DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Pennsylvania Avenue Landfill
Borough of Brooklyn
Kings County
Site Code: 224002
Funding Source: 1986 Environmental Quality Bond Act

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Pennsylvania Avenue Landfill inactive hazardous waste disposal site that was chosen in accordance with the New York State Environmental Conservation Law (ECL) and consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et., sec., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Appendix B identifies the documents that comprise the Administrative Record for the site and includes the final Remedial Investigation and Feasibility Study (RI/FS) reports. The documents in the Administrative Record are the basis for the selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health and the environment.

SUMMARY OF REMEDY SELECTION

Based on the results of the RI/FS for the Pennsylvania Avenue Landfill and the criteria for selecting a remedy, the New York State Department of Environmental Conservation (NYSDEC) has selected a remedy consisting of landfill capping with active gas collection, active waste oil and leachate collection in the oil contamination area along Fresh Creek, excavation of sediments which are visibly oil stained or which exceed 1 ppm total PCBs, and long term monitoring of site media.

NEW YORK STATE DEPARTMENT OF HEALTH CONCURRENCE

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

DECLARATION

The selected remedy is protective of human health and the environment, complies with State and Federal Standards, Criteria and Guidance (SCGs) that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. Waivers are justified for SCGs that will not be met. This remedy utilizes permanent solutions and innovative technologies to the maximum extent practicable, and satisfies the statutory preference for treatment as a principal element. Hazardous wastes will remain on site, however, since the landfill material cannot be excavated and treated effectively.

February 10, 1995
Date

Ann Hill DeBarbieri
Deputy Commissioner
Office of Environmental Remediation
New York State Department of
Environmental Conservation

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1: SITE DESCRIPTION

The Pennsylvania Avenue Landfill is a 110 acre landfill located at the southern end of Pennsylvania Avenue in the Borough of Brooklyn, New York City. As shown in Figure 1, the site is bounded by the Belt Parkway to the northwest, Hendrix Creek to the northeast, Jamaica Bay to the southeast, and Fresh Creek to the southwest.

Directly across the Belt Parkway from the site lies the Starrett City residential development, housing an estimated 14,000 residents. Upstream on Hendrix Creek is the 26th Ward Sewage Treatment Plant, which discharges an average of 68.5 million gallons per day of treated wastewater. Across Hendrix Creek lies the Fountain Avenue Landfill, another Class 2 inactive hazardous waste disposal site.

2: SITE HISTORY

2.1 Operational/Disposal History

1956 - The site was opened for receipt of residential and commercial wastes, including incinerator ash, street cleanings, construction & demolition wastes and waste oil.

1962 - 1968 - Landfilling at the site was suspended when activities shifted to the Fountain Avenue Landfill.

1968 - Disposal of construction & demolition waste resumed.

1974 - 1980 - Illegal disposal of hazardous wastes is reported to have occurred. Liquid wastes disposed at the site include waste oils, spent plating baths, sludges and spent thinners and lacquers.

1980 - Disposal of all wastes ceased. The site continued to be used for sanitation vehicle storage until 1985.

2.2 Remedial History

In June 1980 the site was added to the Registry of inactive hazardous waste disposal sites as a closed site requiring further surveillance. In 1983 the site classification was changed to a Class 3 site, to reflect one which did not pose a significant threat, and for which action may be deferred.

In 1983, oil was observed to be seeping from the landfill along the Fresh Creek shoreline. Sorbent booms were installed in the outbreak area to absorb floating oil and contain oil migration. A 1984 study estimated the amount of oil present at the site and evaluated the feasibility of product recovery.

In June 1984 the site classification was changed to a Class 2, to reflect a site which poses a significant threat to public health or the environment.

3: CURRENT STATUS

The New York City DEP, by order of the New York State DEC, initiated a Remedial Investigation/ Feasibility Study (RI/FS) in March 1993 to address contamination at the site.

3.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from waste disposal activities at the site.

The Final Remedial Investigation Report, dated May 1994, describes the field activities and findings of the RI in detail. A summary of the RI Report follows:

The RI activities consisted of the following:

- Collection of 10 surface soil samples from areas of exposed fill and along roadways. Analysis of soil samples for volatiles, semivolatiles, metals, pesticides, and PCBs.

- Drilling of 12 exploratory borings through the waste material to characterize the waste and determine the extent and thickness of Tidal Marsh Deposits (TMD) beneath the site. Analysis of one waste sample from each borehole for volatiles, semivolatiles, metals, pesticides, and PCBs.

- Survey of soil gas concentrations across the surface of the site. A 200 foot square grid was set up across the site, and at each of 103 sample locations subsurface gas was measured for temperature, methane, hydrogen sulfide, oxygen, carbon monoxide, nitrogen dioxide, sulfur dioxide, and total volatile organic contaminants (VOCs).

- Based on the results of the soil gas survey, 5 locations were selected for emission monitoring using an emission isolation flux chamber (flux box). At each location, the rate of VOC, methane and hydrogen sulfide emission was measured over a 16 minute period.

- Ambient air sampling at six locations consisting of 1 upwind location, 1 on-site source area, 2 downwind property boundary points and 2 downwind off-site receptor locations. Two rounds of 8-hour composite samples were taken in June and September 1993 using a SUMMA vacuum canister.

- Installation of 28 new groundwater monitoring wells to supplement the existing site wells found to be usable. The new wells were installed and screened in the following locations:

U-Wells: 12 on-site wells screened in the upper water bearing zone (leachate mound)

S-Wells: 7 on-site wells screened in the top of the Upper Glacial Aquifer (UGA)

D- Wells: 6 on-site wells screened in a deeper portion of the UGA

Background Wells: 3 off-site, upgradient wells screened in the U, S and D zones.

- Aquifer permeability testing and measurement of water levels in on-site monitoring wells. Results of the permeability tests were input into a groundwater flow model (MODFLOW), which was calibrated to the measured water levels.

- Sampling and analysis of groundwater from 69 on-site and off-site monitoring wells in August 1993, and from 39 monitoring wells in December 1993. All samples from the first round were analyzed for volatiles, semivolatiles, metals, pesticides, PCBs, and landfill leachate parameters. Second round samples were taken from a reduced number of wells and were analyzed for a reduced list of compounds.

- Sampling and analysis of surface water and sediments at 13 locations around the perimeter of the site. Samples were analyzed for volatiles, semivolatiles, metals, pesticides, and PCBs.

- Drilling of 7 offshore borings to determine the extent and thickness of the Tidal Marsh Deposits (TMD) around the perimeter of the site. The top foot of sediment from these borings was also analyzed for volatiles, semivolatiles, metals, pesticides and PCBs.

The analytical data obtained from the RI was compared to Applicable Standards, Criteria, and Guidance (SCGs) in determining remedial objectives. Groundwater, drinking water and surface water SCGs identified for the Pennsylvania Avenue Landfill were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. For the evaluation and interpretation of soil analytical results, NYSDEC soil cleanup guidelines for the protection of groundwater, background conditions, and risk-based remediation criteria were used to develop remediation goals. Sediment contaminant levels were compared to guidance values for salt water sediments at four levels of protection:

- Human Health Bioaccumulation
- Wildlife Bioaccumulation
- Benthic Chronic Toxicity
- Benthic Acute Toxicity

Based upon the results of the remedial investigation in comparison to the SCGs and potential public health and environmental exposure rates, certain areas and media of the site require remediation.

Soils - Surface soils exhibited widespread contamination of semivolatiles, pesticides, metals and PCBs at levels that exceed soil cleanup guidelines.

Waste Oil - An area of free product oil is present beneath the site, as delineated in Figure 2. The volume and chemical makeup of free product at the site is consistent with extensive historic disposal of liquid wastes at the site. The oil is a source of contamination to surface water in Fresh Creek, and to groundwater in the leachate mound beneath the site. In addition to the volatile and semivolatile contaminants associated with petroleum oils, the waste oil is contaminated with PCBs at levels that classify it as a hazardous waste (ie. > 50 ppm). Tests conducted during the Feasibility Study indicate that oils found in wells along the Fresh Creek shoreline have a lower viscosity and density than those found further inland. This indicates that the oils with the capability of migrating to the shoreline have already done so, and the oils remaining in the source area are relatively immobile.

Groundwater - In the leachate mound (U wells), groundwater in contact with floating waste oil is highly contaminated with volatiles, semivolatiles, metals and PCBs. In U wells outside the waste oil area, groundwater is contaminated above standards, but to a lesser degree and with a fewer number of contaminants. The shallow and deep Upper Glacial Aquifer (S and D wells) did not exhibit significant levels of contamination. Elevated levels of chloroform in S and D well samples was traced to the water used to drill those wells. As a result, the Upper Glacial Aquifer does not require remediation.

Surface Water - In the vicinity of the Fresh Creek oil outbreak, surface water samples were contaminated with volatiles, semivolatiles and PCBs. Outside the outbreak area, only two samples, both taken from Hendrix Creek, exhibited contaminant levels above standards. These samples exceeded standards for chlorobenzene, lead and copper.

Sediments - Sediment samples also showed high levels of volatile, semivolatile and PCB contaminants in the vicinity of the waste oil outbreak in Fresh Creek. The upstream sediment sample taken from Hendrix Creek also had high levels of volatiles, semivolatiles, metals pesticides and PCBs. Apart from the oil outbreak area, landfill shoreline sediments and most offshore sediment samples showed low levels of PCBs and pesticides. These samples generally exceeded the wildlife and human Bioaccumulation guideline concentrations, but were below the benthic toxicity guidelines.

Landfill Gas - Soil gas measurements verified that anaerobic decomposition is generating significant levels of methane and trace amounts of hydrogen sulfide and carbon monoxide. The flux box sampling program did not account for emissions from the network of vents and fissures at the site, and therefore the extent of air emissions from the site could not be determined during the RI. A single sample taken from a vent in the subsurface fire area showed high levels of volatile contaminants, including benzene at 2,800 ppb_{vol}. This sample represents the emissions potential from the immediate area of the fire during a period of very active venting, and not general landfill conditions.

Ambient air sampling indicated that benzene is a widespread contaminant in the area, at levels that exceed the Annual Guideline Concentration (AGC). The detected levels of benzene are consistent

with those of an urban setting, and do not indicate that the landfill is a primary source. Methane and low levels of landfill contaminants were detected in off-site ambient air samples. Because methane may also be produced by natural marsh deposits and garbage disposed in vacant land north of the Belt Parkway, it is unclear whether these detections are attributable to the landfill. Other than benzene, only one contaminant, Tetrachloroethylene, exceeded the AGC in an off-site or perimeter sample. The air sample taken from the landfill source area had AGC exceedances for several contaminants. Because emissions data could not be adequately characterized using the flux box data, the air dispersion computer model could not correlate off-site detections with the source data.

