Superfund Proposed Plan

Nepera Chemical Company, Inc. Superfund Site

Hamptonburgh, Orange County, New York

EPA

July 2007

PURPOSE OF THE PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for the contaminated soil and groundwater at the Nepera Chemical Company Superfund Site, and identifies the preferred remedy with the rationale for this preference. This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC).

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended (commonly known as the federal "Superfund" law), and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the contamination at the site and the alternatives summarized in this Proposed Plan are further described in the June 16, 2006 Remedial Investigation (RI) Report and the June 26, 2007 Feasibility Study (FS) Report, respectively. EPA and NYSDEC encourage the public to review these documents to gain a more comprehensive understanding of the site and Superfund activities that have been conducted at the site.

This Proposed Plan is being provided to inform the public of EPA's preferred remedy and to solicit public comments pertaining to the remedial alternatives evaluated, including the preferred alternatives. EPA's preferred remedy consists of the following components:

> Excavation of the soil in the source area (former lagoon area), the design and construction of a biocell to contain the excavated soil, the installation of a soil vapor extraction (SVE) system within the biocell, and operation of the SVE and biocell to remediate contaminated soil. This soil remedial alternative is referred to as Soil Alternative 4 (S4). In addition, the excavated area will be treated with oxygenating compounds (e.g., Oxygen Releasing Compounds) to create an aerobic environment and, thereby, stimulate biodegradation within the area of elevated groundwater contamination. This groundwater remedial alternative is referred to as Groundwater Alternative 2 (GW2). The injection of oxygenating compounds directly into the groundwater at location-specific injection points to further enhance biodegradation of groundwater contamination will be evaluated during the remedial design. This will be followed by a long-term groundwater monitoring program where groundwater samples would be

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July 27, 2007 – August 26, 2007: Public Comment Period on the Proposed Plan.

August 16, 2007 at 7:00 p.m.: The U.S. EPA will hold a Public Meeting to explain the Proposed Plan. The meeting will be held at Campbell Hall in Hamptonburgh, New York.

For more information, see the Administrative Record file (which will include the Proposed Plan and supporting documents), which is available at the following locations:

Hamptonburgh Town Hall
18 Bull Road
Campbell Hall, New York 10916
Tel. 845-427-2424
Hours: Monday - Friday 9:00am - 3:30pm

and

USEPA-Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
(212) 637-4308
Hours: Monday-Friday, 9:00 a.m. - 5:00 p.m.

Written comments on this Proposed Plan should be addressed to:

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collected and analyzed regularly in order to verify that the concentrations and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and location of any additional monitoring wells would be determined during the design phase. This remedial alternative is referred to as Groundwater Alternative (GW2).

The remedy described in this Proposed Plan is the preferred remedy for the site. Changes to the preferred remedy or a change from the preferred remedy to another remedy may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the alternatives considered in this Proposed Plan.

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NYSDEC rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan, along with the supporting Remedial Investigation and Feasibility Study Reports, have been made available to the public for a public comment period which begins on **July 27, 2007** and concludes on August 26, 2007.

A public meeting will be held during the public comment period at Campbell Hall in Hamptonburgh, New York on **August 16, 2007** at 7:00 P.M. to elaborate on the reasons for the proposed remedy and to receive public comments.

Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document which formalizes the selection of the remedy.

SCOPE AND ROLE OF ACTION

This Proposed Plan presents the preferred alternatives to remediate the site. The objectives of the proposed remedy are to remediate contaminated soil, reduce and minimize the migration of contaminants in the groundwater, restore groundwater quality, and minimize any potential future health and environmental impacts.

SITE BACKGROUND

Site Description

The property is located on the south side of Orange County Highway 4 in Hamptonburgh, Orange County, New York, approximately 1.5 miles southwest of the Village of Maybrook (see Figure 1). The site is owned by Nepera Chemical Company, Inc. (Nepera). The site is 29.3 acres in area; approximately 5 acres of the site were used for the historical lagoon operations (see Figure 2). The site is located in a rural residential/agricultural area, bounded by Orange County Highway 4 to the north, Beaverdam Brook to the west, the Otter Kill to the south, and an undeveloped tract of land to the east. Three residences exist in the immediate vicinity of the site, one to the southwest, one to the north and one to the northeast (on the other side of Orange County Highway 4).

Approximately 7,000 people live within three miles of the site, with the closest residences located approximately 250 feet to the west-southwest and 175 feet to the northeast. The public water supply wells for the Village of Maybrook are located approximately 800 feet to the northeast of the site property. All residences in the vicinity of the site rely on private wells for the potable water supply.

Site Geology/Hydrogeology

The site is in an area of rolling hill topography and is located within a 4.5 square mile watershed consisting of Beaverdam Brook and its tributaries, which discharge to the Otter Kill, located approximately 500 feet to the south of the property. The geologic units at the site are divided into two primary units, the overburden (comprised of topsoil, fill, and gravel) and the bedrock (comprised of shale). Ground surface topography is generally bedrock controlled in that the ground surface generally follows the bedrock surface topography. The overburden thickness at the site is also related to bedrock topography in that it is generally thinner (or absent) over bedrock ridges, while greater overburden thicknesses have been deposited in bedrock depressions and valleys. The overburden ranges in thickness from 0 to 20 feet.

Most of the site is forested. The former lagoon area, which was stripped of vegetation while in use, is now covered with grasses, wild flowers, and mixed brush. There are two aquifers that exist beneath the site, the overburden aquifer and the bedrock aquifer. The overburden aquifer is the surficial unit which overlies the bedrock aquifer. The bedrock aquifer is the primary source for public water in the area. No significant layers of impeding clays were observed between the two aquifers within the study area. An east to west trending groundwater divide is present in the bedrock aquifer underlying (and transecting) the lagoon area. As such, groundwater flow has a northerly and a southerly component radiating from this divide.

Site History

The site was used for the disposal of industrial wastewater generated at the Nepera Chemical Company facility in Harriman, New York, located approximately 25 miles from the site. Wastewater was trucked to the site and disposed of in six constructed lagoons from 1953 through December 1967. Approximately 5 acres of the site were used for the historical lagoon operations, six lagoons in all. No wastewater disposal has occurred at the Site since December 1967. Three of the lagoons were backfilled with clean soil in 1968 and the remaining three lagoons were backfilled with clean soil in 1974.

Beginning in 1967, numerous investigations were conducted by various consultants to Nepera to determine the extent of contamination at the site. Based on the results of these investigations, NYSDEC placed the site on the New York Registry of Inactive Hazardous Waste Disposal Sites. On August 17, 1984, the State of New York entered into a Consent Decree with Nepera Chemical Company, Inc. to conduct a remedial investigation to determine the type and extent of contamination at the site.

On June 1, 1986, the EPA placed the Nepera site on the National Priorities List (NPL) of sites under the Comprehensive Environmental Response Compensation and Liability Act 1980 (CERCLA), as amended. NYSDEC continued as the lead regulatory agency overseeing the implementation of the RI/FS.

Under an Administrative Order with NYSDEC, signed on March 21, 1988, the Potentially Responsible Party (PRP), namely Nepera Chemical Company, Inc., hired a contractor to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the site in 1988. The first draft RI was submitted in March 1996. NYSDEC and EPA determined that further work was necessary to define the type and extent of soil contamination at the site and to determine the downgradient extent of the contaminant plume which emanated from the site. In March 2005, an updated draft RI was submitted to NYSDEC and USEPA. This document was revised and a Final RI Report was submitted on June 16 2006.

