Department of Environmental Conservation

Division of Hazardous Waste Remediation

Record of Decision

Clarkstown Town Landfill
Town of Clarkstown, Rockland County
Site Number 344001

November 1995

Funded Under Title 3
of the
1986 Environmental Quality Bond Act

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* MICHAEL D. ZAGATA, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Clarkstown Town Landfill Inactive Hazardous Waste Site
Town Of Clarkstown, Rockland County, New York
Site No. 344001

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the **Clarkstown Town Landfill** inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The selected remedial action is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the **Clarkstown Town Landfill** Inactive Hazardous Waste Site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

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

Description of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the **Clarkstown Town Landfill** and the criteria identified for evaluation of alternatives the NYSDEC has selected **closure according to 6NYCRR Part 360 and consolidating off-site wastes for the Clarkstown Town Landfill**. The components of the remedy are as follows:

Acquiring the Northeast Area, consolidating the waste from the Northwest Area onto the Main Landfill Area, grading the Main Landfill and the Northeast Area and installing a 6NYCRR Part 360 cap over these areas;

Relocating tributaries along the southern edge of waste to allow for installing the cap;

Relocating the leachate collection and installing a vertical barrier around the Northeast Area;

Draining, filling and capping the two existing leachate collection basins under the Main Landfill;

Replacing the existing leachate force mains with new equalization tanks and connecting to the existing sewage pumping station;

Installing an active landfill gas collection and treatment system;

Continuing leachate disposal to Rockland County Sewer District Number 1;

Installing a vertical barrier along all four sides of the Ballfield Area to convert it to a wetland;

Constructing replacement wetlands; and,

Long term monitoring of ground water and landfill gas.

New York State Department of Health Acceptance

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

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

This alternative requires recording of a Deed Restriction by the Town of Clarkstown in the Rockland County Clerks Office, NYSDEC approved institutional controls, and the notification and approval by the NYSDEC and the NYSDOH of a substantial change of use of the site. This Deed Restriction will meet the requirements set forth in 6NYCRR Part 375-1.6 as promulgated in May of 1992.

11/28/95
Date

Michael J. O'Toole, Jr.
Division Director
Division of Hazardous Waste Remediation

RECORD OF DECISION

CLARKSTOWN TOWN LANDFILL

Clarkstown, Rockland County, New York
Site No. 344001
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SECTION 1: SITE DESCRIPTION

The Clarkstown Town Landfill is in the hamlet of West Nyack in the Town of Clarkstown in Rockland County, New York State. It is about 1000 feet south of New York State Route 59 on the west side of New York State Route 303. The landfill is on town property except two areas that extend onto private property in the northwest and northeast corners. Waste disposal occurred on an area of about 100 acres located on a larger Town-owned area. Figure 1 shows the site's location.

The landfill is at the bottom of a basin in an urban area. High ground on the east and north sides allows runoff into the basin from surrounding roadways and commercial properties. The landfill's west and south sides border streams and wetlands. The wetlands are both United States Army Corp. of Engineers and NYSDEC regulated wetlands. The identification number for the NYSDEC wetland next to the landfill is NA-4. A small stream runs partly along the landfill's north side. The streams and the wetlands are all tributary to the Hackensack River. The Hackensack River is about 500 feet to the west and flows southerly toward New Jersey. The Hackensack River is a Class A stream used for drinking water both upstream and downstream of the landfill. Figure 2 shows site features.

There are several inactive hazardous waste sites within one mile of the Clarkstown Town Landfill. These include:

- Nyack Town Landfill, Site Number 344006. This site operated as a municipal dump before closing in 1973. This is a Class 5 site and remediation is complete. Pyramid Development Corporation intends to incorporate this site into a proposed mall.
- Orange & Rockland Utilities, Site Number 344014. Transformers were stored and repaired and PCB disposal is confirmed at this site. This site is a Class 2 site and has a remedial investigation underway.
- Xerox Corporation, Site Number 344021. Soil and ground water contamination with halogenated solvents has been confirmed at this site. The remedy is substantially complete and ground water treatment is underway at this Class 2 site.
- Chromalloy (SEQUA), Site Number 344039. This site is a manufacturing facility where tetrachloroethene and chromium contamination is confirmed in soil and ground water. This site is a Class 2 site and has a remedial investigation underway.

Figure 3 shows the location of these sites.

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

Waste disposal at this site began in the 1940's before the Town owned the property. The Town bought the land in the 1950's and operated the landfill until December 31, 1990. The Town and the NYSDEC signed an Order on Consent ending waste disposal. Waste was also received from the towns of Greenburgh, Orangetown and Ramapo. Waste tetrachloroethene was disposed at the landfill.

2.2: Remedial History

When New York issued the Part 360 Solid Waste Regulations in 1977, the Town applied for a permit to operate the landfill. During the permitting process, the landfill was studied which included installing ground water wells and soil and ground water testing. The permit was denied due to contamination that violated regulations. The Town and the NYSDEC then entered into an Order on Consent that allowed the Town to correct the regulation violations. Actions taken by the Town included installing a leachate collection system and a soil cover and monitoring ground water. When the leachate collection system was installed, Muddy Brook was rerouted to the southwest side of the landfill. The Town discharges collected leachate to Rockland County Sewer District Number 1. Waste disposal was also allowed to temporarily continue if the monies received were deposited into a remedial account. These funds could only be used for the cleanup of the landfill. The Town was further allowed to build a solid waste transfer station at the site. Waste disposal stopped on December 31, 1990 after the solid waste transfer station was built. A Remedial Investigation/Feasibility Study was also required by the Order. The remedial account funds mentioned above paid for the Remedial Investigation/Feasibility Study. Additional funds remain to partially fund the design of the selected cleanup program. This Proposed Remedial Action Plan explains the Remedial Investigation/Feasibility Study results.

SECTION 3: CURRENT STATUS

3.1: Summary of the Remedial Investigation

The RI defined the nature and extent of contamination resulting from previous site activities. RI work occurred during the Summer and Fall of 1990 with additional work between the Summer of 1991 to Fall of 1993. A report entitled **Final Remedial Investigation Report, Clarkstown Sanitary Landfill RI/FS, April 10, 1995**, describes the RI activities.

The RI activities consisted of the following:

- Surface water and sediment samples were taken from the Hackensack River, its tributaries and the wetlands around the landfill. The purpose was to see if landfill discharges affect either water or sediment quality.
- A surface geophysical survey to locate the landfill boundaries on the north, west and south sides.
- A subsurface geophysical survey to see if a peat layer existed in the landfill's southwest corner.
- Installing soil borings and monitoring wells to sample soils and ground water for chemical analysis and

physical properties for hydrogeologic conditions.

- Sampling surface soil to see if soils contribute to on- and off-site contamination.
- Excavating test pits in the northeast and southeast corners to identify the type, amount and depth of the waste present.
- Sampling soil gas and ambient air to see if landfill gas emissions contribute to air contamination.
- Investigating ground water to find out how fast and which direction it flows.
- Sampling leachate to see if it contributes contamination.

To decide which media (soil, ground water, etc.) are contaminated at levels of concern, the RI analytical data were compared to environmental Standards, Criteria, and Guidance (SCGs). Ground water, drinking water and surface water SCGs identified for the Clarkstown Town Landfill site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of the NYS Sanitary Code. Background conditions, NYSDEC soil cleanup guidelines for the protection of ground water, and risk based remediation criteria were used to develop remediation goals for soil and sediment. Soil gas analytical data could not be compared to regulatory values as none exist for this medium. The ambient air analytical data were compared to short term ambient air guideline concentrations to assess any impacts.

Site remediation is required based upon comparing the RI results to the SCGs and considering potential public health and environmental exposure routes. This is summarized below. Detailed information can be found in the RI Report.

Soil

Surface and sub-surface soils were analyzed for the full Target Compound List parameters. Sub-surface soil samples were also collected during the transfer station construction. The sampled soils were covered by an interim soil cover after sampling. These soils were studied to find out if any soil had contamination warranting removal from the landfill. No contamination was found in these soils which would require them to be removed from the landfill.

Surface Water

Surface water samples were only analyzed for some Priority Pollutant parameters. Upstream results were compared against downstream results to identify landfill impacts. Table 1 and Table 2 show on a site-wide basis the contaminants detected in the surface water for upstream and downstream locations, respectively. This comparison was also done for each tributary stream located next to the landfill. The results showed contaminants both upstream and next to the landfill. The downstream sample on the Hackensack River showed little contamination. Organic contamination in the surface water was higher in the upstream samples than the samples next to the landfill. For example, tetrachloroethene was found at an upstream location at 7.0 micrograms per liter and next to the landfill at 2.0 micrograms per liter. The downstream sample on the Hackensack River showed little organic contamination. Inorganic contamination from the landfill is present in the surface waters around the landfill. The inorganic compounds were found more often than organic compounds. While upstream surface water did contain inorganics, the waters next to the landfill contained higher levels of inorganic contamination. Beryllium and chromium exceeded their applicable surface water quality standard next to the landfill. Surface water quality standards for aluminum, iron and manganese were exceeded both next to the landfill and at either upstream or downstream locations. Downstream, the Hackensack River did not show significant inorganic contamination from the landfill.