Landfill Fire Investigation - Separate from the Remedial Investigation, and after Interim Remedial Measures were implemented at the site (see Section 3.2 below), an investigation was performed to determine the nature and extent of the remaining subsurface landfill fire. A series of monitoring probes were installed to depths of 10 to 30 feet in areas of previous fire outbreaks, from which measurements of temperature, oxygen, methane, carbon dioxide and carbon monoxide were made. The monitoring results suggest that although a deep-seated fire is not presently burning, anaerobic decomposition of waste is generating sufficiently high temperatures to warrant concern about possible recurrence of subsurface fires. Monitoring results indicate that the lack of oxygen is preventing combustion from occurring.

3.2 Interim Remedial Measures

Interim Remedial Measures (IRMs) were conducted at the site, as specified in the Order on Consent. An IRM is implemented when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

At the Pennsylvania Avenue Landfill, IRMs involved the following activities:

- Placement of interim cover to prevent casual contact with exposed waste, to cut off oxygen to the subsurface landfill fire, and to minimize air emissions from this area. Interim cover was effective in smothering the landfill fire and in eliminating smoke emissions from the site.

- Installation of rip rap shoreline protection at locations that were potentially subject to wave and storm erosion.

- Installation of a passive waste oil interceptor trench along the shoreline of Fresh Creek. The purpose of this trench was to capture waste oil before it entered Fresh Creek, thereby reducing the potential for surface water and sediment contamination. The collection trench was completed in January 1994, but it has not been shown to be effective in collecting oil. DEC believes that the trench is hydraulically isolated from the local groundwater flow, and that oil and contaminated groundwater are flowing around it.

3.3 Ecological Assessment

To evaluate potential site risks to ecological receptors, an Ecological Assessment (EA) was performed as an element of the Remedial Investigation. The EA consisted of the following tasks:

- A site reconnaissance to identify terrestrial habitats and potential ecological receptors, including rare, threatened, endangered species, and species of special concern.

- An off-site sediment study at 10 locations along the North Channel of Jamaica Bay to determine the bay-wide extent of contamination attributable to the site.

- A macroinvertebrate study at 9 near-site locations and 4 reference locations to evaluate possible site impacts on species richness and diversity.

- An edible tissue survey to evaluate the extent of contaminant bioaccumulation and the potential need for local fishing advisories or other actions to protect human health. Species were chosen for sampling and analysis based on their role in human consumption, food chain bioaccumulation and, to the extent possible, representativeness of local contaminant conditions. That is, highly migratory species, whose contaminant levels could not be attributed to local conditions, were not sampled.

Generally, the edible species data was affected by several laboratory quality control problems, particularly PCB contamination in blank samples. Therefore, DEC views the analytical results as questionable. However, some general conclusions may be interpreted from the data.

PCB contamination in the laboratory blanks suggests that PCB results in tissue samples may be higher than their actual values, so the reported values reflect the maximum potential levels from site samples. The most heavily contaminated group of samples were the hepatopancreas (liver) portion of Blue Crabs, which had an average concentration of 1.3 ppm of PCB, with a maximum value of 3.3 ppm. The next highest group of samples were the American Eels, averaging 0.74 ppm PCB, with the highest value of 2.5 ppm PCB. The average PCB concentrations in the other species were:

Atlantic Silverside	0.25 ppm
Bluefish	0.23 ppm
Winter Flounder	0.22 ppm
Scup	0.19 ppm
Ribbed Mussel	0.039 ppm
Soft Shell Clam	0.029 ppm
Hard Shell Clam	0.020 ppm
Blue Crab (edible portion)	Non Detected

Levels of pesticides and metals in these tissues generally followed similar patterns as for PCB results.

3.4 Summary of Human Exposure Pathways

Possible human exposure pathways associated with the Pennsylvania Avenue Landfill include:

- Dermal (skin) Contact with Surface Soils
- Ingestion of Surface Soils
- Inhalation of Fugitive Dust
- Inhalation of Airborne Contaminants
- Dermal Contact with Sediment
- Ingestion of Sediment
- Dermal Contact with Surface Water
- Ingestion of Surface Water
- Consumption of contaminated biota

Based on data collected during the Remedial Investigation, a risk assessment was performed to quantify the carcinogenic and non-carcinogenic risks associated with the above exposures. Using reasonable worst-case exposure scenarios for potential future uses of the site, the following exposure routes were found to produce risks above acceptable guidelines:

- Dermal Contact with Surface Soils
- Incidental Ingestion of Surface Soils
- Dermal Contact with Fresh Creek Surface Water
- Dermal Contact with Fresh Creek Sediments
- Ingestion of Fresh Creek Surface Water
- Ingestion of Fresh Creek Sediments
- Ingestion of Jamaica Bay Surface Water

The majority of sitewide cancer risk is associated with exposure to PCBs and benzo(a)pyrene in surface soils. The majority of non-cancer risk is associated with exposure to toluene and ethyl benzene in Fresh Creek surface water.

Due to data limitations and the uncertain source of contaminants in the tissues of edible species, a quantitative risk assessment was not performed for the consumption of biota. Instead, to evaluate the acceptability of this exposure route, tissue concentrations were compared to the USDA guideline of 2 ppm PCB in flesh. Two samples exceeded this guideline, one American Eel sample at 2.5 ppm, and one blue crab hepatopancreas sample at 3.3 ppm.

The New York State Department of Health (NYSDOH) advisory for marine waters, which includes Jamaica Bay, advises against consuming the hepatopancreas of blue crabs and against consuming more than one meal per week of American Eel.

3.5 Summary of Environmental Exposure Pathways

Possible exposure pathways for environmental receptors include exposure to surface soils, surface waters and sediments. Due to data limitations, a quantitative risk assessment was not performed for environmental receptors. Instead, surface water and sediment concentrations were compared to water quality standards and sediment guideline concentrations to evaluate potential risks to aquatic species.

4: ENFORCEMENT STATUS

The NYSDEC and the City of New York entered into a Consent Order on April 7, 1992. The Order obligates the City to implement a full remedial program and allows reimbursement to the City of up to 75 percent of the eligible cost of the remediation.

The following is the chronological enforcement history of this site.

On December 16, 1985 and again on April 17, 1990, DEC executed Orders on Consent with the New York City Department of Sanitation (DOS) to properly close and remediate the site.

On April 7, 1992 the New York City Department of Environmental Protection (DEP) entered into an Order on Consent with the New York State DEC to perform a remedial program at the site.

5: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6NYCRR 375-1.10. These goals are established under the guideline of meeting all Standards, Criteria, and Guidance (SCGs) and protecting human health and the environment.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to the public health and to the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for the Pennsylvania Avenue Landfill are:

- Reduce, control, or eliminate the contamination present in surface soils and waste disposal areas on site.

- Eliminate the threat to surface waters by eliminating surface run-off from contaminated soils, eliminating erosion of waste material along perimeter shorelines and eliminating the migration of leachate into surrounding waters.

- Eliminate the potential for direct human or animal contact with contaminated soils on site.

- Minimize the impact of contaminated groundwater on the environment.
- Reduce the concentrations of contaminants in sediments to levels that are protective of human and environmental receptors.
- Control landfill gas emissions to levels that are protective of on-site and off-site receptors.

The feasibility of achieving these remedial goals was evaluated in the Feasibility Study.

6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

Potential remedial alternatives for the Pennsylvania Avenue Landfill site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled "Final Feasibility Study Report", dated September 1994. A summary of the detailed analysis follows.

6.1 Description of Alternatives

The potential remedies are intended to address the contaminated soils, sediments, surface water and groundwater 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 is an unacceptable alternative as the site would remain in its present condition, and human health and the environment would not be adequately protected.

Alternative 2 - Limited Action

Limited action consists of administrative actions such as deed and access restrictions to prevent human exposure to site contaminants. Site fencing and security would be upgraded, and contaminated media (soil, water, sediments and gas) would be monitored. This alternative is potentially protective of human health, but would not provide any environmental benefit.

Present Worth:	$ 1,263,000
Capital Cost:	$ 62,000
Annual O&M:	$ 91,800
Time to Implement	3 months

Alternative 3
Combination (Double Barrier/360) Cap, Fresh Creek Leachate Collection and Treatment, Limited Sediment Excavation, Active Gas Control

In addition to the combination double barrier/Part 360 cap, this alternative would provide:

- An active product and leachate collection system along the shoreline of Fresh Creek where floating product (oil) and high concentrations of dissolved contaminants occur. This trench would extend down to the Tidal Marsh Deposits (TMD) and would be pumped from both the water and product phases to capture contaminants. Oil collected in the trench would be separated and transported off site for disposal. Collected leachate would be treated on site and discharged to surface water in compliance with State Pollution Discharge Elimination System (SPDES) standards. Because this area contains the highest levels of contaminants, leachate collection along Fresh Creek would reduce the flow of contaminants to surface water by an estimated 99%.

- Excavation of sediments in the area of the waste oil outbreak as indicated in Figure 3. Generally, the cleanup goal for this limited excavation would be to remove visibly oil-stained material and PCBs at levels exceeding 1 ppm. Sampling conducted within the boom area found only one location where PCBs exceeded 1 ppm, suggesting that removing visibly stained sediments would also achieve the PCB cleanup goal. The estimated 5,000 cubic yards (cu yds) of contaminated sediments would be dewatered and placed on the landfill prior to capping.

- Control of landfill gas emissions with an active collection system. This system would consist of a series of extraction wells screened in waste. These wells would be connected via blowers to an enclosed flare or other gas treatment device for destruction or control of contaminants.

Present Worth:	$ 32,180,900
Capital Cost:	$ 28,203,700
Annual O&M:	$ 283,040
Time to Implement:	30 months

Alternative 4
Combination (Double Barrier/360) Cap, Full Perimeter Leachate Collection and Treatment, Limited Sediment Excavation, Active Gas Control

This alternative would provide the same capping, sediment excavation and gas control options as Alternative 3, but would provide leachate collection around the entire perimeter of the site. This would effectively eliminate all subsurface flow of contaminants to surrounding waters. Treatment

of collected leachate would occur on site, with discharge to surface water in accordance with SPDES standards.

Present Worth:	$ 50,701,900
Capital Cost:	$ 39,423,700
Annual O&M:	$ 819,640
Time to Implement:	36 months

Alternative 5
Combination (Double Barrier/360) Cap, Full Perimeter Leachate Collection and Treatment,
Full Sediment Excavation,
Active Gas Control

This alternative would provide the same capping, gas control and full perimeter leachate collection options as Alternative 4, but would add excavation of all sediments that exceed the most stringent sediment guideline concentrations. This would essentially require excavation of sediments along the entire perimeter of the site to a depth of 1 foot, resulting in 46,000 cubic yards of contaminated material to be dewatered and placed on the landfill prior to capping.