The lead agency for the Nepera site was recently re-designated, at the conclusion of the RI/FS process, from NYSDEC to USEPA.

SUMMARY OF SOIL AND GROUNDWATER SAMPLING

Major RI activities performed during field data collection activities included: on-site soil borings, soil sampling, monitoring well drilling and installation, groundwater sampling, and residential well sampling. The results of the RI are summarized below.

Soil

The PRP performed the RI in several phases. Soil sampling activities were conducted in 1991 and 1996. Focused soil sampling identified contamination in the lagoon area and determined the lagoon area to be the primary source of the contaminants in the groundwater plume. The primary contaminants identified during soil sampling activities include benzene (maximum concentration of 13 milligrams per kilogram (mg/kg)), chlorobenzene (maximum concentration of 12 mg/kg), ethylbenzene (maximum concentration of 22 mg/kg), toluene (maximum concentration of 52 mg/kg), xylenes (maximum concentration of 300 mg/kg) and pyridine-related compounds (maximum concentration of 74 mg/kg of 2-amino pyridine). Each of these contaminants are considered as Contaminants of Concern (COCs) for the Site. In addition, several samples detected elevated levels of metals, including mercury and manganese. An additional 120 soil samples were collected from the lagoon area in 2003 to evaluate concentration levels of metals. Soil samples were also collected from locations not impacted by the site to determine Site-specific background levels for metals. Analytical data from the 2003 sampling activities indicated that the metals in the lagoon area were analogous to background concentrations and, as such, metals are not considered to be COCs. The presence of mercury in earlier samples (from 1991 and 1995) was of additional concern as the form of mercury (e.g., organo-mercury or inorganic mercury) can significantly change its toxicity. As such, additional analyses were performed on selected samples from the 2003 activities to determine form (or species) of mercury present in Site soils. These analyses determined that over 99% of the mercury present in Site soils is in the form of inorganic mercury, which is significantly less toxic than organo-mercury.

As stated earlier, the former lagoons are within an area approximately 5 acres in size, but the total area of the actual six lagoons is smaller. The total area of contaminated soils (i.e., the six lagoons) is estimated to be 128,850 square feet (approximately 3 acres). The volume calculations for contaminated soil are based on the actual surface area of each lagoon, the average depth of the overburden within each lagoon (down to bedrock), the thickness of a distinct black-stained layer observed during the completion of test pits, and the clean fill put on the lagoons. The average overburden thickness was estimated to range from 3.4 (for lagoon 6) to 13.3 feet (for Lagoon 3). The total volume of contaminated soil is estimated to be 30,086 cubic yards. Furthermore, it is estimated that 20% (approximately 6,000 cubic yards) of this is comprised of shale and cobble which will be sorted-out prior to implementing a soil remedy. Therefore, the remedial alternatives assessed in this Proposed Plan are based on the total volume of contaminated soil being 24,086 cubic yards, which is equivalent to approximately 38,700 tons of contaminated soil.

Groundwater

The groundwater monitoring program included sampling of groundwater monitoring wells located at (and bordering) the site and analyses of these samples for organic and inorganic compounds. These efforts were comprised of several separate field mobilizations conducted between 1995 and 2003. The investigation was conducted in an iterative manner, where the results of each task were used to develop the scope of each subsequent task. The RI included:

- Installing permanent groundwater monitoring wells to act as fixed monitoring and/or compliance points within both the overburden aquifer and the bedrock aquifer. A total of 38 groundwater monitoring wells were installed in the study area.
- Collecting a series of groundwater samples from the assembled monitoring network;
- Identifying the Contaminants of Potential Concern in both aquifers;

- Characterizing the horizontal and vertical extent of site-related contaminants in the overburden and bedrock aquifers and determining the extent of the groundwater contaminant plume;

As with the contaminated soil, the primary contaminants identified in groundwater include benzene, chlorobenzene, ethylbenzene, toluene, xylenes and pyridine-related compounds. These contaminants were detected in the wells located within the property boundary.

Residences in the vicinity of the site rely on private wells for their potable water supply. As a precautionary measure, to ensure that these wells are not impacted by the Site, private wells in the immediate vicinity of the Site have routinely been sampled for Site-related contaminants. With the exception of minor levels of Site-related contaminants detected below drinking water standards (e.g., MCLs) in May 2002 and September 2003, sampling data indicates nondetectable levels of Site-related contaminants in private wells. Also, because of their close proximity to the Site (approximately 800 feet), the public wells located on County Highway 4, which are used to supply drinking water to customers served by the Village of Maybrook, are monitored on a quarterly basis for Site-related contaminants and must comply with the New York State Department of Health drinking water standards. Site-related contaminants have not been detected in the Village of Maybrook Public Wells.

Sediment

As stated earlier, the Site is bounded by Beaverdam Brook to the west and the Otter Kill to the south. Since the hydrogeological link between groundwater and these water bodies was not clear, sediment samples were collected in 1985, 1991, and 1995 from Beaverdam Brook and the Otter Kill.

The EPA performed additional sediment sampling from the floor of Beaverdam Brook in 2003. Groundwater flow direction was considered to determine sampling location points. Samples were collected from a total of 27 sampling locations, upstream, downstream, and adjacent to the Site, and were analyzed for volatile organic compounds and semi-volatile organic compounds (including Site-related COCs). Site-related COCs were not detected in these samples.

RISK SUMMARY

The purpose of the risk assessment is to identify potential cancer risks and noncancer health hazards at the site assuming that no further remedial action is taken. A baseline human health risk assessment was performed to evaluate current and future cancer risks and noncancer health hazards based on the results of the Remedial Investigation.

A baseline ecological risk assessment was also conducted to assess the risk posed to ecological receptors due to site-related contamination.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern (COC) at a site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a “reasonable maximum exposure” scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other noncancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and noncancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a “one-in-ten-thousand excess cancer risk”; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk) with 10^{-6} being the point of departure. For noncancer health effects, a “hazard index” (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a “threshold level” (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

Human Health Risk Assessment

As part of the RI/FS, a baseline human health risk assessment was conducted to estimate the risks associated with the current and future effects of contaminants on human health and the environment. A baseline human health risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these under current and future land uses. A four-step human health risk assessment process was used for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of: Hazard Identification of Chemicals of Potential Concern (COPCs), Exposure Assessment, Toxicity Assessment, and Risk Characterization (see adjoining box “What is Risk and How is it Calculated”).

The human health risk estimates summarized below are based on current reasonable maximum exposure scenarios and were developed by taking into account various conservative estimates about the frequency and duration of an individual’s exposure to the site-related contaminants both for adults and children, as well as the toxicity of these contaminants.

The baseline risk assessment began with selecting COPCs in the various media (e.g., soil and groundwater) that would be representative of site risks. The property is currently zoned as agricultural/residential. Though the land is currently undeveloped, the reasonably anticipated future land use, based on its current zoning, is residential. As such, the risk assessment was based on a future anticipated residential land-use scenario (the most conservative scenario), though, an open-space, park setting was also considered in the baseline risk assessment. In addition, the potential future use of groundwater as a drinking water source is consistent with the State use designation of the aquifer. The baseline risk assessment considered health effects for trespassers/hikers, maintenance workers, and residents who may be exposed to contaminants in the soils by ingestion, inhalation, and dermal contact, and ingestion and inhalation of groundwater used as a potable water supply. In this assessment, exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95 percent upper confidence limit of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. Central tendency exposure (CTE) assumptions, which represent typical average exposures, were also developed. A complete summary of all exposure scenarios can be found in the baseline human health risk assessment.

