RECORD OF DECISION

Nepera Chemical Company Superfund Site

Orange County, New York

United States Environmental Protection Agency
Region 2
New York, New York

September 2007

DECLARATION

SITE NAME AND LOCATION

Nepera Chemical Company Superfund Site
Hamptonburgh, Orange County, New York
Superfund Identification Number: NY000511451

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for the Nepera Superfund Site (hereinafter the Site) located in Hamptonburgh, Orange County, New York. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based on the Administrative Record for this Site, which has been developed in accordance with Section 113(k) of CERCLA, 42 United States Code Section 9613(k). This Administrative Record file is available for review at the Hamptonburgh Town Hall in Campbell Hall, New York and at the United States Environmental Protection Agency Region 2 Superfund Records Center at 290 Broadway, New York, NY. The Administrative Record Index (Appendix III) identifies each of the items comprising the Administrative Record upon which the selection of the Remedial Action is based. The State of New York (State) concurs with the Selected Remedy.

ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances from the Site into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The EPA will address the Site contamination as one operable unit. The selected remedy involves remediation of two site-specific media, namely, soil and groundwater. The remediation of contaminated soil involves excavating the soils within the former lagoons and treatment of these soils utilizing soil vapor extraction and biological degradation within an engineered, below-grade biocell (e.g., bioremedial reactor). The remediation of groundwater involves introducing an oxygenating compound to create aerobic conditions and, thereby, enhance biodegradation within the excavation below the natural overburden water table.

The selected remedy includes the following components:

- Excavation of Contaminated Soils: Site soils, which exceed New York State Department of Environmental Conservation (NYSDEC) soil cleanup objectives, within the former lagoons will be excavated and placed into a biocell;
- Treatment of Soils in the Biocell: Soils within the biocell will be treated using soil vapor extraction and biological degradation technologies to reach target cleanup levels. The biocell will operate as a dual-technology system utilizing SVE and biological degradation within an engineered below-grade biocell. Excavated soils will be treated to reach target cleanup levels;
- Backfilling of Excavated Areas: The excavated areas of the Site, which are not utilized in the construction of the biocell will be backfilled to grade, using clean fill meeting NYSDEC soil cleanup objectives;
- Bioremediation of Contaminants of Concern (COCs) in Site Groundwater: Bioremediation will be accomplished by enhancement of the indigenous microbial population through the introduction of oxygenating compounds into targeted areas of the groundwater aquifer. Bioremediation (oxygenating compounds) technology would be applied as an initial enhancement within the excavated area of the former lagoons;
- Long-term Groundwater Monitoring Program: A long-term groundwater monitoring program will be implemented to verify that the concentrations and the extent of the groundwater contaminants are declining. Results of the long-term groundwater monitoring will be used to evaluate the effectiveness of the remedy and to assess the need for additional injections/applications of oxygenating compounds. This program will also include the continued sampling of those private wells in the vicinity of the Site which are currently monitored;

- Institutional Controls: To protect human health from exposure to the existing contamination while cleanup is ongoing, this alternative includes institutional controls, which include an environmental easement/restrictive covenant, which will be filed in the property records of Orange County. The environmental easement/restrictive covenant will, at a minimum require: (a) restricting excavation or other activities that would interfere with constructed remedies (with the exception of Alternative S6 – Excavation and Off-Site Disposal), unless the excavation or other 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 SMP and (c) restricting the use of groundwater as a source of potable or process water unless groundwater quality standards are met;
- Site Management Plan: A SMP will be developed to address soil and groundwater at the Site and would provide for the proper management of all Site remedy components post-construction, including the institutional controls discussed above, and will also include: (a) monitoring of Site groundwater to ensure that, following remedy implementation, the groundwater quality improves; (b) provision for any operation and maintenance required of the components of the remedy; and (c) periodic certifications by the owner/operator or other person implementing the remedy that any institutional and engineering controls are in place;
- Engineering Controls: Engineering controls consisting of fencing and posting signs will be implemented to prevent inadvertent exposure to Site contaminants by the local populace;
- Contingency Plan: In the event that monitoring should indicate that the Village of Maybrook public water supply wells have been impacted by the Site-related contaminants above health-based levels, a contingency plan would be necessary to provide for a wellhead treatment for the Village of Maybrook wells on an interim basis pending further consideration of groundwater treatment alternatives to meet groundwater treatment standards; and
- Five-Year Review: Hazardous substances will remain at this Site above levels that would not allow for unlimited use and unrestricted exposure for at least five years.

Pursuant to Section 121(c) of CERCLA, EPA will review site remedies no less often than every five years. The first five-year review is due within five years of the date that construction is initiated for the remedial action. The current expectation is that construction will be initiated during the year 2010 and the first five-year review will be due in the year 2015.

DECLARATION OF STATUTORY DETERMINATIONS

Statutory Requirements

The Selected Remedy attains the mandates of CERCLA Section 121, and the regulatory requirements of the NCP. The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

Statutory Preference for Treatment

The Selected Remedy satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of hazardous substances through treatment). Remedial actions at the source area and in the water table are expected to remove site-related contaminants and eliminate the threat of further migration of the contaminants in the groundwater.

Five-Year Review Requirements

Hazardous substances will remain at this Site above levels that would allow for unlimited use and unrestricted exposure for at least five years. Pursuant to Section 121(c) of CERCLA, EPA will review site remedies no less often than every five years.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for the Site, the index of which can be found in Appendix III of this document.