Present Worth:	$ 56,870,900
Capital Cost:	$ 45,592,700
Annual O&M:	$ 819,640
Time to Implement:	36 months

Alternative 6
Combination (Double Barrier/360) Cap, Fresh Creek Leachate Collection and Treatment, Limited Sediment Excavation, Product Recovery,
Active Gas Collection

This alternative would provide the same capping, gas control, Fresh Creek leachate collection and limited sediment excavation options as Alternative 3, but would add product recovery in the landfill area where waste oil is present. Due to the high viscosity and density of the oil, steam enhanced extraction would be necessary to effectively mobilize and capture significant amounts of product. Removal of product from the waste disposal area would reduce the flow of floating and dissolved contaminants toward Fresh Creek. This would potentially reduce the amount and duration of contaminants collected in the leachate collection trench.

Present Worth:	$ 40,898,700
Capital Cost:	$ 30,786,500

Annual O&M:	$ 289,040
Time to Implement:	36 months

Alternative 7
Part 360 Cap, Fresh Creek Leachate Collection and Treatment, Limited Sediment Excavation, Active Gas Control

This alternative is similar to Alternative 3, except that a Part 360 cap, rather than a combination double barrier/360 cap would be provided. As described in Alternative 3, a product/leachate collection trench would be constructed along part of the Fresh Creek shoreline, limited sediment excavation would be done in the outbreak area, and landfill gas would be actively collected and treated.

Present Worth:	$ 31,348,800
Capital Cost:	$ 27,377,100
Annual O&M:	$ 288,640
Time to Implement:	30 months

Alternative 8
Part 360 Cap, Full Perimeter Leachate Collection and Treatment, Limited Sediment Excavation, Active Gas Control

This alternative is similar to Alternative 4, except that a Part 360 cap, rather than a combination double barrier/360 cap would be provided. As described in Alternative 4, a product/leachate collection trench would be constructed along the entire perimeter of the site, limited sediment excavation would be done in the outbreak area, and landfill gas would be actively collected and treated.

Present Worth:	$ 49,869,300
Capital Cost:	$ 38,597,100
Annual O&M:	$ 819,200
Time to Implement:	36 months

Alternative 9
Part 360 Cap, Full Perimeter Leachate Collection and Treatment, Full Sediment Excavation,

Active Gas Control

This alternative is similar to Alternative 5, except that a Part 360 cap, rather than a combination double barrier/360 cap would be provided. As described in Alternative 5, a product/leachate collection trench would be constructed along the entire perimeter of the site, sediment excavation would be done along the entire perimeter, and landfill gas would be actively collected and treated.

Present Worth:	$ 56,038,800
Capital Cost:	$ 44,766,100
Annual O&M:	$ 819,240
Time to Implement:	36 months

Alternative 10
Part 360 Cap, Fresh Creek Leachate Collection and Treatment, Limited Sediment Excavation, Product Recovery, Active Gas Control

This alternative is similar to Alternative 6, except that a Part 360 cap, rather than a combination double barrier/360 cap would be provided. As described in Alternative 6, a product/leachate collection trench would be constructed along part of the Fresh Creek shoreline, limited sediment excavation would be done in the outbreak area, steam-enhanced product recovery would be done in waste oil areas of the fill, and landfill gas would be actively collected and treated.

Present Worth:	$ 40,066,600
Capital Cost:	$ 29,959,900
Annual O&M:	$ 288,640
Time to Implement:	36 months

Alternative 11
Combination (Soil/Part 360) Cap, Fresh Creek Leachate Collection and Treatment, Limited Sediment Excavation, Active Gas Control

This alternative is similar to Alternatives 3 and 7, except that a combination soil/360 cap would be provided. As described in Alternative 3, a product/leachate collection trench would be constructed along part of the Fresh Creek shoreline, limited sediment excavation would be done in the outbreak area, and landfill gas would be actively collected and treated.

Present Worth:	$ 26,990,900
Capital Cost:	$ 23,019,200
Annual O&M:	$ 288,640

Time to Implement: 30 months

Alternative 12
Combination (Soil/Part 360) Cap, Full Perimeter Leachate Collection, Limited Sediment Excavation,
Active Gas Control

This alternative is similar to Alternatives 4 and 8, except that a combination soil/360 cap would be provided. As described in Alternative 4, a product/leachate collection trench would be constructed along the entire perimeter of the site, limited sediment excavation would be done in the outbreak area, and landfill gas would be actively collected and treated.

Present Worth:	$ 48,788,200
Capital Cost:	$ 34,239,200
Annual O&M:	$ 1,057,340

Time to Implement: 30 months

Alternative 13
Combination (Soil/Part 360) Cap, Full Perimeter Leachate Collection, Full Sediment Excavation,
Active Gas Control

This alternative is similar to Alternatives 5 and 9, except that a combination soil/360 cap would be provided. As described in Alternative 5, a product/leachate collection trench would be constructed along the entire perimeter of the site, sediment excavation would be done along the entire perimeter, and landfill gas would be actively collected and treated.

Present Worth:	$ 54,957,200
Capital Cost:	$ 40,408,200
Annual O&M:	$ 1,057,340

Time to Implement: 36 months

Alternative 14
Combination (Soil/Part 360) Cap, Fresh Creek Leachate Collection and Treatment, Limited Sediment Excavation, Product Recovery,
Active Gas Control

This alternative is similar to Alternatives 6 and 10, except that a Part 360 cap, rather than a combination double barrier/360 cap would be provided. As described in Alternative 6, a product/leachate collection trench would be constructed along part of the Fresh Creek shoreline,

limited sediment excavation would be done in the outbreak area, steam-enhanced product recovery would be done in waste oil areas of the fill, and landfill gas would be actively collected and treated.

Present Worth:	$ 35,708,700
Capital Cost:	$ 25,602,000
Annual O&M:	$ 288,640
Time to Implement:	36 months

6.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

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

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. The remedy for a site must conform with **Standards** and **Criteria**, which are officially promulgated rules and standards that are directly applicable, or relevant and appropriate to the action. **Guidance** documents are unpromulgated guidelines that, upon exercise of engineering judgement, are found to be applicable on a site-specific basis.

One applicable criterion for landfill closure is a cap with a continuous single or double impermeable layer, as specified in 6NYCRR Part 360. Because the no action, limited action and combination soil/360 cap alternatives do not provide this, Alternatives 1, 2, and 11 through 14 do not comply with this Criterion.

DEC believes that surface water standards would be met by a combination of a landfill cap and leachate collection along the heavily contaminated portion of Fresh Creek (Alternatives 3, 6, 7, and 10). A Part 360 cap alone would reduce volatile and semivolatile contaminant transport to surface water by 83% (from 895 lbs/yr to 153 lbs/yr). In combination with a Fresh Creek interceptor trench, contaminant flow would be reduced to 4 lbs/yr, a 99% reduction. This SCG would also be met by cap alternatives in combination with full perimeter leachate collection (Alternatives 4, 5, 8, and 9).

Air quality standards are expected to be met by those alternatives that provide active gas collection (Alternatives 3 through 14)

The most stringent sediment Guideline concentrations would only be met by alternatives that provide full perimeter sediment excavation (Alternatives 5, 9, and 13). Because it is uncertain whether the landfill is the source of this contamination, it is not clear whether sediments could be recontaminated after excavation. Sediment Guidelines for protecting benthic organisms would be met by the alternatives that provide for limited sediment excavation near the waste oil outbreak (Alternatives 3, 4, 6, 7, 8, 10, 11, 12, and 14).

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

Human health is protected by elimination of the routes of exposure identified in Section 4.4 as producing unacceptable health risks. Therefore, alternatives that prevent direct contact with surface soils and wastes, prevent exposure to site-related contaminants in Fresh Creek surface water and sediments, and prevent ingestion of site contaminants in Jamaica Bay waters are considered to be protective. Alternatives that provide a landfill cover (including a soil cover), that reduce or eliminate contaminant flow to Fresh Creek and Jamaica Bay, and that provide for excavation of Fresh Creek sediments would meet these objectives. These objectives are met by Alternatives 3 through 14.

Protection of the environment is achieved by eliminating routes of exposure to ecological receptors, and by reducing contaminant exposure to levels that comply with ecologically-based standards. As discussed in Section 1 above, compliance with the most stringent sediment guideline concentrations (human and wildlife bioaccumulation) would be achieved by alternatives that provide full perimeter sediment excavation (Alternatives 5, 9, and 13). Benthos protection would be achieved by alternatives that provide sediment excavation in the area of the Fresh Creek waste oil outbreak (Alternatives 3, 4, 6, 7, 8, 10, 11, 12, and 14). Compliance with surface water standards would be achieved by alternatives that provide a Part 360-compliant cap and interception of leachate at least in the waste oil outbreak area (Alternatives 3 through 10). This would also be provided by a combination soil cap with full perimeter leachate collection (Alternatives 12 and 13).

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

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

Alternatives that provide for grading and capping the landfill will cause short term adverse impacts due to potential exposure to excavated wastes, contaminated runoff and airborne dusts, vapors and gases. Because the amount of waste regrading is the same for the three capping options under consideration, these short term impacts are also similar.

Short term impacts to surface waters and marine habitat will also be caused by alternatives that involve sediment excavation, particularly along the entire perimeter shoreline of the site.

In summary, the No and Limited Action Alternatives (1 and 2) will have no short term impacts, Alternatives 3, 4, 6, 7, 8, 10, 11, 12 and 14 will have moderate impacts, and Alternatives 5, 9 and 13 will have greater short term impacts due to the large degree of sediment excavation required.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of alternatives after implementation of the response actions. Because wastes will remain at the site for all alternatives under consideration, none of the alternatives is considered to be permanent. Long term effectiveness is therefore evaluated based on the magnitude of residual risks and the reliability of control measures under consideration.

Alternatives which provide leachate collection along the entire perimeter shoreline would provide the highest degree of long term effectiveness. Alternatives which provide leachate collection only along Fresh Creek rely on the landfill cap to minimize leachate production and limit its migration to surface waters, and are therefore less certain in the long term. Alternatives that include a soil cap provide the least degree of long term effectiveness in reducing leachate impacts to surface water.

Because the source of low-level sediment contamination in Jamaica Bay is unknown, the effectiveness of extensive sediment excavation is uncertain. If the landfill is not the sole source of this contamination, sediments may be recontaminated from continuing sources.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site. Because the alternatives under consideration generally involve containment technologies (capping and leachate collection),
they reduce the mobility of contaminants by reducing leachate generation and restricting its flow. Alternatives that include a Part 360 cap provide the greatest reduction in leachate generation, followed by alternatives with a soil cap. Alternatives that include perimeter leachate collection provide the greatest reduction in contaminant mobility. Alternatives that include product recovery (Alternatives 6, 10 and 14) provide some reduction in volume because the product is withdrawn from the waste and incinerated.

