Report

Feasibility Study
Cherry Farm Site
Tonawanda, New York

Niagara Mohawk Power Corporation
Syracuse, New York

April 1990

O'BRIEN & GERE

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REPORT

FEASIBILITY STUDY

CHERRY FARM SITE

TONAWANDA, NEW YORK

NIAGARA MOHAWK POWER CORPORATION

SYRACUSE, NEW YORK

APRIL 1990

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SECTION 1 - INTRODUCTION

1.01 Objectives and Overview

A Remedial Investigation/Feasibility Study (RI/FS) has been conducted for the Cherry Farm Site (Site) in Tonawanda, New York. The location of the site is presented in Figure 1. The RI/FS was conducted by O'Brien & Gere Engineers, Inc. (OBG) on behalf of the Niagara Mohawk Power Corporation (NMPC), in accordance with an Administrative Order on Consent between NMPC and the New York State Department of Environmental Conservation (NYSDEC). The results of the RI were documented in the June 1989 RI Report for the Site, which was approved by the NYSDEC, in correspondence to NMPC dated August 22, 1989.

This document presents the FS Report, which sets forth the formulation and evaluation of remedial alternatives for the Site. The FS was conducted in accordance with the Administrative Order on Consent, the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final, October 1988), and the proposed National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300, Federal Register, December 21, 1988).

The FS Report is organized into six sections, with accompanying tables, figures, appendices, and exhibits. A brief overview of these sections follows.

Section 1 summarizes the information contained in the approved RI Report. It presents information about the Site such as, its history and environmental conditions at the Site and surrounding areas. In addition, a discussion of contaminant fate and transport, as well as a summary of the baseline risk assessment is included. State and Federal requirements which are determined to be applicable or relevant and appropriate (ARAR) are also identified.

Section 2 presents the identification and screening of remedial technologies. Included in this section is the presentation of remedial action objectives, general response actions, and identification of representative process options. The screening of remedial technologies which address the remedial action objectives is also discussed.

Section 3 presents the development of remedial alternatives. In this section, remedial technologies which are applicable to different media are combined into remedial alternatives which address all the remedial objectives. This section also documents the screening of alternatives using the criteria of effectiveness, implementability, and cost.

Section 4 presents the detailed evaluation of remedial alternatives which pass the screening phase. Each alternative is evaluated with respect to the following criteria:

- overall protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, and volume;
- short-term effectiveness;
- implementability;
- cost;

- support agency acceptance; and
- community acceptance.

A relative comparison of the alternatives based on the above criteria is also documented. Based on the detailed evaluation of alternatives, a remedial alternative which is preferred over the others is identified and recommended for implementation.

Section 5 presents the conceptual design of the alternative which is recommended for implementation.

Section 6 presents an evaluation of the remedial alternatives relative to the future potential development of the Site by the Town of Tonawanda as a waterfront industrial/commercial/ recreational development.

Tables have been prepared to summarize information generated as part of this study.

Figures prepared to help summarize and present key issues are included in the Report.

Appendices include raw data, calculations, or other materials prepared by OBG which support the information presented in the Report.

Exhibits include tables, reports, or other information prepared by organizations other than OBG which would assist a reviewer in understanding the FS Report.

1.02 Site Background Information

1.02.1 Site Description

The Cherry Farm Site is located between River Road and the Niagara River in the Town of Tonawanda, New York (Figure 1).

The land use of the area surrounding the Site can be characterized as industrial. The Site encompasses approximately 55 acres, of which approximately 40 acres is covered by fill material. The fill material consists primarily of foundry sand, slag, and cinders. The surface of the fill is between 10 to 20 feet above the original surrounding land surface. The present topography of the filled area is essentially flat but several low lying areas temporarily collect surface water after precipitation. The Site is accessible from River Road through a locked gate which leads to the fill entrance driveway.

The fill area is surrounded by intermittent surface water. A wetland designated as BW-6 by the NYSDEC is present on the eastern portion of the Site. This wetland drains into two drainage ditches which flow along the southern and northern boundaries of the property and ultimately discharge to the Niagara River which forms the western side of the Site (Figure 2). The 100-year flood elevation in the vicinity of the Site is 571 feet. The toe of the landfill is at an elevation of 570 feet. Therefore, the perimeter of the landfill would be under one foot of water during the 100-year flood.

Historical site information indicated a small drainage ditch cut diagonally across the Site from the southeast corner to approximately the center of the west side of the property. Additionally, two settling ponds were also present in the southwest corner of the property. The approximate locations of the previous ditch and settling ponds are presented on Figure 2. These features ponds are now covered with fill material.

The City of Tonawanda water supply is obtained from the Niagara River. The intake is located approximately three miles downstream from the Site. Ground water is not used for municipal supplies in the vicinity of the Site.

1.02.2 Site History

Between 1945 and 1970 the Cherry Farm site was owned by Colorado Fuel & Iron Steel Corporation (CF&I) which discarded dust and slag from their blast and open-hearth furnace operations until 1963. CF&I then entered into an agreement with INS Equipment Company (INS), which allowed INS to dispose of foundry sand and sandcasts from a nearby Chevrolet plant on the property.

NMPC purchased the Site in 1970 from CF&I at which time foundry sand was exposed at the surface of the fill area. To prevent wind erosion and reduce human exposure, the surface of the fill was capped by NMPC with approximately six inches of clay and seeded with rye grass. The sides of the fill, which have slopes of approximately 70%, are exposed.

Presently, the Site is used for recreational purposes by NMPC. Two softball fields have been constructed on top of the clay cap in the center of the fill area.

Several environmental investigations have been conducted at the Cherry Farm Site since 1978. The first studies were completed by the Interagency Task Force between 1978 and 1980 as part of a statewide program. These investigations were completed as a result of a misunderstanding of the site history which indicated that Dow Chemical and Hooker-Durez disposed chemical wastes at the Site. Disposal of waste material by these companies has not been substantiated by site investigations.

As a result of the April 1980 NYSDEC Hazardous Waste Disposal Site Report, the Site was listed in NYSDEC's Hazardous Waste Disposal Sites in New York State - First Annual Report in June of 1980 (Site No. 915063). The Site received an "A" classification which indicated that further field inspection and additional hydrogeological and chemical information were needed.

In March 1981, a USEPA Site Inspection and Background Report was completed, and in June 1981, an analysis of soils, sediment, and surface water was performed in conjunction with NYSDEC's In-Place Toxics study. The In-Place Toxics study report concluded that phenols were present in the surface water and chlorobenzenes existed in the soil.

In July 1982 the USGS sampled soil and surface water at the Site. The analytical results indicated the presence of iron, lead, nickel, cadmium, and arsenic in both the soil and surface water. Based upon these analyses, the USGS sampled soils and surface water for organic compounds. The analyses identified polychlorinated biphenyls (PCBs), toluene, phenol, naphthalene, and benzene to be present in the fill material. Naphthalene and PCBs were also detected in the surface water around the site.

A NYSDEC type Phase I Investigation was completed in 1983 by Contractors for the agencies. The previous disposal allegations and previous analytical data referred to in this investigation indicated that the waste materials might contain tars and resins.

The Phase I investigation included a preliminary Hazard Ranking System (HRS) scoring of the site. (It was concluded that there were insufficient data to complete a final HRS score.) The total score of the preliminary HRS for the Site, S (m), was 28.95 which exceeded the USEPA response value of 28.5 and meant that a more detailed, Phase II Investigation was warranted.

In 1984, the Niagara River Toxics Committee issued a report that summarized discharges of hazardous substances to the Niagara River (Niagara River Toxics Committee, October 1984). The Cherry Farm Site was included in this report as a non-point source based on data collected during preliminary investigations completed by NYSDEC. This report included a list of 261 substances identified in the water, sediments, and biota of the Niagara River. A number of the substances considered by the Committee to pose a threat to human health or the environment had previously been identified at the Cherry Farm Site.

In 1985, NMPC in cooperation with NYSDEC agreed to complete a Phase II Investigation of the Site. NMPC retained O'Brien & Gere Engineers, Inc. (OBG) to prepare a Work Plan which was subsequently approved by NYSDEC. The scope of the Phase II Investigation included completion of geophysical surveys, installation of seven ground water monitoring wells, completion of five soil borings, and the analysis of soil, ground water, surface water, and sediment samples. As a result of the Phase II Investigation, the NYSDEC required that an RI/FS be completed. A Work Plan detailing the investigation tasks to be completed at the Cherry Farm Site was prepared by NMPC and OBG. The Work Plan approved by the NYSDEC was then attached to the Administrative Order on Consent signed by NYSDEC and NMPC in May 1988.

1.02.3 Site Conditions

1.02.3.1 Site Geology

The subsurface materials on the Cherry Farm Site are comprised of 15 to 20 feet of fill underlain by alluvium. A thin mantle of glacial till separates the alluvium from the Camillus Formation shale bedrock.

The fill material was deposited from approximately 1945 to 1970. Information obtained from the soil and monitoring well borings completed on the property indicates that the fill is inhomogeneous mixture of foundry sand, cinders and pieces of slag.

The fill material is underlain by alluvial deposits comprised of fine to medium grained sand, and silt. The upper foot of this material contains organic material such as twigs, root hairs, and other plant matter which suggests that it was once exposed at the surface. The alluvium varies in thickness and ranges from approximately 25 feet on the eastern side of the property to less than 10 feet on the west side of the site.

1.02.3.2 Site Hydrogeology

Ground water occurs between ten and fifteen feet below the fill surface and within the bottom portion of the fill. Monitoring wells were installed within three ground water flow zones identified at the site: the shallow zone is present within the fill material; the intermediate zone is within the underlying alluvium; and the deep zone is located at the till alluvium interface.

The horizontal ground water flow direction beneath the site in all three monitored flow zones is from east to west towards the Niagara River. Vertical hydraulic flow potentials in the ground water suggest that ground water discharges to or has the potential to discharge to the Niagara River. Radial flow of ground water or ground water mounding conditions in the fill were not observed. This suggests that the clay cap material on the landfill surface may be limiting infiltration of precipitation into the fill material and/or the hydraulic conductivity of the fill material allows for relatively rapid dissipation of recharge that may be occurring through the fill.

The average volume of ground water discharge from the three ground water flow zones identified at the site (estimated using median hydraulic conductivity values and average hydraulic gradients) are as follows: shallow zone - 10,231 gpd; intermediate zone - 2,189 gpd; and deep zone - 432 gpd. The ground water flow velocities were estimated to be 0.45 ft/day in the shallow zone; 0.18 ft/day in the intermediate zone; and 4.6×10^{-3} ft/day in the deep zone.

1.02.4 Nature and Extent of Contamination

The June 1989 RI Report summarized the data collected during the RI and from previous studies conducted at the Cherry Farm Site. These data established the basis for completing the site risk assessment and were used in the evaluation of remedial options for the Site.

The chemical analytical data resulting from the on-site investigations indicated that the exposed surface soils along the sides of the fill contained detectable concentrations of volatile organics, phenols, PAHs, PCBs, and inorganics. Sand casts found along the sides of the fill contained PAHs, PCBs, and phthalates. Subsurface samples of the fill material were found to contain volatile organics, phenols, PAHs, PCBs, phthalates, and inorganics.

Sediment samples taken from the drainage ditches running along the sides of the fill indicate the presence of PCBs in the center of the southern drainage ditch which may be the result of the fill sides eroding or migration of contaminants from upgradient surface water sources. Surface water samples, however, suggest that upstream contaminant source(s) of detected phenols and PAH's exist, as surface water quality does not degrade as it moves across the Site.

Ground water quality data indicate volatile organics, phenols, PAHs, PCBs, and inorganics were present with the highest concentrations of these compounds found in the shallow wells. Lower contaminant levels, if any, were detected in the deep wells indicating that there is limited vertical migration of contaminants in the ground water system.

Ground water analytical results indicated that the volatile organic contaminants were horizontally migrating towards the Niagara River. The highest chlorinated organic concentrations were observed in the vicinity of the former settling ponds and on the northern side of the site, suggesting localized sources. Aromatic hydrocarbon compound concentrations were detected in intermediate well MW-6I which is in the vicinity of the former settling ponds, suggesting the ponds were excavated into the natural material.

Concentrations of PCBs in the on-site ground water were primarily detected in the shallow wells, with the exception of two intermediate wells. The approved RI Report indicated that the presence of PCBs in the ground water samples was likely due to PCBs adsorbed to the soil particles present in the ground water samples, rather than soluble PCBs. PCBs did not appear to be migrating horizontally or vertically. Of all the wells sampled, the highest phenol and PCB levels were detected in the upgradient, off-site well MW-13.

Inorganic contaminants were randomly distributed in the ground water. The observed inorganics were likely a result of the aquifer materials in the vicinity of the wells rather than a plume of soluble inorganics, as samples that were filtered prior to analysis resulted in lower concentrations of inorganic constituents.

1.02.5 Contaminant Fate and Transport

1.02.5.1 Air Pathway

The air pathway for existing site conditions was identified in the approved RI Report as non-functional and incomplete. This determination was based on air monitoring conducted during the Phase II investigation and the presence of the clay cap on the fill material. Under future no action site conditions, the air pathway was also determined to be non-functional and incomplete.

1.02.5.2 Direct Contact Pathway

The direct contact exposure pathway was identified as functional and complete for existing site conditions. This determination was based on the presence of detectable concentrations of PCBs, PAHs, phthalate esters, and heavy metals in samples of surface soils exposed along the sides of the landfill. The direct contact pathway was also determined to be functional and complete under the future no action scenario.

1.02.5.3 Surface Water Pathway

The surface water exposure pathway was determined to be functional and complete for existing site conditions. This was based on the potential for surface runoff to erode soils from the exposed side slopes of the landfill into the existing on-site drainage ditches and the potential for discharge to the Niagara River from ground water in contact with portions of the fill. Under the future no action scenarios, the surface water exposure pathway would remain functional and complete. It is noteworthy that surface water quality does not degrade as it moves across the Site.

1.02.5.4 Ground Water Pathway

The ground water exposure pathway was identified as functional but incomplete for existing site conditions. This functional determination was based on the presence of site contaminants (PCBs, phthalate esters, PAHs, VOCs, and metals) in ground water samples. The exposure pathway was determined to be incomplete due to the absence of potable ground water wells in the vicinity of the site. The ground water exposure pathway was also determined to be functional and incomplete for the future no action scenario.

1.02.5.5 Summary

The results of the evaluation of site related contaminant fate and transport in the study area indicated two pathways for potential human exposure to site contaminants. These pathways are: 1) the direct contact exposure pathway, with exposed surface soils containing site contaminants providing a source for incidental ingestion of site contaminants, and 2) the surface water exposure pathway, which could result from exposed surface soils being eroded into surface waters.

1.02.6 Baseline Risk Assessment

The RI Report presented a detailed site specific risk assessment which addressed site conditions and exposures. The risk assessment qualitatively and quantitatively evaluated the hazards to human health and the environment at the Cherry Farm Site. The qualitative analysis characterized the potential exposure pathways for functionality and completeness while the quantitative analysis determined the risk of the complete pathways.

Under current conditions, the qualitative analysis identified two transport pathways considered potentially complete, surface water and direct contact. Under the future no action scenario, it was determined that the surface water and direct contact pathways would remain complete.

The quantitative risk assessment analyzed the two transport media determined to be complete in the qualitative assessment. The quantitative assessment initially compared the contaminant concentrations from the Cherry Farm site to New York State drinking water standards. The second part of the quantitative assessment selected site parameters and their concentrations in surface water, ground water, and soil to calculate their chronic daily intakes (CDIs). The CDIs were then compared to acceptable intake levels for chronic exposure (AICs) as presented by the USEPA (USEPA, 1986). A third approach, the hazard index (HI), assessed the overall potential for non-carcinogenic effects posed by potential additive effects of exposure to multiple site parameters. Fourthly, the excess cancer risk posed by each carcinogenic site parameter was calculated and compared to USEPA's acceptable range of excess cancer risk.

The quantitative assessment evaluated 1) incidental ingestion of soil by adults and children, 2) incidental ingestion of surface water by adults and children, and 3) intentional ingestion of surface water by adults and children. It was determined, based on the evaluation of sample concentrations and potential exposure routes, that only chronic exposure to the exposed soils along the sides of the fill would pose an unacceptable health risk. Lead, arsenic, and PCBs represented the compounds which exceeded AICs or the USEPA's acceptable range of excess cancer risk. The USEPA's acceptable cancer range (1×10^{-5} to 1×10^{-7}) was exceeded by PCBs and arsenic in soil which had incremental risks of approximately 10^{-4}. The HI was greater than 1 for the exposure scenario which included ingestion of the highest observed soil lead concentration by children.

It is important to note that, since the risk assessment was conducted, USEPA has revised the acceptable range for excess cancer risk to 1×10^{-4} to 1×10^{-6}. The excess cancer risk due to arsenic in soil was determined to be 1.8×10^{-4} at the maximum observed soil concentration, and $1.2. \times 10^{-4}$ at the average observed soil concentration. These risks are only slightly outside of USEPA's acceptable range. The excess cancer risk due to PCBs in soil for the maximum observed soil concentration was also just outside USEPA's acceptable range, at 2.18×10^{-4}. The excess cancer risk due to PCBs in soil at the average observed concentration was 3.7×10^{-5}. This was within USEPA's acceptable risk range. It is also noteworthy that the highest observed soil lead concentration, which had a corresponding hazard index of greater than 1, was less than the soil lead concentration range identified by USEPA as potentially resulting in blood lead concentrations in children being above background concentrations (14).

In presenting this risk assessment, conservative exposure assumptions were made to avoid underestimating the potential health risks. Additionally, the soil residue concentrations used in the risk calculations were taken from uncapped areas on the site which would be much higher than the actual mean soil residue concentrations. However, the risk calculations indicated that potentially unacceptable health risks may be associated with chronic exposure to the fill soils or the uncapped areas along the fill sides. To eliminate or reduce the potential health risk, the remedial objectives that were identified as being applicable are:

(1) Reduce the potential for direct contact exposure with the landfill sites.

(2) Control surface runoff.

SECTION 2 - IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.01 Introduction

The objective of this phase of the FS is to identify general response actions and representative process options which may be assembled into a range of treatment and containment alternatives. This process is the first stage of the development of alternatives process. The technology identification and screening process includes the development of remedial action objectives; development of general response actions; identification and screening of remedial technologies and process options; and evaluation of remedial technologies and process options.

2.02 Remedial Action Objectives

Remedial action objectives specify the contaminants and media of concern, exposure pathways, and preliminary remediation goals (acceptable contaminant levels) for each exposure route. Preliminary remediation goals are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), while final remediation goals are based on site characterization data and the baseline risk assessment.

Three remedial action objectives have been developed for the Site. Two of the remedial action objectives address the contaminant transport pathways (direct contact and surface water) which were identified as a concern in the RI. The third remedial objective addresses ground water. In the RI, the ground water pathway was determined to be incomplete. This pathway, however, has chemical-specific ARARs in the form of drinking water standards. Compliance with these ARARs is therefore addressed by the third remedial objective.

The following remedial action objectives have been developed for this site:

1. Prevent ingestion of ground water containing volatile organics, semi-volatile organics, PCBs or metals in concentrations exceeding drinking water standards.
2. Prevent direct contact exposure with landfill materials which contain: arsenic in concentrations which would produce an excess cancer risk greater than 10^{-4} to 10^{-7}; and lead and PCBs in concentrations exceeding the reference dose.
3. Prevent the potential for surface runoff to erode landfill materials from exposed side slopes into on-site surface water channels.

USEPA's Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites (12), directs that remedial action objectives be presented as estimates or ranges; that is, goals, whether achievable or not, sought through remediation. The remedial action may not attain these objectives. They may be necessarily modified during implementation of the remedial action to account for performance of the remedy. Then, institutional controls may be necessary to manage residual contamination. For example, a ground water remedial action may be implemented until remedial action objectives are obtained or until aquifer contaminant levels reach a constant value. At that time, remaining contamination would be managed through institutional controls.

2.03 General Response Actions

General response actions are medium-specific actions which may be combined into alternatives which satisfy the remedial objectives. General response actions which may be combined into alternatives that satisfy the remedial objectives for the site ground water include: institutional actions, containment actions, collection actions and treatment actions. General response actions which may be combined into alternatives that satisfy the remedial objectives for the landfill materials include: institutional actions, containment actions, removal actions and treatment actions.

The USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA requires evaluation of a no action alternative. This alternative will require consideration of the no action general response action.

2.04 Identification and Screening of Technology Types and Process Options

This step requires identification of potentially applicable remedial technology types and process options within each general response action. Process options are screened mainly on the basis of technical implementability. The technical implementability of each identified process option is evaluated with respect to site contaminant information, physical characteristics, volumes of affected media, and probable exposure levels. Technologies and process options identified for the Site are described and screened for applicability in Tables 1 and 2. A discussion of eliminated technologies follows.

Remedial technologies identified for institutional general response actions relative to ground water were access restrictions, alternate water supply and monitoring. As a result of this screening step, development of an alternate water supply was eliminated from consideration as a technology for ground water remediation. This technology was considered inapplicable to the Cherry Farm Site because there are no drinking water wells on the Site and a municipal water supply serves the Site and surrounding area. Thus, the ground water institutional general response remedial technologies remaining after this screening step are access restrictions and monitoring.

Potentially applicable remedial technologies for ground water containment general response actions were capping and subsurface barriers. Those identified for ground water collection general response actions were extraction and subsurface drains. All of the ground water containment and collection remedial technologies were deemed applicable to this site and will be evaluated further.

Remedial technologies identified for the ground water treatment general response action included physical/chemical treatment, thermal treatment, biological treatment, and in-situ treatment. Biological treatment, thermal treatment and in-situ treatment of ground water were deemed inappropriate for the Cherry Farm ground water. Biological treatment (either in a reactor or an in-situ bioreclamation technique) would not result in removal or transformation of inorganic contaminants and the process may be inhibited by the concentration of those constituents. Further, biological treatment of PCBs is not a proven technology.

Thermal treatment is not an appropriate technology for remediation of a contaminated water, particularly with respect to the low levels of contaminants present in the ground water at the Cherry Farm Site. The in-situ treatment methods of bioreclamation, permeable treatment beds, and oxidation are not effective for treatment of the combination of inorganic and organic contaminants present in the ground water. Thus, only the ground water treatment general response technologies of physical/chemical treatment remain under consideration for this site.

All of the potentially applicable remedial technologies associated with the landfill material institutional action passed the preliminary screening. These technologies included access restrictions and monitoring.

There are two remedial technologies associated with landfill material containment general response action: capping and land disposal. The volume of contaminated fill material at the Cherry Farm Site is of such magnitude as to make removal of the entire volume of fill material (followed by either off-site containment or treatment) technically infeasible. The total volume of fill material is approximately 1.0 million cubic yards, based on a fill area of approximately 40 acres and an average depth of 15 feet. If the materials are to be managed at an off-site facility, approximately 50,000 truckloads (with a 20 ton capacity) would be required. Assuming 20 truckloads could be scheduled per day, it would take 2,500 days to transport the excavated material to the off-site facility. Thus, an off-site management (i.e., land disposal) alternative would require approximately 10 years for transportation alone, (assuming 260 work days per year). In addition to the limitations imposed by transport of landfill materials, off-site containment of the

1.0 million cubic yards of landfill material, which contain low volumes of contaminants, is not an appropriate use of limited landfill capacity. Off-site treatment is also not appropriate due to the amount of time required for treatment, which is expected to exceed the 10 years required for transportation.

