000
Annual OM&M (Years 1-30): . . . . . $18,000 to $19,500

This alternative consists of the capping of landfill areas with a multi-layer cap in accordance with the regulatory requirements of 6NYCRR Part 360, with the exception of the existing area of mature trees, where a 6-inch soil cover would be placed over the soils, allowing the existing trees to remain. Landfill operations predated the requirements for an impermeable cap as currently defined in Part 360 and thus a Part 360 cap is not specifically required. Regulatory requirements in place at the time that the landfill operations were terminated consisted of placement of a soil cover. Site inspection indicates that these requirements were satisfied.

A Part 360 cap, which includes a synthetic geomembrane layer, is more impermeable than a soil cover but requires more stringent future land use restrictions to ensure the integrity of the geomembrane layer. Institutional controls would be implemented to ensure that future site use is limited to non-residential purposes and to require prior notification of NYSDEC of any activities expected to extend to or below the Part 360 cap or soil cover. Fencing would be used to control public access in the area with the 6-inch soil cover. It is expected that this alternative could be implemented within a 14 to 16 month period following completion of design and permitting activities. Annual inspection and certification would be provided to insure the integrity of the Part 360 cap and 6-inch soil cover. A maintenance plan would provide for necessary repairs, such as management of breaches in the Part 360 cap or 6-inch soil cover caused by fallen trees.

Landfill Gas Remedial Alternatives

Alternative LFG-1: No Action

The No Action Alternative allows the site to remain in an unremediated state with respect to landfill gas management and would not provide any additional protection to human health or the environment. There are no costs associated with this alternative.

Alternative LFG-2: Combined Passive/Active Landfill Gas Control with Institutional Controls and Monitoring

Present Worth: $1,400,000
Capital Cost: $970,000
Annual OM&M (Years 1-30): $31,000

This alternative consists of active landfill gas control in building areas and other areas where gas accumulation or migration may pose a potential hazard without active removal. The final design of the control system would be based on additional field studies and a modeling analysis. Active control requires the use of blowers and other equipment to enhance the extraction of landfill gas from the subsurface. In areas of the site where landfill gas generation is minimal and does not pose

a potential risk, passive means (e.g., venting) would be utilized to collect and/or release the gas. Passive control is appropriate for use with a soil cover since the soil cover allows for some passive venting through the cover itself. Continued monitoring of landfill gas levels at the site and leaving the site would ensure that the gas control systems are protective under future site use conditions. For areas planned for passive gas management, a design assessment will emphasize gas management systems that can be retrofitted to convert from passive to active operations, as needed, based on the results of monitoring of system performance. Institutional controls would include requirements that NYSDEC be notified of any activities that could impact landfill gas collection and/or monitoring systems. This alternative would be implemented concurrently with the construction of the landfill cover and with the construction of any structures associated with future site use.

LFG-3: Active Landfill Gas Control with Institutional Controls and Monitoring

Present Worth: $2,000,000
Capital Cost: $1,300,000
Annual OM&M (Years 1-30): $47,000

This alternative consists of active landfill gas control both beneath the landfill soil cover or Part 360 cap and in building areas and other areas where gas accumulation or migration may pose a potential hazard without active removal. Active control is best suited for use with a multi-layer Part 360 cap, since the gas has a tendency to accumulate beneath the geomembrane layer. A gas venting layer beneath the geomembrane combined with blowers and other gas extraction equipment allows for the collection and release of landfill gas from beneath the cap (or cover). The final design of the landfill gas control system would be based on additional field studies and a modeling analysis. Continued monitoring of landfill gas levels at the site and leaving the site will ensure that the gas control system is protective under future site use conditions. Institutional controls would include requirements that NYSDEC be notified of any activities that could impact landfill gas collection and/or monitoring systems. This alternative would be implemented concurrently with the construction of the landfill cap (or cover) and with the construction of any structures associated with future site use.

Groundwater Alternatives

Alternative GW-1: No Action

Present Worth: $6,000
Capital Cost: $6,000
Annual OM&M: $0

The No Action Alternative allows the site to remain in an unremediated state with respect to groundwater. It would include the grouting of existing monitoring wells. This alternative would not provide any additional protection to human health or the environment.

Alternative GW-2: Ground Water Monitoring with Institutional Controls

Present Worth: $190,000

Capital Cost: *$92,000*
Annual OM&M:
(Year 1): *$55,000*
(Year 2): *$53,000*

This alternative includes the grouting of existing monitoring wells, installation of new wells following site construction activities, periodic groundwater monitoring, and the implementation of institutional controls to prevent future groundwater use at the site, thereby preventing future exposures to groundwater.

Sediment Remedial Alternatives

Alternative SD-1: No Action

The No Action Alternative allows the site to remain in an unremediated state with respect to sediment and would not provide any additional protection to human health or the environment. There are no costs associated with this alternative.

Alternative SD-2: Covering of Shallow Pond Area Sediments and Shoreline Stabilization with Institutional Controls

Present Worth: *$3,500,000*
Capital Cost: *$3,400,000*
Annual OM&M:
(Years 1-5): *$11,000*
(Year 6-30): *$6,000*

This alternative includes the covering of shallow pond area sediments and shoreline stabilization measures to minimize future erosion of the landfill's shoreline slopes. As illustrated in Figure 16, a one-foot thick layer of clean fill materials would be placed over contaminated shallow sediments (i.e., sediments that are covered with less than 10 feet of water) in the pond areas and in adjacent wetland areas. This alternative would also include institutional controls requiring NYSDEC notification of any future activities that could disrupt the sediment cover or shoreline stabilization areas. Following completion of design and permitting activities, it is estimated that this alternative could be implemented within 6 to 8 months.

Alternative SD-3: Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments and Shoreline Stabilization with Institutional Controls

Present Worth: . . . . . *$4,600,000 to $6,600,000*
Capital Cost: . . . . . *$4,500,000 to $6,500,000*
Annual OM&M:
(Years 1-5): *$11,000*
(Year 6-30): *$6,000*

This alternative includes excavation of a one-foot thick layer of contaminated sediments in the shallow pond areas and in the adjacent wetlands and placement of one foot of clean cover soils over these areas. In the deeper pond areas, fill materials derived from onsite would be placed to decrease the depth of water in the ponds to enable attainment of a specified (target) pond depth. A diagram of this alternative is shown in Figure 16. One foot of clean cover soil would be placed over the fill materials and will be completed to the target pond depth. Thus, the entire bottom of the pond and the adjacent wetlands would be covered with one foot of clean soil under this alternative. The target pond depth will be pre-determined and will be based on the most appropriate pond depth for habitat purposes. Additional field work would be conducted to determine the target pond depth (the minimum target depth is likely to be 6 to 10 feet). This alternative would also include shoreline stabilization measures to minimize future erosion of landfill shoreline slopes.

The fill used in this alternative (i.e. in deeper pond areas below the one foot clean soil layer) would include reuse of select excess materials generated during the grading and covering of the landfill. Sampling and chemical analysis of excess fill material will be performed to assist the fill selection process and insure that fill materials used for this purpose are acceptable. This alternative would also include institutional controls requiring NYSDEC notification of any future activities that could disrupt the sediment cover or shoreline stabilization areas. Due to this alternative's inter-relationship with landfill covering activities, construction would generally coincide with landfill cover construction, although shoreline stabilization would likely be conducted prior to cover construction. Following completion of design and permitting activities, it is estimated that this alternative could be implemented within 14 to 16 months, depending on the selected soil alternative.

Alternative SD-4: Covering of Pond Area Sediments, Salt Marsh Habitat Creation and Shoreline Stabilization with Institutional Controls

Present Worth: $3,300,000
Capital Cost: $3,100,000
Annual OM&M:
(Years 1-5): . . . . . Incrementally falling from $42,000 to $18,000/year
(Year 6-30): $6,000

In this alternative, the ponds would be filled and covered in such a manner as to create a salt marsh and no open water habitat would be retained within the pond areas. This alternative is illustrated in Figure 16. This alternative would reuse a significantly greater volume of the excess materials generated during landfill covering than Alternative SD-3. This alternative would also include shoreline stabilization measures to minimize future erosion of landfill shoreline slopes.

This alternative would also include institutional controls requiring NYSDEC notification of any future activities that could disrupt the sediment cover or shoreline stabilization areas. Due to this alternative's inter-relationship with landfill covering activities, construction would generally coincide with cover construction, although shoreline stabilization would likely be conducted prior to cover construction. Following completion of design and permitting activities, it is estimated that this alternative could be implemented within 14 to 18 months, depending on the selected soil alternative.

7.2: Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of environmental restoration projects in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the RA report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectiveness. Capital costs and operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the SI/RA reports and the PRAP have been evaluated. The responsiveness summary (Appendix A) presents the public comments received and the manner in which the NYSDEC addressed the concerns raised. In general, the public comments received were supportive of the selected remedy. Several comments were received, however, pertaining to the limitation of public access to the wooded area with the 6-inch soil cover through the use of prohibitive fencing and the requirement that only supervised access be allowed in this area. The public objected to such stringent access controls, indicating that they would like the restrictions eased to allow greater public accessibility. As a result of the public comments, NYSDEC and NYSDOH have agreed to modify the remedy to allow greater public access to this area in a manner that assures the protection of public health. The remedy in the wooded area has been revised to allow unsupervised but controlled public access. This controlled access will be achieved by the use of less restrictive fencing (such as split-rail type fencing) along engineered walkways (such as raised walkways or trails) with additional vegetative plantings and signage, combined with more frequent inspections to insure the integrity of the 6-inch soil cover. During inspections, the presence of the demarcation layer between the soil cover and the underlying fill materials will enable a definitive determination regarding the possible impairment of the integrity of the soil cover. The final design details of this element of the remedy will be determined during the remedial design, in conjunction with the final park design for this area.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based on the Administrative Record (Appendix B) and the discussion presented below, the NYSDEC has selected a remedy for the site that consists of the following remedial alternatives:

SO-2:	2-Foot Soil Cover with 6-Inch Soil Cover in Wooded Area and Institutional Controls
LFG-2:	Combined Passive/Active Landfill Gas Controls with Institutional Controls and Monitoring
GW-2	Groundwater Monitoring with Institutional Controls
SD-3	Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments and Shoreline Stabilization with Institutional Controls

The elements of this remedy are described at the end of this section. The combined components of the selected remedy, including a conceptual landfill gas management plan, are shown in Figure 17.

The selected remedy is based on the results of the SI and the evaluation of alternatives presented in the RAR. The selected remedy is protective of human health and the environment while meeting the remedial goals for the proposed future use of the site. The soil cover, landfill gas management and sediment covering/stabilization components combined with institutional controls will be protective of human health under the proposed future use of the site as a park. The containment features of the soil cover and sediment covering/stabilization components will also be protective of the adjacent Upper New York Bay, both with respect to surface water and sediment quality. The remedy can be implemented within a relatively short time with few impacts to the adjacent community and is expected to be effective over the long-term. The containment features reduce the

mobility of the existing contaminants. The individual components of the remedy are readily implemented.

Each of the individual alternatives that make up the selected remedy were chosen because they satisfy the threshold criteria and provide the best balance of the primary balancing criteria, as described in Section 7.2, for the individual environmental media that they address. A summary of the basis for the selection of each of the individual remedy components is presented below:

Basis for Selected Soil and Groundwater Remedy

Alternative SO-1 will not eliminate the direct exposure pathway for human contact with contaminated waste and surface soils and therefore must be eliminated from further consideration. Alternatives SO-2 (soil cover) and SO-3 (Part 360 cap) are equally effective at achieving the remediation goals for the site by preventing human exposure to waste and soils that exceed TAGM 4046 soil cleanup guidelines. Alternative SO-2 (soil cover) and SO-3 (Part 360 cap) are also equivalent with respect to protection of environmental receptors, including groundwater and surface water, for several reasons. The landfill has been in place for more than thirty years and has already received considerable flushing from infiltration of precipitation, and from inflow of groundwater and saline tidal water. Existing contaminant levels in groundwater are low and in all but a few instances, are below applicable groundwater standards, and therefore do not require extensive additional protection. The water table is shallow throughout the site, generally about 10 to 15 feet below ground surface, while wastes extend as deep as 70 feet below ground surface. As a result, most of the waste contained in the landfill is below the water table. Placement of an impermeable cap on landfills is intended to isolate wastes from water flow as a means to minimize leachate production. Placement of an impermeable cap on top of a landfill site with mostly saturated wastes, as is the case at Bush Terminal Landfill Piers 1-4, will not substantially lessen water contact with wastes compared to placement of a soil cover. Groundwater below the site under current conditions is saline and the close proximity to the Bay eliminates consideration of the use of onsite groundwater for potable water supply. Alternate potable water supplies are already available for residents of the region. Environmental easements will further insure that there will be no usage of on site groundwater for production or other purposes.

With respect to protection of the Bay and contained sediments, Alternatives SO-2 and SO-3 are equally protective. Currently, there are no measurable impacts in surface water or sediment that can be attributed to the landfill. Both alternatives will therefore be equally effective in assuring that impacts to surface water and sediment will not occur in the future. Both methods will eliminate impacts related to erosion of contaminated soils and wastes from the site.

With respect to the five balancing criteria, Alternatives SO-2 and SO-3 both have short-term impacts which can easily be controlled. The time needed to achieve the remediation goals would be longest for Alternative SO-3, since its implementation involves a greater total thickness of material, a greater number of material types, more complexity in execution of construction, and a greater level of quality control and testing during its application. Since Alternative SO-3 involves the use of a greater volume of construction materials, it would incur impacts caused by a higher number of trucks needed to transport the material onto the site. Alternatives SO-2 and SO-3 are equivalent with respect to public health protection and environmental protection under both short term and long term

conditions. Alternative SO-2 and Alternative SO-3 are both readily implemented. However, Alternative SO-2 involves the use of more common and standard construction techniques.

