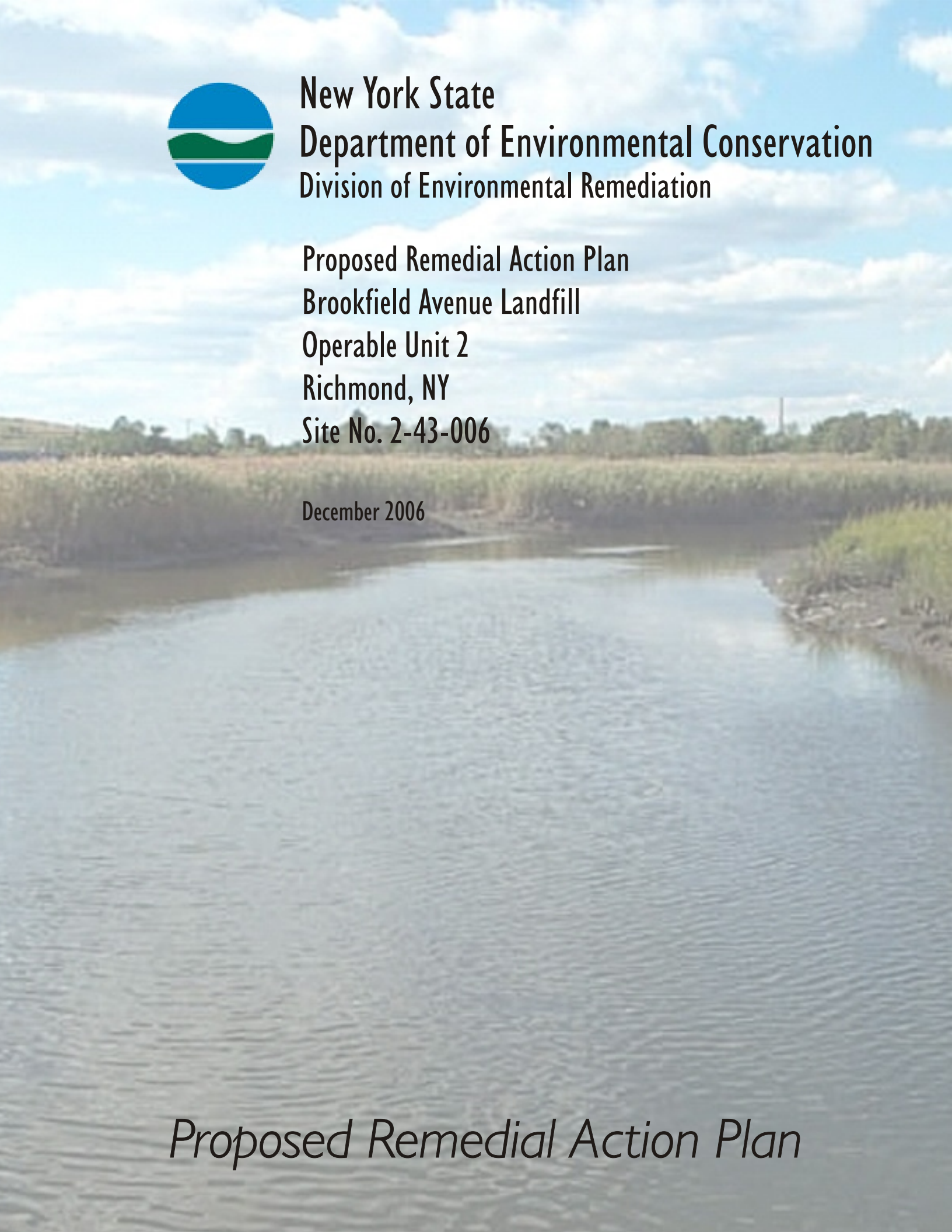


New York State
Department of Environmental Conservation
Division of Environmental Remediation

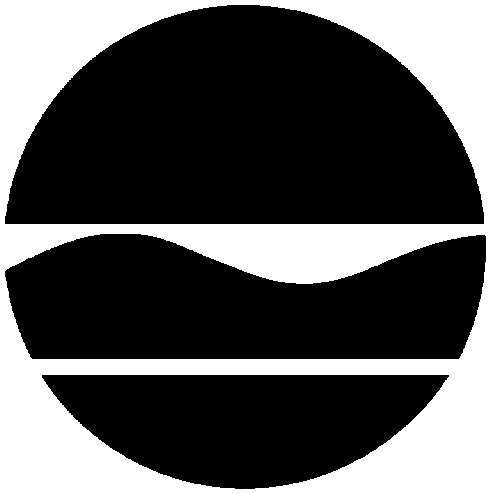
Proposed Remedial Action Plan
Brookfield Avenue Landfill
Operable Unit 2
Richmond, NY
Site No. 2-43-006

December 2006

Proposed Remedial Action Plan

PROPOSED REMEDIAL ACTION PLAN
Brookfield Avenue Landfill
Operable Unit No. 2
New York City, Richmond County, New York
Site No. 243006

December 2006



Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

Brookfield Avenue Landfill
Operable Unit No.2
New York City, Richmond County, New York
Site No. 243006
December 2006

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Brookfield Avenue Landfill Operable Unit 2. Operable Unit 2 (OU-2) is located in a portion of Richmond Creek north of the Brookfield Avenue Landfill in Richmond County, New York (see Figures 1-4 for site location and OU-2 boundaries). The designation of OU-2 (the site) is associated solely with contamination that was disposed at, and discharged from, the Brookfield Avenue Landfill (OU-1) in the 1970s. At the close of the Remedial Investigation (RI) for OU-1, it was decided that a RI should be conducted in order to more fully investigate the impact of the landfill on the adjacent Richmond Creek. This investigation was conducted as a separate operable unit. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Both the RI report and the Feasibility Study (FS) report for OU-2 are now complete. This Proposed Remedial Action Plan (PRAP) is based on the information received by the Department from these reports. As more fully described in Sections 3 and 5 of this document, it is alleged that liquid industrial and hazardous waste material was illegally dumped at several New York City landfills, including the Brookfield Avenue Landfill. The materials reportedly consisted of waste oil, sludges, metal plating wastes, lacquers and solvents. It was determined that leachate from the landfill has discharged into the surface water and sediment in Richmond Creek. Extensive remedial activities have already been proposed at the Brookfield Avenue Landfill under a Record of Decision for OU-1 to halt the discharge of contamination from the landfill into OU-2. This OU-1 remedy includes a Title 6, Official Compilation of Codes, Rules and Regulations of the state of New York Part 360 landfill cap to prevent water infiltration into the landfill which results in leachate generation; a subsurface, low permeability barrier wall around the entire landfill to a depth ranging from 25 to 40 feet to halt lateral migration of leachate already generated; a series of leachate collection pipes and wells inside the barrier wall and between the landfill and Richmond Creek to collect leachate already generated and to create an inward hydraulic head to minimize potential leakage of leachate through the barrier wall; and a system for leachate treatment onsite and offsite to ensure that future loading of contaminants into Richmond Creek does not occur; a landfill gas collection and flaring system; and wetlands enhancements. In addition to source control of contaminants within the Brookfield Avenue Landfill (OU-1), the Department proposes the following remedy for OU-2:

- engineering controls consisting of signage in the waterfront area to provide advice on existing fish consumption advisories;
- institutional controls consisting of an environmental easement, annual inspection and certification that engineering controls are in place; and
- monitoring of surface waters for a period of two years beginning three years after the OU-1 remedy is complete (this would augment monitoring conducted as part of the OU-1 post-closure monitoring program).

The proposed 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.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The Department will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The Department has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the September 2005 New York City Department of Environmental Protection (NYCDEP), Brookfield Avenue Landfill, Operable Unit-2, Final Remedial Investigation (RI) Report, The November 2006 Brookfield Avenue Landfill Feasibility Study (FS) Report, and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

The Staten Island Public Library
Richmondtown Branch
200 Clarke Avenue
Staten Island, New York 10306
(718) 668-0413
Nancy Avrin-Branch Librarian
Mon:1-8;Tue-Fri.:10-6;Sat.:10-5

Staten Island Public Library
New Dorp Regional
309 New Dorp Lane
Staten Island, NY 10306
(718)351-2977
Theresa Myrhol-Branch Librarian
Mon., Wed., Thu.: 10-6;
Tue.:1-8;Fri.:1-6;Sat.:10-5

Staten Island Borough Hall
Room 100
Staten Island, NY 10301
(718) 816-2000
Mr. Nick Dmytryszyn
Mon.-Fri. 9-5

Community Board #3
655-218 Rossville Avenue
Staten Island, NY 10309
(718)356-7900
Marie Bodnar, District Manager
Mon-Fri. 9-5

Community Board #2
460 Brielle Avenue
Staten island, NY 10301
(718)317-3209

Kathy Dodd-District Manager
Mon.-Fri. 9-5

New York City
Department of Environmental Protection
Office of Community Outreach
59-17 Junction Boulevard
Corona, NY 11365-5107
(718) 595-3484

New York State Department of Environmental Conservation
47-40 21st Street, 1st Floor
Long Island City, Queens, New York 11101
Nigel N. Crawford, Project Manager
(718) 482-4900 Ext 4010
Mon-Fri.:9-3

New York State
Department of Environmental Conservation
625 Broadway
Albany, New York 12233

The Department seeks input from the community on all PRAPs. A public comment period has been set from Monday January 8, 2007 to Tuesday February 6, 2007 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for Thursday February 1st, 2007 at the P.S. 8, 100 Lindenwood Road, Staten Island, N.Y. 10308 beginning at 7:30 P.M..

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to Mr.Crawford at the above address through Tuesday February 6, 2007.

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The Brookfield Avenue Landfill is located at 40°33'44" latitude and 74°09'38" longitude in Richmond County, Borough of Staten Island, City of New York, in the State of New York. The site is approximately 272 acres in size and is bounded on the north by Richmond Creek, on the east by the Colonial Square Condominium properties, on the south by Arthur Kill Road, and on the west by Richmond Avenue (see Figures 1, 2, and 3).

Operable Unit (OU) No. 2, which is the subject of this document, consists of a portion of Richmond Creek and associated tributaries and wetlands located north of the landfill. OU-2 includes Richmond Creek, from the Richmond Avenue overpass to the eastern limit of the landfill; several small tributaries that empty into the creek from the south; and tidal wetlands between the creek and the landfill (Figures 1, 2, 3 and 4). Tidal and freshwater wetland areas located at the southern end of the site, between the landfill and Arthur Kill Road, are addressed as part of OU-1 remedial activities and were not the focus of work performed under OU-2. However, biota samples were collected from both the eastern and western drainage channels between

the landfill and Arthur Kill Road at the direction of the Department during the RI for OU-2. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. The remaining operable unit for this site is OU-1: The landfill portion of the Site (OU-1) encompasses approximately 132 acres and is divided into two cells, the eastern and western cells, which represent former solid waste disposal areas. The site is currently inactive with a well-established vegetative cover. A paved road bisects the west cell and lies above the 48-inch wastewater interceptor that leads to the Eltingville Pump Station. This wastewater pump station is onsite and lies between the east and west landfill mounds. A three-barrel, 16-foot by 6.5-foot storm sewer originates at Arthur Kill Road and Abingdon Avenue and traverses underground between the east and west cells with a terminus into Richmond Creek (Fig. 3).

The landfill is enclosed by fencing with the exception of the boundary along Richmond Creek, which is unfenced. The site is guarded full time by a security guard stationed in a trailer near the front entrance to the landfill on Arthur Kill Road. For public safety purposes, signs have been placed on the perimeter fence identifying the area as an inactive hazardous waste site. A portion of the east cell of the landfill (approximately 38 acres) was covered with a clay cap in 1983. Localized erosion of the cap is now evident. Along the southern perimeter of the landfill, a 525-foot-long passive methane collection trench was installed to halt the migration of methane gas toward the residences south of the landfill. The RI/FS for OU-1 was completed in 1998 and the OU-1 ROD is dated March 2002. The design report for the remedy for OU-1 was approved by the Department on May 29, 2006. Remedial construction on OU-1 is expected to start in 2007.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The New York City Department of Sanitation (NYCDOS) operated the Brookfield Avenue Landfill as a municipal solid waste disposal facility from 1966 to 1980. During the 15 years of operation approximately 132 acres of the site received refuse. The remaining 140 acres (272 acres total) served as a buffer zone around the landfill. The facility operated 24 hours per day, six days per week. Records indicate that approximately 1,000 tons per day of household refuse and construction debris was delivered to the landfill by the city sanitation department and private garbage trucks. The loaded trucks were weighed at on-site scales, and the weight and the type of material they were hauling were recorded. The waste was dumped in lifts up to 15 feet high and in cells approximately 150 feet wide. After each cell was completed, cover material was applied.

Access for public drop-off of refuse was provided on the seventh day of the week. Residents were required to sign in and unload refuse in an area specifically designated for public drop-off. Salvageable material suitable for recycling was removed by a private contractor. The salvage area was located on site in a separate fenced area so as not to interfere with daily operations.

Industrial/Hazardous Waste Dumping

It is alleged that liquid industrial and hazardous waste material was illegally dumped at several New York City landfills, including the Brookfield Avenue Landfill, between 1974 and 1980. The materials reportedly consisted of waste oil, sludges, metal plating wastes, lacquers and solvents. The exact quantities and disposal locations of the wastes are not known. It was reported that volumes disposed of ranged from 11,000 to 55,000 gallons per week in 1974. In 1978, volumes ranged up to 50,000 gallons per night, with the primary disposal point identified as the Brookfield Avenue Landfill. It was also reported that contaminants such as cyanide, dichlorobenzene, dioctylphthalate, naphthalene, ethyl benzene, toluene, xylene, and alkyl phenol were potentially disposed of at the Site.

City Sewer System Construction

In January 1982, excavation for the installation of 1,500 feet of sewer line (interceptor) through the west cell of the landfill took place.

Environmental Setting

Land Use and Site Topography

The Brookfield Avenue Landfill site is vacant and undeveloped, except for the Eltingville Pump Station located in the central portion of the site, and the former office and maintenance building near the landfill's main entrance. Land uses surrounding the site include La Tourette Park and golf course to the northeast, residential areas to the east and south, a cemetery to the southeast, the Fresh Kills Landfill complex to the west and the closed Richmond Truck Landfill across Richmond Creek to the north. The Atlantic Ocean and Great Kills Harbor are located less than two miles south of the site.

Before 1960, prior to use as a landfill, the Brookfield Avenue site was a coastal marshlands area with little topographic relief. Site topography was altered by landfilling, resulting in mounds with inner plateaus and outer slopes exceeding eight percent. The landfill ranges in height from 15 to 40 feet above surrounding grades. Areas of ponded water are located on both the east and west sides of the main landfill access road, and a tidally-influenced pond is located at the southeast corner of the landfill. The landfill site is located in a low-lying area adjacent to the shoreline of Richmond Creek. The topography within one mile south of the site rises from approximately mean sea level (msl) to about 80 feet above msl. Northeast of the site, across Richmond Creek, elevations rise to approximately 250 feet above msl within 1.5 miles.