The remedial technologies associated with the general response action for on-site treatment of landfill material include: thermal treatment, chemical/physical treatment, and biological treatment. Based on the presence of similar contaminants to those contained in the ground water, biological treatment is not expected to be an effective technology for the treatment of the fill material.

The thermal treatment technologies under consideration for the landfill materials are incineration and in-situ vitrification. On-site thermal treatment is not expected to be feasible for the entire volume of landfill material. A large capacity mobile incinerator would be expected to treat soils at the rate of 250 tons/day. At that rate, it would take approximately 20 years to treat 1.0 million cubic years (assuming a density of 1.3 tons of landfill material per cubic yard, 260 days per year operation, and no down-time). Actual processing time would be greater due to down-time for repairs and maintenance. Further, incineration would not provide treatment for the inorganic constituents contained in the fill material.

In-situ vitrification (utilizing one unit) is expected to proceed at the rate of 600 to 800 tons per week with 70 percent operating efficiency (1). At this rate one unit would require 52 years to treat the entire landfill material volume. This time period might be reduced considerably through the use of several units. However, even utilizing five units, ten years would be required for treatment of all fill materials. Further, in-situ vitrification would likely be technically unsuitable for this site, due to processing problems posed by slag contained in the landfill materials.

On-site chemical/physical treatment of the entire volume of landfill material was also determined to be infeasible. Chemical/physical process options identified include stabilization and soil washing/extraction. These technologies require excavation of the fill material and subsequent batch processing. On-site stabilization can be accomplished using a mobile mixing plant or by area mixing. A mobile facility might be expected to treat 180 cubic yards per day of non-pumpable material, while area mixing might allow treatment of 400 to 600 cubic yards per day (13). Stabilization of 1.0 million cubic yards of landfill material would, therefore take 8 to 27 years depending on the method selected (assuming 260 days per year operation and 20% down-time). There are several commercial soil washing/extraction units in operation in the Netherlands, but only one in the United States (4, 5, 7). These units have capacities of 20 to 40 tons per hour (4, 5, 7). If two 20 ton per hour units are used, it would take approximately 19.5 years to treat the landfill material (assuming a density of 1.3 tons of landfill material per cubic yard, 8 hour operating, 260 days per year operation and 20% down-time). Based on the time required for treatment, chemical/physical treatment of all landfill materials is considered technically infeasible.

Elimination of the general response action of treatment of landfill material as it applies to all landfill material, based on the large volume of low concentration landfill material, is consistent with USEPA guidance. The preamble to the proposed revisions (December 21, 1988) to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides a detailed explanation of the revisions to the NCP which were promulgated on March 8, 1990. The preamble states, "While the CERCLA amendments strongly encourage the use of treatment technologies in CERCLA remedial actions, they allow for discretion in dealing with site circumstances and technological, economic, and implementation constraints that place practical limitations on the use of treatment technologies."

The preamble to the proposed NCP revisions continues " ... Treatment is most likely to be practicable for ... high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure)... (and) treatment is less likely to be practicable where sites have large volumes of low concentrated material ... Specific situations that may limit the use of treatment could include sites where: (1) Treatment technologies are not technically feasible or are not available within a reasonable timeframe; (and) (2) the extraordinary size or complexity of a site makes implementation of treatment technologies impracticable ...In addition, there are CERCLA sites or portions of sites where the concentrations of the wastes are at low levels or are substantially immobile, and where the wastes can be reliably contained over a long period of time through the use of engineering controls. In these situations, treatment may not always offer a sufficient degree of increased permanence and long-term protection to be cost-effective."

As discussed in Section 1.02.6 of this Report, the baseline risk assessment for this Site established that the Site is characterized by low level contamination. The excess cancer risk associated with the maximum concentrations of carcinogens (PCBs and arsenic) was only slightly outside USEPA's acceptable risk range. It is also noteworthy that, of the non-carcinogenic contaminants observed at the site, only lead at its maximum observed soil concentration lead had a hazard index of greater than 1. The highest observed lead soil concentration is less than the concentration range identified by USEPA as potentially resulting in blood lead concentrations in children being above background (14). These factors put the contaminant concentrations at the site in perspective as low level concentrations.

This policy is reiterated in the USEPA, OSWER Directive "Advancing the Use of Treatment Technologies for Superfund Remedies" which states "Containment may also be appropriate for large scale sites where treatment is infeasible or clearly impracticable (11)." Due to the impracticability of treating or containing all landfill materials, for the general response actions of removal, containment and treatment as they apply to all landfill materials, only the containment general response action of cap installation will be evaluated further.

Removal and on- or off-site treatment or containment of part of the landfill material, however, may be technically feasible, as the time-frame required for the action may be reduced from that required for treatment of all landfill material. Treatment of the surface landfill material, followed by replacement of the treated material, would be a general response action which would satisfy the remedial objective that requires prevention of direct contact exposure.

The remedial technologies for treatment of surface landfill material are the same as those for treatment of all landfill material: thermal treatment, physical/chemical treatment, and biological treatment. With the exception of physical/chemical treatment, the other remedial technologies are not suitable for this site. As discussed above, biological treatment is not suitable for treatment of the contaminants of concern at this site and incineration would not provide a reduction in mobility, toxicity or volume of inorganic constituents.

The thermal treatment technology of in-situ vitrification is suitable for treatment of both inorganic (encapsulation) and organic (destruction, removal) constituents. However, during vitrification depth of processing is a significant variable that relates directly to the ratio of operating time to downtime and cost. The minimum depth to avoid a significant reduction in processing time and significant increase in cost is 5 to 7 feet (1). Processing problems can also be caused by the presence of slag in landfill materials. Based on these considerations, in-situ vitrification will not be considered further for treatment of surface landfill materials.

The general response actions for ground water which passed this screening step include: no action, institutional actions, containment actions, collection actions and treatment actions. The general response actions for landfill material which passed this screening step include: no action, institutional actions, containment actions, removal actions (surface landfill material) and treatment actions (surface landfill material). A discussion of each remedial technology process option which passed the technology screening follows.

2.04.1 Institutional Actions

The ground water institutional remedial technologies which passed the initial screening include deed restrictions and ground water monitoring. The landfill material institutional remedial technologies which passed the screening include access restrictions (deed restrictions and fencing), and ground water monitoring. A description of the process options which passed the screening follows.

Deed Restrictions

Deed restrictions incorporated into a property deed might include land use restrictions that would preclude the conduct of activities which would expose contaminated materials and thereby limit direct contact exposure. Restrictions precluding the placement of potable wells at the Site (until such time as the ground water attains drinking water standards) would prevent ingestion of ground water.

Fencing

Fencing would consist of the placement of a fence around the contaminated area to limit access and thereby reduce risks of direct contact with contaminated materials.

Ground Water Monitoring

Ground water monitoring includes periodic sampling and analysis of ground water. Monitoring provides a means of assessing the conditions and the rate of improvement of the ground water.

2.04.2 Containment Actions

The ground water containment remedial technologies which passed the initial screening are caps and subsurface barriers (slurry walls). The landfill material containment remedial technology which passed the screening is caps. A description of the process options which passed the screening follows.

Caps

Capping techniques are used to cover contaminated materials. Capping will minimize surface water infiltration, provide for control of erosion, and isolate and contain wastes. This is accomplished by the construction of a relatively impermeable material over the contaminated material. Caps are typically constructed of clay and soil, asphalt, concrete or multi-media. The construction of a cap at this site will include grading of the side slopes or landfill faces to an acceptable grade.

A multi-layer cap will be considered for containment at this site. This cap would be consistent with 6 NYCRR Parts 360 and 373 and would be a three-layer system consisting of an upper vegetated layer, underlain by a drainage layer over a low permeability layer. The low-permeability layer would consist of 2 feet of clay with a maximum permeability of 1×10^{-7} cm/sec. The drainage layer would be comprised of 6 inches of sand and gravel with a permeability greater than 1×10^{-3} cm/sec. The drainage layer would be isolated from the vegetated layer and low permeability layer with filter fabric to prevent clogging by soil fines and would serve to convey away infiltrating rainwater. The surface of the landfill would be comprised of a 6-inch vegetative layer underlain by a 24-inch soil layer for vegetative support and frost protection. The minimum grade of the cap would be 5 percent. The cap would prohibit direct contact with contaminated materials, and would minimize infiltration by encouraging controlled surface runoff and evapotranspiration.

A low-permeability cap will also be considered for containment of the site, following treatment of the surface 4 to 6 feet of landfill material. This cap would be comprised on an upper vegetated layer, covering a low-permeability layer consisting of 2 feet of clay with a maximum permeability of 1×10^{-5} cm/sec. The minimum grade of the cap would be 5 percent. This cap would prohibit direct contact with the untreated deep landfill material, and minimize infiltration by encouraging controlled surface runoff and evapotranspiration.

Neither the analytical data developed during the RI, nor site historic information indicate that the contaminated materials would generate gases. Therefore, it is anticipated a gas venting system would not be required for protection of the cap. Further evaluation of the necessity of a gas venting system would be conducted during final design. If a gas venting system is required, potential emissions would be assessed to determine if they would present a risk to human health, wildlife or the environment, and monitoring would be instituted following installation.

Slurry Wall

Slurry walls are vertical subsurface barriers constructed in a trench excavated under a slurry. Slurry walls are low permeability barriers used to isolate contaminated ground waters. The slurry, usually a mixture of bentonite, soil and water, acts essentially like a drilling fluid. It hydraulically shores the trench to prevent collapse, and, at the same time forms a filter cake on the trench walls to prevent high fluid losses into the surrounding subsurface area.

2.04.3 Collection Actions

The ground water collection remedial technologies which passed the initial screening are extraction wells (extraction and extraction/injection wells) and subsurface drains (interceptor trenches). Collection remedial actions are not applicable, however, to the actual landfill waste materials. A description of the ground water collection process options which passed the screening follows.

Extraction Wells

Extraction wells are a ground water control technique which uses ground water pumping to capture a contaminated plume or alter the direction of ground water movement. Extraction wells would be used at this site to either contain or remove contaminated shallow and intermediate depth ground water. Extraction wells may be used with an upgradient ground water barrier to reduce the amount of contaminated water that requires removal. An extraction/injection well system incorporates injection wells which recharge the aquifer with clean or treated water, increasing the rate of flow to extraction wells.

Interceptor Trenches

Interceptor trenches consist of buried conduits used to intercept and collect ground water. These subsurface drains create a zone of influence in which ground water flows towards the drain. They can be used to contain or remove a plume or to lower the ground water table. These subsurface drains essentially function like an infinite line of extraction wells, by creating a continuous zone of influence in which groundwater within this zone flows towards the drain.

2.04.4 Removal Actions

The landfill material removal action technology which passed the initial screening is excavation. A description of this technology follows.

Excavation

Excavation and removal followed by containment or treatment are activities performed extensively in hazardous waste site remediation. Excavation of landfill materials could be conducted using standard construction equipment such as backhoes, cranes, front-end loaders or bulldozers. At the Cherry Farm Site, excavation would be employed to achieve the correct configuration for in-situ containment (i.e, slopes for cap installation), or for transfer to treatment units.

2.04.5 Ground Water Treatment Actions

The ground water treatment technology which passed the initial screening is chemical/physical treatment (carbon adsorption, ion exchange, oxidation, precipitation, reverse osmosis and stripping). A description of the ground water treatment process options which passed the screening follows.

Carbon Adsorption

Carbon adsorption consists of the adsorption of organic contaminants and a limited number of inorganic contaminants onto activated carbon by a surface reaction in which contaminants are attracted to the internal pores of the carbon. Upon saturation the spent carbon must either be replaced with fresh carbon or regenerated. Regeneration is typically accomplished thermally, resulting in simultaneous destruction of the organic contaminants. Carbon adsorption may be used exclusively to remove organics from site ground water, or carbon adsorption may be preceded by other treatment methods to remove some organic constituents and thereby reduce the frequency of carbon regeneration or replacement.

Ion Exchange

Ion exchange involves the interchange of ions between an aqueous solution and a solid material (ion exchange resins). Depending on the resins selected, anions, cations, or organics would be removed. The use of several columns allows for removal of more than one type of contaminant. Continual contact of the exchange resin with the solution containing the ions to be removed results in eventual exhaustion of the active sites on the resins. The resin is regenerated by contact with a sufficiently concentrated solution of the ion originally associated with the resin. The spent regenerant which has the potential for containing high concentrations of contaminants requires appropriate management.

Oxidation

In chemical oxidation, the oxidation state of the target compound is raised while the oxidation state of the oxidizing agent is lowered. This results in destruction of the target compound. Ozone and hydrogen peroxide are suitable oxidants for organic contaminants. The removal efficiency of the ozone or hydrogen peroxide oxidation process may be enhanced by combining treatment with ultraviolet radiation. This combined treatment process is an innovative technology being evaluated under the demonstration program of the Superfund Innovative Technology Evaluation program. It may be suitable for destruction of organic compounds, including chlorinated hydrocarbons, in dilute concentrations in water.

Precipitation/Flocculation/Sedimentation

Precipitation is a physiochemical process whereby some or all of a substance in solution is transformed into a solid phase. It is based on alteration of the chemical equilibrium relationships affecting the solubility of inorganic species. Removal of metals as hydroxides or sulfides is the most common precipitation application in wastewater treatment. Precipitation is followed by flocculation, which transforms small suspended particles into larger suspended particles so they can be more easily removed, and sedimentation, which removes the suspended particles from the liquid. Precipitation generates sludge which requires disposal.

Reverse Osmosis

Reverse osmosis is the application of sufficient pressure to a solution to overcome the osmotic pressure and force the net flow of water through a membrane towards the dilute phase. This allows the concentration of solute (contaminants) to be built up on one side of the membrane while relatively pure water is transported through the membrane. Reverse osmosis can be used to reduce the concentration of dissolved solids, both organic and inorganic. Ions and small molecules can be separated from water by this technique.

Stripping

Stripping is a physical treatment process in which air or steam is used to remove dissolved volatile organic compounds from water. Air stripping involves transferring a dissolved substance from the liquid to the gas phase whereas steam stripping is essentially a distillation process in which the volatile contaminants are removed from the wastewater as the distillate. Stripping may be used as a cost-effective pretreatment step prior to carbon adsorption. An evaluation of the suitability of a stripper for treatment of a wastewater typically includes an evaluation of the air emissions which would be produced.

2.04.6 Landfill Material Treatment Actions

The landfill material treatment technologies which passed the initial screening are the physical/chemical treatment technologies of soil washing/extraction and stabilization. A description of these process options follows:

Soil Washing/Extraction

Soil washing/extraction is an innovative process used to separate contaminants from semi-solid matrices (i.e., soil, sludge, landfill material, etc.). The washing/extraction fluid may be composed of water, organic solvents, chelating agents, surfactants, acids, or bases, depending on the contaminant to be removed. Soil washing/extraction concentrates the contaminants in the washing/extraction fluids. Thus, the volume of the waste streams requiring further treatment, followed by recycling or ultimate disposal, are significantly reduced from the original volume of contaminated material.

One category of soil washing processes operates on the principle that the large proportion of the contaminants are associated with lighter weight fine material. These soil washing processes utilize segregation of fine material from the other size fractions to produce a treated soil. The effectiveness of this step depends on the proportion of the contaminants associated with lighter weight organics.

Contaminants can be held on solids by three mechanisms: 1) mechanical entrapment; 2) weak chemical bonds; or 3) strong chemical bonds. Entrapped contaminants can be separated through solids dispersion (i.e., flotation). Additives, including inorganic chemicals such as soluble silicates, may be added to enhance separation. Contaminants held by weak chemical forces may be released through modification of surface properties of the matrix material, with either inorganic or organic reagents. Where contaminants are held by strong chemical forces, they can only be liberated by modifying the chemistry of the system to reverse the reaction.

The performance and cost of the soil washing/extraction technology is specific to the media of contamination and type of contaminants. The cost has been reported to be dependent on: a) the distribution of contaminants as a function of grain size; b) the distribution of contaminants as a function of minerology; and c) cleanup levels to be achieved (8).

Various vendors have developed proprietary soil washing/extraction processes. Several of these systems are being evaluated in the USEPA's Superfund Innovative Technology Evaluation Program. Reports regarding these technologies have not yet been issued. Since 1983, however, industrial soil washing/extraction facilities have been in operation in the Netherlands (4, 5).

There are limited data available demonstrating the effectiveness of soil washing/extraction for removal of PCBs and lead. Some of the available data are compiled in Table 5. These data indicate PCB removals of 73.8 to 97.7 percent, and lead removals of 75.0 to 99.7 percent. The range of removals illustrate the specificity of the process with respect to type of contaminated material, initial contaminant concentrations and type of extraction fluid. More importantly, the data indicate regardless of removal efficiency, some residual concentration of contaminants will remain in the treated material.

Stabilization

Stabilization is a technology used to reduce the mobility of hazardous constituents. Mobility is reduced through the binding of hazardous constituents into a solid mass with low permeability that resists leaching. The actual mechanism of binding can be physical or chemical. Stabilization agents typically used include: cement-based materials, pozzolanic-based materials, silicate-based materials, thermoplastic- based materials, or organic polymer-based materials. More than one stabilization agent may be utilized. Additives, such as silicates, are frequently used in conjunction with the stabilizing agent to control curing rates or to enhance the properties of the solid product.

Stabilization is a proven, demonstrated technology for inorganic contaminants. Data demonstrating long-term effectiveness is not available for treatment of materials contaminated with PCB's.

2.05 Evaluation of Process Options

In this step the technology process options considered to be implementable are evaluated in greater detail before selecting one process to represent each type of technology for purposes of remedial alternative development. Process options are evaluated using the criteria of effectiveness, implementability, and cost. Effectiveness refers to: 1) the potential effectiveness of process options in handling the estimated areas or volumes of media and meeting the remediation goals identified in the remedial objectives; 2) the potential impacts to human health and the environment during the construction and implementation phase; and 3) how proven and reliable the process is with respect to the contaminants and conditions at the site. Implementability encompasses both the technical and administrative feasibility of implementing a technology process. Factors including the ability to obtain necessary permits for off-site actions, the availability of treatment, storage, and disposal facilities, and the availability of necessary equipment and skilled workers to implement the technology are addressed. Cost is assessed in the form of relative capital and O & M costs rather than detailed estimates, with each process evaluated as to whether costs are high, medium, or low relative to other process options in the same technology type. An evaluation of each technology process option which passed the initial screening is contained on Tables 3 and 4.

Representative process options are selected for purposes of developing remedial alternatives. It should be noted, however, that the process option actually used to implement remedial action at a site may not be selected until the remedial design phase. Selected representative process options for use in developing remedial alternatives are identified on Tables 3 and 4. Two representative process options were selected for ground water physical/chemical treatment, as it is expected more than one technology will be required to achieve acceptable effluent quality. The ground water physical/chemical treatment scenario selected incorporates the use of precipitation for the removal of inorganics, followed by carbon adsorption for removal of organics. Alternate treatment scenarios are discussed in Section 3. Treatability tests may be used to identify the most economical treatment scenario which would achieve the required contaminant removals.

Soil washing/extraction is the process option which has been selected as the representative physical/chemical treatment technology for treatment of the surface landfill materials. This technology was chosen because it is innovative and available information suggests that it can be used to treat both organic and inorganic constituents. Treatability testing would be required to determine the effectiveness of this process for contaminants of concern; establish the required process configuration and operating conditions for both the extraction procedure and extraction fluid regeneration or treatment; and develop a site-specific economic assessment.

SECTION 3 - DEVELOPMENT OF REMEDIAL ALTERNATIVES

3.01 Introduction

The objective of this phase of the FS is to develop a range of waste management options which protect human health and the environment. Remedial alternatives are developed by assembling technologies into combinations of technologies which address the remedial objectives. The alternatives are then subject to a screening process to eliminate alternatives that are significantly less implementable or more costly than comparably effective alternatives, and thereby narrow the list of potential alternatives that will enter the detailed evaluation phase.

3.02 Assembly of Remedial Alternatives

Alternatives are developed by assembling general response actions, and the process options chosen to represent the various technology types for each media, into combinations which address the site. Typically a range of treatment alternatives, one or more alternatives that involve containment of the waste, and a no action alternative are developed. Based on the technical infeasibility of the general response actions of landfill material removal and treatment (Section 2.04), development of treatment alternatives for the entire volume of landfill material is not practicable for this site. Treatment of a portion of the landfill material, however, may be practicable. Therefore, with respect to the entire volume of landfill materials, alternatives will address only containment, limited action and no action. An additional alternative will address treatment of a portion of the landfill material.

Six alternatives have been developed for the site. These alternatives which include a no action, a containment, and four treatment alternatives are presented in Table 6 and described below.

Alternative 1

Alternative 1 is the no action alternative. This alternative would provide for an assessment of the risk to humans and the environment if no remedial actions are implemented. The no action alternative would require implementation of a ground water monitoring program. This program would be used to monitor ground water conditions and provide a data base for future remedial actions which may be required.

Alternative 2

Alternative 2 is the containment alternative. This alternative would contain the waste and result in minimizing the contaminant transport mechanisms by which the contaminants may leave the site. Alternative 2 provides containment through installation of a circumferential slurry wall surrounding the contaminant plume and installation of a cap over the landfill material (including grading of the side slopes). Also included in Alternative 2 are ground water monitoring and deed restrictions.

The cap under consideration is the multi-layer clay cap described in Section 2.04.2., although alternate cap designs would be feasible (e.g., to accomplish future development). The slurry wall would be composed of soil bentonite slurry, and would be keyed to the till and/or bedrock. The cap would contain the landfill materials and minimize infiltration of water into the landfill materials, and the slurry wall would minimize horizontal flow of ground water beneath the site. The landfill materials and contaminated ground water would effectively be isolated by the cap and slurry wall components of this alternative.

Alternative 3

Alternative 3 provides for collection of ground water utilizing extraction wells, physical/chemical treatment of contaminated ground water utilizing precipitation and activated carbon, and containment of the landfill material with a multi-layer clay cap. This alternative also includes ground water monitoring and land use deed restrictions.

The ground water extraction and treatment system would remove site ground water with treatment provided for the contaminated ground water (i.e., above drinking water standards). Any uncontaminated ground water and treated contaminated ground water would be discharged to the nearest surface water body (on-site drainage channel or Niagara River). The treatment system would be designed to achieve effluent limitations established pursuant to the technical requirements of the State Pollutant Discharge Elimination System (SPDES) Program. The ground water treatment system would be operated until such time that the ground water contaminant concentrations are at or below the effluent limitations. The ground water extraction system would be operated to control ground water until the ground water contaminant concentrations are at or below drinking water standards. The cap would contain the landfill materials and minimize infiltration of water into the landfill materials, and the ground water extraction system would prevent ground water from leaving the site until it meets drinking water standards.

Alternate technology process options suitable for this alternative include: 1) ground water treatment utilizing precipitation, air stripping, and activated carbon; precipitation, oxidation and activated carbon; or reverse osmosis and activated carbon; 2) installation of an alternate cap; and 3) use of an injection well system or interceptor trenches for ground water collection and control.