With respect to cost, Alternative SO-2 is substantially less expensive than Alternative SO-3 while achieving the same degree of public health and environmental protection. Consequently, Alternative SO-2 is considerably more cost-effective, averaging approximately $8 million to $9 million less than Alternative SO-3, depending on the sediment alternative with which it is paired. Further, Alternative SO-2 will not require a mounded profile and the greater thickness of construction materials that are necessary for Alternative SO-3 (Part 360 cap). Consequently, Alternative SO-2 can be designed in a manner that will fully support the end use of the site as a public park and will therefore maximize the public use benefit of the property. Alternative SO-2 conforms well with the park development criteria, including (1) maintaining a relatively low profile at the park entrance, and (2) maintaining grade variability with level and contoured topography that can support all contemplated uses, including active and passive recreation features such as walkways and playing fields. The greater compatibility of SO-2 with park development criteria weighs toward greater community acceptance than Alternative SO-3.

Alternative GW-2 (groundwater monitoring with institutional controls) provides greater attainment of remediation goals than Alternative GW-1 (no action). Alternative GW-2 provides greater control of potential exposures to groundwater compared to the no action alternative, which provides no added protection over the existing site conditions. Alternatives GW-2 satisfies the threshold criteria and meets the balancing criteria more effectively than the no action alternative by providing added protection at minimal cost.

Basis for Selected Landfill Gas Remedy

Alternative LFG-2 (combined passive/active landfill gas control) helps achieve the remediation goals for the site by controlling the discharge of landfill gases where such gases could pose potential health and safety concerns. Alternative LFG-2 would also comply with explosive gas (methane) standards established for landfills. Alternative LFG-3 (active landfill gas control) would be similar to Alternative LFG-2 in terms of its level of protectiveness and compliance with landfill gas limits.

Because both alternatives satisfy the threshold criteria, the five balancing criteria are particularly important in selecting the preferred landfill gas remedy. The short-term impacts associated with Alternatives LFG-2 and LFG-3 would be comparable, resulting in few impacts to the surrounding community and comparable implementation periods. Similarly, both alternatives would be expected to be effective in the long-term. Both alternatives are also expected to similarly control the mobility of the landfill gas.

The more extensive active controls included in Alternative LFG-3 would be more difficult to implement and more costly than the combined passive and active controls of Alternative LFG-2. Due to the long residence time of wastes in the landfill and the preponderance of inert construction and demolition debris in the landfill, gas production rates are very low. These field conditions result in very low cost effectiveness of Alternative LFG-3. Flexible design elements in Alternative LFG-2

will enable conversion from a passive system to an active system if post-construction conditions warrant.

Basis for Selected Sediment Remedy

Alternative SD-3 (excavation/covering of shallow pond area sediments, filling/covering of deeper pond area sediments and shoreline stabilization) would help achieve the remediation goals for the site by preventing exposures of both human and environmental receptors to contaminated sediments. It would also achieve remedial goals by reducing potential erosion of contaminated sediments/soils and by conserving and enhancing existing tidal wetland areas. While NYCEDC preferred the salt marsh alternative (SD-4) for remediation of the pond areas due to its cost-effectiveness, that alternative would result in the greatest alteration of the existing aquatic habitat complex (i.e. replacement of an open water/fringe salt marsh habitat with a salt marsh habitat). In implementing the New York Tidal Wetland Land Use Regulations, NYSDEC maintains a program standard opposed to habitat exchange. Therefore, Alternative SD-3, which achieves the established remedial goals, and maintains the existing aquatic habitat complex of open water and fringing salt marsh, is supported by NYSDEC and is presented as the preferred sediment alternative within the RA report. Under Alternative SD-2 (covering of shallow pond area sediments and shoreline stabilization), however, some tidal wetlands would be reduced in size by the placement of the sediment cover without prior excavation.

Each of the sediment remedial alternatives would be comparable in terms of preventing future exposures to sediments/soils containing contaminants at levels exceeding NYSDEC Sediment Screening Criteria. As stated above, Alternative SD-3 provides a programmatic advantage over Alternative SD-4 due to the fact that it does not involve habitat exchange. Alternative SD-4 replaces the existing open water habitat with a salt marsh habitat, so it does not meet this programmatic standard.

With respect to the five balancing criteria, short-term and long-term effectiveness would be fairly comparable between the alternatives.

Each of the alternatives offers a reduction in the potential mobility of contaminated sediments through the containment features of the sediment covers and shoreline stabilization measures.

With respect to implementability, Alternative SD-2 is the most easily implemented, as it requires no excavation and covering of the shallow pond areas only. Alternative SD-4 follows in terms of implementability, as the filling of the entire ponds to wetland elevations is more easily conducted than filling only the deeper portions of the ponds under Alternative SD-3.

Alternative SD-4 offers the greatest cost-effectiveness, both in comparison with other sediment alternatives and even more so when evaluated in combination with the covering alternatives, due to its reuse of a significant volume of the excess material generated during site covering.

Basis for Complete Site Remedy

While the basis for selecting the individual remedy components is presented above, the inter-relationships between the individual remedy components and the impact of those inter-relationships on the total site remedial cost must also be considered in evaluating overall cost-effectiveness. As stated previously, because the sediment remedial alternatives reuse excess materials generated during covering of the site, the way in which the soil and sediment alternatives are combined greatly impacts overall remedial costs. Total site remediation costs for combined remedies based on use of the 2-foot soil cover are presented in Table 3 while total site remediation costs for combined remedies based on use of the Part 360 cap are presented in Table 4.

As indicated in Table 3, the least costly remedy that involves the use of the 2-foot soil cover is $10.8 million and consists of combined passive/active landfill gas control (Alternative LFG-2), ground water monitoring (Alternative GW-2) and covering of pond area sediments with salt marsh creation (Alternative SD-4). The highest cost complete remedy involving the use of the 2-foot soil cover, at $17.2 million to $19.2 million, includes active landfill gas control (Alternative LFG-3), ground water monitoring (Alternative GW-2) and excavation/covering of shallow pond area sediments, filling/covering of deeper pond area sediments and shoreline stabilization (Alternative SD-3).

As indicated in Table 4, the lowest cost complete remedy involving the use of the Part 360 cap, at $18.6 million to $19.7 million, includes combined passive/active landfill gas control (Alternative LFG-2), ground water monitoring (Alternative GW-2) and covering of pond area sediments with salt marsh creation (Alternative SD-4). The highest cost complete remedy involving the use of the Part 360 cap, at $25 million to $28.5 million, includes active landfill gas control (Alternative LFG-3), ground water monitoring (Alternative GW-2) and excavation/covering of shallow pond area sediments, filling/covering of deeper pond area sediments and shoreline stabilization (Alternative SD-3).

The estimated present worth cost to implement the complete remedy (consisting of Alternatives SO-2, LFG-2, GW-2 and SD-3) is $16.6 to 18.6 million, as presented in Table 3. The cost to construct the remedy is estimated to be $15.9 million to $17.9 million and the estimated average annual operation, maintenance, and monitoring cost for 30 years is $53,000. While this combined remedy is not the least expensive complete remedy, it meets the programmatic requirements for sediment remediation maintained by NYSDEC.

Elements of Selected Complete Remedy:

The elements of the selected remedy are as follows:

Selected Soil Remedy:

The selected soil remedy will consist of a 2-foot soil cover, with a 6-inch soil cover in the existing wooded area and institutional controls, to be implemented as described below:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the soil covers.

2. The site will be cleared, excavated to achieve the site elevations necessary to support the future site use, and graded. Excess materials will be used as part of the sediment remedial alternative or shipped off-site for disposal.

3. The soil covers (both 2-foot and 6-inch covers) will then be placed on the site. Cover materials will meet TAGM 4046 limits unless otherwise approved by NYSDEC and NYSDOH. A demarcation layer will be placed beneath the covers to provide a visual separation between the covers and the underlying landfill materials. The site will be restored by seeding. In certain areas (e.g., soccer/softball fields), alternate materials required for park design may take the place of the soil cover in providing a barrier to the underlying soils, as long as two feet of separation is maintained.

4. A soils management plan will be developed to address residual contaminated soils that may be excavated from the site in the future. The plan will require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations.

5. Institutional controls in the form of environmental easements will prevent future residential use of the site. The environmental easements will also require prior notification of NYSDEC of any activities expected to extend to or below the cover layer and compliance with the approved soils management plan. Annual certification and inspection will be required to insure the continued integrity of the 2-foot soil cover. Engineering controls will also be implemented to control public access in the 6-inch soil cover this area. Public access to this area will be controlled through the construction of engineered pathways (such as raised walkways or trails) bordered by split-rail type fencing with additional vegetative plantings and signage. These elements will be combined with more frequent inspections to insure the integrity of the 6-inch soil cover. During inspections, the presence of the demarcation layer between the soil cover and the underlying fill materials will enable a definitive determination regarding the possible impairment of the integrity of the soil cover. The final design details of this element of the remedy will be determined during the remedial design, in conjunction with the final park design for this area. A maintenance plan will provide for necessary repairs, such as management of breaches in the soil cover caused by fallen trees.

Selected Landfill Gas Remedy:

The selected landfill gas remedy will consist of combined passive/active landfill gas controls with institutional controls and monitoring, to be implemented as described below:

1. A design modeling analysis will be conducted to determine the specific landfill gas management features that will be required to manage landfill gas odors, off-site gas migration or other nuisance- and safety-related landfill gas concerns. Additional field testing may be required to support this analysis.

2. A passive gas venting system will be designed based on the results of the design modeling analysis. Typically, passive venting systems consist of venting wells and/or trench systems. The design analysis will evaluate supplemental design elements, such as the provision of a

geosynthetic gas venting layer beneath the cover. Gas vent release locations will be designed to minimize impacts on future site use.

3. Active controls will be used to prevent landfill gas migration into structures at the site (e.g., the indoor hockey rink and community building) or other areas where there is a potential for landfill gas to accumulate. The active controls will use mechanical means (e.g., blowers) to vent any accumulated gases. The design of the structures themselves will also include appropriate features (e.g., utility seals, vapor barriers, etc.) to address landfill gas migration.

4. The active controls will be supplemented by combustible gas monitors with appropriate alarms that will be placed in areas of on-site structures where the accumulation of landfill gas is possible.

5. Landfill gas management features along Marginal Street will be defined following the modeling design analysis. Potential options include the construction of a monitoring system or the construction of a passive gas venting system. Both options will include utility seals for subgrade utility lines to prevent off-site migration of landfill gas through the utility bedding materials.

6. Pre-construction perimeter landfill gas monitoring will be conducted to provide a baseline to determine if later site construction activities have an impact on landfill gas migration.

7. A contingency plan will be developed to address odors and gas-related nuisances or problems, should they develop in the future.

8. Institutional controls in the form of environmental easements that will require prior notification of NYSDEC of any activities expected to impact landfill gas collection and/or monitoring systems or the design or construction of any new facilities that could require landfill gas collection systems will be implemented.

Selected Groundwater Remedy:

The selected groundwater remedy will consist of groundwater monitoring on a periodic basis to monitor any changes to groundwater quality over time, to be implemented as described below:

1. Because it is likely that on-site construction activities will damage existing monitoring wells, the existing wells will be permanently sealed prior to initiation of construction activities, and replaced with monitoring wells located around the perimeter of the site after construction is complete.

2. Groundwater samples will be collected periodically for chemical analysis.

3. Institutional controls in the form of environmental easements that will prevent future groundwater use at the site will be implemented.

Selected Sediment Remedy:

The selected sediment remedy will consist of excavation and covering of shallow pond area sediments, filling and covering of deeper pond area sediments, and shoreline stabilization with institutional controls, to be implemented as described below:

1. A pre-design survey will be conducted to evaluate the final depth of fill within the pond areas, based on benthic habitat and water quality. It is expected that a final pond depth that maintains a water depth in the range of 6 to 10 feet will be acceptable from a habitat standpoint.

2. Design studies will be conducted to determine the most cost-effective means of stabilizing the landfill slopes along the Bay, given the proposed future use of the site. Stabilization methods could consist of stone rip rap, interlocking stone wall units, gabions or other types of revetment erosion control.

3. Construction of the slope stabilization features will likely begin before completion of the soil cover, to minimize impacts to the cover caused by construction vehicles traveling across the site to the shoreline stabilization areas. Construction may require cutting back of the existing steep slopes. Excavated materials could potentially be reused on-site (e.g., in the pond fill areas) or could require disposal off-site.

4. Within the tidal wetland areas along the shoreline of the ponds and within the shallow pond areas, a one-foot depth of sediments will be removed, dewatered and transported off-site for disposal or used as fill in the deeper pond areas. It is also possible that the materials could be dewatered and placed under the landfill cover. One foot of clean suitable materials will then be placed in the areas where the sediments were removed.

5. An access way will be constructed to the deeper pond areas, and excess materials generated during shallow sediment excavation, shoreline stabilization and/or landfill cover construction will be used to fill the deeper pond areas. The upper one foot of surficial material will consist of clean material, as described in the previous paragraph.

6. Institutional controls in the form of environmental easements that require prior notification of NYSDEC of any activities that may impact the effectiveness or protectiveness of the shoreline stabilization area or pond or wetland remediation areas will be implemented.

   The property owner will complete and submit to the NYSDEC an annual certification until the NYSDEC notifies the property owner in writing that this certification is no longer needed. This submittal will contain certification that the institutional controls and engineering controls put in place, pursuant to the Record of Decision, are still in place, have not been altered, and are still effective.

SECTION 9: <u>HIGHLIGHTS OF COMMUNITY PARTICIPATION</u>

As part of the Bush Terminal Landfill Piers 1-4 environmental restoration process, a number of Citizen Participation activities were undertaken to inform and educate the public about conditions

at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.

- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.