Sediments

Sediment samples were analyzed for full Target Compound List parameters and for total organic carbon content. Hexavalent chromium analysis was added for samples taken later in the investigation. The sample results were compared to New York State Sediment Criteria. Upstream results were compared against downstream results to identify landfill impacts. Table 3 and Table 4 show on a site-wide basis the contaminants detected in the sediments for upstream and downstream locations, respectively. This comparison was also done for each tributary stream located next to the landfill. Generally, upstream sediment samples showed higher concentrations and greater frequencies of organic and semi-volatile organic compounds than either adjacent or downstream sediment samples. While New York State Sediment Criteria Lowest Effect Level and Severe Effect Level were exceeded for inorganics upstream, downstream and next to the landfill, generally, the downstream and adjacent samples showed higher concentrations of inorganic compounds than the upstream locations. On the landfill's south side in Muddy Brook, downstream arsenic was twice upstream, downstream cadmium was thrice upstream, downstream chromium was twice upstream, downstream iron was twice upstream, downstream manganese was fourfold upstream, downstream nickel was twice upstream and downstream zinc was twice upstream. In the stream on the landfill's north side, downstream cadmium was thrice upstream, downstream lead was twice upstream and downstream mercury was twice upstream. In the northern part of the adjacent wetland, downstream aluminum was up to thrice upstream, downstream arsenic was greater than upstream and downstream potassium was twice upstream. All detected metals except calcium, lead, magnesium and zinc were elevated in the southern part of the adjacent wetland. Generally, downstream contaminant levels were about twice that of upstream.

Ground Water

Ground water collected during the initial sampling was analyzed for the Target Compound List parameters and some leachate indicator parameters. The samples taken later in the investigation were analyzed for the NYCRR Part 360 volatile organics and metals, cyanide and leachate indicators. In an attempt to confirm earlier detections of Target Compound List pesticides and PCBs, Wells RFW-2 and RFW-3D samples were also analyzed later for these parameters. The results were compared to New York State ground water standards and evaluated for frequency of occurrence, upgradient/downgradient levels and historical data. Table 5 and Table 6 show on a site-wide basis the contaminants detected in the ground water for upgradient and downgradient locations, respectively. Table 7 shows the contaminant levels found in the wells installed in the landfill itself.

Although confining soil units are below the landfill and an upward ground water hydraulic gradient impede the downward flow of contaminated leachate, some contamination was found in the lower aquifer. Ground water contamination was found in the wells located around the landfill in both the shallow wells and the deep wells. Downgradient wells showed greater contaminant levels than upgradient wells. The wells installed in the landfill showed the highest levels of contaminants. The wells installed in the landfill contained organic contamination from benzene, ethylbenzene, toluene, xylenes, chlorobenzene, 1,2-dichloroethene, 1,4-dichlorobenzene and bis(2-ethylhexyl)pthalate, all about twice that of their respective standard. Lead was found above ground water standards in landfill well RFW-14 and in downgradient wells at RFW-6S and RFW-7. Zinc and cadmium were also found above ground water standards in RFW-14. The inorganics found in the landfill wells were considered indicators for ground water impacts as they are normally only in ground water at trace levels if at all. These wells showed significant levels of indicator parameters such as total dissolved solids, turbidity, ammonia, chlorides and bromide.

Air

Air samples were analyzed for volatile organic compounds using the United States Environmental Protection Agency Method TO-14. Table 8 shows on a site-wide basis the contaminant levels found in the air sampling done at the landfill. NYSDEC short term ambient air guideline concentrations were not exceeded during the sampling at any ambient air sampling locations; however, benzene, tetrachloroethene and carbon disulfide were found to have average concentrations above the annual ambient guideline concentration at downwind locations. While the analysis showed these exceedances, it is unlikely that the conditions during the air sampling represent the average conditions for the year because these reflected worst case conditions.

The data collected during the Remedial Investigation represents a "snap shot" of the landfill's condition. Landfill records show significant quantities of hazardous waste were disposed in the landfill. Given the landfill's size, the analytical results obtained may not reflect the highest contamination concentrations at the landfill. The Remedial Investigation cannot predict what future releases may be if the landfill is not remediated.

3.2: Summary of Human Exposure Pathways

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

An exposure pathway is the process by which an individual contacts a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Exposure pathways existing at the site include skin contact with sediments by people who wade in the streams and wetlands next to the site and with leachate in both the leachate collection system and the leachate holding ponds on the site. Exposure pathways that could exist at the site include skin contact with soils, ground water and leachate during remedial construction and inhalation of soil gas during remedial construction.

The identified compounds of concern for the sediments are beryllium, carbazole and copper. There is no human health regulatory value for these compounds so no comparison was possible. Consequently, the human health risk from these sediments is considered low although an exposure pathway from contaminated sediments exists.

Many inorganic and organic compounds identified as landfill-related compounds of concern appeared in leachate. The list of these compounds is found on p 6-14 of the RI. Exposure to leachate would be to people working on the collection system or the leachate ponds who contact the leachate. Trespassers could also be exposed to leachate from the leachate collection ponds. While the exposure pathway from contaminated leachate exists, the human health risk from exposure to the leachate is low due to site security and workers taking appropriate health and safety measures.

Many metals were found in sub-surface soils with beryllium, chromium, nickel and zinc identified as compounds of concern. Surface soils also contained a variety of metals; however, beryllium was the only identified compound of concern. As the site has an interim soil cover on it, these soils are not exposed. The exposure pathway from sub-surface soils and surface soils is limited to workers regrading or excavating wastes during remediation. The human health risk from exposure to these soils, consequently, will be low if workers take appropriate health and safety measures.

Ground water site-related compounds of concern include arsenic, barium, beryllium, cadmium, copper, lead, mercury, vanadium, zinc, trichloroethene, PCB, ammonia and nitrite. The exposure pathway from ground water is limited to workers regrading or consolidating wastes done during remediation as no drinking water wells in use are affected by the landfill. The human health risk from exposure to the ground water, consequently, would be low if workers take appropriate health and safety measures.

Soil gas compounds of concern include benzene and vinyl chloride. The exposure pathway for soil gas is limited to workers regrading or consolidating wastes done during remediation as the landfill has an interim cover in place. The human health risk from exposure to soil gas, consequently, will be limited if workers take appropriate health and safety measures.

3.3: Summary of Environmental Exposure Pathways

This section summarizes the types of environmental exposures possibly presented by the site. The Habitat Based Assessment included in the Section 4 of the RI presents a more detailed discussion of the potential affects from the site to fish and wildlife resources. The following pathways for environmental exposure exist:

Surface Water

Ecological risks from the landfill to surface water do not exist on a basin wide basis. Locally, ecological risks exist where detected compounds exceed risk-based ecological criteria. A comparison of the data between upstream, downstream and adjacent sample locations showed the landfill affects surface water quality. The organic compound data showed no effect while the inorganic compound data showed an impact to the surface water quality from the landfill.

Sediments

Ecological risks from the landfill to sediments in the streams and the wetlands exist. The data did not show the landfill is a significant source of organic compounds to the sediments. A comparison of the data between upstream, downstream and adjacent sample locations showed that the landfill has contributed to increased inorganic content in the sediments in the downstream streams and wetlands. The comparison showed the greatest difference between the upstream/downstream for arsenic, chromium, iron, lead, manganese, mercury and nickel. These metals exceeded the Low Effect Level found in the Department's Technical Guidance for Screening Contaminated Sediments, dated November 1993. Similarly, the comparison showed the metals copper and iron exceeded the Severe Effect Level. The large number of Low Effect Level and Severe Effect Level exceedances showed landfill impacts stress the wetlands and streams next to the landfill.

SECTION 4: ENFORCEMENT STATUS

The NYSDEC and the Town of Clarkstown entered into a Consent Order on August 7,1989. The Order obligates the Town of Clarkstown to implement a full remedial program and allows reimbursement to the Town of Clarkstown of up to 75 percent of the eligible cost of the remediation.

SECTION 5: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. These goals are established under the overall goal of meeting all standards, criteria, and guidance (SCGs) and protecting human health and the environment.

At a minimum, the selected remedy will eliminate or mitigate significant threats to the public health and to the environment from the hazardous waste disposed at the site by properly applying scientific and engineering principles.

The goals selected for this site are:

- Reduce, control, or eliminate the generation of leachate.
- Eliminate the threat to surface waters by eliminating any future contaminated surface runoff from the contaminated soils.
- Eliminate the potential for direct human or animal contact with the contaminated soils.
- Mitigate the impacts of contaminated ground water to the environment.
- Prevent, to the extent possible, migration of contaminants from the landfill to sediments and ground water.
- Provide for attainment of SCGs for ground water quality at the limits of the area of concern.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

Potential remedial alternatives for the Clarkstown Town Landfill site were identified, screened and evaluated in a feasibility study. This evaluation is presented in the report entitled **Feasibility Study, Clarkstown Sanitary Landfill, May 30, 1995**. The NYSDEC added another alternative to the analysis based upon cost-effectiveness. This alternative is identified as Alternative 5B below. A summary of the detailed analysis follows.

6.1: Description of Alternatives

The potential remedies will address the contaminated soils, sediments, surface water and ground water at the site.

