Department of Environmental Conservation

Division of Hazardous Waste Remediation

Croton Point Landfill

Site Number 360001
Westchester County, New York

Record of Decision

March 1993

Funded Under Title 3
of the
1986 Environmental Quality Bond Act

New York State Department of Environmental Conservation
MARIO M. CUOMO, *Governor* THOMAS C. JORLING, *Commissioner*

RECORD OF DECISION

CROTON POINT SANITARY LANDFILL

WESTCHESTER COUNTY, NEW YORK

ID NUMBER 360001

PREPARED BY

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF HAZARDOUS WASTE REMEDIATION

MARCH 1993

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Croton Point Sanitary Landfill
Croton Point Peninsula
Village of Croton-on-Hudson, Town of Cortlandt
Westchester County, New York
Site Code: 360001
Funding Source: 1986 Environmental Quality Bond Act

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Croton Point Sanitary Landfill Site, which was chosen in accordance with the New York State Environmental Conservation Law (ECL), and is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et., seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Exhibit A identifies the documents that comprise the Administrative Record for the site. The documents in the Administrative Record are the primary basis for the proposed remedial action.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

The major elements of the selected remedy include:

- Design and construction of an engineered capping system to isolate the landfilled wastes from rainfall and human contact. This cap system will extend over both the original fill area and the Ballfield cell. A stormwater diversion system will be included to hydraulically control precipitation induced runoff and to route it to permitted discharge to the Hudson River and Croton Bay.

- Design and construction of an active landfill gas collection system to prevent exposure to landfill emissions. This system will include active removal of landfill gases with a gas flare to destroy the volatile components of the gas.

- Design and construction of a leachate seepage collection system. This system will enclose the landfill perimeter at the toe of the cap. This system will collect and convey leachate seepage to a series of pumping stations for permitted discharge to the sanitary sewer system. The system will have sufficient storage capacity to avoid discharging leachate to the sanitary sewer system during periods of high flow to the sewers (storm events).

- Environmental monitoring to determine the effectiveness of the remedial program. Groundwater, surface waters, leachate, landfill gases, stormwater discharges and marsh sediments will all be subjected to a periodic monitoring program designed to detect any changes in the effectiveness of the remedial program. Groundwater and surface water monitoring parameters will include 6 NYCRR Part 360 baseline parameters annually and routine parameters quarterly at a minimum for the first five years. Subsequent monitoring may vary based on those results.

The County must prepare and submit for NYSDOH and NYSDEC acceptance a complete plan for the operational, maintainance and monitoring activities, as well as long-term land uses planned for the landfill after construction. Monitoring of leachate quality will be performed monthly for the first several years to assess any change in leachate quality which may impact the sewage treatment plant's ability to treat it. Should the leachate monitoring indicate a change in leachate quality or the sewage treatment plant's pretreatment limits change such that the leachate would exceed those pretreatment limits, pretreatment of the leachate will be implemented.

o Deed restrictions to prevent future uses of the site that would interfere with the effectiveness of the remedy.

The estimated net present worth of the preferred alternative described above is $33,370,000. This estimate includes $28,700,000 in capital costs and $4,670,000 in present worth of recurring operational and maintenance costs for the 30 year post closure monitoring period. These estimates are based upon a combination of actual bid proposals from contractors and the projected annual operational costs.

DECLARATION

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost-effective. Waivers are justified for applicable or relevant and appropriate requirements that will not be met. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the preference for treatment as a principal element.

Because this remedy will not allow for unlimited use and unrestricted exposure to wastes, within five years after completion of remedial action, a five year review will be conducted. This evaluation will be conducted within five years after the completion of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

March 25, 1993
Date

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

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SITE #360001

I. SITE LOCATION AND DESCRIPTION

The former Croton Point Sanitary landfill site is located in the Village of Croton-On-Hudson, Town of Cortlandt, Westchester County. The peninsula extends into the Hudson river for an estimated 2 miles and separates Haverstraw Bay from Croton Bay. The Point has a total area of approximately 500 acres. The landfill complex occupies approximately 142 acres on the Croton Point peninsula. The remainder of the Point has been developed as a County Park, and includes sports fields and day use areas as well as several options for overnight accommodations. The Park surrounds the landfill area on all sides except the eastern perimeter which abuts the Croton Marsh. The site is located adjacent to and south of Metro North Croton Harmon maintenance center. Figure 1 shows the location of the site with respect to the local area and figure 2 presents the landfill boundary.

The selected remedy will include the "Original Fill area" and the "Ballfield Cell" of the landfill complex. The third landfill unit, "Railroad I" has already complied with closure requirements in place at the time it closed in the early 1980's. The 96 acre Original cell and the 18.5 acre Ballfield cell share a common boundary and will be closed under this program.

II. SITE HISTORY

The CPSL operated from circa 1927 through 1986 and received both municipal and industrial wastes during that timeframe. The landfill served as the primary disposal location for most of County of Westchester for over 40 years and contains an estimated 11,000,000 cubic yards of buried wastes. The landfill was owned and operated by Westchester County throughout its existence. Accurate accounting data or records of past disposal activities prior to the 1970's do not exist. Available information indicates that the site received some quantities of the following wastes: mixtures of flammable liquids, organic solvents, and acids. The exact locations of these items were not recorded by the site operators at the time of disposal. Subsequent investigations failed to locate hot spots and indicates these materials were not segregated from the municipal wastes but buried together.

The landfill has been the subject of a multitude of investigations and studies beginning in the early 1970's when the County was sued for disposing of wastes in the navigable waters of the United States. This first action led to a series of engineering and scientific endeavors aimed at determining the landfill's impact on the Croton Marsh, the Hudson River, local residents and site workers. These reports and studies have yielded a significant data base upon which to develop a final investigative program for the CPSL. One of the later reports concerning the site impacts, prepared for the USEPA in 1986, was utilized by the NYSDEC to classify the landfill as a Class 2 inactive hazardous waste site under New York State law. A list of the previous investigations and study efforts is included in Exhibit A of this Record of Decision (ROD).

The County is currently obligated to perform a complete remedial program in accordance with federal and State legislation as cited in the Consent Order executed in May of 1989 with the NYSDEC. The County also continues to have Federal obligations relative to CPSL under United States v. Edwin J. Michcailian. Reimbursement of up to 75% of the eligible costs incurred in the design and construction of the remedial program is available to the County through the New York State 1986 Environmental Quality Bond Act (State Assistance Contract #C300069).

III. CURRENT SITE STATUS

A. Summary of Field Investigations:

The following paragraphs summarize the components and conclusions of the current remedial investigations performed at the site. This investigation was conducted in accordance with plans formally approved by NYSDEC in April 1989 and encompassed two separate phases of work conducted in 1989 and 1991. For more detailed information regarding the individual investigations or for additional regional information, refer to the appropriate report(s) listed in the Administrative Record (Exhibit A). Many of the efforts discussed below were confirmatory actions to verify the large volume of existing information available from the extensive past efforts involving the CPSL.

Given the size, volume of, and location of this landfill, a decision was reached at the conclusion of the Phase I RI to place the site into an early remedial action program. The NYSDEC and the County acknowledged that as a minimum the remediation at CPSL would include an engineered landfill cap system and authorized the design of a cap in early 1990. It is this decision that has resulted in the final design plans that have been completed by Gibbs and Hill and are currently under contract for construction. The ROD acknowledges these facts and after comparison to other alternatives in the Feasibility Study and consideration of public input, selects the early remedy as a component of the final remedy for CPSL.

B. Summary of Site Conditions:

For ease of reference, the following information summarizes the main characteristics of the Croton Point Sanitary Landfill site (all values are approximate):

Landfill Area to Remediate:	115 acres
Contaminated Media:	Landfilled Wastes
	Marsh Sediments
	Leachates & Gas Emissions

Regionally, groundwater in the unconsolidated aquifer (shallowest and therefore threatened/contaminated by the site) flows to the south-southeast towards Croton Bay and the Hudson River. However, the local flow pattern is such that the shallow groundwaters in the immediate vicinity of the site flow outward from the center of the landfill in a radial pattern, with greater gradients towards the eastern channel of the Croton Marsh and towards the Haverstraw Bay in the vicinity of the closed beach area. The presence of the Hudson river in close proximity to the waste mass perimeter makes discussion of a "shallow groundwater aquifer" problematic in nature. The groundwater in question is considered by many to be brackish due to tidal influences and is not a viable water supply source. The entire area is serviced by public water supplies. The deep groundwater existing below the low permeable layers appears to be unaffected by the landfill.

The geology and hydrogeology of the site are complex. The bulk of the contamination at the site appears to be contained within the actual waste mass and the on-site sediments present in the leachate accumulation areas. The landfill is underlain by layers of organic marsh deposits, deltaic sands, organic peats/clays and sands at various depths. The central and southeastern portions of the site are underlain by marsh deposits and lacustrine deposits over bedrock. The peninsula is dominated by two prominent lodgement till outcrops at its outer most points, Tellers point and Enoch's point. This results in a preferential flow direction away from the outcrops and towards the more conductive sand deposits in the vicinity

of the ancient Croton river bed running southeast to northwest. The relatively high organic carbon content of the peat soils in the marsh area appear to be effectively retarding contaminant migration beyond the initial edge of fill. Although water quality standards are being exceeded in the immediate vicinity of the waste mass, it is believed that once the site is isolated to stop the periodic leachate releases and upgradient clean waters are routed around the landfill that the water quality will again be within standards.

Groundwater (GW) quality was evaluated through two rounds of samples taken from the 22 individual wells installed during this RI. The primary compounds of concern are inorganics, many of which exceed the NYS GA standards. The contaminant concentrations in groundwater appear to be stable when the existing data base and the two rounds of current groundwater data are reviewed. The most frequent inorganics detected above standards were iron, manganese, sodium, chlorides, and magnesium. Volatile organics were detected at low levels, however no site pattern was evident. Well 9 detected the most volatiles with adjacent wells showing non-detections. No consistent detections of pesticides or PCBs were found in the groundwaters.

A total of 36 surface water (SW) and associated sediment (SD) samples were analyzed during the RI. The results of the Phase I samples showed the presence of numerous compounds at levels expected of a municipal waste mass. The Phase II Program was designed to establish a final confirmation of the site's impact on the surrounding areas and did show consistency with the Phase I data. The surface water samples exhibited a concentration gradient outside of the disposal area that indicates migration of contaminants has not taken place to a large extent. The primary compounds detected above relevant standards were inorganic compounds. No detectable concentrations of pesticides or PCBs were found and only a single validated sample showed the presence of any volatile organics (tetrachloroethene at 2ppb:Sta#13). Copper exceeded the aquatic protection standard of 2.9 ppb at every station with a range of 6.7 to 171 ppb. The surface water program also included sampling of background water quality at Iona Island, located approximately 15 miles upriver from CPSL. The samples from this area also exceeded aquatic protection standards for several inorganic compounds including copper.

The sediment results were compared to NYSDEC guidance documents relative to the protection of aquatic environments and have been normalized to organic carbon content. There are no promulgated regulatory criteria for the sediment matrix. Detections of volatile or semi-volatiles were found at low levels across the sampling stations and were consistent with the backgound station at Iona Island. The PCB results ranged from non-detect to a high of 540 ppb, a relatively low level for Hudson River sediments. No Pesticides were found above detection limits. As with the GW and SW samples, inorganics were the primary compounds of concern, mainly copper (2 exceedences of the Limit Of Tolerance (LOT) at sta#3 & 7), mercury (4 exceedences of the LOT at sta# 4, 7, 12a & 15), arsenic (1 @ Sta#4), and lead (1 @ sta#4). The LOT has been defined as the concentration which would be detrimental to the majority of species, potentially eliminating most. If these values were exceeded in significant portions of the ecosystem it is highly likely that biota would be impaired. Sediment criteria have been exceeded for one or more metals in 54 out of 60 sediment analyses in the eastern drainage channel of the Croton Marsh. Sediment criteria have been predicted based on "no-effect" and "lowest-effect" levels from empirical evidence from both lab and field studies without an attempt to normalize for any toxicity controlling factors in the sediment. Site-specific tests were conducted to determine any impacts from these exceedances as described below.

Overall the sediment samples showed that the area which exhibited the most occurences of exceedences of the derived LOT values was the eastern drainage channel of the Croton Marsh. Based on the effected sample locations approximately 4 acres appear to be of a concern. The State believes the major impact of the site is, however, primarily restricted to the waste mass itself and the surface waters of the Croton Marsh which receives periodic leachate releases with identified impacts to the eastern drainage channel of the Croton Marsh.