Human Health Risks

In the Human Health Risk Assessment, chemical data were used to calculate cancer risks and noncancer health hazards expressed as individual Hazard Quotients (HQ). These cancer and noncancer risks, for the most conservative scenario (namely, future residential use of the Site) are expressed below.

EPA's statistical analysis of the groundwater sampling data indicates that the probable exposure concentrations of benzene (330 ug/l), xylenes (270 ug/l), 2-aminopyridine (189 ug/l), and aniline (16 ug/l), when evaluated under future residential exposure scenarios, are associated with noncancer hazard quotients of 21, 4, 570, and 23, respectively. In addition, the concentration of benzene is associated with an excess lifetime cancer risk of 1×10^{-3}. All of these values exceed EPA's acceptable levels of noncancer hazard or excess lifetime cancer risk.

Similarly, EPA's evaluation of the soils indicates that direct exposure to the probable exposure concentrations of benzene (4,440 ug/kg), toluene (10,000 ug/kg), chlorobenzene (1,000 ug/kg), xylenes (69,000 ug/kg), and 2-aminopyridine (23,400 ug/kg) are associated with hazard quotients of 42, 7, 5, 61, and 2, respectively. All of these values exceed EPA's acceptable levels of noncancer hazard. In addition, the concentration of benzene is associated with an excess lifetime cancer risk of 1×10^{-4}.

These risk and hazard levels indicate that there is significant potential risk to receptors from direct exposure to contaminated soil and groundwater. The risk estimates are based on current reasonable maximum exposure scenarios and were developed by taking into account conservative assumptions about the frequency and duration of an individuals' exposure to the soil and groundwater, as well as the toxicity of these chemicals.

These calculated risks to human health require EPA to implement remedial measures to reduce the risks associated with the observed contamination in soil and groundwater and restore the groundwater to beneficial use.

Ecological Risk Assessment

A baseline ecological risk assessment (BERA) was prepared to identify the potential environmental risks associated with surface water, groundwater, sediment, and soil. The results of the BERA suggested that there are contaminants in groundwater, soils, and sediment, but they are not present at levels posing significant risks to ecological receptors. The potential for risk to ecological receptors exposed to site-related contaminants was limited to isolated locations, primarily in Lagoon 6, and the risk associated with this area used the conservative assumption that the ecological receptors (e.g., soil invertebrates, mammalian insectivores, and carnivores) spend 100% of their lives in the area of Lagoon 6. The contaminants that were identified in the BERA (outside of Lagoon 6) were determined not to pose a potential for adverse ecological effects because they were common elements of soil that were not related to Site operations, the detected concentrations were lower than background levels, the frequency of detections was low, or the HQs were only slightly above 1 with no adverse impacts to populations expected. A detailed presentation of these data can be found in the RI Report.

Risk Summary Conclusion
Exposure to contaminated soil poses risks to human health. Furthermore, the contaminated soil continues to be a source of groundwater contamination. As such, it was decided that a remedial action should be taken to reduce contamination in the soil to levels below cleanup objectives. In addition, exposure to contaminated groundwater poses risks to human health. As such, it was decided that a remedial action should be taken to restore the contaminated groundwater for future use.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are media-specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and risk-based levels established in the risk assessment.

The overall remedial action objective is to ensure the protection of human health and the environment. The general remedial objectives identified for the Site are to:

1. prevent exposure to contaminated soils and groundwater to human and ecological receptors;
2. minimize migration of contaminants from soils to groundwater;
3. restore the aquifer(s) to beneficial use;
4. ensure that hazardous constituents within the soil and groundwater meet acceptable levels consistent with reasonably anticipated future use; and
5. minimize potential human contact with waste constituents.

Preliminary Remediation Goals
Preliminary Remediation Goals (PRGs) were selected based on federal and state promulgated ARARs, risk-based levels, background concentrations, and guidance values. These PRGs were then used as a benchmark in the technology screening, alternative development and screening, and detailed evaluation of alternatives presented in the subsequent sections of the FS Report. The PRGs for groundwater and soil are shown in Table 1 below.

Table 1: Preliminary Remediation Goals

Contaminant	PRG for Groundwater (ug/L) *	PRG for Soils (ug/kg)
Benzene	1	60 ***
Chlorobenzene	5	1,100 ***
Ethylbenzene	5	1,000 ***
Toluene	5	700 ***
Xylenes	5	1,600 ***
2-amino pyridine	1	400 ****
Pyridine	50	400 ****
Alpha picoline	50	575 ****
Acetone	50	50 ***
Aniline	5	1,510 ****
Pyridine-related tentatively identified compounds	50	400 ****

* Groundwater cleanup levels for organic COCs are based on the more conservative of the Federal Maximum Contaminant Levels (MCLs) and the New York Ambient Groundwater Standards and Guidance Values (NYSDEC TOGs 1.1.1, June 1998).
*** The values shown are from *NYSDEC Subpart 375: Remedial Program Soil Cleanup Objectives*.
**** The values shown were derived by NYSDEC based on the *Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels, Division of Hazardous Waste Remediation, January 24, 1994.*

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA Section 121(b)(1), 42 U.S.C. Section 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with other statutory laws (ARARs), and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. CERCLA Section 121(d), 42 U.S.C. Section 9621(d) further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4), 42 U.S.C. Section 9621(d)(4).

The objective of the feasibility study (FS) was to identify and evaluate cost-effective remedial action alternatives which would minimize the risk to public health and the environment resulting from soil and groundwater contamination at the site.

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the site can be found in the FS report. This document presents a summary of the six soil remediation alternatives and five groundwater remediation alternatives that were evaluated.

The remedial alternatives are described below.

Common Elements for All Alternatives

All action alternatives would include institutional controls. Specifically, an environmental easement/restrictive covenant would be filed in the property records of Orange County. The easement/covenant would, at a minimum, require: (a) with the exception of Alternative S6 – Excavation and Off-Site Disposal, restricting any excavation below the soil surface layer in those areas undergoing remediation, unless the excavation activities are in compliance with an EPA approved site management plan; (b) restricting new construction at the Site unless an evaluation of the potential for vapor intrusion is conducted and mitigation, if necessary, is performed in compliance with an EPA approved site management plan; (c) restricting the use of groundwater as a source of potable or process water unless groundwater quality standards are met; and (d) the owner/operator to complete and submit periodic certifications that the institutional and engineering controls are in place.

A Site Management Plan (SMP) would be developed to address soils and groundwater at the Site. The SMP would provide for the proper management of all Site remedy components post-construction, such as institutional controls, and shall also include: (a) monitoring of Site groundwater to ensure that, following the soil excavation, the contamination is attenuating and groundwater quality continues to improve; (b) identification of any use restrictions on the Site; (c) necessary provisions for implementation of the requirements of the above easement/covenant; and (d) provision for any operation and maintenance required of the components of the remedy.

In addition, physical controls, such as regular maintenance of the perimeter fence, would be implemented to restrict Site access and thereby prevent the potential exposure to chemicals present in the soils in the vicinity of the former lagoons.

Finally, all groundwater remedial alternatives would include the requirement that those private wells, in the vicinity of the Site, currently being monitored in relation to this Site will continue to be monitored on an ongoing basis. The frequency of the residential well sampling will be determined during Remedial Design.