6. Implementability. The technical and administrative feasibility of implementing each alternative is evaluated. Technically, this includes the difficulties associated with the construction, the reliability of the technology, and the ability to monitor the effectiveness of the remedy. Administratively, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.. Technically, with the exception of steam-enhanced product extraction, the technologies under consideration for landfill capping and leachate collection are well developed and reliable. Product recovery in a landfill setting is not a proven technology, and pilot testing would be necessary to

design a full scale system. The greatest technical difficulty for cap construction would be the transportation of cover materials to the site and the regrading of wastes to meet final slope requirements.

Administratively, sediment excavation and construction activities that affect wetlands will require approvals of several state and federal agencies, as would any dredging activities necessary to barge construction materials to the site. Approvals for the landfill cap design, air and surface water discharges would come from DEC, and would require less administrative coordination.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. A comparison of costs for all alternatives are presented in Table 1.

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

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan were considered during DEC's selection of the final remedy. Public response generally supported the decision to cap the site, and most reviewers favored importation of fill material, with proper controls, to regrading the existing waste. Commenters unanimously supported barging construction materials to the site. Many comments were received concerning the need to properly specify the materials and methods used to import fill materials, and the need for vigilant enforcement of the specifications set for the fill material. Commenters also stated the need for comprehensive air monitoring during both waste regrading and fill placement operations, the need to prevent the recurrence of subsurface landfill fires during regrading activities, and the need for a well-defined protocol to minimize air emissions and surface runoff during construction. These have been incorporated in this Record of Decision.

Details of DEC's and DEP's citizen participation activities are listed in Section 8, below, and a summary of written comments and DEC's response to them are presented in Appendix A, "Responsiveness Summary".

7: SUMMARY OF THE PREFERRED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC has selected Alternative 7: a Part 360 Cap, Leachate Collection along Fresh Creek, Limited Sediment Excavation and Active Gas Control as the remedy for this site.

The selection of a Part 360 cap is based on the need to comply with applicable regulations, which a soil cap combination would not provide, and the negligible additional benefit of a double barrier cap, which would not be cost effective. A Part 360 cap will also provide long term effectiveness in minimizing leachate generation and migration to surface waters, and will allow landfill gas to be actively collected and controlled.

DEC has selected limited sediment excavation, where sediments and beach sands are visibly oil saturated or where contamination exceeds 1 ppm of total PCBs. The benefits of extensive sediment excavation are not justified by the additional cost and the uncertain benefits to biota. The source of low-level (<1 ppm) sediment contamination in Jamaica Bay is uncertain, DEC cannot ensure that remediated sediments would not become recontaminated from other sources. The remediation criteria of visible oil-staining or total PCB concentrations exceeding 1 ppm were chosen because they are clearly attributable impacts from the waste oil outbreak at the site. Because locally-collected fish and shellfish tissue sample results did not contain unusually high levels of contaminants, the remaining areas of low-level contamination do not appear to be causing significant impacts to human or environmental receptors.

The selection of active leachate collection in the waste oil outbreak area of Fresh Creek, rather than along the full perimeter of the site, is based on the estimate that 90% of site contaminant releases are from that area. In combination with a Part 360 cap, limited leachate collection will reduce the amount of volatile and semivolatile contaminants leaching to surface waters by approximately 900 lbs/yr. Leachate collection along the remaining shorelines would collect an additional 3.5 lbs/yr of volatile organic contaminants and 0.37 lbs/yr of semivolatile contaminants, which DEC believes would not be cost effective.

DEC has not selected product recovery because it does not provide sufficient benefits to justify its costs and technical drawbacks. Implementing product recovery would have delayed construction of the landfill cap in the affected area, or the landfill cap would have been penetrated by an estimated 100 wells as part of the injection/withdrawal system. Both these factors would have increased the amount of leachate generation from the area, as compared to simply capping the site. Although product recovery would provide some reduction of waste volume, a waste oil and leachate interceptor trench would still be required along Fresh Creek to collect residual contamination.

The Final Feasibility Study presented a conceptual final grading plan that included top slopes of a 2% grade. Based on a comparison of 1983 and 1993 topographic surveys, the site has settled approximately 2 feet during that period. Part 360 regulations specify a 4% final grade for recently deactivated landfills that may be subject to on-going settlement. Due to the age of the Pennsylvania Avenue Landfill, the nature of the waste disposed there, and the minor extent of past settlement, DEC will grant a variance from the 4% grading requirement in order to reduce the amount of waste regrading and the associated air emissions and odors. This variance is contingent upon review of the December 1994 survey data, and evaluation as to the stability of the site since the 1993 survey.

Although DEC prefers regrading at this site, we will also consider allowing inert waste materials to be imported from off site for grading purposes. Imported grading materials would be allowed if the waste proves to be resistant to cutting and filling, and in areas where subsurface landfill fires may be present, as discussed below. Such materials include Alternate Grading Material (AGM), which consists of crushed and sorted road construction debris and inert demolition debris. Any such material will be carefully specified and monitored to ensure that putrescible materials and gypsum wallboard are minimized, and that hazardous materials are not mixed in. DEC will also consider allowing dredged, dewatered sediments and ocean sands to be placed at the site as grading material. These materials may be available from other City, State and Federal dredging projects in the metropolitan area. If these materials are to be used, a specification will be developed, in consultation with the community, that defines acceptable physical and chemical properties of this material.

When waste relocation is performed, DEC will restrict the regrading period to colder months to minimize odor generation, migration and exposure. Odor controls, including the application of daily cover and/or foam spray will be implemented as necessary to control odors. Throughout the construction period, and particularly during the grading process, air quality will be closely monitored to ensure that on-site and off-site air quality is not adversely affected by site operations. Contingency plans will be developed and implemented as necessary by the construction contractor, with oversight by DEC and DOH, to ensure that air and surface waters are protected during construction.

The preferred method of transportation for construction materials, including grading material, is barge delivery to the existing pier at the site. DEC will direct DEP to develop specific plans for upgrading and constructing the necessary facilities to enable barge deliveries of materials. Overland transportation of small amounts of materials will be permitted, provided that this is coordinated with the CAC and local Community Boards.

With regard to possible subsurface fires, DEC believes that, since oxygen is the limiting factor in the combustion process, the landfill cap will be effective in preventing any recurrence of fire. The gas extraction must be properly designed and operated to ensure that it does not draw air into the waste. During the design and construction period, DEC will require periodic inspection and monitoring to detect air intrusion, and additional interim cover or other contingency as necessary to eliminate air infiltration pathways. To limit the flow of oxygen in areas where the subsurface landfill fire is a concern, no regrading will be permitted in suspected fire areas, and these areas will be brought to final grades by filling.

During design of the active product/leachate collection trench, the ineffectiveness of the existing, passive trench will be investigated to determine whether it can be modified to achieve the goal of the remedy. Such an investigation will include actively pumping the trench to monitor groundwater hydraulics along the shoreline and to observe whether oil enters the trench. If the investigation demonstrates that activating the existing trench, possibly with modifications, can effectively collect both oil and heavily contaminated leachate, then the existing trench may be used in the final remedy.

If the existing trench cannot be made effective, it will be replaced with the deeper, longer trench conceptualized in the Feasibility Study.

The Feasibility Study proposed a variance from Part 360 capping requirements in the thickness of the barrier protection layer above the synthetic membrane. Rather than the required 24" soil layer, New York City has requested approval of an 18" layer. DEC will grant this request, provided that, during design, it is shown that a thinner layer will not be subject to significant erosion, that frost and root penetration will not damage the membrane, that adequate drainage will be ensured, and that heat from recurring brush fires will not damage the membrane.

For the conceptual design and cost estimate considered in this document, DEC is considering the conventional "hard" technology for shoreline protection, the use of rip rap to armor the base of the landfill cap. However, during design of the landfill cap, DEC will evaluate the use of innovative "soft" shoreline protection to absorb wave energy and storm surges. These soft protection measures consist of properly designed and vegetated intertidal marshes and high marshes along the perimeter of the site. These measures would provide better habitat and recreational value than the conventional technology. The final shoreline protection plan will likely consist of a combination of both soft and hard designs. The Remedial Design will evaluate the suitability of each method along the shorelines of the site.

The design of the final cover system will be closely coordinated with the future use plans of the Gateway National Recreation Area, which will own the property upon completion of closure, as such plans are developed with input from the community. Design modifications will be considered, as appropriate, to ensure that future uses of the site will not be unduly restricted by the landfill cap.

The elements of the selected remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Uncertainties identified during the RI/FS will be resolved by implementing several pre-design studies.

2. Construction of a Part 360 landfill cap, featuring a gas venting layer, synthetic membrane barrier layer, 18" soil barrier protection layer and vegetated topsoil layer.

3. An active leachate collection trench in the area of the waste oil outbreak along Fresh Creek. Leachate collected in the trench will be pumped to an on-site facility for treatment prior to discharge to surface water.

4. An active gas collection system, consisting of a series of extraction wells screened in the waste and connected via blowers to an enclosed flare or energy recovery device for combustion. The

depth and spacing of extraction wells will be designed to ensure full collection and control of landfill gas.

5. Institution of deed restrictions on the property to ensure that groundwater beneath the site is not extracted for consumptive use and to ensure that any future site construction or other invasive activity is approved by NYSDEC and NYSDOH.

6. Because the remedy results in hazardous waste remaining untreated at the site, a long term monitoring program will be instituted. This program will allow the effectiveness of the selected remedy to be monitored. This long term monitoring program will be a component of the operations and maintenance plan for the site and will be developed in accordance with 6NYCRR Part 360.

The estimated present worth cost to implement the remedy is $ 31,349,000. The cost to construct the remedy is estimated to be 27,377,000 and the estimated average annual operation and maintenance cost for 30 years is $ 288,640.