A major component of the current work was an intensive ecological study of the Croton Marsh. Four distinct sampling efforts were undertaken: macrobenthos sampling, fish survey with tissue analysis, wetlands vegatative surveys, and wildlife habitat assessments. The macrobenthos work revealed that the eastern channel of the marsh has lower diversity, evenness, and abundance levels than the other areas surveyed. The fish survey work revealed that previously identified instances of lordosis and scoliosis in mummichugs was no longer evident and a large number of fish species exist in the vicinity of the landfill, including short-nosed sturgeon. Whole body tissue analysis has shown that fish taken from the area of the Croton Point Landfill contain polychlorinated biphenyls (PCBs) as do fish from throughout the Lower Hudson River. The contribution of the Croton Point Landfill to this contamination is undetermined. Regardless of the source of the contamination, the contamination does present health risks for people consuming these fish. The NYSDOH has issued an advisory on the consumption of fish caught and Blue Claw Crabs from the Lower Hudson River which includes the Croton Point area.

The wetlands vegetative work was designed to duplicate previous transects established by Buckley, et al. in the early 1970's. Aerial infra-red spectrometry was used as an additional assessment tool. The results showed that although the marsh has transitioned from cattail dominated to phragmites dominated, that the biomass has recovered from previous recorded lows and that this increased biomass is contrary to predicted declines by 1989 (Buckley, 1982). The habitat assessment work revealed that the Croton Marsh is habitat for a wide variety of wildlife including two species of special concern (sedge wrens and least bitterns). A total of seven plant species observed in the Croton Marsh appear on the NY rare plant status list or the NY watch list.

Ambient air and landfill gases (point & nonpoint discharges) were also evaluated during the RI. A total of 25 ambient air samples, 4 vent gas samples and almost 100 soil gas samples were evaluated. The results reveal that a significant amount of methane is being generated and released into the air, and that trace amounts of non-methane organics are also present. The most frequently detected organic was vinyl chloride in the vents and soil gas samples. No vinyl chloride was detected in the ambient air program.

C. SUMMARY OF SITE RISKS

A health risk assessment was accomplished utilizing the present-use exposure conditions for recreational adults, youths, and children, adult workers, and residential adults on the hazardous waste site and for areas immediately adjacent to the landfill. The details of this assessment can be found in Chapter 6 of the RI reports and are briefly summarized here. Exposures to adjacent surface waters (ingestion and contact), fugitive dusts (inhalation), onsite soils (ingestion & contact), fish tissues (ingestion) and ambient air (inhalation) were evaluated. Dermal exposure to on-site soils (the area within the fenced landfill) present carcinogenic and non-carcinogenic health risks to adult workers on-site. On-site soils would also present these health risks to adults and children if it were developed for residential and recreational property in its uncapped condition.

Consumption of fish caught from the Lower Hudson River, including in the area of the Croton Point Landfill, present carcinogenic and non-carcinogenic risks. Fish throughout the Lower Hudson River have been shown to contain elevated PCB levels. Sources upriver have been identified. In response to this contamination, the New York State Department of Health has issued advisories on the consumption of fish and Blue Claw Crabs caught from the Lower Hudson River.

Elevated levels of contaminants in Croton Marsh indicate an influence by the landfill. In the eastern drainage channel, inorganic substances exist at concentrations that are known to seriously effect benthic life. The invertebrate benthic community in the eastern channel is significantly less diverse than the communities of the other two channels or of the background marsh.

In addition to impacts to the marsh aquatic community, impacts may be occurring to birds associated with the marsh. The risk assessment found a potential toxic impact to a representative fish-consuming bird, the kingfisher. In addition, impacts to birds that directly consume benthic invertebrates are possible.

Croton Marsh has undergone a decrease in plant species diversity which makes it less suitable as habitat for wildlife. This change in diversity may be a result, at least in part, to the influence of contaminants originating from the landfill.

IV. ENFORCEMENT STATUS

Orders on Consent

Agency	Date	Index No.	Subject:
NYSDEC	17 April 1989	W3-0082-8707	Remedial Program
USDOJ	4 February 1975	n/a	Final Judgement
USDOJ	8 December 1987	n/a	Stipulation & Order

The NYSDEC and the County of Westchester began negotiations toward a Consent Order to govern the remedial program at Croton Point in 1987 shortly after the County reached their most recent agreement with the Federal Government. These discussions resulted in an executed Consent Order on 17 April 1989. The Order states that pursuant to the Environmental Conservation Law, Section 27-1313, the hazardous waste remedial fund is being used to reimburse the County for up to 75 percent (75%) of the costs for the remedial program. The Order also acknowledges that the County was acting on behalf of all the municipalities within the County in its activities at the landfill. Currently there have been no agreements reached concerning funding from other potentially responsible parties nor have any actions to recover costs from potentially applicable insurance coverages been initiated.

The County also has obligations to the United States Government through the existing Final Judgement and Stipulation and and Order in United States of America v. Edwin G. Michaelian. It is beyond the scope of this ROD to address these obligations.

V. GOALS FOR THE REMEDIAL ACTIONS

The remedial alternative selected for the site by the Department was developed in accordance with the New York State Environmental Conservation Law (ECL) and 6 NYCRR Part 375, NYS Inactive Hazardous Waste Site Remedial Program. The ROD is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et., seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The criteria which were used in evaluating the potential remedial alternatives can be summarized as follows:

1. Compliance with Applicable or Relevant and Appropriate New York State Standards, Criteria and Guidelines (SCGs)--SCGs are divided into the categories of chemical-specific (e.g., groundwater standards), action-specific (e.g., design of a landfill), and location-specific (e.g., protection of wetlands).

2. Protection of Human Health and the Environment--This criterion is an overall and final evaluation of the health and environmental impacts to assess whether each alternative is protective. This is based upon a composite of factors assessed under other criteria, especially short/long-term effectiveness and compliance with SCGs.

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

4. Long-term Effectiveness and Permanence--If wastes or residuals will remain at the site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude and nature of the risk presented by the remaining wastes; 2) the adequacy of the controls intended to limit the risk to protective levels; and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility, and Volume--Department policy is to give preference to alternatives that permanently and significantly reduce the toxicity, mobility, and volume of the wastes at the site. This includes assessing the fate of the residues generated from treating the wastes at the site.

6. Implementability--The technical and administrative feasibility of implementing the alternative is evaluated. Technically, this includes the difficulties associated with the construction and operation of the alternative, the reliability of the technology, and the ability to effectively monitor the effectiveness of the remedy. Administratively, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining special permits, rights-of-way for construction, etc.

7. Cost--Capital and operation and maintenance costs are estimated for the alternatives and compared on a present worth basis. Although cost is the last criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, lower cost can be used as the basis for final selection.

The overall objective of the remediation is to reduce the concentrations of contaminants and the routes of exposure to levels which are protective of human health and the environment. The site-specific goals for remediating the site can be summarized in general as follows:

- Reduce, control, or eliminate the generation of leachates within the fill mass.
- Reduce or eliminate the uncontrolled emission of landfill gases and to prevent uncontrolled combustion of landfill gases.
- Eliminate the potential for direct human or animal contact with the waste mass and leachate seeps.
- Reduce, control, or eliminate the potential impacts to the ecological environment of the Croton Marsh.

The following section addresses the alternatives that were evaluated to achieve these goals.

VI. SUMMARY OF THE EVALUATION OF REMEDIAL ALTERNATIVES

A. DESCRIPTION OF ALTERNATIVES

The CPSL has been evaluated as a single "operable unit." That is, the site consists essentially of a single contaminated area and the evaluations would not benefit from dividing the site into separate pieces. Remediation of the CPSL entails addressing the waste mass, contaminated leachates, gaseous emissions and sediments/soils of concern. The FS initially screened many different technologies either individually or in combination with other technologies for technical implementability in achieving the remedial goals. More complete descriptions of the screening and development of technologies into alternatives can be found in Chapters 4 and 5 of the FS report. Detailed evaluations of these alternatives are contained in Chapter 6. Table 6 presents the feasible alternatives developed for remediation of the CPSL site. The following alternatives were subjected to full evaluations:

Alternative 1: No Action With Institutional Controls:

For all inactive hazardous waste sites, the evaluation of the No-Action alternative is carried through to the end of the analysis for comparison purposes. The No-Action alternative is inappropriate for a landfill which has not achieved the current closure requirements presented in 6 NYCRR Part 360: Solid Waste Management Facilities. Included in the no action alternative, is an environmental monitoring program to evaluate the progress of the remedial alternative selected. This monitoring program will be required of the selected alternative and is common to all alternatives considered. This program will consist of periodic sampling and analysis of groundwater from the network of monitoring wells, surface water from the surrounding water bodies, flare exhaust gases, marsh sediments and ambient air from the site on a regular basis.

This program will be evaluated periodically to ensure it remains appropriate and applicable based on the site data. This review will occur at a minimum of every five years for a minimum period of thirty years.
Institutional controls in the form of deed restrictions on the use of groundwater beneath the site and limitations on land uses are included. Physical improvements in the form of enhanced fences and posting of the property, vegetation establishment and maintenance, and continued stormwater/leachate recirculation (as necessary during storm events) are also included.

The County must prepare and submit for NYSDOH and NYSDEC acceptance a complete plan for the operational, maintainance and monitoring activities, as well as long-term land uses planned for the landfill after construction.

Time to implement: 6 months

Direct Capital Costs: $370,000
Estimated Annual Costs: $231,000

Alternative 2: Containment by Capping

This alternative is the early remedial action currently under contract for construction. It includes all the institutional items and post-closure monitoring items from alternative 1: No Action. The primary components of this alternative are a NYSDEC part 360 compliant cap with perimeter leachate and active gas collection systems. The cap design consists of a flexible geomembrane barrier layer, an active gas collection system, gas flare system perimeter leachate seepage collection, leachate piping systems with connections to sanitary sewers on the mainland and stormwater management facilities. The leachate collection system will have sufficient storage capacity to avoid discharging leachate to the sanitary sewer system during periods of high flow to the sewers.

The selected geomembrane is a forty (40) millimeter very low density polyethylene membrane (VLDPE) protected by a 24" barrier protection layer. Included in the protection layer are location specific drainage layers and a

topsoil layer. Steep slopes will receive a textured VLDPE to improve stability. The gas collection system will consist of active gas removal through over 80 fully penetrating wells located within the waste mass and piping to a gas flare system located adjacent to the waste mass in the northeast corner of the property. A landfill gas vent relief system will be constructed as a back-up system and will consist of a geocomposite gas collection layer immediately below the VLDPE liner and a series of pressure relief valves.

The final elevations of the cap system were designed to facilitate stormwater management through a series of swales and drainage channels to route stormwater runoff offsite in a controlled manner to three separate discharge points. The final topsoil layer will be planted with various plants and grasses to promote the long-term use of the area for scenic walkways in association with the existing County park facilities on the Croton Point peninsula and to provide suitable habitat for breeding, migratory and wintering species of birds.

Time to implement: approximately 28 months

Direct Capital Costs: $28,700,000
Estimated Annual Costs: $304,000

Alternative 2B: Containment with Pump & Treat of leachate

This alternative consists of alternative 1:No Action, alternative 2:capping, and the additional elements necessary to actively remove the leachate located within the landfill mound. This alternative would include a low permeability barrier around the landfill perimeter, a recovery well system located within the existing leachate mound, and associated piping systems. Cost estimates include leachate pretreatment prior to discharge to sanitary sewers based on the results of samples from well 13 located in the area where the recovery well was modeled. The advantage of active leachate mound removal is that the watertable within the landfill would reach equilibrium conditions in approximately 2 years, based upon model input assumptions. The pumping would be continued for a longer period of time in order to maintain hydraulic control, but would operate at reduced flows as the head within the landfill decreases. It is estimated that approximately 129,000,000 gallons would be recovered at pumping rates ranging from over 58,000 gallons/day at startup to less than 2500 gallons/day in year 15.

The selection of this alternative would result in decreased inorganic loading to the surrounding water bodies at a point in time that is earlier (by several years) then that which is predicted to be achieved with a cap alone. Using chromium as an example, this alternative would reduce loading to the surrounding areas from an estimated level of 13.7 pounds per year (at a point in time one year after capping is complete and without any pumping) to less than 2.4 pounds per year with pumping. Capping alone would achieve a similar 2.4 pounds per year loading in approximately 8 years without pumping. The increased capital cost from alternative 2, for this early achievement is $26,700,000. The incremental change in monitoring, operational and maintenance costs from alternative 2 is $1,091,000 yearly.

Time to Implement: 36 months

Direct Capital Costs: $55,380,000
Estimated Annual Costs: $1,394,500

Alternative 3: Complete Removal and Off-site Disposal

This alternative involves the complete excavation and removal of the waste mass from Croton Point and the reestablishment of the area to former pre-landfill conditions. A post remediation monitoring plan similiar to but less extensive then alternative 1 is included in this alternative. An estimated 11,600,000 cubic yards of waste would be excavated from the original and ballfield cells. Underlying soils which are visually

contaminated would also be removed. Most of the excavated materials would be redisposed of in permitted solid waste landfills with a lesser amount being placed in regulated industrial and or hazardous waste landfills. Major components of this alternative include cut-off wall construction around the waste mass perimeter to allow dewatering and excavation of the wastes located below river elevations, construction of leachate handling and treatment systems with discharges to the surrounding waters, organic vapor and dust monitoring/controls, dredging of an access channel to the landfill for barges to remove the wastes and to deliver clean backfill materials, and final grading for stormwater management.