Site Geology and Hydrogeology

The Brookfield Avenue Landfill is located in a low-lying coastal marsh area that drains to Richmond Creek. From Richmond Creek, surface water flows through the Fresh Kills waterway and into the Arthur Kill. Collectively, Richmond Creek, Main Creek and the Fresh Kills Creek are referred to as the Fresh Kills Estuary. All of these water bodies are tidal and have variable flow directions depending on the tidal stage. This causes intermixing of water throughout the Fresh Kills estuary and from the Arthur Kill.

Richmond Creek is the longest stream of Staten Island's surface drainage system, extending approximately 2.5 miles from the central part of the island to the Fresh Kill. Richmond Creek is tidal to the check dam at St. Andrew's Church and is fed by a Class B freshwater stream upstream of this point and by the Sweet Brook tributary from the south. Freshwater can extend downstream of the St. Andrew's Church check dam, depending on tidal conditions and recent extent of precipitation/stormwater runoff. During heavy precipitation events, Richmond Creek is dominated by freshwater inflow into the main trunk from overland flow and point sources, such as stormwater culverts and outfalls. During periods of low precipitation, freshwater inflow is minimal and Richmond Creek is dominated by tidal action which moves saltwater from the Arthur Kill through Fresh Kills to Richmond Creek during high tide, and in the opposite direction during low tide.

Stormwater runoff naturally flows from the landfill to Richmond Creek through the marsh or through onsite drainage channels. Area-wide stormwater runoff is routed through a storm sewer that bisects the site and discharges to Richmond Creek. The Fresh Kill system is part of the NYCDEP Outer Harbor Combined Sewer Overflow study area and the New York Harbor National Estuary Program.

The Richmond Creek area has been classified by New York State as Class SC. As per 6 NYCRR Part 701.12, surface waters classified as SC are suitable for fish propagation and survival with best usage for fishing. SC classified waters should also be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. They are not suitable for shellfishing for market purposes.
Freshwater and tidal wetlands were field delineated by a wetlands specialist in July 2001 as part of one of the OU-1 pre-design tasks.

Hydrogeology

The Site is underlain by approximately 150 feet of unconsolidated sediments which overlay bedrock. The uppermost unit consists of recent marsh deposits including silts, clays, and "meadow mat." This latter unit is as much as 10 to 15 feet thick within the study area. A series of glacial sediments, consisting of glacial till, and glacial outwash type sands lay directly below the marsh deposits in the wetlands, and are in direct contact with the fill material beneath the landfill. The glacial sediments comprise the Upper Glacial Aquifer, which ranges in approximate thickness from 60 to 70 feet within the study area.

The shallow sediments were further characterized during a geotechnical investigation conducted in the fall of 2002 as part of the remedial design for OU-1. The investigation confirmed the presence of fine-grained marsh deposits at the northern toe of the landfill. The fine-grained marsh deposits are thin to non-existent in the sandy zone. A lower aquifer, known as the Cretaceous aquifer, consists of marine sands, silts and clays, and is also present within the study area. Both of these aquifers contain a number of sub-aquifers. A continuous, leaky, confining unit made up of overlapping glacio-lacustrine clay, glacial till, and Cretaceous clay separate the Upper Glacial and Cretaceous aquifers.

Regional groundwater flow in the recent sediments and the Upper Glacial aquifer is to the north. Regional flow in the Cretaceous aquifer is to the south although locally under the landfill a northward flow component has been identified. Groundwater is present within a few feet of the ground surface throughout most of the landfill except under landfill plateaus. Mounding of the water table within the landfill reaches elevations as high as 12 feet above mean sea level resulting in a radial flow pattern within the landfill. Shallow groundwater discharges to the surface waters and wetlands to the north, east, and west of the landfill. On the south side of the landfill, the southward component of radial flow encounters northward regional groundwater flow and is deflected toward surface waters to the east and west. While data suggests that leachate has impacted groundwater in localized areas just south of the site boundary, the regional northward flow limits the extent of this impact.

The OU-1 RI and previous studies have concluded that Richmond Creek and its associated wetland areas are the local discharge point for the Upper Glacial aquifer, and portions of the Cretaceous aquifer. To the north side of the Site, the Cretaceous leaks upward to the Upper Glacial aquifer and eventually into Richmond Creek. Over the rest of the site, the Upper Glacial aquifer leaks downward into the Cretaceous aquifer. This results in a very complex local flow pattern in the Cretaceous aquifer**.**

The Upper Glacial aquifer near Richmond Creek is moderately influenced by tidal fluctuations in the creek, however, the influences are not strong enough to reverse flow directions over any significant areas. Tidal influences in the Cretaceous aquifer are slight and hydraulically insignificant.

Habitat

OU-2 and adjoining areas of Richmond Creek constitute a complex and valuable habitat that has developed over several thousand years. Three classifications of tidal wetlands are present within OU-2 including high marsh, intertidal marsh, and littoral zone. The overall importance of tidal wetlands in New York State is emphasized in the tidal wetland regulations which state, "*Intertidal marsh and coastal fresh marsh tidal wetlands are the most biologically productive of all tidal wetlands areas. …Because of these high values and their sensitive location at the land and water interface, intertidal and coastal fresh marshes must be the most stringently protected and preserved tidal wetlands zones. Even small portions of these zones are critically important resources. Consequently, only very limited types of land use and development are compatible with the values of these areas*" (6 NYCRR Part 661.2(d)).

The tidal wetlands present in OU-2 currently perform many beneficial functions, some of which are summarized below:

- The tidal marshes of Richmond Creek are important to a broad assemblage of birds and other wildlife due mainly to the availability of cover for nesting and the abundance of prey.

- The extensive network of tidal creeks and freshwater inflows provide potential spawning and nursery habitats for freshwater fishes and invertebrates**.**

- Many of the juvenile fish and larval invertebrates that reside within tidal wetlands serve as a primary food source for local crustacean and bird populations.

- Wetlands, such as those within OU-2, are the primary source of much of the organic matter and nutrients forming the basis of the coastal and estuarine food web.

- Encompassing 73 acres, the tidal wetlands of OU-2 provide a significant amount of flood control and storage. During heavy rain events, storm flows from the freshwater portion of Richmond Creek and Sweet Brook undergo attenuation as they reach the tidal wetlands within OU-2. Reduction of flow velocities by the wetland vegetation present in OU-2 also contributes to flood control.

- Pollutants are removed in the natural wetlands of OU-2 via various physical, chemical, and/or biological processes. Some of the specific contaminant attenuation processes likely to be occurring in the wetlands of OU-2 include biodegradation, diffusion, dilution, adsorption, volatilization, chemical reaction or destruction, and burial by clean material. The net result of such processes is a reduction in the concentration of the contaminants within the sediment and surface water, and the overall water quality improvement in the estuary.

Elevated concentrations of various contaminants from multiple sources within the Fresh Kills estuary and the Arthur Kill were identified in earlier studies of the area of OU-2 performed in the mid-1990s. However, more recent studies conducted in 2003 have shown improvements in surface water and sediment quality in OU-2. Continued improvements are expected over time, particularly after all discharges of contaminants from OU-1 are terminated by pending remedial work under the approved ROD.

All remedies considered under this PRAP must consider the impacts to habitat value of OU-2 caused by remedial construction activities once the remedy is complete. Remedial actions that impair or destroy the wetlands (for instance, excavation or dredging) would cause irreparable environmental damage to complex habitats that must be weighed against any environmental benefits that result from the remedy. Wetland restoration has been used to attempt to reconstruct vital habitats in areas where they have been destroyed. While this may be considered as a means to mediate the impacts caused by a destructive excavation or dredge remedy, the current state of the science of habitat restoration suggests that replacing the functions and values of a natural wetland system are difficult, if not impossible, to achieve through a habitat restoration construction project. Further, there are many other sources of pollution in the Arthur Kill watershed that would continue to contribute a contaminant load to the restored area, thus compromising the quality of the newly placed sediments.

3.2: Remedial History

Landfill Closure

In 1986, the Department listed the Brookfield Avenue Landfill site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required. When the site became inactive in 1980, NYCDOS designated 38 acres in the eastern section of the Site for closure. Phase I closure construction started in October 1982 and was completed in 1984. Phase I of landfill closure included regrading, capping with 24 inches of clay and topsoil, and seeding the area. Ten passive vertical methane gas vents were also installed. A passive methane-venting trench was constructed in 1984. The truck scale was demolished in 1981.

Phase II Closure Design was conducted between 1981 and 1983, and consisted of a series of design investigations, and the development of a Preliminary Engineering Report and Preliminary Technical Specifications. The selected remedy was grading, venting, capping, and covering the Phase II area, however, the plans were never implemented. The passive methane-venting trench was extended in 1986 to provide greater control of methane migration, and two 550-gallon diesel fuel tanks were removed from the area of the Site entrance in 1995. Interim Remedial Measures (IRMs) were conducted at areas designated hot spots 3 and 5 at the southern and western site borders in 1998 and 1999. A sorbent boom was also deployed to contain an oil seep at hot spot 5.

A soil vapor extraction system and flare were installed to control gas migration at hot spot 3 in February 2001. The Department issued a Record of Decision for OU-1 in March 2002. The design report for the ROD was approved by the Department on May 29, 2006.

SECTION 4: ENFORCEMENT STATUS

The Department and the City of New York entered into Consent Orders index numbers 2-0952 and 2-43-006 on December 16, 1985 and April 17,1990, respectively to properly remediate the landfill. The responsible City agency at that time was the New York City Department of Sanitation (DSNY). On May 15, 1992, the New York City Department of Environmental Protection (NYCDEP) entered into a consent order with the Department to perform a remedial program at the site. The Order obligates the City of New York to implement a full remedial program and allows reimbursement to the City of New York of up to 75 percent of the eligible remediation cost.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted at OU-2. A summary of the RI/FS is presented in the following sections.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between October 2003 and September 2005. The field activities and findings of the investigation are described in the RI report.

During the RI sampling and analysis of surface water, sediment and biota was conducted. In addition, a bathymetric survey of Richmond Creek was conducted.

5.1.1: Standards, Criteria, and Guidance (SCGs)

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

- Surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

- Sediment SCGs are based on the Department's "Technical Guidance for Screening Contaminated Sediments."

More complete information can be found in the RI report.

5.1.2: Nature and Extent of Contamination

Surface water, sediment, and biota samples were collected at the site to characterize the nature and extent of contamination.

The following activities were conducted during the RI:

- Collection of a total of 13 surface water samples, including one high-tide and one low-tide surface water samples from each of six sampling stations in Richmond Creek and one surface water sample from a background location;
- Collection of ten composite sediment samples for waste characterization from ten sampling stations in Richmond Creek;
- Collection of one shallow- and one deep-sediment sample from each of 12 Richmond Creek locations and one background location.
- Collection of one shallow- and one deep-sediment samples from each of 10 marsh locations.
- Collection of biota (tissue) samples from seven locations in OU-2 and two offsite reference locations
- Bathymetric survey of Richmond Creek streambed elevations within OU-2.

The main categories of contaminants that exceed their SCGs are inorganics (metals), volatile organic contaminants (VOCs), semivolatile organic contaminants (SVOCs),pesticides and polychlorinated biphenyls (PCBs). The specific inorganic contaminants of concern are copper, lead, mercury, nickel, antimony, arsenic, cadmium, chromium, manganese, silver and zinc. The specific VOC and SVOC contaminants of concern are chlorobenzene and benzo-a-anthracene. The PCBs and pesticides of concern are 4,4-DDD, 4,4-DDE, 4,4-DDT, alpha-BHC (lindane), PCBs, dieldrin, endosulfan I, endosulfan II and gamma-chlordane. Each contaminant was measured one or more times in surface water, sediment or biota at concentrations exceeding SCGs and was also detected in soil and groundwater during the OU-1 RI.

Consequently, the Brookfield Avenue Landfill is considered to be a possible source of contamination. Other sources are also likely contributors, such as the Fresh Kills Landfill, numerous stormwater outfalls, and industrial sources that discharge to the Arthur Kill. The Fresh Kills Landfill, which prior to the installation of leachate controls in the late 1990s, was estimated to discharge leachate at a rate 16 times greater than that from the Brookfield Avenue Landfill.

Figure 4 is a map showing OU-2 sampling locations. This section describes the findings of the investigation for all environmental media that were investigated.

Figures 5 through 14 summarize the SCG exceedances in the following media: surface water, creek sediments and marsh sediments. These figures present lists of analytes detected above SCGs in the aforementioned media with comparison to applicable SCGs.

Chemical concentrations are reported in parts per billion (ppb) for surface water and for organics in the sediment. Concentrations are reported in parts per million (ppm) for metals in the sediment.

Surface Water

Surface water quality contraventions in OU-2 included chlorobenzene, copper, lead, mercury, and nickel. Copper was the most commonly detected metal exceeding SCGs. Figures 5 and 6 show SW exceedances. These analytes were also detected in landfill leachate and shallow groundwater samples collected and analyzed during the OU-1 RI. This indicates that the Brookfield Avenue Landfill is a potential source of contamination to surface water in OU-2. However, higher concentrations of these contaminants were identified in leachate from adjacent Fresh Kills Landfill, which also had leachate discharge rates 16 times higher than the Brookfield Avenue Landfill.

The OU-2 surface water data indicates that Richmond Creek water quality has improved over the last decade. For instance, the mean copper concentration in surface water of OU-2 during the most recent study

(2003-2004) was almost one-half of the mean concentration detected during similar work in 1994 and 1997 during the OU-1 RI. Surface water quality data from the ongoing Fresh Kills Landfill study conducted by IT Corporation further indicates that the surface water and sediments throughout the Fresh Kills estuary and the Arthur Kill are contaminated. That study also indicates that surface water contamination in OU-2 and in portions of Richmond Creek has improved since the installation of leachate controls at the Fresh Kills Landfill in 1998.

Surface water contaminant levels in the portion of Richmond Creek that is adjacent to Brookfield Avenue Landfill are higher than concentrations further to the west (away from the landfill). As noted, lead, mercury, and nickel generally appear at higher concentrations in surface water from the IT sampling station IT SS 12 (seen on Figure 4) that is located within OU-2 limits, compared to the IT sampling stations which are located within Richmond Creek to the west of Richmond Avenue and outside of OU-2. However, an identical pattern was identified in Main Creek, a second tidal tributary to the Fresh Kills estuary. Main Creek has a similar contaminant and contaminant distribution pattern, but is far distant from Brookfield Avenue Landfill and OU-2. Higher contaminant concentrations in the upper reaches of both tidal tributaries is explained in the IT report by contaminant loadings from leachate from Fresh Kills Landfill under the influence of tidal action. At high tide, these contaminants are pushed to the upper reaches of both Richmond and Main Creeks including the area of Brookfield Avenue Landfill and OU-2.