- Contaminants of concern and their respective concentrations (See ROD, pages 6,7,8 and Appendix II Table A)
- Baseline risk represented by the chemicals of concern (see ROD page 10 and Appendix II Tables A - F)
- Remediation goals (e.g., Cleanup levels) established for chemicals of concern and the basis for these levels (see ROD, page 19)
- A discussion of source materials constituting principal threats may be found in the "Principal Threat Waste" section. (see ROD, page 39)
- Current and reasonably-anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (see ROD, page 9)
- Expected land and groundwater use that will be available at the Site as a result of the selected remedy (see ROD, page 41)
- Estimated capital, annual operation and maintenance, and total present-worth costs, and the number of years over which the remedy cost estimates are projected (see ROD, pages 35 and 39, and Appendix VI)
- Key factors that led to selecting the remedy (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, emphasizing criteria key to the decision) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections. (see ROD, pages 31 through 39, and page 45)

George Pavlou
Director,
Emergency and Remedial Response Division
USEPA Region 2

9/28/07
Date

VI

RECORD OF DECISION FACT SHEET
EPA REGION 2

Site

Site name: Nepera Chemical Company Site

Site location: Hamptonburgh, Orange County, New York

Listed on the NPL: June 1, 1986

Record of Decision

Date signed: September 28, 2007

Selected remedy:

Soil: Excavation and treatment of the soils in a below-grade biocell utilizing soil vapor extraction and biodegradation.

Groundwater: Groundwater in the overburden will be treated through application of an oxygenating compound, which will flow radially outward from the former lagoon area and also downward to enhance biodegradation of groundwater in both the overburden aquifer and the bedrock aquifer.

Capital cost: $2,570,000

Operation and Maintenance
and Monitoring costs: $512,700

Total Present-worth cost: $3,815,000

Lead: EPA

Primary Contact: Mark Dannenberg, Remedial Project Manager, (212) 637-4251

Secondary Contact: Angela Carpenter, Chief, Eastern New York Remediation Section, (212) 637-4263

Main PRPs: Nepera, Inc., Cambrex Corp., Warner Lambert Company, Pfizer, Inc.

Waste

Waste type:	Volatile organic and semi-volatile organic compounds, including pyridine-related compounds
Waste origin:	Chemical processing wastewater from the Nepera, Inc. facility in Harriman, New York
Contaminated media:	Soil, groundwater

RECORD OF DECISION

DECISION SUMMARY

Nepera Chemical Company Superfund Site

Hamptonburgh, Orange County, New York

United States Environmental Protection Agency
Region 2
New York, New York

September 2007

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APPENDICES

SITE NAME, LOCATION, AND DESCRIPTION

The Nepera Chemical Company Site (Site) includes a 29-acre property located on County Highway 4 in Hamptonburgh, Orange County, New York (hereinafter, the Nepera Property), and all contamination emanating from the Nepera Property (see Appendix I, Figure 1). The Site property is bounded on the north by Orange County Highway 4, 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 just west of the southwest marsh area, and two to the north and northeast of the Site on the opposite side of Orange County Highway 4.

The Nepera Property is owned by Nepera, Inc. Wastewaters from chemical production processes conducted at the Nepera plant facility located in Harriman, New York, were trucked to the Site and discharged into lagoons on the Nepera Property. The lagoons, comprising an area of approximately five (5) acres, were constructed within the Nepera Property.

Approximately 6,500 people live within three miles of the Nepera Property. The closest residences are located approximately 250 feet, 175 feet and 450 feet to the west, north and northeast, respectively. These residences rely on private supply wells for their drinking water. The vicinity near the Nepera Property is residential and agricultural in nature. The public water supply wells for the Village of Maybrook are located approximately 800 feet to the east-northeast of the Nepera Property.

The Site is situated in the Valley and Ridge province of the Appalachian Region in Orange County, New York. In general, the topography of the area is typified by relatively low-lying ridges and valleys. The Site 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 Nepera 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 predominantly 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.

Both aquifers have been impacted by Site-related contamination. The unconsolidated deposits that form the overburden are generally thin (e.g., 5 to 20 feet). The overburden overlies the harder and denser bedrock, which is comprised of compressed shale and sandstone. The shale bedrock has a high degree of fracturing and the bedrock aquifer provides a significant portion of the groundwater for domestic uses in the area.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Nepera Chemical Company was a producer of bulk pharmaceutical chemicals, hydrogels, and pyridine-based industrial chemical intermediate compounds at its facility, located in Harriman, New York, approximately 25 miles away from the Site.

The Nepera Property was purchased by the Nepera Chemical Company in 1952. The Nepera Chemical Company itself was purchased by Warner Lambert Corporation in 1956 and reincorporated as Nepera, Inc. From 1953 through 1967, Nepera used the lagoons at the Site for the discharge of industrial wastewater generated at its plant in Harriman (see Appendix I, Figure 3). No wastewater disposal has taken place at the Site since December 1967. All of the lagoons were back-filled with clean soil by 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 to conduct a remedial investigation to determine the type and extent of contamination at the Site.

On June 1, 1986, EPA placed the Site on the National Priorities List (NPL) of sites under CERCLA. EPA subsequently designated the New York State Department of Environmental Conservation (NYSDEC) as the lead regulatory agency for overseeing the implementation of a Remedial Investigation and Feasibility Study (RI/FS) at the Site.

Beginning in 1988, under an NYSDEC-issued order, Nepera, Inc. hired a contractor to conduct an investigation to determine the nature and extent of the contamination at and emanating from the Site. The investigation of groundwater was expanded in 1993, and, again, in 2001 with the installation of additional groundwater monitoring wells. Subsequent groundwater monitoring was conducted in 2001 and 2002. Extensive additional soil sampling activities were conducted in 2002 and a wetland delineation survey was conducted in 2003. The phased approach to the RI was iterative in nature, where the results of each task were used to focus the scope of each subsequent task.