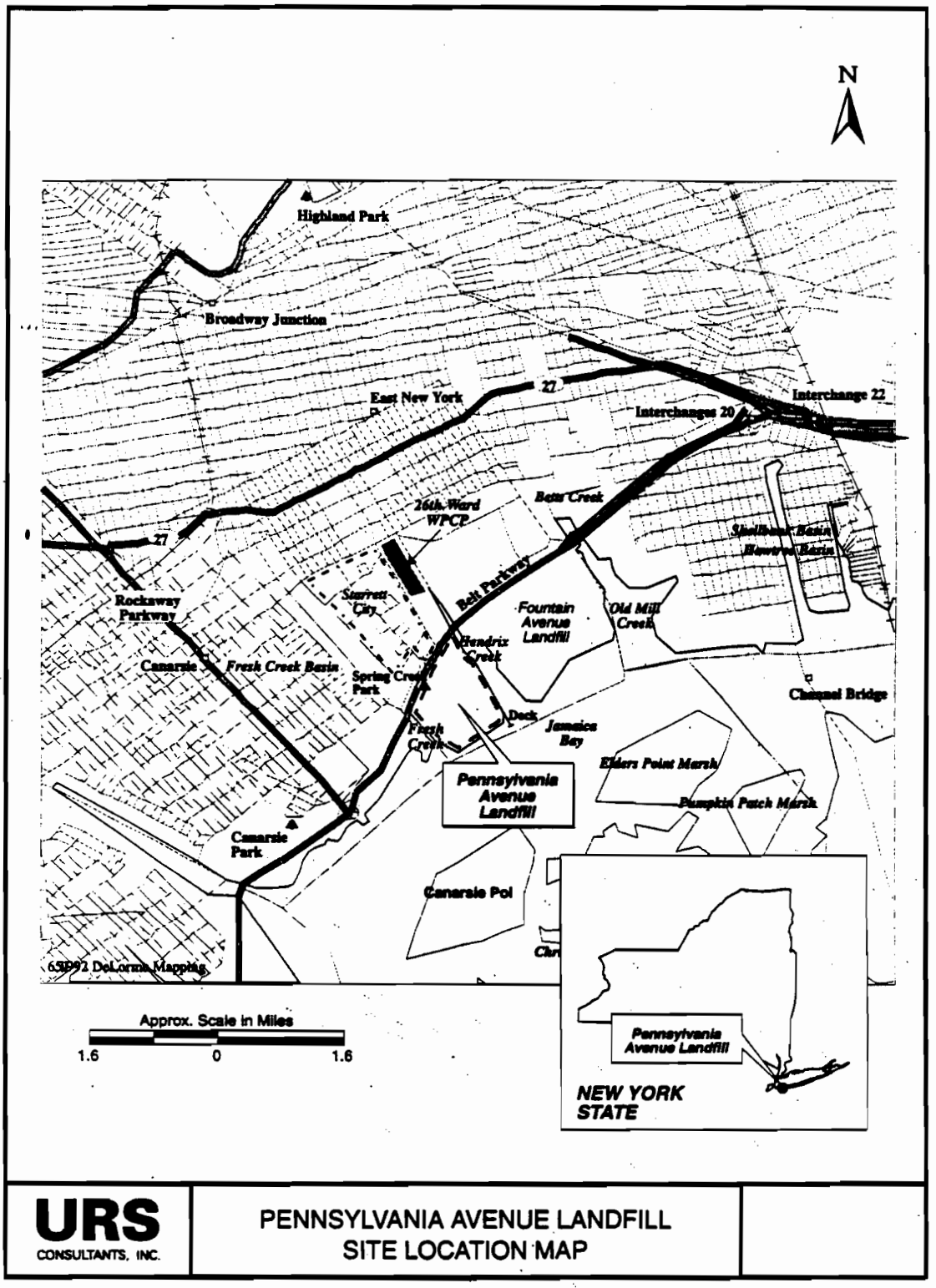
8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

A Citizen Participation Plan was developed and implemented by NYC DEP with the oversight and participation of NYS DEC. All work plans and reports were placed in document repositories in the vicinity of the site for public review. During the course of the Remedial Investigation and Feasibility Study, DEP has held frequent meetings with the Citizens Advisory Committee to keep the community informed and to solicit feedback. Beginning with the first meeting on August 12, 1992, DEC has participated in these monthly and bimonthly meetings, including the significant milestones listed below:

October 21, 1992	Presentation of Final RI/FS Work Plans
February 8, 1993	Presentation of Final IRM Plans
February 15, 1994	Presentation of Draft RI Report
April 12, 1994	Presentation of DEC comments on the RI Report
August 9, 1994	Presentation of Draft FS Report
November 16, 1994	Presentation of DEC's Proposed Remedial Action Plan

Inquiries and comments, both written and verbal, were received and responded to throughout the course of the project. Comments received concerning the PRAP have been addressed, as documented in the Responsiveness Summary (Appendix A). Verbal comments raised during the November 16, 1994 public meeting are addressed in the meeting transcript, which is part of the Administrative Record.

FIGURE 1 - SITE LOCATION PLAN



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URS CONSULTANTS, INC.	PENNSYLVANIA AVENUE LANDFILL SITE LOCATION MAP	