Alternative 1 - No Action

Present Worth Cost:	$3,270,400
Capital Cost:	$ 451,000
Annual O&M Cost:	$ 250,000
Time to Implement	6 months - 1 year

The no action alternative is a procedural requirement and a basis for comparison. This alternative would include installing security fencing and warning signs, long-term monitoring of surface water, ground water and landfill gas, and beginning deed and site restrictions to prevent use of the landfill property and the underlying ground water. The pumping of the leachate collection system would stop. This is an unacceptable alternative as the site would remain in its present condition and neither human health nor the environment would be adequately protected.

Alternative 2 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas

Present Worth Cost:	$47,400,000
Capital Cost:	$43,900,000
Annual O&M Cost:	$ 310,000
Time to Implement	24 months - 36 months

This alternative would include acquiring the Northeast Area (about 6 acres) and the Northwest Area (about 1 acre). The cost to acquire these parcels would not be eligible for Title 3 funds. Stream relocation in the north and the south would be necessary to place the cap. All waste disposal areas would then be graded and closed according to 6NYCRR Part 360. An active gas collection system would be installed to collect and treat the landfill gas from the capped area. The existing leachate collection system would be improved by installing a slurry wall. Additional leachate collection lines, with slurry wall, would be installed around the Northeast Area, the Northwest Area and the Ballfield Area (about 11 acres). The leachate would continue to be disposed at Rockland County Sewer District Number 1. A stormwater collection system would be installed to control stormwater runoff from the covered landfill. Compensatory wetlands would be constructed to replace wetlands lost to construction. A long-term ground water and landfill gas monitoring program would be carried out.

Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area

Present Worth Cost:	$43,700,000
Capital Cost:	$40,300,000
Annual O&M Cost:	$ 304,000
Time to Implement	24 months - 36 months

This alternative is similar to Alternative 2 except the Ballfield Area would not be capped as it presents no significant impact to human health and the environment.

This alternative would include acquiring the Northeast Area and the Northwest Area. The cost to acquire these parcels would not be eligible for Title 3 funds. These areas and the Main Landfill would then be graded and closed according to 6NYCRR Part 360. Stream relocation in the north and the south would be necessary to place the cap. An active gas collection system would be installed to collect and treat the landfill gas from the capped area. The existing leachate collection system would be improved by installing a slurry wall. Additional leachate collection lines, with slurry wall, would be installed around the Northeast Area and the Northwest Area. The leachate would continue to be disposed at Rockland County Sewer District Number 1. A stormwater collection system would be installed to control stormwater runoff from the covered landfill. Compensatory wetlands would be constructed to replace wetlands lost to construction. Part of the Ballfield Area would be converted to compensatory wetland by installing a slurry wall around it. A long-term ground water and landfill gas monitoring system program would be carried out.

Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas

Present Worth Cost:	$50,200,000
Capital Cost:	$46,800,000
Annual O&M Cost:	$ 300,000
Time to Implement	24 months - 36 months

This alternative would result in waste outside the Main Landfill area being excavated and brought to the Main Landfill area. Stream relocation in the south would be necessary to place the cap. The Main Landfill would then be graded and closed according to 6NYCRR Part 360. An active gas collection system would be installed to collect and treat the landfill gas from the capped area. The existing leachate collection system would be improved by installing a slurry wall. The leachate would continue to be disposed at Rockland County Sewer District Number 1. A stormwater collection system would be installed to control stormwater runoff from the covered landfill. Compensatory wetlands would be constructed to replace wetlands lost to construction. A long-term ground water and landfill gas monitoring program would be carried out.

Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier except Ballfield Area

Present Worth Cost:	$43,600,000
Capital Cost:	$40,200,000
Annual O&M Cost:	$ 303,000
Time to Implement	24 months - 36 months

This alternative is similar to Alternative 3 as the Ballfield Area would not be capped as it presents no significant impact to human health and the environment.

This alternative would result in the waste from the Northwest Area being excavated and brought to the Main Landfill area. Stream relocation in the south would be necessary to place the cap. The Main Landfill and the Northeast Area would then be graded and closed according to 6NYCRR Part 360. An active gas collection system would be installed to collect and treat the landfill gas from the capped area. The existing leachate collection system would be improved by installing a slurry wall. Additional leachate collection lines, with slurry wall, would be installed around the Northeast Area. The leachate would continue to be disposed at Rockland County Sewer District Number 1. A stormwater collection system would be installed to control stormwater runoff from the covered landfill. Compensatory wetlands would be constructed to replace wetlands lost to construction. Part of the Ballfield Area would be converted to compensatory wetland by installing a slurry wall around it. A long-term ground water and landfill gas monitoring program would be carried out.

Alternative 5B - Waste Consolidation and Part 360 Cover

Present Worth Cost:	$42,100,000
Capital Cost:	$38,700,000
Annual O&M Cost:	$ 303,000
Time to Implement	24 months - 36 months

This alternative is similar to Alternative 5A except the existing leachate collection system's vertical barrier would not be replaced. A benefit-cost analysis shows it is not cost-effective to replace the existing vertical barrier.

This alternative would result in the waste from the Northwest Area being excavated and brought to the Main Landfill area. Stream relocation in the south would be necessary to place the cap. The Main Landfill and the Northeast Area would then be graded and closed according to 6NYCRR Part 360. An active gas collection system would be installed to collect and treat the landfill gas from the capped area. Additional leachate collection lines, with slurry wall, would be installed around the Northeast Area. The leachate would continue to be disposed at Rockland County Sewer District Number 1. A stormwater collection system would be installed to control stormwater runoff from the covered landfill. Compensatory wetlands would be constructed to replace wetlands lost to construction. Part of the Ballfield Area would be converted to compensatory wetland by installing a slurry wall around it. A long-term ground water and landfill gas monitoring program would be carried out.

6.2 Evaluation of Remedial Alternatives

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

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

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet applicable environmental laws, regulations, standards, and guidance.

Due to the size of the Landfill, meeting all SCGs is not possible. The waste mass cannot be treated to completely eliminate a continuing source of contamination. Partially meeting some SCGs, such as surface water and ground water standards, is possible with current technology to minimize the adverse impacts of the site.

Alternative 1: No Action would not meet any SCGs as it leaves the site in its present condition that is adversely affecting the environment. Further, off-site leachate migration into ground water and surface water would increase after stopping leachate collection. Alternative 2 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas would meet most ground water and surface water SCGs by reducing infiltration and percolation and collecting contaminated leachate from all waste disposal areas. This alternative would result in significant wetland disruption requiring compensatory wetland mitigation. The capping would not allow for adjacent wetland replacement on Town property. Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area would attain fewer ground water and surface water SCGs than Alternative 2 as it would not cap nor would it collect leachate from all waste disposal areas. This alternative would result in less wetland disruption and compensatory wetland mitigation. It would also allow for adjacent wetland replacement on Town property. Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas similarly would meet most ground water and surface water SCGs as in Alternative 2 by reducing infiltration and percolation and collecting contaminated leachate from the consolidated waste disposal area. Like Alternative 2, this alternative would result in significant wetland disruption requiring compensatory wetland mitigation. The waste consolidation would allow adjacent wetland replacement on Town property. Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier except Ballfield Area and Alternative 5B - Waste Consolidation and Part 360 Cover are similar to Alternative 3 and attain fewer ground water and surface water SCGs than Alternative 2 or Alternative 4 as they would not cap nor would collect leachate from all waste disposal areas. These alternatives would result in less wetland disruption and compensatory wetland mitigation. They would also allow for adjacent wetland replacement on Town property.

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

Alternative 1: No Action would not provide any additional protection over existing conditions that are adversely affecting both ground water, surface water and sediments. Alternative 2 - Part 360 Cover System with Ground Water Barrier for All Waste Disposal Areas and Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas would provide the most environmental protection by minimizing infiltration and percolation by capping all waste disposal areas and reducing generation of contaminated ground water. Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area, Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier except Ballfield Area and Alternative 5B - Waste Consolidation and Part 360 Cover, provide less environmental protection than Alternative 2 and Alternative 4 as all waste disposal areas are not capped. For all alternatives but Alternative 1, the risk to human health is insignificant in each of the above alternatives. For all alternatives but Alternative 1, the environmental risk is similar in each of the above alternatives.

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

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

Alternative 1: No Action would not present any significant adverse short-term impacts as the site remains in its present condition with little construction involved. Alternative 2 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas, Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area, Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas, Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier Except Ballfield Area and Alternative 5B - Waste Consolidation and Part 360 Cover, would all present the potential for adverse impacts due to the construction activities for these alternatives. The capping and leachate collection system work would require health and safety measures to protect workers, the public and the environment. Dust and stormwater runoff control, and air monitoring would be examples of measures to control the adverse impacts. Alternative 4, Alternative 5A and Alternative 5B, which would have the same capping construction activities as Alternative 2 and Alternative 3, would have greater impacts to workers, the public and the environment due to the added work associated with the waste consolidation. Alternative 4 would have significantly more waste consolidation than either Alternative 5A or Alternative 5B that would result in greater risks. Alternative 1 would take about 6 - 12 months to implement with the remaining alternatives taking about 24 - 36 months to implement.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of alternatives after implementation of the response actions. As wastes or treated residuals will remain on-site with any of the remedies, the following items are evaluated: 1) the importance of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative 1: No Action would not provide any reduction in existing risk due to the site. It would be expected for the existing adverse impacts to worsen over time. Alternative 2 - Part 360 Cover with Ground Water Barrier for All

Waste Disposal Areas, Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area, Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas, Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier except Ballfield Area and Alternative 5B - Waste Consolidation and Part 360 Cover would all provide long term reduction in site risks due to the cap placement that would reduce exposure with contaminated soils and landfill gas. They would also reduce risks from contaminated surface water and ground water as the cap would minimize infiltration and percolation through the landfill and would limit contaminated ground water generation. Contaminated ground water which would be generated would be collected and reduce the risks from ongoing contaminant release. These controls would be considered reliable over the long term.

