# Fulton Avenue Superfund Site (OU1)

Garden City Park, Nassau County, New York

EPA

***February 2007***

## EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the interim remedial alternatives considered for the Fulton Avenue Superfund Site (Site), identifies the preferred interim remedial action, and provides the rationale for this preference. The Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC). The preferred interim remedial action described in this plan addresses human and environmental risks associated with contaminants identified in groundwater emanating from the Site which is primarily contaminated with tetrachloroethylene (PCE).

This Proposed Plan is being provided as a supplement to the Remedial Investigation and Feasibility Study (RI/FS) reports and the FS Addendum, for operable unit 1 (OU1), to inform the public of the remedy preferred by EPA, and to solicit public comments on all of the interim remedial alternatives evaluated. Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended, and Section 300.430(f) of the National Oil & Hazardous Substances Pollution Contingency Plan (NCP) requires EPA to solicit public comments on proposed plans. The interim remedial alternatives summarized here are more fully described in the FS report and the FS Addendum contained in the Administrative Record file for the Site.

EPA's preferred interim remedial action for the Site is the installation of a groundwater extraction and treatment system, and the application of in-situ chemical oxidation technology as an enhancement within the areas of groundwater containing high contaminant concentrations. The remedy also includes upgrading the wellhead treatment for Garden City potable water supply wells 13 and 14. This wellhead treatment system will be maintained until it has been determined that these public supply wells are no longer being impacted by the Site-related contaminants above health-based standards. In addition, the remedy includes monitoring of groundwater to ensure that the contamination is attenuating and groundwater quality is improving.

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

***Mark Your Calendar***

***Public comment period:***
**February 23, 2007 – March 24, 2007**
U.S. EPA will accept comments on the Proposed Plan during this public comment period

***Public Meeting:***
**March 6, 2007 at 7:00 p.m.**
U.S. EPA will hold a Public meeting to explain the Proposed Plan. The meeting will be held at
Garden City Village Hall, 351 Stewart Avenue, Garden City, New York.

**For more information, see the Administrative Record file, which is available at the following locations:**

Shelter Rock Public Library
165 Searingtown Road
Albertson, New York 12548
Tel. 516-883-7331
*Hours*: Monday - Friday 9:00am - 3:30pm

Garden City Public Library
60 Seventh Street
Garden City, New York 11530
Tel. 516-742-8405
*Hours:* Monday and Friday 1:00pm - 6:00pm, Tuesday 1:00pm - 8:00pm , Wednesday and Thursday 10:00am - 8:00pm , Saturday 10:00am - 3:00pm

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

Written comments on this Proposed Plan should be addressed to:

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## *COMMUNITY ROLE IN SELECTION PROCESS*

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan, along with the supporting Remedial Investigation and Feasibility Study Reports and FS Addendum, have been made available to the public for a public comment period which begins on February 23, 2007 and concludes on March 24, 2007.

A public meeting will be held during the public comment period at the Garden City Village Hall, New York on March 6, 2007 at 7:00 P.M. to present the data gathered during the remedial investigation and feasibility study for the proposed interim remedial action and to receive public comments.

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

## *SCOPE AND ROLE OF ACTION*

Site remediation activities are sometimes segregated into different phases, or operable units, so that remediation of different aspects of a Site can proceed separately, resulting in a more expeditious cleanup of the entire site. This Proposed Plan describes EPA's preferred interim action to address groundwater emanating from the Site which is primarily contaminated with PCE. EPA has designated this action as the first operable unit (OU1) of Site remediation. The PCE dominant plume is the subject of OU1.

EPA uses interim actions when site characterization data are not sufficient to determine the likelihood of attaining long-term objectives over all or part of a plume. Since there is TCE-dominant contamination in the drinking water aquifer up- and side-gradient to the PCE-dominant contamination that is being addressed as OU1 in this proposed plan, the OU1 groundwater plume is expected to be fully restored to its beneficial use when the TCE-dominant contamination is addressed as part of a second operable unit (OU2). This interim remedial action will work towards restoration of the drinking water aquifer to its beneficial use. The second operable unit (OU2) will address all contamination remaining at the Site that is not being addressed by the OU1 action. EPA expects that the OU2 remedial investigation will begin in the near future. OU2 will be addressed through a separate Proposed Plan and Record of Decision. Any changes to the OU1 remedy that may be needed as a result of the OU2 investigation would be addressed in these documents.

## *SITE BACKGROUND*

### Site Description

The Site includes a 0.8-acre property located at 150 Fulton Avenue, Garden City Park, Nassau County, New York (hereinafter, the "Fulton Property"), all contamination emanating from the Fulton Property, as well as all other contamination impacting the groundwater in the vicinity of the Site.

The Fulton Property is owned by Gordon Atlantic Corporation. It is located within the Garden City Park Industrial Area (GCPIA), Village of Garden City Park, Town of North Hempstead, Nassau County, New York (see figure). A fabric-cutting mill operated at the Fulton Property from January 1, 1965 through December 31, 1974, which involved dry-cleaning of fabric with PCE. Currently, the Fulton Property is occupied by a business support company.