This alternative is being presented only for comparison purposes since it is highly unlikely that it would be a viable option for a variety of reasons. Significant health and safety issues would require closing of the Croton Point Park for the duration of the project in order to minimize human health impacts. Excavation and removal of materials that took almost 60 years to accumulate will take far too long to accomplish. Locating a facility or several facilities willing to accept this volume of material is problematic. The final issue which prevents serious consideration of this alternative is the overall cost estimates. The analysis is included as a vehicle to provide an understanding of the severe ramifications involved in attempting to remove a large heterogenous landfill.

Time to Implement: 6 years (estimated)

Direct Capital Cost:
$3,946,000,000
Estimated Annual Costs:
$163,500

Alternative 4A: Eastern Marsh Channel Remediation

This alternative was developed to address concerns over the results of the sediment samples from the eastern drainage channel of the Croton Marsh. The eastern channel of the marsh is approximately four (4) acres in size and extends from the toe of the landfill out into Croton Bay. The area is essentially dewatered during periods of low tides. The RI data indicated that sediment samples from this area exceeded NYSDEC guidelines for protection of aquatic macrobenthic invertebrates and that the community here was less healthy than the other marsh channels.

The various technologies applicable to remediate this area of concern were analyzed. The depth of sediment removal was determined to be between two (2) feet and six (6) feet. The actual depth would be determined in the field based upon the results of sediment analysis. These depths when combined with the four acre area of concern correspond to a range of a minmum of 15,000 cubic yards to a possible high of 45,000 cubic yards. Suction dredging or mechanical excavation were selected as the most appropriate means to effect removal of the sediments in question. Sedimentation structures and siltation control systems would be a required component of either method. Dewatering systems would be needed to insure that the excavated sediments could be disposed of onsite under the final cap. If the timing of the excavation were to be delayed and the cap is complete before excavation, then an off-site disposal location would be required.

The capital cost estimate for excavation and on-site disposal of the sediments is from $2,650,000 (15,000 cubic yards) to $4,435,000 (45,000 cubic yards). If these materials are disposed of offsite the costs will increase to an estimated total of between $4,150,000 (15,000 yds) and $8,935,000 (45,000 yds). Implementation of this alternative would result in a significant short term disturbance of this sensitive habitat.

Time to Implement:6 months

Direct Capital Cost:
$2,650,000 to $8,935,000
Estimated Annual Costs:
None-Monitoring costs are included in Alt.#1

Alternative 4B: Eastern Marsh Channel Monitoring

This alternative consists of the elements of Alternative 1: no action that involve monitoring and sampling of the Croton Marsh area. No active remedial efforts are included under this alternative for the eastern channel area. Current studies have shown that the continued decline in biomass predicted by previous studies has not occurred. This is primarily due to the invasion of this area by phragmites which is a highly productive plant species. The marsh is valuable habitat for bird and reptile species that are of special concern and contains plants that are on the New York State Watch List. Based on the sediment sampling results under this monitoring alternative, if significantly higher concentrations of contaminants are found the impacts will be reevaluated.

Time to Implement: None

Direct Capital Costs: None
Estimated Annual Costs: None
(Monitoring costs included in Alt.#1)

B. EVALUATION OF ALTERNATIVES

During the detailed evaluation of alternatives, each alternative is assessed against the seven evaluation factors which were presented in Section V of this ROD. Since alternatives 4A and 4B deal exclusively with the Eastern Marsh Channel, they will be compared to each other in conjunction with the proposed source control alternative.

1. Source Control Alternatives

Alternative 1 would not be protective of human health and the environment due to the long-term risks identified in the risk assessment and briefly summarized in Section III.C of this ROD. Alternatives 2 and 2B would have equal overall protectiveness since they both isolate and contain the waste in the long-term. Alternative 3 would be the most protective of this local area as it would totally remove the waste and relocate it to several permitted land disposal facilities.

Alternatives 2, 2B and 3 would substantially comply with ARARs while Alternative 1 would not. Part 360 would be complied with for all alternatives except Alternative 1. Groundwater and surface water standards/background quality would eventually be achieved by all alternatives except Alternative 1 by eliminating or isolating the waste mass as the source of contamination and allowing natural attenuation to occur. The amount of time to achieve water standards/background quality will vary with Alternatives 2, 2B or 3 but is estimated to take 15, 8, or 6 years respectively based on the groundwater model. In the eight (8) years it would take Alternative 2B to achieve water standards/background quality, Alternative 2 will have reduced the contaminant loading by over 90 percent. Accelerating the capping schedule by two years by proceeding with the design of the cap prior to this ROD has resulted in a greater reduction in contaminant loading to the Hudson River than would result from 15 years of actively pumping the leachate under Alternative 2B.

Alternative 3 has the greatest long-term effectiveness followed by Alternatives 2B and 2 (equal values), then alternative 1. None of the remedies is considered permanent or results in a reduction of toxicity or volume in that the hazardous waste would not be treated. This is due to the heterogenous nature and the size of the CPSL which make it impossible to locate the hazardous waste. The mobility of the waste is reduced by Alternative 3 the most, followed by Alternatives 2B, 2 and 1 in that order.

Alternative 2 has the greatest short-term effectiveness in that it has a relatively short time to implement with a significant rapid reduction in mobility and therefore, excellent short-term effectiveness. Alternative 1 can be implemented the fastest but has no reduction in mobility and therefore is not effective in the short-term. Alternative 2B would take

longer to implement than Alternative 2 and would have similar short-term benefits. Alternative 3 would take much longer to implement than Alternatives 1, 2 or 2B and also has the greatest potential for short-term exposures due to dust and volitilization of organics during excavation of the waste.

Alternative 1 is the easiest to implement and the lowest in cost since no action would be taken. Alternative 2 is the easiest "action alternative" to implement and least cost followed by Alternatives 2B and 3 respectively.

2. **Croton Marsh Eastern Channel Sediment Alternatives**

Alternative 4A is more protective than Alternative 4B in the long-term due to the removal of sediments which have elevated metal concentrations. However, the removal of sediments in Alternative 4A also poses a potential short-term ecological threat due to physical disturbance of the adjacent areas and the potential for suspended sediments to escape from the containment dams needed to excavate this area. However, a release of sediments from a containment dam would only be expected during a severe storm event.

The only ARARs for sediments would be administrative, i.e., dredging permits. Alternative 4A would comply with this ARAR by obtaining necessary permits while no permit would be required for Alternative 4B.

The channel is a depositional area and as such will begin to reaccummulate Hudson River sediments immediately after removal of the siltation control devices associated with Alternative 4A. The apparent lower quality of the eastern channel may be due in part to the dissimilarity of this channel to the others present. The eastern channel is the only channel studied that completely dewaters during periods of low tide, whereas the others maintain some standing waters.

Once the landfill is capped and proper leachate and stormwater control systems begin operating, the eastern channel should experience a significant change in hydraulic and chemical loading. NYSDEC expects that only clean precipitation-induced surface water discharges will be occurring in the eastern channel in the future. The stormwater management system includes settling basins which have been designed to eliminate any detrimental transport of sediments to the Hudson River. These stormwater discharge points will be monitored under the County's general stormwater discharge permit. The chemical loading from landfill leachates should decrease relatively rapidly (90 percent in 8 years) based upon the groundwater modeling performed during the RI/FS. Since the migration pathway from the landfill to the marsh has existed for over 60 years the driving forces behind these conditions are expected to be remedied by Alternative 2.

The Department has determined that remediation of the sediments was impracticable since the cost was considered to be excessive for the expected benefits that would be realized by the biotic community. Alternative 4A's estimated cost would be a minimum of $2,650,000 for on-site disposal up to a maximum of $8,935,000 for off-site disposal.

VII. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Residents and environmental groups in the immediate vicinity of the site have shown very strong interest in the Croton Point Landfill site throughout the remedial process. Public meetings and other events have been held to update the community on remedial activities, as summarized in the following chronology:

September, 1989: A public informational meeting concerning the remedial program and the Title 3 State Assistance Program was held at the Croton Village Municipal Building.

September, 1990: A public informational meeting was held at the Croton Village Municipal Building to present the results of the RI work to date and to present the preliminary plans for the early cap.

October, 1991: Westchester County held a public hearing in the Village on their Draft Environmental Impacts Statement: "Proposed Dredging for Materials Delivery: CPSL." Due to several issues including community concerns, the County did not pursue the dredging option.

November 25, 1992: The Department of Environmental Conservation (DEC) announced the availability of its Proposed Remedial Action Plan (PRAP) to the general public.

December 14, 1992: A public meeting was held at the Croton Village Municipal Building to present the PRAP.

December 24, 1992: In response to community requests, DEC extends the formal public comment period on the PRAP to January 15, 1993.

A Citizen Participation Plan for this site was developed and implemented jointly by Westchester County and DEC. All major reports were placed in document repositories in the vicinity of the site and made available for public review. A public contact list was developed, expanded as needed throughout the project, and used to distribute information and meeting announcements.

Comments received regarding the Proposed Remedial Action Plan (PRAP) have been addressed and are documented in the Responsiveness Summary (Exhibit D).

VIII. SELECTED REMEDY

The selected remedy consists of Source Alternative 2 and Marsh Alternative 4B which would incorporate the final design plans for the leachate transfer system and the Cap System. The major elements of the proposed remedial program can be summarized as follows:

- Construction of an engineered capping system to isolate the landfilled wastes from rainfall and human contact. This cap system will extend over both the original fill area and the Ballfield cell.

- Construction of an active landfill gas collection system to prevent exposure to landfill emissions. This system will include active removal of landfill gases with a gas flare to destroy the volatile components of the gas.

- Construction of a stormwater diversion system on the site. This system will collect clean, precipitation induced runoff, will eliminate any detrimental discharge of sediments, and bypass the water around the waste mass for controlled discharges to the Hudson River and Croton Bay.

- Construction of a leachate seepage collection system . This system will enclose the landfill perimeter at the toe of the cap. This system will collect and convey leachate to a series of pumping stations for permitted discharge to the sanitary sewer system. The system will have sufficient storage capacity to avoid discharging leachate to the sanitary sewer system during periods of high flows to the sewers (storm events).

- Environmental monitoring to determine the effectiveness of the remedial program. Groundwater, surface waters, leachate, landfill gases, stormwater discharges and marsh sediments will all be subjected to a periodic monitoring program designed to detect any changes in the effectiveness of the remedial program. Groundwater and surface water

parameters will include 6 NYCRR Part 360 baseline parameters annually and routine parameters quarterly at a minimum for the first five years. Subsequent monitoring may vary based on those results. The County must prepare and submit for NYSDOH and NYSDEC acceptance a complete plan for the operational, maintainance and monitoring activities, as well as long-term land uses planned for the landfill after construction. Monitoring of leachate quality will be performed monthly for the first several years to assess any change in leachate quality which may impact the sewage treatment plant's ability to treat it. Should the leachate monitoring indicate a change in leachate quality or the sewage treatment plant's pretreatment requirements change such that the leachate would exceed those pretreatment requirements, pretreatment of the leachate will be implemented.

o Imposition of deed restrictions which limit the future uses of the site to specific non-intrusive activities and restricts the utilization of groundwaters beneath the site in accordance with the operational and maintenance programs to be developed during the Remedial Action.

The estimated net present worth of the selected remedy described above is $33,370,000. This estimate includes $28,700,000 in capital costs and $4,670,000 in present worth of recurring operational and maintenance costs for the 30 year post closure monitoring period. These estimates are based upon a combination of actual bid proposals from contractors and the projected annual operational costs. The transfer components and sections of the leachate collection system are already operating and the costs associated with these components are included in the above figure.

The selected remedy represents the best technical and cost-effective approach from among the assembled alternatives. It recognizes that this site was primarily a municipal landfill and has been inactive for 6 years without any significant remediation. It is readily constructed and results in achievement of the remedial goals. The selected remedy is both protective of both human health and the environment and it recognizes the unique problems presented with a landfill site which is as large as CPSL and contains such a heterogeneous waste mass. The selected remedy allows Westchester County to utilize the parcel upon completion for additional recreational opportunity as an extension of the existing park facility, thereby enhancing the prospects for continued compliance with Part 360. Future use of the site by residents should ensure that any significant settlement of waste, which is the most likely reason for any significant leakage through the cap, will be noticed right away and could be quickly remedied to maintain the cap's integrity. Deed restrictions will ensure that this future use will not result in unacceptable exposure to contaminants.