Soil Remedial Alternatives

Alternative S1 - No Action

Capital Cost:	$0
Annual Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The "No Action" alternative is considered in accordance with NCP requirements and provides a baseline for comparison with other alternatives. If this alternative were implemented, the current status of the site would remain unchanged. Institutional controls would not be implemented to restrict future site development or use. Engineering controls would not be implemented to prevent site access or exposure to site contaminants. Although existing security fencing at the site would remain, it would not be monitored or maintained under this alternative.

Alternative S2 – Institutional Controls with Limited Actions

Capital Cost:	$12,600
Annual Cost:	$13,550
Present-Worth Cost:	$217,000
Construction Time:	3 months

Physical controls would also be used to eliminate the future potential for on-Site exposures. A perimeter security fence (with appropriate warning signs) has been constructed to restrict Site access and thereby prevent the potential exposure to chemicals present in the surface soils in the vicinity of the former lagoons. The Site security fencing and warning signs would be routinely inspected and maintained at the Site to restrict access to the Site.

Institutional controls as the sole remedy would not be an adequate substitute for engineering controls at this Site. This Alternative would not achieve the Remedial Action Objectives. Accordingly, this alternative will not be retained for further consideration. Institutional controls, however, as described in this alternative, will be retained as components of other remedial alternatives.

Alternative S3 – Installation of a Cap Over the Contaminated Soils

Capital Cost:	$2,290,000
Annual Cost:	$24,000
Present-Worth Cost:	$2,647,000
Construction Time:	8 months

Under this alternative, a cap would be constructed over the area with contaminated soils. This area has soils above the water table with concentrations exceeding the NYSDEC Soil Cleanup Objectives.

Chemicals in the soils above the water table would be contained by a cap. The cap would serve to inhibit infiltration of precipitation and thereby reduce leaching of chemicals from the soils to groundwater, and, therefore, reduce chemical concentrations in the overburden and bedrock groundwater over time. The decreased infiltration over the former lagoon area would result in a lowering of the water table in the overburden aquifer directly beneath the Site and, hence, further reduce the chemical migration from this area via groundwater transport.

Alternative S4 – Excavation and On-Site SVE and Biocell

Capital Cost:	$2,388,000
Annual Cost:	$406,000

Present-Worth Cost:	$3,119,000
Construction Time:	2 years

This alternative would involve the excavation of the soils within the former lagoons and treatment of the soils with concentrations of Contaminants of Concern (COCs) exceeding the NYSDEC Soil Cleanup Objectives on-Site utilizing SVE and biological degradation within an engineered below-grade biocell. Excavated soils would be treated to reach target cleanup levels.

The soils would be treated within the biocell by installing perforated pipes within multiple layers of the biocell. The perforated pipes would be connected to a blower unit to draw air through the piles; contaminants would be volatilized into this air. The air would be treated, if necessary, using carbon adsorption, prior to being recirculated or exhausted to the atmosphere. Nutrients would be added to the treatment layers as required to enhance biological degradation.

In general, the biocell would be operated in two primary modes: SVE mode (high air flow rate); and bioremediation mode (low air flow rate).

During the SVE mode, the system would be operated at higher air flow rates which would be selected to optimize the removal of the volatile organic compounds (VOCs) constituents using SVE. After the removal rate of the VOCs decreases to an asymptotic or nominal rate, the system would be switched over to the bioremediation mode. During the bioremediation mode, the system would be operated at an optimized air flow rate selected to sustain the aerobic biodegradation of the remaining VOCs and semi-volatile organic compounds (SVOCs).

<u>Alternative S5 – In-Situ Soil Vacuum Extraction</u>

Capital Cost:	$1,211,000
Annual Cost:	$460,900
Present-Worth Cost:	$2,302,000
Construction Time:	4 years

This alternative involves the installation of an in situ soil vacuum extraction system (ISVE) in the area identified for potential soil remediation. A drainage swale would be constructed along the edge of the treatment area to prevent surface water run-on to the treatment area.

The soil vapor extraction wells would be strategically placed within the area of soil to be treated to ensure that airflow within the area is maximized. The extraction wells would consist of a screened section of pipe (or pipes) placed in a permeable packing with the top few feet of the well grouted to prevent the short circuit of airflow from the surface. An impermeable temporary cap would be placed over the treatment area to minimize infiltration of precipitation, lower the water table and increase the volume of the unsaturated zone, and prevent short circuiting of airflow directly from the surface.

The extraction wells would be installed with vacuum and positive pressures being applied at alternating well locations to create an induced pressure gradient to move the vapors through the soil. Extracted vapors would be treated utilizing carbon filters, if required, prior to being reinjected or exhausted to the atmosphere. Vapor-phase nutrients would also be injected into the soils, if needed, to enhance biodegradation.

<u>Alternative S6 – Excavation and Off-Site Disposal</u>

Capital Cost:	$11,208,000
Annual Cost:	$22,000
Present-Worth Cost:	$11,228,000
Construction Time:	1 year

Alternative S6 involves the excavation of soils within the former lagoons containing COCs at concentrations exceeding NYSDEC Soil Cleanup Objectives. The excavated soils would be disposed of off Site at an appropriate landfill.

The Capital Cost associated with Alternative S6, as reported in the FS Report, has a significant range because it is not exactly known how much of the contaminated soil would be classified as hazardous waste and would, therefore, be more expensive to handle and dispose. The Capital Cost cited above represents the high end of the range. The Capital Cost associated with the low end of the range is $5,736,000.

Alternative S6 would include the following major components:

- pre-design investigation;
- excavation of on-site soils exceeding soil cleanup objectives for the COCs;
- post excavation sampling to verify achievement of soil cleanup objectives;
- disposal of excavated soils at appropriate off-site facility (or facilities);
- backfilling of excavated areas with clean fill.

<u>Groundwater Remedial Alternatives</u>

<u>Alternative GW1 – No Action</u>

Capital Cost:	$0
Annual Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The No Action alternative was retained for comparison purposes as required by the NCP. No remedial actions would be implemented as part of this alternative. Groundwater would continue to migrate and contamination would continue to attenuate through dilution. This alternative does not include institutional controls or long-term groundwater monitoring.

Alternative GW2 – Enhanced Bioremediation with Long-Term Groundwater Monitoring

Capital Cost:	$13,200
Annual Cost:	$106,700
Present-Worth Cost:	$528,000
Construction Time:	8 years

This alternative involves the manipulation of Site groundwater conditions to enhance in situ bioremediation of the COCs by the indigenous microbial population. The design details for enhanced bioremediation would be established following the removal of the source area soils. The excavated area will be treated with oxygenating compounds to create an aerobic environment and, thereby, stimulate biodegradation within the area of elevated groundwater contamination. Multiple applications of the oxygenating compounds may be necessary. This will be followed by a long-term groundwater monitoring program where groundwater samples would be collected and analyzed regularly in order to verify that the concentrations and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and location of any additional monitoring wells would be determined during the design phase. The site-related COCs are susceptible to degradation in aerobic conditions. To enhance aerobic biodegradation outside of the source area, the remedial design will consider the controlled, location-specific injection(s) of oxygenating compounds into the groundwater contamination plume(s) at various locations to stimulate biodegradation of COCs. Multiple injections over time may also be necessary for this action to be fully effective.

The groundwater monitoring program would be conducted to ensure that this remedy was protective, that the concentrations of COCs were attenuating, and to evaluate the rates of biodegradation/bioremediation (in both the bedrock and overburden aquifers).