FIGURE 2 - EXTENT OF WASTE OIL CONTAMINATION

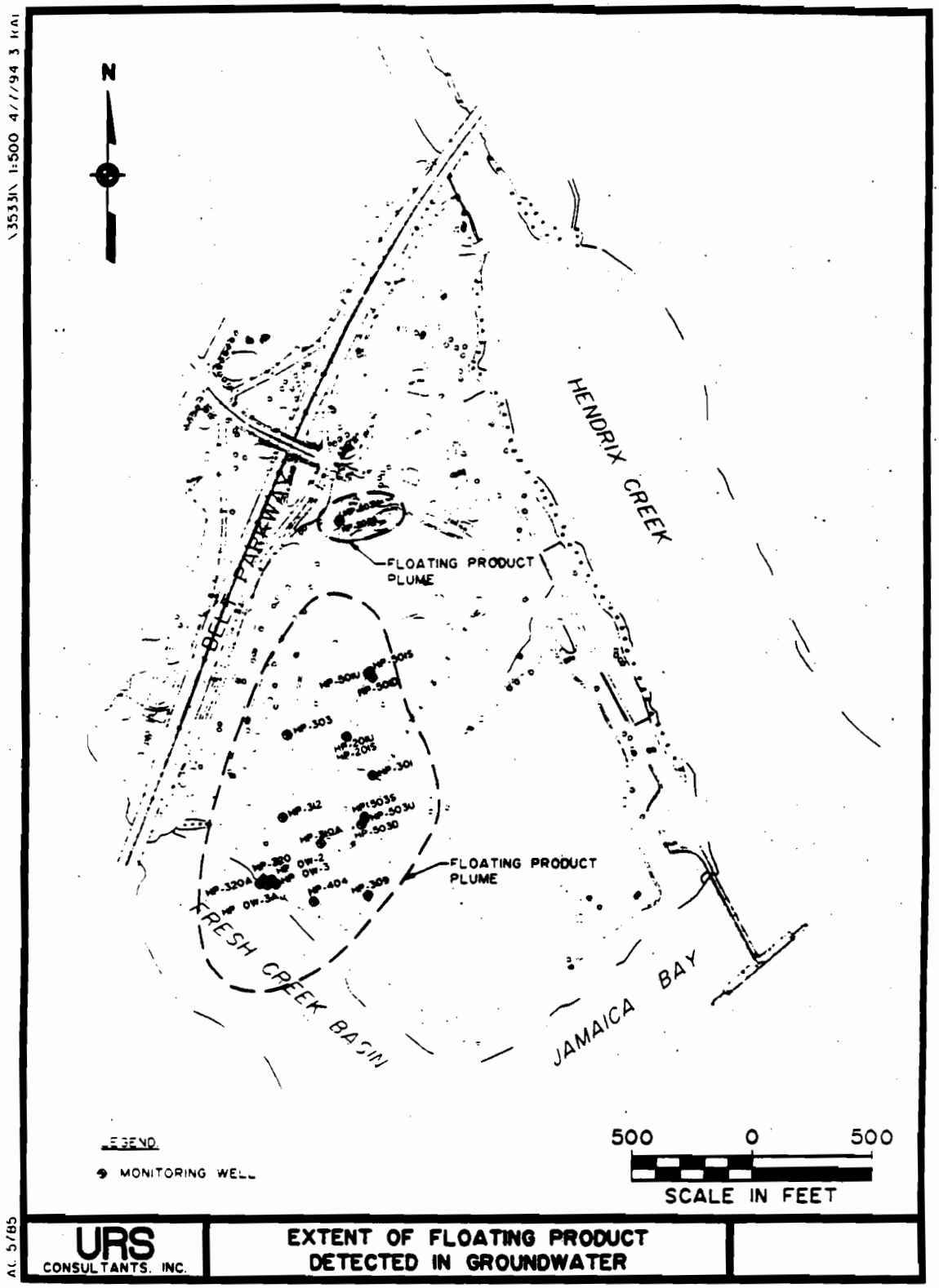


FIGURE 3 - APPROXIMATE EXTENT OF FRESH CREEK SEDIMENT REMEDIATION

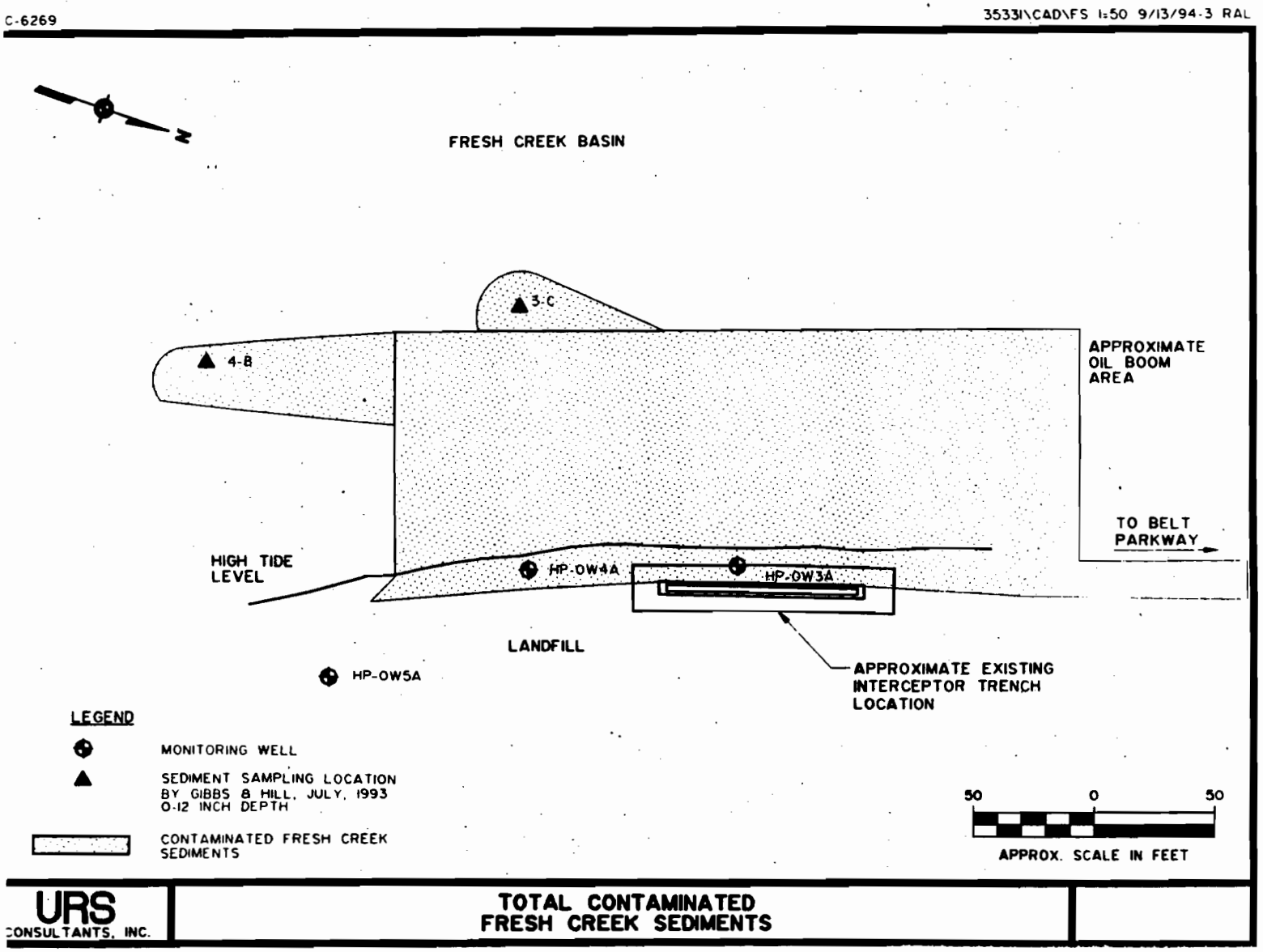
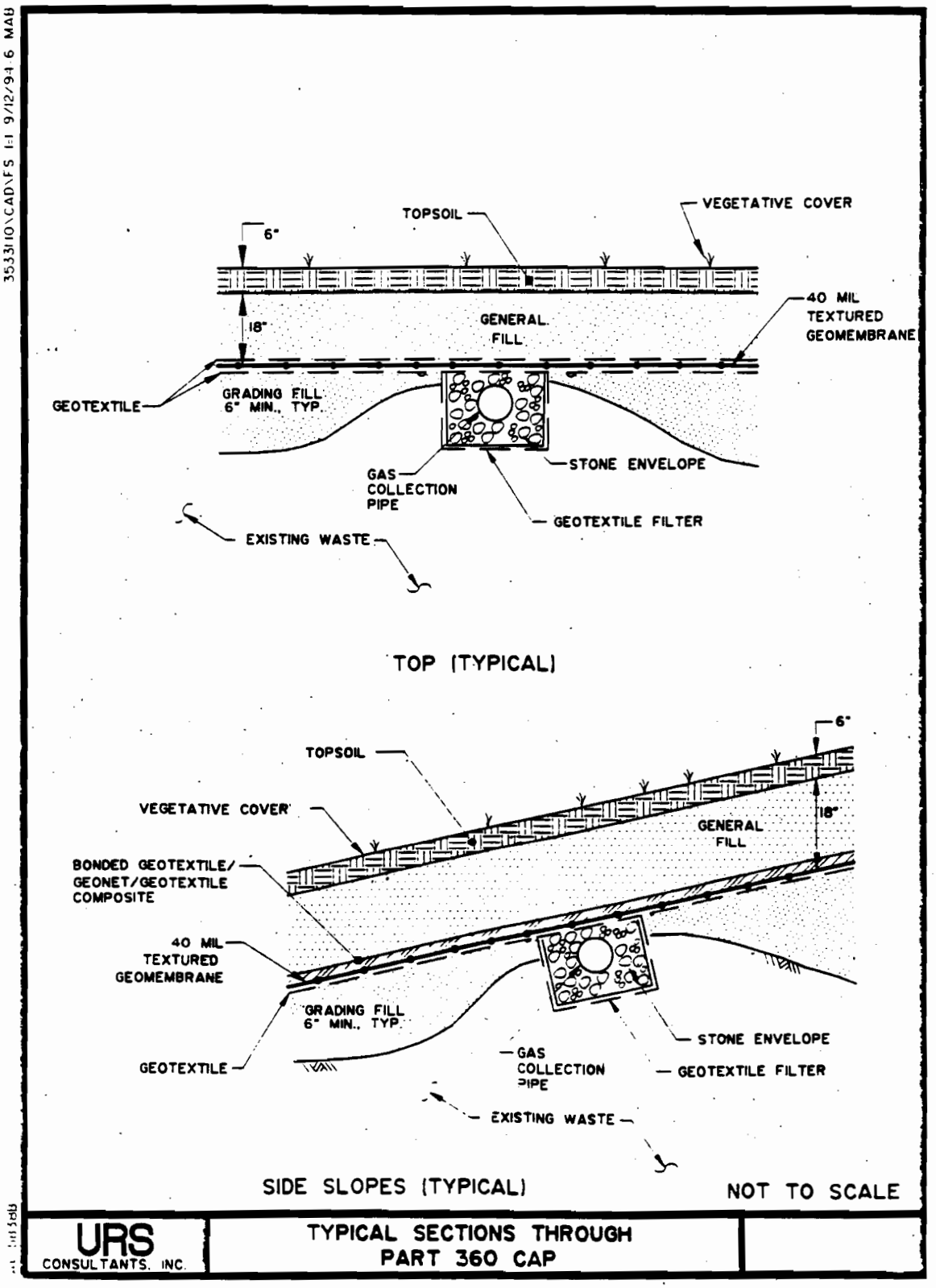


FIGURE 4 - LANDFILL CAP CROSS SECTION



APPENDIX A: RESPONSIVENESS SUMMARY

Written comments on the Proposed Remedial Action Plan PRAP were received from the parties listed below. Because the majority of comment letters addressed both the Pennsylvania and Fountain Avenue Landfills, this Responsiveness Summary also pertains to both sites. Comments received verbally during the November 16, 1994 public meeting are discussed below only if they were not fully addressed during the question and answer portion of that meeting. The transcript of the public meeting is included in the site Administrative Record.

1. Eugenia Flatow, Coalition for the Bight
2. John Herbert, MD, Science Advisory Comittee
3. Richard Lockshin, PhD, Science Advisory Committee
4. Dennis Thoney, PhD, Science Advisory Committee
5. Thomas Lawson, PE, URS Consultants, on behalf of NYCDEP
6. Lee Shelley, Citizens Advisory Committee
7. Alan Weisberg, New Perspectives Development Corporation
8. Rev. Stephen Marsh, East Brooklyn Congregations
9. Audobon Society
10. Myrvin Garnett, Citizens Advisory Committee
11. John Tanacredi, NPS Gateway National Wildlife Refuge

Several issues were common to most written comments; these are presented first. Issues specific to individual letters are addressed at the end.

Common Issues

Comment: **Additional leachate collection and sediment remediation is necessary**
The Coalition for the Bight, Audobon Society and the National Park Service commented that additional leachate collection and a more stringent sediment cleanup criterion are necessary to protect the biota of Jamaica Bay. Although specific criteria for sediment remediation were not provided by these commenters, the focus of the comments is that larger areas of contamination should be targeted for remediation. The Audobon Society also pointed out that the other sources of sediment contamination in the area have been reduced or eliminated, so that the long term effectiveness of extensive sediment excavation is not questionable, as DEC expressed in the PRAP. The Coalition for the Bight stated that "No Action" for leachate collection and treatment does not meet the Remedial Objective stated in the Feasibility Study. The Audobon Society suggested that full perimeter leachate collection should be retained as a contingency if capping does not produce the expected 95% reduction in leachate flow to Jamaica Bay.

Response: Despite improvements in controlling other sources of Jamaica Bay contamination,

they have not been eliminated, and DEC cannot ensure that remediated sediments would not become recontaminated from other sources. Background sediment samples in Hendrix Creek contained elevated levels of PCBs (0.3 ppm), suggesting that a portion of the PCBs found elsewhere in Hendrix Creek may not be attributable to the landfill. Because locally collected fish and shellfish tissue sample results did not contain unusually high levels of contaminants, these areas of low-level contamination do not appear to be causing significant impacts to human or environmental receptors. Based on these factors, DEC has determined that remediation of sediments containing low levels of PCBs (< 1 ppm) is impracticable since the cost would be excessive for the limited expected benefits that would be realized by the biotic community. Because these low levels of sediment contamination will remain in the vicinity of the site, residual risks to wildlife will remain after remediation. Based on the edible tissue data collected near the site, existing fishing advisories are sufficient to protect public health from these risks.

On the issue of leachate collection, DEC believes that capping will reduce leachate production to such a degree that the Fountain Avenue Landfill will no longer cause a contravention of water quality standards in adjacent surface waters. Waste was last deposited at the Fountain Avenue site in 1985, and DEC expects that levels of contaminants in the leachate will begin to decrease as the waste continues to age. After the water level in the waste mound (the "leachate mound") is lowered as a result of capping, some waste will remain saturated because it was placed below mean sea level. DEC estimates that the amount of this waste is 3-4% of the volume of waste at the site. However, this waste is the oldest material deposited at the site, approximately 30 years old, and it has already been depleted of most of its contaminants. The leachate mound at Fountain was measured to be 14 feet high in the center, which is relatively smaller than similar landfills in New York State. (Other landfills have leachate mounds ranging from 50 to 80 feet). As a result, the volume of leachate that would be collected during the dewatering period after capping is smaller than at other landfills where leachate collection is necessary. In summary, based on the age of the waste and its diminishing leachate strength, combined with the relatively small leachate mound, DEC has determined that the environmental benefits expected from requiring a leachate collection system would not justify the estimated $28 million cost.

At the Pennsylvania Avenue site, the Fresh Creek leachate collection trench is required in addition to capping to achieve similar non-contravention. Estimates of leachate flow developed in the Feasibility Study are that capping Fountain Avenue Landfill will reduce the loading of volatile, semivolatile and toxic metal contaminants by 94% in approximately 4 years. At the Pennsylvania Avenue site, the cap and Fresh Creek leachate collection trench will reduce the flow of these contaminants by 99%.

Comment: **Import of grading material is preferable to regrading, strict controls are required during construction.**

Several commenters from the CAC and SAC expressed support for importing fill to achieve grades, rather than regrading existing waste. Justifications for this preference included potential odors associated with regrading, the ability to better control material content by importing, and

the impacts of regrading on total landfill settlement. The East Brooklyn Congregations commented that DEC did not present sufficient analysis to warrant an informed decision on the issue of regrading versus import. No written comments were received that opposed the importation of grading material. Most commenters expressed the critical need for strict controls on any material imported to the site and on the procedures used to transport and place such material in an effort to minimize potential odors. The Audobon Society expressed concern that imported material could be contaminated with asbestos, lead and mercury. Others expressed the need for a protocol to test imported material, to monitor air emissions, surface runoff and noise during regrading, filling, and other construction activities, and to ensure that adequate cover is maintained on the sites. The Citizens Advisory Committee (CAC) suggested that City agencies pay a fee to dispose of material at the site, and that a survey should be made of City and State agencies to determine the available supply of material. The East Brooklyn Congregations stated the need to separate the monitoring of construction activities, including grading, from the contractors performing the work, and suggested the formation of an Environmental Cleanup Corps to represent the local community in monitoring construction activities. URS and NYCDEP commented that regrading should not be permitted in areas of potential landfill fires, and that dredge soils or other excavated ocean sands should be considered for grading material. The Audobon Society suggested that, to protect local residents from airborne contaminants, any regrading should be suspended during periods when the wind is blowing from the south or west.