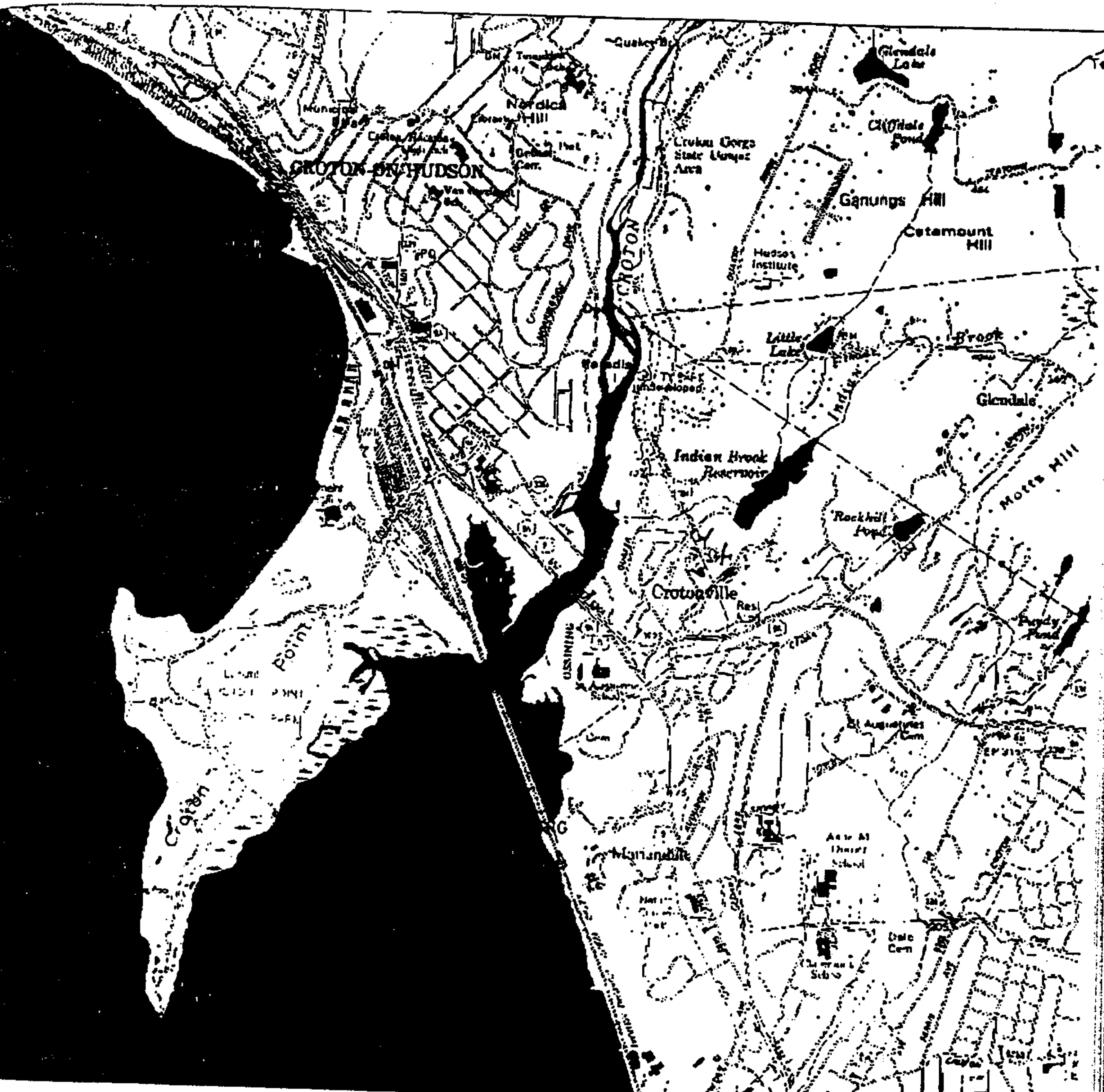
Because this remedy will not allow for unlimited use and unrestricted exposure to wastes, within five years after completion of remedial action, a five year review will be conducted. This evaluation will be done to ensure that the remedy continues to provide adequate protection of human health and the environment.

IX. DOCUMENTATION OF SIGNIFICANT CHANGES

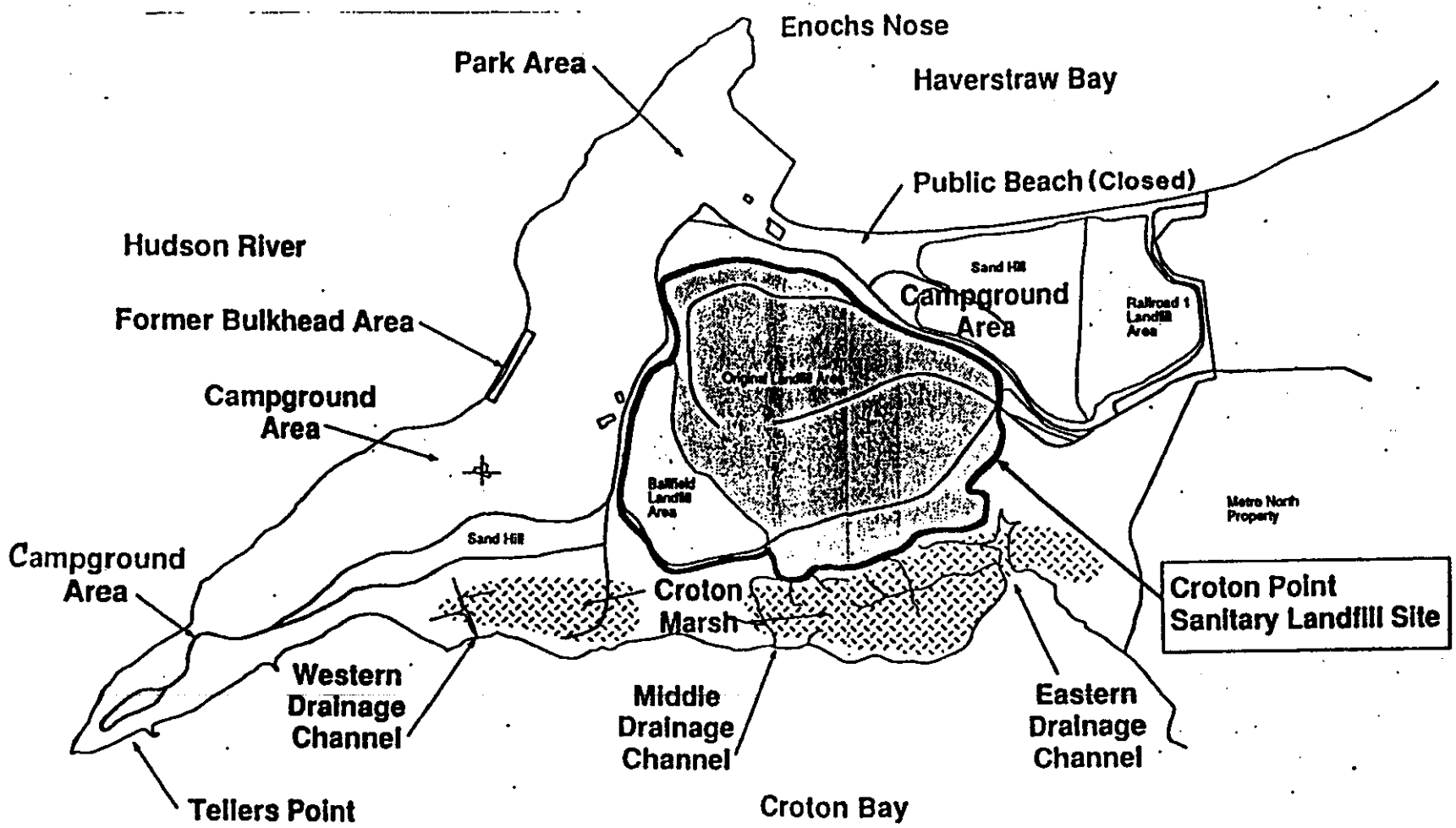
The remedy presented to the public in the November 1992 PRAP proposed Feasibility Study Alternatives 2 and 4B, design and construction of an engineered multimedia capping system with a leachate seepage collection system, a stormwater management system, an active gas collection system, and environmental monitoring. Although no comments or new information were received during the comment period for the PRAP which would fundamentally change the nature of the State's preferred remedy, there have been some minor modifications/clarifications of the remedy based on the comments received. The leachate collection system will have sufficient storage capacity to avoid discharging leachate to the sewer system during high flow events; the stormwater management system will eliminate any detrimental

discharge of sediments to the Hudson River; and vegetative plantings in specific areas of the landfill cover will provide a conducive habitat to various forms of wildlife while not compromising the cap's integrity with deep root systems.

FIGURE 1



CROTON-ON-HUDSON
Nordica Hill
Croton Gorge State Unique Area
Glendale Lake
Ganungs Hill
Catamount Hill
Hudson Institute
Little Lake
Brook
Glendale
Indian Brook Reservoir
Rockhill Pond
Motts Hill
CROTON
Crotonville
Croton Point
Croton
USSINING
St Augustines Cem
Quaker Br



General Site Map

FIGURE 2

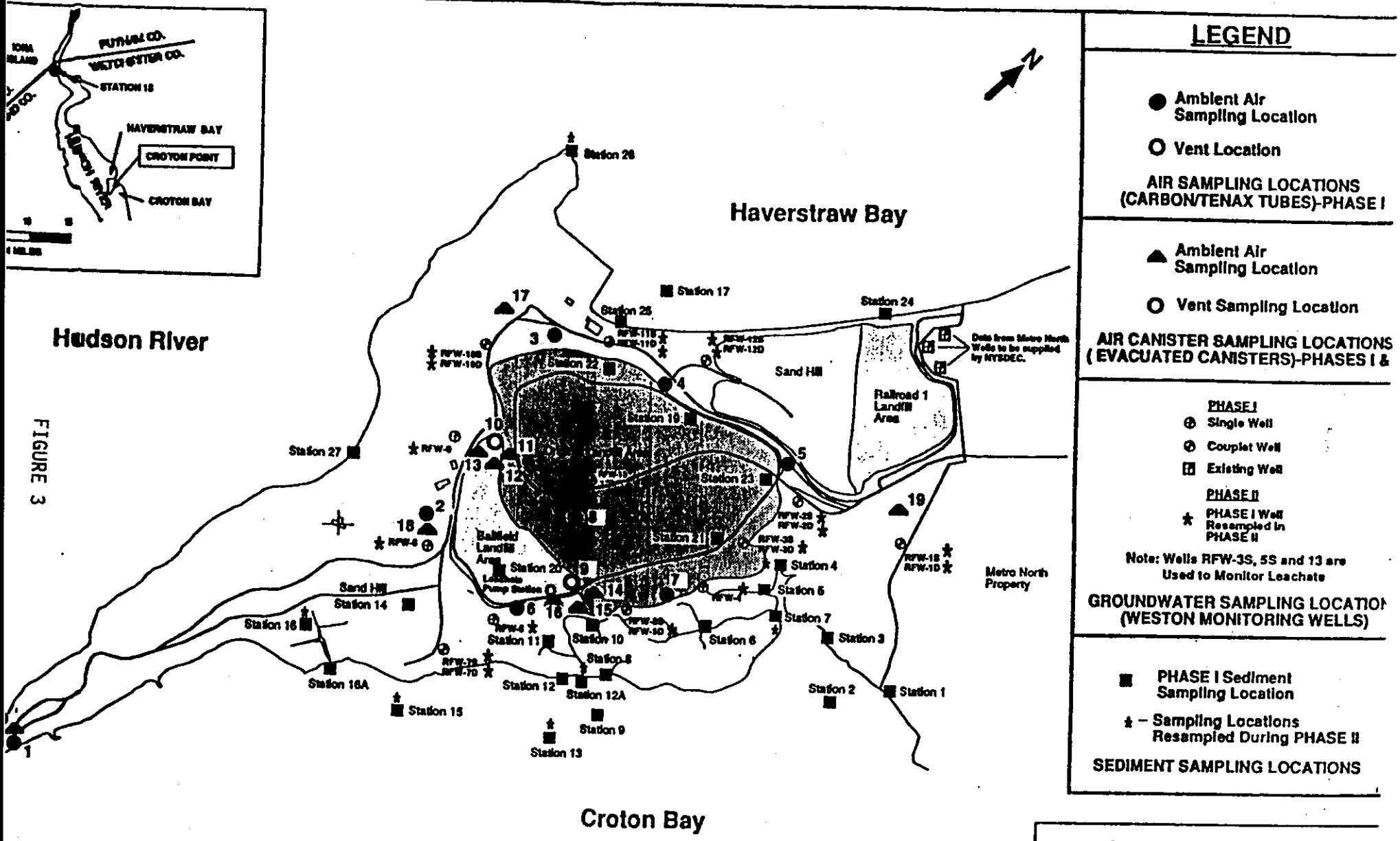


FIGURE 3

LEGEND

- Ambient Air Sampling Location
- Vent Location

AIR SAMPLING LOCATIONS (CARBON/TENAX TUBES)-PHASE I

- Ambient Air Sampling Location
- Vent Sampling Location

AIR CANISTER SAMPLING LOCATIONS (EVACUATED CANISTERS)-PHASES I &

PHASE I
- Single Well
- Couplet Well
- Existing Well

PHASE II
- PHASE I Well Resampled in PHASE II

Note: Wells RFW-3S, 5S and 13 are Used to Monitor Leachate

GROUNDWATER SAMPLING LOCATION (WESTON MONITORING WELLS)