Alternative GW3 – Groundwater Extraction and Treatment (Pump And Treat)

Capital Cost:	$1,656,000
Annual Cost:	$229,000
Present-Worth Cost:	$3,339,000
Construction Time:	13 years

Under this alternative, an overburden and bedrock groundwater collection system would be installed downgradient of each area with identified soil and groundwater concentrations above the potential cleanup levels. The components of this alternative include the installation of several strategically located bedrock groundwater extraction wells and a water table tile collection system installed in two areas of the overburden (downgradient of the source area to capture both the north and south components of the groundwater flow from the source area). The collection systems would be designed to minimize the migration of contaminants in groundwater and to restore the aquifer(s) to beneficial use. The bedrock extraction wells would pipe contaminated groundwater to a groundwater treatment system for treatment; the tile collection system would route contaminated groundwater in the overburden to the groundwater treatment system for treatment. This alternative would prevent the potential migration of chemicals off Site via groundwater transport. The collected groundwater would be treated via a carbon adsorption system located along the western edge of the Site to meet discharge standards as well as water quality requirements for discharge to Beaverdam Brook.

An ongoing groundwater monitoring program would be conducted to ensure that this remedy was protective.

Alternative GW4 – Enhanced Bioremediation

Capital Cost:	$332,000
Annual Cost:	$106,700
Present-Worth Cost:	$846,000
Construction Time:	8 years

This alternative involves the manipulation of Site groundwater conditions to enhance in situ bioremediation of the COCs by the indigenous microbial population. The design details for enhanced bioremediation would be established following the treatment/removal of the source area soils. Treatment would involve either the controlled injection of oxygenating compounds (e.g., Oxygen Releasing Compounds (ORCs)) to enhance biodegradation of the COCs or the controlled injection of a chemical oxidizer (e.g., hydrogen peroxide) and nutrients into the groundwater contamination plumes to chemically convert the organic contamination into nonhazardous compounds. The preliminary design assumes that 440 injection points would be required for the injection of ORC into the overburden groundwater. The area would encompass both the source area and locations downgradient of the source area, including both the north and south components of the groundwater flow. Multiple injections over time may be necessary for this action to be fully effective.

An ongoing groundwater monitoring program would be conducted to ensure that this remedy was protective, that the concentrations of COCs were attenuating, and to evaluate the rates of biodegradation/bioremediation (in both the bedrock and overburden aquifers).

Alternative GW5 – Biosparging

Capital Cost:	$191,000
Annual Cost:	$106,700
Present-Worth Cost:	$738,000
Construction Time:	8 years

Under this alternative, pressurized gas (i.e., oxygen) would be injected into the groundwater at very low flowrates to enhance bioremediation. Specifically, the biosparging technology considered here is "in situ Submerged Oxygen Curtain" (iSOC). This technology injects supersaturated oxygen into the groundwater such that oxygen is infused into groundwater without the formation of bubbles. This prevents vapors (e.g., the bubbles) from entering the vadose zone. The vadose zone is that portion of the soil between the land surface and the zone of saturation, or, in other words, the vadose zone extends from the ground surface to the water table.

An ongoing groundwater monitoring program would be conducted to ensure that this remedy was protective.

EVALUATION OF ALTERNATIVES

In selecting a remedy for a site, EPA considers the factors set forth in CERCLA §121, 42 U.S.C. §9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR §300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis consists of an assessment of the individual alternatives against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with applicable or relevant and appropriate requirements addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and regulations or provide grounds for invoking a waiver.

- Long-Term effectiveness and permanence refer to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.

- Short-Term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost includes estimated capital and operation and maintenance costs, and net present-worth costs.

- State acceptance indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred remedy at the present time.

- Community acceptance will be assessed in the ROD, and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports.

A comparative analysis (one for soils and one for groundwater) of these alternatives, based upon the evaluation criteria noted above, follows.

Comparative Analysis for Soils

- Overall Protection of Human Health and the Environment

  Alternatives S1 and S2 would not be protective of human health and the environment, since they would not actively address the contaminated soils, which present unacceptable risks of exposure and are a source of groundwater contamination. Alternative S3 would be protective of human health and the environment in that the cap would prevent exposure to contaminated soil and would also serve to minimize infiltration of precipitation and thereby reduce leaching of chemicals from the soils to groundwater, hence, reducing contamination of the groundwater; however, Alternative S3 would not actively remediate contaminated soil. Alternatives S4, S5, and S6 would be protective of human health and the environment, since each alternative relies upon a remedial strategy or treatment technology capable of eliminating human exposure and removing the source of groundwater contamination.

- Compliance with ARARs

  The soil cleanup objectives used for the Site are based on NYSDEC values (*NYSDEC Subpart 375: Remedial Program Soil Cleanup Objectives* -and/or- NYSDEC's *Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels, Division of Hazardous Waste Remediation, January 24, 1994.)* These NYSDEC soil cleanup objectives were utilized as PRGs for the site-related contaminants.

  Since the contamination in the soils would not be addressed under Alternatives S1 and S2, they would not achieve the soil cleanup objectives. While the cap installed under Soil Alternative S3 would comply with RCRA design standards, this alternative would not actively remediate contaminated soil and, as such, would not achieve the soil cleanup objectives. Alternatives S4 and S5 would each attain the soil cleanup objectives specified. Alternative S6 would involve the excavation and removal of the contaminated soil from the site, and thereby achieve soil cleanup objectives for the Site property.

  Alternatives S4 and S6 both involve the excavation of contaminated soils and would, therefore, require compliance with fugitive dust and VOC emission regulations. In addition, Alternative S6 would be subject to New York State and federal regulations related to the transportation and off-site treatment/disposal of wastes. In the case of Alternatives S4 and S5, compliance with air emission standards would be required for the SVE or ISVE system. Specifically, treatment of off-gases would have to meet the substantive requirements of New York State Regulations for Prevention and Control of Air Contamination and Air Pollution (6 NYCRR Part 200, et seq.) and comply with the substantive requirements of other state and federal air emission standards.

- Long-Term Effectiveness and Permanence

  Alternatives S1 and S2 would not involve any active remedial measures, and, as such, not be effective in eliminating the potential exposure to contaminants in soil and would result in the continued migration of contaminants from the soil to the groundwater. Alternative 3 involves installation of a landfill cover which would eliminate the potential exposure to contaminants in the soil and also reduce leaching of contaminants from the soil to groundwater. Alternatives S4, S5, and S6 would each be effective in the long term by either removing the contaminated soils from the Site or treating them in place.

- Reduction in Toxicity, Mobility or Volume

  Alternatives S1 and S2 would provide no reduction in toxicity, mobility, or volume of contaminants. Alternative S3 would reduce the migration of contaminants from soil to groundwater but would not provide a reduction in toxicity or volume of contaminants. Alternatives S4 and S5 would reduce toxicity, mobility, and volume of contaminants through on-site treatment. Under Alternative S6, the toxicity, mobility, and volume of the contaminants would be eliminated by removing contaminated soil from the Site property.

- *Short-Term Effectiveness*

  Alternative S1 and S2 do not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to on-property workers or the community as a result of their implementation. Alternatives S3, S4, S5, and S6 could result in some adverse impacts to on-property workers through dermal contact and inhalation related to the installation of the remedial systems associated with each of these alternatives. Alternatives S4 and S6 involve significant excavation activities that would need to be properly managed to prevent or minimize adverse impacts. For instance, excavation activities would need to be properly managed to prevent transport of fugitive dust and exposure of workers through dermal contact and by inhalation of volatile organic compounds in the air. Noise from the treatment unit and the excavation work associated with Alternatives S3, S4, S5, and S6 could present some limited adverse impacts to on-property workers, while truck traffic related to Alternative S6 could provide nuisance impacts (e.g., noise and traffic) to nearby residents. In addition, interim and post-remediation soil sampling activities would pose some risk to on-property workers. The risks to on-property workers and nearby residents under all of the alternatives could, however, be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by using proper protective equipment.