- A Working Group comprised of local elected officials, Community Board 7, key governmental agencies, civic organizations and community groups was formed, with meetings held during the development of the schematic park plan on November 14, 2001, May 23, 2002 and October 24, 2002.

- Community Board 7 Meeting and Public Hearings were held as follows:
  - June 15, 1999 - public hearing on site investigation activities
  - June 27, 2001 - introduction of the park design consultant and discussion of project issues
  - June 19, 2002 - reviewed the preliminary concept for the park and project status
  - October 17, 2002 - presented the conceptual design for the park

- Meetings were held with individual organizations as part of the outreach for the project, as follows:
  - UPROSE - August 7, 2001 and December 10, 2002
  - Brooklyn Borough President's Office - September 25, 2001
  - Port Authority of New York and New Jersey - August 9, 2001
  - Community Board 7 - August 22, 2001
  - Hispanic Young People's Association, including a tour of the site - August 27, 2001
  - Chinese American Planning Council - August 3, 2001
  - Southwest Brooklyn Industrial Development Corporation - August 20, 2001
  - Sunset Park BID - August 13, 2001

- Fact sheets were mailed to interested parties, including the following:
  - Kick-off Summary Sheet
  - Fact Sheet, Summer 2001, highlighting design tasks, contractors, schedule, environmental issues, funding and public outreach mechanisms and contacts
  - Fact Sheet, Winter 2002, highlighting project goals, park design objectives, economic and access issues, initial design concepts and public outreach mechanisms and contacts
  - Project Brochure
  - Summary of the Site Investigation
  - Notice and Summary of the PRAP

- A model and project materials were displayed at Community Board 7 for one year beginning in November 2002 , with a notebook provided for public comments.

- A public meeting was held on January 8, 2004 to present and receive comments on the PRAP.

- A responsiveness summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP.

TABLE 1
Nature and Extent of Contamination

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	4-Chloroaniline	ND to 0.24	0.22	1 of 18
	Pyrene	ND to 100	50	1 of 32
	Benzo(a)anthracene	ND to 17	0.224	29 of 32
	Chrysene	ND to 19	0.40	28 of 32
	Benzo(b)fluoranthene	ND to 26	1.1	26 of 32
	Benzo(k)fluoranthene	ND to 11	1.1	26 of 32
	Benzo(a)pyrene	ND to 26	0.061	30 of 32
	Indeno(1,2,3-c,d)pyrene	ND to 4.1	3.2	1 of 32
	Dibenz(a,h)anthracene	ND to 1.1	0.014	9 of 32
Inorganic Compounds	Arsenic	2 to 32.4	7.5	6 of 32
	Barium	17.4 to 4,960	300	6 of 32
	Cadmium	0.28 to 66.1	1	22 of 32
	Calcium	805 of 46,600	35,000	1 of 32
	Chromium	6.7 to 151	10	30 of 32
	Copper	11.2 to 648	25	30 of 32
	Iron	7,920 to 59,500	2,000	32 of 32
	Lead	5.5 to 4,320	1,000	3 of 32
	Magnesium	1,240 to 28,100	5,000	6 of 32
	Mercury	ND to 6.5	0.1	31 of 32
	Nickel	5.9 to 84.8	13	30 of 32
	Zinc	40.7 to 2,560	20	32 of 32

TABLE 1
Nature and Extent of Contamination (Continued)

UNSATURATED SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Acetone	ND to 0.15	0.11	2 of 13
Semivolatile Organic Compounds (SVOCs)	Phenol	ND to 0.71	0.03	1 of 13
	Benzo(a)anthracene	ND to 17	0.224	12 of 13
	Chrysene	ND to 19	0.4	12 to 13
	Benzo(b)fluoranthene	ND to 21	1.1	11 of 13
	Benzo(k)fluoranthene	ND to 14	1.1	11 of 13
	Benzo(a)pyrene	ND to 13	0.061	12 of 13
	Dibenz(a,h)anthracene	ND to 0.98	0.014	6 of 13
Inorganic Compounds	Arsenic	1.5 to 47.1	7.5	1 of 13
	Barium	24.2 to 1,180	300	5 of 13
	Beryllium	0.17 to 1.4	0.16	13 of 13
	Cadmium	8.1 to 33.5	1	13 of 13
	Chromium	8.2 to 76.8	10	12 of 13
	Copper	9.5 to 377	25	12 of 13
	Iron	8,720 to 34,300	2,000	13 of 13
	Lead	4.4 to 9,350	1,000	1 of 14
	Magnesium	1,470 to 10,800	5,000	4 of 13
	Mercury	ND to 3.7	0.1	11 of 13
	Nickel	6.4 to 99.8	13	12 of 13
	Zinc	21.6 to 1,200	20	13 of 13

TABLE 1
Nature and Extent of Contamination (Continued)

SATURATED SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Acetone	ND to 2.3	0.11	3 of 23
Semivolatile Organic Compounds (SVOCs)	Phenol	ND to 0.46	0.03	1 of 23
	2-Methylphenol	ND to 0.28	0.1	1 of 23
	4-Methylphenol	ND to 1.0	0.9	1 to 23
	Naphthalene	ND to 30	13	2 of 23
	4-Nitrophenol	ND to 0.36	0.1	1 of 23
	Dibenzofuran	ND to 24	6.2	3 of 23
	Phenanthrene	ND to 130	50	5 of 23
	Fluoranthene	ND to 140	50	5 of 23
	Pyrene	ND to 130	50	3 of 23
	Benzo(a)anthracene	ND to 63	0.224	18 of 23
	Chrysene	ND to 59	0.4	17 of 23
	Benzo(b)fluoranthene	ND to 64	1.1	14 of 23
	Benzo(k)fluoranthene	ND to 55	1.1	14 of 23
	Benzo(a)pyrene	ND to 52	0.061	19 of 23
	Indeno(1,2,3-cd)pyrene	ND to 11	3.2	1 of 23
	Dibenz(a,h)anthracene	ND to 2.1	0.014	8 of 23
Inorganic Compounds	Arsenic	1.4 to 37.1	7.5	7 of 23
	Barium	19.2 to 1,400	300	3 of 23
	Beryllium	0.12 to 3.1	0.16	19 of 23
	Cadmium	8.3 to 31.9	1	23 of 23
	Calcium	717 to 47,800	35,000	2 of 23
	Chromium	6.4 to 120	10	20 of 23
	Copper	10 to 605	25	18 of 23
	Iron	8,610 to 33,800	2,000	23 of 23

TABLE 1
Nature and Extent of Contamination (Continued)

SATURATED SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Lead	4.3 to 31,900	1,000	2 of 28
	Magnesium	1,430 to 21,200	5,000	9 of 23
	Mercury	ND to 5	0.1	20 of 23
	Nickel	6.8 to 216	13	17 of 23
	Vanadium	10.6 to 1,870	150	1 of 23
	Zinc	20.7 to 1,950	20	23 of 23

SHORELINE SOILS (SEDIMENTS)	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Acenaphthene	ND to 330	ERL-0.016	1 of 3
			ERM-0.5	1 of 3
	Anthracene	0.25 to 790	ERL-0.085	3 of 3
			ERM-1.1	2 of 3
	Fluorene	ND to 310	ERL-0.019	1 of 3
			ERM-0.54	1 of 3
	Naphthalene	ND to 270	ERL-0.16	1 of 3
			ERM-2.1	1 of 3
	Phenanthrene	1.1 to 3,100	ERL-0.24	3 of 3
			ERM-1.5	2 of 3
	Benzo(a)anthracene	0.98 to 2,200	ERL-0.261	3 of 3
			ERM-1.6	2 of 3
	Benzo(a)pyrene	0.96 to 2,100	ERL-0.43	3 of 3
			ERM-1.6	2 of 3
	Chrysene	1.0 to 2,100	ERL-0.384	3 of 3
			ERM-2.8	2 of 3

TABLE 1
Nature and Extent of Contamination (Continued)

SHORELINE SOILS (SEDIMENTS)	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Dibenz(a,h)anthracene	0.058 to 230	ERL-0.063	2 of 3
			ERM-0.26	2 of 3
	Fluoranthene	1.7 to 4,200	ERL-0.6	3 of 3
			ERM-5.1	2 of 3
	Pyrene	1.7 to 4,000	ERL-0.665	3 of 3
			ERM-2.6	2 of 3
PCB/Pesticides	4,4-DDT	0.030 to 0.064	ERL-0.00158	3 of 3
			ERM-0.0461	1 of 3
Inorganic Compounds	Cadmium	12.7 to 13.7	ERL-1.2	3 of 3
			ERM-9.6	3 of 3
	Copper	27.4 to 59.2	ERL-34	2 of 3
			ERM-270	0 of 3
	Lead	127 to 248	ERL-46.7	3 of 3
			ERM-218	1 of 3
	Mercury	0.11 to 0.33	ERL-0.15	2 of 3
			ERM-0.71	0 of 3
	Zinc	132 to 189	ERL-150	1 of 3
			ERM-410	0 of 3

SHORELINE SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Acenaphthylene	ND to 0.18	ERL-0.044	7 of 18
			ERM-0.64	0 of 18
	Acenaphthene	ND to 2.9	ERL-0.016	12 of 18
			ERM-0.5	2 of 18

TABLE 1
Nature and Extent of Contamination (Continued)

SHORELINE SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Anthracene	0.11 to 4.0	ERL-0.085	18 of 18
			ERM-1.1	1 of 18
	Fluorene	ND to 1.8	ERL-0.019	12 of 18
			ERM-0.54	1 of 18
	Naphthalene	ND to 0.31	ERL-0.16	2 of 18
			ERM-2.1	0 of 18
	Phenanthrene	0.26 to 9.4	ERL-0.24	18 of 18
			ERM-1.5	5 of 18
	Benzo(a)anthracene	0.37 to 4.8	ERL-0.261	18 of 18
			ERM-1.6	2 of 18
	Benzo(a)pyrene	ND to 4.9	ERL-0.43	17 of 18
			ERM-1.6	1 of 18
	Chrysene	0.42 to 6.2	ERL-0.384	18 of 18
			ERM-2.8	1 of 18
	Fluoranthene	0.67 to 14	ERL-0.6	18 of 18
			ERM-5.1	2 of 18
	Pyrene	0.97 to 19	ERL-0.665	18 of 18
			ERM-2.6	9 of 18
Inorganic Compounds	Lead	41.9 to 283	ERL- 46.7	17 of 18
			ERM-218	3 of 18

PIER SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Phenanthrene	ND to 1.6	ERL-0.24	2 of 4
			ERM-1.5	1 of 4

TABLE 1
Nature and Extent of Contamination (Continued)

PIER SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Benzo(a)anthracene	ND to 2.5	ERL-0.261	1 of 4
			ERM-1.6	1 of 4
	Benzo(a)pyrene	ND to 2.6	ERL-0.43	1 of 4
			ERM-1.6	1 of 4
	Chrysene	ND to 2.9	ERL-0.384	1 of 4
			ERM-2.8	1 of 4
	Fluoranthene	ND to 7.3	ERL-0.6	1 of 4
			ERM-5.1	1 of 4
	Pyrene	ND to 6.7	ERL-0.665	1 of 4
			ERM-2.6	1 of 4
Inorganic Compounds	Arsenic	1.8 to 14.6	ERL-8.2	2 of 4
			ERM-70	0 of 4
	Cadmium	5.5 to 28.9	ERL-1.2	4 of 4
			ERM-9.6	2 of 4
	Chromium	6.7 to 140	ERL-81	1 of 4
			ERM-370	0 of 4
	Copper	5 to 208	ERL-34	1 of 4
			ERM-270	0 of 4
	Lead	17.5 to 323	ERL-46.7	2 of 4
			ERM-218	1 of 4
	Mercury	ND to 3.5	ERL-0.15	2 of 4
			ERM-0.71	2 of 4
	Nickel	7.5 to 38.2	ERL-20.9	2 of 4
			ERM-51.6	0 of 4
	Silver	ND to 5.9	ERL-1	1 of 4
			ERM-3.7	1 of 4

TABLE 1
Nature and Extent of Contamination (Continued)

PIER SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Zinc	26.3 to 375	ERL-150	1 of 4
			ERM-410	0 of 4

POND SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Acenaphthene	ND to 7.1	ERL-0.016	10 of 15
			ERM-0.5	5 of 15
	Anthracene	ND to 16	ERL-0.085	14 of 15
			ERM-1.1	7 of 15
	Fluorene	ND to 6.6	ERL-0.019	11 of 15
			ERM-0.54	6 of 15
	Naphthalene	ND to 2.7	ERL-0.16	4 of 15
			ERM-2.1	1 of 15
	Phenanthrene	ND to 62	ERL-0.24	14 of 15
			ERM-1.5	11 of 15
	Benzo(a)anthracene	ND to 33	ERL-0.261	14 of 15
			ERM-1.6	11 of 15
	Benzo(a)pyrene	ND to 41	ERL-0.43	14 of 15
			ERM-1.6	14 of 15
	Chrysene	ND to 33	ERL-0.384	14 of 15
			ERM-2.8	8 of 15
	Dibenz(a,h)anthracene	ND to 2.9	ERL-0.063	3 of 15
			ERM-0.26	3 of 15

TABLE 1
Nature and Extent of Contamination (Continued)

POND SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Fluoranthene	ND to 82	ERL-0.6	14 of 15
			ERM-5.1	8 of 15
	Pyrene	ND to 78	ERL-0.665	14 of 15
			ERM-2.6	14 of 15
PCB/Pesticides	PCB Aroclor 1260	ND to 0.92	ERL-0.0227	1 of 4
			ERM-0.18	1 of 4
Inorganic Compounds	Cadmium	9.7 to 19.8	ERL-1.2	4 of 4
			ERM-9.6	4 of 4
	Copper	10 to 89	ERL-34	2 of 4
			ERM-270	0 of 4
	Lead	18.1 to 4,840	ERL-46.7	14 of 15
			ERM-218	9 of 15
	Mercury	0.07 to 0.99	ERL-0.15	2 of 4
			ERM-0.71	1 of 4
	Zinc	54.1 to 528	ERL-150	3 of 4
			ERM-410	1 of 4