Surface water contamination identified during the RI/FS will be addressed in the remedy selection process.

Sediments

The sediment in Richmond Creek adjacent to the Brookfield Avenue Landfill contains contamination at levels above SCGs. During the initial (OU-1) investigation phases, PCBs, iron, nickel, lead, copper, zinc and mercury were detected above SCGs. In the OU-2 dataset, the most frequently detected metals exceeding criteria were arsenic, copper, iron, lead, mercury, and nickel. Pesticides and PCBs and some SVOCs, poly aromatic hydrocarbons (PAHs) were also present in surface sediment at concentrations exceeding SCGs. In general, impacted sediments are limited to the first two feet of each boring. See Figures 7 thru 9 and 11 thru 14 which show sediment data. However, a few samples at depths of up to 75 inches contained some elements or compounds at concentrations above SCGs (see Figure 10).

The Fresh Kills Landfill study data indicate that most contaminants are found at higher concentrations in Richmond Creek sediment west of Richmond Avenue than in the OU-2 portion of Richmond Creek, i.e. the higher concentrations are away from the Brookfield Avenue Landfill and OU-2. No significant differences in the types and concentrations of detected analytes were observed between the southern shore samples (closest to the landfill) and the northern southern shore samples (farthest from the landfill) of Richmond Creek. Thus, no concentration gradients were detected in OU-2 emanating from the Brookfield Avenue Landfill. Concentrations of contaminants in sediment in OU-2 are similar to those in Main Creek, a second tidal tributary to Fresh Kills estuary that is distant from the landfill. Overall, sediment concentrations were similar to those observed in other parts of the Arthur Kill. These factors do not support the dominance of a local source of contaminants discharging from the landfill into OU-2, but rather the dominance of other area-wide sources, such as the Fresh Kills Landfill and extensive industry along the Arthur Kill. Failure to identify higher concentrations in the vicinity of the Brookfield Avenue Landfill is not supportive of local contaminant hotspots within OU-2 that would require removal by dredging. Collectively, these data suggest that hotspots do not exist within OU-2.

Differences in marsh sediment samples and creek sediment samples generally showed marsh sediments to contain higher contaminant concentrations. This is expected because marsh vegetation absorbs dissolved metals that wash in from the tidal system and consolidates particulate bound contaminants into their root mat. Marsh sediment sampled from locations SM-1 and SM-4 (Figures 12, 13 and 14),closest to the west mound of OU-1 (within 120 feet), contained significantly lower concentrations of metals compared to sediment from sampling locations SM-2 and SM-3 which are farther away (approximately 400 feet north of the west mound). The samples closer to the landfill are at a higher elevation and represent the high marsh

zone, which was built up long ago and is now flooded only once or twice a year. Contamination in this high marsh zone, is primarily in the first 6 inches, with no contamination above SCGs found below 12 inches.

The marsh sampling locations farther from the landfill, called the intertidal marsh, are likely at a lower elevation and represent areas of more recent deposition. Since these are different depositional environments, they are generally not comparable.

The OU-2 RI concluded that the contaminants detected above SCGs in sediment during the OU-2 investigation were also detected in landfill leachate and shallow groundwater sampled during the OU-1 RI. As such, the Brookfield Avenue Landfill must be considered a potential source of some of the contaminants found in OU-2 sediments. However, tidal action and higher concentrations of similar leachate contaminants and much higher rates of leachate discharge from the Fresh Kills Landfill complex suggests that Fresh Kills Landfill is the dominant contaminant source within the Fresh Kills estuary. Leachate controls installed at the Fresh Kills Landfill in the late 1990s have had a positive impact in reducing contaminant concentrations in shallow sediment.

Outside of the Fresh Kills estuary, many sources of contaminant discharges to the Arthur Kill have been identified. Tidal action regularly carries dissolved and particulate forms of these contaminants into the Fresh Kills estuary (including Richmond Creek and OU-2) where deposition has occurred. This explains the generally comparable concentrations of contaminants in sediment in OU-2 (Richmond Creek) compared to those in Main Creek and the Arthur Kill. These concentration patterns and gradients are not supportive of a predominant localized source of contaminants in OU-1.

Sediment contamination identified during the RI/FS will be addressed in the remedy selection process.

Biota

Biota samples were obtained from seven locations in and around OU-2 during October 2003 and analyzed for pesticides/PCBs, mercury, cadmium, and copper. The targeted and collected biota were generally grouped based on size, trophic level, and foraging range as follows:

- Small, sedentary bivalves-ribbed mussel
- Forage fish-mummichog
- Medium and large, migratory fish-striped bass, white perch, American shad, gizzard shad
- Large reptile-snapping turtle

4,4'-DDD, 4,4'-DDE, Aroclor-1254, copper, and mercury were detected in all biological tissue samples from the OU-2 sampling locations. Alpha-chlordane, gamma-chlordane and cadmium were detected in a portion of samples from all biota groups.

Mean contaminant concentrations in tissues of the mummichog were found to be within the same range as the concentrations detected in those collected from the reference site. Mean contaminant concentrations in tissues of the ribbed mussel were found to be higher from OU-2 locations than concentrations detected in the same species collected from the reference site. The contaminants detected in biota were also found in OU-2 surface water and sediment, although not always at concentrations above SCGs.

Waste Characterization

Ten composite sediment samples for waste characterization were collected. Waste characterization analyses included hazardous waste characteristics testing (toxicity characteristic leachate procedure-TCLP, corrosivity, ignitability, reactivity) plus physical characterization, including grain size distribution (sieve and hydrometer) and water content. Waste characterization laboratory analytical results did not identify any sediment samples as exhibiting characteristics for hazardous waste, i.e. no hazardous waste as defined by

the Resource Conservation and Recovery Act (RCRA) was identified in OU-2. No TCLP failure for organics was detected in any of the composite samples collected.

5.2: Interim Remedial Measures

There were no IRMs performed at this site during the RI/FS.

5.3: Summary of Human Exposure Pathways:

A more detailed discussion of the human exposure pathways can be found in Section 5 of the RI 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.

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 exposure pathways and potential health risks can be found in Section 1.3.6 of the OU-2 Feasibility Study Report (August 2006).
Exposure pathways evaluated for OU-2 include:

- Ingestion of sediment;
- Dermal contact with surface water;
- Ingestion of surface water; and
- Consumption of contaminated biota.

These pathways are further discussed below, organized by media type.

Sediment

Public access to OU-2 adjacent to the landfill is limited since the landfill is enclosed by fencing and is guarded full-time by security. Therefore, direct contact and incidental ingestion of contaminated creek and marsh sediment is unlikely. In the future, if adults and children wade in the creek they may be exposed to sediments. However, implementation of the remedy for OU-1, a barrier wall and leachate collection system, would stop leachate from migrating into Richmond Creek. Unacceptable human health risks to adults and children due to exposure to creek sediment were not identified based on the levels of contaminants documented in the OU-2 RI. Additional contaminant reductions in creek sediment are expected following implementation of the OU-1 remedy. The potential for unacceptable risk to children due to exposure to marsh sediment were identified; however, this exposure pathway is considered unlikely.

Surface Water

As with dermal contact to sediments, only limited current dermal contact with surface water is expected. Ingestion of surface water is considered to be unlikely. Unacceptable human health risks to adults and children due to exposure (dermal contact and ingestion) to surface water were not identified.

Biota

Extensive fish advisories (issued by the New York State Department of Health) apply to the Arthur Kill and its tributaries, including Richmond Creek. These advisories are based primarily on contamination with PCBs and dioxin (in finfish and crabs) and cadmium (in crabs) and are unrelated to the Brookfield Avenue Landfill. Despite the presence of fish advisories, human exposures to contaminants in fish and shellfish may still occur if people are unaware of, or ignore, the advisories. The contribution of the Brookfield Avenue Landfill to overall contaminant levels in Arthur Kill is probably limited, and would be reduced further following implementation of the OU-1 remedy.

5.4:Summary of Environmental Assessment

This section summarizes the assessment of 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.

The Fish and Wildlife Impact Analysis, which is included in the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors. In summary, mercury in creek sediment, marsh sediment, and in surface water, and copper in creek sediment of Richmond Creek may pose potential risks to aquatic biota. In addition, potential for adverse effects to birds consuming fish from the Richmond Creek may also exist due to exposure to total DDT. Considering the similar and often higher levels of the contaminants of potential concern detected in surface water and sediment of Arthur Kill and other parts of the New York/New Jersey Harbor, similar risks to aquatic biota occur elsewhere in the regional waterways, as a result of multiple sources of contamination.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. In addition to the goals that have been established for OU-1, the following are Remedial Action Objectives (RAOs) for Public Health Protection related to surface water and sediment in OU-2. These RAOs serve as the primary basis upon which the remedial alternatives are developed and evaluated.

- Prevent releases of contaminants from sediments that would result in surface water levels in excess of ambient water quality criteria;
- Prevent or minimize human consumption of aquatic biota in a manner that is incompatible with existing health advisories; and
- Preserve productive ecological habitat created by existing wetlands and marsh areas and open water.

Further, goals for OU-2 related to the extensive remedial work to be performed under OU-1 will ensure compatibility with the OU-1 remedy and the end use plan for the site.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Brookfield Avenue Landfill OU-2 were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

A summary of the remedial alternatives that were considered for this site is discussed 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

Since the OU-1 remedy is common to all the remedial alternatives, the following is a brief description: a 6 NYCRR Part 360 landfill cap to prevent infiltration into the landfill and leachate generation; a subsurface low permeability barrier wall around each landfill cell to a depth ranging from 25-40 feet to halt lateral migration of leachate that has already been generated; a series of leachate collection pipes and wells in the subsurface inside the barrier wall and between the landfill and Richmond Creek to collect leachate that has been generated and to create an inward hydraulic head to minimize potential leakage of leachate through the wall; and a system for leachate treatment onsite and offsite to ensure that future loading of contaminants to Richmond Creek does not occur; a landfill gas collection and flaring system; and wetlands enhancements. Figure 15 shows the major components of the OU-1 remedy.

The following potential remedies were considered to address the contaminated sediment and surface water for OU-2 at the site.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Present Worth: *$0*
Capital Cost: *$0*
Annual Costs:
(Years 1-30): *$0*

Alternative 1 assumes that the source control remedy for OU-1 is implemented. The No Action alternative assumes that the institutional controls currently in place, such as fish advisories, are continued since they are not put in place because of the Brookfield Avenue Landfill and would continue under any circumstance. There would be no monitoring to assess contamination status or to determine if public health is protected. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment. Alternative 1 allows for the natural reduction of mass and toxicity of contaminants in the sediments by naturally occurring biological, chemical, and physical processes. It does not involve excavation or dredging of contaminated sediments, and preserves and protects the existing functioning estuary and coastal wetlands in OU-2 and associated habitat for aquatic and terrestrial animals and plants.

Alternative 2: Institutional Controls and Monitoring

Present Worth: *$276,264*
Capital Cost: *$0*
Annual Costs:
(Years 1-30): *$39,800*

Alternative 2 (engineering controls, and institutional controls and monitoring) includes the source control remedy for OU-1 and continuation of the current institutional controls including the New York State fish consumption advisories. Engineering controls include the placement of signage to provide information on

local fish advisories. Institutional controls would include annual inspection and certification that signs were in place. Alternative 2 also provides for at least two consecutive years of surface water quality monitoring to be performed three years after the remedy is complete to assess changes in surface water quality.

Like Alternative 1, this alternative allows for natural reduction of mass and toxicity of contaminants in the sediments by naturally occurring biological, chemical, and physical processes. Alternative 2 does not involve excavation or dredging of contaminated sediments, and preserves and protects the existing functioning estuary and coastal wetlands in OU-2 and associated habitat for aquatic and terrestrial animals and plants.

Common Elements of Alternatives 3 through 5

The following principal components are common to Alternatives 3 through 5. Each design contains unique aspects in addition to the aspects described below.

- Source control via OU-1 remediation as discussed in Section 7.1 above;
- Institutional Controls as for Alternative 2;
- Dewatering excavated and dredged sediments with drying beds, collection of supernatant fluids and testing to ensure water meets New York State Pollutant Discharge Elimination system (SPDES) discharge criteria, addition of polymers to pumped sediment, if necessary, to accelerate dewatering and reduce amounts of contaminant in effluent;
- Transportation of dewatered sediments to nearby Brookfield and Fresh Kills Landfills for beneficial use under the cap or transportation/disposal at a regional disposal facility;
- Capping of creek sediments; and
- A performance monitoring program.

Alternative 3**: Sediment Removal in Creek and Marsh, Restoration , and Beneficial Use/Disposal**

Present Worth: . . . . . *$19,971,688-$30,675,688*
Capital Cost: . . . . . *$19,710,000-$30,414,000*
Annual Costs:
(Years 1-30): *$37,700*

In addition to the common elements listed above for Alternatives 3-5, Alternative 3 also includes the following elements:

- In-stream dewatering and excavation of sediments in Richmond Creek and Marsh using conventional earth moving equipment with the use of suction dredges as needed; and
- Placement of marsh substrate material in marsh area to appropriate elevations followed by vegetative habitat replacement

Alternative 4: **Sediment Removal in Creek and Intertidal Marsh, Restoration, and Beneficial Use/Disposal**

Present Worth: . . . . . *$11,356,829-$16,817,829*
Capital Cost: . . . . . *$11,100,000-$16,561,000*

Annual Costs:
(Years 1-30): *$37,000*

In addition to the common elements listed above for Alternatives 3-5, Alternative 4 also includes the following elements:

- In-stream dewatering and excavation of sediments in Richmond Creek and intertidal marsh using conventional earth moving equipment with the use of suction dredges as needed; and

- Placement of marsh substrate material within the intertidal marsh area to original or other appropriate elevations followed by vegetative habitat replacement

Alternative 4 differs from Alternative 3 in that only the intertidal portion of the marsh would be subject to sediment excavation. Based on the findings of the RI, it appears the majority of the deposition of contaminated sediments within the marsh has occurred within the intertidal marsh areas; therefore, the high marsh is much less contaminated.

Alternative 5**: Sediment Removal in Creek and Beneficial Use/Disposal**

Present Worth: . . . . . *$6,048,994-$9,357,994*
Capital Cost: . . . . . *$5,788,000-$9,026,000*
Annual Costs:
(Years 1-30): *$37,600*

In addition to the common elements listed above for Alternative 3-5, Alternative 5 also includes the following elements:

- In-stream dewatering and excavation of sediments in Richmond Creek using conventional earth moving equipment with the use of suction dredges as needed with an additional excavation of areas of intertidal marsh bordering the creek so that the slope between the marsh and the creek remains unchanged; and

- Placement of marsh substrate material in excavated areas of intertidal marsh area to original or other appropriate elevations followed by vegetative habitat replacement.