During the several phases of the RI, a total of 38 monitoring wells were installed in the study area (see Appendix I, Figure 2). The first draft RI Report 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 groundwater contamination plume which emanated from the Site. In March, 2005, an updated draft RI Report was submitted to NYSDEC and EPA. This document was further revised and an approved Final RI Report was submitted on June 16, 2006.

NYSDEC and EPA agreed that EPA would be designated as the lead agency for the Nepera Site at the conclusion of the RI/FS process.

COMMUNITY PARTICIPATION

The Proposed Plan and supporting documentation for the Nepera Site were made available to the public on July 31, 2007 at the EPA Region 2 Administrative Record File Room in New York, NY, and at the Hamptonburgh Town Office in Campbell Hall, New York. EPA issued a public notice in the Times Herald-Record on July 31, 2007, which contained information relevant to the duration of the public comment period, the date of the public meeting, and the availability of the Proposed Plan and the Administrative Record. The public comment period was held from July 31, 2007 through August 29, 2007. This notice was sent to all addresses on the mailing list. In addition, a public meeting was held on August 16, 2007, at the Hamptonburgh Town Office, 18 Bull Road, Campbell Hall, NY. The purpose of the meeting was to inform interested citizens and local officials about the Superfund process, to discuss the Proposed Plan, to receive comments on the Proposed Plan, and to respond to questions from area residents and other interested parties. The comments and questions received at the public meeting and in writing throughout the public comment period, as well as EPA's responses to those comments and questions, are included as part of this Record of Decision in the Responsiveness Summary (Appendix V).

SCOPE AND ROLE OF RESPONSE ACTION

This Record of Decision addresses the remediation of the contaminated soil and contaminated groundwater related to the Site. The entire Site is addressed as one operable unit. The Site-specific media impacted at the Site are soils (in the former lagoon area) and groundwater. The two main objectives for response action at this Site are to remediate contaminated soil, which continues to act as a source of groundwater contamination, and to treat groundwater so that the Contaminants of Concern (COCs) are below Maximum Contaminant Levels (MCLs), established pursuant to the Safe Drinking Water Act, 42 U.S.C. §300f et.seq., thereby making the Site suitable for residential use. The planned Remedial Action is a final action for the Site and is expected to successfully achieve the Remedial Action Objectives (RAOs). The EPA has selected a combination of technologies to address the contamination in the two media. By using a combination of different treatment technologies, this response will permanently reduce the toxicity, mobility, and volume of source materials at the Site and restore groundwater to meet ARARs/MCLs.

SITE CHARACTERISTICS

This section of the ROD provides an overview of the Site's geology and hydrogeology; the sampling strategy used at the Site; the conceptual Site model (CSM); and the nature and extent of contamination at the Site. Further detailed information about the Site's characteristics can be found in the RI Report.

Overview of the Site

The Town of Hamptonburgh is located in the northern part of Orange County, New York, in the Poughkeepsie-Newburgh metropolitan area. Its population was 4,686, based on the 2000 census. The latitude of the Town of Hamptonburgh is 41.450N and the longitude is 74.253W.

The Nepera Site is in an area of rolling hill topography. Two hills, and a portion of a third, occupy the Site with a maximum local relief of approximately 40 feet. Most of the Site is forested. The Site is bordered on the west by Beaverdam Brook, and on the south and southeast by Otter Kill and wetlands.

The area where the Site is located is zoned residential/agricultural. Residences in the immediate vicinity of the Site are located to the west, north, and northeast of the Nepera Property.

Geology/Hydrogeology

The Site is situated in the valley and ridge province of the Appalachian Region in Orange County, New York. In general, the topography of the area is typified by relatively low-lying ridges and valleys. There are two aquifers that exist beneath the Site, the overburden aquifer and the bedrock aquifer. Both aquifers have been impacted by Site-related contamination. The unconsolidated deposits that form the overburden are generally thin (e.g., 5 to 20 feet). The overburden overlies the harder, denser bedrock consisting of compressed shale and sandstone. The shale bedrock has a high degree of fracturing and the bedrock aquifer provides a significant portion of the groundwater for domestic uses in the area.

Ecology

The Nepera Site is in an area of rolling hill topography. Two hills, and a portion of a third, occupy the Site with a maximum local relief of approximately 40 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. The Site is bordered on the west by Beaverdam Brook, and on the south and southeast by Otter Kill and wetlands.

Cultural Resources

A Cultural Resources Survey was performed for the Site and indicated that there were neither any significant National Register of Historic Places or National Register of Historic Places-eligible properties nor any likely prehistoric resources within the project boundaries. As such, the regulatory requirements relating to the identification and protection of historic properties/places have been addressed and no additional archaeological investigations are considered necessary at the Site.

Nature and Extent of Contamination

Activities performed as part of the RI included: on-site soil borings, soil sampling, monitoring well drilling and installation, groundwater sampling, and residential well sampling. These activities were performed by the potentially responsible parties (PRPs) with EPA and NYSDEC oversight. Site-related contamination was found in soil and groundwater. The results of the RI are summarized below.

Soil: RI soil sampling activities were conducted in phases. Sampling performed in 1991 and 1996 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). All of these contaminants are deemed to be 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 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 concentration levels of metals in the lagoon area were comparable 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 collected in 2003 to determine the 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 six lagoons is estimated to be 128,850 square feet (approximately 3 acres). The volume of contaminated soil was calculated 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 that was put in the lagoons when they were closed. 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 implementation of a soil remedy. Therefore, the remedial alternatives assessed in the Proposed Plan were based on a total volume of contaminated soil of 24,086 cubic yards, which is equivalent to approximately 38,700 tons.

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; and
- 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 above MCLs 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 indicate non-detectable 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 bed of Beaverdam Brook in 2003. Groundwater flow direction was considered in determining 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.