GROUNDWATER - SHALLOW ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND to 140	GA-1	4 of 9
			Class I-10	1 of 9
	Toluene	ND to 25	GA-5	1 of 9
			Class I-92	0 of 9
	Chlorobenzene	ND to 7	GA-5	1 of 9
			Class I-5	1 of 9

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - SHALLOW ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
	Ethylbenzene	ND to 17	GA-5	2 of 9
			Class I-4.5	2 of 9
	Xylene	ND to 89	GA-5	2 of 9
			Class I-19	1 of 9
Semivolatile Organic Compounds (SVOCs)	Phenol	ND to 6	GA-1	1 of 9
			Class I-NA	NA
	4-Methylphenol	ND to 8	GA-1	1 of 9
			Class I-NA	NA
	2,4-Dimethylphenol	ND to 6	GA-1	2 of 9
			Class I-1,000	0 of 9
	Naphthalene	ND to 76	GA-10	2 of 9
			Class I-16	1 of 9
	2-Methylnaphthalene	ND to 8	GA-NA	NA
			Class I-4.2	1 of 9
	Acenaphthene	ND to 16	GA-20	0 of 9
			Class I-6.6	1 of 9
	Fluorene	ND to 14	GA-50	0 of 9
			Class I-2.5	2 of 9
	Phenanthrene	ND to 15	GA-50	0 of 9
			Class I-1.5	3 of 9
Inorganic Compounds - Total	Antimony	ND to 30.1	GA-3	6 of 28
			Class I-NA	NA
	Arsenic	ND to 137	GA-25	3 of 28
			Class I-NA	NA
	Barium	ND to 1,660	GA-1,000	3 of 28
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - SHALLOW ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Inorganic Compounds - Total	Beryllium	ND to 8.3	GA-3	1 of 28
			Class I-NA	NA
	Cadmium	ND to 227	GA-5	8 of 28
			Class I-2.7	NA
	Chromium	ND to 581	GA-50	3 of 28
			Class I-NA	NA
	Copper	ND to 1,250	GA-200	2 of 28
			Class I-NA	NA
	Iron	ND to 238,000	GA-300	23 of 28
			Class I-NA	NA
	Lead	ND to 3,690	GA-25	10 of 28
			Class I-NA	NA
	Magnesium	8,450 to 667,000	GA-35,000	21 of 28
			Class I-NA	NA
	Manganese	30 to 3,990	GA-300	18 of 28
			Class I-NA	NA
	Mercury	ND to 9	GA-0.7	4 of 28
			Class I-NA	NA
	Nickel	ND to 619	GA-100	3 of 28
			Class I-NA	NA
	Sodium	ND to 9,650,000	GA-20,000	27 of 28
			Class I-NA	NA
	Thallium	ND to 16.9	GA-0.5	5 of 28
			Class I-NA	NA
	Zinc	ND to 3,470	GA-2,000	2 of 28
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - SHALLOW ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
	Iron + Manganese	30 to 241,990	GA-500	24 of 28
			Class I-NA	NA
Inorganic Compounds - Dissolved	Antimony	ND to 4.9	GA-3	1 of 10
			Class I-NA	NA
	Cadmium	ND to 17.2	GA-5	1 of 10
			Class I-2.7	0 of 10
	Iron	ND to 19,000	GA-300	3 of 10
			Class I-NA	NA
	Magnesium	1,430 to 464,000	GA-35,000	7 of 10
			Class I-NA	NA
	Manganese	3 to 2,750	GA-300	5 of 10
			Class I-NA	NA
	Sodium	133,000 to 6,770,000	GA-20,000	10 of 10
			Class I-NA	NA
	Thallium	ND to 3.5	GA-0.5	1 of 10
			Class I-NA	NA
	Zinc	ND to 325	GA-2,000	0 of 10
			Class I-66	5 of 10
	Iron + Manganese	55.7 to 21,750	GA-500	4 of 10
			Class I-NA	NA

GROUNDWATER - INTERMEDIATE ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Acetone	ND to 60	GA-50	1 of 4
			Class I-NA	NA
	1,2-Dichloroethylene	ND to 11	GA-5	1 of 4
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - INTERMEDIATE ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
	Benzene	ND to 13	GA-1	2 of 4
			Class I-10	2 of 4
	Trichloroethene	ND to 13	GA-5	1 of 4
			Class I-40	0 of 4
	Tetrachloroethene	ND to 4	GA-5	0 of 4
			Class I-1	1 of 4
Semivolatile Organic Compounds (SVOCs)	Phenol	ND to 130	GA-1	2 of 4
			Class I-NA	NA
	4-Methylphenol	ND to 24	GA-1	2 of 4
			Class I-NA	NA
	2,4-Dimethylphenol	1 to 5	GA-1	2 of 4
			Class I-1,000	0 of 4
	Naphthalene	ND to 140	GA-10	1 of 4
			Class I-16	1 of 4
	2-Methylnaphthalene	ND to 17	GA-NA	NA
			Class I-4.2	1 of 4
	Acenaphthene	1 to 19	GA-20	0 of 4
			Class I-6.6	1 of 4
	Fluorene	ND to 12	GA-50	0 of 4
			Class I-2.5	1 of 4
	Phenanthrene	ND to 23	GA-50	0 of 4
			Class I-1.5	3 of 4
Inorganic Compounds - Total	Antimony	ND to 102	GA-3	7 of 12
			Class I-NA	NA
	Cadmium	ND to 27.2	GA-5	2 of 12
			Class I-2.7	1 of 12

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - INTERMEDIATE ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
	Iron	393 to 29,500	GA-300	12 of 12
			Class I-NA	NA
	Lead	ND to 168	GA-25	1 of 12
			Class I-NA	NA
	Magnesium	17,200 to 272,000	GA-35,000	11 of 12
			Class I-NA	NA
	Manganese	59.9 to 736	GA-300	4 of 12
			Class I-NA	NA
	Sodium	1,130,000 to 8,730,000	GA-20,000	12 of 12
			Class I-NA	NA
	Thallium	ND to 8.7	GA-0.5	3 of 12
			Class I-NA	NA
	Iron + Manganese	ND to 29,847	GA-500	10 of 12
			Class I-NA	NA
Inorganic Compounds - Dissolved	Antimony	ND to 79.2	GA-3	4 of 6
			Class I-NA	NA
	Iron	ND to 1,450	GA-300	3 of 6
			Class I-NA	NA
	Magnesium	24,300 to 152,000	GA-35,000	5 of 6
			Class I-NA	NA
	Manganese	ND to 619	GA-300	1 of 6
			Class I-NA	NA
	Nickel	ND to 16.4	GA-100	0 of 6
			Class I-8.2	1 of 6
	Sodium	336,000 to 5,520,000	GA-20,000	6 of 6
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - INTERMEDIATE ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
	Zinc	ND to 156	GA-2,000	0 of 6
			Class I-66	1 of 6
	Iron + Manganese	ND to 1,603	GA-500	3 of 6
			Class I-NA	NA

GROUNDWATER - DEEP ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,2-Dichloroethylene	ND to 10	GA-5	1 of 4
			Class I-NA	NA
	2-Butanone	ND to 79	GA-50	2 of 4
			Class I-NA	NA
	Trichloroethene	ND to 21	GA-5	1 of 4
			Class I-40	0 of 4
	Tetrachloroethene	ND to 12	GA-5	1 of 4
			Class I-1	1 of 4
	Xylene	ND to 13	GA-5	1 of 4
			Class I-19	0 of 4
Semivolatile Organic Compounds (SVOCs)	bis(2-Ethylhexyl) phthalate	2 to 6	GA-5	1 of 4
			Class I-NA	NA
Inorganic Compounds - Total	Antimony	ND to 65.8	GA-3	4 of 12
			Class I-NA	NA
	Arsenic	ND to 27.8	GA-25	1 of 12
			Class I-NA	NA
	Cadmium	ND to 4.3	GA-5	0 of 12
			Class I-2.7	1 of 12
	Iron	ND to 1,130	GA-300	4 of 12
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - DEEP ON-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
	Magnesium	1,370 to 188,000	GA-35,000	7 of 12
			Class I-NA	NA
	Manganese	ND to 4,180	GA-300	9 of 12
			Class I-NA	NA
	Sodium	ND to 2,020,000	GA-20,000	11 of 12
			Class I-NA	NA
	Thallium	ND to 11.8	GA-0.5	4 of 12
			Class I-NA	NA
	Iron + Manganese	5.2 to 46,900	GA-500	9 of 12
			Class I-NA	NA
Inorganic Compounds - Dissolved	Antimony	ND to 51	GA-3	4 of 6
			Class I-NA	NA
	Magnesium	1,130 to 188,000	GA-35,000	4 of 6
			Class I-NA	NA
	Manganese	ND to 4,380	GA-300	4 of 6
			Class I-NA	NA
	Nickel	ND to 18.4	GA-100	0 of 6
			Class I-8.2	1 of 6
	Sodium	179,000 to 2,370,000	GA-20,000	6 of 6
			Class I-NA	NA
	Zinc	ND to 178	GA-2,000	0 of 6
			Class I-66	2 of 6
	Iron + Manganese	ND to 4,397.3	GA-500	4 of 6
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - SHALLOW OFF-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Inorganic Compounds - Total	Antimony	ND to 8.5	GA-3	2 of 6
			Class I-NA	NA
	Cadmium	ND to 33.2	GA-5	2 of 6
			Class I-2.7	2 of 6
	Iron	19.9 to 32,000	GA-300	2 of 6
			Class I-NA	NA
	Manganese	27.3 to 4,060	GA-300	2 of 6
			Class I-NA	NA
	Nickel	ND to 504	GA-100	1 of 6
			Class I-NA	NA
	Sodium	ND to 48,400	GA-20,000	3 of 6
			Class I-NA	NA
	Thallium	ND to 7	GA-0.5	2 of 6
			Class I-NA	NA
	Iron + Manganese	47.2 to 36,060	GA-500	2 of 6
			Class I-NA	NA
Inorganic Compounds - Dissolved	Antimony	ND to 22.8	GA-3	3 of 4
			Class I-NA	NA
	Sodium	14,200 to 47,300	GA-20,000	2 of 4
			Class I-NA	NA
	Zinc	ND to 77.8	GA-2,000	0 of 4
			Class I-66	1 of 4

TABLE 1
Nature and Extent of Contamination (Continued)

GROUNDWATER - INTERMEDIATE OFF-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,2-Dichloroethylene (total)	6	GA-5	1 of 1
			Class I-NA	NA
Inorganic Compounds - Total	Antimony	ND to 4.5	GA-3	1 of 2
			Class I-NA	NA
	Cadmium	ND to 7.4	GA-5	1 of 2
			Class I-2.7	1 of 2
	Sodium	28,300 to 43,200	GA-20,000	2 of 2
			Class I-NA	NA
Inorganic Compounds - Dissolved	Antimony	6.4 to 13.1	GA-3	2 of 2
			Class I-NA	NA
	Sodium	28,200 to 40,100	GA-20,000	2 of 2
			Class I-NA	NA

GROUNDWATER - DEEP OFF-SITE WELLS	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Tetrachloroethene	6	GA-5	1 of 1
			Class I-1	1 of 1
Inorganic Compounds - Total	Cadmium	ND to 6	GA-5	1 of 3
			Class I-2.7	1 of 3
	Sodium	108,000 to 216,000	GA-20,000	3 of 3
			Class I-NA	NA
	Thallium	ND to 5.7	GA-0.5	1 of 3
			Class I-NA	NA
Inorganic Compounds - Dissolved	Antimony	ND to 4.6	GA-3	1 of 2
			Class I-NA	NA
	Sodium	109,000 to 208,000	GA-20,000	2 of 2
			Class I-NA	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SURFACE WATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Inorganic Compounds	Zinc	282 to 354	66	9 of 9

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil

[b] SCG = standards, criteria, and guidance values;
Soils: TAGM 4046 Criteria
Sediments: NYSDEC Sediment Screening Criteria (ERLs and ERMs - see footnote c)
Groundwater: NYS TOGS 1.1.1 GA Groundwater Criteria and Class I Surface Water Criteria
Surface water: NYS TOGS 1.1.1 Class I Surface Water Criteria

[c] ERL = Effect Range - Low and ERM = Effect Range - Moderate. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the ER-L is exceeded, the impact is considered to be moderate.