- PHASE I Sediment Sampling Location
- ★ – Sampling Locations Resampled During PHASE II

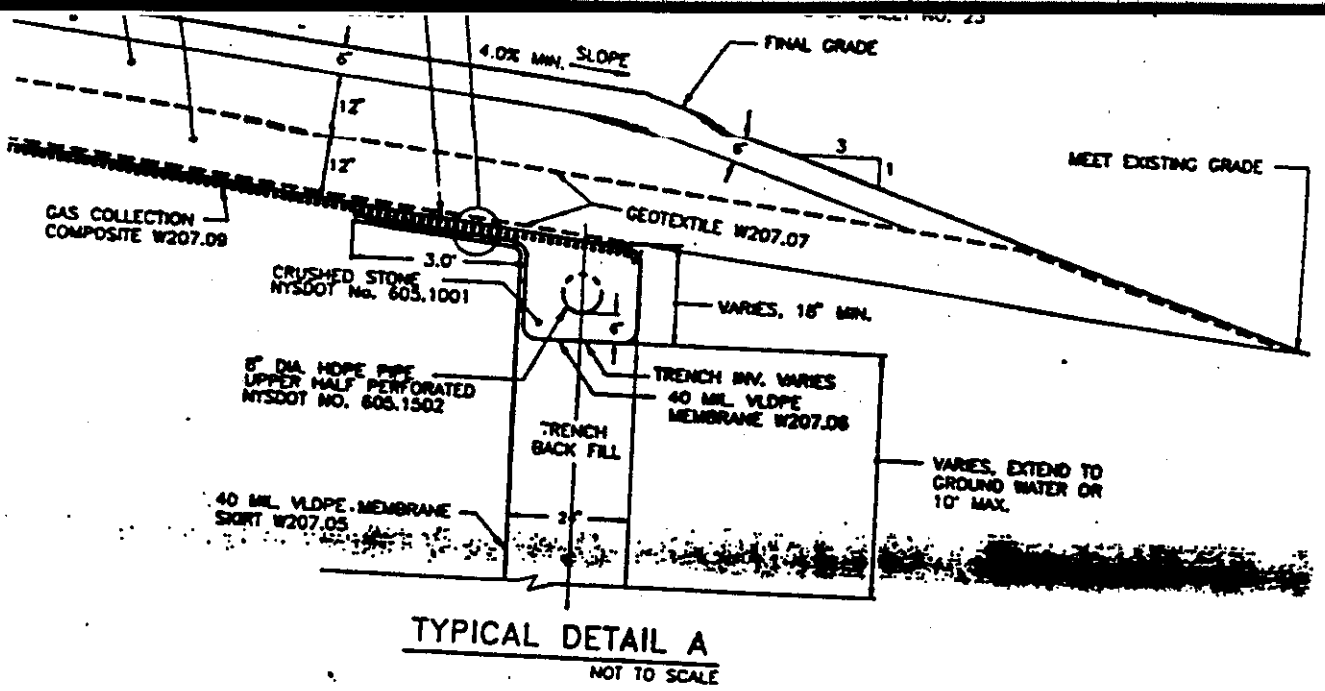
SEDIMENT SAMPLING LOCATIONS

Air, Groundwater and Sediment Sampling Locations

WESTON

Roy F. Weston, Inc.

Croton Point Sanitary La	
Drawn	B.D.
Check	G.S.A.
Date	3/17/89
Revised	9/18/91
FileName	CrotonBase



TYPICAL DETAIL A

NOT TO SCALE

FIGURE 4

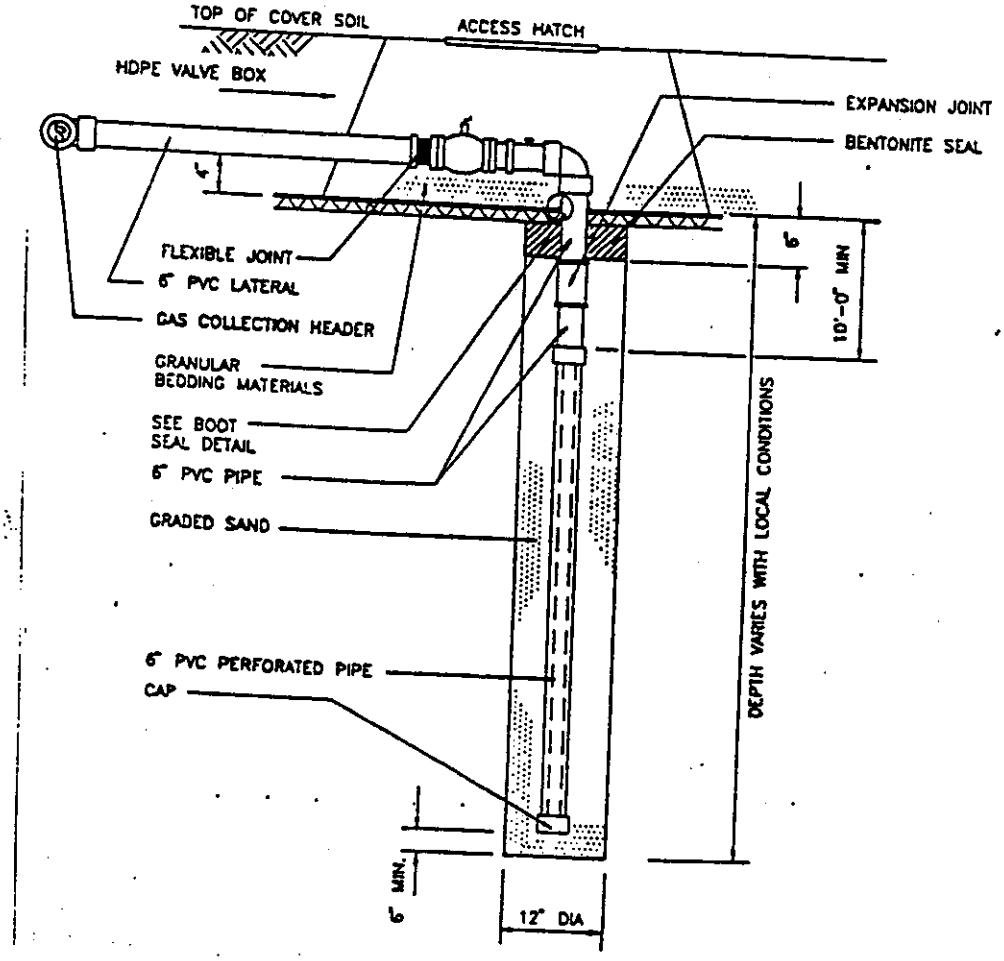


TABLE 7-1

NON-COST COMPARISON OF ALTERNATIVES
CROTON POINT SANITARY LANDFILL

Alternative	Compliance with SCGs	Short-Term Effectiveness	Long-Term Effectiveness	Overall Protection of Human Health and Environment	Reduction of Toxicity, Mobility, and Volume of Contaminants	Implementability
Alternative 1 - No Action with Institutional Controls	Will not meet the TBC requirements of Part 360.	Risks posed by landfill will not be reduced.	No significant lowering of risk associated with landfill.	Risk is above accepted levels for human health and ecologic effects.	No substantial reduction can be expected.	Readily implementable.
Alternative 2 - Containment	Will meet TBC of NYS directive for requirements of Part 360. SCGs will be met.	Additional precautions are required to ensure short-term risk is acceptable during closure activities.	Expected to greatly reduce risk so that quantified risks are lowered to below levels of concern.	With appropriate measures during closure activities, will provide overall protection of human health and environment.	Significant reduction in mobility of contaminants to the environment.	Employ relatively conventional and readily implementable construction methods. Transportation issues can be addressed.
Alternative 2B - Containment with Pump and Treat	Will meet TBC of NYS directive for requirements of Part 360. SCGs will be met.	Additional precautions are required to ensure short-term risk is acceptable during closure activities.	Expected to greatly reduce risk so that quantified risks are lowered to below levels of concern.	With appropriate measures during closure activities, will provide overall protection of human health and environment.	Significant reduction in mobility of contaminants to the environment.	Employ relatively conventional and readily implementable construction methods. Transportation issues can be addressed.
Alternative 3 - Offsite Disposal	SCGs will be met.	Additional precautions are required to ensure short-term risk is acceptable during removal and disposal.	Expected to greatly reduce or eliminate risk.	With appropriate measures during removal and disposal, will provide long-term overall protection of human health and environment.	Significant reduction in mobility in the long-term, based on secure disposal.	Complete removal may prove difficult due to the nature and depth of the material. Significant volumes of liquids will be generated. Additional transportation and disposal issues must be addressed.
Alternative 4A - Marsh Remediation	SCGs will be met.	Short terms risks during construction and dredging.	Will benefit from capping. No long term assurance that organic and metal levels will remain low.	Capping will provide significant increase in overall protection of human health and environment.	Capping will reduce mobility of contaminants, no assurance that levels of organics and metals will remain low.	Installation of sheet piling and dewatering of sediment basins - readily implementable. If sediment cannot be placed on landfill before capping, a suitable disposal area must be located.
Alternative 4B - Marsh Restoration No Action	SCGs will be met.	Maintains current state of risk to public; risk to environment will decrease with capping.	Benefit greatly from capping, reduces soil migration to marsh.	Capping will provide significant increase in overall protection of human health and environment.	Capping will reduce mobility of landfill contaminants.	Readily implementable.

TABLE 2

COST COMPARISON TABLE
CAPITAL, OPERATIONAL AND MAINTENANCE COSTS FOR REMEDIAL ALTERNATIVES AT THE CROTON POINT SANITARY LANDFILL, SITE #360001

ALTERNATIVE	CAPITAL COST	NET PRESENT WORTH NOTE 2	O&M COSTS YEARLY
1:NO ACTION	$366,000	$3,917,000	$231,000
2:CAPPING	$28,700,000	$33,370,000	$303,500
2B:PUMP & TREAT W/CAP	$55,380,000	$76,820,000	$1,394,500
3:OFFSITE DISPOSAL	$3,945,530,000	$3,948,050,000	$163,500
4A:MARSH SEDIMENTS NOTE 1	$4,435,000	$4,435,000	NOTE 3

Note 1: Costs are based on the following senario, onsite disposal of approximately 45,000 cubic yards. For offsite disposal costs increase to $8,935,000. Alt 4B has no capital costs.
Note 2: net present worth based on a 30 year period and a discount rate of 5% using 1992 dollars & includes capital costs.
Note 3: There are no annual costs associated directly with this alternative.

TABLE 3

STANDARDS, CRITERIA AND GUIDANCE FOR THE REMEDIAL ACTION

ACTION-SPECIFIC SCGs

6 NYCRR 50:	National Primary and Secondary Ambient Air Quality Standards
6 NYCRR 182:	Endangered and Threatened Species of Fish and Wildlife
6 NYCRR 200:	General Air Provisions
6 NYCRR 212:	General Process Emission Sources
6 NYCRR 257:	Air Quality Standards
6 NYCRR 360:	Solid Waste Management Facilities
6 NYCRR 371:	Identification and Listing of Hazardous Waste
6 NYCRR 375:	Inactive Hazardous Waste Disposal Site Remedial Program

CHEMICAL-SPECIFIC SCGs

USEPA Safe Drinking Water Act (SDWA), MCLs and MCLGs (40 CFR Part 141)

6 NYCRR Parts 700-705:	NYSDEC Water Quality Regulations for Surface and Groundwaters
10 NYCRR Subpart 5-1:	NYSDOH Maximum Contaminant Levels, Public Water Supplies

NYSDEC Air Guide 1 (1991 Printing) - Guidelines for the Control of Toxic Ambient Air Concentrations

LOCATION-SPECIFIC SCGs

6 NYCRR Parts 662-665: Freshwater Wetlands Regulations
National Historic Preservation Act (16 USC 470-470 et seq.)

EXHIBIT A: ADMINISTRATIVE RECORD

CROTON POINT SANITARY LANDFILL

WESTCHESTER COUNTY, N.Y. ID NUMBER 360001

A. "Final Feasibility Study Report for: Croton Point Sanitary Landfill," prepared for Westchester County by Velzy-Weston, Inc.; June 1992 confirmed to September 1992.

B. "Final Remedial Investigation Report for: Croton Point Sanitary Landfill," with appendices, prepared for Westchester County by Velsy-Weston, Inc.; June 1992 confirmed to September 1992.