Contaminant Fate and Transport

Migration of contaminants at the Nepera Site occurs from contaminated soils to the groundwater. Migration of dissolved contaminants also occurs within the groundwater aquifers. The site-related Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) emanate from the former lagoon area which, itself, still acts as an ongoing source of groundwater contamination and migration to both the overburden and bedrock aquifers. Groundwater contamination has generally been confined within the site property boundary.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The Site is in an area used for residential and/or agricultural purposes. The zoning of the Site (residential/agricultural) is not expected to change in the near future.

The groundwater at the Site is classified by NYSDEC as GA, which is groundwater suitable as a source of drinking water. There is a future potential beneficial use of groundwater at the Site as a drinking water source. Residences in the vicinity of the Site rely on private wells for their potable water supply. In addition, public water supply wells of the Village of Maybrook are located approximately 800 feet east-northeast of the property boundary.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted a baseline risk assessment to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site in the absence of any actions or controls to mitigate such releases, under current and future land uses. The baseline risk assessment includes a human health risk assessment and an ecological risk assessment. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessments for this Site.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: Hazard Identification – uses the analytical data collected to identify the contaminants of potential concern at the Site for each medium, with consideration of a number of factors explained below; Exposure Assessment - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed; Toxicity Assessment - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and Risk Characterization - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of Site-related risks. The risk characterization also identifies contamination with concentrations which exceed acceptable levels, defined by the National Contingency Plan (NCP) as an excess lifetime cancer risk greater than 1 x 10^{-6} – 1 x 10^{-4} or a Hazard Index greater than 1.0; contaminants at these concentrations are considered chemical of concern (COCs) and are typically those that will require remedial action at the Site. This section also includes a discussion of the uncertainties associated with these risks.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the Site in each medium were identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentration, mobility, persistence, and bioaccumulation. Analytical information that was collected to determine the nature and extent of contamination revealed the presence of a number of constituents, such as benzene, xylenes, aniline, and 2-aminopyridine in groundwater and benzene, toluene, chlorobenzene, xylenes, and 2-aminopyridine in soils at concentrations of potential concern. Based on this information, the risk assessment focused on groundwater and soils and the contaminants which may pose significant risk to human health. A comprehensive list of all COPCs can be found in the baseline human health risk assessment (BHHRA) in the administrative record. Only the COCs, or those chemicals requiring remediation at the Site, are listed in Appendix II, Table A. The COCs for groundwater at the Site are benzene, xylenes, aniline, and 2-aminopyridine, and the COCs for soils at the Site are benzene, toluene, chlorobenzene, xylenes, and 2-aminopyridine.

Exposure Assessment: Consistent with Superfund policy and guidance, the BHHRA is a baseline human health risk assessment and therefore assumes no remediation or institutional controls to mitigate or remove hazardous substance releases. Cancer risks and noncancer hazard indices were calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at the Site. The RME is defined as the highest exposure that is reasonably expected to occur at a site. For those contaminants for which the risk or hazard exceeded acceptable levels, the central tendency estimate (CTE), or the average exposure, was also evaluated.

Current Site land use is zoned agricultural/residential. The neighboring properties are primarily residential in nature. Future land use is expected to remain the same, or be developed as a recreational area. Groundwater is designated by the State as a potable water supply, meaning it could be used for drinking in the future. Therefore, potential exposure to groundwater as a drinking water source was evaluated. The BHHRA evaluated potential risks to populations associated with both current and potential future land uses. Exposure pathways were identified for each potentially exposed population and each potential exposure scenario for the groundwater and soils at the Site. Exposure pathways assessed in the BHHRA for the groundwater included ingestion of and dermal contact with tap water. Inhalation of volatile contaminants while showering and bathing was also evaluated for the hypothetical future resident. Exposure pathways evaluated for the soils included construction workers exposed to soils from excavation or other construction activities that might disturb soil. Based on current and anticipated future use of the Site, the BHHRA considered a variety of possible receptors, including the future Site construction worker and the potential future on-site resident (adult and child). A summary of the exposure pathways included in the baseline human health risk assessments can be found in Appendix II, Table B.

Typically, exposures are evaluated using a statistical estimate of the exposure point concentration (EPC), which is usually an upperbound estimate of the average concentration for each contaminant, but in some cases may be the maximum detected concentration. A summary of the exposure point concentrations for the COCs in groundwater can be found in Appendix II, Table A, while a comprehensive list of the exposure point concentrations for all COPCs can be found in the BHHRA.

Toxicity Assessment: Under current EPA guidelines, the likelihood of carcinogenic risks and noncancer hazards due to exposure to Site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of the Site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COPCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and noncarcinogens, respectively.

Toxicity data for the human health risk assessment were provided by the Integrated Risk Information System (IRIS) database or other sources that are identified as appropriate references for toxicity values consistent with EPA’s directive on toxicity values. This information is presented in Appendix II, Table C (noncancer toxicity data summary) and Appendix II, Table D (cancer toxicity data summary).

Risk Characterization: Noncarcinogenic (systemic) risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses [RfDs], reference concentrations [RfCs]). RfDs and RfCs are estimates of daily exposure levels for humans (including sensitive individuals) which are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (e.g., the amount of a chemical in soil incidentally ingested) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds within a particular medium that impact a particular receptor population.

The HQs for oral and dermal exposures are calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC rather than the RfD.

HQ = Intake/RfD

Where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day)

The intake and the RfD represent the same exposure period (i.e., chronic, subchronic, or acute).

As previously stated, the HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1.0 indicates that the potential exists for noncarcinogenic health effects to occur as a result of Site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1.0, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1.0 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. A summary of the noncarcinogenic risks associated with these chemicals for each exposure pathway is contained in Appendix II, Table E.