Alternative 4

Alternative 4 provides for collection of Site ground water utilizing extraction wells, physical/chemical treatment of contaminated ground water utilizing precipitation and activated carbon, installation of an upgradient slurry wall to prevent intrusion of off-site ground water, and installation of a multi-layer clay cap over landfill materials. This alternative also includes ground water monitoring and land use deed restrictions.

The ground water extraction and treatment system would remove and treat the contaminated ground water at the Site. The upgradient slurry wall would reduce the amount of ground water to be collected and treated by minimizing upgradient contributions to Site ground water. The contaminated ground water would be treated to concentrations at or below effluent limitations established in accordance with the technical requirements of the SPDES Program. Following treatment, ground water would be discharged to the nearest surface water body (on-site drainage channel or Niagara River). Treatment of ground water would continue until the untreated ground water contaminant concentrations met the effluent limitations. The ground water extraction system would be operated to control ground water until the ground water contaminant concentrations met drinking water standards. The cap would contain the landfill materials and minimize infiltration of water into the landfill materials, and the upgradient slurry wall and ground water extraction system would prevent contaminated ground water from leaving the site.

Alternate technology process options suitable for this alternative include: 1) ground water treatment utilizing precipitation, air stripping, and activated carbon; precipitation, oxidation and activated carbon; or reverse osmosis and activated carbon; 2) installation of an alternate cap; and 3) use of an injection well system or interceptor trenches for ground water collection and control.

Alternative 5

Alternative 5 is similar to alternative 4, except that intrusion of upgradient ground water is prevented through use of a collection system instead of a barrier. Alternative 5 provides for collection of site ground water utilizing extraction wells, physical/chemical treatment of contaminated ground water utilizing precipitation and oxidation, installation of an upgradient interceptor trench to prevent intrusion of off-site ground water, and installation of a multi-layer clay cap over landfill materials. This alternative also includes ground water monitoring and land use deed restrictions. Alternate technology process options are the same as discussed for Alternative 4.

The ground water extraction and treatment system would remove and treat the contaminated ground water at the Site. The upgradient ground water interceptor trench would reduce the amount of ground water to be collected and treated by minimizing upgradient contributions to Site ground water. Ground water collected by the interceptor trench would be discharged to the nearest surface water body. The contaminated ground water would be treated to concentrations at or below discharge limitations established in accordance with the technical requirements of the SPDES Program. The treatment system effluent would be discharged to the nearest surface water body (on-site drainage channel or Niagara River). Treatment of ground water would continue until such time that the untreated ground water contaminant concentrations were at or below the discharge limitations. The ground water extraction system would be operated to control ground water as long as the ground water contaminant concentrations were in excess of drinking water standards. The cap would contain the landfill materials and minimize infiltration of water into the landfill materials, and the upgradient ground water interceptor trench and extraction system would prevent contaminated ground water from leaving the site.

Alternative 6

Alternative 6 provides for treatment of the surface 4 to 6 feet of landfill material utilizing a soil extraction/washing technology. Treated soil would be returned to the site and capped with a layer of low-permeability soil. Slopes which promote drainage and minimize erosion would be established. Residuals generated from the soil washing/extraction process would be treated (on- and/or off-site), with ultimate disposal in an approved off-site facility. Alternative 6 also provides for ground water collection and treatment. The ground water system would be designed to meet discharge limitations established pursuant to the technical requirements of the SPDES program. This alternative also includes ground water monitoring and land use restrictions.

The Alternative 6 ground water extraction and treatment system would be identical to that proposed for Alternative 3, with the exception of size. The ground water extraction and treatment system in Alternative 6 would require a greater capacity to provide treatment for precipitation which infiltrates through the landfill. The ground water extraction system would prevent water from leaving the site until it meets drinking water standards. The low-permeability soil cover would encourage controlled drainage and evapotranspiration, and thus would reduce the amount of infiltration. Nonetheless, continual long-term leaching of contaminants from the untreated landfill material would be expected.

3.03 Screening of Remedial Alternatives

The intent of the screening of alternatives step is to eliminate alternatives that are significantly less implementable or more costly than comparably effective alternatives. The screening is conducted on the basis of effectiveness, ease of implementation, and cost.

3.03.1 Effectiveness

The factors included under the criterion of effectiveness are: overall reduction in toxicity, mobility or volume of waste; long-term effectiveness and permanence; short-term impacts which the alternatives may pose during implementation; and how quickly protection can be achieved. Alternatives that do not protect human health and the environment to an acceptable degree are not carried through this initial screening, with the possible exception of the no-action alternative (Alternative 1). The no-action alternative is carried through to the detailed analysis step without prior screening, as a baseline for comparison with other alternatives, regardless of the degree of protectiveness it offers.

Alternative 2

Alternative 2 would protect human health and the environment through containment of the ground water and landfill material. Containment would be provided through installation of a circumferential slurry wall surrounding the contaminated ground water and a cap over the landfill material. The slurry wall would minimize horizontal flow of ground water on and off the site. The clay cap would limit infiltration of water by promoting controlled surface runoff and evapotranspiration. Water infiltrating through the vegetative and support layers of the cap would be intercepted by the lateral drainage layer and conveyed away from the cap. The slurry wall and clay cap would minimize the transport of contaminants by ground or surface water. Therefore, mobility of the contaminants in the landfill would be minimized. Deed restrictions would prohibit development of a well on-site and the conduct of activities which would impact the integrity of the cap. The potential for human consumption or direct contact exposure with contaminants would be eliminated. Periodic inspection of the cap and slurry wall and maintenance as necessary would provide for long-term effectiveness and permanence of the alternative.

The combination of a slurry wall and a cap is expected to be effective for containment of contaminants. As standard construction techniques would be utilized, the actions associated with Alternative 2 could be implemented in a relatively short period of time. Short-term impacts would be minimized during construction through the use of dust and erosion control measures, and developing health and safety procedures for workers.

Alternative 3

Alternative 3 would protect human health and the environment through collection and treatment of contaminated ground water and containment of the landfill materials. The clay cap would limit infiltration of water by promoting controlled run-off and evapotranspiration of precipitation. Water which infiltrates through the vegetative and support layers would be intercepted by the lateral drainage layer and conveyed away from the cap. The ground water collection system would collect contaminated ground water for subsequent treatment. These measures, in conjunction with deed restrictions preventing the installation of wells and activities which would disturb the integrity of the cap, would eliminate the potential for direct contact exposure to contaminants and transport of the contaminants with ground water. This alternative would result in reductions in toxicity, mobility, and volume of contaminants. Periodic inspection of the cap and maintenance as necessary, together with operation of the ground water extraction and treatment system, would provide for long-term effectiveness and permanence of this alternative.

The effectiveness of the selected ground water treatment process options would be confirmed through treatability testing during design. If the representative technologies, precipitation and carbon adsorption, are not effective in removing the contaminants from ground water, it is anticipated other standard wastewater treatment technologies will be able to achieve acceptable effluent quality. Precipitation will remove metal contaminants from the water and concentrate them in a smaller volume of sludge. Carbon adsorption will remove organics and concentrate them on the carbon, which will subsequently be regenerated resulting in thermal destruction of the organics. Alternate technologies which might be substituted for ground water treatment, air stripping and/or oxidation, would result in removal of the organics from the liquid waste stream.

Installation of the cap could be implemented in a relatively short period of time. Ground water treatment is expected to be required for a considerable time period. However, this alternative provides protectiveness throughout that time period, as the ground water containing contaminants will be collected and treated, and not allowed to migrate off-site during that entire time period. If, as a result of the ground water extraction and treatment system operation, the ground water beneath the site attains cleanup criteria prior to treatment, use of the ground water treatment system will cease. It is likely, however, that extraction of ground water will continue indefinitely to control ground water levels beneath the site. Short-term impacts would be minimized during implementation through the use of dust and erosion control measures, by enclosing the ground water treatment system, and developing health and safety procedures for workers.

<u>Alternative 4</u>

Alternative 4 would protect human health and the environment through collection and treatment of contaminated ground water, diversion of uncontaminated upstream ground water, and containment of the landfill materials. The clay cap would limit infiltration of water by encouraging controlled runoff and evapotranspiration of precipitation. Water which infiltrates through the vegetative and support layers would be intercepted by the lateral drainage layer and conveyed away from the cap. The ground water collection system would collect contaminated ground water for subsequent treatment. These measures in conjunction with deed restrictions prohibiting well installations and activities which would adversely impact the cap would prevent contaminant transport by ground water and eliminate the potential for direct contact exposure to contaminants. Alternative 4 would result in reductions in toxicity, mobility, and volume of contaminants.

Periodic inspection of the slurry wall and cap and maintenance as necessary, together with operation of the ground water extraction and treatment system, would provide for long-term effectiveness and permanence of Alternative 4.

The upgradient slurry wall proposed for this alternative is provided to prevent movement of uncontaminated water onto the site. In conjunction with extraction wells this system will result in controlling the ground water and limiting contact of the ground water with the landfill material.

Installation of the cap and slurry wall could be implemented in a relatively short period of time. The ground water treatment provided in this alternative will be the same as discussed for Alternative 3. The proposed treatment scenario of precipitation and activated carbon will result in removal of metals and destruction of organics. Ground water treatment is expected to be required only until the water table is lowered, resulting in isolation of the contaminants in the landfill material without migration to ground water, or until the ground water quality meets effluent requirement without treatment. Subsequently, pumping of uncontaminated ground water will be required to maintain the lowered water table. Pumping is expected to be required even with an upgradient wall interfaced with an impermeable layer, due to ground water flow expected from the Niagara River. Ground water treatment may be required for a period of several months to several years, depending on the extraction well system design. However, this alternative provides protectiveness throughout that period, as the contaminated ground water would be collected and treated, and not allowed to migrate off-site during the entire time period. Short-term impacts would be minimized during implementation through the use of dust and erosion control measures, enclosing the ground water treatment system, and developing health and safety procedures for workers.

Alternative 5

Alternative 5 is identical to Alternative 4 except that a subsurface drain is used for diversion of upgradient ground water, instead of the slurry wall provided in Alternative 4. This combination of ground water treatment and diversion, and landfill material containment is expected to be equally effective as Alternative 4 in protecting humans and the environment from direct contact exposure to contaminants and eliminating the transport of contaminants. Treatment technologies will be the same as proposed for Alternatives 3 and 4, and the time period required for treatment will be similar to Alternative 4 with equivalent protectiveness provided during the treatment period. Alternative 5 would result in reductions in toxicity, mobility, and volume of the contaminants. Periodic inspection of the cap with maintenance as necessary together with operation of the ground water extraction and treatment system, would provide for long-term effectiveness and permanence of this alternative. Installation of the cap and ground water extraction and treatment system could be implemented in a relatively short period of time. Short-term impacts would be minimized during implementation through the use of dust and erosion control measures, enclosing the ground water treatment system, and developing health and safety procedures for workers.

Alternative 6

Alternative 6 would protect human health and the environment through treatment of the surface landfill material, and collection and treatment of contaminated ground water. These measures, in conjunction with deed restrictions preventing the installation of wells and activities which would expose untreated landfill material, would eliminate the potential for direct contact exposure to contaminants and transport of the contaminants with ground water. This alternative would result in reductions in toxicity, mobility and volume of contaminants. Continued operation and maintenance of the ground water collection and treatment system for an indefinite period, would provide for long-term effectiveness and permanence of this alternative.

The time period required for completion of Alternative 6 surface landfill material treatment is expected to be substantially longer than that required for the landfill material containment actions included in Alternatives 2, 3, 4, and 5, due to the limited processing capacity of the soil washing/extraction technology. Proper construction procedures should provide protectiveness during this extended period. Procedures to minimize short-term impacts would include the use of dust and erosion control measures, enclosing the ground water treatment system, and developing health and safety procedures for workers.

3.03.2 Implementability

Implementability is associated with the degree of difficulty in constructing, operating and maintaining a particular alternative. The performance of a remedial action is subject to a number of technical, administrative and logistical issues. These factors are assessed to characterize the implementability of each alternative. An alternative which would be more difficult or time consuming to implement than a comparably effective remedy would not be carried through this initial screening.

Alternative 2

Alternative 2 requires installation of a slurry wall and a clay cap. The construction activities associated with these actions are readily implementable standard procedures. The construction activities may infringe upon part of the wetland located east and south of the landfill. However, the construction activities would result in a positive impact to the wetland and surrounding land. This positive impact relates to engineering controls resulting from the construction activities. Installation of the clay cap would prevent erosion of the landfill materials from the exposed side slopes, thus prohibiting contaminated surface runoff from entering the wetland. Additionally, the construction activities would only cause a temporary disturbance of the wetland. Disturbed wetlands would be restored to the extent possible upon completion of the construction activities. Maintenance and monitoring would be readily implemented.

Alternative 3

The cap and extraction well system required for Alternative 3 are readily implementable. Treatability studies would be required to design the ground water treatment system. However, it is expected a readily implementable ground water treatment scenario could be identified. The cap would be constructed using standard construction techniques. Activities related to construction of the cap may infringe upon part of the wetland. However, the activities would have a net positive impact on the wetland and surrounding land. The wetland would be temporarily disturbed during the construction activities but would be restored upon completion of the cap. The clay cap would prevent erosion of the landfill and subsequent surface runoff from the contaminated side slopes, thereby preventing contaminants from reaching the wetland. Operation, maintenance, and monitoring would be readily implemented.

Alternative 4

Alternative 4 requires installation of a cap, slurry wall, and ground water extraction and treatment system. The construction activities associated with these actions are readily implementable standard procedures. As in Alternative 3, a readily implementable ground water treatment scenario would be identified through treatability studies. Construction activities may infringe upon part of the wetland, although these activities would result in a positive impact on the wetland and surrounding land. This positive impact relates to engineering controls resulting from the construction activities. Installation of a clay cap would prevent erosion of the landfill materials from the exposed side slopes, thus prohibiting contaminated surface runoff from entering the wetland. Additionally, the construction activities would only cause a temporary disturbance of the wetland. Disturbed wetlands would be restored to the extent possible upon completion of the construction activities. Operation, maintenance, and monitoring would be readily implemented.

Alternative 5

Alternative 5 requires installation of a cap, subsurface interceptor trench, and ground water extraction and treatment system. The construction activities associated with these actions are readily implementable standard procedures. As in Alternatives 3 and 4, a readily implementable ground water treatment scenario is expected to be identified.

Construction activities may infringe upon part of the wetland. These activities would result in a positive impact on the wetland and surrounding land. Installation of a cap and interceptor trench would cause temporary disturbance of the wetlands. The wetlands would be restored to the extent possible, minimizing the impact of the construction activities. Installation of the clay cap would eliminate erosion of the existing landfill and prevent contaminated surface runoff from the exposed side slopes from reaching the wetland.

Alternative 6

Treatability studies would be required to design the ground water treatment system for Alternative 6. As discussed for Alternative 3, it is expected a readily implementable ground water treatment scenario would be identified through treatability studies. Operation, maintenance and monitoring associated with the ground water extraction and treatment system would be readily implementable.

The soil extraction/washing procedure is not readily implementable, with respect to either time to complete the remedial action or complexity of operation. The soil extraction/washing procedure has a limited processing rate and would take substantially longer than other alternatives for completion. If two soil washing/extraction units were utilized, each with a capacity of 20 tons per hour, approximately 5 years (to treat surface four feet) to 8 years (to treat surface 6 feet) would be required for soil washing/extraction treatment of the surface landfill materials (assuming a density of 1.3 tons of landfill material per cubic yard, 8 hour operating days, 260 days of operation per year and 20% down-time).

The soil extraction/washing technology is an innovative technology. Treatability studies would be required to determine if this technology would achieve clean-up criteria for contaminants of concern. Treatability studies would also be required to determine appropriate treatment or disposal for residuals and materials recycled within the process. Solvent washing/extraction and associated residuals management are complex activities. To remove the combination of organic and inorganic contaminants of concern observed at the Site, many of the following operations might be required: feed preparation; solvent wash; acid or chelation agent wash; distillation (solvent recovery); flotation; liquid/solids separation (flocculation, clarification, thickening, dewatering), water treatment (ion exchange, carbon adsorption); and ultimate disposal of residuals (incineration, landfill).

3.03.3 Cost

Cost factors include costs necessary to perform a remedial action, and any operating and maintenance costs associated with an action. Cost is used to eliminate alternatives which provide a similar degree of protectiveness at a significantly greater cost.

Preliminary cost estimates including capital and annual operation and maintenance costs were developed for each alternative, and are included as Tables 7 through 12. The total present worth cost for implementing each alternative is as follows:

Alternative	Total Present Worth Cost
1	$ 652,000
2	$ 22,407,000
3	$ 17,154,000
4	$ 21,165,000
5	$ 28,997,000
6	$100,818,000

3.03.4 Screening Summary

Remedial action alternatives (2, 3, 4, and 5) would result in the elimination of unacceptable risk to humans and the environment through containment and/or treatment technologies. The remedial response objectives would be achieved by each of these alternatives. Alternative 6 would also be expected to eliminate unacceptable risk and achieve remedial objectives. This expectation would, however, require confirmation through treatability tests which would demonstrate the effectiveness of the soil washing/extraction process for the landfill materials.

Alternatives 2, 3, 4, and 5 would be readily implementable. Alternative 6 is expected to take a longer period of time to complete and would be more complex to operate. For Alternative 2, 3, 4, and 5, the cost of the highest alternative is less than two times the cost of the lowest alternative. The cost of Alternative 6 is three and one-half to six times greater than costs associated with Alternatives 2, 3, 4, and 5.

Alternative 6 is expected to offer protection equal to that which would be produced by Alternatives 2, 3, 4, and 5, but be less readily implementable and more costly then Alternatives 2, 3, 4, and 5. Alternatives 3, 4, 5, and 6 provide for treatment of contaminated ground water. Alternative 6 is the only alternative, however, which includes treatment of landfill material. To maintain a range of alternatives with regard to the landfill material, all alternatives will, therefore, be carried through to the detailed evaluation presented in Section 4.

SECTION 4 - DETAILED EVALUATION OF ALTERNATIVES

4.01 Introduction

The detailed evaluation of alternatives provides the basis for remedial alternative selection. This analysis is comprised of an assessment of the alternatives against nine evaluation criteria that encompass statutory requirements and include other gauges of the overall feasibility and acceptability of remedial alternatives, and a comparative analysis designed to determine the relative performance of the alternatives and identify major trade-offs between them.

The preamble to the proposed NCP (December 21, 1988) categorizes "these nine criteria ... into three groups, each with distinct functions in selecting the remedy. During the selection process, the decision maker will consider these criteria as follows. Overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection. Long-term effectiveness and permanence, reduction of toxicity, mobility or volume, short-term effectiveness, implementability, and cost are the primary balancing factors used to weigh major trade-offs between alternative hazardous waste management strategies. State and community acceptance are modifying considerations that are formally taken into account after public comment is received on the proposed plan and the RI/FS report."

4.02 Threshold Criteria

4.02.1 Overall Protection of Human Health and the Environment

Each remedial alternative, with the exception of the no action alternative (Alternative 1), incorporates treatment and/or containment of the same impacted areas and media, and by elimination of contaminants and/or transport routes results in protection of humans and the environment. The Remedial Investigation identified landfill material as the only site media which poses an unacceptable risk to humans. Specifically, the exposed landfill materials on the sides of the landfill poses risks due to the potential for direct contact exposures; and could potentially result in risks related to direct contact exposure or ingestion due to transport of contaminants via surface runoff to the drainage channels. In addition, ground water beneath the landfill was observed to contain some contaminants at concentrations above drinking water standards. Although the ground water is not currently used as a drinking water supply, it is possible, though highly unlikely, that it could be a source of drinking water in the future.

Alternatives 2, 3, 4, and 5 require proper installation and maintenance of the cap which would be constructed over the landfill materials. Alternative 6 requires treatment of the surface landfill material and replacement on the site with a low permeability cover. Each of these alternatives require grading of the side slopes and top to minimize erosion and promote drainage. The remedial alternatives also include containment of the site ground water (Alternative 2) or collection and treatment of contaminated ground water (Alternatives 3, 4, 5, and 6); and deed restrictions preventing well installation and activities which would damage the integrity of the cap (Alternatives 2, 3, 4, and 5), or allow contact with untreated landfill material (Alternatives 2, 3, 4, 5, and 6). These alternatives would eliminate the potential for direct contact exposure to contaminants in fill material; the potential for erosion of landfill materials resulting in transport of contaminants to surface water; and transport of contaminants with ground water. Alternatives 2, 3, 4, 5, and 6 would prevent ingestion or direct contact exposure to contaminants. Therefore, this Site would not pose any direct contact or ingestion risks to humans following remediation conducted in accordance with alternatives 2, 3, 4, 5, or 6. These alternatives (2, 3, 4, 5, and 6) are equally effective in meeting the site remedial objectives which were established based on the site-specific risk assessment conducted for contaminant sources.

The no action alternative (Alternative 1) does not meet the remedial objectives of eliminating the potential for direct contact exposure or ingestion of contaminants in concentrations exceeding drinking water standards. Long-term human health risks for the site would remain the same as those identified in the Risk Assessment, which found unacceptable risk associated with direct contact exposure to landfill material. Alternative 1 does not control exposure to the contaminated landfill material, and permits contact of the ground water with fill materials which might produce continued transport of contaminants. A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

4.02.2 Compliance with ARARs

Section 121(d) of CERCLA, as amended by SARA, requires that remedial actions comply with applicable or relevant and appropriate requirements (ARARs) or standards under Federal and State environmental law. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law, that while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to that particular site.

Under Section 121(d) of CERCLA, as amended by SARA, the requirements to attain State ARARs applies to requirements promulgated under State environmental or facility siting laws which are either more stringent than Federal requirements, or address a chemical, location or action that Federal ARARs do not. Therefore, the discussion of ARARs in relation to each alternative, will address Federal requirements when they are at least as stringent or more stringent than State requirements.

SARA does allow selection of remedies which do not attain all ARAR's, provided one or more of six waiver conditions are met and protection of human health and the environment remains assured. The six waiver conditions are: fund- balancing, technical impracticability, interim remedy, greater risk to human health and the environment, inconsistent application of State standards, or attainment of equivalent standard of performance. Alternatives are developed and refined throughout the CERCLA process to ensure either that they would meet all of their respective ARARs or that there is good rationale for waiving an ARAR. There are three types of ARARs: chemical-specific, location-specific, and action-specific ARARs.

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to the ambient environment. Chemical-specific ARARs for this site are applicable or relevant and appropriate to air emissions and surface water discharges.

Promulgated under the Clean Air Act are National Ambient Air Quality Standards (NAAQS) for particulates and lead. The NAAQS for particulates regulates particulate matter with an aerodynamic diameter equal to or less than 10 microns (PM10). The PM10 standard for particulates is a maximum 24-hour average concentration of 150 micrograms per cubic meter and an annual average of 50 micrograms per cubic meter not to be exceeded on more than one day per year (averaged over the three most recent years). The NAAQS for lead is an annual arithmetic mean averaged over a calendar quarter of 1.5 grams per cubic meter.