ND = not detected
NA = not applicable

Table 2
Individual Remedial Alternative Costs

Remedial Alternative		Capital Cost	Annual OM&M	Total Present Worth
Soil Remedial Alternative				
SO-1	No Action	$0	$0	$0
SO-2	2-Foot Soil Cover with 6-Inch Soil Cover in Wooded Areas	$5,700,000 to $10,800,000	$12,000	$5,900,000 to $11,000,000
SO-3	Part 360 Cap with 6-Inch Soil Cover in Wooded Areas	$13,400,000 to $20,000,000	$18,000 to $19,500	$13,700,000 to $20,300,000
Landfill Gas Remedial Alternative				
LFG-1	No Action	$0	$0	$0
LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls and Monitoring	$970,000	$31,000	$1,400,000
LFG-3	Active Landfill Gas Control with Institutional Controls and Monitoring	$1,300,000	$47,000	$2,000,000
Groundwater Remedial Alternatives				
GW-1	No Action	$6,000	$0	$6,000
GW-2	Continued Groundwater Monitoring	$92,000	$53,000 to $55,000	$190,000

Table 2
Individual Remedial Alternative Costs (Continued)

Remedial Alternative		Capital Cost	Annual OM&M	Total Present Worth
Sediment Remedial Alternatives				
SD-1	No Action	$0	$0	$0
SD-2	Covering of Shallow Pond Area Sediments and Shoreline Stabilization with Institutional Controls	$3,400,000	$6,000 - $11,000	$3,500,000
SD-3	Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments, and Shoreline Stabilization with Institutional Controls	$4,500,000 to $6,500,000	$6,000 to $11,000	$4,600,000 to $6,600,000
SD-4	Covering of Pond Area Sediments, Salt Marsh Creation, and Shoreline Stabilization with Institutional Controls	$3,100,000	$6,000 to $42,000	$3,300,000

TABLE 3

SUMMARY OF TOTAL SITE REMEDIAL COST ESTIMATES BASED ON A 2-FOOT SOIL COVER (ALTERNATIVE SO-2)

Bush Terminal Landfill Piers 1-4

Brooklyn, New York

2-FOOT SOIL COVER REMEDIES WITH COMBINED PASSIVE/ACTIVE LANDFILL GAS CONTROL:

WITH Covering OF SHALLOW POND SEDIMENTS (ALT. SD-2):			WITH EXCAVATION/COVERING OF SHALLOW POND SEDIMENTS AND FILLING/Covering OF DEEPER POND AREA SEDIMENTS (ALT. SD-3):			WITH SALT MARSH CREATION (ALT. SD-4):		
SO-2	2-Foot Soil Cover, 6-Inch Cover in Wooded Area with Institutional Controls	11 million	SO-2	2-Foot Soil Cover, 6-Inch Cover in Wooded Area with Institutional Controls	10.4 million	SO-2	2-Foot Soil Cover, 6-Inch Cover in Wooded Area with Institutional Controls	5.9 million
LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls & Monitoring	1.4 million	LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls & Monitoring	1.4 million	LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls & Monitoring	1.4 million
GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million
SD-2	Covering of Shallow Pond Area Sediments and Shoreline Stabilization with Institutional Controls	3.5 million	SD-3	Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments and Shoreline Stabilization with Institutional Controls	4.6 - 6.6 million	SD-4	Covering of Pond Area Sediments, Salt Marsh Creation, and Shoreline Stabilization with Institutional Controls	3.3 million
	Total Estimated Cost:	**16.1 million**		**Total Estimated Cost:**	**16.6 - 18.6 million**		**Total Estimated Cost:**	**10.8 million**

2-FOOT SOIL COVER REMEDIES WITH ACTIVE LANDFILL GAS CONTROL:

WITH Covering OF SHALLOW POND SEDIMENTS (ALT. SD-2):			WITH EXCAVATION/COVERING OF SHALLOW POND SEDIMENTS AND FILLING/Covering OF DEEPER POND AREA SEDIMENTS (ALT. SD-3):			WITH SALT MARSH CREATION (ALT. SD-4):		
SO-2	2-Foot Soil Cover, 6-Inch Cover in Wooded Area with Institutional Controls	11 million	SO-2	2-Foot Soil Cover, 6-Inch Cover in Wooded Area with Institutional Controls	10.4 million	SO-2	2-Foot Soil Cover, 6-Inch Cover in Wooded Area with Institutional Controls	5.9 million
LFG-3	Active Landfill Gas Control with Institutional Controls & Monitoring	2 million	LFG-3	Active Landfill Gas Control with Institutional Controls & Monitoring	2 million	LFG-3	Active Landfill Gas Control with Institutional Controls & Monitoring	2 million
GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million
SD-2	Covering of Shallow Pond Area Sediments and Shoreline Stabilization with Institutional Controls	3.5 million	SD-3	Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments and Shoreline Stabilization with Institutional Controls	4.6 - 6.6 million	SD-4	Covering of Pond Area Sediments, Salt Marsh Creation, and Shoreline Stabilization with Institutional Controls	3.3 million
	Total Estimated Cost:	**16.7 million**		**Total Estimated Cost:**	**17.2 - 19.2 million**		**Total Estimated Cost:**	**11.4 million**

TABLE 4

SUMMARY OF TOTAL SITE REMEDIAL COST ESTIMATES BASED ON A PART 360 CAP (ALTERNATIVE SO-3)

Bush Terminal Landfill Piers 1-4

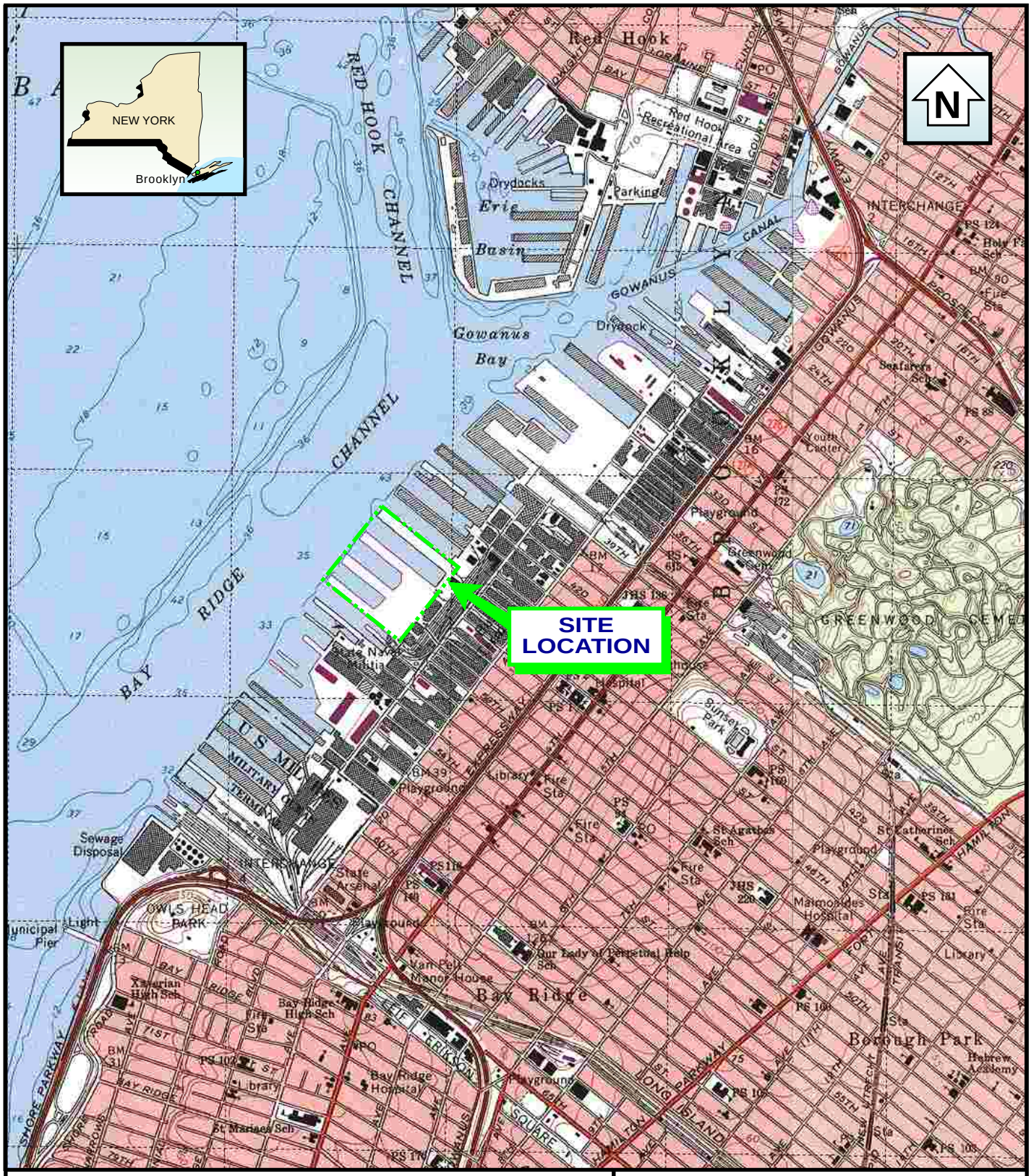
Brooklyn, New York

PART 360 CAP REMEDIES WITH PASSIVE LANDFILL GAS CONTROL:

WITH Covering OF SHALLOW POND SEDIMENTS (ALT. SD-2):			WITH EXCAVATION/COVERING OF SHALLOW POND SEDIMENTS AND FILLING/Covering OF DEEPER POND AREA SEDIMENTS (ALT. SD-3):			WITH SALT MARSH CREATION (ALT. SD-4):		
SO-3	Part 360 Cap, 6-Inch Cover in Wooded Area with Institutional Controls	18.7 - 20.3 million	SO-3	Part 360 Cap, 6-Inch Cover in Wooded Area with Institutional Controls	18.2 - 19.7 million	SO-3	Part 360 Cap, 6-Inch Cover in Wooded Area with Institutional Controls	13.7 - 14.8 million
LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls & Monitoring	1.4 million	LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls & Monitoring	1.4 million	LFG-2	Combined Passive/Active Landfill Gas Control with Institutional Controls & Monitoring	1.4 million
GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million
SD-2	Covering of Shallow Pond Area Sediments and Shoreline Stabilization with Institutional Controls	3.5 million	SD-3	Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments and Shoreline Stabilization with Institutional Controls	4.6 - 6.6 million	SD-4	Covering of Pond Area Sediments, Salt Marsh Creation, and Shoreline Stabilization with Institutional Controls	3.3 million
	Total Estimated Cost:	**23.8 - 25.4 million**		**Total Estimated Cost:**	**24.4 - 27.9 million**		**Total Estimated Cost:**	**18.6 - 19.7 million**

PART 360 CAP REMEDIES WITH ACTIVE LANDFILL GAS CONTROL:

WITH Covering OF SHALLOW POND SEDIMENTS (ALT. SD-2):			WITH EXCAVATION/COVERING OF SHALLOW POND SEDIMENTS AND FILLING/COVERING OF DEEPER POND AREA SEDIMENTS (ALT. SD-3):			WITH SALT MARSH CREATION (ALT. SD-4):		
SO-3	Part 360 Cap, 6-Inch Cover in Wooded Area with Institutional Controls	18.7 - 20.3 million	SO-3	Part 360 Cap, 6-Inch Cover in Wooded Area with Institutional Controls	18.2 - 19.7 million	SO-3	Part 360 Cap, 6-Inch Cover in Wooded Area with Institutional Controls	13.7 - 14.8 million
LFG-3	Active Landfill Gas Control with Institutional Controls & Monitoring	2 million	LFG-3	Active Landfill Gas Control with Institutional Controls & Monitoring	2 million	LFG-3	Active Landfill Gas Control with Institutional Controls & Monitoring	2 million
GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million	GW-2	Ground Water Monitoring	0.19 million
SD-2	Covering of Shallow Pond Area Sediments and Shoreline Stabilization with Institutional Controls	3.5 million	SD-3	Excavation/Covering of Shallow Pond Area Sediments, Filling/Covering of Deeper Pond Area Sediments and Shoreline Stabilization with Institutional Controls	4.6 - 6.6 million	SD-4	Covering of Pond Area Sediments, Salt Marsh Creation, and Shoreline Stabilization with Institutional Controls	3.3 million
	Total Estimated Cost:	**24.4 - 26 million**		**Total Estimated Cost:**	**25 - 28.5 million**		**Total Estimated Cost:**	**19.2 - 20.3 million**



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BASE CREATED WITH TOPO™ © 1996 WILDFLOWERS PRODUCTIONS, www.topo.com
JERSEY CITY, NJ-NY - 7.5' USGS TOPOGRAPHIC MAP

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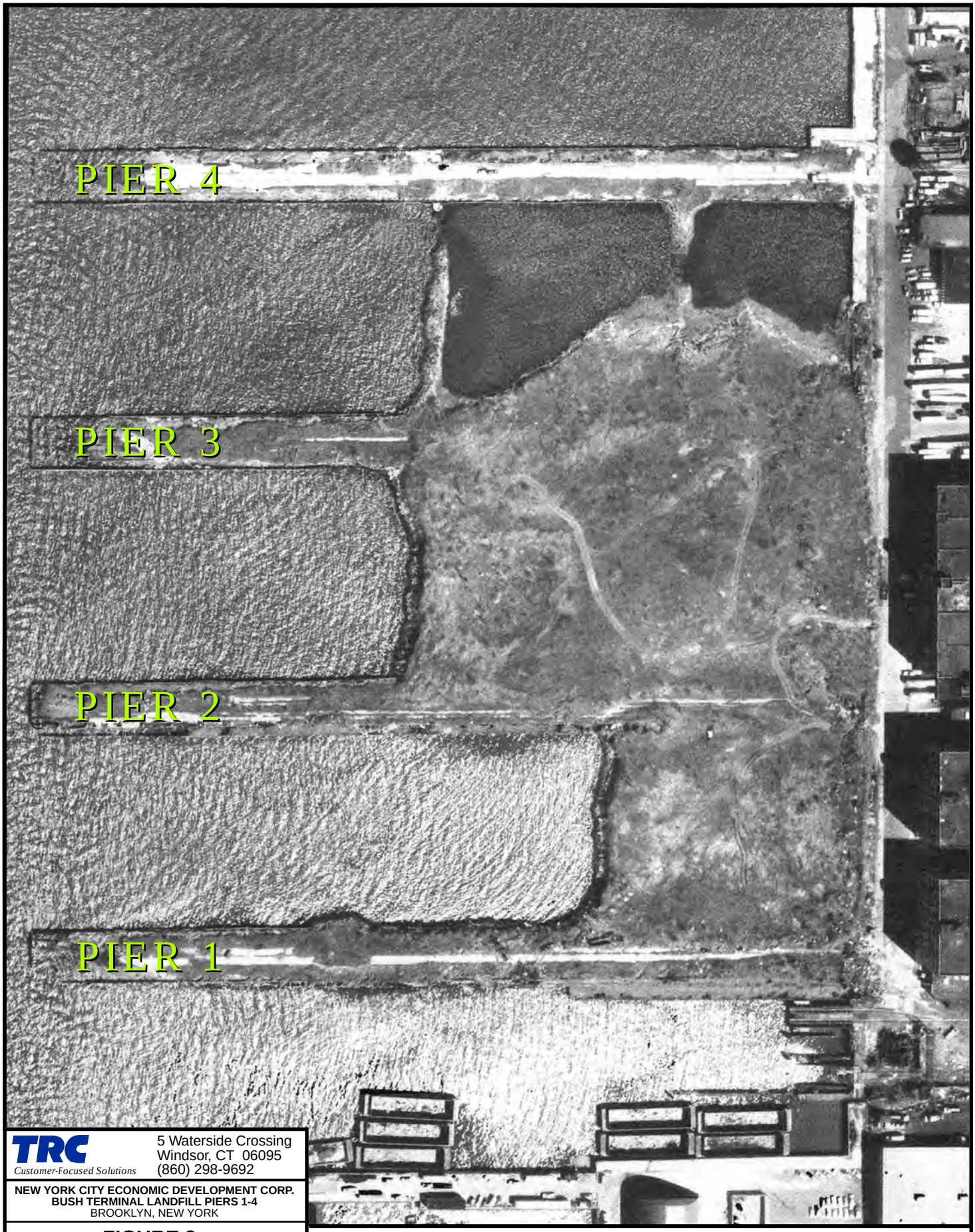
NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION
BUSH TERMINAL LANDFILL PIERS 1-4
BROOKLYN, NEW YORK