As seen in Appendix II, Table E, noncancer hazard for the potential future site resident (child and adult) who may be exposed to groundwater as a drinking water is 620, and the noncancer hazard for the potential future construction worker who may be exposed to soils is 120. Therefore, noncarcinogenic hazards may occur from exposure routes evaluated in the risk assessment. The noncarcinogenic hazards were attributable primarily to exposure to benzene, xylenes, aniline, and 2-aminopyridine in groundwater and to benzene, toluene, chlorobenzene, xylenes, and 2-aminopyridine in soils.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD x SF

Where: Risk = excess lifetime cancer risk, a unitless probability (1×10^{-6}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as [1/(mg/kg-day)]

These risks are probabilities that are usually expressed in scientific notation (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the conditions identified in the assessment. As stated in the NCP, the acceptable risk range for Site-related exposure is 10^{-6} to 10^{-4}.

As shown in BHHRA and summarized in Appendix II, Table F, in the event that untreated Site groundwater were to be used as drinking water, exposure to groundwater contaminated with benzene would be associated with an excess lifetime cancer risk of 1 x 10^{-3} for the potential future on-site resident (child and adult). Exposure to soils by potential future construction workers would be associated with an excess lifetime cancer risk of 1 x 10^{-4}.

These cancer risks and noncancer health hazards indicate that there is significant potential risk from direct exposure to soils and groundwater to potentially exposed populations. For these receptors, exposure to benzene in soils and groundwater results in both an excess lifetime cancer risk that exceeds EPA's target risk range of 10^{-4} to 10^{-6}, while exposure to benzene, xylenes, aniline, toluene, chlorobenzene, and 2-aminopyridine results in an HI above the threshold of 1. The concentration of benzene is also in excess of the Federal and State MCL of 5 μg/L.

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, they were detected at concentrations lower than background levels, they were infrequently detected, or they were detected at concentrations indicating that the HQs were only slightly above 1 with no adverse impacts to exposed receptors expected. A detailed presentation of these data can be found in the RI Report.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- Environmental chemistry sampling and analysis;
- environmental parameter measurement;
- fate and transport modeling;
- exposure parameter estimation; and
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and the characteristics of the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the Site, and is highly unlikely to underestimate actual risks related to the Site.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the BHHRA report.

Basis for Remedial Action

The response actions selected in this ROD are necessary to protect the public health or welfare or the environment from actual releases of hazardous substances in the environment. The response actions are warranted because:

1. Exposure to contaminated soil poses risks to human health;

2. The contaminated soil continues to be a source of groundwater contamination. As such, a remedial action is warranted to reduce contamination in the soil to levels below cleanup objectives;

3. Groundwater COCs are present in concentrations both above MCLs and that pose a significant potential risk from direct exposure to potentially exposed populations. As such, a remedial action is warranted to restore the contaminated groundwater for future use.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) provide general descriptions of what the Superfund cleanup is designed to accomplish. The RAOs are established on the basis of the nature and extent of the contamination, the resources that are currently and potentially threatened, and the potential for human and environmental exposure. Remedial action goals are media-specific goals to protect human health and the environment and 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. Section 121(d) of CERCLA requires that, at a minimum, any remedial action implemented at a site achieve overall protection of human health and the environment and comply with all ARARs. ARARs at a site may include other federal and state environmental statutes and regulations.

The general RAOs identified for the Site are to:

1. prevent exposure of human receptors to contaminated soils and contaminated groundwater;

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.

Implementing active remedies in the source area and in the groundwater aquifers will address the risks associated with the site-related contaminants. Specifically, implementation of the remedies is expected to reduce the concentration of contaminants in soils below soil cleanup objectives and reduce the concentrations of contaminants in groundwater to drinking water standards. To meet these remedial action objectives the following cleanup objectives have been selected based on federal and state promulgated ARARs, risk-based levels, background concentrations, and guidance values.

Cleanup Objectives

Contaminant	Groundwater (ug/L) *	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.*

DESCRIPTION OF ALTERNATIVES

CERCLA § 121(b)(1), 42 U.S.C. § 9621(b)(1), requires that each selected site remedy be protective of human health and the environment, be cost-effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

A number of alternatives were evaluated to address soil and groundwater contamination. These alternatives are described below.

Common Element for All Alternatives

All 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) restricting excavation or other activities that would interfere with constructed remedies (with the exception of Alternative S6 – Excavation and Off-Site Disposal), unless the excavation or other 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; and (c) restricting the use of groundwater as a source of potable or process water unless groundwater quality standards are met.

A Site Management Plan would also be developed to address soil and groundwater at the Site and would provide for the proper management of all Site remedy components post-construction, including the institutional controls discussed above, and will also include: (a) monitoring of Site groundwater to ensure that, following remedy implementation, the groundwater quality improves; (b) provision for any operation and maintenance required of the components of the remedy; and (c) periodic certifications by the owner/operator or other person implementing the remedy that any institutional and engineering controls are in place.

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

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.

In addition, in the event that monitoring should indicate that the Village of Maybrook public water supply wells have been impacted by the Site-related contaminants above health-based levels, a contingency plan is necessary to provide for a wellhead treatment for the Village of Maybrook wells on an interim basis pending further consideration of groundwater treatment alternatives to meet groundwater treatment standards.

Soil Alternatives:

The following alternatives were evaluated for the remediation of soils:

S1: No Further Action
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 sjuite 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.

Capital Cost	$ 0
O & M Cost	$ 0
Present Worth Cost	$ 0
Construction Time	N/A

S2: Institutional Controls with Limited Actions
This alternative is comprised of the institutional controls mentioned previously. 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 prevents 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.

This Alternative would not achieve the Remedial Action Objectives. Institutional controls, as described in this alternative, will be retained as components of other remedial alternatives.