Alternatives 2, 3, 4, and 5 require installation of a vegetated, multi-layer cover on the landfill. This cover would prevent future fugitive emissions. During construction of the cover the slope of the existing sides of the landfill would be graded to appropriate stable slopes. These construction activities would increase the propensity for fugitive emissions. Fugitive emissions would be minimized through the use of dust supressants and temporary cover, as needed. Compliance of Alternatives 2, 3, 4, and 5 with the applicable NAAQS is, therefore, expected both during and following construction.

Alternative 6 requires treatment of the surface landfill material, replacement of the treated material, grading to reduce side slopes, and installation of a low permeability, vegetated cover on the site. Construction activities, including site grading, cover installation, and excavation and staging for treatment, would increase the possibility of fugitive emissions. Dust suppressants and temporary cover would be used to minimize fugitive emissions, if needed. Treatment activities (soil washing/extraction) are also a potential source of fugitive emissions. The potential for NAAQS being exceeded during treatment would be evaluated during remedial design, and, if necessary, appropriate air pollution control equipment would be specified. Alternative 6 is, therefore, expected to comply with the applicable NAAQS both during and following construction.

The no action alternative might allow for continued fugitive emissions to be produced from erosion of the steep, bare landfill sides. However, due to the nature of the landfill material, primarily sand, the NAAQS for particulates or lead would not be expected to be exceeded.

Maximum contaminant levels (MCLs) promulgated under the Federal Safe Drinking Water Act (42 U.S.C. 300f) and New York State Public Health Law Section 225 are applied at the point of distribution to a public water system. MCLs are not applicable to the Cherry Farm Site, as the ground water is not used to supply a public water system. Although a future ground of ground water users has not been identified, MCLs are relevant and appropriate because the Site ground water could potentially be used as a drinking water source.

Discharge to a surface water body is an action which must be conducted in accordance with the chemical-specific requirements established in accordance with the Clean Water Act. In New York State the Clean Water Act requirements are implemented by the State Pollutant Discharge Elimination System (SPDES) program. Direct discharges on-site would be exempt from the procedural and administrative requirements of this program. The technicai requirements of this program, which require that any discharge comply with effluent limitations established in accordance with the Clean Water Act would, however, be relevant and appropriate. The effluent limitations which are relevant and appropriate to on-site discharges site include State Water Quality Standards based on the receiving stream and technology limitations based on best professional judgement.

In addition, the surface water bodies on-site would be required to meet Ambient Water Quality Standards (AWQS) promulgated under 6 NYCRR Part 701. The drainage channels are intermittent streams, and therefore are classified as Class D surface water. The Class D AWQS are applicable as chemical-specific ARARs for the surface water in the drainage channels. Upon completion of the remedy for the Cherry Farm Site, there would be no contributions from the Site to the drainage channels which would cause excursions of the Class D AWQS. The Niagara River is a Class A surface water, as it serves as a source of potable water, approximately three miles downstream of the site. Therefore, the Class A AWQS are applicable chemical-specific ARARs for the Niagara River. Discharges from the site to the Niagara River would be of sufficient quality so as to not cause contravention of these standards or existing concentrations in the Niagara River.

Location-specific ARARs set restrictions on activities based on the characteristics of the Site or immediate environs. Location-specific ARARs may restrict the conduct of activities solely because they occur in special locations. Two potential location-specific ARARs for the site were identified pertaining to wetlands and floodplains.

The Executive Order of Protection of Wetlands (Exec. Order No. 11,990, 40 CFR 6.302 (a) & Appendix A) requires actions to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible. There is a wetland along the eastern and southern sides of the Cherry Farm landfill. All alternatives would achieve compliance with the wetland requirements by maintaining the wetland area to the extent possible. If part of the wetlands were filled, to properly construct the landfill, drainage structures or required access roads, these actions would be included in the remediation plan only because there is no practicable alternative. Overall, the remedial alternatives, with the exception of the no action alternative, are protective of the wetland, because they serve to eliminate the potential migration of contaminants to this area.

The Executive Order on Floodplains Management (Exec. Order No. 11,988, 40 CFR 6.302(b) & Appendix A) requires actions to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values in floodplains. The Cherry Farm site is located in a 100 year floodplain. However, the Niagara River 100 year flood elevation is 571 feet, which is only 1 foot higher than the bottom of the existing landfill. Actions taken with respect to this site are not expected to further affect the floodplain. Due to the minimal rise in depth expected from the 100 year flood, washout of the landfill or cover would not occur. Periodic inspections and maintenance as required would maintain the integrity of the landfill.

Action-specific ARARs set controls or restrictions on particular types of actions related to management of hazardous substances, pollutants, or contaminants. Table 13 identifies Federal and State of New York action-specific ARARs. State ARARs are included where they are more stringent or address a requirement not regulated by Federal laws and regulations. A brief discussion of the jurisdictional prerequisites for the regulations (with the exception of the Clean Water Act which was previously discussed for chemical-specific requirements) listed on Table 13 follows.

The New York State Environmental Conservation Law, Article 27, Titles 7 and 9 regulates the disposal of hazardous waste in the State of New York. The New York Compilation of Rules and Regulations (NYCRR), Title 6, Chapter 371 establishes the characteristics of hazardous waste, while NYCRR, Chapter 373 regulates hazardous waste treatment, storage and disposal facilities. NYCRR, Chapter 371 identifies all solid wastes containing greater than 50 parts per million by weight or greater of polychlorinated biphenyls as a listed hazardous waste. The landfill material does contain areas with PCBs in concentrations exceeding 50 mg/kg, Chapter 373 requirements are, therefore, requirements for management of this site.

Subpart H of the Occupational Safety and Health Standards (29 CFR 1910) provides for worker health and safety when engaged in the handling of hazardous materials. This section covers employers and employees engaged in hazardous substance response operations under the CERCLA action. It would, therefore, be relevant and appropriate to employers and employees engaged in remedial actions under this State lead remediation action. The Safety and Health Regulations for Construction (29 CFR 1926) establish that no contractor or subcontractor shall require laborers or mechanics performing construction work to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to health and safety. These standards would be applicable to employees engaged in any part of contract work, including construction activities such as excavation, landfill or cap installation, and stream diversion, or treatment activities such as soil washing/extraction. Compliance with these ARARs would be achieved through the development of a health and safety program.

ARAR's are alternative-specific, therefore, each alternative would not be impacted by each law or regulation previously discussed. Table 14 identifies alternative-specific ARAR's. A discussion of individual alternatives and compliance with ARARs follows.

Although Alternative 1 requires no actions, this alternative is still subject to ARARs pertaining to existing conditions. As previously discussed, it is not expected erosion would cause exceedence of the NAAQS for lead or particulates. Erosion might allow for transport of contaminants from the landfill sides to drainage ditches or the Niagara River. The substantive requirements of the SPDES program would be relevant and appropriate to these on-site discharges. For surface water and ground water flows, it is expected that water quality standards would be met at the point of discharge or in a mixing zone established in the Niagara River. This alternative, however, would not attain all MCLs.

Although the no action alternative does not constitute disposal, Part 373 requirements specifying prevention of run-on and run-off, installation of appropriate cover, and ground water monitoring would be relevant and appropriate. This alternative would comply with prevention of run-on and run-off and ground water monitoring provisions, however, adequate cover to minimize migration of liquids and promote drainage is not provided by the vegetated clay cover which was installed only on the top of the existing landfill.

Alternative 2 provides for containment of landfill materials through installation of a cap and for containment of contaminated ground water through installation of a slurry wall. This alternative would, therefore, prevent transportation of contaminants by air or surface water and achieve compliance with NAAQS and substantive requirements of the SPDES program. Alternatives 3, 4, 5, and 6 require installation of a cap and a ground water extraction and treatment system. These containment and ground water treatment measures would also prevent transportation of contaminants by air or surface water and achieve compliance with these ARARs.

Any equipment used in Alternative 2, 3, 4, 5, and 6 construction or treatment activities which contacts material containing PCBs in concentrations exceeding 50 mg/kg would be decontaminated as required by Part 373. The Part 373 landfill cover requirements would be relevant and appropriate to the cap provided for these alternatives. These requirements would be achieved through proper design of the cap which provides for minimization of migration of liquids, promotion of controlled run-off and evapotranspiration, minimization of erosion, and prevention of run-on. The required amendment would be made to the site deed and a ground water monitoring program would be instituted as required by Part 373-2.6.

Site ground water presently contains some contaminants at concentrations exceeding drinking water standards. Alternatives 2, 3, 4, 5, and 6 would prohibit the use of Site ground water as a drinking water source through the use of deed restrictions. Alternatives 3, 4, 5, and 6 would provide for removal and treatment of ground water which contains contaminants in concentrations exceeding drinking water standards, until such time as the ground water attains drinking water standards. Alternatives 2, 3, 4, 5, and 6 would eliminate both the consumption of on-site ground water which contains contaminants in excess of drinking water standards, and the potential contravention of drinking water standards in off-site drinking water sources due to transport of contaminants from the Cherry Farm Site.

Alternatives 3, 4, 5, and 6 require extraction of ground water, treatment of contaminated ground water and discharge to an on-site surface water body. The technical requirements of the SPDES program which are relevant and appropriate to on-site discharges include State Water Quality Standards based on the receiving stream and technology limitations based on best professional judgement. The treatment process selected during final design would be based on these limitations. It is expected that treatment for both organics and inorganics would be required, although further monitoring might indicate the ground water withdrawn from an extraction well system would be in compliance with various limitations prior to treatment. Based on treatment by precipitation and activated carbon or other comparably effective methods such as combinations of precipitation, activated carbon and air stripping, it is anticipated that effluent limitations and water quality standards developed for a discharge to the Niagara River would be met by all four alternatives prior to discharge (technology based limitations or parameters for which that water body is not limited) or, where acceptable, in a mixing zone established in the Niagara River.

The evaluation of ARARs indicates all alternatives, with the exception of the no action alternative, would comply with all of their respective ARARs. A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

4.03 Primary Balancing Criteria

4.03.1 Long-term Effectiveness and Permanence

Following completion of the remedial efforts, Alternatives 2, 3, 4, 5, and 6 would provide effective long-term protectiveness by preventing the exposure to and transport of contaminants. Alternatives 2, 3, 4, and 5 require installation of a cap over the fill material, while Alternative 6 requires treatment of surface landfill material, replacement on-site, and installation of low-permeability cover over the landfill. Following completion of remedial actions associated with Alternatives 2 through 6, wastes would be contained and no materials would be exposed which would have an adverse impact or pose a risk to the environment.

The slurry wall provided for in Alternative 2 would provide long-term minimization of horizontal ground water movement, thereby minimizing migration of contaminants via ground water. Minimal operation and maintenance is required for this alternative to achieve continued effectiveness over the long-term.

Ground water extraction and treatment would be required indefinitely for Alternatives 3, 4, 5, and 6. This activity would prevent contaminants from leaving the site via ground water, thus eliminating transport. Contaminated ground water would be treated, resulting in no exposure to or ingestion of contaminants.

The no action alternative (Alternative 1) does not provide long-term protectiveness. This alternative would permit the transport of contaminants, particularly due to erosion of the upcapped steep sides. The mobility of the contaminated ground water would not be restricted.

A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

4.03.2 Reduction of Toxicity, Mobility or Volume

Alternative 2 provides containment of landfill material and contaminated ground water. The cap and slurry wall system would minimize horizontal ground water movement and virtually eliminate vertical movement. This would result in the minimization of the mobility of the contaminants associated with landfill material and ground water.

Alternatives 3, 4, and 5 provide containment of landfill material and collection and treatment of contaminated ground water. The extraction well system in Alternative 3, and extraction well and upstream ground water diversion systems in Alternatives 4 and

5, would be used to extract and control ground water. These alternatives would, therefore, eliminate the mobility of contaminants associated with erosion or leaching and prevent transport of these contaminants to uncontaminated ground water. Contaminated ground water which is collected would be treated. The ground water treatment proposed, precipitation and activated carbon, would result in removal of the metals and destruction of organics through thermal regeneration of spent carbon. This treatment system would thereby reduce the toxicity and volume of the contaminants.

Alternative 6 provides for treatment of the surface landfill material and collection and treatment of contaminated ground water. Table 5 indicates appropriate extraction fluids may reduce the volume of PCBs and lead contained in surface landfill materials by 90 percent or greater. Soils would contain residual concentrations of contaminant following treatment. Treated surface landfill materials would be returned to the site and covered with low-permeability materials, eliminating the potential for contaminant mobility due to erosion.

The impermeable cover provided for Alternatives 3, 4, and 5 would eliminate infiltration. In conjunction with operation of the extraction wells, this would eventually result in dewatering of the landfill material, which would eliminate migration of contaminants. The low-permeability cover provided for Alternative 6 would minimize percolation through the landfill. However, sufficient percolation would occur to allow continued leaching of contaminants contained in landfill materials. The mobility of these contaminants and transport to uncontaminated ground water would be eliminated through ground water collection and treatment.

The no action alternative (Alternative 1) provides no reduction in the toxicity, mobility or volume of the contaminated landfill material or ground water.

A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

4.03.3 Short-term Effectiveness

During construction activities (Alternatives 2, 3, 4, 5, and 6) and surface landfill material treatment activities (Alternative 6), visitor access to the site would be restricted, to eliminate the potential for exposure to contaminants. Site remediation workers would be protected through use of the appropriate direct contact and respiratory protection as required by OSHA and the Health and Safety Plan which would be developed prior to remediation. The environment would be protected through measures to prevent fugitive emissions and transport of excavated material, such as dust suppression and temporary cover.

The sides of the filled area are generally steep (approximately 70 percent slope). Therefore, prior to installation of a cap a reduced slope must be developed. To develop an acceptable slope (approximately 22 percent), landfill material would have to be excavated from the sides and placed on top (Alternatives 2, 3, 4, 5, and 6). Excavation and staging of landfill materials would be required prior to the surface landfill material treatment incorporated in Alternative 6. These activities would require earth moving which could generate dusts. Dusts could also be generated during other activities associated with cap installation, although this would be minimized by the vegetation on the top of the landfill. The generation of dusts might be somewhat limited, as the fill material is primarily a sand which would be less likely to produce dusts than finer grained soils.

Generation of fugitive dusts would increase the potential for direct contact exposure to contaminants associated with the dust. The earth moving activities, which would increase the friability of the landfill material, could increase both the potential for human exposure to contaminants and transport of contaminants. The risk to humans would be minimized through the use of proper personal safety equipment (respiratory and contact protection). Transport of contaminated materials during construction activities would be minimized through the use of appropriate techniques, such as dust suppression measures and temporary cover.

There is a potential for generation of fugitive emissions during soil washing/extraction (Alternative 6). If such a remedy were selected for implementation, these emissions would be evaluated during detailed design and proper operator safety equipment and air pollution control equipment would be specified as needed.

Construction activities for Alternatives 2, 3, 4, 5, and 6 consist primarily of: installation of a cap and a slurry wall for Alternative 2; installation of a cap and an extraction well system for Alternative 3; installation of a cap, upgradient slurry wall and an extraction well system for Alternative 4; installation of a cap, upgradient interceptor trench, and an extraction well system for

Alternative 5; and treatment of surface landfill material, and installation of low-permeability cover and an extraction well system for Alternative 6. With the exception of Alternative 6, these combinations of activities are expected to be completed in approximately one year, not including the time necessary for design and awarding of contracts. It is expected construction of the ground water treatment systems required for Alternatives 3, 4, 5 and 6 might take a period of 3 months to 6 months. Dependent on the location of the treatment plant, installation might be conducted concurrent with or prior to completion of cap installation activities.

There are several commercial soil washing/extraction units in operation in the Netherlands, but only one in the Unites States (4, 5, 7). These units have capacities of 20 to 40 tons per hour (4, 5, 7). If two 20 ton per hour units are used, each with an 8 hour operating day, 260 days of operation per year, and 20% down-time, approximately 5 years (to treat surface four feet) to 8 years (to treat surface 6 feet) would be required for soil washing/extraction treatment of the surface landfill material (assuming a density of 1.3 tons of landfill material per cubic yard). Partial construction of the cover and installation of the ground water extraction well and treatment system may be performed concurrently with surface landfill material treatment. Depending on the depth of surface landfill material selected for treatment, the total time to complete Alternative 6 would be expected to exceed 5 to 8 years. This period of time does not include the time necessary for treatability testing, design, and awarding of contracts.

Following completion of Alternative 2 construction activities, the contaminated soil and ground water would be fully contained. Therefore, that alternative would be fully protective of human health and the environment in approximately one year. The on-going extraction of ground water and treatment of contaminated ground water provided for in Alternatives 3, 4, 5, and 6 would provide for removal and treatment of contaminated ground water and control of the ground water table to prevent transport of contaminants. These alternatives would be fully protective upon operation of the extraction well systems, as contaminated ground water would be extracted and treated, and not allowed to migrate to the river.

There would be no additional risks posed to the community, workers, or the environment as a result of implementation of Alternative 1, however, present risks associated with the site would continue.

A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

4.03.4 Implementability

Caps, slurry wall, interceptor trenches and extraction well systems are proven technologies. These systems could be installed through readily implementable standard actions, although further hydrologic study would be required prior to design of the slurry wall, interceptor trench and extraction well system. The extraction well system and ground water treatment system would require periodic servicing by a trained technician. Maintenance, consisting primarily of inspection and mowing of the caps, would be required to ensure proper operation of these units.

Alternatives 3, 4, 5, and 6 require treatment of contaminated ground water. Both precipitation for removal of metals, and activated carbon for removal of organics, are demonstrated, proven technologies that would be readily implementable following pilot tests to finalize parameters necessary to design the system. The treatment system would require periodic attention by a trained operator for proper operation.

An approved ultimate disposal site would have to be located for the sludge generated from removal of metals. The quantity of sludge expected to be generated and constituents of the material suggest there should be suitable locations in the area.

Alternative 1 does not require any actions, with the exception of ground water monitoring. Therefore, this alternative is expected to be readily implementable.

Alternative 6 requires treatment of the surface landfill material by a soil washing/extraction procedure. Soil washing/extraction is an innovative technology which is not readily implementable. No operational commercial or pilot-scale units suitable for treatment of the combination of organic and inorganic contaminants present in the landfill material have been identified (4, 5, 6, 7). Treatability testing would be required to determine if the process would be effective for treatment of landfill materials.

Solvent washing/extraction is a complex procedure. Pretreatment would be required to remove debris and over-sized material. The appropriate extraction agents would be identified during treatability testing. Based on the combination of inorganic and organic contaminants present in the landfill material it appears likely a multiple-stage extraction system would be required. Additional operations would be required for treatment of extraction fluids and residual waste streams prior to recycling or disposal. These operations may include a combination of the following processes: solvent recovery (distillation); liquid solids separation (flocculation, clarification, thickening, dewatering); and water treatment (ion exchange, carbon adsorption).

Considerable attention by a trained operator and periodic sampling of treated material would be required during operation. Approved disposal sites would have to be located for residuals which might include spent solvents, spent activated carbon and sludges.

A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

4.03.5 Cost

Tables 7 through 12 detail the cost estimates prepared for the alternatives. The present worth of each alternative was estimated based on 5 percent interest over a 30 year period. The following costs estimates were developed for each alternative:

Alternative	Capital Cost	Annual O&M	Total Present Worth
1	$ 106,285	$ 35,466	$ 651,486
2	$17,783,044	$300,783	$ 22,406,837
3	$12,396,711	$309,489	$ 17,154,333
4	$15,471,204	$370,396	$ 21,165,115
5	$21,885,748	$462,414	$ 28,997,204
6	$86,645,475	$921,910	$100,817,529

A summary of the detailed evaluation of alternatives considering this criterion is presented in Table 15.

The No Action Alternative is by far the least costly alternative to implement. Alternative 6 is by far the most costly treatment and containment alternative.

4.04 Modifying Criteria

4.04.1 Support Agency and Community Acceptance

These criteria will be addressed in the Record of Decision (ROD) once comments on the FS report and proposed plan have been received. It should be noted that significant community objection to Alternatives 2, 3, 4, 5, and 6, which eliminate the risk at the site would not be not expected. The Town of Tonawanda has expressed interest in developing several properties, including the Cherry Farm Site, which are located along the Niagara River. Issues related to development of the Cherry Farm Site and remediation of the Site are discussed in Section 6 of this Report.

4.05 Selection of Recommended Remedial Alternative

The risk assessment conducted during the RI indicated that the exposed landfill materials on the sides of the landfill pose an unacceptable risk due to direct contact. In addition, the potential exists for these exposed materials to erode into the drainage channels and cause excursions of the Ambient Water Quality Standards (AWQS) for the drainage channels. The site ground water quality is also in excess of certain drinking water standards. Although the ground water is not a source of potable water, and a public water system is currently in place, it is possible that someone could install a well and use the ground water as a drinking water source. For these reasons, the No Action Alternative would not attain the remedial action objectives presented in Section 2.02, and therefore would not be protective of human health and the environment.

All of the containment and treatment alternatives (Alternatives 2, 3, 4, 5, and 6) attain the remedial action objectives and compare favorably in the non-cost criteria utilized in the detailed evaluation of alternatives. Alternative 2, however, does not satisfy the statutory preference for treatment as Alternatives 3, 4, 5, and 6 do. Alternative 6 provides for treatment of the surface landfill material. This action does not provide any increase in protectiveness, but does produce an extremely costly remedial alternative. In addition, the soil washing/extraction treatment process considered in Alternative 6 could result in additional risks due to additional contaminated materials handling requirements. The process also would result in the generation of contaminated residuals which would require off-site treatment and/or disposal. It also considerably increases the period of time required to achieve remedial objectives. Of the containment and treatment alternatives, Alternative 3 offers equal protectiveness and is the most cost-effective alternative. Alternative 3 is the alternative which is recommended for implementation.

SECTION 5 - CONCEPTUAL DESIGN

5.01 Conceptual Design

Remedial Alternative 3 is recommended for implementation at the Cherry Farm Site. This alternative includes the installation of a multi-layer clay cap over the landfill, ground water extraction wells, and a treatment system for contaminated ground water. Ground water monitoring, fencing, and deed restrictions will also be implemented.

Construction activities would be initiated by establishing proper grades on the landfill. This would entail cutting the existing sides of the landfill to slopes of no greater than approximately 22% (1 vertical on 4.5 horizontal). The landfill material would be placed on top of the landfill. Additional clean backfill would be brought on-site to establish top slopes of at least 5%. Once the final grades are attained, the ground water extraction wells would be installed. Piping would lead from the wells to the ground water treatment system.

At this point, the multi-layer clay cap would be constructed. The ground water treatment plant would be installed, with discharge piping leading to the drainage channel. Startup of the ground water extraction and treatment system would occur after the cap construction is completed. Based on the Site hydrogeology, the ground water extraction and treatment system would be operated at a flow rate of approximately 10 gallons per minute.