Response: The Record of Decision for the Fountain Avenue Landfill will state a preference for importing grading material, but will allow for small amounts of waste regrading where this is necessary to reduce the site footprint along the perimeter, and where small amounts of regrading would significantly reduce the amount of imported fill required. At the Pennsylvania Avenue site, DEC believes that the waste material, primarily construction and demolition debris, is much less putrescible (odor causing), and is therefore more suitable for regrading. Therefore the ROD for this site will state a preference for regrading over importing waste. One concern at the Pennsylvania Avenue site is that regrading in areas of historical and potential landfill fires may cause an influx of oxygen that may fuel the subsurface fire. Another concern at the Pennsylvania Avenue site is that the waste is composed of large chunks of debris that may not be easily cut, moved and replaced. To address these concerns, DEC will minimize the amount of regrading in landfill fire areas, and will retain the flexibility for importing grading material if regrading proves to be too difficult.

DEC fully agrees that strict controls on the grading material are essential for controlling odors and preventing the disposal of additional hazardous materials at the site. DEC will require DEP to submit a comprehensive material specification, sampling protocol, operations plan, and health and safety plan for review and approval before any material is delivered to the site. These plans will be provided to the public for review and comment prior to approval.

Issue: **Barging materials to the site is preferable to trucking**

Many commenters stated that trucking materials through adjacent neighborhoods to the site would create unacceptable noise, traffic and air emission impacts on local residents and that barging should be considered as the primary mode of transportation. Some commenters expressed the need to minimize even barge traffic to the site, and to expedite the overall construction of the cap. A preference was expressed for a permanent, rather than temporary, pier, and suggestions were made for various future uses of the barge offloading facility, including recreational access and ferry service.

Response: The Record of Decision and will include a preference for the barging of grading and soil cover materials to the site. Subsequent Remedial Design documents will include provisions to build and/or improve barge offloading facilities for transportation of construction materials. The ROD will not mandate barge transportation exclusively, however, to provide some flexibility in material deliveries, particularly for small quantities of materials. Any significant need for road transportation during construction will be coordinated with the CAC and the Transportation Committee of local Community Boards.

Issue: **An environmental health study should be performed to ensure a "clean bill of health" for the surrounding community.**

Some reviewers stated that an environmental health or epidemiological study of chronic diseases in neighborhoods adjacent to the landfills should be performed to address the health concerns of the community. Reportedly, cancer clusters exist in the vicinity of the landfills and these clusters are related to chemicals of concern in the landfills. With a major new development proposed for the adjacent lands, a health study is essential to ensure a clean bill of health for the community.

Response: The New York City Department of Health, in conjunction with the Citizens Advisory Committee, has formed a Health Study Subcommittee that includes members of NYCDOH, the Science Advisory Committee and the community. The purpose of the subcommittee is to discuss the health concerns of the community, review prior DOH investigations of health outcomes in landfill communities, and to determine the most appropriate way to address the health concerns expressed by members of the CAC and the community. The New York State Department of Health will assist the committee and review the Study results.

The Health Risk Assessment conducted as part of the RI/FS identified several exposure pathways by which both landfills presented unacceptable human health risks. By addressing those exposure pathways, the selected remedy reduces the risk to public health to acceptable levels. An epidemiological study would not provide information that would modify DEC's selection of a remedy since capping the landfills with active gas collection will eliminate the exposure pathways attributable to the sites.

Issue: **Landfill fires are potentially an on-going problem at the sites, and contingency plans for monitoring and controlling landfill fire outbreaks must be developed.**

Many commenters expressed concern that the areas of past and potential subsurface fires must be monitored for fire activity and that a contingency plan must be developed for controlling any future outbreaks of fire. Most commenters acknowledged that the landfill fires are presently under control. Several reviewers added that regrading in the landfill fire areas should be minimized to eliminate oxygen flow to the fires.

Response: DEC agrees with this comment and has included a provision in the Record of Decision for landfill fire monitoring and contingency plans. During site grading activities, suspected landfill fire areas will be restricted to filling only; no cutting of waste will be permitted.

Issue: **Flaring of collected landfill gas is unacceptable, the gas should be recovered for an alternative end use.**

Several commenters stated that flaring landfill gas would be unacceptable to the community and that methane should be recovered for alternative end uses such as sale to the gas utility, operation of electric generators or use in local industrial and residential facilities.

Response: DEC agrees that methane recovery for alternative end use or electric generation is beneficial from a resource conservation perspective. However DEC cannot spend funds from the 1986 Environmental Quality Bond Act to subsidize a methane recovery project beyond what is needed for protection of public health and the environment. Therefore DEC cannot require such a project in the site Record of Decision, and the feasibility of a recovery system must stand on its own economic merits. To promote resource conservation, DEC will provide technical assistance to New York City if a methane recovery project is developed as part of the Remedial Design. The Record of Decision has been written to allow a methane recovery system, provided that it is designed and operated in a manner that is consistent with the remedial goals of the project. Flaring of landfill gas is a proven technology for destroying Volatile Organic Contaminants (VOCs) at destruction efficiencies of 99% or greater. Therefore, flaring of landfill gas would satisfy the remedial objective of minimizing public exposure to site-related air contaminants in the most cost-effective manner. Reviewers should note that closed, horizontal flares (Horizontal Combustion Units) are commonly used for landfill gas destruction where site aesthetics are a community concern.

Issue: **Granting a variance from the 4% final grade requirement at the Pennsylvania Avenue Landfill**

Comments on the proposed variance to the final grade requirement at the Pennsylvania Avenue Landfill ranged from support to uncertainty to opposition. Commenters expressing support for the variance stated that this was based on the assumption that subsidence would not occur, then questioned the certainty of that assumption. Commenters who were undecided on the issue stated that DEC did not provide sufficient information concerning the implications of

unanticipated long-term settling if a variance was granted. One citizen commented verbally during the November 16, 1994 public meeting that granting the variance from 4% final grade requirement would not provide sufficient room for error if subsidence should ocur in the future. URS/DEP commented that a 4% grade should be maintained in the area of the subsurface fire to facilitate long term maintenance.

Response: Landfills experience settlement according to two processes; consolidation and decay. The first is a physical process, in which the weight of additional fill material compresses the waste beneath it. Consolidation is the primary settlement process during the active landfilling period. The second process involves microbial degradation, in which components are chemically broken down into methane, carbon dioxide, water and other degradation products. As the products of decay volatilize and leave the site, the amount of remaining solid material is reduced, and the landfill settles. Wastes that contain higher percentages of organic matter will undergo microbial action for a longer period of time and to a greater extent, producing a greater degree of settlement. Based on several factors; the low organic content of the waste at the Pennsylvania Avenue Landfill, the lack of settlement observed during the period 1983-1993, and the inconsistent detections of degradation products during the RI soil gas survey, DEC believes that microbial degradation is not significantly contributing to landfill settlement. DEC will review the December 1994 aerial survey and mapping to determine whether the site continues to resist settlement. During the grading phase of construction, DEC will also monitor landfill elevations to determine whether consolidation occurs. If significant settlement is not evident, DEC will allow the site to be graded to a 2% final grade. With regard to ease of maintenance, it is unclear why a 4% grade is desirable in the fire areas, and not at the rest of the site. This comment suggests that the possible landfill fire may cause increased settlement as burned out areas collapse or subside, and that, upon closure, a greater slope is necessary to compensate for settlement. DEC believes that the landfill fires are presently inactive, and that with diligent monitoring and maintenence of cover they will remain inactive through the design and construction period.

Issue: **Future use of the sites is a critical concern of the community**

Many commenters expressed concern that the proposed passive use of the site after closure, as announced by the National Park Service (NPS), does not meet the needs of the local community. Commenters stated that the East New York community is under-served by open space and has no access to Jamaica Bay, and that the closing of the landfills represents an opportunity to provide such access. Commenters acknowledged that the integrity of the landfill cap is the primary consideration in determining the future uses of the site. Specific suggestions for future uses of the sites were provided, along with a proposal for a public/private partnership to secure funding for construction of active recreational facilities at the sites.

Response: DEC will work with the CAC, DEP and NPS to develop appropriate future uses for the sites that are compatible with the site remedies and the residual site health risks.

Issue: **Wetlands as a Remedial Treatment Technology**

Comments were received both in support and in opposition to the use of constructed or rehabilitated wetlands to treat landfill leachate and oil. Verbal comments received during the public meeting questioned whether DEC had considered this technology, and indicated that constructed wetlands had performed well in degrading oil contaminants at a site on the Arthur Kill. Written comments indicated that this technology should be considered, but that it is not the best solution due to unreliability, high maintenance, seasonal variability and the inability to remove certain classes of contaminants.

Response: DEC agrees with the latter comment, that constructed wetlands would not be sufficiently reliable as a primary treatment technology for the types and levels of contaminants that are present along Fresh Creek. DEC will consider rehabilitating the wetlands on the downgradient side of the interceptor trench to remove low levels of contaminants that may exist in residual oil present in subsurface soils. This revegatation may be implemented as part of the sediment and soil excavation plan along the Fresh Creek shoreline. The suitability of wetlands reconstruction will be evaluated based on the final grade and residual contamination after soil and sediment excavation is complete.

Individual Issues

(superscripts reference the commenters listed above)

The following section summarizes the comments that were received both verbally during the November 16, 1994 public meeting and in writing during the public comment period, that have not been discussed above.

Issue: The plan does not contemplate additional efforts to collect and treat leachate from both landfills. The Feasibility Study states that "No Action" for leachate treatment is considered to be not effective in meeting the remedial objective. Why are the leachate mounds at both landfills being ignored for treatment in the Proposed Plan? Is there any study that estimates how much leachate is expected to continue discharging to the Bay over time? Has DEC evaluated various mitigation measures?[1]

Response: Capping the landfills is an action that will significantly reduce the production of leachate. As explained above, DEC believes that capping alone will reduce leachate production to such a degree that the Fountain Avenue Landfill will no longer cause a contravention of water quality standards in adjacent surface waters. At the Pennsylvania Avenue site, the Fresh Creek leachate collection trench is required in addition to capping to achieve similar non-contravention. Estimates of leachate flow developed in the Feasibility Study are that capping Fountain Avenue Landfill will reduce the loading of volatile, semivolatile and toxic metal contaminants by 94% in approximately 4 years. At the Pennsylvania Avenue site, the cap and Fresh Creek leachate collection trench will reduce the flow of these contaminants by 99%. DEC has evaluated the

mitigation measures outlined in the Feasibility Study and determined that the selected remedies are protective of health and the environment and are cost-effective.

Issues: Airborne emissions from the site have the potential to negate any environmental benefits achieved by controlling leachate and oil impacts from the sites. It is important to provide an acceptable baseline estimate of air emissions so that the degree of emission control after capping can be evaluated.[2]

Response: DEC agrees that air emissions are potentially a significant source of contaminant migration and exposure. However, as the results of the Remedial Investigation demonstrate, it is difficult to obtain a reliable emissions estimate from uncapped landfills, particularly sites as large as these. The important consideration is whether the level of post-closure emissions is protective and complies with standards, not the relative reduction in emissions. For these reasons, DEC believes that additional sampling to establish a baseline air emissions estimate is not warranted.