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

Alternative 1: No Action would not change the existing conditions which adversely impact both ground water and surface water as no waste treatment is provided. Alternative 2 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas, Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area, Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas, Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier Except Ballfield Area and Alternative 5B - Waste Consolidation and Part 360 Cover would all provide reduction in contaminant mobility due to the cap placement that would effectively reduce infiltration and percolation through the landfill limiting waste transport through ground water. Contaminated ground water which would be generated would be collected and would further reduce ongoing contaminant release. None of these remedies would reduce either the toxicity or the volume of the site wastes.

6. Implementability. The technical and administrative feasibility of implementing each alternative is evaluated. Technically, this includes the difficulties associated with construction, the technology's reliability and the ability to monitor the remedy's effectiveness. Administratively, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternative 1: No Action would be easily implemented as there is little construction activity and most work is administrative in nature. The remaining alternatives would all require compensatory wetland construction which would increase the administrative and technical difficulty. Alternative 2 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas and Alternative 3 - Part 360 Cover with Ground Water Barrier for All Waste Disposal Areas Except Ballfield Area, would involve extensive construction activities that would increase the difficulty to implement these alternatives. The capping activities are standard on-site construction activities and would not significantly increase the technical difficulty. Alternative 4 - Part 360 Cover with Ground Water Barrier after Consolidating All Waste Disposal Areas, Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier Except Ballfield Area and Alternative 5B - Waste Consolidation and Part 360 Cover would essentially consist of standard capping activities as in Alternative 2 and Alternative 3 but with the added waste consolidation work. The activities required to consolidate the waste are not standard construction work and would increase the difficulty of the project. The potential for exposure to hazardous waste would increase the difficulty of waste consolidation. Alternative 4 would have significantly more waste consolidation than either Alternative 5A or Alternative 5B that would further increase the work's difficulty. The administrative difficulty of each alternative is similar.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present

worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in the following table. While Alternative 3, Alternative 5A and Alternative 5B have similar costs as shown, adding the necessary land acquisition cost would increase both Alternative 5A's and Alternative 5B's advantage as less property is needed.

Cost Element ($)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5A	Alternative 5B
Present Worth	3,270,000	47,400,000	43,700,000	50,200,000	43,600,000	42,100,000
Capital	451,000	43,900,000	40,300,000	46,800,000	40,200,000	38,700,000
Annual O&M	250,000	310,000	304,000	300,000	303,000	303,000

8. Community Acceptance. This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It focuses on the public comments on the Proposed Remedial Action Plan.

The community's concerns regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated in a "Responsiveness Summary" that describes public comments received and how the Department addressed the concerns raised. This Responsiveness Summary is found in Appendix A. The Administrative Record which lists the documents the Department relied upon to select the remedy is found in Appendix B.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 6, the NYSDEC selected Alternative 5B - Waste Consolidation and Part 360 Cover as the remedy for this site. The existing vertical barrier will not be replaced as part of this remedy. The current barrier, while not efficiently collecting leachate, appears to satisfactorily protect human health and the environment through collection of leachate. While installing the slurry wall will reduce collected leachate, the installation cost will exceed savings in leachate treatment costs.

This selection is based upon the equivalent benefits to human health and the environment gained compared to the costlier alternatives evaluated. Alternative 1: No Action would be easily implemented but would not reduce the threats posed by the landfill. Each of the remaining alternatives would be protective to a similar degree but differ in the short term risk during construction.

Due to the size of the Landfill, attainment of all SCGs is not possible. The waste mass cannot be treated to completely eliminate a continuing source of contamination. Partial attainment of some SCGs, such as surface water and ground water standards, is possible with current technology to minimize the site's adverse impacts.

The remedy's estimated present worth cost is $42,100,000. The remedy's construction cost is estimated to be $38,700,000 and the estimated average annual operation and maintenance cost for 30 years is $303,000.

The elements of the selected remedy will be as follows:

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

2. Acquiring the Northeast Area.

3. Consolidating the waste in the Northwest Area onto the Main Landfill Area.

4. Grading the Main Landfill and the Northeast Area and installing a 6NYCRR Part 360 cap over these areas.

5. Relocating the leachate collection and installing a vertical barrier around the Northeast Area.

6. Installing a vertical barrier along all four sides of the Ballfield Area to convert it to a wetland.

7. Relocating tributaries along the southern edge of waste to allow for installing the cap.

8. Draining, filling and capping the two existing leachate collection basins under the Main Landfill.

9. Replacing the existing leachate force mains with new equalization tanks and connecting to the existing sewage pumping station.

10. Installing an active landfill gas collection and treatment system.

11. Continuing leachate disposal to Rockland County Sewer District Number 1.

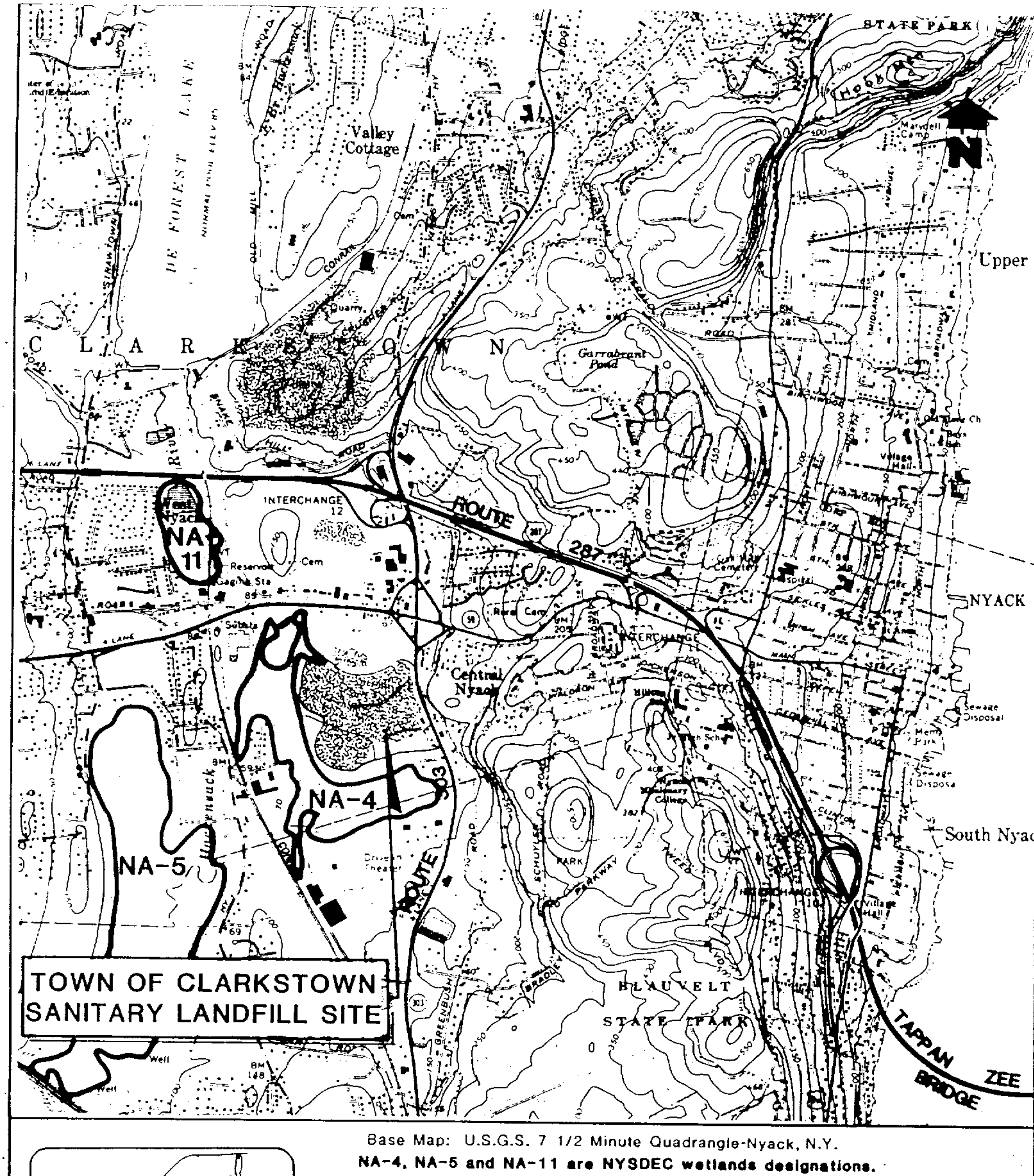
12. Constructing replacement wetlands.