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 inactive hazardous waste disposal sites in New York A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative #2, Institutional Controls and Monitoring, in combination with the OU-1 selected alternative as the remedy for this site. The elements of this remedy are described at the end of this section.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS. The preceding sections presented a detailed description of five different remedial alternatives to address the contamination identified at the Brookfield Avenue Landfill OU-2. The alternatives were developed to represent the full range of feasible site remediation alternatives, considering proper application of scientific and engineering principles. As per 6 NYCRR 375-1.10 the alternatives evaluated include a “No action” alternative (Alternative 1) to establish the baseline conditions for comparing the site remedial alternatives

and one alternative which will return the site to as close to "pre-disposal conditions" as feasible. This is Alternative 3: Sediment removal in Creek and Marsh, Restoration, and Beneficial Use/Disposal, which will achieve the most contaminant mass removal while also creating the most wetland destruction. Two partial sediment removal alternatives (Alternatives 4 and 5) involve lesser degrees of wetland disturbance and contaminant mass removal in OU-2. Each alternative evaluated is compatible with the selected remedy and end use plan for OU-1, although minor modifications may be required.

Despite the impacts associated with landfill operations and other sources of contaminants to Richmond Creek, the tidal wetlands in OU-2 adjoining the landfill currently exhibit a complex habitat and a fair degree of value and function. While excavation or dredging of the creek bed or salt marsh would remove certain contaminants in the sediment, it would also irreparably destroy the complex habitat that has developed over the last several thousand years. The current state of the science of habitat restoration suggests that recreating the functions and value of a natural wetland system after dredging is difficult to achieve through a habitat restoration project (i.e. the restoration proposed in Alternatives 3,4 and 5 following excavation/dredging).

The OU-2 sampling has documented improvement of surface water and sediment quality since sampling was performed in 1996 and 1997 as part of the OU-1 RI. This indicates that when the extensive OU-1 remedy is completed and further loading of leachate from OU-1 is halted, natural processes would continue to facilitate improvement of environmental quality in OU-2 without the destruction to the local wetlands ecosystem that would be caused by excavation and dredging.

Additionally, there are many other sources of pollution in the Arthur Kill watershed that would continue to contribute a contaminant load to the restored area, thus compromising the quality of the newly placed sediments under Alternatives 3, 4 and 5. Considering these factors collectively, a non-invasive remedy for OU-2 (i.e. those not incorporating excavation or dredging) provides the least impairment of the existing ecosystem and habitat. In addition, a non-invasive remedy would eliminate the need for double handling of sediments, dewatering and truck transportation which would have negative short-term impacts on the community and the environment.

The primary risk posed by OU-2 to human health is through the consumption of contaminated finfish and shellfish. Extensive fish advisories (issued by the New York State Department of Health) apply to the Arthur Kill and its tributaries, including Richmond Creek. These advisories are primarily due to contamination with PCBs and dioxin (in finfish and crabs) and cadmium (in crabs) and are unrelated to the Brookfield Avenue Landfill. Despite the presence of fish advisories, human exposures to contaminants in fish and shellfish may still occur if people are unaware of, or ignore, the advisories. The contribution of the Brookfield Avenue Landfill to overall contaminant levels in Arthur Kill is probably limited, and would be reduced further following the implementation of the OU-1 remedy.

The risk posed by OU-2 is most rapidly and effectively addressed through the application of consumption advisories as has already been done by the NYSDOH. Given the patterns of occurrence of contaminants in OU-2, Richmond Creek and the Fresh Kills estuary, contaminants from other sources seem to be primarily responsible for existing contamination in OU-2. Even if some sediment was removed from OU-2, consumption advisories would still be required since other pollution sources within the Arthur Kill tidal system remain unchanged and their impacts to surface water and sediment habitats within and outside OU-2 would continue unabated.

Based on the results of the detailed and comparative analyses, Alternative 2: Institutional Controls and Monitoring, in combination with the OU-1 active remedy, is selected as the recommended alternative for the Brookfield Avenue Landfill OU-2 site. Alternative 2 is protective of public health and the environment and complements the extensive remedial work to be performed at OU-1.

Alternative 2 maintains the integrity and functionality of the existing wetlands and associated habitats and is considered the most effective approach to improvement of environmental conditions within OU-2. While Alternative 2 does not meet existing SCGs, such compliance would not be expected given the discharge of

contaminants from other sources outside of OU-1 and OU-2. Contaminant source reduction to OU-2 is going to be accomplished as part of the OU-1 remedy. Past reduction of contaminant loading from Fresh Kills Landfill caused by installation of leachate collection systems in the late 1990s and reduction of mass and toxicity of contaminants in the sediment caused by naturally occurring biological, chemical, and physical processes, have already resulted in documented improvements in surface water and sediment quality in OU-2 and continued improvement is expected.

The estimated present worth cost to implement the remedy is $ 276,265. The cost to construct the remedy is estimated to be $ 0 and the estimated average annual costs for 30 years years is $ 39,800.

The elements of the proposed remedy are as follows:

1. Continuation of the current institutional controls including the New York State fish consumption advisories. Institutional controls would include annual inspection and certification that signs and fences are in place and performing as designed.

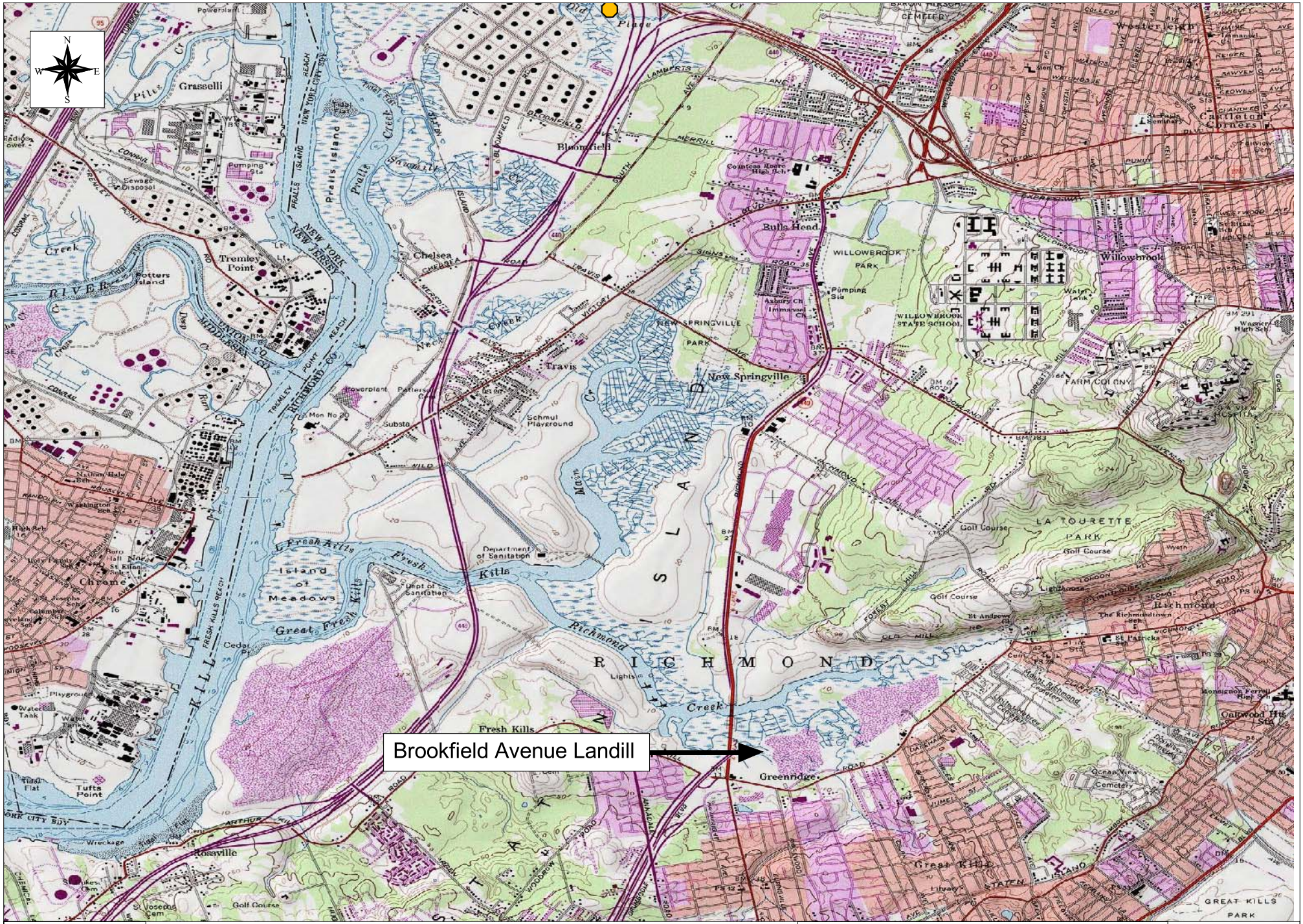
2. The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

3. Development of the following engineering controls: Engineering controls including the placement of signage along the waterfront and at waterfront access points explaining existing fish advisories, monitoring of surface water (see below) and provisions for the continued proper operation and maintenance of the components of the remedy.

4. At least two consecutive years of surface water quality monitoring to be performed three years after the OU-1 remedy is complete to assess changes in surface water quality.

Table 1
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
No Action	0	0	0
Alternative 2	0	39,800	276,265
Alternative 3	19,710,000-30,414,000	37,000	19,971,688-30,675,688
Alternative 4	11,100,000-16,561,000	37,000	11,356,829-16,817,829
Alternative 5	5,788,000-9,026,000	37,600	6,048,994-9,357,994



c:\ou2gis\Site location (PRAP)

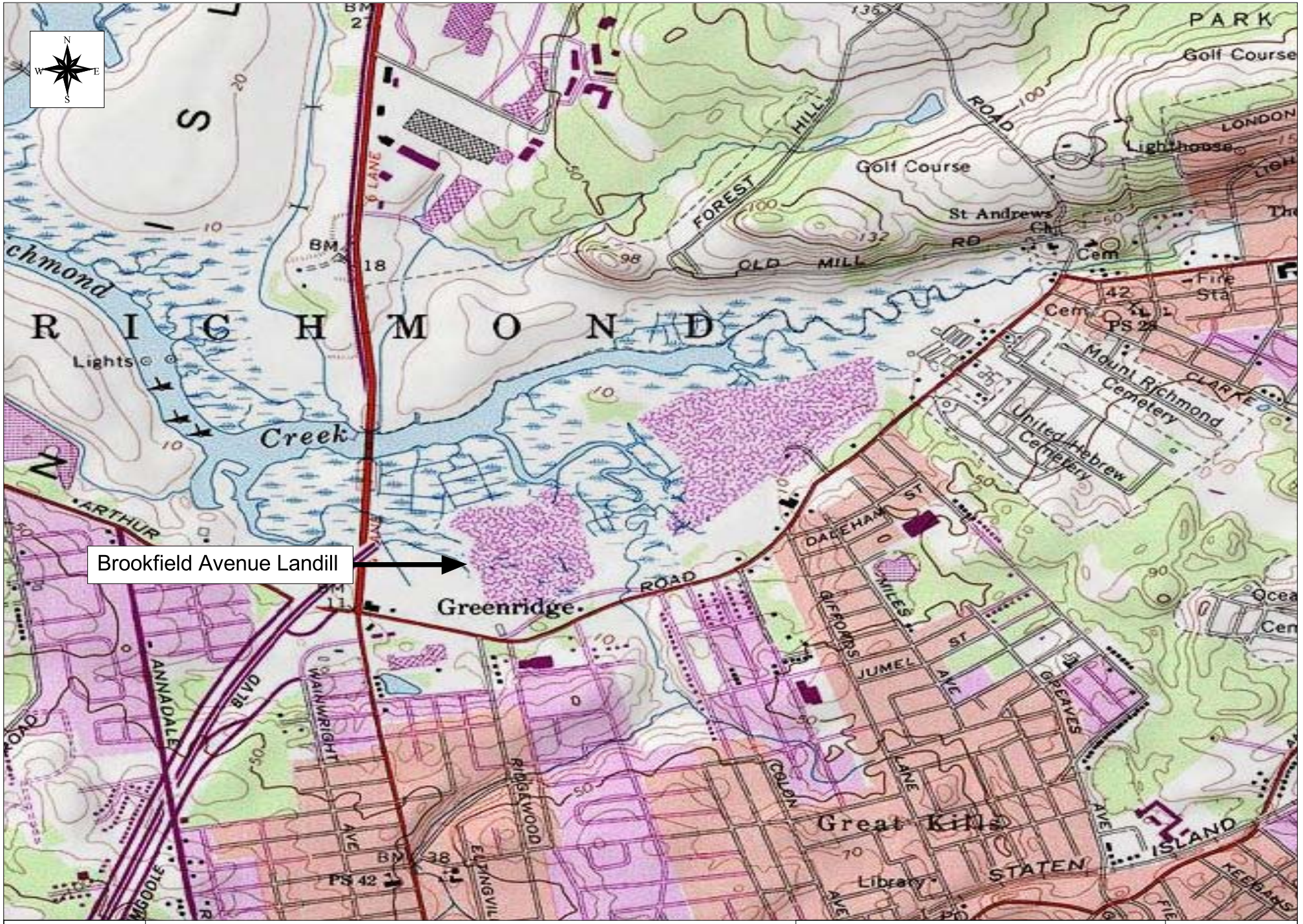
CDM

New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

DEP

Site Location

Figure 1



CDM	New York City Department of Environmental Protection Brookfield Avenue Landfill Operable Unit 2	DEP	Historic Topographic Map	Figure 2

c:\ou2gis\topo map (PRAP)

Fresh Kills Landfill

Richmond Creek

East Cell

West Cell

Eltingville
Pump Station

Colonial Square

Holterman's Bakery

United Hebrew Cemetary

Forest Hill Rd

Richmond Ave

Arthur Kill Rd

Newvale Ave

Tanglewood Dr

Corbin Ave

Troy St

Greaves Ave

Cromer St

Mills Ave

Daleham St

Teakwood Ct

Nutwood Ct

Country Woods Ln

Ironwood St

Cottonwood Ct

Elverton Ave

Duane Ave

Brookfield Ave

Cohan Ave

Gurley Ave

Brandis Ave

Macon Ave

Getz Ave

Ridgewood

Armstrong

Abington Ave

Drumgoole Rd W

Drumgoole Rd E

Emery Ct

Token St

Ladd Ave

Berry Ave

Crestfield Ave

LEGEND

- Storm Sewer
- Sanitary Sewer
- Approximate extent of OU2 boundary
- Surface water feature