Capital Cost	$12,600
O & M Cost	$13,550
Present Worth Cost	$217,000
Construction Time	3 months

S3: Installation of a Cap over the Contaminated Soils
Under this alternative, a cap would be constructed over the area where contaminated soils exceed the NYSDEC Soil Cleanup Objectives. This area corresponds to that of the former lagoons.

The objectives of this alternative are to:

- minimize infiltration and thereby reduce leaching of chemicals from the soils to the groundwater. This would result in a reduction of chemical concentrations in the overburden and bedrock aquifers;

- eliminate the potential for dermal contact by chemicals associated with surface and subsurface soils;

- minimize volatilization of chemicals in the near surface soils to the atmosphere; and

- minimize the potential transport of chemicals in surface water runoff by eliminating surface water runoff contact with chemicals in the surface soils.

Two capping options were considered in the Feasibility Study for this Site, namely, a Resource Conservation and Recovery Act (RCRA) cap and a clay cap meeting NYSDEC standards for a sanitary landfill. Both of these options would achieve the objectives, but the RCRA cap would be more effective in reducing leachate generation. As such, the RCRA cap is the option considered here.

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, resulting in reduced chemical concentrations in the overburden and bedrock groundwater over time. Furthermore, 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 resulting in further reductions of the chemical migration from this area via groundwater transport.

Capital Cost	$2,290,000
O & M Cost	$24,000
Present Worth Cost	$2,647,000
Construction Time	8 months

S4: Excavation and On-Site Soil Vapor Extraction and Biocell

This alternative would involve the excavation of the soils within the former lagoons, placement of the soils into a biocell, and treatment of these soils with concentrations of COCs exceeding the NYSDEC Soil Cleanup Objectives. Specifically, the biocell will operate as a dual-technology system utilizing soil vapor extraction (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. In addition, 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 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 SVOCs.

Capital Cost	$2,388,000
O & M Cost	$406,000
Present Worth Cost	$3,119,000
Construction Time	2 years

S5: In-Situ Soil Vapor Extraction

This alternative involves the installation of an in-situ soil vapor 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 flow from entering 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 permeable packing with the top few feet of the well grouted to prevent the short circuiting 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.

Capital Cost	$1,211,000
O & M Cost	$460,900
Present Worth Cost	$2,302,000
Construction Time	4 years

S6: Excavation and Off-Site Disposal

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 known exactly how much of the contaminated soil would be classified as hazardous waste which is more expensive to handle and dispose than conventional solid waste. The capital cost cited in the table below 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); and

- backfilling of excavated areas with clean fill.

Capital Cost	$11,208,000
O & M Cost	$22,000
Present Worth Cost	$11,228,000
Construction Time	1 year

Groundwater Alternatives

The following alternatives were evaluated for the remediation of groundwater.

GW-1: No Further Action
The Superfund program requires that a "No Action" alternative be considered as a baseline for comparison with the other alternatives.

Under this alternative (alternative GW-1 in the FS), EPA would take no further action at the Site to prevent exposure to groundwater contamination. The No Action alternative was retained for comparison purposes as required by the NCP. This alternative would only be considered in this evaluation as a baseline to compare other alternatives. 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.

Because this alternative would result in contaminants remaining on-Site above levels that would allow for unlimited use and unrestricted exposure, CERCLA requires that the Site be reviewed at least once every five years.

Capital Cost	$ 0
O & M Cost	$ 0
Present Worth Cost	$ 0
Construction Time	N/A

GW-2: Enhanced Bioremediation with Long-Term Groundwater Monitoring

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 site-related COCs are susceptible to degradation in aerobic conditions. 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. To enhance aerobic biodegradation outside of the source area, the remedial design would 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).

The oxygen additive would be applied into the areas of the contaminant plume where the contamination is highest.

Capital Cost	$182,000
O & M Cost	$106,700
Present Worth Cost	$696,000
Construction Time	6 months

GW-3: Groundwater Extraction and Treatment
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.

Capital Cost	$1,656,000
O & M Cost	$229,000
Present Worth cost	$3,339,000
Construction Time	10 months

GW-4: Enhanced Bioremediation
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).

Capital Cost	$332,000
O & M Cost	$106,700
Present Worth Cost	$846,000
Construction Time	10 months

GW-5: Biosparging

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 (the water table).

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

Capital Cost	$191,000
O & M Cost	$106,700
Present Worth Cost	$738,000
Construction Time	10 months

COMPARATIVE ANALYSIS 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 EPA 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 of these alternatives based upon the evaluation criteria noted above, follows.

Comparative Analysis for Soil Alternatives

1. 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.

2. 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 Preliminary Remediation Goals 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 through treatment. Alternative S6 would involve the excavation and removal of the contaminated soil from the site, and, thereby, achieve soil cleanup objectives for the Site.

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.

3. 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.

4. Reduction in Toxicity, Mobility or Volume through Treatment
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 in the soil. 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.

5. 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 VOCs 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.

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 a few months to complete the landfill cap, Alternative S4 would require 2 years to complete, Alternative S5 would require at least 4 years to complete, and Alternative S6 would require approximately one year to complete.

While efforts would be made to minimize the impacts, some disturbances would result from disruption of traffic, excavation activities on public and private land, noise, and fugitive dust emissions for Alternatives GW-2, GW-3, and GW-4. However, proper health and safety precautions and fugitive dust mitigation measures would minimize these impacts.

6. Implementability

The technologies presented in Alternatives GW-2, GW-3, and GW-4 have been used at other Superfund sites and have been proven effective.

Alternatives S1 and S2 would be the easiest soil alternatives to implement in that there are no field 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.