  Alternatives S4 and S6 involve significant excavation activities that would need to be properly managed to prevent or minimize adverse impacts. For instance, excavation activities would need to be properly managed to prevent transport of fugitive dust and exposure of workers to volatile organic compounds in the air.

  Since no actions would be performed under Alternative S1, there would be no implementation time. Since only limited actions would be performed under Alternative S2, there would be very little implementation time. It is estimated that Alternative S3 would require 3 months to complete the landfill cap, Alternative S4 would require 2 years to complete, Alternative S5 would require 4 years to complete, and Alternative S6 would require approximately one year to complete.

- Implementability

Alternatives S1 and S2 would be the easiest soil alternatives to implement in that there are no activities (or minimal activities) to undertake.

Alternatives S3, S4, S5, and S6 would all employ technologies known to be reliable (though the biocell proposed as a component of Alternative S4 is a lesser known technology relative to the site-related COCs) and that can be readily implemented. In addition, equipment, services, and materials needed for these alternatives are readily available, and the actions under these alternatives would be administratively feasible. Furthermore, sufficient facilities are available for the treatment/disposal of the excavated materials under Alternative S6.

Monitoring the effectiveness of the SVE system (in Alternative S4), and the ISVE system (in Alternative S5) would be easily accomplished through soil and soil-vapor sampling and analysis. Under Alternatives S4, S5, and S6, determining the extent of soil cleanup would be easily accomplished through post-excavation soil sampling and analysis.

- <u>Cost</u>
The estimated capital, annual operation and maintenance (O&M) (including monitoring), and present-worth costs for each of the soil remediation alternatives are presented in Table 2. All costs are presented in U.S. Dollars.

Table 2: Cost Analysis for Soil Remediation Alternatives

Remedial Alternative	Capital Cost	Annual O&M Cost	Present Worth Cost	Construction Time
S1	0	950	15,000	No time
S2	12,600	13,550	217,000	Months
S3	2,290,000	24,000	2,647,000	Several months to install cap
S4	2,388,000	406,000	3,119,000	2 years
S5	1,211,000	460,900	2,302,000	4 years
S6	5,736,000	22,000	5,756,000	1 year

According to the capital cost, O&M cost and present worth cost estimates, Alternative S1 has the lowest cost and Alternative S6 has the highest cost when comparing all Alternatives.

<u>Comparative Analysis for Groundwater</u>

- <u>Overall Protection of Human Health and the Environment</u>

All alternatives except GW1 would provide adequate protection of human health and the environment. As noted above in the risk assessment section, there are unacceptable human health cancer risks or non-cancer health hazards associated with the groundwater contamination at the site. Though no private wells exist on the Site property, the future use of groundwater as a drinking water source is consistent with the State use designation of the aquifer and such use would present unacceptable present and future carcinogenic and noncarcinogenic risks at the Site. These calculated risks to human health require EPA to enact remedial measures to reduce the risks associated with the observed contamination and restore the groundwater to beneficial use. EPA believes that Alternatives GW2, GW4 and GW5 would ultimately provide full protection of human health by reducing contaminant concentrations to cleanup objectives. Alternative GW3 would also reduce contaminant concentrations through treatment, would prevent migration of chemicals off-Site via groundwater transport, and, ultimately, restore the aquifer(s) to best use.

- <u>Compliance with ARARs</u>

EPA and the New York State Department of Health (NYSDOH) have promulgated health-based protective MCLs (40 CFR Part 141, and 10NYCRR, Chapter 1 and Part 5), which are enforceable standards for various drinking water contaminants (chemical specific ARARs). The aquifer at the Site is classified as Class GA (6 NYCRR 701.18), meaning that it is designated as a potable water supply.

Alternative GW1 does not include any active groundwater remediation; contamination in the groundwater would likely attenuate naturally, to some degree, particularly after a soil remedy is implemented. Alternatives GW2, GW4, and GW5 involve the manipulation of Site groundwater conditions to enhance in situ bioremediation of the COCs by the indigenous microbial population, and, thereby, break-down the COCs into non-hazardous compounds. Alternatives GW2, GW4, and GW5, each focus on the most contaminated regions of the bedrock and overburden aquifers (e.g., under and immediately downgradient of the source area) and, as such, would decrease the amount of time needed to achieve cleanup objectives. Following implementation of Alternatives GW2, GW4 or GW5, it is estimated that ARARs would be achieved throughout the Site within ten years after the soil remedy is implemented. Under Alternative GW3, groundwater would be extracted from both the bedrock and the overburden aquifers, treated by a carbon adsorption system, and discharged to Beaverdam Brook. The discharge to Beaverdam Brook would comply with surface water discharge requirements and the disposition of treatment residuals would have to be consistent with the Resource Conservation and Recovery Act (RCRA). Alternative GW3 would prevent the potential migration of chemicals off Site via groundwater transport and, as such, ARARs would be met downgradient of the groundwater containment system (e.g., off the site property); ultimately treatment of the contaminated groundwater would achieve ARARs within the site property and would restore the aquifer(s) to best use.

For Alternatives GW2, GW3, GW4, and GW5, compliance with ARARs would be demonstrated through a long-term groundwater monitoring program.

- Long-Term Effectiveness and Permanence

Once the source control remedy is implemented, it is anticipated that all of the groundwater alternatives would achieve groundwater ARARs, although Alternative GW1 would be expected to take the longest. The time to achieve groundwater standards would vary for the other alternatives due to the complex nature of the subsurface environment.

Alternative GW3 would prevent the potential migration of chemicals off Site via groundwater transport, but would take longer to achieve cleanup objectives than Alternatives GW2, GW4, or GW5. As Alternatives GW2, GW4, and GW5 focus on the most contaminated regions of the bedrock and overburden aquifers, these alternatives would be expected to achieve aquifer restoration more quickly than the other alternatives.

- Reduction in Toxicity, Mobility or Volume

Alternatives GW2, GW4, and GW5 would each reduce the volume and toxicity of the contaminants through treatment by chemically breaking down the bulk of the dissolved VOC and SVOC contamination as it migrates through the aquifer. The VOC and SVOC contaminants would be changed into degradation products.

Alternative GW3 would reduce the toxicity, mobility, and volume of contaminated groundwater through removal and treatment with the goal of restoring the aquifers to their beneficial uses.

GW1 provides no further reduction in toxicity, mobility or volume of contaminants of any media through treatment. Following implementation of the source area remedy, natural attenuation processes would likely occur to some degree even under this alternative. Future risks posed by the site will depend on future site usage.

- Short-Term Effectiveness

Alternative GW1 presents virtually no change to the short-term impacts to human health and the environment since no construction or active remediation is involved. Alternatives GW2, GW3, GW4, and GW5 each present some risk to on-property workers through dermal contact and inhalation from activities associated with groundwater remediation. Specifically, construction and remedial activities required to implement Alternative GW2, GW4, and GW5 would potentially pose a risk of worker exposure to the oxygenating compound(s) when injected into the aquifer. The possibility of having to readminister oxygenating compound(s) in future injections is likely. Alternative GW3 would potentially result in greater short-term exposure to contaminants to workers who install extraction wells and the groundwater tile collection system, as well as come into contact with the treatment system. In addition, under Alternatives GW2, GW3, GW4, and GW5, some adverse impacts would result from disruption of traffic, excavation activities, noise, and fugitive dust emissions. However, proper health and safety precautions would minimize short-term exposure risks as well as disturbances.