The extraction system would consist of four wells. The extraction system has been designed with the intention of treating the water passing below the site in the shallow and intermediate zones. The ground water flow beneath the Cherry Farm Site has been estimated at 12,389 gallons per day (O'Brien & Gere Engineers, Inc., Remedial Investigation Report - Cherry Farm Site, Tonawanda, New York, June 1989, pp. 3-12, 3-14). The estimated pumping rate of the extraction system is 10 gallons per minute (14,400 gallons per day). Therefore, the proposed extraction and treatment system would be adequate for collecting the ground water from the shallow and intermediate zones and preventing contaminated ground water from reaching the Niagara River. Although the deep ground water zone is not contaminated with constituents of concern, the extraction of the ground water from the shallow and intermediate zones may create an upward flow from the deep zone and subsequently capture some of this water. The proposed containment and treatment alternative would provide complete reduction of contaminants entering the Niagara River. A detailed discussion of the ground water extraction system rationale is presented in Appendix A.

Site fencing would be installed. It would consist of six foot high chain link industrial fencing. Property deed restrictions could be imposed at any point during implementation of the remedy. The deed restrictions would not preclude future use of the Site. Rather, they would provide additional protection against potential exposure to the low level contaminants present at the Site. The deed restrictions would include measures to prevent the installation of drinking water wells at the Site, and restrict activities which could affect the integrity of the cap. The monitoring program would be initiated upon completion of the closure activities. A layout of the conceptual design is presented in Figure 3.

The total 30-year present worth of Alternative 3 is approximately $17.2 million. This includes a capital cost of $12.4 million and a 30-year present worth O&M cost of $4.8 million.

Standard construction methods would be used to implement this alternative. Level C or D protection is expected to be adequate to protect on-site workers during constructions.

SECTION 6 - SUPPLEMENTAL CONSIDERATIONS

6.01 Introduction

The Town of Tonawanda, New York is presently considering developing the Waterfront Region along the Niagara River. This region, which encompasses more than 1,100 acres paralleling River Road and the Niagara River, includes the Cherry Farm Site. A May 1989 market analysis and development study conducted for this area (Halcyon, Ltd. and Sasaki Associates, 1989) examined the level of supportable development for the following major real estate categories: housing, retail, office, industrial and marina. The study concluded that strong market support exists for industrial development and development as a marina, and limited, short-term market support exists for retail development. The study further considered three development concepts. The Town Harbor concept would not include the Cherry Farm area. The Waterfront Boulevard concept would use the Cherry Farm Site for retail, office, housing and a marina. The Linear Park concept would use the Cherry Farm Site for a public park and interpretive center.

During a March 7, 1990 meeting with representatives of NMPC, OBG, and NYSDEC, representatives of the Town of Tonawanda indicated the most recent development plans for the Waterfront Region proposed development of the Cherry Farm Site as a public park (Exhibit A). The following elements were identified for potential inclusion in the park:

8-10 boat launching ramps

Public marina (150 - 200 slips)

Fishing piers

Fish cleaning station

Picnic area

Band shell

Concession stands

Lavatory facilities

Riverwalk/bikeway

Interpretive Center

Decorative fountains

Boat trailer and automobile parking

Landscaping

Boat supply and services (gas)

No design details for the development were offered by the Town representatives, although they indicated that it was the Town's interest to pursue a design study in the near future.

This section evaluates the feasibility of developing the Cherry Farm Site as a park, in conjunction with site remediation conducted in accordance with Alternatives 2, 3, 4, 5, or 6. The no action alternative (Alternative 1) will not be addressed in this discussion, as it would not be protective of human health. The detailed evaluation criteria which may be impacted by land use will be evaluated with respect to actions required by development. The two threshold criteria, overall protection of human health and compliance with ARARS will be evaluated. Of the primary balancing criteria, long-term effectiveness and permanence, implementability, short-term effectiveness, and cost may be impacted by alternate land use. Reduction of toxicity, mobility or volume will not be an issue, as the ultimate land use will not affect the treatment provided for each alternative. The modifying criteria will not be evaluated until the public and supporting agencies have had the opportunity to evaluate the proposed plan. It should be noted, however, that during the March 7 meeting, Town representatives indicated they would not be adverse to remediation of landfill material utilizing on-site closure, as long as adequate protection to public health would be provided.

The park concept includes several differing potential land uses for the Cherry Farm site. Based on similar considerations these land uses can be grouped into the following categories: buildings (band shell, concession stands, lavatory facilities, interpretive center), marina (8-10 boat launching ramps, 150-200 boat slips, fishing piers, fish cleaning station, and boat supply and services (gas)), and miscellaneous park facilities (picnic areas, riverwalk/bikeway, decorative fountains, boat trailer and automobile parking, and landscaping). Each category of land use will be evaluated with respect to each remedial alternative (except the no action alternative) and the CERCLA detailed evaluation criteria.

6.02 Overall Protection of Human Health and the Environment

Alternatives 2, 3, 4, and 5 would be protective of humans and the environment if either buildings, a marina or miscellaneous park facilities are located on the site following remediation, provided that proper care is taken in construction and design of the buildings, marina or park facilities, and the cap. The cap provided in each of these alternatives would prevent direct contact exposure to contaminants. However, the cap would effectively prevent direct contact exposure only as long as its integrity is maintained. Construction activities related to the buildings, marina, and park facilities would require careful planning and would only be acceptable if the integrity of the cap is maintained. Design details which would impact final topography, such as road locations, building locations, underground utility locations, drainage pathways, river access and other factors would have to be incorporated into cap design. During and subsequent to construction, inspections of the cap and repair of any damage caused during construction would be required.

Development of marina facilities would require excavation of landfill material. To achieve acceptable grading of the landfill cap, preliminary estimates indicate 85,000 cubic yards of off-site embankment material would be required. If a park is developed, material excavated for marina construction would be utilized instead of off-site grading materials. It is anticipated all landfill materials excavated for marina construction could be accommodated on-site without compromising park or landfill cover topographic requirements.

Regardless of the land use at the Site, to ensure the integrity of the cap a deeper vegetative support layer would be required. Construction of building foundations and underground utility installation would not be allowable unless sufficient embankment material were provided to prevent the structures from impacting the integrity of the cap. A deeper vegetative support layer would allow activities such as installation of signs, fences, volleyball nets, or children digging holes to be conducted without adversely impacting the cap or exposing contaminants. These activities might otherwise be prohibited by deed restrictions but not necessarily eliminated by these restrictions. The deeper vegetative support layer would also allow minor grading of the Site to be conducted without impacting the cap. A vegetative support layer significantly increased in depth, possibly overlying an impermeable layer, would be required in areas where deep rooted vegetation is desired. Deed restrictions would be required to prevent installation of wells until the ground water beneath the site attains drinking water quality or is first treated before use as drinking water.

Alternative 6, which provides for treatment of the surface four to six feet of landfill material and installation of low-permeability cover, would be protective of humans and the environment, if either buildings, a marina or miscellaneous park facilities are located on the site following remediation. This alternative would impose design constraints similar to those imposed by Alternatives 2 through 5 (i.e., design details which would impact final topography would have to be incorporated into cap design). Material excavated for marina development could be accommodated in this alternative, provided it is first treated if it is to be placed directly below the cover.

Development of the Site would not impact the effectiveness of the ground water containment or collection/treatment systems utilized in Alternatives 2, 3, 4, 5, or 6. Therefore, these alternatives would prevent transport of contaminants through ground water if the Site were to be developed. Deed restrictions would be required to prevent installation of potable wells until the ground water quality attained drinking water quality. If ground water wells were to be installed, proper procedures would have to be implemented to limit exposure to drill cuttings (landfill materials), and to maintain integrity of the cap.

6.03 Compliance with ARARs

No additional ARARs related to site development have been identified. The chemical-specific ARARs under the Clean Water Act would be met by Alternatives 2, 3, 4, 5, and 6 if any of these alternatives are implemented in conjunction with developing the site, as the ground water containment or collection and treatment originally proposed with the alternatives would not be altered. The chemical-specific ARARs under the Clean Air Act would be met by Alternatives 2, 3, 4, 5, and 6 if any of these alternatives are implemented in conjunction with developing the site, provided that the landfill material would be covered by grass, pavement or buildings following construction and temporary covers and dust suppressants would be used as needed during construction.

The location-specific ARARs pertaining to floodplains will not be impacted by construction of buildings at the site, as the perimeter of the landfill presently occupies the floodplain area and further impact on the floodplain would not be produced by construction of buildings at the site. As proposed, the remedial alternatives maintain the wetland area to the extent possible. If development requires destruction of the wetlands, appropriate federal and state permits would be required. If construction of the marina requires dredge and fill activities in the Niagara River, a permit under Section 404 of the Clean Water Act and other required federal and state permits may be necessary.

The action-specific ARARs pertaining to 6 NYCRR Part 373 will be achieved through inclusion of the landfill cover design requirements when the building, marina or park layout and associated topography is considered. The OSHA requirements will be met by providing proper training, and respiratory and contact protection to construction workers whenever contaminants may potentially be exposed.

6.04 Long-term Effectiveness and Permanence

If proper consideration is given to maintaining the integrity of the cap during the land use design phase, and appropriate care is taken during construction activities, Remedial Alternatives 2, 3, 4, 5, and 6 would provide long-term effectiveness by preventing the exposure to and transport of contaminants. In particular, for Alternatives 2 through 5 the depth of the vegetative support layer of the cap should be increased to prevent breach of the cap and exposure of contaminants.

Future construction of buildings, installation of sub-surface pipes or other future activities which might breach the cap would require a study to determine their impact on the cap and measures which would have to be taken to avoid disrupting the integrity of the cap. To maintain long-term effectiveness the provision for study prior to sub-surface activity should be made a deed restriction. Long-term effectiveness would also require strict enforcement of the deed restriction on well installation. In addition, drill cuttings (landfill materials) would require proper management.

6.05 Short-term Effectiveness

During both remedial activities and land development activities workers would use protective equipment and clothing, as needed, when contaminants are exposed, and dust suppressants and temporary cover would be provided, as needed, to prevent fugitive emissions. The short-term effectiveness of Alternatives 2, 3, 4, 5, and 6 would, therefore, be maintained during site development.

6.06 Implementability

Construction of buildings, a marina, or miscellaneous park facilities on the landfill would be technically feasible. However, to properly design roads and provide an acceptable base to locate buildings, roads, picnic areas, etc., the slope of the landfill would likely have to be reduced from what would typically be considered acceptable. Location of roads, buildings, drainage routes, pipe locations, and other topography issues would require careful attention to maintain a cap design which would promote controlled run-off, limit infiltration, and achieve compliance with other Part 373 requirements.

To avoid infringement of the downgradient end of the slurry wall provided in Alternative 2 by access roads to the River would require that the landfill be cut back further than would be required to achieve an acceptable slope. This would be technically feasible due to the large area of the landfill which would be available as a disposal location for the cut material.

Development of the site, following remediation by Alternatives 2, 3, 4, or 5, would require a deeper vegetative support layer in the cap and reduced slopes. This would result in an increase in the height of the landfill. This height would not preclude development of the site, but it may make it less desirable, particularly if easy access to the River is desired. Alternative 6 includes the treatment of the first 4 to 6 feet of landfill material and replacement of the treated material. If appropriate clean-up levels are accomplished through treatment, additional soil may not be necessary for development.

To be consistent with the land use, the extraction well system would have to be flush mounted. The treatment plant would be fenced in for security purposes. Construction of buildings, a park, or a marina on the cap, while achieving protectiveness and ARARs is implementable, if careful consideration is given to details during the design phase.

6.07 Cost

Construction of buildings, a park or a marina on the cap would increase the cost of the remedial alternatives, primarily through the requirement for installation of additional vegetative support material, reduction of cap slopes associated with developing an acceptable slope for roads and buildings, and cost associated with the additional study required for final design of the cap based on building layout, piping, roads, and other construction requirements.

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Tables

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TABLE 1

CHERRY FARM SITE
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
GROUND WATER

Ground Water General Response Action	Remedial Technology	Process Options	Description	Screening Comments
NO ACTION	None	Not applicable	No action	Required for consideration by NCP
INSTITUTIONAL ACTIONS	Access restrictions	Deed restrictions	Property deeds in the area of influence would include restrictions on wells	Potentially Applicable
	Alternate water supply	Municipal water supply	Extension of municipal water supply to area of influence	Not applicable because no user wells in area
		New community well	New uncontaminated wells in area of influence	Not applicable because municipal water supply in place
	Monitoring	Ground water monitoring	Continued monitoring of wells	Potentially applicable
CONTAINMENT ACTIONS	Cap	Clay and Soil	Compacted clay covered with soil over areas of contamination	Potentially applicable
		Asphalt	Application of a layer of asphalt over areas of contamination	Potentially applicable
		Concrete	Installation of a concrete slab over areas of contamination	Potentially applicable
		Multimedia Cap	Clay and synthetic membrane covered by soil over areas of contamination	Potentially applicable
	Subsurface Barriers	Slurry wall	Soil or cement bentonite slurry trench surrounding area of influence	Potentially applicable but may not be feasible if impervious layer is not located
		Grout curtain	Pressure injection of grout into soil or rock	Not applicable to alluvial deposits and glacial till at site

TABLE 1

CHERRY FARM SITE
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
GROUND WATER

Ground Water General Response Action	Remedial Technology	Process Options	Description	Screening Comments
COLLECTION ACTIONS	Extraction	Extraction Wells	Series of wells to extract contaminated ground water	Potentially applicable
		Extraction/Injection Wells	Injection wells inject uncontaminated water to increase flow to extraction wells	Potentially applicable
	Subsurface Drains	Interceptor Trenches	Preforated pipe in trenches back-filled with media to collect contam-	Potentially applicable
TREATMENT ACTIONS	Physical/Chemical Treatment	Carbon Adsorption	Adsorption of contaminants onto activated carbon	Potentially Applicable
		Ion Exchange	Exchange of ions between ion exchange resin and water	Potentially Applicable
		Oxidation	Detoxification of contaminants by oxidation-reduction reactions	Potentially Applicable
		Precipitation	Alteration of chemical equilibria to reduce contaminant solubility	Potentially Applicable
		Reverse Osmosis	Use of high pressure to force water through a membrane, separating con-	Potentially Applicable
		Stripping	Mixing large volumes of air or steam with water to promote transfer of volatile organics	Potentially applicable
	Thermal treatment	(continued on page 3)		
	Biological treatment	(continued on page 3)		
	In-situ treatment	(continued on page 3)		

TABLE 1

CHERRY FARM SITE
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
GROUND WATER

Ground Water General Response Action	Remedial Technology	Process Options	Description	Screening Comments
TREATMENT ACTIONS (continued)	Biological treatment	Aerobic	Degradation of organic contaminants by aerobic microorganisms.	Not feasible for combination of organic and inorganic contaminants present in ground water
		Anaerobic	Degradation of organic contaminants by anaerobic microorganisms.	Not feasible for combination of organic and inorganic contaminants present in ground water
	Thermal treatment	Rotary kiln	Combustion of waste in rotating horizontal cylinder	Not applicable for site dilute contaminants in ground water
		Fluidized bed	Combustion of waste in hot sand bed	Not applicable for site dilute contaminated ground water
	In-Situ treatment	Bioreclamation	Injection of microorganisms and nutrients into ground water to biodegrade contaminants	Not feasible for combination of organic and inorganic contaminants present in ground water
		Aeration	Injection of air into wells to strip contaminants from ground water	Not feasible for combination of organic and inorganic contaminants present in ground water
		Permeable treatment beds	Adsorption of contaminants in trenches filled with adorbent material	Not feasible for combination of organic and inorganic contaminants present in ground water
		Oxidation	Injection of oxidizer into wells to oxidize contaminants.	Not feasible for combination of organic and inorganic contaminants present in ground water

TABLE 2

CHERRY FARM SITE
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
LANDFILL MATERIAL

Landfill Material General Response Action	Remedial Technology	Process Options	Description	Screening Comments
NO ACTION	None	Not applicable	No action	Required for consideration by NCP
INSTITUTIONAL ACTIONS	Access restrictions	Deed restrictions	Property deeds in the area of the landfill would include restrictions on land use	Potentially applicable
		Fencing	Installation of fence surrounding area of contamination	Potentially applicable
	Monitoring	Ground water monitoring	Continued monitoring of wells	Potentially applicable
CONTAINMENT ACTIONS	Cap	Clay and Soil	Compacted clay covered with soil over areas of contamination	Potentially applicable
		Asphalt	Aplication of a layer of asphalt over areas of contamination	Potentially applicable
		Concrete	Installation of a concrete slab over areas of contamination	Potentially applicable
		Multimedia Cap	Clay and synthetic membrane covered by soil over areas of contamination	Potentially applicable
	Land Disposal	On-site landfill	Placement of waste in on-site landfill	Infeasible for entire site due to volume of contaminated material; Potentially applicable to limited areas
		Commercial landfill	Placement of waste in off-site landfill	Infeasible for entire site due to volume of contaminated material; Potentially applicable to limited areas

TABLE 2

CHERRY FARM SITE
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
LANDFILL MATERIAL

Landfill Material General Response Action	Remedial Technology	Process Options	Description	Screening Comments
REMOVAL ACTION	Removal Action	Excavation	Removal of waste using applicable construction equipment such as: backhoes, cranes, front-end loaders, etc.	Infeasible for entire site due to volume of contaminated material; Potentially applicable to limited areas
TREATMENT ACTIONS	Thermal treatment	Rotary kiln	Combustion of waste in rotating horizontal cylinder	Does not provide treatment for combination of contaminants present in landfill
		Fluidized bed	Combustion of waste in hot sand bed	Does not provide treatment for combination of contaminants present in landfill
		In-situ vitrification	Vitrification in place	Infeasible for entire site due to volume of contaminated material; Potential problems due to presence slag
	Chemical/Physical	Stabilization	Solidification of material	Not demonstrated for all contaminants of concern; Infeasible for entire site due to volume of contaminated material; Potentially applicable to limited areas
		Soil Washing	Extraction of contaminants	Innovative technology; Infeasible for entire site due to volume of contaminated material; Potentially applicable to limited areas
	Biological treatment	Aerobic	Degradation of organic contaminants by aerobic microorganisms.	Not feasible for combination of organic and inorganic contaminants present in landfill
		Anaerobic	Degradation of organic contaminants by anaerobic microorganisms	Not feasible for combination of organic and inorganic contaminants present in landfill

TABLE 3

CHERRY FARM SITE
EVALUATION OF PROCESS OPTIONS
GROUND WATER

Ground Water General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
NO ACTION	None	Not applicable*	Does not reduce contamination	Readily implementable	None
INSTITUTIONAL ACTIONS	Monitoring	Ground water monitoring*	Effective for observation of conditions Does not reduce contamination or prevent exposure	Readily implementable	Low capital, Medium O & M
CONTAINMENT ACTIONS	Cap	Clay and Soil*	Effective in minimizing infiltration, Susceptible to cracking, but has self-sealing properties	Readily implementable	Low capital, Low O & M
		Asphalt	Effective in minimizing infiltration, Susceptible to weathering and cracking	Readily implementable	Low capital, High O & M
		Concrete	Effective in minimizing infiltration, Susceptible to weathering and cracking	Readily implementable	Moderate capital, High O & M
		Multimedia Cap	Effective in minimizing infiltration, Least susceptible to weathering and cracking	Readily implementable	Moderate capital Moderate O & M
	Subsurface Barriers	Slurry wall*	Effective aid to ground water	Specially formulated slurry material required to withstand organics in ground water	High capital, Very low O & M

*Representative Process Option

TABLE 3

CHERRY FARM SITE
EVALUATION OF PROCESS OPTIONS
GROUND WATER

Ground Water General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
COLLECTION ACTIONS	Extraction	Extraction wells*	Effective collection method for small	Readily implementable	Low capital, Low O & M
		Extraction/ Injection wells	Effective collection/recharge method for large quantities of ground water	Readily implementable	Medium capital, Low O & M
	Subsurface Drains	Interceptor Trenches*	Effective for flow interception	Readily implementable	High capital, Low O & M
TREATMENT ACTIONS	Physical/Chemical Treatment	Carbon Adsorption*	Effective treatment for most organic contaminants, Carbon regeneration or disposal required, Effective for removal of organics and selected inorganics	Readily implementable	Medium capital, High O & M
		Ion Exchange	Effective removal for ionic species including metals and inorganic anions, Organic acids and amines may be removed pretreatment; Regenerant requires disposal	Readily implementable	Medium capital, High O & M
		Oxidation	Documentation indicates variable effectiveness in organic reduction, Treatability study required to determine effectiveness, UV/ozone oxidation considered innovative treatment	Readily implementable	Medium capital, Medium O & M
		Precipitation*	Effective for removal of metals; Sludge disposal required	Readily implementable	Medium capital, High O & M
		Reverse Osmosis	Effective for removal of charged anions and cations and high molecular weight organics	Readily implementable, Subject to chemical attack, fouling and plugging (may not be an issue issue with ground water)	High capital, Medium O & M
		Stripping	Effective treatment for volatile organic contaminants, Air pollution control may be required	Readily implementable, Attainment of air discharge limits required	Medium capital, Medium O & M

*Representative Process Option

TABLE 4

CHERRY FARM SITE
EVALUATION OF PROCESS OPTIONS
LANDFILL MATERIAL

Landfill Material General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
NO ACTION	None	Not applicable*	Does not reduce contamination	Readily implementable	None
INSTITUTIONAL ACTIONS	Access restrictions	Deed restrictions*	Minimizes direct contact exposure by precluding various activities Does not reduce contamination	Readily implementable	Very low capital
		Fencing	Limits direct contact exposure of humans and large wildlife to contaminants	Readily implementable	Low Capital, Very low O & M
	Monitoring	Ground water monitoring*	Effective for observation of conditions Does not reduce contamination or prevent exposure	Readily implementable	Low capital Medium O & M
CONTAINMENT ACTIONS	Cap	Clay and Soil*	Effective in minimizing direct contact exposure, Susceptible to cracking, but has self-healing properties	Readily implementable	Low capital, Low O & M
		Asphalt	Effective in minimizing direct contact exposure, Susceptible to weathering and cracking	Readily implementable	Low capital, High O & M
		Concrete	Effective in minimizing direct contact exposure, Susceptible to weathering and cracking	Readily implementable	Moderate capital, High O & M
		Multimedia Cap	Effective in minimizing direct contact exposure, Least susceptible to weathering and cracking	Readily implementable	Moderate capital, Moderate O & M

*Representative Process Option

TABLE 4

CHERRY FARM SITE
EVALUATION OF PROCESS OPTIONS
LANDFILL MATERIAL

Landfill Material General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
TREATMENT ACTIONS	Chemical/Physical	Stabilization	Minimizes direct contact exposure by immobilization of contaminants. Proven technology for inorganics. Long-term effectiveness not demonstrated for PCBs. Does not reduce volume of contaminants.	Readily implementable	Moderate capital Low O & M
		Soil Washing/Extraction*	Eliminates direct contact exposure by removal of contaminants. Effectiveness of process is site- and contaminant-specific and must be demonstrated by treatability testing. Process including residuals treatment may be complex. Processing rate is limited.	Fairly implementable	High capital Very low O & M

*Representative Process Option

TABLE 5
SOIL WASHING/EXTRACTION PERFORMANCE

VENDOR OR FACILITY NAME	INITIAL CONCENTRATION	FINAL CONCENTRATION	PERCENT REMOVAL	TYPE OF CONTAMINATED MEDIA	TYPE OF SYSTEM	REFERENCE
			PCBS			
EXTRAKSOL SYSTEM*	7,925 ppm	2,080 ppm	73.8	Clay	Pilot	(6)
Sanivan Group	2,055 ppm	43.8 ppm	97.6	Clay	Pilot	
Montreal, Canada	600 ppm	6.3 ppm	98.9	Sand	Pilot	
	3.6 ppm	0.69 ppm	89.0	Mixed Soil	Pilot	
	5.3 ppm	0.70 ppm	87.0	Mixed Soil	Pilot	
	5.2 ppm	1.0 ppm	81.0	Mixed Soil	Pilot	
	4.8 ppm	1.1 ppm	77.0	Mixed Soil	Pilot	
	150 ppm	14 ppm	91.0	Clay-bearing	Batch - 1 ton/hr	
	163 ppm	28 ppm	82.0	Clay-bearing	Batch - 1 ton/hr	
	54 ppm	4.4 ppm	92.0	Clay-bearing	Batch - 1 ton/hr	
CF Systems, Inc.	350 ppm	8 ppm	97.7	Sediments	Pilot - 0.2 - 1.5 gpm	(15)
Waltham, MA	288 ppm	47 ppm	83.7	Sediments	Pilot - 0.2 - 1.5 gpm	
	2,575 ppm	200 ppm	92.2	Sediments	Pilot - 0.2 - 1.5 gpm	
			LEAD			
MTARRI, INC.	280 ppm	0.82 ppm	99.7	Soil	Laboratory	(9)
Golden, CO	470 ppm	6.1 ppm	98.7	Soil	Laboratory	
HWZ BODEMSANERING The Netherlands	100 ppm	25 ppm	75.0	Sandy soil	Mobile System - 20 tons/hour	(4)
HEIJMANS MILIEUTECHNIEK The Netherlands	100 - 450 ppm	20 - 70 ppm		Fine Sand	Operating Facility - 11 tons/hour	(5)
HEIDEMIJI UITVOERING	11,900 ppm	110 ppm	99.1	Soil	Laboratory/Pilot Scale	(5)
The Netherlands	500 -1,000 ppm	90 ppm		Soil	Laboratory/Pilot Scale	(5)

*Results using various extraction fluids.