N
W
E
S

200 0 200 400 Feet

c:\ou2gis\PRAP Fig 3

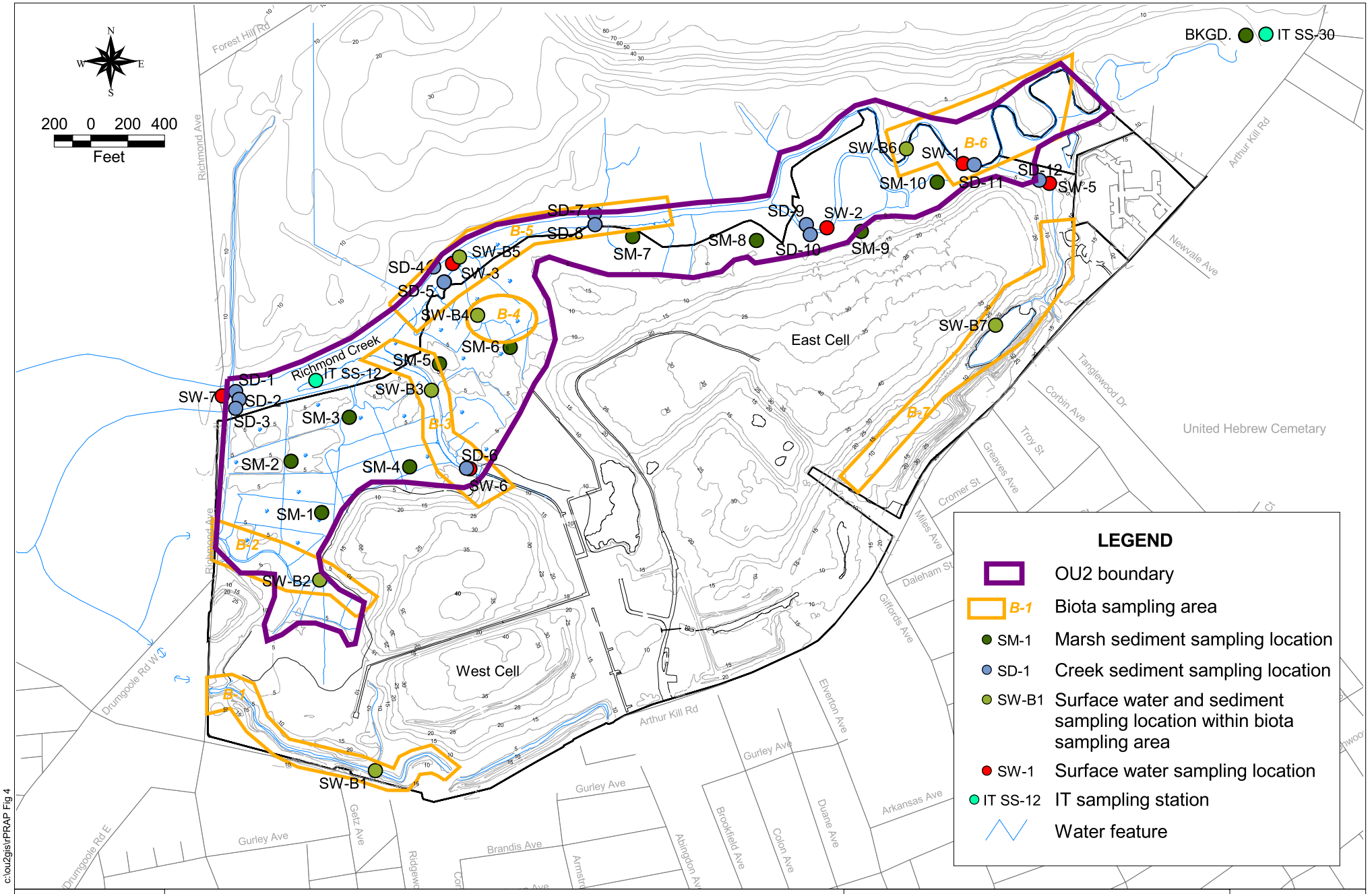
CDM

New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION DEP

Site Plan

Figure 3



c:\ou2gis\rPRAP Fig 4

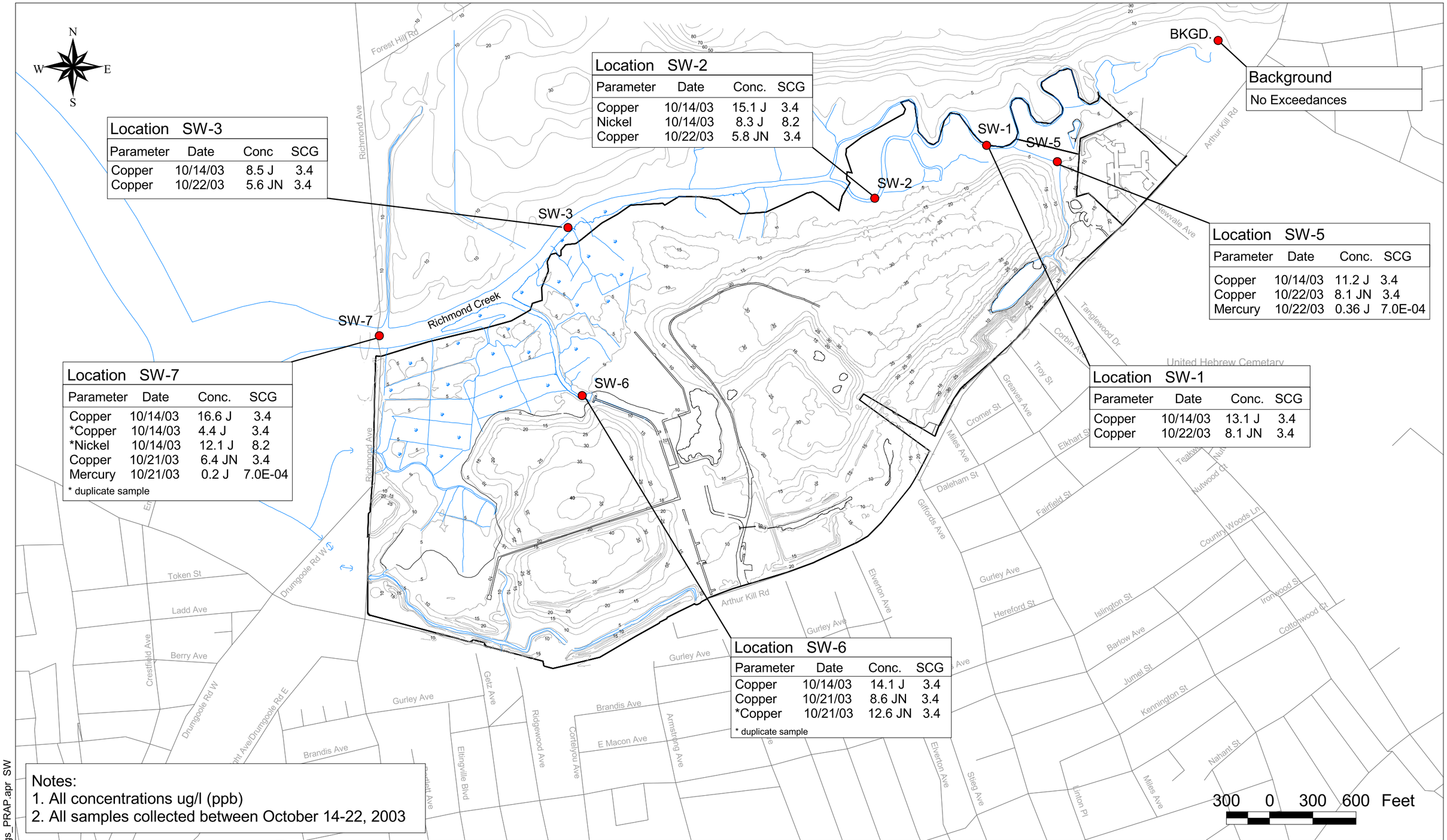
CDM

New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

DEP

OU2 Surface Water, Sediment, and Biota Sampling Locations

Figure 4



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CDM

New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION DEP

SCG Exceedances in Surface Water

Figure 5

N
W E
S

Location SW-B5			
Parameter	Date	Conc.	SCG
Copper	10/16/03	12.5 J	3.4
Lead	10/16/03	12.9	8

Location SW-B4			
Parameter	Date	Conc.	SCG
Copper	10/16/03	3.7 J	3.4
Chlorobenzene	10/16/03	5.2	5

Location SW-B3			
Parameter	Date	Conc.	SCG
Copper	10/16/03	9.2 J	3.4

Location SW-B2			
Parameter	Date	Conc.	SCG
Copper	10/16/03	11.9 J	3.4
Lead	10/16/03	13.0	8

Location SW-B1			
Parameter	Date	Conc.	SCG
Copper	10/16/03	5.5 J	3.4

Location SW-B6			
Parameter	Date	Conc.	SCG
Copper	10/16/03	13.9 J	3.4
Lead	10/16/03	12.8	8

Location SW-B7
No Exceedances

SW-B1
SW-B2
SW-B3
SW-B4
SW-B5
SW-B6
SW-B7

Richmond Creek
Forest Hill Rd
Richmond Ave
Arthur Kill Rd
Newvale Ave
Tanglewood Dr
United Hebrew Cemetary
Corbin Ave
Troy St
Greaves Ave
Cromer St
Elkhart St
Miles Ave
Daleham St
Fairfield St
Giffords Ave
Teakwood Ct
Nutwood Ct
Country Woods Ln
Gurley Ave
Hereford St
Islington St
Barlow Ave
Jumel St
Kennington St
Ironwood St
Cottonwood Ct
Nahant St
Elverton Ave
Arkansas Ave
Duane Ave
Colon Ave
Stieg Ave
Union Pl
Emery Ct
Berry Ave
Crestfield Ave
Drumgoole Rd W
Drumgoole Rd E
Getz Ave
Ridgewood Ave
Cortelyou Ave
Bartlett Ave
Eltingville Blvd

Notes:
1. All concentrations ug/l (ppb)
2. All samples collected between October 16-17, 2003
3. Sample locations are approximate

300 0 300 600 Feet

c:\ou2gis\ri_sec4_figs_PRAP.apr SW-biota locations

CDM

New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION DEP

SCG Exceedances in Surface Water at Biota Sampling Locations

Figure 6

Location SD-4		10/8/2003
Parameter	Conc.	SCG
Pesticides		
Total PCBs	160	22.70 E
Metals		
Antimony	4.4 J	2 E
Arsenic	60.0	8.2 E
Cadmium	5.4	1.2 E
Chromium	133.0	81 E
Copper	389.0	34 E
Iron	25,200	2% E
Lead	239.0	46.7 E,F
Mercury	9.8	0.15 E,F
Nickel	60.8	20.9 E,F
Silver	3.2	1.0 E
Zinc	464.0	150 E,F

Location SD-7		10/9/2003
Parameter	Conc.	SCG
Metals		
Antimony	2.6 J	2 E
Arsenic	29.7 J	8.2 E
Cadmium	5.0 J	1.2 E
Chromium	122.0 J	81 E
Copper	343.0 J	34 E,F
Iron	33,500 J	2% E
Lead	236.0 J	46.7 E,F
Mercury	2.1 J	0.15 E,F
Nickel	63.6 J	20.9 E,F
Silver	4.5 J	1.0 E,F
Zinc	508.0 J	150 E,F

Location SD-11			10/10/2003		
Parameter	Conc.	SCG	Parameter	Conc.	SCG
Pesticides			*Metals*		
4,4-DDD	0.51 J	0.23 A	Arsenic	23.1 J	8.2 E
4,4-DDE	13.0 J	2.20 E	Cadmium	3.6 J	1.2 E
alpha-BHC	3.1 J	0.69 C	Chromium	91.4 J	81 E
Total PCBs	125 J	22.7 E	Copper	257.0 J	34 E
Camphechlor	8.2 J	0.23 C,A,B	Iron	26,800 J	2% E
Endosulfan I	1.3 J	0.09 C	Lead	189.0 J*	46.7 E
Endosulfan II	0.77 J	0.09 C	Mercury	1.8 J*	0.15 E,F
gamma-Chlordane	0.77 J	0.02 A,C,D	Nickel	81.2 J	20.9 E,F
Heptachlor	2.6 J	0.02 A,C	Silver	3.1 J	1.0 E
Heptachlor epoxide	0.77 J	0.02 A	Zinc	401.0 J	150 E

Location BACKGROUND		10/15/2003
Parameter	Conc.	SCG
Metals		
Antimony	2.9 J	2 E
Lead	271.0 J	46.7 E,F
Nickel	174.0 J	20.9 E,F

Location SD-12		10/10/2003
Parameter	Conc.	SCG
Semi-Volatiles		
Fluoranthene	850 J	600 E
Phenanthrene	520 J	240 E
Pyrene	920 J	665 E
Metals		
Antimony	2.6 J	2 E
Arsenic	15.1 J	8.2 E
Copper	94.5 J	34 E
Iron	20,500 J	2% E
Lead	105.0 J	46.7 E
Mercury	0.4 J	0.15 E
Nickel	88.4 J	20.9 E,F
Silver	1.1 J	1.0 E
Zinc	199.0 J	150 E

Location SD-1		10/8/2003
Parameter	Conc.	SCG
Metals		
Antimony	2.1 J	2 E
Arsenic	11	8.2 E
Cadmium	3.2	1.2 E
Chromium	83.3	81 E
Copper	148.0	34 E
Lead	109.0	46.7 E
Mercury	2.3	0.15 E,F
Nickel	36.6	20.9 E
Silver	2.1	1.0 E
Zinc	277.0	150 E

Location SD-2		10/8/2003
Parameter	Conc.	SCG
Pesticides		
4,4-DDD	3.7 J	0.16 A
Metals		
Lead	127.0	46.7 E
Mercury	0.16	0.15 E

Location SD-3		10/8/2003
Parameter	Conc.	SCG
Metals		
Antimony	4.5 J	2 E
Arsenic	50.0	8.2 E
Cadmium	5.3	1.2 E
Chromium	106.0	81 E
Copper	246.0	34 E
Iron	22,600	2% E
Lead	149.0	46.7 E
Mercury	4.7	0.15 E,F
Nickel	40.4	20.9 E
Silver	2.4	1.0 E
Zinc	357.0	150 E

Location SD-6		10/9/2003
Parameter	Conc.	SCG
Metals		
Copper	41.7 J	34 E
Mercury	0.4	0.15 E

Location SD-5		10/9/2003
Parameter	Conc.	SCG
Metals		
Antimony	3.3 J	2 E
Arsenic	31.5	8.2 E
Cadmium	6.2	1.2 E
Chromium	127.0	81 E
Copper	377.0	34 E,F
Iron	32,600	2% E
Lead	254.0	46.7 E,F
Mercury	2.1 J	0.15 E,F
Nickel	57.5	20.9 E,F
Silver	5.0	1.0 E,F
Zinc	556.0	150 E,F

Location SD-9		10/10/2003
Parameter	Conc.	SCG
Metals		
Arsenic	31.1 J	8.2 E
Cadmium	4.5 J	1.2 E
Chromium	87.1 J	81 E
Copper	258.0 J	34 E
Iron	29,000 J	2% E
Lead	180.0 J	46.7 E
Mercury	1.7 J	0.15 E,F
Nickel	97.1 J	20.9 E,F
Silver	2.6 J	1.0 E
Zinc	429.0 J	150 E,F