- Implementability

Alternative GW1 would be the easiest groundwater alternative to implement, since it would require no activities. Alternative GW3 would be the most difficult alternative to implement in that it would require the construction of a groundwater extraction system including piping and a tile water collection system. Alternative GW2 would be easier to implement than Alternatives GW4 and GW5. The services and materials necessary for each of the groundwater alternatives are readily available. Under Alternatives GW2, GW3, GW4, and GW5, groundwater sampling would be necessary to monitor treatment effectiveness. Each of the alternatives have been proven effective for most, if not all, of the COCs in groundwater.

- Cost

The estimated capital, annual operation and maintenance (O&M) (including monitoring), and present-worth costs for each of the soil remediation alternatives are presented in Table 3. All costs are presented in U.S. Dollars.

Table 3: Cost Comparison for Groundwater Remediation Alternatives

Remedial Alternative	Capital Cost	Annual Cost	Present Worth	Duration of Operation
GW1	0	950	15,000	N/A
GW2	13,200	106,700	528,000	8 years
GW3	1,656,000	229,000	3,339,000	13 years
GW4	332,000	106,700	846,000	8 years
GW5	191,000	106,700	738,000	8 years

According to the capital cost, O&M cost and present worth cost estimates, Alternative GW1 has the lowest cost and GW3 has the highest cost when comparing all Alternatives.

- State Acceptance

  NYSDEC concurs with the preferred remedy.

- Community Acceptance

  Community acceptance of the preferred remedy will be assessed in the ROD following review of the public comments received on the Post Decision Proposed Plan.

PREFERRED ALTERNATIVES

Based upon an evaluation of the various alternatives, EPA recommends employing Alternative S4 (Excavation and On-Site SVE and Biocell) to remediate the source area and Alternative GW2 (Enhanced Bioremediation with Long-Term Groundwater Monitoring) to remediate the groundwater. Implementation of these alternatives would include institutional controls to restrict groundwater use and prevent disturbance of the soils in the biocell until groundwater ARARs and/or soil cleanup objectives are met.

Specifically, an environmental easement/restrictive covenant would be filed in the property records of Orange County. The easement/covenant would, at a minimum, require: (a) restricting any excavation below the soil surface layer in the area of the biocell, unless the excavation activities are in compliance with an EPA approved site management plan; (b) restricting new construction at the Site unless an evaluation of the potential for vapor intrusion is conducted and mitigation, if necessary, is performed in compliance with an EPA approved site management plan; (c) restricting the use of groundwater as a source of potable or process water unless groundwater quality standards are met; and (d) the owner/operator to complete and submit periodic certifications that the institutional and engineering controls are in place.

A Site Management Plan (SMP) would be developed to address soils and groundwater at the Site. The SMP would provide for the proper management of all Site remedy components post-construction, such as institutional controls, and shall also include: (a) monitoring of Site groundwater to ensure that, following the soil excavation, the contamination is attenuating and groundwater quality continues to improve; (b) identification of any use restrictions on the Site; (c) necessary provisions for implementation of the requirements of the above easement/covenant; and (d) provision for any operation and maintenance required of the components of the remedy.

Upon completion of remediation, no hazardous substances would remain above levels that would prevent unlimited use or unrestricted exposure. Under the preferred remedy, EPA would conduct reviews of the site at least once every five years until groundwater remediation has restored the aquifer(s) to drinking water quality standards and soil cleanup objectives are met.

<u>Basis for the Remedy Preference</u>

EPA believes that Alternative S4 is the most cost-effective option for the contaminated soils given the evaluation criteria and reasonably anticipated future land use. While Alternative S4 may involve potential short-term community impacts in the form of nuisances associated with construction (e.g., noise and truck traffic), Alternative S4 would be protective of human health and the environment. Furthermore, Alternative S4 would provide a permanent solution, and would achieve soil cleanup objectives for the site-related COCs in the shortest amount of time and in the most cost-effective manner. Therefore, EPA and NYSDEC believe that Alternative S4 would effectuate the soil cleanup while providing the best balance of tradeoffs with respect to the evaluating criteria.

Alternative S1 was not identified as the preferred alternative because it calls for no action and would not be protective of human health and the environment. Similarly, Alternative 2 would only provide limited action by imposing institutional controls and site fencing and warning maintenance signs. Alternative 3 was not proposed because, while it is slightly less expensive than Alternative 4, it calls for containment of the waste constituents and provides no treatment of the contamination. Alternative 5 was not proposed because, while it includes the soil vapor extraction technology of Alternative 4, it does not include the biological treatment component, which EPA believes will be effective in addressing the pyridine-related compounds. Alternative 6 was not proposed because it would not appear to be cost-effective compared to the other alternatives.

EPA is proposing Alternative GW2 to address the contaminated groundwater because the Agency believes it would be protective of human health and the environment and would achieve the ARARs in the most cost-effective manner. Alternative GW1 would rely solely on natural processes to restore groundwater quality to beneficial use, and, as such, would take significantly longer than the preferred alternative. While Alternative GW3 would prevent the potential migration of chemicals off Site via groundwater transport, it would take longer to achieve cleanup objectives and would cost significantly more than Alternatives GW2, GW4, and GW5. While Alternatives GW2, GW4, and GW5 are similar in that they each involve the addition of oxygen into the groundwater environment to enhance biodegradation of the contaminants, Alternative GW2 would be easier to implement then the other alternatives, and is expected to cost significantly less.

Therefore, EPA and NYSDEC believe that the combination of Alternatives S4 and GW2 would successfully remediate the contaminated soils and expedite the remediation of contaminated groundwater at the Site, while providing the best balance of tradeoffs among the alternatives with respect to the evaluation criteria. Furthermore, the preferred remedies would utilize permanent solutions and treatment technologies to the maximum extent practicable.