FIGURE 1
SITE LOCATION MAP

Date: 08/02 | **Project No.** 31193-0140

HAZ/31193-0140.FH10



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BROOKLYN, NEW YORK

FIGURE 2
AERIAL PHOTO
MARCH 29, 1990

Date: 08/02 | **Project No.** 31193-0140

Source: National Aerial Resources, Troy, NY
Serial No. 020P 98-0645A

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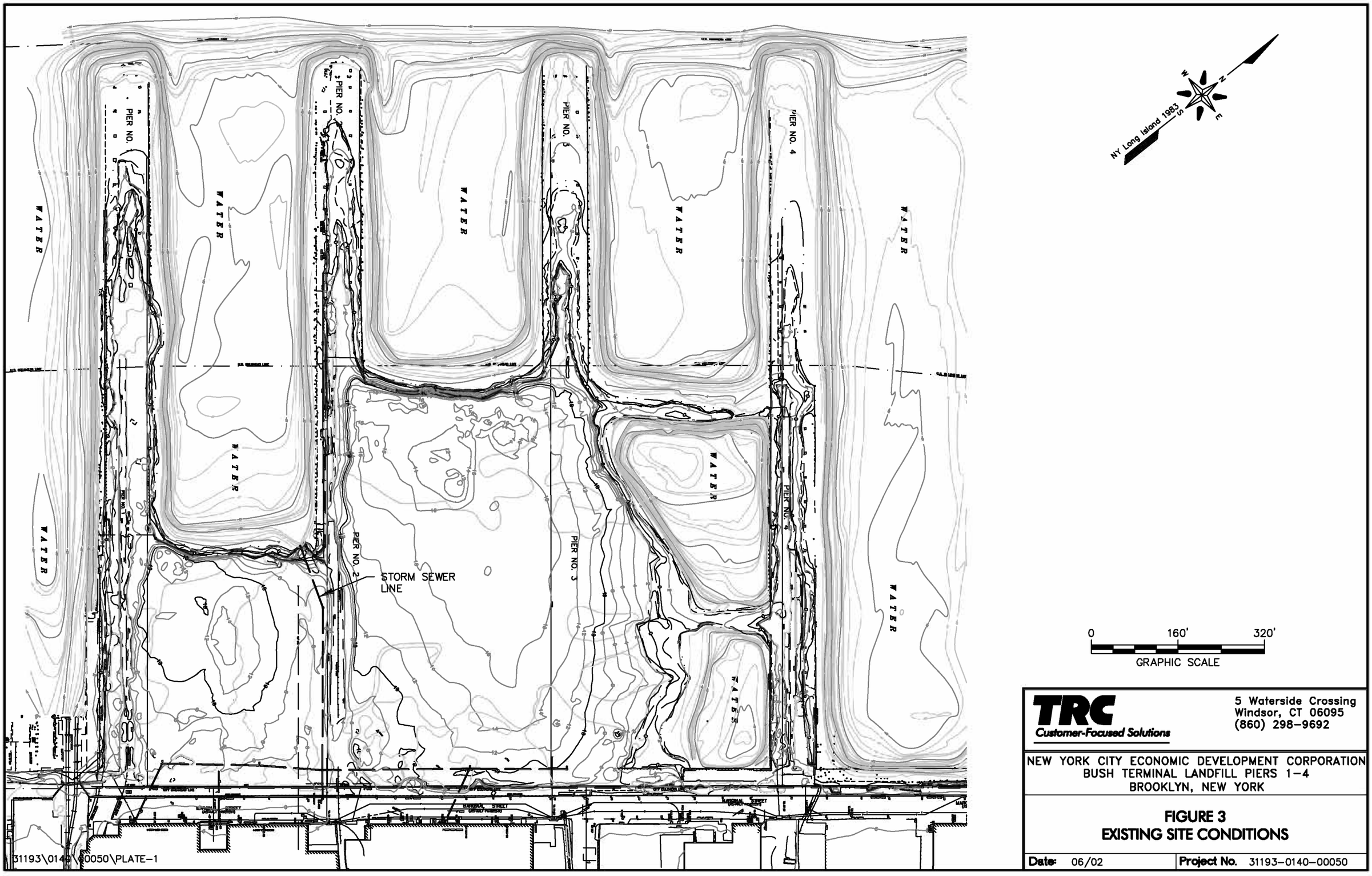

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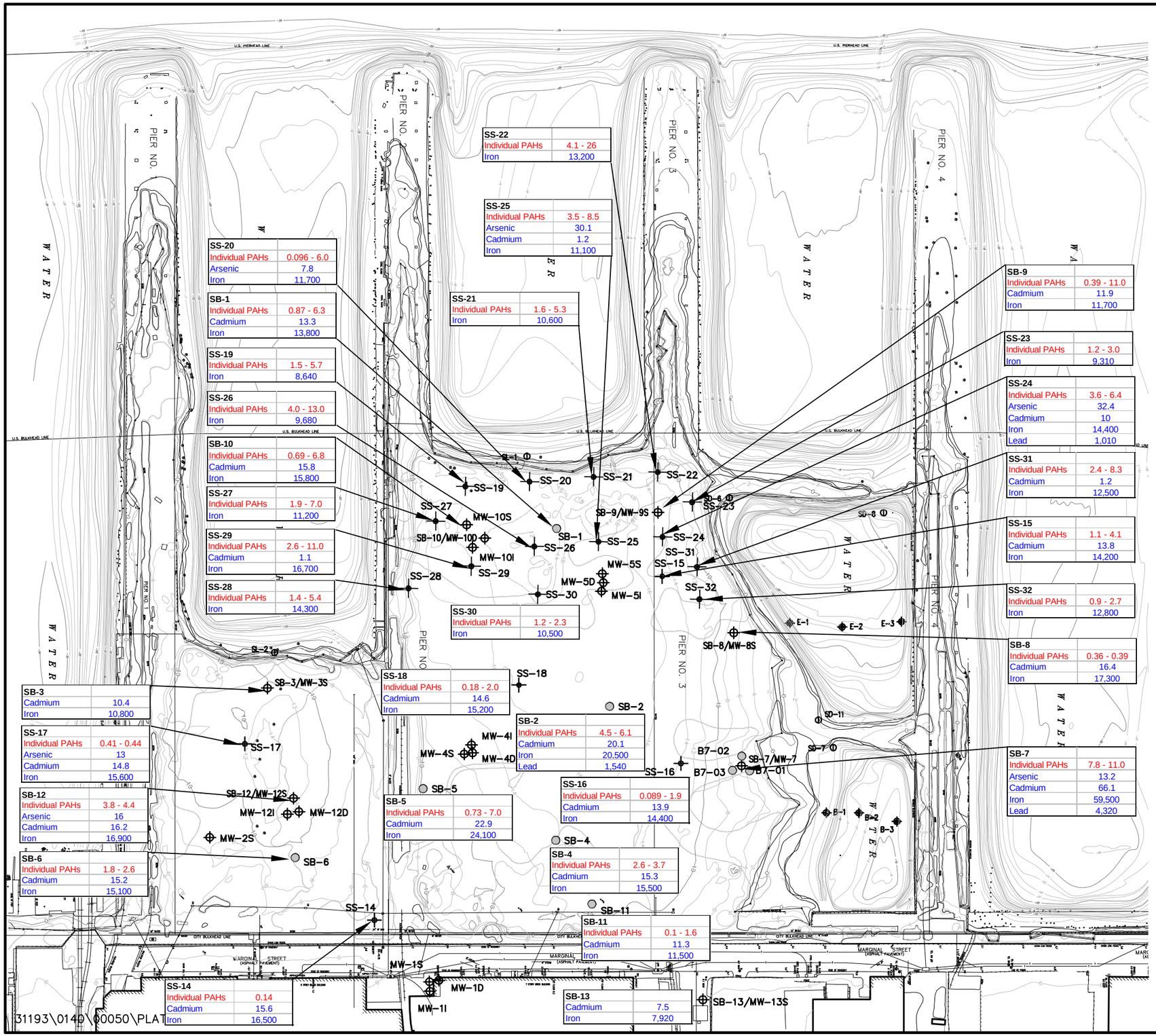
FIGURE 3
EXISTING SITE CONDITIONS

Date: 06/02 | **Project No.** 31193-0140-00050



SS-22	
Individual PAHs	4.1 - 26
Iron	13,200

SS-25	
Individual PAHs	3.5 - 8.5
Arsenic	30.1
Cadmium	1.2
Iron	11,100

SS-21	
Individual PAHs	1.6 - 5.3
Iron	10,600

SS-20	
Individual PAHs	0.096 - 6.0
Arsenic	7.8
Iron	11,700

SB-1	
Individual PAHs	0.87 - 6.3
Cadmium	13.3
Iron	13,800

SS-19	
Individual PAHs	1.5 - 5.7
Iron	8,640

SS-26	
Individual PAHs	4.0 - 13.0
Iron	9,680

SB-10	
Individual PAHs	0.69 - 6.8
Cadmium	15.8
Iron	15,800

SS-27	
Individual PAHs	1.9 - 7.0
Iron	11,200

SS-29	
Individual PAHs	2.6 - 11.0
Cadmium	1.1
Iron	16,700

SS-28	
Individual PAHs	1.4 - 5.4
Iron	14,300

SS-30	
Individual PAHs	1.2 - 2.3
Iron	10,500

SB-9	
Individual PAHs	0.39 - 11.0
Cadmium	11.9
Iron	11,700

SS-23	
Individual PAHs	1.2 - 3.0
Iron	9,310

SS-24	
Individual PAHs	3.6 - 6.4
Arsenic	32.4
Cadmium	10
Iron	14,400
Lead	1,010

SS-31	
Individual PAHs	2.4 - 8.3
Cadmium	1.2
Iron	12,500

SS-15	
Individual PAHs	1.1 - 4.1
Cadmium	13.8
Iron	14,200

SS-32	
Individual PAHs	0.9 - 2.7
Iron	12,800

SB-8	
Individual PAHs	0.36 - 0.39
Cadmium	16.4
Iron	17,300

SB-7	
Individual PAHs	7.8 - 11.0
Arsenic	13.2
Cadmium	66.1
Iron	59,500
Lead	4,320

SB-3	
Cadmium	10.4
Iron	10,800

SS-17	
Individual PAHs	0.41 - 0.44
Arsenic	13
Cadmium	14.8
Iron	15,600

SB-12	
Individual PAHs	3.8 - 4.4
Arsenic	16
Cadmium	16.2
Iron	16,900

SB-6	
Individual PAHs	1.8 - 2.6
Cadmium	15.2
Iron	15,100

SS-18	
Individual PAHs	0.18 - 2.0
Cadmium	14.6
Iron	15,200

SB-2	
Individual PAHs	4.5 - 6.1
Cadmium	20.1
Iron	20,500
Lead	1,540

SB-5	
Individual PAHs	0.73 - 7.0
Cadmium	22.9
Iron	24,100

SS-16	
Individual PAHs	0.089 - 1.9
Cadmium	13.9
Iron	14,400

SB-4	
Individual PAHs	2.6 - 3.7
Cadmium	15.3
Iron	15,500

SB-11	
Individual PAHs	0.1 - 1.6
Cadmium	11.3
Iron	11,500

SS-14	
Individual PAHs	0.14
Cadmium	15.6
Iron	16,500

SB-13	
Cadmium	7.5
Iron	7,920

Red Text	Semivolatile Organic Compounds		
Blue Text	Inorganics		
Associated TAGM Levels			
PAHs	0.014 - 3.2	(see notes below)	
Arsenic	7.5		
Cadmium	1		
Iron	2,000		
Lead	1,000	(SEE NOTE BELOW)	
All concentrations are in parts per million.			
Notes: PAH = Polynuclear Aromatic Hydrocarbon. Only those constituents of concern present at levels exceeding TAGM levels are shown. For PAHs, ranges in concentrations for those PAHs detected at levels exceeding individual TAGM limits are noted. Individual PAHs present in one or more samples at levels exceeding TAGM levels include the following:			
			TAGM
Benzo(a)anthracene			0.224
Benzo(b)fluoranthene			1.1
Benzo(k)fluoranthene			1.1
Benzo(a)pyrene			61
Dibenz(a,h)anthracene			14
Indeno(1,2,3-c,d)anthracene			3,200
For lead, the TAGM standard is site background, which can vary widely in metropolitan areas. A screening level of 1,000 ppm was used.			
TAGM levels are from NYSDEC TAGM 94-4046.			
Constituents of concern were identified in Section 6 of the SI Report (CDM, 2001).			