TABLE 6

CHERRY FARM SITE
REMEDIAL ALTERNATIVES

GENERAL RESPONSE ACTIONS	TECHNOLOGY	ALTERNATIVES 1	2	3	4	5	6
NO ACTION	NO ACTION	X					
INSTITUTIONAL ACTIONS	MONITORING	X	X	X	X	X	X
	DEED RESTRICTIONS		X	X	X	X	X
COLLECTION	EXTRACTION			X	X	X	X
	SUBSURFACE DRAINS					X(1)	
CONTAINMENT	CAP		X	X	X	X	X
	VERTICAL BARRIERS		X		X(1)		
GROUND WATER TREATMENT	PHYSICAL/CHEMICAL			X	X	X	X
SURFACE LANDFILL MATERIAL TREATMENT	SOIL WASHING/EXTRACTION						X

Notes:
(1) Installed to prevent intrusion of upgradient ground water

TABLE 7

CHERRY FARM SITE

Cost Estimate - Alternative 1
No Action Alternative

DIRECT CAPITAL COSTS

Item	Quantity	Units	Unit Cost	Total Cost
SITE PREPARATION				
Fencing landfill	6,700	LF	$10	$67,000
Monitoring wells-(3 wells @ 30 ft)	90	LF	$70	$6,300
		Estimated Direct Capital Cost		$73,300

INDIRECT CAPITAL COSTS

Contingency Allowance (25%)	$18,325
Engineering Fees (15%)	$10,995
Legal Fees (5%)	$3,665
Estimated Indirect Capital Cost	$32,985
TOTAL ESTIMATED CAPITAL COST	$106,285

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Quantity	Units	Unit Cost	Total Cost
Groundwater sampling	8	mandays	$250	$2,000
Sample analysis	16	samples	$2,000	$32,000
Reserve fund @ 1% of direct capital cost	Lump sum	Lump sum	$733	$733
Insurance @ 1 % of direct capital cost	Lump sum	Lump sum	733	733
		Estimated Annual Operating and Maintenance Costs		$35,466
		PRESENT WORTH OF ANNUAL OPERATING & MAINTENANCE COST FOR 30 YRS (i=5%)		$545,201
		REMEDIAL ALTERNATIVE 1 TOTAL ESTIMATED COST		$651,486

Cost information sources include:
R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.
O'Brien & Gere Engineers, Inc. - Professional Experience

TABLE 8

CHERRY FARM SITE

Cost Estimate - Alternative 2
Containment Alternative - Circumferential Slurry Wall
and Multi-Layer Cap

DIRECT CAPITAL COSTS

Item	Quantity	Units	Unit Cost	Total Cost
SITE PREPARATION				
Clearing and grubbing landfill area	40	Acres	$5,000	$200,000
Clearing and grubbing wetlands area	7	Acres	$15,000	$105,000
Install work platform - geotextile	30,750	SY	$0.55	$16,913
- 2 ft gravel layer	18,625	CY	$18	$335,250
Excavate/haul/place landfill materials	45,100	CY	$10	$451,000
Buy/haul/place embankment material	85,000	CY	$12	$1,020,000
CAP MATERIALS AND INSTALLATION				
Buy/haul/place/compact 2 feet of soil with maximum permeability of 1 E-7 cm/sec	129,200	CY	$20	$2,584,000
Buy/place geotextile filter fabric (2 layers)	425,920	SY	$0.55	$234,256
Buy/haul/place 6" drainage layer	32,300	CY	$18	$581,400
Buy/haul/place 1.5 ft. embankment	96,900	CY	$12	$1,162,800
Buy/haul/place 6" topsoil	32,300	CY	$18	$581,400
Seed, fertilizer and mulch	193,600	SY	$1	$193,600
SLURRY WALL CONSTRUCTION AND INSTALLATION				
Slurry trenching/excavation/mixing/backfilling	169,000	SF	$10	$1,690,000
Deep soil mixing (along river)	121,500	SF	$15	$1,822,500
OTHER COSTS				
Safety Program	Lump Sum	Lump Sum	$1,063,750	$1,063,750
Dust Control	Lump Sum	Lump Sum	$40,000	$40,000
Off-Site Drainage Control	Lump Sum	Lump Sum	$15,000	$15,000
Equipment Decontamination	Lump Sum	Lump Sum	$15,000	$15,000
Mobilization/Demobilization	Lump Sum	Lump Sum	$79,000	$79,000
Fencing landfill	6,700	LF	$10	$67,000
Monitoring wells (3 wells @ 30 ft)	90	LF	$70	$6,300
	Estimated Direct Capital Cost			$12,264,169

INDIRECT CAPITAL COSTS

Contingency Allowance (25%)	$3,066,042
Engineering Fees (15%)	$1,839,625
Legal Fees (5%)	$613,208
Estimated Indirect Capital Cost	$5,518,876
TOTAL ESTIMATED CAPITAL COST	$17,783,044

TABLE 8

CHERRY FARM SITE

Cost Estimate - Alternative 2
Containment Alternative - Circumferential Slurry Wall
and Multi-Layer Cap

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Quantity	Units	Unit Cost	Total Cost
Groundwater sampling	8	mandays	$250	$2,000
Sample analysis	16	samples	$2,000	$32,000
Site mowing	26	mandays	$250	$6,500
Site inspection	8	mandays	$250	$2,000
Miscellaneous site work	36	mandays	$250	$9,000
Site work materials	Lump sum	Lump sum	$4,000	$4,000
Insurance @ 1% of direct capital cost	Lump sum	Lump sum	$122,642	$122,642
Reserve fund @ 1% of direct capital cost	Lump sum	Lump sum	$122,642	$122,642
			Estimated Annual Operating and Maintenance Costs	$300,783
			PRESENT WORTH OF ANNUAL OPERATING & MAINTENANCE COST FOR 30 YRS (i=5%)	$4,623,792
			REMEDIAL ALTERNATIVE 2 TOTAL ESTIMATED COST	$22,406,837

Cost information sources include:
CECOS International, Williamsburg, OH
R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.
O'Brien & Gere Engineers, Inc. - Professional Experience
Calgon Corporation, Pittsburgh, PA
Penfield Liquid Treatment Systems, Plantsville, CT
J. Andrew Lange, Inc., Syracuse, NY

TABLE 9

CHERRY FARM SITE

Cost Estimate - Alternative 3
Treatment Alternative - Multi-layer Cap and Collection and Treatment of Ground Water

DIRECT CAPITAL COSTS

Item	Quantity	Units	Unit Cost	Total Cost
SITE PREPARATION				
Clearing and grubbing landfill area	40	Acres	$5,000	$200,000
Excavate/haul/place landfill materials	45,100	CY	$10	$451,000
Buy/haul/place embankment material	85,000	CY	$12	$1,020,000
CAP MATERIALS AND INSTALLATION				
Buy/haul/place/compact 2 feet of soil with maximum permeability of 1 E-7 cm/sec	129,200	CY	$20	$2,584,000
Buy/place geotextile filter fabric (2 layers)	425,920	SY	$0.55	$234,256
Buy/haul/place 6" drainage layer	32,300	CY	$18	$581,400
Buy/haul/place 1.5 ft. embankment	96,900	CY	$12	$1,162,800
Buy/haul/place 6" topsoil	32,300	CY	$18	$581,400
Seed, fertilizer and mulch	193,600	SY	$1	$193,600
ON-SITE GROUND WATER COLLECTION AND TREATMENT				
Extraction wells (4 @ 35 ft)	140	LF	$100	$14,000
Submersible pumps and piping	5	Each	$700	$3,500
Ground water holding tank	Lump sum	Lump sum	$35,000	$35,000
On-site package treatment plant	Lump sum	Lump sum	$235,000	$235,000
Miscellaneous appurtenances(pumps, piping, etc)	Lump sum	Lump sum	$42,000	$42,000
OTHER COSTS				
Safety Program	Lump Sum	Lump Sum	$1,063,750	$1,063,750
Dust Control	Lump Sum	Lump Sum	$40,000	$40,000
Off-Site Drainage Control	Lump Sum	Lump Sum	$15,000	$15,000
Equipment Decontamination	Lump Sum	Lump Sum	$15,000	$15,000
Mobilization/Demobilization	Lump Sum	Lump Sum	$77,750	$77,750
Fencing landfill	6,700	LF	$10	$67,000
Monitoring wells(3 wells @ 30 ft)	90	LF	$70	$6,300
	Estimated Direct Capital Cost			$8,549,456

INDIRECT CAPITAL COSTS

Contingency Allowance (25%)	$2,137,364
Engineering Fees (15%)	$1,282,418
Legal Fees (5%)	$427,473
Estimated Indirect Capital Cost	$3,847,255
TOTAL ESTIMATED CAPITAL COST	$12,396,711

TABLE 9

CHERRY FARM SITE

Cost Estimate - Alternative 3
Treatment Alternative - Multi-layer Cap and
Collection and Treatment of Ground Water

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Quantity	Units	Unit Cost	Total Cost
Groundwater sampling	8	mandays	$250	$2,000
Sample analysis	20	samples	$1,000	$20,000
Site mowing	26	mandays	$250	$6,500
Site inspection	8	mandays	$250	$2,000
Miscellaneous site work	36	mandays	$250	$9,000
Sludge disposal	80	CY	$350	$28,000
Site work materials	Lump sum	Lump sum	$4,000	$4,000
Ground water treatment system	Lump sum	Lump sum	$67,000	$67,000
Insurance @ 1% of direct capital cost	Lump sum	Lump sum	$85,495	$85,495
Reserve fund @ 1% of direct capital cost	Lump sum	Lump sum	$85,495	$85,495
			Estimated Annual Operating and Maintenance Costs	$309,489
			PRESENT WORTH OF ANNUAL OPERATING & MAINTENANCE COST FOR 30 YRS (i=5%)	$4,757,621
			REMEDIAL ALTERNATIVE 3 TOTAL ESTIMATED COST	$17,154,333

Cost information sources include:
CECOS International, Williamsburg, OH
R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.
O'Brien & Gere Engineers, Inc. - Professional Experience
Calgon Corporation, Pittsburgh, PA
Penfield Liquid Treatment Systems, Plantsville, CT
J. Andrew Lange, Inc., Syracuse, NY

TABLE 10

CHERRY FARM SITE

Cost Estimate - Alternative 4
Treatment Alternative - Upgradient Slurry Wall, Multi-layer Cap, and Extraction and Treatment of Ground Water

DIRECT CAPITAL COSTS

Item	Quantity	Units	Unit Cost	Total Cost
SITE PREPARATION				
Clearing and grubbing landfill area	40	Acres	$5,000	$200,000
Clearing and grubbing wetlands area	5	Acres	$15,000	$75,000
Install work platform - geotextile	24,800	SY	$0.55	$13,640
- 2' gravel layer	15,100	CY	$18	$271,800
Excavate/haul/place landfill materials	45,100	CY	$10	$451,000
Buy/haul/place embankment material	85,000	CY	$12	$1,020,000
CAP MATERIALS AND INSTALLATION				
Buy/haul/place/compact 2 feet of soil with maximum permeability of 1 E-7 cm/sec	129,200	CY	$20	$2,584,000
Buy/place geotextile filter fabric (2 layers)	425,920	SY	$0.55	$234,256
Buy/haul/place 6" drainage layer	32,300	CY	$18	$581,400
Buy/haul/place 1.5 ft. embankment	96,900	CY	$12	$1,162,800
Buy/haul/place 6" topsoil	32,300	CY	$18	$581,400
Seed, fertilizer and mulch	193,600	SY	$1	$193,600
SLURRY WALL CONSTRUCTION AND INSTALLATION				
Slurry trenching/excavation/mixing/backfilling	169,000	SF	$10	$1,690,000
ON-SITE GROUND WATER COLLECTION AND TREATMENT				
Extraction wells (3 @ 35 ft)	105	LF	$100	$10,500
Submersible pumps	3	Each	$700	$2,100
Ground water holding tank	Lump sum	Lump sum	$35,000	$35,000
Package treatment plant	Lump sum	Lump sum	$235,000	$235,000
Miscellaneous appurtenances(pumps, piping, etc)	Lump sum	Lump sum	$42,000	$42,000
OTHER COSTS				
Safety Program	Lump Sum	Lump Sum	$1,063,750	$1,063,750
Dust Control	Lump Sum	Lump Sum	$40,000	$40,000
Off-Site Drainage Control	Lump Sum	Lump Sum	$15,000	$15,000
Equipment Decontamination	Lump Sum	Lump Sum	$15,000	$15,000
Mobilization/Demobilization	Lump Sum	Lump Sum	$79,250	$79,250
Fencing landfill	6,700	LF	$10	$67,000
Monitoring wells (3 wells @ 30 ft)	90	LF	$70	$6,300
	Estimated Direct Capital Cost			$10,669,796

INDIRECT CAPITAL COSTS

Contingency Allowance (25%)	$2,667,449
Engineering Fees (15%)	$1,600,469
Legal Fees (5%)	$533,490
Estimated Indirect Capital Cost	$4,801,408
TOTAL ESTIMATED CAPITAL COST	$15,471,204

TABLE 10

CHERRY FARM SITE

Cost Estimate - Alternative 4
Treatment Alternative - Upgradient Slurry Wall, Multi-layer Cap,
and Extraction and Treatment of Ground Water

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Quantity	Units	Unit Cost	Total Cost
Groundwater sampling	8	mandays	$250	$2,000
Sample analysis	16	samples	$2,000	$32,000
Site mowing	52	mandays	$250	$13,000
Site inspection	8	mandays	$250	$2,000
Miscellaneous site work	36	mandays	$250	$9,000
Sludge disposal	80	CY	$350	$28,000
Site work materials	Lump sum	Lump sum	$4,000	$4,000
On-site ground water treatment facility	Lump sum	Lump sum	$67,000	$67,000
Insurance @ 1% of direct capital cost	Lump sum	Lump sum	$106,698	$106,698
Reserve fund @ 1% of direct capital cost	Lump sum	Lump sum	$106,698	$106,698
			Estimated Annual Operating and Maintenance Costs	$370,396
			PRESENT WORTH OF ANNUAL OPERATING & MAINTENANCE COST FOR 30 YRS (i=5%)	$5,693,911
			REMEDIAL ALTERNATIVE 4 TOTAL ESTIMATED COST	$21,165,115

Cost information sources include:
CECOS International, Williamsburg, OH
R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.
O'Brien & Gere Engineers, Inc. - Professional Experience
GEO-CON INC., Pittsburgh, PA
Calgon Corporation, Pittsburgh, PA
Penfield Liquid Treatment Systems, Plantsville, CT
J. Andrew Lange, Inc., Syracuse, NY

TABLE 11

CHERRY FARM SITE

Cost Estimate - Alternative 5
Treatment Alternative - Multi-layer Cap, Upgradient
Interceptor Trench, and Extraction and Treatment of Ground Water

DIRECT CAPITAL COSTS

Item	Quantity	Units	Unit Cost	Total Cost
SITE PREPARATION				
Clearing and grubbing landfill area	40	Acres	$5,000	$200,000
Clearing and grubbing wetlands area	4	Acres	$15,000	$60,000
Install work platform - geotextile	16,150	SY	$0.55	$8,883
- 2' gravel layer	18,625	CY	$18	$335,250
Excavate/haul/place landfill material	45,100	CY	$10	$451,000
Buy/haul/place embankment material	85,000	CY	$12	$1,020,000
CAP MATERIALS AND INSTALLATION				
Buy/haul/place/compact 2 feet of soil with maximum permeability of 1 E-7 cm/sec	129,200	CY	$20	$2,584,000
Buy/place geotextile filter fabric (2 layers)	425,920	SY	$0.55	$234,256
Buy/haul/place 6" drainage layer	32,300	CY	$18	$581,400
Buy/haul/place 1.5 ft. embankment	96,900	CY	$12	$1,162,800
Buy/haul/place 6" topsoil	32,300	CY	$18	$581,400
Seed, fertilizer, and mulch	193,600	SY	$1	$193,600
INTERCEPTOR TRENCH CONSTRUCTION AND INSTALLATION				
Trench excavation	12,300	CY	$30	$369,000
Upgradient sheet piling-removed and salvaged	110,000	SF	$20	$2,200,000
Downgradient sheet piling-left in place	110,000	SF	$30	$3,300,000
Buy/haul place gravel bedding	8,600	CY	$18	$154,800
Discharge piping and pumps	Lump sum	Lump sum	$5,000	$5,000
Collection manholes	Lump sum	Lump sum	$1,000	$1,000
Backfill	3,700	CY	$12	$44,400
Buy/haul/place 6" topsoil	125	CY	$18	$2,250
Seed, fertilizer and mulch	750	SY	$1	$750
ON-SITE GROUND WATER COLLECTION AND TREATMENT				
Extraction wells (3 wells @ 35 ft)	105	LF	$100	$10,500
Submersible pumps	3	Each	$700	$2,100
Ground water holding tank	Lump sum	Lump sum	$30,000	$30,000
On-site package treatment plant	Lump sum	Lump sum	$235,000	$235,000
Miscellaneous appurtenances(pumps, pipes, etc)	Lump sum	Lump sum	$42,000	$42,000
OTHER COSTS				
Safety Program	Lump Sum	Lump Sum	$1,063,750	$1,063,750
Dust Control	Lump Sum	Lump Sum	$40,000	$40,000
Off-Site Drainage Control	Lump Sum	Lump Sum	$15,000	$15,000
Equipment Decontamination	Lump Sum	Lump Sum	$15,000	$15,000
Mobilization/Demobilization	Lump Sum	Lump Sum	$79,250	$79,250
Fencing landfill	6,700	LF	$10	$67,000
Monitoring wells (3 wells @ 30 feet)	90	LF	$70	$6,300

Estimated Direct Capital Cost $15,095,689

TABLE 11

CHERRY FARM SITE

Cost Estimate - Alternative 5
Treatment Alternative - Multi-layer Cap, Upgradient
Interceptor Trench, and Extraction and Treatment of Ground Water

INDIRECT CAPITAL COSTS

Contingency Allowance (25%)	$3,773,922
Engineering Fees (15%)	$2,264,353
Legal Fees (5%)	$754,784
Estimated Indirect Capital Cost	$6,793,060
TOTAL ESTIMATED CAPITAL COST	$21,888,748

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Quantity	Units	Unit Cost	Total Cost
Groundwater sampling	8	mandays	$250	$2,000
Sample analysis	16	samples	$2,000	$32,000
Site mowing	26	mandays	$250	$6,500
Site inspection	8	mandays	$250	$2,000
Miscellaneous site work	36	mandays	$250	$9,000
Sludge disposal	80	CY	$350	$28,000
Site work materials	Lump sum	Lump sum	$4,000	$4,000
Ground water treatment system	Lump sum	Lump sum	$77,000	$77,000
Insurance @ 1% of direct capital cost	Lump sum	Lump sum	$150,957	$150,957
Reserve fund @ 1% of direct capital cost	Lump sum	Lump sum	$150,957	$150,957
			Estimated Annual Operating and Maintenance Costs	$462,414
			PRESENT WORTH OF ANNUAL OPERATING & MAINTENANCE COST FOR 30 YRS (i=5%)	$7,108,456
			REMEDIAL ALTERNATIVE 5 TOTAL ESTIMATED COST	$28,997,204

Cost information sources include:
CECOS International, Williamsburg, OH
R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.
O'Brien & Gere Engineers, Inc. - Professional Experience
OBG Technical Services, Inc - Professional Experience
Calgon Corporation, Pittsburgh, PA
Penfield Liquid Treatment Systems, Plantsville, CT
J. Andrew Lange, Inc., Syracuse, NY

TABLE 12

CHERRY FARM SITE

Cost Estimate - Alternative 6
Treatment Alternative - Surface Soil Treatment and
Collection and Treatment of Ground Water

DIRECT CAPITAL COSTS

Item	Quantity	Units	Unit Cost	Total Cost
SITE PREPARATION				
Clearing and grubbing landfill area	40	Acres	$5,000	$200,000
Excavate/haul/place landfill materials	45,100	CY	$10	$451,000
Buy/haul/place embankment material	85,000	CY	$12	$1,020,000
SOIL WASHING/EXTRACTION				
Excavate surface landfill material (5 feet)	330,000	CY	$5	$1,650,000
Soil Washing/Extraction Costs including residual treatment and disposal	330,000	CY	$150	$49,500,000
Place treated landfill material	297,000	CY	$5	$1,485,000
COVER MATERIALS AND INSTALLATION				
Buy/haul/place compact 2 feet of soil with maximum permeability of 1 E-5 cm/sec	96,900	CY	$18	$1,744,200
Buy/haul/place 6" topsoil	32,300	CY	$18	$581,400
Seed, fertilizer and mulch	193,600	SY	$1	$193,600
ON-SITE GROUND WATER COLLECTION AND TREATMENT				
Extraction wells (4 @ 35 ft)	140	LF	$100	$14,000
Submersible pumps and piping	5	Each	$700	$3,500
Ground water holding tank	Lump sum	Lump sum	$70,000	$70,000
On-site package treatment plant	Lump sum	Lump sum	$470,000	$470,000
Miscellaneous appurtenances(pumps, piping, etc)	Lump sum	Lump sum	$84,000	$84,000
OTHER COSTS				
Safety Program	Lump Sum	Lump Sum	$2,067,750	$2,067,750
Dust Control	Lump Sum	Lump Sum	$40,000	$40,000
Off-Site Drainage Control	Lump Sum	Lump Sum	$15,000	$15,000
Equipment Decontamination	Lump Sum	Lump Sum	$15,000	$15,000
Mobilization/Demobilization	Lump Sum	Lump Sum	$77,750	$77,750
Fencing landfill	6,700	LF	$10	$67,000
Monitoring wells(3 wells @ 30 ft)	90	LF	$70	$6,300
	Estimated Direct Capital Cost			$59,755,500