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

This alternative requires recording of a Deed Restriction by the Town of Clarkstown in the Rockland County Clerks Office, NYSDEC approved institutional controls, and the notification and approval by the NYSDEC and the NYSDOH of a substantial change of use of the site. This Deed Restriction will meet the requirements set forth in 6NYCRR Part 375-1.6 as promulgated in May of 1992.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

The community participation activities carried out for the Clarkstown Town Landfill complied with the NYSDEC's statewide citizen participation plan. Some of the project activities exceeded the statewide plan's minimum requirements. Public meetings and fact sheets were additional activities carried out to increase the public's



Base Map: U.S.G.S. 7 1/2 Minute Quadrangle-Nyack, N.Y.

NA-4, NA-5 and NA-11 are NYSDEC wetlands designations.

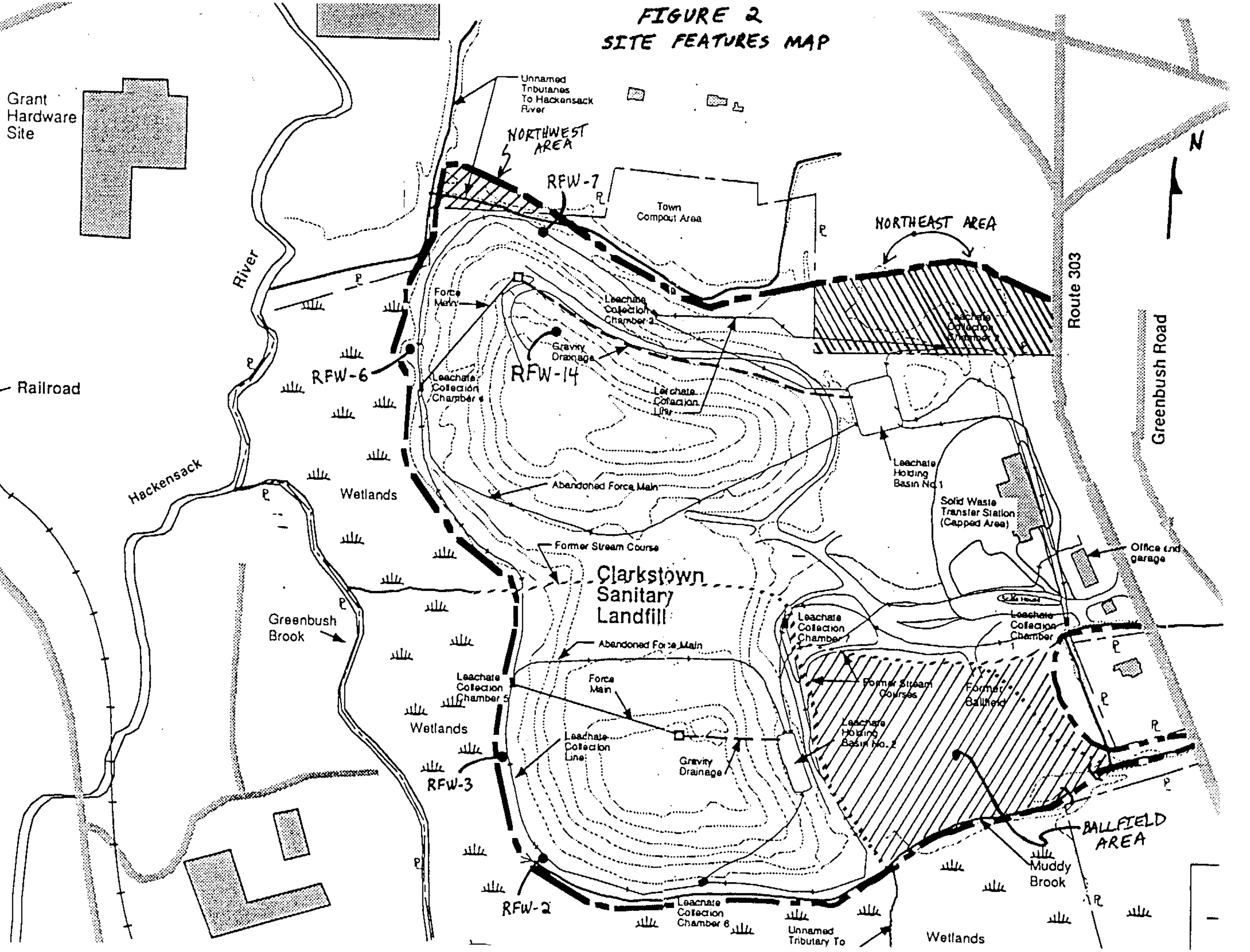
0 1000 2000 3000 4000 5000 6000
1 Mile

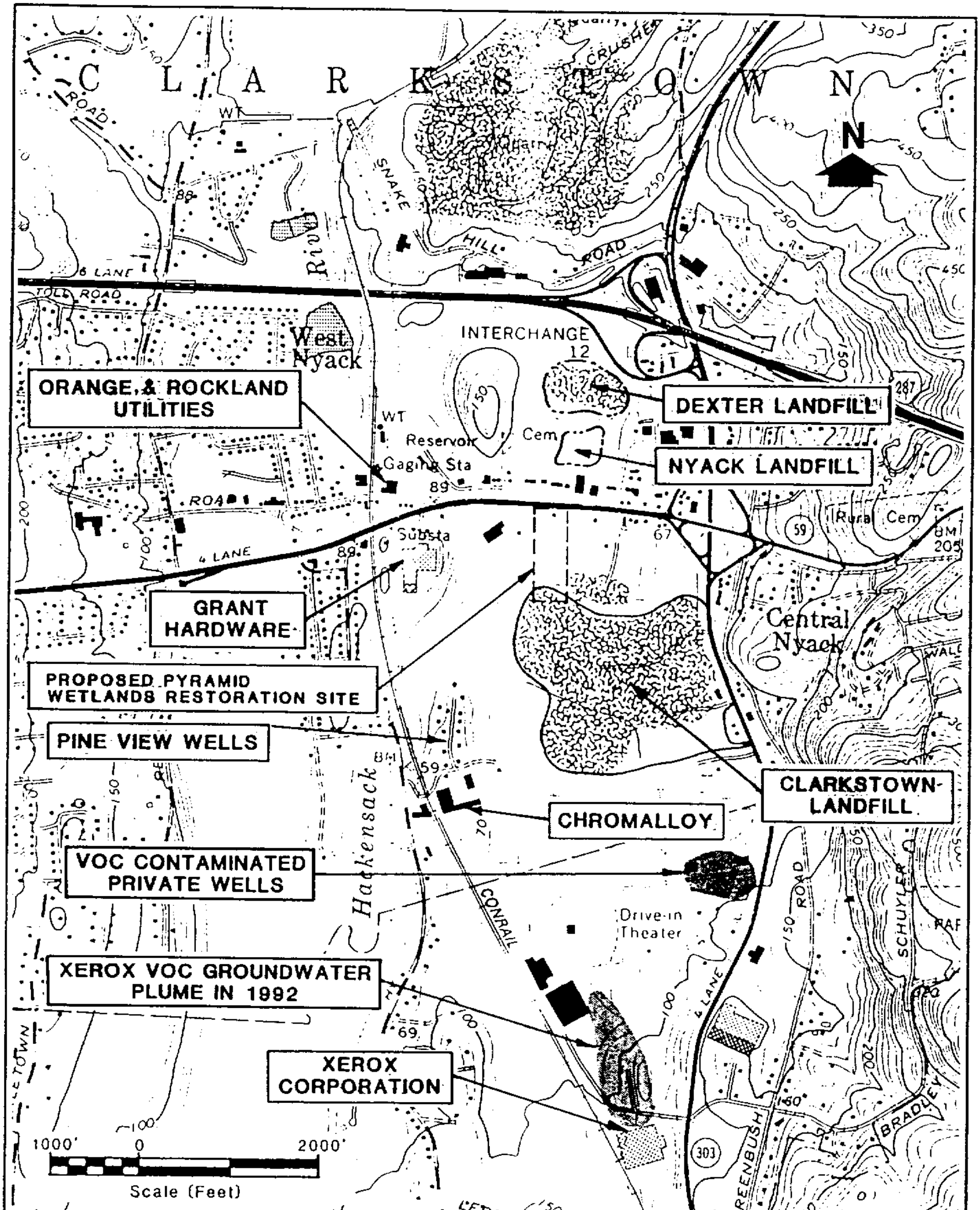
FIGURE 1

SITE LOCATION MAP AND LOCATION OF NYSDEC DESIGNATED WETLANDS

WESTON

FIGURE 2
SITE FEATURES MAP





Base Map:
U.S.G.S. 7 1/2 Minute Quadrangle-Nyack, N.Y.

Information From:
NYSDEC, Albany and New Paltz, N.Y. Offices

FIGURE 3

OFF-SITE LOCATIONS OF ENVIRONMENTAL INVESTIGATION

WESTON

EXPLANATION OF NOTES APPEARING IN TABLES 1 THROUGH 8 (ATTACHED)

SEDIMENT

ND - Non-Detected

(1) - Technical Guidance for Screening Contaminated Sediment, 22 November 1993, used as Guidance by the Bureau of Environmental Protection, Division of Fish and Wildlife, and Division of Marine Resources, New York State Department of Environmental Conservation.