Location SD-8		10/9/2003
Parameter	Conc.	SCG
Metals		
Antimony	5.3 J	2 E
Arsenic	60.3 J	8.2 E
Cadmium	9.3 J	1.2 E
Chromium	178.0 J	81 E
Copper	453.0 J	34 E,F
Iron	37,400 J	2% E
Lead	304.0 J	46.7 E,F
Mercury	7.9 J*	0.15 E,F
Nickel	93.4 J	20.9 E,F
Silver	5.8 J	1.0 E,F
Zinc	620.0 J	150 E,F

Location SD-10		10/10/2003
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	0.43 J	0.21 A
alpha-BHC	2.6 J	0.63 C
Total PCBs	74.9 J	22.7 E
Camphechlor	7.0 J	0.21 C,A,B
Endosulfan I	1.1 J	0.08 C
Endosulfan II	0.65 J	0.08 C
gamma-Chlordane	0.65 J	0.02 A,C,D
Heptachlor	2.2 J	0.02 A,C
Heptachlor epoxide	0.65 J	0.02 A
Metals		
Mercury	0.52 J*	0.15 E

Notes:
All concentrations in ug/kg (organics) and mg/kg (metals).
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

300 0 300 600 Feet

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Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Creek Sediment
0 to 6 Inch Depth Interval

Figure 7

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Location SD-1	10/8/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	12.2	8.2 E
Cadmium	5.1	1.2 E
Chromium	83.1	81 E
Copper	207.0	34 E
Lead	143.0	46.7 E
Mercury	2.2	0.15 E,F
Nickel	44.6	20.9 E
Silver	2.6	1.0 E
Zinc	314.0	150 E

Location SD-2	10/8/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
Anthracene	130 J	85.3 E
Benzo(a)anthracene	780	261 E
Benzo(a)pyrene	750	430 E
Fluoranthene	1700	600 E
Phenanthrene	790	240 E
Pyrene	1400	665 E
Pesticides/PCBs		
Total PCBs	27.0	22.7 E
Metals		
Copper	40.8	34 E
Lead	61.6	46.7 E
Mercury	0.35	0.15 E

Location SD-3	10/8/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	12.6	8.2 E
Iron	25,400	2% E
Mercury	0.27	0.15 E
Nickel	21.3	20.9 E

Location SD-4	10/8/2003	
Parameter	Conc.	SCG
Metals		
Antimony	4.1 J	2 E
Arsenic	52.9	8.2 E
Cadmium	4.8	1.2 E
Chromium	116.0	81 E
Copper	340.0	34 E,F
Iron	21,900	2% E
Lead	209.0	46.7 E
Mercury	4.7	0.15 E,F
Nickel	52.6	20.9 E,F
Silver	2.8	1.0 E
Zinc	404.0	150 E

Location SD-5	10/9/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDT	48.0 J	1.58 E,F
Metals		
Antimony	3.3 J	2 E
Arsenic	32.9 J	8.2 E
Cadmium	6.8 J	1.2 E
Chromium	126.0 J	81 E
Copper	375.0 J	34 E,F
Iron	33,100 J	2% E
Lead	260.0 J	46.7 E,F
Mercury	1.7 J	0.15 E,F
Nickel	64.1 J	20.9 E,F
Silver	5.0 J	1.0 E,F
Zinc	573.0 J	150 E,F

Location SD-6	10/9/2003	
Parameter	Conc.	SCG
Pesticides		
4,4-DDD	11.0 J	0.03 A,D
Metals		
Lead	55.0	46.7 E
Mercury	0.17	0.15 E

Location SD-7	10/9/2003	
Parameter	Conc.	SCG
Metals		
Antimony	2.5 J	2 E
Arsenic	12.9 J	8.2 E
Iron	30,400 J	2% E
Nickel	27.4 J	20.9 E

Location SD-8	10/9/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	24.9	8.2 E
Iron	45,400	2 E,F
Manganese	652.0	460 E
Mercury	0.26	0.15 E
Nickel	52.6	20.9 E,F
Silver	2.8	1.0 E

Location SD-9	10/10/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	32.0 J	8.2 E
Cadmium	4.7 J	1.2 E
Chromium	114.0 J	81 E
Copper	330.0 J	34 E,F
Iron	32,500 J	2% E
Lead	238.0 J	46.7 E,F
Mercury	1.7 J	0.15 E,F
Nickel	92.4 J	20.9 E,F
Silver	3.6 J	1.0 E
Zinc	500.0 J	150 E,F

Location SD-10	10/10/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	0.42 J	0.20 A,C,D
alpha-BHC	2.5 J	0.60 C
Total PCBs	73.7 J	22.70 E
Camphechlor	6.8 J	0.20 C,A,B
Endosulfan I	1.1 J	0.08 C
Endosulfan II	0.64 J	0.08 C
gamma-Chlordane	0.64 J	0.02 A,C,D
Heptachlor	2.1 J	0.02 A,C
Heptachlor epoxide	0.64 J	0.02 A
Metals		
Arsenic	18.6 J	8.2 E
Copper	35.7 J	34 E
Iron	35,100 J	2% E
Lead	71.7 J*	46.7 E
Mercury	0.31 J	0.15 E
Nickel	91.1 J	20.9 E,F

Location SD-11	10/10/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
Phenanthrene	300 J	240 E
Pesticides/PCBs		
4,4-DDD	0.42 J	0.23 A,D
alpha-BHC	2.5 J	0.69 C
Total PCBs	74.7 J	22.7 E
Camphechlor	6.8 J	0.23 A,B,C
Endosulfan I	1.1 J	0.09 C
Endosulfan II	0.64 J	0.09 C
gamma-Chlordane	0.64 J	0.02 A,C,D
Heptachlor	2.1 J	0.02 A,C
Heptachlor epoxide	0.64 J	0.02 A
Metals		
Arsenic	23.8 J	8.2 E
Cadmium	3.4 J	1.2 E
Chromium	81.5 J	81 E
Copper	226.0 J	34 E
Iron	23,600 J	2% E
Lead	164.0 J*	46.7 E
Mercury	1.1 J	0.15 E,F
Nickel	72.5 J	20.9 E,F
Silver	2.9 J	1.0 E
Zinc	350.0 JN	150 E

Location SD-12	10/10/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
2-Methylnaphthalene	75 J	70 E
Acenaphthene	75 J	16 E
Acenaphthylene	75 J	44 E
Anthracene	95 J	85.3 E
Benzo(a)anthracene	490 J	261 E
Dibenz(a,h)anthracene	96 J	63.4 E
Fluoranthene	1200 J	600 E
Fluorene	70 J	19 E
Hexachloro-1,3-Butadiene	95 J	5.10 A,C,D
Hexachlorocyclopentadiene	240 J	11.9 C,B
Phenanthrene	740 J	240 E
Pyrene	1100 J	665 E
Metals		
Arsenic	8.7 J	8.2 E
Copper	44.8 J	34 E
Nickel	74.4 J	20.9 E,F

Location BACKGROUND	10/15/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
2-Methylnaphthalene	250 J	70 E
Acenaphthene	220 J	16 E
Acenaphthylene	160 J	44 E
Fluorene	140 J	19 E
Napthalene	250 J	160 E
Pesticides/PCBs		
4,4-DDD	0.7 J	0.31 A
alpha-BHC	4.3 J	0.93 C
Total PCBs	123.5 J	22.70 E
Camphechlor	11.0 J	0.31 C,A,B
Endosulfan I	1.8 J	0.12 C
Endosulfan II	1.1 J	0.12 C
gamma-Chlordane	1.1 J	0.03 A,C,D
Heptachlor	3.6 J	0.02 A,C
Heptachlor epoxide	1.1 J	0.02 A
Metals		
Antimony	3.4 J	2 E
Arsenic	12.2 J	8.2 E
Iron	23,000 J	2% E
Nickel	251.0 J	20.9 E,F

Notes:
All concentrations in ug/kg (organics) and mg/kg (metals).
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

300 0 300 600 Feet

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New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Creek Sediment
6 to 12 Inch Depth Interval

Figure 8

Location SD-4		10/8/2003
Parameter	Conc.	SCG
Metals		
Antimony	2.3 J	2 E
Arsenic	48.5	8.2 E
Cadmium	1.6	1.2 E
Chromium	84.9	81 E
Copper	248.0	34 E
Iron	20,900	2% E
Lead	181.0	46.7 E
Mercury	2.0	0.15 E,F
Nickel	61.2	20.9 E,F
Silver	1.6	1.0 E
Zinc	298.0	150 E

Location SD-1 (41-46 in.)		10/8/2003
Parameter	Conc.	SCG
Metals		
Arsenic	11.7	8.2 E
Mercury	0.25	0.15 E

Location SD-2		10/8/2003
Parameter	Conc.	SCG
Metals		
Antimony	3.1 J	2 E
Arsenic	31.0	8.2 E
Cadmium	7.9	1.2 E
Chromium	122.0	81 E
Copper	352.0	34 E,F
Lead	191.0	46.7 E
Mercury	0.26	0.15 E
Nickel	51.7	20.9 E,F
Silver	3.7	1.0 E
Zinc	458.0	150 E,F

Location SD-3		10/8/2003
Parameter	Conc.	SCG
Volatiles		
1,1-Dichloroethylene	2.3 J	0.32 A
Vinyl Chloride	2.1 J	1.12 A
Metals		
Iron	24000	2% E

Location SD-7		10/9/2003
Parameter	Conc.	SCG
Metals		
Antimony	2.3 J	2 E
Arsenic	41.3 J	8.2 E
Cadmium	8.4 J	1.2 E
Chromium	177.0 J	81 E
Copper	501.0 J	34 E,F
Iron	35,800 J	2% E
Lead	344.0 J	46.7 E,F
Mercury	1.9 J*	0.15 E,F
Nickel	117.0 J	20.9 E,F
Silver	5.2 J	1.0 E,F
Zinc	696.0 J	150 E,F

Location SD-9		10/10/2003
Parameter	Conc.	SCG
Metals		
Arsenic	33.7 J	8.2 E
Cadmium	3.9 J	1.2 E
Chromium	105.0 J	81 E
Copper	290.0 J	34 E,F
Iron	34,000 J	2% E
Lead	246.0 J	46.7 E,F
Mercury	1.4 J	0.15 E,F
Nickel	125.0 J	20.9 E,F
Silver	3.1 J	1.0 E
Zinc	470.0 J	150 E,F

Location SD-8		10/9/2003
Parameter	Conc.	SCG
Metals		
Arsenic	11.4	8.2 E
Iron	35,500	2% E
Nickel	29.4	20.9 E
Silver	2.1	1.0 E

Location SD-5		10/9/2003
Parameter	Conc.	SCG
Metals		
Antimony	3.6 J	2 E
Arsenic	41.3 J	8.2 E
Cadmium	9.6 J	1.2 E
Chromium	169.0 J	81 E
Copper	516.0 J	34 E,F
Iron	32,900 J	2% E
Lead	326.0 J	46.7 E,F
Mercury	4.3 J	0.15 E,F
Nickel	87.2 J	20.9 E,F
Silver	6.0 J	1.0 E,F
Zinc	625.0 J	150 E,F

Location SD-6	10/9/2003
No exceedances at 30-36 inches	

Location SD-10		10/10/2003
Parameter	Conc.	SCG
Metals		
Arsenic	9.9 J	8.2 E
Iron	31,500 J	2% E
Nickel	72.5 J	20.9 E,F

Location BACKGROUND		10/15/2003
Parameter	Conc.	SCG
Metals		
Nickel	76.5 J	20.9 E,F

Location SD-12		10/10/2003
Parameter	Conc.	SCG
Semi-Volatiles		
Acenaphthene	53 J	16 E
Acenaphthylene	53 J	44 E
Dibenz(a,h)anthracene	67 J	63.4 E
Fluorene	49 J	19 E
Hexachloro-1,3-Butadiene	67 J	1.65 A,C,D
Hexachlorocyclopentadiene	170 J	3.85 C,B
Metals		
Nickel	44.1	20.9 E

Location SD-11		10/10/2003
Parameter	Conc.	SCG
Semi-Volatiles		
Acenaphthene	51 J	16 E
Acenaphthylene	51 J	44 E
Dibenz(a,h)anthracene	66 J	63.4 E
Fluorene	48 J	19 E
Hexachloro-1,3-Butadiene	65 J	2.16 A,C,D
Hexachlorocyclopentadiene	160 J	5.04 C,B
Metals		
Antimony	2.1 J	2 E
Arsenic	23.3	8.2 E
Copper	74.6	34 E
Lead	120.0 *	46.7 E
Mercury	0.28	0.15 E
Nickel	95.1	20.9 E,F
Zinc	182.0 N	150 E

Notes:
All concentrations in ug/kg (organics) and mg/kg (metals).
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

300 0 300 600 Feet

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Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Creek Sediment
24 to 30 Inch Depth Interval

Figure 9

BKGD.

No BACKGROUND sample below 24-30 in.