INDIRECT CAPITAL COSTS

Contingency Allowance (25%)	$14,938,875
Engineering Fees (15%)	$8,963,325
Legal Fees (5%)	$2,987,775
Estimated Indirect Capital Cost	$26,889,975
TOTAL ESTIMATED CAPITAL COST	$86,645,475

TABLE 12

CHERRY FARM SITE

Cost Estimate - Alternative 6
Treatment Alternative - Surface Soil Treatment and
Collection and Treatment of Ground Water

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Quantity	Units	Unit Cost	Total Cost
Groundwater sampling	8	mandays	$250	$2,000
Sample analysis	20	samples	$1,000	$20,000
Site mowing	26	mandays	$250	$6,500
Site inspection	8	mandays	$250	$2,000
Miscellaneous site work	36	mandays	$250	$9,000
Sludge disposal	100	CY	$350	$35,000
Site work materials	Lump sum	Lump sum	$4,000	$4,000
Ground water treatment system	Lump sum	Lump sum	$100,500	$100,500
Insurance @ 1% of direct capital containment cost	Lump sum	Lump sum	$371,455	$371,455
Reserve fund @ 1% of direct capital containment cost	Lump sum	Lump sum	$371,455	$371,455
			Estimated Annual Operating and Maintenance Costs	$921,910
			PRESENT WORTH OF ANNUAL OPERATING & MAINTENANCE COST FOR 30 YRS (i=5%)	$14,172,054
			REMEDIAL ALTERNATIVE 6 TOTAL ESTIMATED COST	$100,817,529

Cost information sources include:
CECOS International, Williamsburg, OH
R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.
O'Brien & Gere Engineers, Inc. - Professional Experience
Calgon Corporation, Pittsburgh, PA
Penfield Liquid Treatment Systems, Plantsville, CT
J. Andrew Lange, Inc., Syracuse, NY
MTARRI, Inc., Golden, CO
BioTrol, Inc., Chaska, MN
Assessment of International Technologies for Superfund Applications -
Technology Identification and Selection (PB89-205959)
Technology Review and Trip Report (PB90-106428)

TABLE 13

ACTION-SPECIFIC ARARS
CHERRY FARM SITE

ACTION	REQUIREMENTS	CITATION
Capping in place - hazardous materials	Cover must be designed and constructed to: - Provide long-term minimization of migration of liquids; - Function with minimum maintenance; - Promote drainage and minimize erosion or abrasion or abrasion of the cover; - Accomodate settling and subsisdence so that the cover's integrity is maintained; and - Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	6 NYCRR 373-2.14(g)
	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsisdence, erosion or other events.	
	Prevent run-on and run-off from eroding or otherwise damaging the final cover.	
	During construction or installation, cover systems must be inspected for uniformity, damage and imperfections.	
	Immediately after construction or installation soil-based and admixed liners and covers must be inspected for imperfections that may cause an increase in the permeability of the cover.	6 NYCRR 373-2.14(e)
	The owner or operator of the landfill must record: - On a map, the exact location and dimensions, including depth, of each cell with respect to permanently surveyed benchmarks; and - The contents of each cell and the approximate location of each hazardous waste type within each cell.	6 NYCRR 373-2.14(f)
Deed Restrictions - hazardous waste unit	A survey plat indicating the location and dimensions of hazardous waste disposal units must be submitted to the local zoning authority, or the authority with jurisdiction over local land use, to the county clerk and to the commissioner. The plat filed with the local zoning authority or the authority with jurisdiction over land use must contain a note which state's the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit.	6 NYCRR 373-2.7(f)(2)
Disposal or decontamination of equipment, or soil - hazardous waste	During closure all contaminated equipment, structures and soils must be properly disposed of or decontaminated.	6 NYCRR 373-2.7(e)

TABLE 13

ACTION-SPECIFIC ARARS
CHERRY FARM SITE

ACTION	REQUIREMENTS	CITATION
Ground water monitoring - hazardous waste unit	The owner or operator must establish a detection monitoring program for indicator parameters, waste constituents or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. This program must comply with general groundwater monitoring requirements contained in cited regulations.	6 NYCRR 373-2.6
Location Standards - hazardous materials	A facility located in a 100-year floodplain must be designed, constructed, operated and maintained to prevent washout of any hazardous waste by a 100-year flood.	6 NYCRR 373-2.2(j)
Personnel Protection	A safety and health program; site characterization and analysis, site control; training program; medical surveillance; engineering controls, work practices and personal protective equipment; monitoring; informational program; proper material handling; decontamination provisions; emergency response capability; illumination; sanitation facilities; site excavation shoring or sloping; and procedures for informing contractors and sub-contractors of potential hazards must be provided.	29 CFR 1910.120
	Laborers performing construction work shall be instructed in recognition and avoidance of unsafe condtions, and provided with first aid services, medical care, personal protection equipment, and sanitary facilities. When excavation, trenching or shoring is conducted specified procedures must be complied with.	29 CFR 1926 Subparts C, D, E, and P
Post-closure care - hazardous waste unit	Post-closure care must begin after completion of closure and continue for at least 30 years and consist of maintenance and monitoring.	6 NYCRR 373-2.7(g)
Surface water discharge	The discharge shall meet effluent standards or prohibitions established under sections 301, 302, 303, 307 318, and 405 of the Clean Water Act. The discharge shall meet water quality standards established under sections 302 or 303 of the Clean Water Act and State requirements.	40 CFR 122.41 40 CFR 122.44 6 NYCRR 745.1

TABLE 14

ACTION-SPECIFIC ARARS
CHERRY FARM SITE

ACTION	CITATION	ALTERNATIVE 1	2	3	4	5	6
Capping in place - hazardous materials	6 NYCRR 373-2.14(g) 6 NYCRR 373-2.14(e) 6 NYCRR 373-2.14(f)	R	R	R	R	R	R
Deed Restrictions - hazardous waste unit	6 NYCRR 373-2.7(f)(2)	R	R	R	R	R	R
Disposal or decontamination of equipment, or soil - hazardous waste	6 NYCRR 373-2.7(e)		R	R	R	R	R
Ground water monitoring - hazardous waste unit	6 NYCRR 373-2.6	R	R	R	R	R	R
Location Standards - hazardous materials	6 NYCRR 373-2.2(j)	R	R	R	R	R	R
Personnel Protection	29 CFR 1910.120 29 CFR 1926 Subparts C, D, E, and P	R A	R A	R A	R A	R A	R A
Post-closure care - hazardous waste unit	6 NYCRR 373-2.7(g)	R	R	R	R	R	R
Surface water discharge	40 CFR 122.41 40 CFR 122.44 6 NYCRR 745.1	R	R	R	R	R	R

A = Applicable
R = Relevant and Appropriate

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE

Criteria	Alternative 1 No Action	Alternative 2 Multi-Layer Cap, Slurry Wall	Alternative 3 Multi-Layer Cap, Extraction Wells
OVERALL PROTECTIVENESS			
Human Health Protection			
Soil - Direct Contact/ Ingestion	No reduction in risk.	Eliminates direct contact risk.	Eliminates direct contact risk.
Ground Water - Ingestion		Prevents migration of contaminated ground water to river. Deed restrictions prevent ingestion of contaminated ground water until ground water attains drinking water standards.	Extraction/Treatment controls and treats ground water. Deed restrictions further eliminate possibility of ingestion of contaminants until ground water attains drinking water standards.
Environmental Protection	Allows continued contamination of ground water and potential transport via surface runoff.	Transport of contaminants via surface runoff or ground water is eliminated.	Transport of contaminants via surface runoff or ground water is eliminated.
COMPLIANCE WITH ARARs			
Chemical - Specific ARARs	Ground water would not comply with drinking water standards.	Would comply with drinking water standards at waste boundary following cap and slurry wall installation. Would comply with air quality standards. Would comply with surface water quality standards.	Would comply with drinking water standards at waste boundary following implementation of extraction system. Would comply with air quality standards. Would comply with surface water quality standards.
Location - Specific ARARs	Complies with location-specific ARARs.	Would comply with action specific ARARs.	Would comply with action specific ARARs.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 4 Multi-Layer Cap, Extraction Wells, Contaminated Ground Water Treatment, Upstream Slurry Wall	Alternative 5 Multi-Layer Cap, Extraction Wells, Contaminated Ground Water Treatment, Upstream Interceptor Trench	Alternative 6 Surface Landfill Material Treatment by Soil Washing/Extraction, On-Site Replacement, Low-Permeability Cap, Extraction Wells, Contaminated Ground Water Treatment
<u>OVERALL PROTECTIVENESS</u>			
Human Health Protection			
Soil - Direct Contact/ Ingestion	Eliminates direct contact risk.	Eliminates direct contact risk	Eliminates direct contact risk.
Ground Water - Ingestion	Extraction/Treatment upgradient diversion control and treat ground water. Deed restrictions further eliminate possibility of ingestion of contaminants until ground water attains drinking water standards.	Extraction/Treatment and upgradient interception control and treat ground water. Deed restrictions further eliminate possibility of ingestion of contaminants until ground water attains drinking water standards.	Extraction/Treatment controls and treats ground water. Deed restrictions eliminate possibility of ingestion of contaminants.
Environmental Protection	Transport of contaminants via surface runoff or ground water is eliminated.	Transport of contaminants via surface runoff or ground water is eliminated.	Transport of contaminants via surface runoff or ground water is eliminated.
<u>COMPLIANCE WITH ARARs</u>			
Chemical - Specific ARARs	Would comply with drinking water standards at waste boundary following implementation of extraction system. Would comply with air quality standards. Would comply with surface water quality standards.	Would comply with drinking water standards at waste boundary following implementation of extraction system. Would comply with air quality standards. Would comply with surface water quality standards.	Would comply with drinking water standards at waste boundary following implementation of extraction system. Would comply with air quality standards. Would comply with surface water quality standards.
Location - Specific ARARs	Would comply with action specific ARARs.	Would comply with action specific ARARs.	Would comply with action specific ARARs.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 1	Alternative 2	Alternative 3
Action - Specific ARARs	Does not comply with Part 373 landfill closure requirements.	Would comply with Part 373 landfill closure requirements. Would comply with OSHA requirements.	Would comply with Part 373 landfill closure requirements. Would comply with SPDES requirements. Would comply with OSHA requirements.
<u>LONG-TERM EFFECTIVENESS AND PERMANENCE</u>			
Magnitude of Residual Risk			
Soil - Direct Contact/ Ingestion	Source has not been removed or contained. Existing risk will remain.	Risk eliminated.	Risk eliminated.
Ground Water - Ingestion	Source has not been removed or contained. Ingestion of contaminants possible if wells are installed. Transport of contaminants to river will continue.	Potential for contaminant ingestion eliminated through deed restrictions. Transport of contaminants to river will cease due to containment.	Contamination of ground water eliminated through extraction/treatment system. Deed restrictions further eliminate the possibility of ingestion of contaminants. Transport of contaminants to river eliminated by extraction system.
Adequacy and Reliability of Controls	No controls.	Reliability of cap should be high with appropriate operation and maintenance. Slurry wall requires little maintenance, and should be reliable as a containment measure. Deed restrictions to control use of ground water are expected to be reliable, based on sole ownership of area of contamination.	Reliability of cap should be high with appropriate operation and maintenance. Ground water extraction/ treatment should be reliable in treating and controlling ground water, however, operation and maintenance required. Deed restrictions to control use of ground water are expected to be reliable, based on sole ownership of area of contamination.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 4	Alternative 5	Alternative 6
Action - Specific ARARs	Would comply with Part 373 landfill closure requirements. Would comply with SPDES requirements. Would comply with OSHA requirements.	Would comply with Part 373 landfill closure requirements. Would comply with SPDES requirements. Would comply with OSHA requirements.	Would comply with Part 373 landfill closure requirements. Would comply with SPDES requirements. Would comply with OSHA requirements.
LONG-TERM EFFECTIVENESS AND PERMANENCE			
Magnitude of Residual Risk			
Soil - Direct Contact/ Ingestion	Risk eliminated.	Risk eliminated.	Risk eliminated.
Ground Water - Ingestion	Contamination of ground water eliminated through extraction/treatment system. Deed restrictions further eliminate the possibility of ingestion of contaminants. Transport of contaminants to river eliminated by extraction system.	Contamination of ground water eliminated through extraction/treatment system. Deed restrictions further eliminate the possibility of ingestion of contaminants. Transport of contaminants to river eliminated by extraction system.	Contamination of ground water eliminated through extraction/ treatment system. Deed restrictions further eliminate the possibility of ingestion of contaminants. Transport of contaminants to river eliminated by extraction system.
Adequacy and Reliability of Controls	Reliability of cap should be high with appropriate operation and maintenance. Upgradient slurry requires little maintenance and should be reliable as an upstream ground water diversion measures. Ground water extraction/ treatment should be reliable in treating and controlling ground water, however, operation and maintenance required. Deed restrictions to control use of ground water are expected to be reliable, based on sole ownership of area of contamination.	Reliability of cover should be high with appropriate operation and maintenance. Ground water extraction/ treatment should be reliable in treating and controlling ground water, however, operation and maintenance required. Deed restrictions to control use of ground water are expected to be reliable, based on sole ownership of area of contamination.	Reliability of cap should be high with appropriate operation and maintenance. Upgradient interceptor trench requires operation and maintenance, but should be reliable as an upstream ground water diversion measure. Ground water extraction/treatment should be reliable in treating and controlling ground water, however, considerable operation and maintenance required. Deed restrictions to control use of ground water are expected to be reliable, based on sole ownership of area of contamination.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 1	Alternative 2	Alternative 3
REDUCTION OF TOXICITY MOBILITY OR VOLUME			
Treatment Process Used	None	None	Treatment of contaminated ground water by precipitation and activated carbon.
Reduction of Toxicity, Mobility, or Volume	None	Reduction in mobility of contaminanted landfill materials and ground water.	Reduction in toxicity and mobility of contaminated ground water, and reduction in mobility of landfill material contaminants.
Type and Quantity of Residuals Remaining after Treatment	No treatment	No treatment	Sludge produced from removal of metals from ground water.
Statuary Preference for Treatment	Does Not Satisfy	Does Not Satisfy	Satisfies
SHORT-TERM EFFECTIVENESS			
Community Protection	Potential risk to site visitors from exposed landfill sides. Transport of contaminants to river will continue.	Risk to site visitors eliminated by restriction of access during construction activities.	Risk to site visitors eliminated by restriction of access during construction activities.
Worker Protection	Appropriate respiratory and contact protection will be used during monitoring activities.	Appropriate respiratory and contact protection will be used.	Appropriate respiratory and contact protection will be used.
Environmental Impact	Continued impact from existing condition.	Contaminant transport during construction will be minimized through use of appropriate measures such as dust suppression.	Contaminant transport during construction will be minimized through use of appropriate measures such as dust suppression.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 4	Alternative 5	Alternative 6
<u>REDUCTION OF TOXICITY MOBILITY OR VOLUME</u>			
Treatment Process Used	Treatment of contaminated ground water by precipitation and activated carbon.	Treatment of contaminated ground water by precipitation and activated carbon.	Treatment of surface landfill material by soil washing/extraction. Treatment of contaminated ground water by precipitation and activated carbon.
Reduction of Toxicity Mobility or Volume	Reduction in toxicity and mobility of contaminated ground water, and reduction in mobility of landfill material contaminants.	Reduction in toxicity and mobility of contaminated ground water, and reduction in mobility of landfill material contaminants.	Reduction in toxicity and mobility of contaminated ground water, and approximately 90 percent reduction in mass of contaminants present in surface landfill material.
Type and Quantity of Residuals Remaining after Treatment	Sludge produced from removal of metals from ground water.	Sludge produced from removal of metals from ground water.	Sludge produced from removal of metals from ground water. Residuals from soil washing/extraction would be dependent on the nature of extraction fluid, but might include: fine clays, silt, and organic material; waste solvents and contaminants; concentrated contaminants and solvent; activated carbon; ion exchange regenerant; and inorganic sludges.
Statuary Preference for Treatment	Satisfies	Satisfies	Satisfies
<u>SHORT-TERM EFFECTIVENESS</u>			
Community Protection	Risk to site visitors eliminated by restriction of access during construction activities.	Risk to site visitors eliminated by restriction of access during construction activities.	Risk to site visitors eliminated by restriction of access during construction activities.
Worker Protection	Appropriate respiratory and contact protection will be used.	Appropriate respiratory and contact protection will be used.	Appropriate respiratory and contact protection will be used.
Environmental Impact	Contaminant transport during construction will be minimized through use of appropriate measures such as dust suppression.	Contaminant transport during construction will be minimized through use of appropriate measures such as dust suppression.	Contaminant transport during construction will be minimized through use of appropriate measures such as dust suppression.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 1	Alternative 2	Alternative 3
Time Until Action is Complete	No Action	Installation of cap and slurry wall expected to take 1 year.	Installation of cap, extraction wells and treatment system expected to take 1 year. Ground water extraction/ treatment would be required indefinitely.
IMPLEMENTABILITY			
Ability to Construct or Operate	No construction or operation.	Simple to operate and construct.	Fairly simple to construct. Extraction well system requires some knowledge to service. Treatment system requires periodic maintenance by skilled technician.
Ease of Doing More Action if Needed	If monitoring indicates more action is necessary, may have to go through the FS/ROD process again.	Alternative addresses all impacted media and complete area of impact.	Alternative addresses all impacted media and complete area of impact.
Ability to Monitor Effectiveness		Ground water monitoring will give notice of failure of containment system.	Ground water monitoring will give notice of improper operation of extraction system. Effluent monitoring will give notice of failure of treatment system.
Availability of Services and Capacities	None required.	No services or capacities required.	Disposal facility for sludge produced from precipitation should be readily available.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 4	Alternative 5	Alternative 6
Time Until Action is Complete	Installation of cap, extraction wells, treatment system and upgradient slurry wall expected to take 1 year. Ground water extraction/treatment would be required indefinitely.	Installation of cap, extraction wells, treatment system and upgradient interceptor trench expected to take 1 year. Ground water extraction/treatment would be required indefinitely.	Soil washing/extraction of the surface landfill material utilizing two units is anticipated to take 5 to 8 years. Extraction well system, ground water treatment system and partial cover installation may be performed concurrently. Ground water extraction/treatment would be required indefinitely.
<u>IMPLEMENTABILITY</u>			
Ability to Construct or Operate	Fairly simple to construct. Extraction well system requires some knowledge to service. Treatment system requires periodic maintenance by skilled technician.	Fairly simple to construct. Extraction well system requires some knowledge to service. Treatment system requires periodic maintenance by skilled technician.	Soil washing/extraction requires treatability testing to determine effectiveness and appropriate extraction fluids. Multiple-stage extraction is expected to be necessary for contaminants of concern. Extraction system and residuals treatment and disposal use complex processes requiring trained operators. Treatment of extraction fluids and waste streams may require a combination of the following processes: solvent recovery (distillation); liquid solids separation (flocculation, clarification, thickening, dewatering); and water treatment (ion exchange, carbon adsorption). Ground water treatment system is fairly simple to construct. Extraction well system requires some knowledge to service. Ground water treatment system requires periodic maintenance by skilled operator.
Ease of Doing More Action if Needed	Alternative addresses all impacted media and complete area of impact.	Alternative addresses all impacted media and complete area of impact.	Alternative addresses all impacted media and complete area of impact.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 4	Alternative 5	Alternative 6
Ability to Monitor Effectiveness	Ground water monitoring will give notice of improper operation of extraction system. Effluent monitoring will give notice of failure of treatment system.	Ground water monitoring will give notice of improper operation of extraction system. Effluent monitoring will give notice of failure of treatment system.	Periodic analyses of treated landfill material and residuals will indicate effectiveness of soil washing/extraction process. Ground water monitoring will give notice of improper operation of extraction system. Effluent monitoring will give notice of failure of treatment system.
Availability of Services and Capacities	Disposal facility for sludge produced from precipitation should be readily available.	Disposal facility for sludge produced from precipitation should be readily available.	Disposal facilities necessary for sludge from ground water treatment and soil washing/extraction residuals which might include: fine clays, silt and organic material; waste solvents; activated carbon; ion exchange regenerant and inorganic sludges.