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- SURFACE SOIL SAMPLE LOCATION
- ADDITIONAL SURFACE SOIL SAMPLE LOCATION

ALL PRIOR SAMPLE LOCATIONS SHOWN ARE FROM MAP TITLED "BUSH TERMINAL LANDFILL, BROOKLYN, NEW YORK, SITE INVESTIGATION REPORT, SAMPLE LOCATIONS", SHEET No. PLATE-4, DATED: APRIL 2000, SCALE: 1"=80', BY CAMP, DRESSER & McKEE, INC..

0 160' 320'

GRAPHIC SCALE

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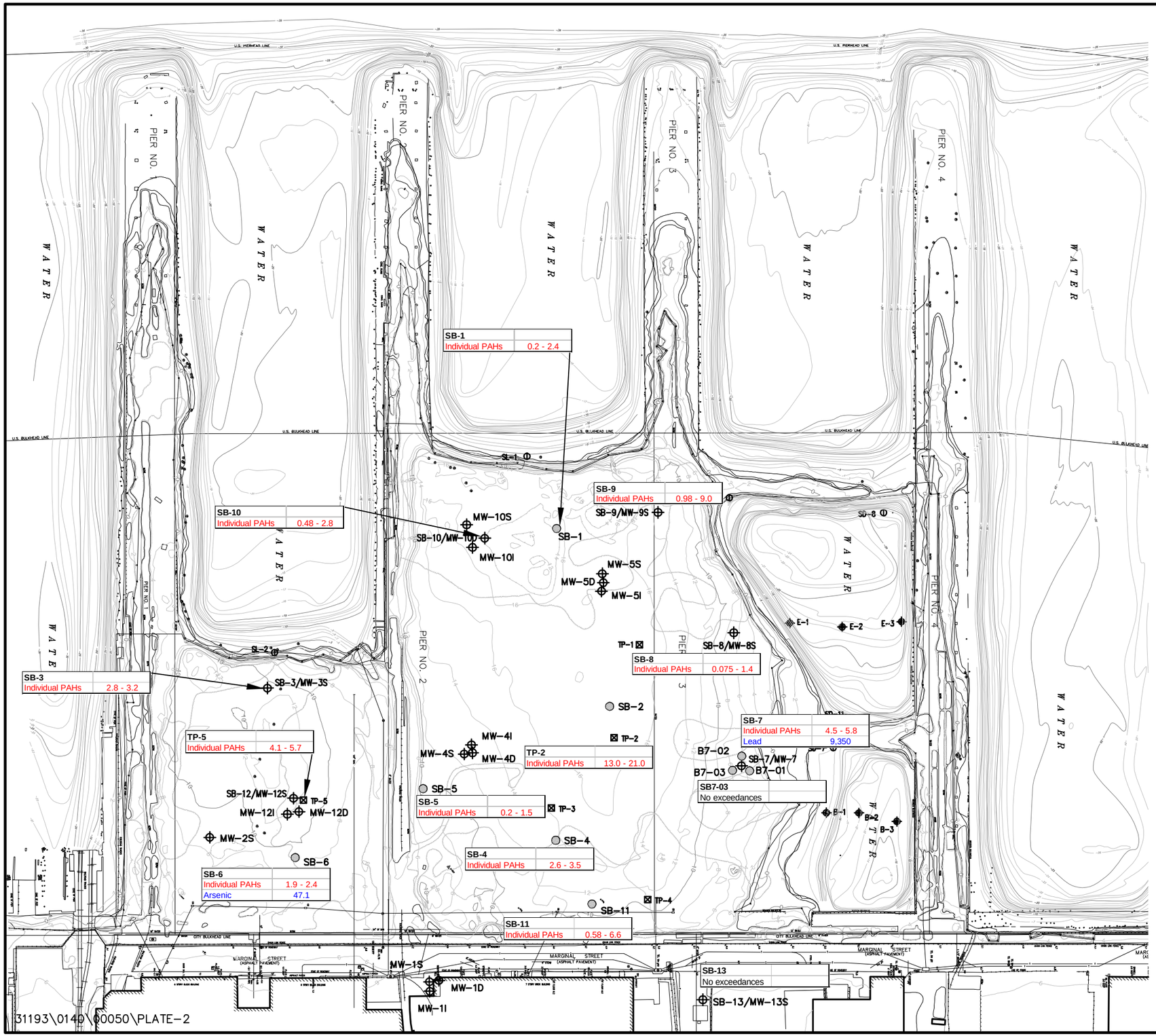
FIGURE 4
SUMMARY OF SURFACE SOIL CONSTITUENTS OF CONCERN THAT EXCEED TAGM LEVELS

Date: 06/03 | Project No. 31193-0140-00050

31193\0140\00050\PLAT



Red Text	Semivolatile Organic Compounds		
Blue Text	Inorganics		
Associated TAGM Levels			
PAHs	0.014 - 3.2	(see notes below)	
Arsenic	7.5		
Lead	1,000	(SEE NOTE BELOW)	
All concentrations are in parts per million.			
Notes: PAH = Polynuclear Aromatic Hydrocarbon.			
Only those constituents of concern present at levels exceeding TAGM levels are shown, with the exception of lead, which was not identified as a constituent of concern but is shown here. For PAHs,			
ranges in concentrations for those PAHs detected at levels exceeding individual TAGM limits are noted.			
Individual PAHs present in one or more samples at levels exceeding TAGM levels include the following:			
			TAGM
Benzo(a)anthracene			0.224
Benzo(b)fluoranthene			1.1
Benzo(k)fluoranthene			1.1
Benzo(a)pyrene			0.061
Dibenz(a,h)anthracene			0.014
For lead, the TAGM standard is site background, which can vary widely in metropolitan areas. A screening level of 1,000 ppm was used.			
TAGM levels are from NYSDEC TAGM 94-4046.			
Constituents of concern were identified in Section 6 of the SI Report (CDM, 2001).			

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- TEST PIT LOCATION

ALL PRIOR SAMPLE LOCATIONS SHOWN ARE FROM MAP TITLED "BUSH TERMINAL LANDFILL, BROOKLYN, NEW YORK, SITE INVESTIGATION REPORT, SAMPLE LOCATIONS", SHEET No. PLATE-4, DATED: APRIL 2000, SCALE: 1"=80', BY CAMP, DRESSER & McKEE, INC..

0 160' 320'

GRAPHIC SCALE

TRC
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5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692

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BUSH TERMINAL LANDFILL PIERS 1-4
BROOKLYN, NEW YORK

FIGURE 5

SUMMARY OF UNSATURATED SUBSURFACE SOIL CONSTITUENTS OF CONCERN THAT EXCEED TAGM LEVELS

Date: 06/03 | Project No. 31193-0140-00050

Red Text		Semivolatile Organic Compounds		
Blue Text		Inorganics		
Associated TAGM Levels:				
PAHs		0.014 - 1.1 (see notes below)		
Arsenic		7.5		
Lead		1,000	(SEE NOTE BELOW)	
All concentrations are in parts per million.				
Notes: PAH = Polynuclear aromatic hydrocarbons				
Only those constituents of concern present at levels exceeding TAGM levels are shown, with the exception of lead, which was not identified as a constituent of concern but is shown here. For PAHs, ranges				
in concentrations for those PAHs detected at levels exceeding individual TAGM limits are noted.				
Individual PAHs present in one or more samples at levels exceeding TAGM levels include the following:				
				TAGM
Benzo(a)anthracene				0.224
Benzo(b)fluoranthene				1.1
Benzo(k)fluoranthene				1.1
Benzo(a)pyrene				0.061
Dibenz(a,h)anthracene				0.014
Indeno (1,2,3-cd)pyrene				3.2
For lead, the TAGM standard is site background, which can vary widely in metropolitan areas. A screening level of 1,000 ppm was used.				
TAGM levels are from NYSDEC TAGM 94-4046.				
Constituents of concern were identified in Section 6 of the SI Report (CDM, 2001)				

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- TEST PIT LOCATION

ALL PRIOR SAMPLE LOCATIONS SHOWN ARE FROM MAP TITLED "BUSH TERMINAL LANDFILL, BROOKLYN, NEW YORK, SITE INVESTIGATION REPORT, SAMPLE LOCATIONS", SHEET No. PLATE-4, DATED: APRIL 2000, SCALE: 1"=80', BY CAMP, DRESSER & McKEE, INC..

0 160' 320'

GRAPHIC SCALE

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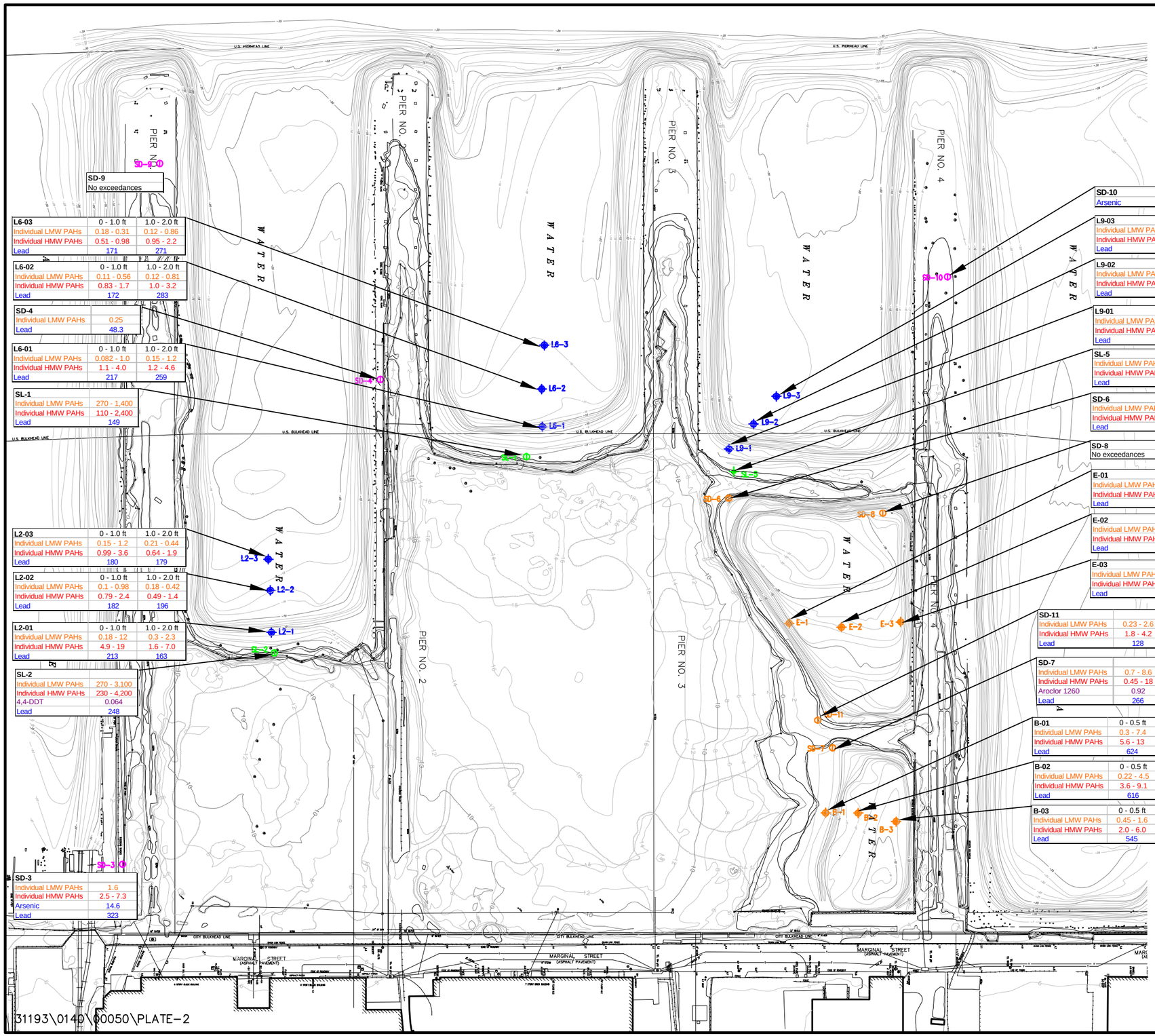
FIGURE 6

SUMMARY OF SATURATED SUBSURFACE SOIL CONSTITUENTS OF CONCERN THAT EXCEED TAGM LEVELS

Date: 06/03 | Project No. 31193-0140-00050

31193\0140\00050\PLATE-2



SD-9	
No exceedances	

L6-03	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.18 - 0.31	0.12 - 0.86
Individual HMW PAHs	0.51 - 0.98	0.95 - 2.2
Lead	171	271

L6-02	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.11 - 0.56	0.12 - 0.81
Individual HMW PAHs	0.83 - 1.7	1.0 - 3.2
Lead	172	283

SD-4	
Individual LMW PAHs	0.25
Lead	48.3

L6-01	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.082 - 1.0	0.15 - 1.2
Individual HMW PAHs	1.1 - 4.0	1.2 - 4.6
Lead	217	259

SL-1	
Individual LMW PAHs	270 - 1,400
Individual HMW PAHs	110 - 2,400
Lead	149

L2-03	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.15 - 1.2	0.21 - 0.44
Individual HMW PAHs	0.99 - 3.6	0.64 - 1.9
Lead	180	179

L2-02	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.1 - 0.98	0.18 - 0.42
Individual HMW PAHs	0.79 - 2.4	0.49 - 1.4
Lead	182	196