Issue: 1) The reason for the failure of the existing Fresh Creek oil collection trench is not completely resolved. The proposed solution appears to be a reasonable means of controlling oil migration, but the effectiveness of this solution is subject to re-evaluation as it progresses. 2) For habitat and aesthetic reasons, reconstruction of marshlands should be given priority over rip rap for shoreline protection.[3]

Response: 1) DEC agrees that a complete explanation is lacking for the absence of oil in the existing trench, and that the effectiveness of either activating the existing trench or constructing another trench should be re-evaluated periodically. 2) DEC agrees that, where "soft" and "hard" shoreline protection provide equivalent levels of protection, priority should be given to soft methods.

Issue: 1) Further tests are necessary to determine the quantity, movement and physical characteristics of the oil seeping out of the Pennsylvania Avenue Landfill. 2) Site access (ie. site security) by the general public continues to be a problem in terms of potential contaminant exposure. 3) The landfill does not incorporate any critical habitat, and it should therefore be entirely capped, as proposed. The closure design should incorporate a plan to restore wildlife habitat during (and after) remediation.[4]

Response: 1) The additional tests referenced in the letter (quantity, physical properties, etc.) were performed and reported in the Final Feasibility Study. DEC will require operational testing of the existing trench, accompanied by measurements of the oil flow response in the aquifer, as part of the design of the trench modification or expansion. It should be emphasized that this testing is to improve the design of the trench, and not to select alternative remediation methods. 2) DEC agrees that trespass at the site continues to be a concern, particularly where it causes exposure to contaminated soils, sediments and biota. DEC has requested that DEP improve its

security measures at these sites. 3) DEC agrees with this comment and has incorporated this in the Record of Decision.

Issue: 1) While the FS recommended that the geomembrane component of the cap system should be 40 mil VLDPE, consideration of a 60 mil HDPE should be retained during the Design phase. 2) Suggestions were made to revise the remedial timeframes for several alternatives in the PRAP so they are consistent with those reported in the Feasibility Study. 3) Several clarifications and corrections were made to the costs of product recovery alternatives at PAL, to the acreages of the combination cap alternatives and to the present worth of FAL Alternative 8. 4) The Fresh Creek sediment remediation alternatives specified remediation of visibly contaminated sediments in addition to areas where PCB levels exceeded 1 ppm. 5) Creation of lined freshwater wetlands should also be considered in the valley area of FAL, where settlement of waste is not expected to be as great.[5]

Response: DEC agrees with issues 1, 3, 4 and 5, and has included these in the Record of Decision. With regard to the creation of lined wetlands overlying waste areas, the location of DEP's proposed wetland, at the foot of the FAL valley, is proposed as part of the surface drainage plan for the site, and is not intended to reduce the amount of grading or regrading. DEC will consider a specific proposal for such a pond during the remedial design phase. With regard to issue #2, DEC believes that the remedial timeframes listed in the Pennsylvania Avenue Landfill PRAP for the alternatives in question are reasonable. For instance, the Feasibility Study lists 48 months as the remedial timeframe for alternatives that provide full sediment excavation with various capping options. DEC believes that, by conducting sediment excavation activities while the leachate collection system and portions of the landfill cap are under construction, Alternatives 5, 9, and 13 can be constructed in 36 months. Similarly, product recovery could be implemented in the waste oil area while the remaining portions of the cap are under construction, so that Alternatives 6 and 10 can be implemented in 36 months. For the duration of Fountain Avenue Landfill Alternatives, DEC agrees that constructing offloading facilities and importing fill materials will extend the timeframe to 3-4 years. However, because perimeter leachate collection and sediment remediation could be performed concurrently with grading activities, the remedial timeframes for Alternatives 5, 6 and 8 are also estimated to be 3-4 years.

Issue: 1) The oil trench should be properly engineered and oversized to ensure that all the oil is collected that may flow into Jamaica Bay. 2) The land north of the site, the Vandalia Dunes, should be investigated to ensure that landfill contaminants have not migrated beneath the surface in concentrations that pose an unacceptable risk to future residents of that development. 3) The community was given very little time to comment on the Proposed Plans, and additional time is necessary to adequately respond to DEC's proposal.[6]

Response: 1) DEC agrees that the trench must be properly designed to collect all oil that could potentially flow to Fresh Creek and Jamica Bay. This requires collecting oil along the entire vertical and horizontal extent of its path. However, it would not be sound engineering practice to

substantially overdesign the trench because that would generate the collection of large quantities of relatively clean water that would increase the costs for treatment and disposal. The trench will be designed with sufficient overcapacity to ensure full oil collection, but not to such a degree that the operating cost is unjustifiably high. 2) Sampling results from background wells located on the adjacent property (BF-U) did not reveal significant contaminant migration from the Fountain Avenue Landfill. On-site wells located across from the proposed development (HF-2U) contained similarly low levels of contaminants. Groundwater modelling results suggest that there is a small component of flow to the north of the site, but monitoring results indicate that this flow does not result in significant levels of contaminants in that area. 3) DEC has participitated in NYCDEP's ongoing community relations for these sites, and the community has been informed of remediation issues as they have arisen throughout the project. The extent of public comment on the PRAP indicates that the community has had adequate time to review and respond to DEC's proposal. DEC will continue to involve the public in the decision-making process throughout the design period.

Issue: 1) Construction and environmental monitoring contracts should include local hiring and training requirements. 2) More consideration should be given to alternative remediation methods, such as constructed wetlands/salt marshes and the use of soil bacteria to decompose oil-related contaminants.[8]

Response: 1) So-called "Pre-Hire Agreements" to require hiring of local workers are a recent development for contracts which have State involvement. Such contracts have been issued on a trial basis by the State Thruway and Dormitory Authorities, and these will be evaluated to determine whether this arrangement is cost effective. The Department of Environmental Conservation has not implemented such contracts, either under a grant program or for our own contracts, as we are awaiting the results of the trial projects. In our grant contract with New York City, DEC requires participation of Minority and Women Owned Businesses and mandates Equal Employment Opportunity hiring goals. Our Bureau of Affirmative Action, in their enforcement of these contract provisions, encourages contractors to meet these obligations through local hiring. 2) The constructed wetlands comment is addressed in the Common Issues section above. The Feasibility Study did evaluate in-place bioremediation (soil bacteria) in the Technology Screening phase, and rejected this technology because it cannot reliably degrade the variety and high levels of contaminants found in the oil at PAL.

Issue: The proposed variance to the 24" barrier protection layer should not be granted because this would not provide sufficient protection to the synthetic membrane, and because it would provide no margin for error in constructing this layer. [9]

Response: DEC believes that a Construction Quality Assurance Plan will be developed that can ensure that the barrier protection layer will be a uniform 18" across the sites, and that a 6" grading error is highly unlikely. If NYCDEP can demonstrate that the combined 24" barrier protection and vegetated topsoil layers above the cap will provide adequate protection to the

membrane, DEC will grant the variance. DEC will ensure that the final vegetative plan is consistent with this reduced soil thickness and if enhanced vegetative cover is proposed, that additional soil cover is provided to protect from root penetration.

Issue: 1) The anchoring of the cap at the landfill boundary is a concern. The standing water between the Belt Parkway and the Fountain Avenue site will be an impediment to a secure anchor, and may be related to buried streambeds or tidal channels that may serve as a conduit for leachate leaving the site. Does DEC have any data regarding the depth of the ponded water and the movement of leachate or groundwater to and from this area? 2) More day to day oversight, recordkeeping and supervision is necessary in connection with the oil mitigation trench. 3) If equipment or other materials are to be transported (overland) through the neighboring community, the CAC and Community Boards must be consulted.[10]

Response: 1) DEC agrees that the design of the anchor for the landfill cap along the Belt Parkway and perimeter shorelines is a key detail. DEC shares the concern that an adequate tie-in be provided with waste in the vicinity of the Belt Parkway and that the cap and surface drainage structures be properly designed in areas where surface water currently ponds. DEC has only limited information regarding the quantity, source and contaminant levels of the ponded water. The presence of this water has three possible explanations; A) surface runoff that collects in this low-lying area due to poor drainage toward Hendrix Creek, B) landfill leachate that seeps out along the perimeter berm, and C) groundwater flow from the North that encounters the compacted, low permeability, perimeter berm and seeps upward. DEC has only limited sampling data from this pond, and the water chemistry indicates the presence of some leachate contaminants, but at much lower concentrations than in other leachate samples. Prior to, or during the early stages of, cap construction, DEC will require that the surface drainage from this area be improved to determine whether surface drainage is the cause. If discharging groundwater if found to be the cause, DEC will investigate whether this flow is leachate from the landfill or groundwater flowing under the Belt Parkway. The comment suggests that there are "dry" streambeds in this area, that may be conduits for landfill gas migration to the north. It should be noted that, based on groundwater levels in the area, any buried tidal channels would be under water, and would not conduct landfill gases. 2) DEC agrees that more oversight is necessary in the inspection and operation of the oil mitigation trench. DEC has reviewed and commented on the Draft Monitoring Plan for the trench, but it has not been resubmitted by NYCDEP. DEC will follow up on this submittal, and will ensure that the pump test to be undertaken as part of the Remedial Design is properly supervised and documented. 3) DEC commits to further involvement with the CAC and Community Boards on the transportation issue during the Design and Construction periods.

Issue: 1) The fish tissue data obtained during the Ecological Assessment is of questionable value due to many Quality Control problems with the analytical laboratory. This questionable data is not useful as a baseline of information for monitoring the performance of the remedy in eliminating contaminant flows to Jamaica Bay and its wildlife. Fish tissues should be resampled

prior to capping with adequate quality assurance to provide a better baseline for future monitoring. 2) Some of the vegetative cover present on the landfills should be considered for maintenance, and not removal, during capping. The funds associated with restoring wetlands along the perimeter of the site should be redirected toward sediment remediation.[11]

Response: 1) DEC agrees that the fish tissue data is of questionable value, but believes that it is of sufficient quality to base the selected remedy. DEC intends to monitor the effectiveness of the remedy by measuring contaminant levels in air, surface water and groundwater. Because fish tissues are subject to contaminant sources other than the landfill, they will not be used as primary monitoring criteria for the remedy. While the National Park Service may conduct a long term monitoring program of contaminant levels in fish, DEC cannot require, nor fund, a sampling effort that does not directly affect the selected remedy. 2) Because the vegetative cover in question is underlain by waste and is contributing leachate impacts to Jamaica Bay, it must be capped in accordance with applicable regulations.

PENNSYLVANIA AVENUE LANDFILL
DEC Site # 224002

APPENDIX B - ADMINISTRATIVE RECORD

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