7. Cost

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

Soil Alternative	Capital Cost	Annual O&M	Present Worth
S1	$ 0	$950	$15,000
S2	$12,600	$13,550	$217,000
S3	$2,290,000	$24,000	$2,647,000
S4	$2,388,000	$406,000	$3,119,000
S5	$1,211,000	$460,000	$2,302,000
S6	$11,208,000	$22,000	$11,228,000

According to the capital cost, O&M cost and present worth cost estimates, Alternative S1 has the lowest cost compared to Alternative S2, S3, S4, S5 and S6.

Comparative Analysis for Groundwater

1. Overall Protection of Human Health and the Environment
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 noncancer 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 implement 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.

2. Compliance with ARARs

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 nonhazardous compounds. Alternatives GW2, GW4, and GW5, each focus on treatment of 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 in comparable time durations, 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.

3. 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.

4. Reduction in Toxicity, Mobility or Volume through Treatment

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.

5. 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 Alternatives 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.

6. Implementability

Alternative GW-1 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 GW-2 would be easier to implement than Alternatives GW-4 and GW-5. The services and materials necessary for each of the groundwater alternatives are readily available. Under Alternatives GW-2, GW-3, GW-4, and GW-5, 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.

7. Cost

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

Groundwater Alternative	Capital Cost	Annual O&M	Present Worth
GW-1	$0	$950	$15,000
GW-2	$182,00	$106,700	$696,000
GW-3	$1,656,000	$229,000	$3,339,000
Gw-4	$332,000	$106,700	$846,000
GW-5	$191,000	$106,700	$738,000

Alternative GW-1 has the lowest cost compared to Alternative GW-2, GW-3, and GW-4; Alternative GW-3 has the highest cost.

8. State Acceptance
NYSDEC concurs with the selected remedy.

9. Community Acceptance
During the public comment period, the community expressed some concerns about the Selected Remedy. The attached Responsiveness Summary summarizes all of the community comments on the Proposed Plan and EPA’s responses to those comments.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430 (a)(1)(iii)(A)). The “principal threat” concept is applied to the characterization of “source materials” at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives, using the remedy selection criteria which are described below. The manner in which principal threats are addressed provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Although treatment will be applied to the VOC contaminated soil and groundwater, there are no principal threats at the Nepera Site. The identified contamination is in the groundwater and on-site soils; no evidence was found during the remedial investigation that nonaqueous phase liquids are present within the aquifers. Soil sample results indicate that while source materials are present they are not considered to be highly toxic or highly mobile and could be contained. Therefore, no principal threat wastes are present at the Site.

SELECTED REMEDY

Based upon an evaluation of the various alternatives, EPA recommends a combination of Alternatives S4 and GW-2 (Soil excavation and treatment in a biocell combined with application of oxygenating compounds into the more contaminated areas of the water table aquifer), as the preferred alternative. This combination of alternatives would substantially reduce the amount of time needed to achieve cleanup objectives for both soil and groundwater.

Summary of the Rationale for the Selected Remedy

The EPA chose the soil remedy (excavation of contaminated soil, placement of the soil into a biocell which uses soil vapor extraction and bioremediation technologies) because this alternative best meets the cleanup objectives by treating contaminated soils at the Site. The alternative reduces the mobility and toxicity of the contaminated soils at the Site by removing the source materials.

The EPA chose the groundwater remedy (bioremediation with long-term groundwater monitoring) because this alternative best meets the cleanup objectives by treating groundwater contaminants exceeding remedial goals at the Site. Based on information used in evaluating the alternatives, the EPA and NYSDEC believe that the Preferred Alternative would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions to the maximum extent practicable. Because it would treat the source materials, the remedy would also meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

Description of Selected Remedy

The selected remedy includes the following components:

Excavation of Contaminated Soils: Site soils, which exceed New York State Department of Environmental Conservation (NYSDEC) soil cleanup objectives, within the former lagoons will be excavated and placed into a biocell

Treatment of Soils in the Biocell: Specifically, the biocell will operate as a dual-technology system utilizing SVE and biological degradation within an engineered below-grade biocell. 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. In addition, 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 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 SVOCs. Excavated soils would be treated to reach target cleanup levels.

Backfilling of Excavated Areas: The excavated areas of the Site, which are not utilized in the construction of the biocell will be backfilled to grade, using clean fill meeting NYSDEC soil cleanup objectives.

Bioremediation of Contaminants of Concern (COCs) in Site Groundwater: Bioremediation will be accomplished by enhancement of the indigenous microbial population through the introduction of oxygenating compounds into targeted areas of the groundwater aquifer. Bioremediation technology would be applied as an initial enhancement within the excavated area of the former lagoons (see Appendix I, Figure 2). The groundwater treatment systems would consist of application of oxygenating compounds into the excavated area of the former lagoons to create aerobic conditions in the aquifers conducive to biodegradation of the Site-related contaminants. This would allow the oxygenating compounds to flow radially outward from the lagoon area within the overburden aquifer and flow downward to also enhance biodegradation of contaminants in the bedrock aquifer. Multiple applications of the oxygenating compounds may be necessary. The remedial design will also consider the need for additional enhancements or injection points for the application of oxygenating compounds directly into the overburden aquifer and/or the bedrock aquifer. The actual method of application, number of applications or injections, the chemical usage, and the well spacing will be assessed and determined during the remedial design and remedial action. A treatability study may be required prior to design or implementation of remediation. Operational parameters will be determined during the remedial design and remedial action.

Long-term Groundwater Monitoring Program: A long-term groundwater monitoring program will be implemented to verify that the concentrations and the extent of the groundwater contaminants are declining. Results of the long-term groundwater monitoring will be used to evaluate the effectiveness of the remedy and to assess the need for additional injections/applications of oxygenating compounds. This program would also include the continued sampling of those private wells in the vicinity of the Site which are currently monitored. The frequency of the residential well sampling will be determined during Remedial Design.