L2-01	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.18 - 12	0.3 - 2.3
Individual HMW PAHs	4.9 - 19	1.6 - 7.0
Lead	213	163

SL-2	
Individual LMW PAHs	270 - 3,100
Individual HMW PAHs	230 - 4,200
4,4-DDT	0.064
Lead	248

SD-3	
Individual LMW PAHs	1.6
Individual HMW PAHs	2.5 - 7.3
Arsenic	14.6
Lead	323

SD-10	
Arsenic	9.9

L9-03	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.33 - 0.78	0.11 - 0.26
Individual HMW PAHs	0.95 - 2.2	0.37 - 0.97
Lead	149	111

L9-02	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.17 - 1.7	0.09 - 1.4
Individual HMW PAHs	1.0 - 2.8	1.2 - 3.2
Lead	107	187

L9-01	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	0.20 - 2.2	0.20 - 2.2
Individual HMW PAHs	1.3 - 3.3	1.3 - 3.7
Lead	50.6	NE

SL-5	
Individual LMW PAHs	0.25 - 1.1
Individual HMW PAHs	0.96 - 1.7
Lead	127

SD-6	
Individual LMW PAHs	0.58 - 5.9
Individual HMW PAHs	0.28 - 10
Lead	156

SD-8	
No exceedances	

E-01	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	0.12 - 1.4	0.15 - 1.7
Individual HMW PAHs	1.6 - 4.7	1.9 - 5.8
Lead	236	248

E-02	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	NA	0.11 - 1.3
Individual HMW PAHs	NA	1.5 - 4.8
Lead	NA	202

E-03	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	2.7 - 62	1.4 - 58
Individual HMW PAHs	28 - 78	2.9 - 82
Lead	192	185

SD-11	
Individual LMW PAHs	0.23 - 2.6
Individual HMW PAHs	1.8 - 4.2
Lead	128

SD-7	
Individual LMW PAHs	0.7 - 8.6
Individual HMW PAHs	0.45 - 18
Aroclor 1260	0.92
Lead	266

B-01	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	0.3 - 7.4	2.1 - 7.8
Individual HMW PAHs	5.6 - 13	9.2 - 24
Lead	624	4,840

B-02	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	0.22 - 4.5	0.36 - 1.2
Individual HMW PAHs	3.6 - 9.1	1.6 - 4.6
Lead	616	682

B-03	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	0.45 - 1.6	0.2 - 2.4
Individual HMW PAHs	2.0 - 6.0	3.1 - 11
Lead	545	653

Orange Text		Low Molecular Weight (LMW) PAHs
Red Text		High Molecular Weight (HMW) PAHs
Purple Text		Pesticides/PCBs
Blue Text		Inorganics

All concentrations are in parts per million.

Associated ERL Levels		
Individual LMW PAHs	0.016 - 0.24	(see notes below)
Individual HMW PAHs	0.063 - 0.665	(see notes below)
PCB Aroclor 1260	0.0227	
Arsenic	8.2	
Lead	46.7	

Only those constituents of concern present at levels exceeding Effects Range Low (ERL) levels are shown. For LMW PAHs and HMW PAHs, ranges in concentrations for those PAHs detected at levels exceeding individual ERL limits are noted.

Individual PAHs present in one or more samples at levels exceeding ERL levels include the following:

	ERL:
Individual LMW PAHs:	
Acenaphthylene	0.044
Acenaphthene	0.016
Anthracene	0.085
Fluorene	0.019
Naphthalene	0.16
Phenanthrene	0.24
Individual HMW PAHs:	
Benzo(a)anthracene	0.261
Benzo(a)pyrene	0.43
Chrysene	0.384
Dibenz(a,h)anthracene	0.063
Fluoranthene	0.6
Pyrene	0.665

ERL levels are from NYSDEC Technical Guidance for Screening Contaminated Sediments, 1/25/99.

Notes:
PAH = Polynuclear Aromatic Hydrocarbon.
NE = ERL levels not exceeded
NA = Not analyzed

Constituents of concern were identified in Section 6 of the SI Report (CDM, 2001).

LEGEND

- SHORELINE SOIL
- SHORELINE SEDIMENT
- PIER SEDIMENT
- POND SEDIMENT
- SEDIMENT SAMPLE LOCATION
- VIBRACORE LOCATION
- SOIL SAMPLE LOCATION

ALL PRIOR SAMPLE LOCATIONS SHOWN ARE FROM MAP TITLED "BUSH TERMINAL LANDFILL, BROOKLYN, NEW YORK, SITE INVESTIGATION REPORT, SAMPLE LOCATIONS", SHEET No. PLATE-4, DATED: APRIL 2000, SCALE: 1"=80', BY CAMP, DRESSER & McKEE, INC..

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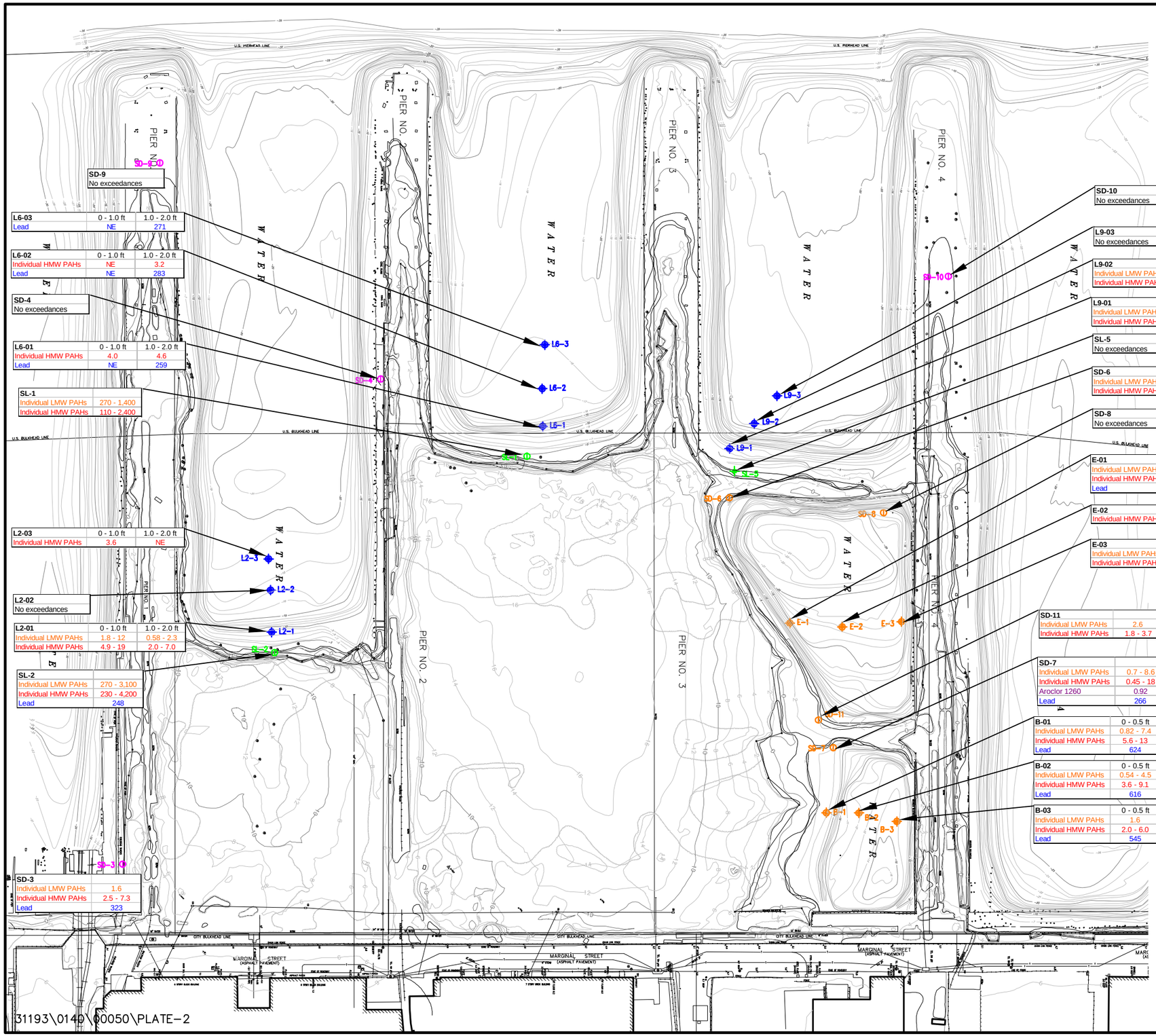
BUSH TERMINAL LANDFILL PIERS 1-4
BROOKLYN, NEW YORK

FIGURE 7

SUMMARY OF SEDIMENT AND SHORELINE SOIL CONSTITUENTS OF CONCERN THAT EXCEED ERL LEVELS

Date: 06/03 | Project No. 31193-0140-00050



SD-9
No exceedances

L6-03	0 - 1.0 ft	1.0 - 2.0 ft
Lead	NE	271

L6-02	0 - 1.0 ft	1.0 - 2.0 ft
Individual HMW PAHs	NE	3.2
Lead	NE	283

SD-4
No exceedances

L6-01	0 - 1.0 ft	1.0 - 2.0 ft
Individual HMW PAHs	4.0	4.6
Lead	NE	259

SL-1	
Individual LMW PAHs	270 - 1,400
Individual HMW PAHs	110 - 2,400

L2-03	0 - 1.0 ft	1.0 - 2.0 ft
Individual HMW PAHs	3.6	NE

L2-02
No exceedances

L2-01	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	1.8 - 12	0.58 - 2.3
Individual HMW PAHs	4.9 - 19	2.0 - 7.0

SL-2	
Individual LMW PAHs	270 - 3,100
Individual HMW PAHs	230 - 4,200
Lead	248

SD-3	
Individual LMW PAHs	1.6
Individual HMW PAHs	2.5 - 7.3
Lead	323

SD-10
No exceedances

L9-03
No exceedances

L9-02	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	1.7	NE
Individual HMW PAHs	NE	3.2

L9-01	0 - 1.0 ft	1.0 - 2.0 ft
Individual LMW PAHs	2.2	2.2
Individual HMW PAHs	2.9	3.2

SL-5
No exceedances

SD-6	
Individual LMW PAHs	0.58 - 5.9
Individual HMW PAHs	0.28 - 10

SD-8
No exceedances

E-01	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	NE	1.7
Individual HMW PAHs	1.8 - 4.7	1.9 - 5.8
Lead	236	248

E-02	0 - 0.5 ft	0.5 - 1.0 ft
Individual HMW PAHs	NA	1.8 - 4.8

E-03	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	2.7 - 62	6.0 - 58
Individual HMW PAHs	28 - 78	2.9 - 82

SD-11	
Individual LMW PAHs	2.6
Individual HMW PAHs	1.8 - 3.7

SD-7	
Individual LMW PAHs	0.7 - 8.6
Individual HMW PAHs	0.45 - 18
Aroclor 1260	0.92
Lead	266

B-01	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	0.82 - 7.4	2.1 - 7.8
Individual HMW PAHs	5.6 - 13	9.2 - 24
Lead	624	4,840

B-02	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	0.54 - 4.5	NE
Individual HMW PAHs	3.6 - 9.1	1.9 - 4.6
Lead	616	682

B-03	0 - 0.5 ft	0.5 - 1.0 ft
Individual LMW PAHs	1.6	2.4
Individual HMW PAHs	2.0 - 6.0	3.1 - 11
Lead	545	653

Orange Text	Low Molecular Weight (LMW) PAHs	
Red Text	High Molecular Weight (HMW) PAHs	
Purple Text	Pesticides/PCBs	
Blue Text	Inorganics	

All concentrations are in parts per million.

Associated ERM Levels		
Individual LMW PAHs	0.5 - 2.1	(see notes below)
Individual HMW PAHs	0.26 - 5.1	(see notes below)
PCB Aroclor 1260	0.18	
Lead	218	

Only those constituents of concern present at levels exceeding Effects Range Median (ERM) levels are shown. For LMW PAHs and HMW PAHs, ranges in concentrations for those PAHs detected at levels exceeding individual ERM limits are noted.

Individual PAHs present in one or more samples at levels exceeding ERM levels include the following:

	ERM:
Individual LMW PAHs:	
Acenaphthene	0.5
Anthracene	1.1
Fluorene	0.54
Naphthalene	2.1
Phenanthrene	1.5
Individual HMW PAHs:	
Benzo(a)anthracene	1.6
Benzo(a)pyrene	1.6
Chrysene	2.8
Dibenz(a,h)anthracene	0.26
Fluoranthene	5.1
Pyrene	2.6

ERM levels are from NYSDEC Technical Guidance for Screening Contaminated Sediments, 1/25/99.

Notes:
PAH = Polynuclear Aromatic Hydrocarbon.
NE = ERM levels not exceeded
NA = Not analyzed

Constituents of concern were identified in Section 6 of the SI Report (CDM, 2001).

LEGEND

- SHORELINE SOIL
- SHORELINE SEDIMENT
- PIER SEDIMENT
- POND SEDIMENT
- SEDIMENT SAMPLE LOCATION
- VIBRACORE LOCATION
- SOIL SAMPLE LOCATION

ALL PRIOR SAMPLE LOCATIONS SHOWN ARE FROM MAP TITLED "BUSH TERMINAL LANDFILL, BROOKLYN, NEW YORK, SITE INVESTIGATION REPORT, SAMPLE LOCATIONS", SHEET No. PLATE-4, DATED: APRIL 2000, SCALE: 1"=80', BY CAMP, DRESSER & McKEE, INC..

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BUSH TERMINAL LANDFILL PIERS 1-4
BROOKLYN, NEW YORK

FIGURE 8

SUMMARY OF SEDIMENT AND SHORELINE SOIL CONSTITUENTS OF CONCERN THAT EXCEED ERM LEVELS

Date: 06/03 **Project No.** 31193-0140-00050