- The lowest of the "Lowest Effect Level", the concentration which will impair sediment use by some benthic organisms but that can be tolerated by the majority (Persuad, 1992), or the "Effect Range-Low" (Long and Morgan, 1990).

- The lowest of the "Severe Effect Level", the concentration which will significantly impair use of sediment by some benthic organisms (Persuad, 1992), or the "Effect Range -Moderate" (Long and Morgan, 1990).

SURFACE WATER

ND - Non-Detected

(2) - Water Quality Regulations for Surface Waters and Groundwater, 6 NYCRR PARTS 700 - 705, Effective September 1, 1991.

· NYSDEC - Technical & Operational Guidance Series (1.1.1), Ambient Water Quality Standards & Guidance Values, Effective November 15, 1991

* = Guidance Value

(H) = Value designated for protection of human health.

(A) = Value designated for protection of aquatic life.

+ + = Calculated Standards based upon hardness values appear in the notes to B-5 of the Final RI Report, April 10, 1995 (WESTON)

GROUNDWATER

ND - Non-Detected
(3) NYSDEC - Technical & Operational Guidance Series (1.1.1), Ambient Water Quality Standards & Guidance Values, November 15, 1991

(a) - Standard applies to cis- and trans-isomers individually.
(b) - Standard applies to 1,2-; 1,3-; and 1,4-isomers individually.
(c) - Standard applies to sum of 1,2- and 1,4-isomers.
(d) - Standard applies to sum of phenolic compounds.
(e) - Standard applies to sum of DDD, DDE, and DDT.
(f) - Standard applies to sum of Aroclors (PCBs)
(g) - Standard applies to sum of heptachlor and heptachlor epoxide

* - Guidance Value

AMBIENT AIR

(4) New York State Air Guide - 1, Guidelines For the Control of Toxic Ambient Air Contaminants, Division of Air Resources, New York State Department of Environmental Conservation, Sept. 1989 Printing.

TABLE 1 - DATA SUMMARY OF SELECTED COMPOUNDS - UPSTREAM SURFACE WATER

Sampling locations: SW1, 2, 2-02, 3, 10, 11, 12, 12FD, 12-02	NYSDEC Surface Water Qual. Stds & Guid. Values (2)			Number Of Samples	Number Of Exceedances	Min	Max	Avg
WATER CLASS	A	A,B,C	D					
Inorganics, Total: µg/l	(H)	(A)	(A)					
Aluminum	-	100	-	9	5	34.00	526.00	187.18
Antimony	3*	-	-	9	0	ND	ND	--
Beryllium	3*	11/1100++	-	9	0	0.50	1.00	0.89
Chromium	50	++	++	9	0	ND	7.00	4.31
Cobalt	-	5	110*	9	4	ND	11.00	7.04
Iron	300	300	300	9	7	135.00	6560.00	1959.44
Lead	50	++	++	9	0	ND	3.70	2.35
Manganese	300	-	-	9	3	3.00	1150.00	382.89
Vanadium	-	14	190	9	6	ND	46.00	23.33
Zinc	300	30	++	9	2	ND	167.00	30.39
Volatiles: µg/l	(H)	(A)	(A)					
Chloroform	7.0	-	-	9	1	ND	26	7.33
Tetrachloroethene	1.0	-	-	9	1	ND	7	5.22
Semi-volatiles: µg/l	(H)	(A)	(A)					
bis(2-Ethylhexyl)phthalate	4*	0.6	-	7	0	ND	4	4.00
Additional Parameters								
Ammonia (mg/l)	2.0	++	++	9	1	0.03	4.60	...

TABLE 2 - DATA SUMMARY OF SELECTED COMPOUNDS - DOWNSTREAM SURFACE WATER

Sampling Loc SW4, 4-02, 5, 6, 7, 8, 9, 13-02	NYSDEC							
14-02, 15-02, 16-02, 17-02, 18-02	Surface Water Qual.			Number	Number			
	Stds & Guid. Values (2)			of	of	Min	Max	Avg
WATER CLASS	A	A,B,C	D	Samples	Exceedances			
Inorganics, Total: µg/l	(H)	(A)	(A)					
Aluminum	-	100	-	13	12	72.80	41500.00	3815.22
Antimony	3*	-	-	13	1	ND	46.00	10.10
Beryllium	3*	11/1100++	-	13	1	ND	9.00	1.36
Chromium	50	++	++	13	1	3.00	51.00	9.14
Cobalt	-	5	110*	13	2	3.20	47.00	8.47
Iron	300	300	300	13	13	562.00	64300.00	7240.69
Lead	50	++	++	13	1	ND	94.80	11.06
Manganese	300	-	-	13	7	116.00	2140.00	537.77
Vanadium	-	14	190	13	5	2.00	101.00	20.69
Zinc	300	30	++	13	6	6.00	485.00	69.78
Volatiles: µg/l	(H)	(A)	(A)					
Chloroform	7.0	-	-	13	0	ND	ND	--
Tetrachloroethene	1.0	-	-	13	0	ND	ND	--
Semi-volatiles: µg/l	(H)	(A)	(A)					
bis(2-Ethylhexyl)phthalate	4*	0.6	-	6	0	ND	ND	--
Additional Parameters								
Ammonia (mg/l)	2.0	++	++	13	1	0.03	3.20	0.65

TABLE 3 - DATA SUMMARY OF SELECTED COMPOUNDS - UPSTREAM SEDIMENT

Sampling Locations SD1, 2, 3, 10, 11, 12,	NYSDEC SEDIMENT CRITERIA (1)		Number Of	Number Of	Min	Max	Avg
	Aq.Tox	Human	Samples	Exceedances			
Inorganics, Total (mg/kg)							
Arsenic	6#/33##	-	9	3/0	1.0	13.4	4.8
Cadmium	0.6#/9##	-	9	5/0	0.7	6.2	2.2
Chromium	26#/110##	-	9	3/0	10.3	78.9	30.0
Copper	16#/110##	-	9	9/1	26.2	173.0	66.9
Iron	2%#/4%##	-	9	3/1	0.09%	6.3%	3.0%
Lead	31#/110##	-	9	7/4	10.1	421.0	133.5
Manganese	460#/1100##	-	9	3/1	168.0	1340.0	536.2
Mercury	0.15#/1.3##	-	9	1/0	0.1	1.0	0.3
Nickel	16#/50##	-	9	4/1	9.5	52.2	22.9
Silver	1#/2.2##	-	9	3/3	ND	16.5	4.6
Zinc	120#/270##	-	9	7/4	41.0	1730.0	459.7
Volatiles (µg/goc)							
1,1-Dichloroethene	-	0.02	9	1	ND	0.05	0.3
Semi-volatiles (µg/goc)	Acute/Chronic						
Benzo(a)anthracene	-	1.3	9	7	ND	28.0	16.70
Chrysene	-	1.3	9	7	ND	28.0	17.56
Benzo(b)fluoranthene	-	1.3	9	7	ND	24.0	16.69
Benzo(k)fluoranthene	-	1.3	9	6	ND	22.0	14.79
Benzo(a)pyrene	-	1.3	9	7	ND	28.0	16.45
Indeno(1,2,3-cd)pyrene	-	1.3	9	5	ND	16.4	12.98
Phenanthrene	120(c)	-	9	0	ND	34.0	16.5
bis(2-Ethylhexyl)phthalate	199.5(c)	-	9	0	ND	80.70	25.32

TABLE 4 - DATA SUMMARY OF SELECTED COMPOUNDS - DOWNSTREAM SEDIMENT

Sampling Locations SD4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17, 18	NYSDEC SEDIMENT CRITERIA (1)		Number Of	Number Of	Min.	Max.	Avg.
	Aq.Tox	Human	Samples	Exceedances			
Inorganics, Total (mg/kg)							
Arsenic	6#/33##	-	13	5/0	1.6	12.1	5.4
Cadmium	0.6#/9##	-	13	10/0	ND	7.9	3.4
Chromium	26#/110##	-	13	8/0	9.1	103.0	36.6
Copper	16#/110##	-	13	11/4	11.6	328.0	98.1
Iron	2%#/4%##	-	13	9/5	1.5%	5.8%	3.3%
Lead	31#/110##	-	13	11/4	5.2	462.0	128.1
Manganese	460#/1100##	-	13	4/1	162.0	1140.0	426.5
Mercury	0.15#/1.3##	-	13	5/0	ND	0.4	0.4
Nickel	16#/50##	-	13	10/1	11.6	56.2	27.4
Silver	1#/2.2##	-	13	2/2	ND	11.0	3.4
Zinc	120#/270##	-	13	9/6	21.8	899.0	305.3
Volatiles: ug/goc							
1,1-Dichloroethene	-	0.02	13	1	ND	2.6	1.0
Semi-volatiles (µg/goc)	Acute/Chronic						
Benzo(a)anthracene	-	1.3	13	3	ND	146.15	33.6
Chrysene	-	1.3	13	4	ND	143.08	33.6
Benzo(b)fluoranthene	-	1.3	13	4	ND	113.85	30.7
Benzo(k)pyrene	-	1.3	13	2	ND	118.46	31.6
Benzo(a)pyrene	-	1.3	13	4	ND	143.08	33.4
Indeno(1,2,3-cd)pyrene	-	1.3	13	4	ND	56.92	25.9
Phenanthrene	120(c)	-	13	1	ND	353.80	35.0
bis(2-Ethylhexyl)phthalate	199.5(c)	-	13	0	ND	ND	--