Institutional Controls: To protect human health from exposure to the existing contamination while cleanup is ongoing, institutional controls, which include an environmental easement/restrictive covenant, will be filed in the property records of Orange County. The environmental easement/restrictive covenant will, at a minimum require: (a) restricting excavation or other activities that would interfere with constructed remedies (with the exception of Alternative S6 – Excavation and Off-Site Disposal), unless the excavation or other 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 SMP and (c) restricting the use of groundwater as a source of potable or process water unless groundwater quality standards are met.

Site Management Plan: A SMP will be developed to address soil and groundwater at the Site and will provide for the proper management of all Site remedy components post-construction, including the institutional controls discussed above, and will also include: (a) monitoring of Site groundwater to ensure that, following remedy implementation, the groundwater quality improves; (b) provision for any operation and maintenance required of the components of the remedy; and (c) periodic certifications by the owner/operator or other person implementing the remedy that any institutional and engineering controls are in place.

Engineering Controls: Engineering controls consisting of fencing and posting signs would be implemented to prevent inadvertent exposure to Site contaminants by the local populace.

Contingency Plan: In the event that monitoring should indicate that the Village of Maybrook public water supply wells have been impacted by the Site-related contaminants above health-based levels, a contingency plan would be necessary to provide for a wellhead treatment for the Village of Maybrook wells on an interim basis pending further consideration of groundwater treatment alternatives to meet groundwater treatment standards; and.

Five-Year Review: Hazardous substances remain at this Site above levels that would not allow for unlimited use and unrestricted exposure for at least five years. Pursuant to Section 121(c) of CERCLA, EPA will review site remedies no less often than every five years. The first five-year review is due within five years of the date that construction is initiated for the remedial action. The current expectation is that construction will be initiated during the year 2010 and the first five-year review will be due in the year 2015.

Summary of the Estimated Remedy Costs: Detailed cost estimates for the Selected Remedy can be found in Appendix VI. The information in the cost estimate summary tables is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50% to -30% of the actual project cost.

Expected Outcomes of the Selected Remedy: The results of the human health risk assessment indicated that: there are unacceptable hazards from potential exposure to groundwater through ingestion and inhalation and to soils through contact and ingestion.

All groundwater at the Site is classified as GA, which is groundwater suitable as a source of drinking water. There is a future potential beneficial use of groundwater at the Site as a drinking water source.

The selected groundwater remedy will:

- Prevent or minimize potential, current, and future human exposures including inhalation of vapors and ingestion of groundwater contaminated with VOCs and SVOCs;

- Ultimately restore groundwater to levels which meet NYS Groundwater and Drinking Water Quality Standards once the entire Site remediation is accomplished.

The selected soil remedy will:

- Prevent exposure of human receptors to contaminated soils;

- Remediate contaminated soils and achieve soil cleanup objectives;

- Minimize migration of contaminants from soils to groundwater.

STATUTORY DETERMINATIONS

As previously noted, Section 121(b)(1) of CERCLA mandates that a remedial action must be protective of human health and the environment, be cost effective, and utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at the Site. Section 121(d) of CERCLA further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to section 121(d)(4) of CERCLA. As discussed below, EPA has determined that the Selected Remedy meets the requirements of Section 121 of CERCLA.

Protection of Human Health and the Environment

The Selected Remedy will adequately protect human health and the environment through removal of contaminants from both Site soil via excavation and treatment and Site groundwater via in-situ treatment through bioremediation.

Compliance with ARARs

At the completion of the response action, the remedy will have complied with appropriate ARARs (see Appendix II, Table G)

Cost-Effectiveness

EPA has determined that the selected remedy is cost effective in mitigating the principal risks posed by contaminated soil and groundwater. Section 300.430(f)ii)(D) of the NCP requires evaluation of cost effectiveness. Overall effectiveness is determined by the following three balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost effective. The selected remedy meets the criteria and provides for overall effectiveness in proportion to its cost. The estimated present worth of the Selected Remedy is $3,815,000.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

Of those alternatives considered to address the groundwater contamination at the Site, the selected remedy is a permanent remedy that treats the soil and the groundwater. The ex-situ component of the remedy (Soil Alternative S4) will reduce the mass of contaminants in the subsurface, thereby reducing the toxicity, mobility, and volume of contamination. The in-situ component of the remedy (Groundwater Alternative GW-2) will also reduce the mass of contaminants in the subsurface and holds the advantage of accelerating the cleanup at the Site.

Preference for Treatment as a Principal Element

By using a combination of ex-situ treatment processes, as well as in-situ treatment, the Selected Remedy satisfies the statutory preference for remedies that employ treatment as a principal element.

Five-Year Review Requirements

Hazardous substances remain at this Site above levels that would allow for unlimited use and unrestricted exposure. Pursuant to Section 121(c) of CERCLA, EPA will review site remedies no less often than every five years. The first five-year review is due within five years of the date that construction is initiated. The current expectation is that construction will be initiated by the year 2010 and the first five-year review will be due before the year 2015.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Nepera Chemical Company Superfund Site was released for public comment on July 31, 2007 and the public comment period ran from that date through August 29, 2007. The Proposed Plan identified Soil Alternative S4 and Groundwater Alternative GW-2 as the Preferred Alternatives.

All written and verbal comments submitted during the public comment period were reviewed by EPA. Though two components have been added to the selected remedy (namely, a contingency plan to provide for a wellhead treatment for the Village of Maybrook wells on an interim basis, if the wells are ever impacted by site-related contaminants, and continuation of an ongoing monitoring program which monitors private wells in the vicinity of the Site) EPA has determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, are necessary.