Location SD-1	10/8/2003
No exceedances	

Location SD-2	10/8/2003
No exceedances	

Location SD-3	10/8/2003
No exceedances	

Location SD-4	10/8/2003	
Parameter	Conc.	SCG
Metals		
Nickel	85.6	20.9 E,F

Location SD-5 (44-50 in.)	10/9/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	12.5 J	8.2 E
Iron	28,000 J	2% E
Nickel	26.0 J	20.9 E

Location SD-6	10/9/2003	
Parameter	Conc.	SCG
Metals		
Copper	35.1 J	34 E
Manganese	672.0	460 E

Location SD-7		
Parameter	Conc.	SCG
Metals		
Iron	22,700 J	2% E
Nickel	47.8 J	20.9 E

Location SD-8	10/9/2003	
Parameter	Conc.	SCG
Metals		
Nickel	28.8	20.9 E

Location SD-9	10/10/2003	
Parameter	Conc.	SCG
Metals		
Nickel	40.0	20.9 E

Location SD-10 (54-60 in.)	10/10/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	9.1	8.2 E
Iron	26,500	2% E
Nickel	34.8	20.9 E

Location SD-11	10/10/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
Acenaphthene	49 J	16 E
Acenaphthylene	49 J	44 E
Fluorene	46 J	19 E
Hexachloro-1,3-Butadiene	63 J	1.74 A,C,D
Hexachlorocyclopentadiene	160 J	4.06 C,B
Metals		
Nickel	104	20.9 E,F

Location SD-12	10/10/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
Acenaphthene	48 J	16 E
Acenaphthylene	48 J	44 E
Fluorene	44 J	19 E
Hexachloro-1,3-Butadiene	60 J	2.25 A,C,D
Hexachlorocyclopentadiene	150 J	5.25 C,B
Metals		
Nickel	174	20.9 E,F

Notes:
All concentrations in ug/kg (organics) and mg/kg (metals).
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

N W E S

300 0 300 600 Feet

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New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Creek Sediment
72 to 78 Inch Depth Interval

Figure 10

Location SD-BREF1		10/17/2003
Parameter	Conc.	SCG
Metals		
Arsenic	24.2 J	8.2 E
Cadmium	2.0 J	1.2 E
Chromium	103.0 J	81 E
Copper	217.0 J	34 E
Iron	26,700 J	2% E
Lead	205.0 J	46.7 E
Mercury	2.4 J	0.15 E,F
Nickel	32.9 J	20.9 E
Silver	2.8 J	1.0 E
Zinc	369.0 J	150 E

Location SD-BREF2		10/22/2003
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4'-DDD	11.0 P	0.30 A
4,4'-DDT	66.0 D	1.58 E,F
Total PCBs	55.0 J	22.70 E
Metals		
Antimony	5.6 J	2 E
Arsenic	72.6	8.2 E,F
Cadmium	4.9	1.2 E
Chromium	190.0 *	81 E
Copper	388.0	34 E,F
Iron	21,200 *	2% E
Lead	332.0 *	46.7 E,F
Mercury	7.7	0.15 E,F
Nickel	36.7	20.9 E
Silver	4.2	1.0 E,F
Zinc	439.0 N*	150 E,F

Location SD-B5		10/20/2003
Parameter	Conc.	SCG
Metals		
Arsenic	19.8 J	8.2 E
Cadmium	4.0 J	1.2 E
Chromium	89.8 J	81 E
Copper	267.0 J	34 E
Iron	22,600 J	2% E
Lead	175.0 J	46.7 E
Mercury	3.5 J	0.15 E,F
Nickel	43.0 J	20.9 E
Silver	3.1 J	1.0 E
Zinc	400.0 J	150 E

Location SD-B6		10/19/2003
Parameter	Conc.	SCG
Metals		
Arsenic	47.0 J	8.2 E
Cadmium	3.1 J	1.2 E
Chromium	96.0 J	81 E
Copper	323.0 J	34 E,F
Iron	47,200 J	2% E,F
Lead	254.0 J	46.7 E,F
Mercury	1.9 J	0.15 E,F
Nickel	61.4 J	20.9 E,F
Silver	4.5 J	1.0 E,F
Zinc	452.0 J	150 E,F

Location SD-B3		10/21/2003
Parameter	Conc.	SCG
Metals		
Arsenic	49.3 J	8.2 E
Cadmium	4.4 J	1.2 E
Chromium	144 J	81 E
Copper	366 J	34 E,F
Iron	26,700 J	2% E
Lead	267.0 J	46.7 E,F
Mercury	4.0 J	0.15 E,F
Nickel	86.5 J	20.9 E,F
Silver	3.9 J	1.0 E,F
Zinc	456.0 J	150 E,F

Location SD-B4		10/18/2003
Parameter	Conc.	SCG
Metals		
Arsenic	20.9 J	8.2 E
Cadmium	3.9 J	1.2 E
Chromium	93.0 J	81 E
Copper	271.0 J	34 E,F
Iron	23,500 J	2% E
Lead	184.0 J	46.7 E,F
Mercury	2.9 J	0.15 E,F
Nickel	44.3 J	20.9 E
Silver	3.4 J	1.0 E
Zinc	451.0 J	150 E,F

Location SD-B7		10/17/2003
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4'-DDT	120 D	1.58 E,F
Metals		
Copper	56.2 J	34 E
Lead	92.7 J	46.7 E
Nickel	22.3 J	20.9 E
Zinc	240.0 J	150 E

Location SD-B2		10/17/2003
Parameter	Conc.	SCG
Metals		
Arsenic	25.0 J	8.2 E
Cadmium	2.9 J	1.2 E
Copper	222.0 J	34 E
Iron	25,300 J	2% E
Lead	197.0 J	46.7 E
Mercury	1.5 J	0.15 E,F
Nickel	40.5 J	20.9 E
Silver	3.5 J	1.0 E
Zinc	357 J	150 E

Location SD-B1		10/16/2003
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4'-DDD	4.9 P	0.30 A
Metals		
Arsenic	15.8	8.2 E
Cadmium	2.6	1.2 E
Copper	162.0	34 E
Iron	23,600	2% E
Lead	131.0	46.7 E
Mercury	1.0	0.15 E,F
Nickel	35.1	20.9 E
Silver	2.6	1.0 E
Zinc	320.0	150 E

SD-B1
SD-B2
SD-B3
SD-B4
SD-B5
SD-B6
SD-B7

Notes:
All concentrations in ug/kg (organic) and mg/kg (metals)
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

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300 0 300 600 Feet

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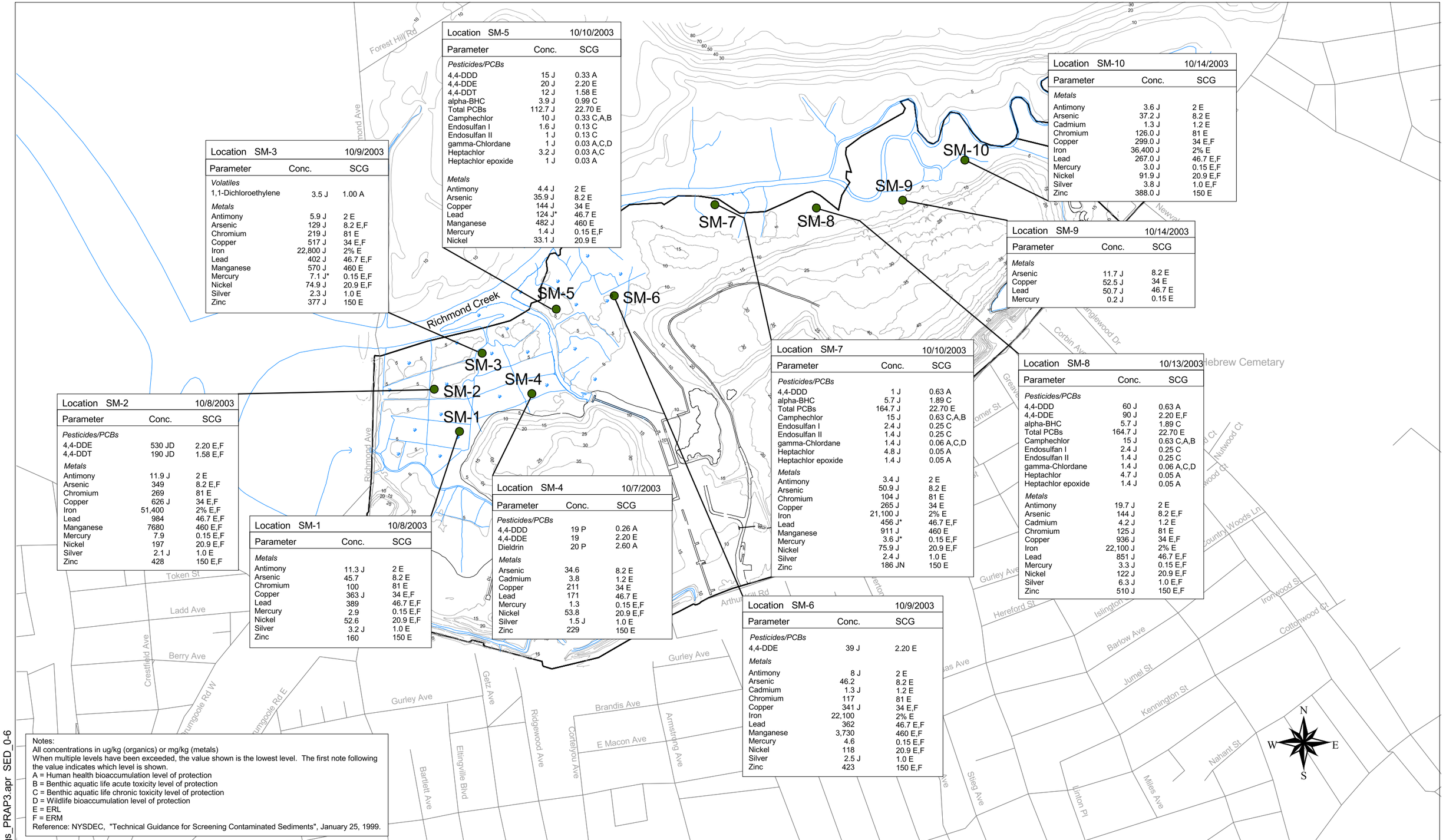
CDM

New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Creek Sediment
at Biota Sampling Locations
0 to 6 Inch Depth Interval

Figure 11



Location SM-5 10/10/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	15 J	0.33 A
4,4-DDE	20 J	2.20 E
4,4-DDT	12 J	1.58 E
alpha-BHC	3.9 J	0.99 C
Total PCBs	112.7 J	22.70 E
Camphechlor	10 J	0.33 C,A,B
Endosulfan I	1.6 J	0.13 C
Endosulfan II	1 J	0.13 C
gamma-Chlordane	1 J	0.03 A,C,D
Heptachlor	3.2 J	0.03 A,C
Heptachlor epoxide	1 J	0.03 A
Metals		
Antimony	4.4 J	2 E
Arsenic	35.9 J	8.2 E
Copper	144 J	34 E
Lead	124 J*	46.7 E
Manganese	482 J	460 E
Mercury	1.4 J	0.15 E,F
Nickel	33.1 J	20.9 E

Location SM-10 10/14/2003

Parameter	Conc.	SCG
Metals		
Antimony	3.6 J	2 E
Arsenic	37.2 J	8.2 E
Cadmium	1.3 J	1.2 E
Chromium	126.0 J	81 E
Copper	299.0 J	34 E,F
Iron	36,400 J	2% E
Lead	267.0 J	46.7 E,F
Mercury	3.0 J	0.15 E,F
Nickel	91.9 J	20.9 E,F
Silver	3.8 J	1.0 E,F
Zinc	388.0 J	150 E

Location SM-3 10/9/2003

Parameter	Conc.	SCG
Volatiles		
1,1-Dichloroethylene	3.5 J	1.00 A
Metals		
Antimony	5.9 J	2 E
Arsenic	129 J	8.2 E,F
Chromium	219 J	81 E
Copper	517 J	34 E,F
Iron	22,800 J	2% E
Lead	402 J	46.7 E,F
Manganese	570 J	460 E
Mercury	7.1 J*	0.15 E,F
Nickel	74.9 J	20.9 E,F
Silver	2.3 J	1.0 E
Zinc	377 J	150 E

Location SM-9 10/14/2003

Parameter	Conc.	SCG
Metals		
Arsenic	11.7 J	8.2 E
Copper	52.5 J	34 E
Lead	50.7 J	46.7 E
Mercury	0.2 J	0.15 E

Location SM-7 10/10/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	1 J	0.63 A
alpha-BHC	5.7 J	1.89 C
Total PCBs	164.7 J	22.70 E
Camphechlor	15 J	0.63 C,A,B
Endosulfan I	2.4 J	0.25 C
Endosulfan II	1.4 J	0.25 C
gamma-Chlordane	1.4 J	0.06 A,C,D
Heptachlor	4.8 J	0.05 A
Heptachlor epoxide	1.4 J	0.05 A
Metals		
Antimony	3.4 J	2 E
Arsenic	50.9 J	8.2 E
Chromium	104 J	81 E
Copper	265 J	34 E
Iron	21,100 J	2% E
Lead	456 J*	46.7 E,F
Manganese	911 J	460 E
Mercury	3.6 J*	0.15 E,F
Nickel	75.9 J	20.9 E,F
Silver	2.4 J	1.0 E
Zinc	186 JN	150 E

Location SM-8 10/13/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	60 J	0.63 A
4,4-DDE	90 J	2.20 E,F
alpha-BHC	5.7 J	1.89 C
Total PCBs	164.7 J	22.70 E
Camphechlor	15 J	0.63 C,A,B
Endosulfan I	2.4 J	0.25 C
Endosulfan II	1.4 J	0.25 C
gamma-Chlordane	1.4 J	0.06 A,C,D
Heptachlor	4.7 J	0.05 A
Heptachlor epoxide	1.4 J	0.05 A
Metals		
Antimony	19.7 J	2 E
Arsenic	144 J	8.2 E,F
Cadmium	4.2 J	1.2 E
Chromium	125 J	81 E
Copper	936 J	34 E,F
Iron	22,100 J	2% E
Lead	851 J	46.7 E,F
Mercury	3.3 J	0.15 E,F
Nickel	122 J	20.9 E,F
Silver	6.3 J	1.0 E,F
Zinc	510 J	150 E,F

Location SM-2 10/8/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDE	530 JD	2.20 E,F
4,4-DDT	190 JD	1.58 E,F
Metals		
Antimony	11.9 J	2 E
Arsenic	349	8.2 E,F
Chromium	269	81 E
Copper	626 J	34 E,F
Iron	51,400	2% E,F
Lead	984	46.7 E,F
Manganese	7680	460 E,F
Mercury	7.9	0.15 E,F
Nickel	197	20.9 E,F
Silver	2.1 J	1.0 E
Zinc	428	150 E,F

Location SM-4 10/7/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	19 P	0.26 A
4,4-DDE	19	2.20 E
Dieldrin	20 P	2.60 A
Metals		
Arsenic	34.6	8.2 E
Cadmium	3.8	1.2 E
Copper	211	34 E
Lead	171	46.7 E
Mercury	1.3	0.15 E,F
Nickel	53.8	20.9 E,F
Silver	1.5 J	1.0 E
Zinc	229	150 E

Location SM-1 10/8/2003

Parameter	Conc.	SCG
Metals		
Antimony	11.3 J	2 E
Arsenic	45.7	8.2 E
Chromium	100	81 E
Copper	363 J	34 E,F
Lead	389	46.7 E,F
Mercury	2.9	0.15 E,F
Nickel	52.6	20.9 E,F
Silver	3.2 J	1.0 E
Zinc	160	150 E

Location SM-6 10/9/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDE	39 J	2.20 E
Metals		
Antimony	8 J	2 E
Arsenic	46.2	8.2 E
Cadmium	1.3 J	1.2 E
Chromium	117	81 E
Copper	341 J	34 E,F
Iron	22,100	2% E
Lead	362	46.7 E,F
Manganese	3,730	460 E,F
Mercury	4.6	0.15 E,F
Nickel	118	20.9 E,F
Silver	2.5 J	1.0 E
Zinc	423	150 E,F

Notes:
All concentrations in ug/kg (organics) or mg/kg (metals)
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

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New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Marsh Sediment
0 to 6 Inch Depth Interval

Figure 12

Location SM-1	10/8/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDE	8.6 J	2.20 A
Metals		
Arsenic	9 J	8.2 E
Copper	80.3 J	34 E