C. "Contract Documents, Final Design Plans, Specifications, and Information for Bidders for Croton Point Landfill Closure", Westchester County Dept. of Public Works, June 1992

D. "Croton Point Landfill Cover Design Report," prepared by Gibbs/Hill, Inc, for Westchester County, January 1991.

E. "Revised Croton Point Remedial Investigation and Feasibility Study:Interim Report," prepared for Westchester County by Velzy-Weston, Inc.; November 1990.

F. "Croton Marsh Quality and Trends Report," prepared for Westchester County by Velzy-Weston, Inc.; April 1990

G. "Conceptual Design & Constructability of Capping Report for CPSL" prepared for Westchester County by Velzy-Weston, Inc., March 1990

H. Preliminary Site Characterization and Remediation Report for CPSL" prepared for Westchester County by Velzy-Weston, Inc.;Feb 1990

I. "Preliminary Receptor Anaylsis for CPSL:RI/FS" prepared for Westchester County by Velzy-Weston, Inc.;June 1989.

J. "RI/FS Work Plans"prepared for Westchester County by Velzy-Weston, Inc.;April 1989.

K. Order on Consent between NYSDEC and Westchester County, executed on 17 April 1989, Index #W3-0082-8707

L. "CPSL - Background & Synopsis of Key Technical Reports" prepared for Westchester County by Velzy-Weston, Inc.;February 1988.

M. Final Stipulation & Judgement in United States v. Edwin J. Michaelian, filed 8 December 1987.

EXHIBIT A: ADMINISTRATIVE RECORD
continued

N. "Site Inspection Report and Hazard Ranking Model Report" Prepared by NUS Corporation for the United States Environmental Protection Agency, November 1986

O. "1981 Croton Point Landfill Investigation" Prepared by Westchester County Departments of Health & Public Works, July 1982

P. "Report of Environmental Assessment for CPSL" prepared by Dolph Rotfield Associates and Wehran Engineering for Westchester County, November 1980

Q. "Engineering Report & Final Management Plans for Phase II at CPSL" prepared by Dolph Rotfield Associates and Wehran Engineering for Westchester County, November 1980

R. "Environmental Impact Statement for CPSL" prepared by Dolph Rotfield Associates and Wehran Engineering for Westchester County, December 1978

S. "Croton Point Landfill Report" prepared by Mueser,Rutledge,Johnston & DeSimone for Westchester County, March 1978.

T. "Croton Point Terrestrial Assessment Study" prepared by Ecological Analysts, Inc.

U. "Phase I Engineering Report for CPSL" prepared by Dolph Rotfield Associates and Wehran Engineering for Westchester County, December 1976

V. "Summary Report of Groundwater Investigation at CPSL" prepared by Geraghty & Miller, Inc. for Westchester County, May 1976.

W. "Annual Reports concerning CPSL" prepared by Westchester County DPW for the Federal Courts pursuant to Consent Degree, annually 1976 to present.

X. "Phase II Program of Hydrological Analysis At CPSL" prepared by Geraghty & Miller, Inc. for Westchester County, July 1975.

Y. "Croton Point Ecology: Assessment of Waste Disposal Impacts" prepared by Boyce Thompson Institute, January 1975.

Z. "A Plan For Solid Waste Management" prepared by Westchester County, May 1974.

A1. "Investigation of Groundwater Conditions at CPSL" prepared by Geraghty & Miller, Inc. for Westchester County, January 1973.

A2. "Croton Point Sanitary Landfill Leachate Collection System Performance and Operational Procedures" prepared by Savin Engineers, P.C., September 1992.

A3. "Effect of Croton Point Leachate on the Ossining WWTP" prepared by the Westchester County Department of Public Works, January 1993.

EXHIBIT B: PROJECT CHRONOLOGY

CROTON POINT SANITARY LANDFILL

WESTCHESTER COUNTY, NEW YORK

SITE ID NUMBER 360001

1927 - 1986	Westchester County operates a disposal operation on property owned by the County on the Croton Point peninsula in the Village of Croton-On-Hudson.
1972	County is sued in Federal Court by the Hudson River Fisherman's Association for alleged pollution of the Hudson River with refuse.
1973	A report of the groundwater conditions at the landfill is prepared by Geraghty & Miller.
1974	Westchester County prepares a comprehensive Solid Waste Management Study and Plan which identifies the need to continue landfilling operations at Croton Point until new long term facilities can be developed.
1/1975	A report on the status of the Croton Point Ecology, prepared by the Boyce Thompson Institute identifies deteriorating conditions in the Croton Marsh and predicts continued declines.
2/1975	Federal Government and the County reach a final judgement in United States v. Edwin H. Michaelian which requires certain actions to be taken at the landfill site. Annual reports are to be submitted to the USDOJ by the County.
7/1975	Geraghty & Miller, Inc completes a Phase II study of the hydrology of the Croton Point Landfill area for the County.
5/1976	Geraghty & Miller, Inc produce a summary report of existing information concerning the groundwater conditions and impacts of the Croton Point Sanitary Landfill for the County
12/1976	The County receives a Preliminary Engineering Report concerning the planned expansions of the Croton Point Landfill from Dolph Rotfield Associates & Wehran Engineering.
8/1977	The County receives a Phase I Engineering Report concerning the progress of the investigations and designs for the Croton Point Landfill expansions from Dolph Rotfield Associates & Wehran Engineering.

EXHIBIT B: PROJECT CHRONOLOGY
continued

11/1977 Ecological Analysts, Inc submits their Croton Point Terrestrial Assessment Study which details the impacts of the Landfill.

12/1978 The County files Environmental Impacts Statements for the expansion and management of the Croton Point Landfill.

11/1980 The County releases a report concerning Engineering, Final Management Plans and Environmental Assessments of the Croton Point Landfill, prepared by Dolph Rotfield Associates & Wehran Engineering.

7/1982 The County Departments of Public Works and Health complete a comprehensive document titled "The 1981 Croton Point Landfill Investigation" which discusses the health impacts of the site.

11/1986 The USEPA directs NUS Corporation to perform a "Site Inspection Report and Hazard Ranking Model" for the CPSL. NYSDEC utilizes this report to classify the landfill as an inactive hazardous waste site.

12/1987 The County enters into a Stipulation and Order with the Federal Government concerning the CPSL. The County begins negotiations with NYSDEC concerning a Consent Order and Title 3 funding of the Landfill Remediation Program. The County contracts with Velzy-Weston to prepare work plans to investigate and study the Site.

2/1988 Velzy-Weston submits a report entitled "CPSL:Background & Synopsis of Key Technical Reports" to the County and NYSDEC.

4/1989 NYSDEC and Westchester County reach agreement on the documents that govern the current remedial program: the NYS Consent Order requiring a complete remedial program and the work plans for the RI/FS.

5/1989 The County submits an application for State Assistance under Title 3 of the 1986 EQBA to reimburse costs incurred under the landfill remedial program. The State accepts the application with an estimated total cost of $23,800,000 which includes RI/FS ($2,400,000), Design ($700,000) and construction ($20,700,000) costs. The contract is executed in Jan 1990. Field work begins for the RI/FS.

9/1989 A public informational meeting concerning the remedial program and the Title 3 State Assistance Program is held at the Croton Village Municipal Building.

2/1990 The County submits a Preliminary Site Characterization report which includes discussions of the need to eventually cap the site.

DEC requests the County to review the applicability of an early remedial action in the form of a cap over the landfill.

3/1990 The County submits and the DEC accepts a report which shows that a accelerated remedial alternative for the CPSL would be a cap and that this action would not hinder the feasibility of other applicable alternatives. The County solicits engineering proposals for Remedial Design and selects Gibbs & Hill in July 1990 to implement this accelerated remedial action.

4/1990 The County submits the "Marsh Quality and Trends Report" on the Croton Marsh. Interim draft RI reports are prepared in June 1990.

9/1990 A second public informational meeting is held at the Village municipal building to present the results of the RI work to date and to present the preliminary plans for the early cap.

11/1990 The County submits a revised "Interim Report on the RI/FS at CPSL" in response to DEC questions on the 6/1990 draft report.

1/1991 The County submits additional information concerning the revised Velzy-Weston interim report under the title "Data Useability Report:CPSL". The County also submits the "Landfill Cover Design Report" prepared by GH.

3/1991 The County receives a "Preliminary Evaluation of Volatile Emissions at CPSL" from Velzy-Weston. The DEC authorizes the County to proceed with partial construction of the leachate transfer system in response to a County request concerning their obligations under the Federal Order.

4/1991 The DEC and the County conclude negotiations for the scope of work for the second phase of work needed to complete the RI/FS. The work begins and is completed in the summer of 1991.

8/1991 The County awards a $1,300,000 contract to Sentrail Construction Company for construction of the leachate transfer system which is completed and operational by 4/92. This system begins to dewater the leachate mounds in the 2 lined cells and assists in the management of leachates from the original cell.

10/1991 The County holds a public hearing in the Village on their Draft Environmental Impacts Statement:Proposed Dredging for Materials Delivery:CPSL". Due to several issues the County does not pursue the dredging option and final design activities begin.

EXHIBIT B: PROJECT CHRONOLOGY
continued

4/1992	The DEC approves the final "Design Plans and Specifications for Capping: CPSL" and authorizes the County to solict contractors.
10/1992	The DEC accepts the final submission entitled "Final RI/FS reports:CPSL" and utilizes the report to prepare this PRAP. The County awards a contract to construct the cap at CPSL for a Total capitol cost of $24,400,000 top Brairwood Construction Co.

EXHIBIT C

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION
INACTIVE HAZARDOUS WASTE DISPOSAL REPORT

CLASSIFICATION CODE: 2 REGION: 3 SITE CODE: 360001
EPA ID: NYD980508055

NAME OF SITE : Croton Point Sanitary Landfill
STREET ADDRESS: Croton Point Avenue

TOWN/CITY:	COUNTY:	ZIP:
Croton-on-Hudson	Westchester	10520

SITE TYPE: Open Dump- Structure- Lagoon- Landfill-X Treatment Pond-
ESTIMATED SIZE: 100 Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: County of Westchester
CURRENT OWNER ADDRESS.: 148 Martine Avenue, White Plains, NY
OWNER(S) DURING USE...: County of Westchester
OPERATOR DURING USE...: County of Westchester
OPERATOR ADDRESS.....: 148 Martine Avenue, White Plains, NY
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From apx.1951 To 1973

SITE DESCRIPTION:
This site encompasses the old landfill area, on a 2 mile long penninsula on the eastern shore of the Hudson River located southwest of the Village of Croton-on-Hudson. It was operated as a landfill between 1927 and 1978 and is closed. The peninsula also contains a County Park including a bathing beach and a camping area. Numerous studies have documented a significant impact on the surrounding environment from the landfill. NYS groundwater standards (Class GA) have been exceeded for chlorides, iron, manganese, phenols, lead, and benzene. Numerous organics have been detected in leachate sediment. Hazardous waste disposal at this site has been confirmed through RTK information. NYS freshwater wetlands are immediately adjacent to the site. A lithium battery fire occured in April 1981. Leachate discharges from the landfill into the Hudson River have been documented.

A DEE consent order has been signed for an RI/FS and remedial action with EQBA funding. The RI/FS is in progress. The landfill cap is in the design stage. The leachate collection system is in progress. Construction of leachate transfer lines began in the summer of 1991.

HAZARDOUS WASTE DISPOSED: TYPE	Confirmed-X	Suspected- QUANTITY (units)
Mixtures of Flammable Liquids (D001)		25 Tons
Phosphoric Acid (U145)		495 Gallons
Trichloroethane (U226)		555 Gallons
Methylene Chloride (U080)		440 Gallons
Rinsewater for Phosphoric Acid (U145)		495 Gallons

SITE CODE: 360001

ANALYTICAL DATA AVAILABLE:
Air- Surface Water-X Groundwater-X Soil- Sediment-X

CONTRAVENTION OF STANDARDS:
Groundwater-X Drinking Water- Surface Water-X Air-

LEGAL ACTION:

TYPE..: Consent Order-DEE State- X Federal-
STATUS: Negotiation in Progress- Order Signed- X

REMEDIAL ACTION:

Proposed- Under design-X In Progress- Completed-
NATURE OF ACTION: Engineered capping systems, leachate collection

GEOTECHNICAL INFORMATION:
SOIL TYPE: Sand, peat, silt, and clay
GROUNDWATER DEPTH: Unlined part of L.F. below GW table

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Several areas of environmental degradation have been identified. Disposal of hazardous wastes has been confirmed. Groundwater contamination is possible. Subsurface discharges to the Hudson River may endanger the fishery.

ASSESSMENT OF HEALTH PROBLEMS:

The landfill is located next to a large County Park on the Hudson River that is mostly used during the summer. Several potential exposure pathways exist on-site and are being addressed by remedial actions currently in place or planned for the near future. The potential exposures associated with contaminant migration from the landfill asssociated with surface water runoff and leachate are being addressed by the expansion of a leachate collection system already in operation on-site and the planned proper closure of the landfill. Swimming in the Hudson River is not allowed at this park due to high coliform counts. A portion of the park used for overnight camping has been temporarily closed by the Westchester County Health Department due to concerns with the documented migration of contaminated soil-gas from the Landfill. A gas extraction system has been installed to recapture this soil-gas plume. Potable water on Croton Point is provided from public water supplies from inland sources.