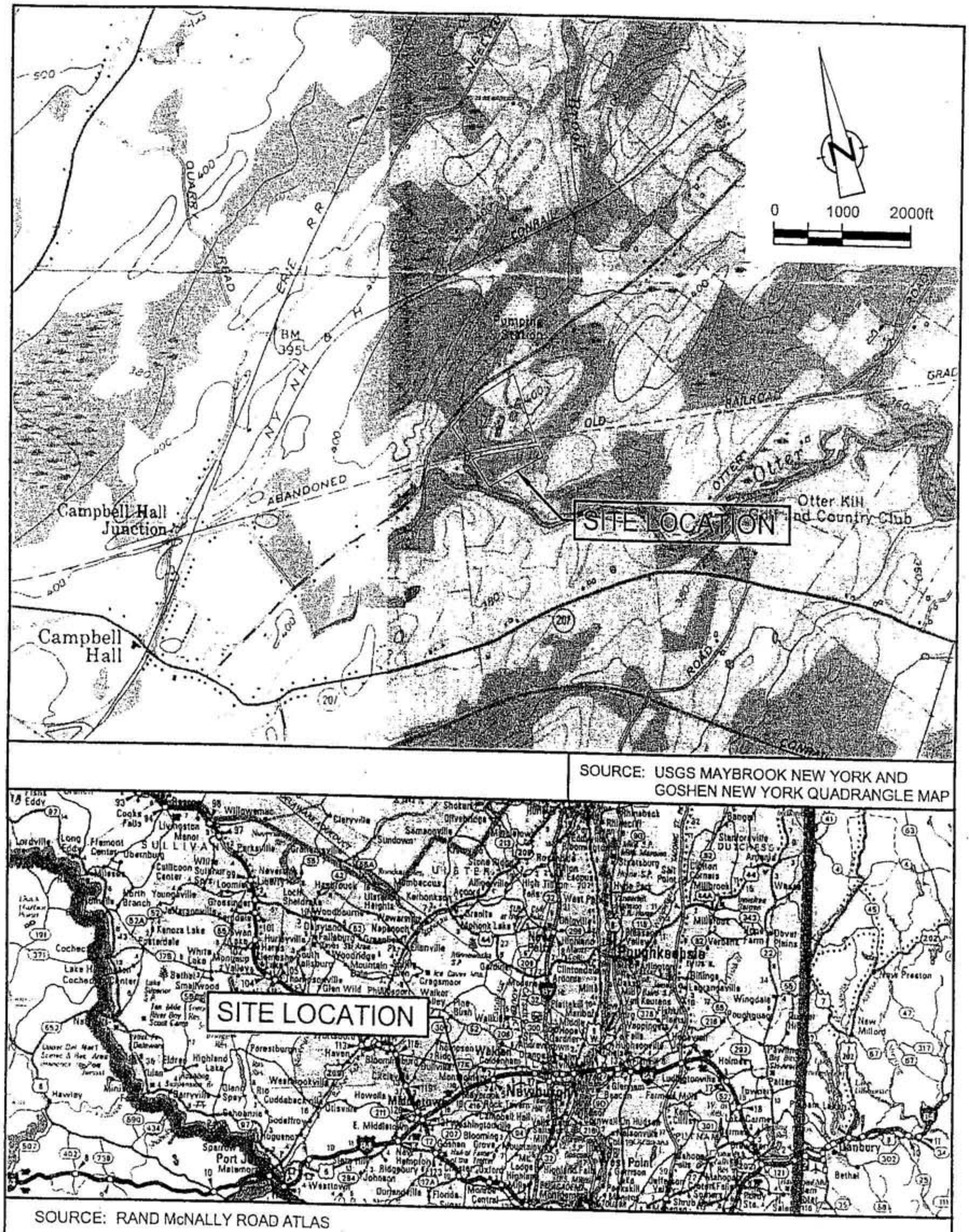

figure 1

SITE LOCATION
FORMER LAGOON SITE
Hamptonburgh, New York

03698-00(032)GN-WA014 JUN 23/2006

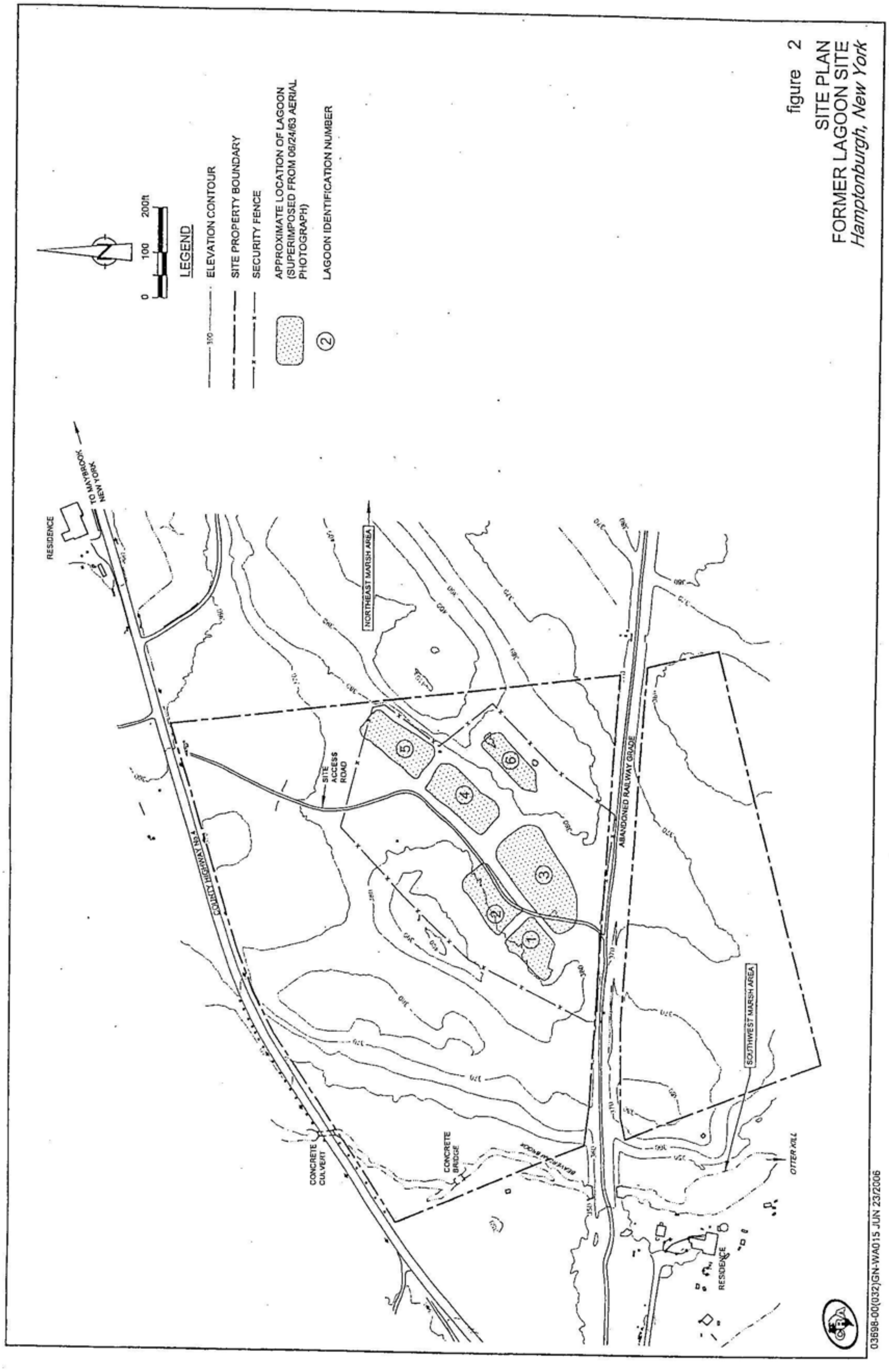
figure 2
SITE PLAN
FORMER LAGOON SITE
Hamptonburgh, New York
LEGEND
0
100
200ft
ELEVATION CONTOUR
SITE PROPERTY BOUNDARY
SECURITY FENCE
APPROXIMATE LOCATION OF LAGOON (SUPERIMPOSED FROM 06/24/63 AERIAL PHOTOGRAPH)
LAGOON IDENTIFICATION NUMBER
RESIDENCE
TO MAYBROOK NEW YORK
NORTHEAST MARSH AREA
SITE ACCESS ROAD
COUNTY HIGHWAY NO.4
ABANDONED RAILWAY GRADE
SOUTHWEST MARSH AREA
CONCRETE CULVERT
CONCRETE BRIDGE
OTTER KILL
RESIDENCE
03898-00(032)GN-WA015 JUN 23/2006