TABLE 5 - DATA SUMMARY OF DETECTED COMPOUNDS - UPGRADIENT GROUNDWATER						
Monitoring Locations RFW - 10D, 11, 13	NYSDEC Groundwater Quality Stds &Guid Vals(3)	Number Of Samples	Number Of Exceedances	Min	Max	Avg
Inorganics, Total: µg/L						
Antimony	3*	6	0	ND	ND	--
Barium	1000	6	0	269.0	338.0	285.20
Beryllium	3*	6	0	ND	1.0	0.80
Cadmium	10	6	0	ND	1.4	1.70
Chromium	50	6	2	ND	1250.0	231.50
Iron	300	6	5	91.9	8690.0	3493.30
Lead	25	6	0	ND	5.0	2.20
Magnesium	35000*	6	0	6360.0	22500.0	12985.00
Manganese	300	6	1	2.2	1690.0	586.90
Sodium	20000	6	4	11200.0	79900.0	46166.70
Zinc	300	6	0	4.1	32.8	16.90
Volatiles: µg/L						
Trichloroethene	5	6	0	ND	ND	--
Benzene	0.6	6	0	ND	ND	--
Tetrachloroethene	5	6	1	ND	7	4.00
Toluene	5	6	0	ND	ND	--
Chlorobenzene	5	6	0	ND	ND	--
Ethylbenzene	5	6	0	ND	ND	--
Xylene (total)	5(b)	6	0	ND	ND	--
cis-1,2-Dichloroethene	5(a)	3	0	ND	ND	--
1,4-Dichlorobenzene	4.7(c)	6	0	ND	ND	--
Semi-Volatiles: µg/L						
Napthalene	10*	3	0	ND	ND	--
bis(2-Ethylhexyl)phtalene	50	3	0	ND	ND	--
Pesticides: µg/L						
Heptachlor	ND(g)	3	0	ND	ND	--
4,4-DDT	ND(e)	3	0	ND	ND	--
PCB's µg/L						
Aroclor-1254	0.1(f)	3	0	ND	ND	--
Aroclor-1260	0.1(f)	3	0	ND	ND	--
Additional Parameters:						
(mg/L unless otherwise noted)						
Total Dissolved Solids (TDS)	500	6	3	186.0	820.0	465.83
Turbidity (NTU)	50	3	0	2.2	26.0	10.23
Ammonia	2	6	0	0.02	0.6	0.14
Total Phenols (µg/l)	1µg/l(d)	6	0	0.01	1.0	0.51
Chlorides	250	6	1	7.0	260.0	138.67
Bromide	2*	3	3	4.0	23.0	11.57
Hexavalent Chromium	0.05	3	1	0.02	0.07	0.04

TABLE 6 - DATA SUMMARY OF SELECTED COMPOUNDS - DOWNGRADIENT GROUNDWATER						
	NYSDEC	Number	Number			
Monitoring Locations RFW - 1S, 1D, 2, 3S, 3D, 4S, 4	Groundwater	Of	Of	Min	Max	Avg
5S, 5D, 6S, 6D, 7S, 7D, 8S, 8D, 9D, 12	Quality Stds	Samples	Exceedances			
	&Guid Vals(3)					
Inorganics, Total: µg/L						
Antimony	3*	34	4	ND	1010.0	48.40
Barium	1000	34	2	105.0	3700.0	422.60
Beryllium	3*	34	2	ND	17.0	1.50
Cadmium	10	34	0	ND	8.0	2.20
Chromium	50	34	10	10.5	300.0	52.00
Iron	300	34	32	199.0	111000.0	11645.10
Lead	25	34	2	1.0	35.6	7.20
Magnesium	35000*	34	0	1860.0	34300.0	11657.60
Manganese	300	34	9	1.9	3690.0	453.70
Sodium	20000	34	9	4630.0	98200.0	18850.90
Zinc	300	34	0	4.0	183.0	43.60
Volatiles: µg/L						
Trichloroethene	5	34	1	ND	12	3
Benzene	0.6	34	0	ND	ND	--
Tetrachloroethene	5	34	0	ND	ND	--
Toluene	5	34	0	ND	ND	--
Chlorobenzene	5	34	0	ND	ND	--
Ethylbenzene	5	34	0	ND	ND	--
Xylene (total)	5(b)	34	0	ND	ND	--
cis-1,2-Dichloroethene	5(a)	18	1	ND	12	2
1,4-Dichlorobenzene	4.7(c)	34	0	ND	ND	--
Semi-Volatiles: µg/L						
Napthalene	10*	17	0	ND	ND	--
bis(2-Ethylhexyl)phtalene	50	17	0	4	10	9
Pesticides: µg/L						
Heptachlor	ND(g)	19	2	0.031	0.15	0.0905
4,4-DDT	ND(e)	19	2	0.09	0.13	0.1
PCB's µg/L						
Aroclor-1254	0.1(f)	19	0	ND	ND	--
Aroclor-1260	0.1(f)	19	2	0.6	1.3	0.99
Additional Parameters:						
(mg/L unless otherwise noted)						
Total Dissolved Solids (TDS)	500	33	5	48.0	873.0	244.72
Turbidity (NTU)	50	17	5	1.4	200.0	55.65
Ammonia	2	34	10	0.02	108.0	8.02
Total Phenols (mg/l)	1µg/l(d)	33	6	0.01	49.5	2.91
Chlorides	250	33	4	1.0	370.0	51.30
Bromide	2*	15	13	1.3	22.6	5.32
Hexavalent Chromium	0.05	15	0	ND	ND	ND

TABLE 7 - DATA SUMMARY OF SELECTED COMPOUNDS - LANDFILL WELLS.						
	NYSDEC	Number	Number			
Monitoring Locations RFW 9S, 14	Groundwater	Of	Of	Min	Max	Avg
	Quality Stds	Samples	Exceedances			
	&Guid Vals(3)					
Inorganics, Total: µg/L						
Antimony	3*	3	2	ND	55.0	32.27
Barium	1000	3	0	432.0	496.0	471.67
Beryllium	3*	3	1	ND	6.0	2.50
Cadmium	10	3	1	2.0	13.0	7.67
Chromium	50	3	1	9.3	113.0	53.10
Iron	300	3	3	12500.0	58800.0	35600.00
Lead	25	3	2	5.3	633.0	221.67
Magnesium	35000*	3	3	70300.0	82800.0	74900.00
Manganese	300	3	2	158.0	5230.0	2796.00
Sodium	20000	3	3	216000.0	1511111.0	689333.33
Zinc	300	3	1	107.0	850.0	372.67
Volatiles: µg/L						
Trichloroethene	5	3	0	ND	ND	--
Benzene	0.6	3	0	ND	ND	--
Tetrachloroethene	5	3	0	ND	ND	--
Toluene	5	3	1	ND	180	62
Chlorobenzene	5	3	1	4	14	8
Ethylbenzene	5	3	1	ND	36	14
Xylene (total)	5(b)	3	1	ND	62	23
cis-1,2-Dichloroethene	5(a)	1	0	ND	ND	--
1,4-Dichlorobenzene	4.7(c)	3	1	ND	9	7
Semi-Volatiles: µg/L						
Napthalene	10*	2	1	ND	13	12
bis(2-Ethylhexyl)phtalene	50	2	1	ND	140	75
Pesticides: µg/L						
Heptachlor	ND(g)	2	0	ND	ND	--
4,4-DDT	ND(e)	2	0	ND	0.22	0.16
PCB's µg/L						
Aroclor-1254	0.1(f)	2	1	ND	0.10	1.55
Aroclor-1260	0.1(f)	2	0	ND	ND	--
Additional Parameters:						
(mg/L unless otherwise noted)						
Total Dissolved Solids (TDS)	500	3	2	236.0	6768.0	2914.67
Turbidity (NTU)	50	2	2	200.0	200.0	200.00
Ammonia	2	3	3	48.0	784.0	296.00
Total Phenols (mg/l)	1 µg/l(d)	3	0	<0.01	<1	0.34
Chlorides	250	3	2	245.0	1900.0	895.00
Bromide	2*	1	1	4.70	4.70	4.70
Hexavalent Chromium	0.05	1	0	ND	ND	--

TABLE 8 - DATA SUMMARY OF SELECTED COMPOUNDS - AMBIENT AIR SAMPLES

	NYSDEC	Downwind				
Sampling locations: *downwind* 66, 46, 133,	Ambient	Number	Number			
119, 63, 141, 146, 134	Guideline	Of	Of	Min	Max	Avg
	Concentration (4)	Samples	Exceedances			
Volatiles: ppm (v/v)						
Benzene	0.00003	8	8	0.0008	0.002	0.002
Tetrachloroethylene	0.00001	8	7	ND	0.003	0.001
Carbon Disulfide	0.00206	8	2	0.001	0.040	0.017
4-Methyl-2-Pentanone(MIBK)	0.00052	8	0	ND	ND	--
Sampling locations: *upwind* 110, 131, 143		**Upwind**				
Volatiles: ppm (v/v)						
Benzene	0.00003	3	3	0.001	0.003	0.002
Tetrachloroethylene	0.00001	3	1	ND	0.0009	0.001
Carbon Disulfide	0.00260	3	0	ND	ND	--
4-Methyl-2-Pentanone(MIBK)	0.00052	3	0	ND	ND	--

APPENDIX A

RESPONSIVENESS SUMMARY

CLARKSTOWN TOWN LANDFILL
SITE NUMBER 344001, ROCKLAND COUNTY

REMEDY SELECTION ISSUES

Concern: How long will the site be monitored? Forever?