C2

EXHIBIT D

RESPONSIVENESS SUMMARY

CROTON POINT LANDFILL INACTIVE HAZARDOUS WASTE SITE (360001)

INTRODUCTION:

The issues and questions addressed in the following Responsiveness Summary were raised during a public meeting held by the New York State Department of Environmental Conservation (DEC) on December 14, 1992 at the Croton Village Municipal Building in Croton-on-Hudson, New York and in various letters received during the comment period which began November 25, 1992 and ended January 15, 1993. The purpose of the meeting was to discuss the results of the Remedial Investigation/ Feasibility Study (RI/FS) of the Croton Point Landfill Site (#360001) and receive comments on DEC's Proposed Remedial Action Plan (PRAP) for the site. Representatives of the DEC, the New York State Department of Health (DOH) and Westchester County were present at the meeting.

A second meeting followed the PRAP meeting at which the County updated the public on the status of the cap construction. While the second meeting did not discuss the PRAP, some of the more significant issues raised at the second meeting are addressed in this summary.

The following organizations and individuals submitted written comments regarding the proposed remedy during the comment period:

- Richard Herbek, Village Manager, Croton-on-Hudson
- Robert Weissman, President, HMB Acquisition Corporation
- Hilary Kitasei, President and Ginger Griffin, Co-chair Natural Resources, League of Women Voters
- Gudrun LeLash, Executive Director, Federated Conservationists of Westchester County, Inc.
- Nina McCall, President, Saw Mill River Audobon Society, Inc.
- Beth Gelber, Environmental Associate, Scenic Hudson
- Henry Webb and Barbara Lariar, Croton-on-Hudson, NY
- Donald Kent, Environmental Associate, CLEARWATER

The following individuals submitted written comments which were received on February 8, 1993 (after the close of the comment period):

- Robert Elliott, Mayor, Village of Croton-on-Hudson
- Jan H. Wines, Chair, Conservation Advisory Council, Village of Croton-on-Hudson

Even though these comments were received late they have been addressed in this Responsiveness Summary.

Copies of all the written comments will be included in the repositories along with the transcript of the public meeting.

QUESTIONS AND RESPONSES:

This summary is organized by issue rather than a listing of all questions presented at the meeting and in writing.

Issue 1: Requests that the comment period be extended two weeks to allow individuals and organizations to comment due to the holiday season and the volume of information to review. A request that the extended comment period be further extended to February 1, 1993.

Response: Since the request to extend the comment period was timely and justified, the comment period was extended 16 calendar days to January 15, 1993 for a total comment period of 50 days. The request for an additional extension was not granted, however, comments received shortly after the January 15th deadline were considered.

Issue 2: Under the contractor's proposed material transport method, a private road running through the Half Moon Bay development would be used. There was an objection to the capping contractor's use of that private road by an alleged owner of a portion of that road.

Response: The Half Moon Bay Homeowners Association (HMBHA) responded back to the alleged owner that he was mistaken about which road was to be used and therefore was mistaken about his ownership of the road.

Issue 3: Why must materials delivery be solely by truck? Why weren't options such as rail or barge delivery left open?

Response: Westchester County pursued other materials delivery options prior to finalizing the plans and specifications for bidding the cap. In October 1991, the County held a public hearing on their Draft Environmental Impact Statement: "Proposed Dredging for Materials Delivery: CPSL." Based on several issues including community concerns about river dredging, the County dropped this option. The County then, with State approval, left the contractors three materials delivery options in the plans and specifications: truck, rail or low draft barges (which would not require river dredging). The response from contractors

demonstrated that trucking was the preferred delivery method over rail or barge both economically and for ease of scheduling the shipment of materials to maintain the project schedule.

Without knowing the exact sources of capping materials, the overall environmental impacts from the three possible delivery methods are virtually the same since material must be trucked from the mining source to either a truck-to-rail loading facility, a truck-to-barge loading facility, or directly to the site. Overall impacts due to dust generation may be slightly worse from barge or rail delivery than truck delivery since the soils would have to be handled twice.

While overall environmental impacts from the three possible delivery methods are virtually the same, the local environmental impacts would be greater for the trucking option versus the rail or barge option. However, the long-term, local environmental benefit of remediating the landfill via capping outweighs the short-term local environmental impacts from trucking.

In response to public concerns about traffic congestion due to trucking, the County has limited the hours which its contractor can truck materials to the site to non-peak traffic hours (8:30 am - 4:30 pm).

Both the County and the State are required by law to get the most competitive prices when procuring goods and services for taxpayer funded projects such as the Croton Point Landfill remediation project. Placing restrictions on the delivery of materials for this project such as requiring a minimum percentage of materials being delivered by rail or barge or even truck could be considered by the State Comptroller as unnecessary restrictions which would limit the number of contractors able to respond to this solicitation. The State Comptroller can require us to rebid the project if bid specifications are determined to be too restrictive. Since rail access is controlled by one entity, requiring rail delivery could result in the elimination of most bidders.

For all of the above reasons, both the County and the State decided to leave all three delivery options open to all contractors who chose to bid on the project.

Issue 4: There is concern about the nature of fill to be used for the cap. Using toxic or untreated fill could present a problem due to the nature of the site.

Response: The contractor will need several sources to provide the necessary 500,000 cubic yards of soils to cap the landfill. Each source that the contractor uses requires a number of submittals to the County's engineer which are also available to DEC. These submittals include: a source certificate that certifies that the soil comes from a certain area, certification regarding non-contamination with a hazardous or industrial waste, and a twenty pound sample of the soil to the engineer.

Issue 5: Will the park be closed during the duration of the cap construction? How will park road damage due to trucking be addressed and how will the overall park be left when construction is complete? Will the cap provide suitable habitats for wildlife? What activities will beallowed in thecapped area once it is turned over to the County Parks Department as a passive use park?

Response: There is no plan to close the park due to cap construction activities. However, several restrictions within the Croton Point peninsula will restrict some park activities such as vehicle access to all areas. The site Health and Safety Plan (HASP) will also contain contingencies to close the park if necessary based on ambient air monitoring. This situation is not expected but is included in the HASP as a precautionary measure.

The construction project includes the rebuilding and restoration of the entire park road. The contractor will also be required throughout the construction to maintain the road in passable condition.

After construction, the landfill will be seeded and landscaped. Vegetative plantings in specific areas of the landfill cover will be chosen to provide habitats conducive to various forms of wildlife while not compromising the cap's integrity with deep root systems. Outside the capped area (staging or other areas disturbed by construction), the contractor is required to bring those areas back to the original condition or better. Photographs will be taken prior to the start of construction to document the original conditions.

The Departments of Environmental Conservation and Health will require the County to place permanent deed restrictions on the capped area. While the details of

these restrictions have not been finalized, in general they would restrict any intrusive (excavation) activities and prevent any use of groundwater at the site.

Issue 6: Will the methane gas being collected under this remedy be used to generate electricity? Will there be any incomplete combustion of the volatile organics?

Response: The Record of Decision (ROD) requires the installation of an active landfill gas (methane being one component) collection system with a gas flare to destroy the volatile organic components of the gas. An active gas collection system and flare exceeds the current regulatory requirements of passively venting landfill gases to the atmosphere. It also allows the flexibility to easily convert the flare system to an energy recovery facility which also would combust the gas.

Although this ROD does not require energy recovery from the gas, the County is presently evaluating whether it is cost-effective to convert the flare system to one that recovers energy.

The results from the flare stack emissions testing (required under DEC's air permit program) demonstrate that the flare is able to destroy in excess of 99.9 percent of the volatile organics which exceeds the control requirements of the air permit for this flare.

Issue 7: There are concerns about the handling of the leachate generated by the Croton Point Landfill. Will the "toxics" be treated by the Ossining Sewage Treatment Plant (STP) or simply passed through the plant and discharged to the Hudson River untreated? If the "toxics" end up in the STP sludge what is their fate in the incinerator where the sludge is burned? Won't the toxic material just enter the air or water at some other discharge point? Will the leachate composition change in the future and how will that be addressed by this remedy?

Response: The STP's pretreatment limits determine whether or not the leachate must be treated prior to discharge of the leachate to the sewer system. Those pretreatment limits are set by the STP operator in order for the STP to meet the discharge limits set by DEC. In essence, the DEC regulates what comes out of the STP discharge pipe while the STP regulates what can enter their system.

Prior to sending the leachate to the Ossining STP, the County's engineering consultant evaluated this STP's ability to properly handle and treat the leachate contaminants and the ultimate fate of those contaminants (refer to the report, "Croton Point Sanitary Landfill Leachate Collection System Performance and Operational Procedures" prepared by Savin Engineers, P.C.). The evaluation showed that all parameters of the leachate comply with the Westchester County Environmental Facilities Act and pretreatment requirements.

The evaluation of leachate impacts on the STP demonstrated that none of the current State Pollution Discharge Elimination System (SPDES) Permit Action Levels would be exceeded. With the addition of the leachate to the waste stream entering the SPT, none of the projected STP effluent (discharge) concentrations would exceed the Permit Action Level. For the metals of concern, the projected plant effluent/SPDES Permit Action Level in pounds per day are as follows: copper (1.48/8.4) nickel (1.47/3.9) zinc (4.1/5.3). Subsequent to this engineering evaluation the Westchester County Department of Public Works prepared a report titled, "Effect of Croton Point Leachate on the Ossining WWTP." Table 2 of this report provides the following actual discharge rates in pounds per day: copper 1.47, nickel <1.83, and zinc <1.83.

The contribution of these metals from the leachate in pounds per day are: copper <0.02, nickel 0.15, and zinc <0.80. ("<" means that compound was below the detection limit and is less than the number shown).

The sludge from the Ossining STP is presently incinerated. Since metals from the CPL leachate will end up in the STP sludge, the impact of those metals on sludge disposal was also evaluated by the County's consultant prior to sending the leachate to the Ossining STP. That evaluation demonstrated that the metals content of the sludge would be within the current limits for incineration of the sludge. That evaluation also demonstrated that with or without the leachate metals loading to the sludge, the proposed USEPA standard for nickel would be exceeded (refer to Westchester County Department of Public Works Report "Effect of Croton Landfill Leachate on the Ossining WWTP," Appendix B, Table 3). If the proposed USEPA standard for nickel is promulgated, the STP would have to upgrade its treatment system regardless of whether the leachate is sent.

As part of the operation and maintenance plan, the leachate will be sampled monthly (at the landfill before it enters the sanitary sewer) for the first few years after capping. This data will be evaluated to determine if any changes in leachate quality would warrant pretreatment of the leachate prior to discharge to the sanitary sewer. Also, if regulations change and pretreatment requirements become more stringent and warrant pretreatment, then on-site pretreatment of the leachate will be implemented.

Issue 8: What type(s) of on-site treatment would be necessary to implement alternative 2B? How much leachate would actually be removed by Alternative 2 versus Alternative 2B?

Response: On-site treatment of leachate was not as clearly defined as the other alternatives in the Feasibility Study (FS), however, the FS does present Alternative 2B: containment with pump and treat, which includes treatment of the leachate. Page 8-5 of the FS also refers the reader to Appendices A and F for further discussion of the pump and treat component of Alternative 2B. DEC carefully reviewed the assumptions used by the County's consultant and the calibration of the groundwater model (Appendix A of the FS presents those results). Based on DEC's experience with mathematical groundwater models the analysis by the County's consultant is reasonable.

Although it does not provide details about leachate treatment, Appendix F does identify the processes needed to pretreat the leachate under active pumping conditions. Those processes would include a chromium reduction system, aeration tank, a first and second stage precipitation system, filtration, neutralization, and a granular activated carbon system. Most metals would end up in a sludge which would require thickeners, a filter press, and sludge disposal. It was assumed that the sludge would be disposed of as a non-hazardous waste (similar to sewage treatment plant sludge). Based on DEC's experience the leachate treatment system described above would provide adequate treatment of the leachate prior to discharge.

It is estimated that Alternative 2B would remove 129 million gallons of leachate over a 15 year period. Based on actual flows recorded to date and projected leachate collection rates it is estimated that in the 15 years beginning April 1992 (when the leachate transfer system began operation), Alternative 2 will remove 127 million gallons of leachate for treatment.

The County's decision, with the DEC's approval, to begin leachate collection and off-site treatment prior to this Record of Decision has resulted in approximately the same volume removal of leachate as pumping and treating leachate for 15 years. High bulk volumes of leachate are currently forming as rain and snow melt water percolate the landfill. The cap will cut the volume of water percolating the landfill producing leachate. Operating a leachate collection system early as we are currently doing is the most effective means of curtailing contaminant rich leachate loading to the environment. The pumping system proposed would only be operational after the cap is in place and would function as an expensive redundant leachate collection system.