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

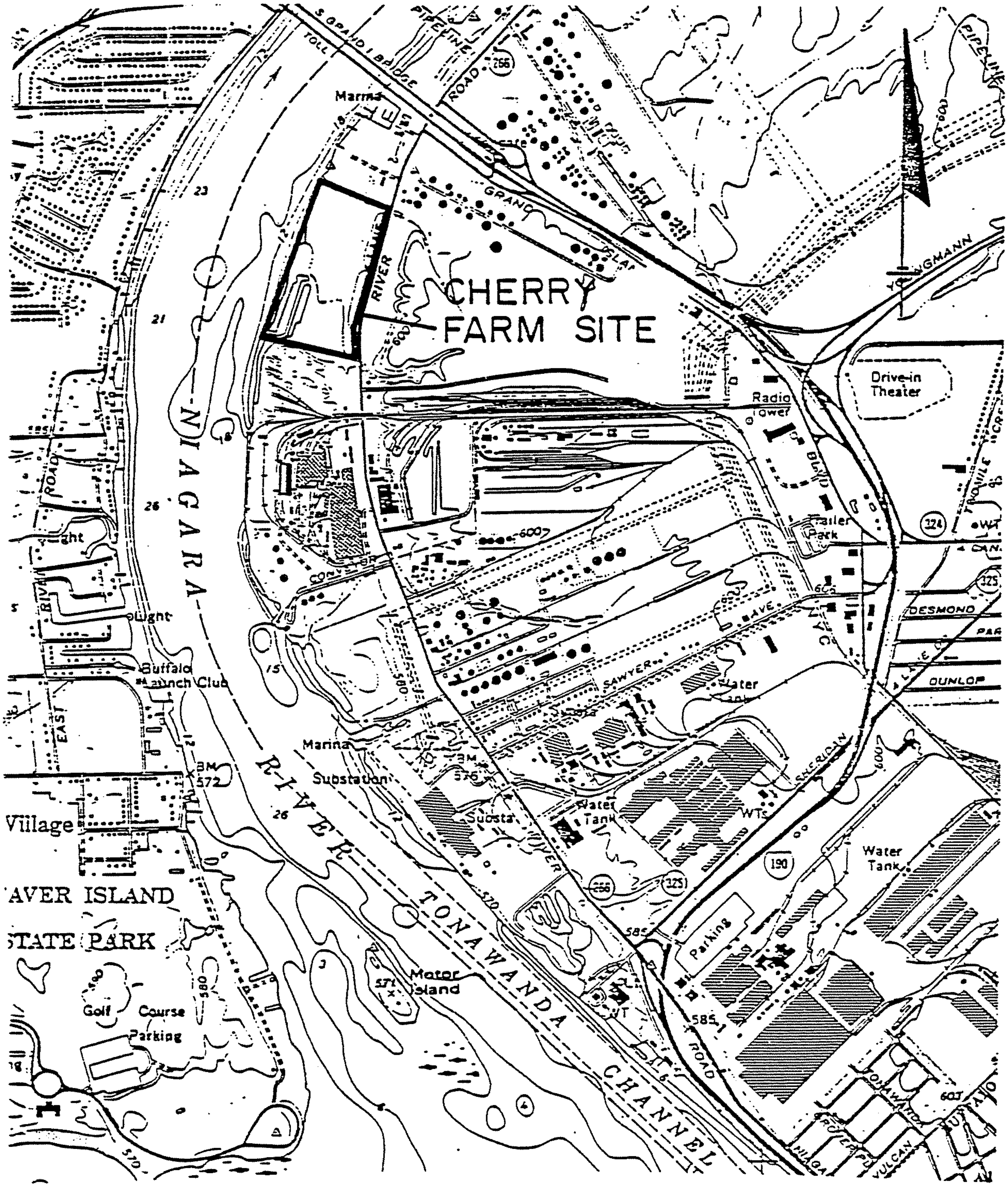
Criteria	Alternative 1	Alternative 2	Alternative 3
Availability of Equipment, Specialists, and Materials	None required.	No special equipment, material or specialists required. Cap and slurry wall materials expected to be available locally.	No special equipment, materials or specialists required for cap. Cap materials expected to be available locally. Extraction/treatment system requires knowledgeable maintenance personnel. Treatment system needs readily available specialists to install and train knowledgeable operator.
Availability of Technologies	None required.	Cap and slurry wall technologies readily available.	Cap and extraction technologies readily available. Precipitation/oxidation treatment system will required testing. If this system proves inappropriate, other demonstrated technologies readily available.
COST			
Capital Cost	$106,285	$17,783,044	$12,396,711
Annual O&M Cost	$ 35,466	$ 300,783	$ 309,489
Present Worth Cost (i = 5%, n = 30)	$651,486	$22,406,837	$17,154,333

TABLE 15
DETAILED ANALYSIS SUMMARY
CHERRY FARM SITE
(Continued)

Criteria	Alternative 4	Alternative 5	Alternative 6
Availability of Equipment, Specialists, and Materials	No special equipment, materials or specialists required for cap or slurry wall. Cap and slurry wall materials expected to be available locally. Extraction/treatment system requires knowledgeable maintenance personnel. Treatment system needs readily available specialists to install and train knowledgeable operator.	No special equipment, materials or specialists required for cap or interceptor trench. Cap and trench materials expected to be available locally. Extraction/treatment system requires knowledgeable maintenance personnel. Treatment system needs readily available specialists to install and train knowledgeable operator.	No special equipment, materials or specialists required for cap. Cap materials expected to be available locally. Soil washing/extraction systems requires trained operators and specialists to supervise. Ground water extraction/treatment system requires knowledgeable maintenance personnel. Ground water treatment system requires readily available specialists to install and train knowledgeable operators.
Availability of Technologies	Cap, extraction and slurry wall technologies readily available. Precipitation/oxidization treatment system will require testing. If this system proves inappropriate, other demonstrated technologies readily available.	Cap, extraction and interceptor trench technologies readily available. Precipitation/oxidization treatment system will require testing. If this system proves inappropriate, other demonstrated technologies readily available.	Soil washing/extraction is an innovative technology. Treatability studies and pilot studies are necessary to determine effectiveness and develop system design. Soil washing/extraction units would have to be constructed for this site. Low-permeability cap and extraction technologies readily available. Ground water precipitation/oxidation treatment system will require testing. If this system proves inappropriate, other demonstrated technologies readily available.
<u>COST</u>			
Capital Cost	$15,471,204	$21,885,748	$ 86,645,475
Annual O&M Cost	$ 370,396	$ 462,414	$ 921,910
Present Worth Cost (i = 5%, n = 30)	$21,165,115	$28,997,204	$100,817,529

Figures

O'BRIEN & GERE



CHERRY FARM
SITE LOCATION MAP

NIAGARA MOHAWK POWER CORP.
TONAWANDA, NEW YORK

ADAPTED FROM U.S.G.S. (7.5 MIN.) BUFFALO NW N.Y.-
ONTARIO QUADRANGLE 1965

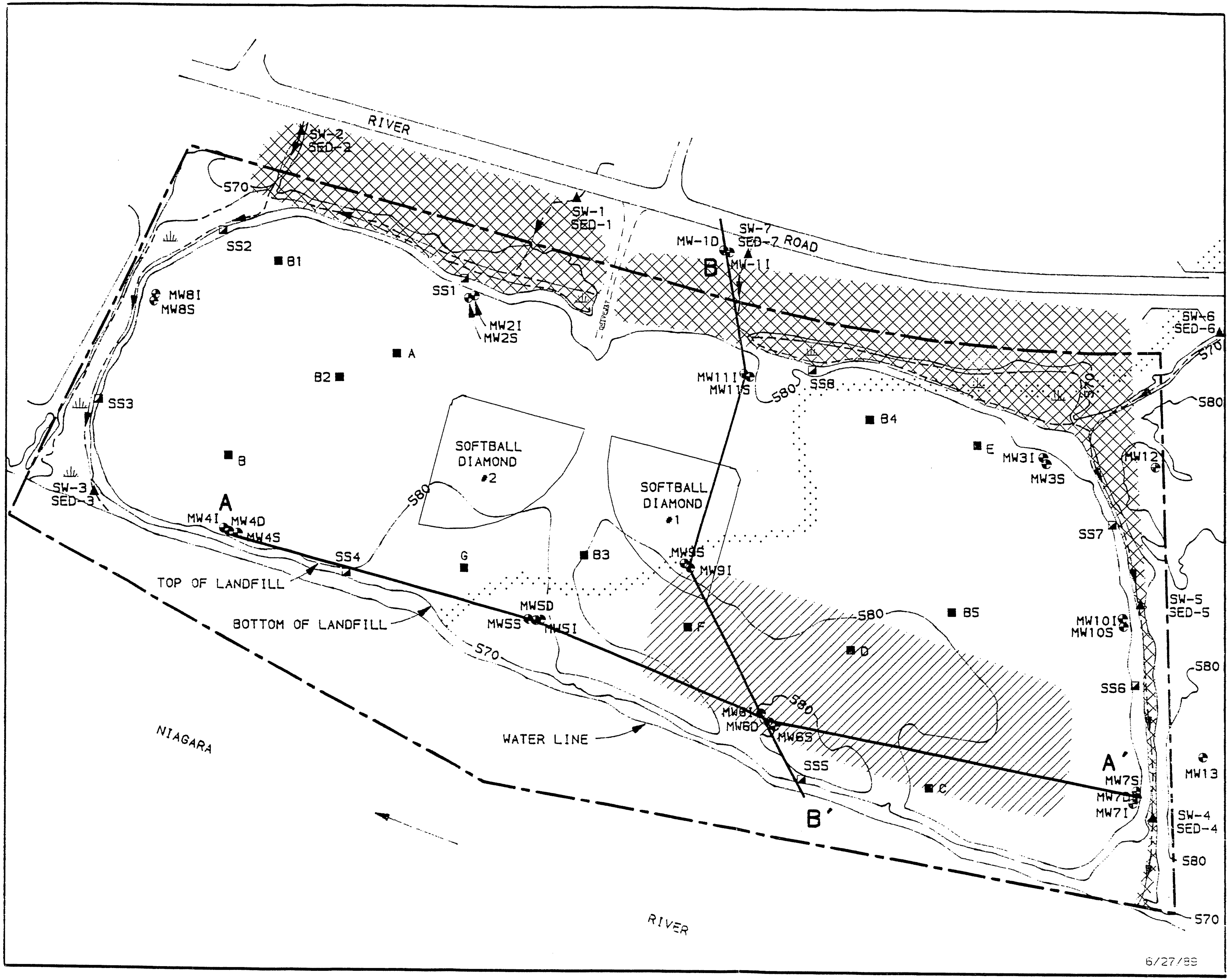
SCALE 1" = 2,000'

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 2

REMEDIAL / INVESTIGATION
CHERRY FARM SITE
TONAWANDA, NEW YORK

SITE MAP



LEGEND

- DRAINAGE DITCH
- APPROXIMATE PROPERTY LINE
- GENERAL AREA OF FORMER SETTLING PONDS
- FORMER STREAM CHANNEL
- MONITORING WELL
- LANDFILL FACE SAMPLE
- SOIL BORING
- SURFACE WATER/SEDIMENT SAMPLING
- A–A' GEOLOGIC CROSS-SECTION
- DESIGNATED WETLAND

0 200 400

SCALE IN FEET

O'BRIEN & GERE ENGINEERS, INC.

Syracuse , New York

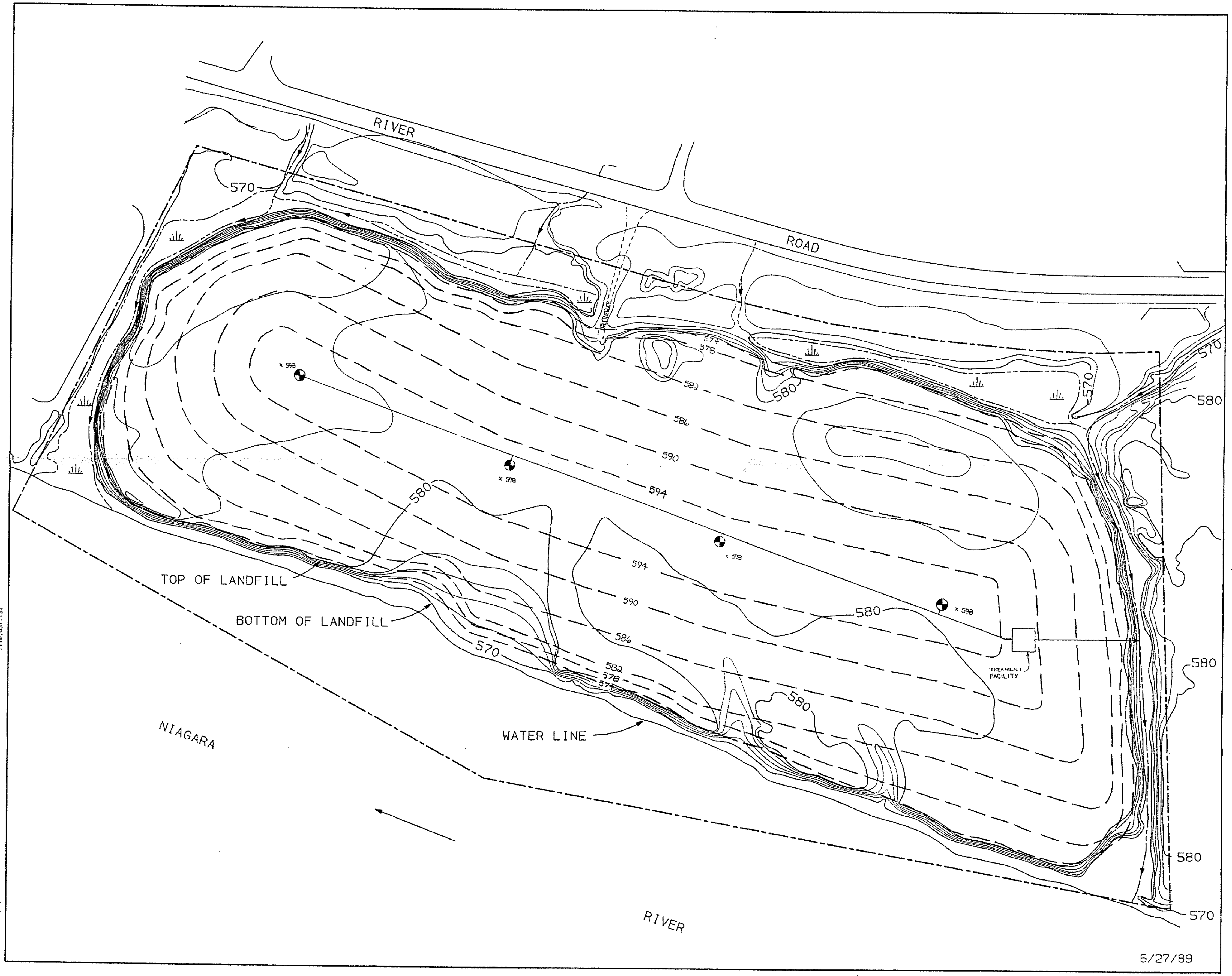


FIGURE 3

CHERRY FARM SITE
TONAWANDA, NEW YORK

CONCEPTUAL DESIGN

LEGEND

- DRAINAGE DITCH
- APPROXIMATE PROPERTY LINE
- PROPOSED CONTOURS (FINAL GRADE)
- GROUND WATER RECOVERY WELL

0 100 200
SCALE IN FEET

O'BRIEN & GERE
ENGINEERS, INC.
Syracuse , New York

Appendices

O'BRIEN & GERE

APPENDIX A

GROUND WATER EXTRACTION SYSTEM

CONCEPTUAL DESIGN

As presented in the Remedial Investigation (RI) Report for the Cherry Farm Site (June 1989), the first encountered aquifer in the site area occurs within the unconsolidated deposits and extends from 15 feet below the landfill surface to the bedrock which is located at a depth of approximately 50 feet below grade. The general ground water flow direction is to the Niagara River which borders the west side of the site. The unconsolidated aquifer was divided into three zones during the investigation, shallow, intermediate and deep, based on physical and chemical characteristics. The shallow zone is contained within the bottom five feet of the fill material. The intermediate zone lies directly beneath the fill in natural alluvial deposits and extends from 20 to 35 feet below the landfill surface. The deep zone begins at 35 feet and continues to the bedrock surface or approximately 50 feet.

As part of Alternative 3, the recommended alternative for remediating the Cherry farm Site, a ground water extraction and treatment system would be employed to prevent off-site migration of contaminants. The RI findings revealed that the contaminants were limited to the shallow and intermediate ground water zones, therefore the extraction system would be required to withdraw water from these zones. As presented in the RI Report, the total volume of ground water that flows through ¥Ŀthe shallow and intermediate ground water zones is approximately 12,400 gallons per day (gpd). For the purpose of the conceptual design of the ground water extraction system, an estimated withdrawal volume of 14,400 gpd (10 gallons per minute) was used. This volume would include inflow of approximately 200 gallons per day from the Niagara River.

Although one well could withdraw 10 gpm from the site area, a multiple well system would be utilized to control the radius of inflow of the system and minimize the flow of ground water from the river. For the purpose of the evaluation of the ground water extraction system effectiveness, four extraction wells were used. The conceptual design provides for the installation of the four wells in a line running in a north-south direction along the center of the site as illustrated on Figure A1. The two end wells would be pumped at a rate of 3 gpm and the inner two wells would be pumped at 2 gpm for a total extraction volume of 10 gpm (14,400 gpd). For the purpose of the evaluation, average values of hydraulic conductivity, transmissivity, storativity, and the hydraulic gradient have been selected from the data presented in the RI Report as representation of both the shallow and intermediate ground water zones. These values are as follows:

Aquifer thickness, b = 20 feet

(shallow = 5 ft, intermediate = 15 ft)

Hydraulic conductivity, K = 10 ft/day = 75 gpd/sq.ft.

(shallow = 140 gpd/sq.ft., intermediate = 38 gpd/sq.ft.)

Transmissivity = T = K*b = 200 sq.ft./day = 1500 gpd/ft.

Storage = S = 0.25 (value for sand to silty sand)

Hydraulic Gradient = i = 0.004 ft/ft

(shallow 0.006 ft/ft, intermediate = 0.0016 ft/ft)

A computer program which was developed based on the Theis equation was used to evaluate whether the conceptual extraction well system would be capable of collecting the ground water which flows through the site in the shallow and intermediate zone. The input parameters for this program were those presented above. The Theis model generates a grid of ground water elevations or heads. This grid of head values is then placed on a flow path model (GWPATH) to assess the capture zone for each of the four withdrawal wells. The output of this model was used to generate Figure A2. The lines radiating from each of the four wells on the figure represent ground water flow paths to the wells. As illustrated, the wells would capture the ground water flowing through the site.

To better evaluate the radius of inflow of the wells in the down-gradient direction, towards the river, Todd's equation was used. This equation is as follows:

$$x = \frac{-Q}{2(\pi)Kbi}$$

Where: Q = discharge of well = 2 gpm (385 cu ft/day)
= 3 gpm (577 cu ft/day)

K = hydraulic conductivity = 10 ft/day

b = aquifer thickness = 20 feet

i = hydraulic gradient = 0.004 ft/ft

Given this information the downgradient radius of inflow of a well pumping at 2 gpm is 77 feet. A well pumping at 3 gpm will have a downgradient radius of 115 feet. This suggests that influence at the river can be limited by the distance the wells are placed from the river. The actual inflow of water from the river will be further evaluated during the design stage of the remediation program with the completion of an aquifer performance test.

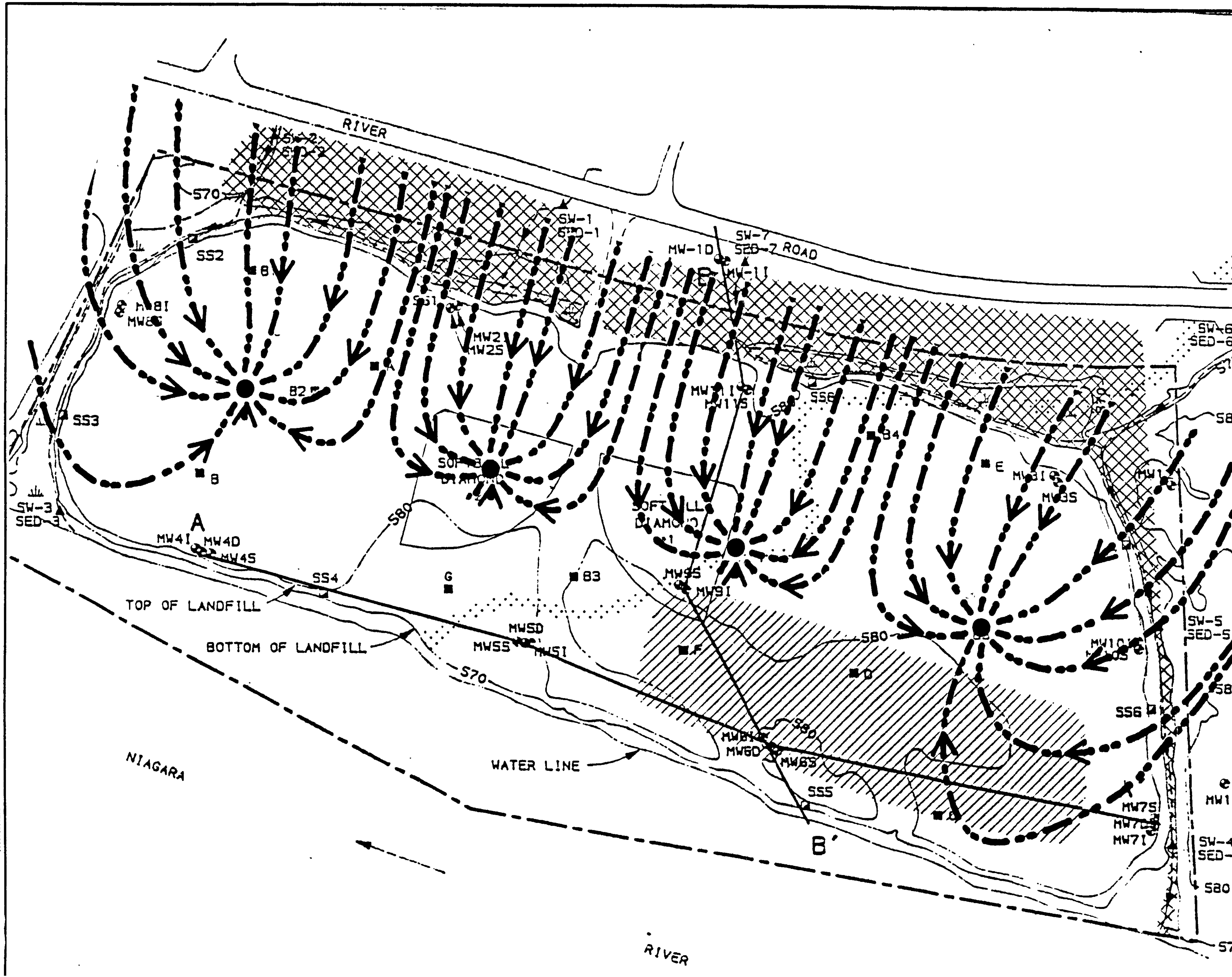


FIGURE A1

CHERRY FARM SITE
TONAWANDA, NEW YORK

CONCEPTUAL GROUND WATER
EXTRACTION SYSTEM
FLOW MAP

LEGEND

GROUND WATER FLOW LINES

PUMPING WELL

CHERRY FARM SITE BOUNDARY

0 200 400

APPROX. SCALE IN FEET

Exhibits

O'BRIEN & GERE

EXHIBIT A

kenmore, new york 14217 • municipal building • 877-8800

Town of Tonawanda

March 12, 1990

Mr. Timothy Spellman
Niagara Mohawk Corporation
10 Lafayette Square
Buffalo, New York 14203

Dear Tim:

I want to thank you for arranging last weeks meeting between representatives of Niagara Mohawk, the Town of Tonawanda and the New York State Department of Environmental Conservation. It was an excellent meeting and we are all very excited over the possibility of seeing this piece of land someday turned into a public park for the people of Erie County.

We have been working on what such a park should contain in order to make it a unique public access facility. It is the feeling of our parks staff that the size of this parcel makes it possible to concentrate a number of recreational activities within its area including:

1. 8-10 boat launching ramps
2. Public marina (150 - 200 slips)
3. Fishing piers
4. Fish cleaning station
5. Picnic areas
6. Band shell
7. Concession stands
8. Lavatory facilities
9. Riverwalk/bikeway
10. Interpretive Center
11. Decorative fountains
12. Boat trailer and automobile parking
13. Landscaping
14. Boat supply and services (gas)

The above items were discussed and it is our understanding that no more extensive feasibility studies are required to proceed with the remediation plan.

Niagara Mohawk and DEC understand that specific development details are appropriately discussed in the design phase. Having your engineering firm begin the remediation design of this land with these plans in mind could serve to make this project a reality within the next few years.

By copy of this letter we are requesting Mr. Michael Brinkman of the DEC provide us a letter which confirms DEC's position that the property will be suitable, following remediation, for use as a public park with the type of facilities described. Such a letter would assist us as we move ahead with our plans and encourage the provision of the substantial funds which will be needed to carry out design studies and other activities.

The Town is moving ahead with producing a design study. We intend to have design layouts available for the ROD later this year.

I hope this information will assist you in completing your feasibility study. Please feel free to call me if you are in need of any additional information.

Sincerely,

Carl

Carl J. Calabrese
Councilman - Town of Tonawanda