Location SM-2	10/8/2003	
Parameter	Conc.	SCG
Metals		
Antimony	8 J	2 E
Arsenic	122 J	8.2 E,F
Chromium	112 J	81 E
Copper	441 J	34 E,F
Lead	453 J	46.7 E,F
Manganese	2,590 J	460 E,F
Mercury	4.4 J	0.15 E,F
Nickel	98 J	20.9 E,F
Silver	2.1 J	1.0 E
Zinc	228 J	150 E

Location SM-3	10/9/2003	
Parameter	Conc.	SCG
Metals		
Antimony	5.4 J	2 E
Arsenic	177 J	8.2 E,F
Chromium	98.8 J	81 E
Copper	533 J	34 E,F
Iron	24,100 J	2% E
Lead	369 J	46.7 E,F
Mercury	2.2 J	0.15 E,F
Nickel	142 J	20.9 E,F
Silver	1.7 J	1.0 E
Zinc	305 J	150 E

Location SM-4	10/7/2003	
Parameter	Conc.	SCG
Semivolatiles		
Penanthrene	370 J	240 E

Location SM-5	10/10/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	1.2 J	0.85 A
alpha-BHC	7 J	2.55 C
Total PCBs	203.6 J	22.70 E,F
Camphechlor	19 J	0.85 C,A,B
Endosulfan I	2.9 J	0.34 C
Endosulfan II	1.8 J	0.34 C
gamma-Chlordane	1.8 J	0.09 A,C,D
Heptachlor	5.8 J	0.07 A
Heptachlor epoxide	1.8 J	0.07 A
Metals		
Antimony	9.1 J	2 E
Arsenic	50 J	8.2 E
Copper	101 J	34 E
Lead	97.9 J*	46.7 E
Mercury	0.4 J	0.15 E
Nickel	37.5 J	20.9 E

Location SM-6	10/9/2003	
Parameter	Conc.	SCG
Semi-Volatiles		
2-Methylnaphthalene	570 J	70 E
Metals		
Antimony	2.4 J	2 E

Location SM-6 (Duplicate)	10/9/2003	
Parameter	Conc.	SCG
Metals		
Antimony	3.7 J	2 E
Mercury	0.4 J	0.15 E
Silver	21.5 J	1.0 E

Location SM-7	10/10/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	0.9 J	0.63 A
alpha-BHC	5.4 J	1.89 C
Total PCBs	157.9 J	22.70 E
Camphechlor	14 J	0.63 C,A,B
Endosulfan I	2.3 J	0.25 C
Endosulfan II	1.4 J	0.25 C
gamma-Chlordane	1.4 J	0.06 A,C,D
Heptachlor	4.5 J	0.05 A
Heptachlor epoxide	1.4 J	0.05 A
Metals		
Antimony	11.5 J	2 E
Arsenic	80.1 J	8.2 E,F
Chromium	110 J	81 E
Copper	415 J	34 E,F
Lead	908 J*	46.7 E,F
Manganese	632 J	460 E
Mercury	5.4 J*	0.15 E,F
Nickel	129 J	20.9 E,F
Silver	2 J	1.0 E
Zinc	498 JN	150 E,F

Location SM-8	10/13/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	1.1 J	0.66 A
4,4-DDE	17 J	2.20 E
alpha-BHC	6.6 J	1.98 C
Total PCBs	193.2 J	22.70 E,F
Camphechlor	18 J	0.66 C,A,B
Endosulfan I	2.8 J	0.26 C
Endosulfan II	1.7 J	0.07 C
gamma-Chlordane	1.7 J	0.07 A,C,D
Heptachlor	5.5 J	0.05 A
Heptachlor epoxide	1.7 J	0.05 A
Metals		
Antimony	11.7 J	2 E
Arsenic	96.4 J	8.2 E,F
Copper	759 J	34 E,F
Lead	429 J	46.7 E,F
Mercury	0.7 JN	0.15 E
Nickel	70.8 J	20.9 E,F
Zinc	213 J	150 E

Location SM-9	10/14/2003	
Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDE	30 J	2.20 E,F
Metals		
Antimony	8 J	2 E
Arsenic	128 J	8.2 E,F
Copper	545 J	34 E,F
Iron	20,400 J	2% E
Lead	362 J	46.7 E,F
Mercury	1.3 J	0.15 E,F
Nickel	116 J	20.9 E,F
Silver	2.6 J	1.0 E
Zinc	212 J	150 E

Location SM-10	10/14/2003	
Parameter	Conc.	SCG
Metals		
Arsenic	64.7 J	8.2 E
Cadmium	1.7 J	1.2 E
Chromium	165 J	81 E
Copper	328 J	34 E,F
Iron	40,300 J	2% E,F
Lead	404 J	46.7 E,F
Manganese	884 J	460 E
Mercury	2.7 J	0.15 E,F
Nickel	224 J	20.9 E,F
Silver	4.7 J	1.0 E,F
Zinc	601 J	150 E,F

Notes:
All concentrations in ug/kg (organics) or mg/kg (metals)
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

300 0 300 600 Feet

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New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Marsh Sediment
6 to 12 Inch Depth Interval

Figure 13

Location SM-5, 52 to 58 inches 10/10/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	2 J	0.79 A
4,4-DDT	2 J	1.58 E
alpha-BHC	12 J	2.37 C
Total PCBs	351 J	22.70 E,F
Camphechlor	32 J	0.79 C,A,B
Endosulfan I	5 J	0.32 C
Endosulfan II	3 J	0.32 C
gamma-Chlordane	3 J	0.08 A,C,D
Heptachlor	9.9 J	0.06 A,C
Heptachlor epoxide	3 J	0.06 A
Metals		
Antimony	41.7 J	2 E,F
Arsenic	365 J	8.2 E,F
Chromium	275 J	81 E
Copper	756 J	34 E,F
Iron	182,000 J	2% E,F
Lead	724 J*	46.7 E,F
Manganese	3,720 J	460 E,F
Nickel	288 J	20.9 E,F
Silver	3.1 J	1.0 E
Zinc	1,010 J	150 E,F

Location SM-10, 24 to 30 inches 10/14/2003

Parameter	Conc.	SCG
Semi-Volatiles		
Anthracene	100 J	85.3 E
Metals		
Arsenic	11.1 J	8.2 E
Iron	34,600 J	2% E
Nickel	66.2 J	20.9 E,F

Location SM-3, 30 to 36 inches 10/9/2003

Parameter	Conc.	SCG
Metals		
Antimony	3.3 J	2 E
Arsenic	14 J	8.2 E
Iron	35,300 J	34 E
Manganese	588 J	460 E
Nickel	31.2 J	20.9 E

Location SM-9, 69 to 75 inches 10/14/2003

Parameter	Conc.	SCG
Metals		
Nickel	26.8 J	20.9 E

Location SM-8, 44 to 50 inches 10/13/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	1.8 J	1.00 A
4,4-DDT	1.8 J	1.58 E
alpha-BHC	11 J	3.00 C
Total PCBs	315 J	22.70 E,F
Camphechlor	29 J	1.00 C,A,B
Endosulfan I	4.5 J	0.40 C
Endosulfan II	2.7 J	0.40 C
gamma-Chlordane	2.7 J	0.10 A,C,D
Heptachlor	9.1 J	0.08 A,C
Heptachlor epoxide	2.7 J	0.08 A

Location SM-2, 24 to 30 inches 10/8/2003

Parameter	Conc.	SCG
Metals		
Antimony	5.7 J	2 E
Arsenic	39.4 J	8.2 E
Nickel	73.5 J	20.9 E,F
Zinc	297 J	150 E

Location SM-6, 24 to 30 inches 10/9/2003

Parameter	Conc.	SCG
Volatiles		
Carbon Tetrachloride	2.8 J	2.40 A
Pesticides/PCBs		
alpha-BHC	1.7 J	0.12 C
Total PCBs	48.7 J	22.70 E
Camphechlor	4.5 J	0.04 A,B,C
Endosulfan I	0.7 J	0.02 C,B
Endosulfan II	0.4 J	0.02 C
gamma-Chlordane	0.4 J	0.004 A,B,C,D
Heptachlor	1.4 J	0.003 A,C
Heptachlor epoxide	0.4 J	0.003 A,C

Location SM-7, 44 to 50 inches 10/10/2003

Parameter	Conc.	SCG
Pesticides/PCBs		
4,4-DDD	0.6 J	0.30 A
alpha-BHC	3.7 J	0.90 C
Total PCBs	108 J	22.70 E
Camphechlor	10 J	0.30 C,A,B
Endosulfan I	1.6 J	0.12 C
Endosulfan II	0.9 J	0.12 C
gamma-Chlordane	0.9 J	0.03 A,C,D
Heptachlor	3.1 J	0.02 A,C
Heptachlor epoxide	0.9 J	0.02 A
Metals		
Antimony	4.6 J	2 E
Arsenic	9.2 J	8.2 E
Iron	29,400 J	2% E
Nickel	27.6 J	20.9 E

Location SM-1, 24 to 30 inches 10/8/2003

No exceedances

Location SM-4, 24 to 30 inches 10/7/2003

No exceedances (volatile fraction rejected)

Notes:
All concentrations in ug/kg (organics) or mg/kg (metals)
When multiple levels have been exceeded, the value shown is the lowest level. The first note following the value indicates which level is shown.
A = Human health bioaccumulation level of protection
B = Benthic aquatic life acute toxicity level of protection
C = Benthic aquatic life chronic toxicity level of protection
D = Wildlife bioaccumulation level of protection
E = ERL
F = ERM
Reference: NYSDEC, "Technical Guidance for Screening Contaminated Sediments", January 25, 1999.

300 0 300 600 Feet

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New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

SCG Exceedances in Marsh Sediment
24 to 75 Inch Depth Intervals

Figure 14

Fresh Kills Landfill

East Cell

West Cell

Colonial Square

Holterman's Bakery

Eltingville Pump Station

Richmond Creek

Forest Hill Rd

Richmond Ave

Arthur Kill Rd

Newwale Ave

Tanglewood Dr

Corbin Ave

Troy St

Greaves Ave

Cromer St

Miles Ave

Daleham St

Fairfield St

Gifford Ave

Gurley Ave

Hereford St

Elverton Ave

Brookfield Ave

Colon Ave

Duane Ave

Arkansas Ave

United Hebrew Cemetary

Token St

Ladd Ave

Berry Ave

Drumgoole Rd W

Drumgoole Rd E

Getz Ave

Ridgewood Ave

Brandis Ave

Abingdon Ave

Cherry Ct

N

W

E

S

200 0 200 400 Feet

LEGEND

Major Components of the OU 1 Remedy

- Leachate Collection Trench
- Landfill Cap
- Groundwater Barrier Wall

Other Features Shown

- Sanitary Sewer
- Storm Sewer
- Surface Water Features

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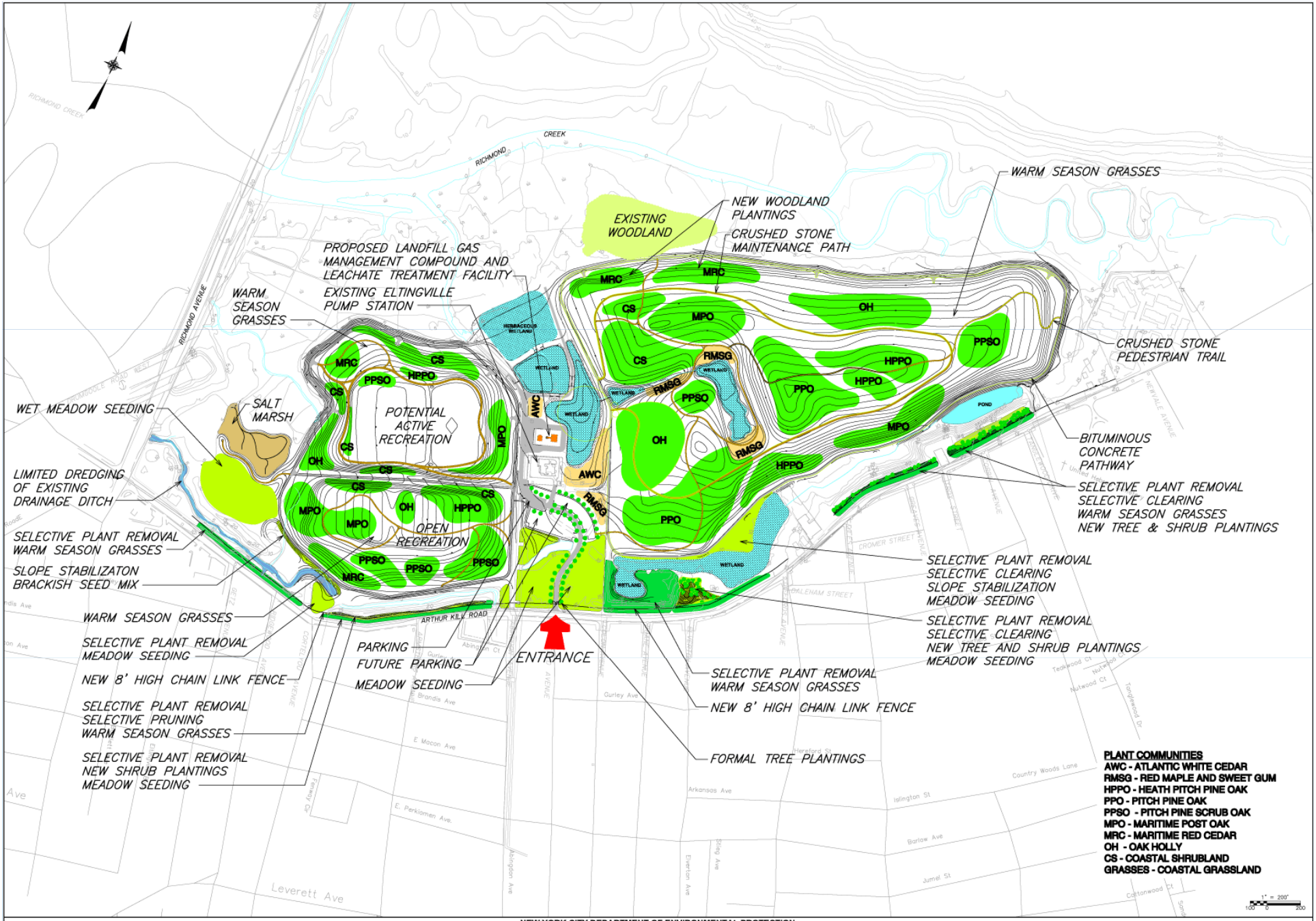
New York City Department of Environmental Protection
Brookfield Avenue Landfill Operable Unit 2

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION DEP

Closure Plan for the Brookfield Avenue Landfill Operable Unit 1

Figure 15



NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BROOKFIELD AVENUE LANDFILL REMEDIATION

END USE PLAN

CDM

William F. Cosulich Associates, P.C.
Environmental Engineers and Scientists

Figure 16

New York State Department of Environmental Conservation