The reason these two alternatives result in approximately the same volume of leachate collection is because the existing collection system is in place without the landfill cap (and therefore under maximum leachate generation conditions) while the pump and treat system leachate estimates are with the landfill cap in place. As described in the response to Issue 14, the cap is estimated to reduce leachate generation through infiltration by 99.9 percent.

Issue 9: Pumping and treating leachate (Alternative 2B) is more protective of the environment and will achieve water quality standards seven years sooner than the proposed Alternative 2. Although Alternative 2B would take eight months longer to implement than Alternative 2 it is worth the additional cost to achieve standards quicker.

Response: DEC evaluates the alternatives in accordance with the National Contingency Plan (NCP) criteria described in Section V of this ROD. Both Alternatives 2 and 2B meet the threshold criteria by substantially complying with Applicable or Relevant and Appropriate Requirements (ARARs) and providing overall protection of human health and the environment.

While the commenter noted that Alternative 2B is projected to achieve water quality standards in 8 years as opposed to Alternative 2 taking 15 years, in those same 8 years, Alternative 2 would reduce contaminant loadings to the Hudson River by 90 percent (refer to FS Report, Appendix A, Tables 4 through 10). In addition, by accelerating the capping schedule 2 full years by proceeding with the cap design prior to this ROD, the net environmental benefit is greater than pumping and treating leachate for 8 or even 15 years (refer to FS,

Appendix A, Tables 4 and 11). By capping the landfill sooner, two years of chromium (along with other contaminants) loading to the river will be eliminated, which equates to a reduction of 46.7 pounds of chromium discharge to the river. Fifteen years of pumping and treating versus capping alone equates to a reduction of only 36.1 pounds of chromium discharge to the river. Other contaminants would follow this same trend. For these reasons, the DEC believes these two alternatives provide essentially equal long-term effectiveness in protection of the environment. Short-term effectiveness is about the same for these two alternatives with no significant adverse impacts expected under either alternative. While Alternative 2B provides a slightly greater reduction in mobility of leachate contaminants than Alternative 2, it is more difficult to implement due to the added construction and operation of an on-site pretreatment plant and it is significantly greater in cost than Alternative 2. Based on the above, the DEC believes that Alternative 2 provides a better balance between long and short-term effectiveness; reduction of toxicity, mobility, and volume; cost, and implementability than Alternative 2B.

Issue 10: If the leachate collection system is unsuccessful in collecting all of the leachate from the landfill, discuss any impacts the leachate which escapes will have on the environment. The benefits of a slurry wall should be reconsidered.

Response: Using the leachate collection estimates in the response to Issue 8, it is clear that the leachate collection system in the selected remedy will capture most but not all of the leachate which is estimated to be within the waste mass. The leachate collection system is intended to prevent the direct discharge of leachate to the surrounding surface waters. The remainder of the leachate in the waste mass will travel downward below mean sea level where it will slowly seep out laterally into the subsurface of the Hudson River. Because this process will take place slowly and the Hudson River provides a dilution of approximately 55,000 to 1, landfill leachate loading will have a negligible impact on surface water quality. The landfill has been leaching significant quantities of leachate into the surrounding environment for 60 years with present estimates of over 55 million gallons per year. Although some quantity of leachate will continue to migrate into the river subsurface approximately 99.9% of the rain and snow melt water will be eliminated from leachate generation by the cap. The landfill leachate mound (water level within the waste) will be starved of

water and will begin to fall as leachate continues to be removed via the collection system. The substrate is not an adequate liner to enhance with a slurry wall and eliminate hydraulic connection with the river discharge system. A slurry wall would only be effective at the CPL in combination with a pump and treat system (Alternative 2B). A slurry wall alone would only retard the flow of water from beneath the landfill to the river. A pumping system within the confines of the slurry wall is needed to reverse the flow of water from the river towards the slurry wall. The reasons why Alternative 2 was selected over Alternative 2B are explained in the response to Issue No. 9.

Issue 11: The selected remedy should be amended to include the installation of an active deep well leachate collection system capable of removing a significant mass of contaminants from the landfill.

Response: As discussed in the response to Issue 9, the acceleration of the capping schedule by two years will result in a greater reduction of contaminant mass loading to the environment than pumping the leachate mound for 15 years. Deeper groundwater is generally less contaminated than the leachate mound within the waste mass as demonstrated by comparing the shallow or S-series monitoring well results to the deep or D-series monitoring well results presented in the RI Report (refer to RI Tables 4.7-1 and 4.7-2). Therefore, pumping from a deep well collection system would not reduce contaminant mass loading to the environment as much as pumping the leachate mound or accelerating the capping schedule by two years.

Issue 12: The selected remedy should include the installation of a temporary leachate recirculating system until the technology is available for the effective treatment of leachate at sewage treatment facilities. In addition, once the on-site treatment system is installed, it could be used to introduce cleansing agents to the landfill to remove the toxins and pollutants.

Response: In April 1992, the County ceased recirculating leachate at the landfill and began to send leachate to the STP with the concurrence of the DEC. By stopping leachate recirculation, the height of leachate within the waste will begin to decrease and will result in less leachate being discharged to the environment. Therefore, to temporarily recirculate leachate would result in a greater impact to the environment. There is no need to hesitate in sending contaminants to a STP because the consultant's analysis clearly shows the plant is fully

capable of processing the landfill leachate and meeting all regulatory limits at the present time.

We presume the cleansing agents referred to by the commenter are surfactants or similar compounds used to make relatively insoluable organic compounds much more soluble in water (acids can also be used to mobilize metals). While such methods are suitable for remediating relatively small volumes (less than 100,000 cubic yards) of contaminated soils or waste in a contained treatment system (concrete or steel tanks), these methods are neither effective nor suitable for a large volume of waste (11 million cubic yards) in-place where containment and control of these fluids would be impractical. Mobilizing metals and organics in this manner would create a much greater impact on the environment than leaving the site unremediated.

Issue 13: Provide a list of parameters for which the County will test the various environmental media.

Response: Groundwater and surface waters will be sampled and tested for 6 NYCRR Part 360 baseline parameters annually and routine parameters quarterly at a minimum for the first five (5) years. Routine parameters include ammonia, nitrate, COD, TOC, TDS, sulfate, alkalinity, phenols, chloride, total hardness, turbidity, potassium, sodium, iron, manganese, magnesium, lead, cadmium, and calcium. Baseline parameters include all the routine parameters plus total Kjeldahl nitrogen, BOD, color, boron, aluminum, antimony, arsenic, beryllium, barium, chromium (total and hexavalent), copper, mercury, nickel, selenium, silver, thallium, zinc, cyanide and volatile organics. Landfill gases will be sampled from the collection pipes and tested for volatile organics and combustible gas concentration. Stormwater discharge testing will be set by the DEC under the County's general stormwater discharge permit.

Marsh sediments will be tested for arsenic, cadmium, copper, lead, mercury, and silver at a minimum. Leachate will be tested monthly for the first several years for biological oxygen demand (BOD), total suspended solids, total organics, and various metals including antimony, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc at a minimum.

The above parameters will be included in the long-term monitoring plan, however, the review of the County's plan by DEC and DOH may result in the addition of other parameters. Subsequent to the first five (5) years of

monitoring the parameter list may be reduced based on trends in the data.

Issue 14: Since the long-term effectiveness of the proposed remedy is based on the long-term ability of the cap to minimize the infiltration of water into the landfilled waste, what measures will be taken to insure the cap's integrity in the long-term? How will typical causes for cap failures such as freezing and thawing of the liner, burrowing animals, impact of heavy equipment during installation, and pinholes during manufacture and construction, be addressed? Why not use a composite cap such as 3-feet of clay between two layers of 100 millimeter very low density polyethylene VLDPE? Even if the cap is 100 percent effective in perpetuity, tidal influences from the Hudson River will continuously draw contaminants from the site. This lateral flow should be monitored and reduced if possible.

Response: The cap for the CPL has been specifically designed to resist stresses induced by frost heave, differential settlement, and temperature changes. During installation, the liner will be protected by a cushion layer below and at least one foot of soil will be placed on the liner before heavy equipment is brought above it. The gravel (rock) drainage layer above the liner should protect it from burrowing animals. Close quality control must be performed by the contractor with strict quality assurance conducted by the County's engineer in order to meet the DEC approved plans and specifications. DEC also provides weekly oversight of the construction activities.

While all of these measures should insure that a sound cap is constructed, the critical part of any cap's function is long-term maintenance. As one commenter noted, "the price of freedom is eternal vigilance and we must be ever vigilante of this remedy." DEC requires an operation and maintenance plan for this site which will include environmental monitoring and inspections of the cap for erosion, cracking, differential settlement, etc. However, since this site will become an extension of the Croton Point Park and a future habitat for birds and other wildlife, the DEC anticipates a significant number of public observers will also be "inspectors" of this cap in the future. DEC encourages the general public to contact the County and the State if they detect any signs of failure of the cap.

The DEC believes the cap designed for the CPL will perform as well as a composite cap based on the approved cap design, the estimated infiltration rate, and continued long-term maintenance. It is estimated that 99.9 percent of the current infiltration of water into the landfill will be eliminated by the cap design proposed for the CPL (see FS Appendix A) which is comparable to a composite cap. This reduction in infiltration is based on proper installation and maintenance of the cap. Procedures are in place to provide for proper installation of the cap as described above. As mentioned above, the long-term maintenance of the cap is expected to be very good due to the future use of the site as a park. Long-term monitoring of groundwater will assess whether significant lateral migration of contaminants persists due to tidal influences.

Issue 15: To prevent surface erosion and damage caused by plant roots it is recommended that a drought resistant species such as white clover and weeping lovegrass be planted on the cap's topsoil layer. It is recommended that a natural meadow with shrub thickets on the edges be established on the final cover topsoil to provide critical sustenance for large numbers of breeding, migratory, and wintering species. There are numerous plants and shrubs that have shallow root systems that will not impact the liners.

Response: Both white clover and weeping lovegrass have already been included in the final cover planting specifications. The second recommendation is excellent and is being carefully reviewed by DEC's biologists and engineers with the goal of providing suitable habitat for breeding, migratory, and wintering species of birds and other wildlife while not compromising the cap's integrity.

DEC may also solicit additional input from the public before finalizing the selection and locations of plants and shrubs.

Issue 16: The marsh is being overtaken by large stands of common reed which is of limited value to wildlife. Why not dredge the middle and eastern channels of the Croton marsh, which contain the highest concentrations of organics and metals, and replant with a native species such as narrow leaved cattails? An earlier interim report had shown decreased species diversity in Croton Marsh. Why are we now saying that we see no effect on the species and contaminant levels in this area?

Response: The ROD identifies impacts to the Croton Marsh in Section III.C., Summary of Site Risks. The benthic communities in the eastern channel showed impacts and impacts to birds that directly consume benthic invertebrates are possible.

The Department has determined that remediation of the marsh sediments is impracticable since the cost is considered to be excessive for the expected benefits that would be realized by the biotic community. Therefore, the DEC has selected Alternative 4B which will provide for continued monitoring of Croton Marsh sediments. With the discharge of a significant portion of clean stormwater to the eastern channel of this marsh it is expected to reduce salinity and improve the water quality in the eastern channel. The stormwater management system has been designed with sedimentation basins to eliminate any deliterious discharge of sediments to the marsh.

Removal of the stands of common reed followed by plantings of cattails would not be effective in preventing the reestablishment of the common reed. The areas would have to be dredged three to four feet to change the hydraulic characteristics of the marsh and make it more favorable to cattails for this to be effective.

Issue 17: What potential health hazards will exist to humans or wildlife on the capped landfill? How will capping mitigate the existing health risk concerns (given the worst case scenario used in the study)?

Response: The existing potential risks to humans which would exceed USEPA criteria (defined as a Hazard Index greater than 1.0 or an increased Carcinogenic Risk of one in one million) include: soil ingestion for an adult residing on the landfill (resident adult), an adult worker on-site, and a child playing on the landfill; soil dermal exposure to a resident adult, adult worker, or anyone (adult or child) recreating on the landfill; ambient air inhalation to a resident adult or an adult worker. These are called potential risks because none of these pathways of exposure are presently complete - no one lives or works or recreates on the landfill.

Although a quantitative risk assessment for wildlife is not possible, similar potential exposures of wildlife to contaminated soils on the landfill currently exists.

The cap will provide a physical barrier (30 inches of soils and an impermeable synthetic membrane) to prevent human exposures to landfilled materials and to minimize the potential for wildlife exposures. The active gas collection system will eliminate any adverse potential exposures to ambient air by flaring the landfill gases.

These measures should prevent human exposures and, therefore, reduce the hazard index to less than 1.0 and the cancer risk to less than one in one million for anyone using the landfill. For these reasons, the NYSDOH believes the remedy chosen for the Croton Point Landfill is protective of public health.