Response: Clean-up remedies that leave untreated wastes on-site are required to be monitored for a minimum period of 30 years and re-evaluated no less than every five years to assure that human health and the environment are being protected by the remedy.

Concern: When is the work expected to be complete? When should the landfill odors disappear?

Response: Odors from the landfill would be expected to be eliminated when the landfill gas recovery and treatment system are operable after the landfill is capped. The remedy will take about two years to install and the landfill gas recovery and treatment system is one of the last work items to be done.

Concern: Were clean-up technologies; e.g., bioremediation, considered for the remedy or was just containment considered?

Response: The Final Feasibility Study Report identified and screened remedial technologies which could address the site's threats to human health and the environment. This process is described in Section 3 of the Report. For example, vitrification was evaluated as a waste treatment alternative but was eliminated due to the type and volume of landfill waste.

Concern: Was waste consolidation; i.e., combining the waste into a smaller area, considered for this landfill?

Response: Waste consolidation was identified and found applicable in the Final Feasibility Study Report. It was considered feasible for Alternative Numbers 4, 5A and 5B. The selected remedy, Alternative 5B, will include some waste consolidation to reduce the size of the cap.

Concern: What is the permeability of the confining layer beneath the landfill?

Response: The confining layer beneath the landfill greatly slows the downward leachate flow due to the low measured vertical permeability ranging from 10^{-7} to 10^{-8} centimeters per second (about one foot per year). Additionally, the peat and organic silt have a relatively high organic carbon content. This contributes to a high capacity for filtering out organic compounds which would limit the movement of organic compounds. For comparison, the landfill liner regulations found in 6NYCRR Part 360 requires soil liners to have maximum permeability of 10^{-7} centimeters per second.

Concern: What type of activity will be allowed on the landfill after it is capped?

Response: Future site use would be limited to those activities which do not impair the remedy; i.e., do not disturb the cap and reduce its effectiveness. Any activity the Town proposes to undertake on the landfill after capping will require the approval of both the New York State Department of Environmental Conservation and the New York State Department of Health.

Concern: Where will the landfill gas go after the landfill is capped?

Response: Currently, any landfill gas generated is emitted to the atmosphere. The landfill gas recovery and treatment system will collect the gas generated by the landfill and pipe it to a flare which will burn the gas. The flare will be on-site and will essentially destroy the gas through proper burning.

Concern: Where is Rockland County Sewer District Number One located?

Response: The Rockland County Sewer District Number One sewage treatment facility that will treat the leachate is located in Blauvelt.

Concern: The Town of Clarkstown believes Alternative 5A - Waste Consolidation and Part 360 Cover with Ground Water Barrier except Ballfield Area should be selected rather than Alternative 5B - Waste Consolidation and Part 360 Cover. The Town believes the existing vertical barrier installed with the leachate collection system is not functioning as designed. The Town believes that the barrier has deteriorated and this deterioration contributes to off-site leachate migration. The migration of leachate contributes to impaired surface water quality and an inability to adequately collect leachate. The Town surmises a new vertical barrier is essential because the landfill may be the cause of the surface water quality impairments. Further, the Town is concerned the leachate treatment cost may increase dramatically due to changing regulations and eliminate the cost benefit the State calculated.

Response: The NYSDEC disagrees with the Town's position and believes the leachate collection system satisfactorily protects human health and the environment even though it is not efficiently collecting leachate. We evaluated the data presented in the Remedial Investigation and concluded the risks were associated with proximity to the site. For example, surface water and sediments next to the landfill presented risks to human health and the environment but further away these risks did not exist. The alternatives identified in the Feasibility Study were developed to eliminate or mitigate significant threats to health or the environment. The NYSDEC developed Alternative 5B - Waste Consolidation and Part 360 Cover as an alternative to meet those goals. As the alternatives were evaluated, the overall goal of meeting standards, criteria, and guidance and protecting human health and the environment were best met by the selected remedy, Alternative 5B - Waste Consolidation and Part 360 Cover. The evaluation took into consideration not only cost and environmental protection but all factors required by statute and regulations that direct the cleanup of inactive hazardous waste sites.

REMEDY COST ISSUES

Concern: The costs between the alternatives, except for the No Action Alternative, seems to be about the same. What part of the remedy most contributes to the cost?

Response: The breakdown of the alternatives' costs are found in Tables 5-1 through 5-5 in the Final Feasibility Study Report. These tables show, for the 6NYCRR Part 360 cap alternatives, the cap itself, which includes the landfill gas recovery and treatment system, costs the most with the leachate collection system work being next most costly. As the landfill is large, there is not much cost savings available between the alternatives due to the limited clean-up options available.

HEALTH AND ENVIRONMENTAL RISK ISSUES

Concern: Can I get the sampling report for the monitoring well located in the southeast corner of the landfill?

Response: This information was sent to the requestor. See enclosed copy of letter.

Concern: There was a statement made that there are no private wells. How do you know there are none? The Rockland County Department of Health has a list of private wells in the vicinity of the landfill.

Response: The Final Feasibility Study Report acknowledges there are private drinking water wells in the area but those that are known to be used are beyond the areas potentially impacted by the landfill. Based upon information received from the Rockland County and New York State Departments of Health, the drinking water exposure pathway is not believed to be complete as no wells contaminated from the landfill are being used for drinking.

Concern: There is a health risk to workers at the landfill mentioned due to the contaminants at the landfill. How close does someone have to be to the landfill to get unacceptably exposed to the contaminants?

Response: The human health exposures which were identified are limited to exposures on the landfill itself. Exposure pathways that could exist at the site include skin contact with soils, ground water and leachate and inhalation of soil gas during remedial construction. Currently, landfill workers wear normal work clothes with no special protection unless the worker digs up the waste or is involved in sampling subsurface materials. People off-site would not normally be on or in contact with the wastes and are not expected to be exposed to landfill contaminants as they are further from the waste than these workers.

Concern: During the construction, will there be any health impacts to places located within one-eighth mile of the landfill?

Response: The human health exposures which were identified are limited to exposures from working on the landfill itself. People off-site are not expected to be exposed to landfill contaminants as they are further from the waste than the construction workers. To avoid any possible off-site exposure, the construction contract will require a Health and Safety Plan including an air surveillance program to monitor and detect contaminants from the work. The Health and Safety Plan will be designed to minimize any air emissions during construction activities. If on-site action levels are exceeded, the work will be shut down before off-site impacts can occur.

Concern: Which two volatile organic compounds were detected above standards in downgradient monitoring wells?

Response: The chemical trichloroethene, found at 12 ug/l, and the chemical cis-1,2-dichloroethene, found at 12 ug/l, were found in a downgradient groundwater sample. Trichloroethene is a solvent and also used in dry cleaning. Cis-1,2-dichloroethene is a solvent and also a breakdown product of trichloroethene. The groundwater regulatory value for both of these chemicals is 5 ug/l. One ug/l is approximately one part per billion. No individuals are being exposed to these chemicals as no wells contaminated from the landfill are being used for drinking.

APPENDIX B

ADMINSTRATIVE RECORD

CLARKSTOWN TOWN LANDFILL
SITE NUMBER 344001, ROCKLAND COUNTY

Final Remedial Investigation Report, Volumes 1 & 2; prepared for the Town of Clarkstown by Roy F. Weston of New York, Inc.; dated April 10, 1995

Final Feasibility Study Report, Volumes 1 & 2; prepared for the Town of Clarkstown by Roy F. Weston of New York, Inc.; dated June 14, 1995

Guidance Documents, various; see Final Remedial Investigation Report & Final Feasibility Study Report; prepared for the Town of Clarkstown by Roy F. Weston of New York, Inc.; dated April 10, 1995 & June 14, 1995, respectively

Inactive Hazardous Waste Disposal Report; prepared by the New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation

Order on Consent, Index Number W-3-0234-88-07; between the Town of Clarkstown and the New York State Department of Environmental Conservation; dated August 7, 1989

Phase I Investigation Report, Clarkstown Landfill; prepared for the New York State Department of Environmental Conservation by Wehran Engineering, P.C.; dated June 1983

Responsiveness Summary; prepared by the New York State Department of Environmental Conservation; dated October 1995

Statement of the Honorable Benjamin A. Gilman, 20th Congressional District, dated October 5, 1995

Statement of the Town of Clarkstown, Supervisor Charles E. Holbrook, dated October 19, 1995