Approximately 208,000 people live within three miles of the Fulton Property. There are about 20,000 people living within a mile of the Fulton Property. Residents within the area obtain their drinking water from public supply wells. The vicinity near the Fulton Property is industrial but residential areas are immediately adjacent to the industrial area.

### Site Geology/Hydrogeology

The Site is situated in the outwash plain on Long Island, New York. Approximately 500 feet of interbedded sands and limited clay lenses overlay Precambrian bedrock. There are three aquifers that exist beneath the Site, two of which are affected. The Upper Glacial aquifer is the surficial unit which overlies the Magothy aquifer. The Magothy is the primary source for public water in the area. No impeding clays were observed between the Upper Glacial and Magothy aquifers within the study area.

### Site History

Beginning in 1986, numerous investigations were conducted by the Nassau County Departments of Health (NCDH) and Public Works (NCDPW) to identify the source(s) of chlorinated volatile organic compounds (VOCs) impacting numerous public supply wells in Nassau County located downgradient of the GCPIA. Based on the results of these investigations, NYSDEC placed the 150 Fulton Avenue property on the Registry of Inactive Hazardous Waste Disposal Sites in New York State and conducted an investigation of the GCPIA which was finalized in late 1996.

On April 1, 1998, the EPA placed the Site on the National Priorities List (NPL) of sites under CERCLA. Since that time, NYSDEC has continued as the lead regulatory agency overseeing the implementation of an RI/FS and an Interim Remedial Measure (IRM) described below.

In 1999, under an Administrative Order with NYSDEC, a Potentially Responsible Party (PRP), Genesco, Inc., contracted ERM, Northeast (ERM), to conduct an RI/FS of the Site. During the RI, 22 monitoring wells were installed in the RI/FS study area which extended west to New Hyde Park Road. A draft RI was submitted in August 2002; it was determined that further work was necessary to determine the downgradient extent of the

contaminant plume which emanated from the Fulton Property. In August 2005, an updated draft RI was submitted to NYSDEC and EPA. This document was revised and approved in November 2005.

The PRP also conducted the IRM from August 1998 to December 2001 to remove contaminants from an original dry well on the Fulton Property in order to prevent further contaminant migration into the aquifer and into the indoor air at the facility. Following the excavation of contaminated soils from the bottom of the drywell, a Soil Vapor Extraction (SVE) system was installed to address residual soil contamination and operated until the soil vapor contaminant concentrations met NYSDOH guidance values. Over 10,000 pounds of PCE were removed from the source area during the operation of the SVE system. Following this action, the PRP installed a sub-slab depressurization system under the building at the Fulton Property to provide additional protection of the occupants from exposure to the contamination. This system remains in operation.

NYSDEC and EPA agreed that EPA would be designated as the lead agency for the Fulton Avenue Site at the conclusion of the OU1 RI/FS process.

## *SUMMARY OF SOIL AND GROUNDWATER SAMPLING*

### Soil

A Focused RI, conducted by NYSDEC, identified a dry well immediately adjacent to the Fulton Property building as the primary source of the PCE-dominant contamination plume migrating downgradient from the Fulton Property. This drywell was connected to a pipe which received dry-cleaning waste from inside the building. The primary contaminant identified in dry well sediments, adjacent soil, and shallow ground water beneath the dry well was PCE. Trichloroethylene (TCE) was also detected on the Fulton Property at lower levels.

### *Groundwater*

The OU1 groundwater sampling program included sampling of 24 groundwater monitoring wells located at the Site and analysis of these samples for organic and inorganic compounds. These efforts resulted in an RI that was comprised of four separate field mobilizations conducted between 1998 and 2004. Initial sampling and analysis during the RI has shown PCE levels in the local aquifer system to be up to 6,100 parts per billion (ppb) and TCE concentrations up to 416 ppb. More recent data have shown a marked increase in PCE levels in wells, MW-21b and MW21c, immediately upgradient of Garden City Water District wells 13 and 14. Garden City Water District well 9, which is to the north and west of wells 13 and 14, will be investigated further as part of OU2.

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. The project scope included:

**WHAT IS RISK AND HOW IS IT CALCULATED?**

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

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

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

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

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

- Using temporary wells to define further the extent of groundwater impacts within the aquifer system (aerially and vertically);
- Installing permanent groundwater monitoring wells;
- Collecting groundwater samples; and
- Depicting the distribution of VOCs in three dimensions through computer simulation.

***Human Health Risk Assessment***

The purpose of the risk assessment is to identify potential cancer risks and noncancer health hazards at the Site assuming that no further remedial action is taken. A baseline human health risk assessment was performed to evaluate current and future cancer risks and noncancer health hazards based on recent sampling data from the monitoring wells and groundwater samples collected at the Site.

A four-step risk assessment process was used for assessing Site-related cancer risks and noncancer health hazards. The process includes: Hazard Identification of Chemicals of Potential Concern (COPCs), Exposure Assessment, Toxicity Assessment, and Risk Characterization.

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future property conditions. A baseline risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these under current and future land uses.

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

The baseline risk assessment began with selecting COPCs in the various media that would be representative of Site risks. Since the area is served by municipal water, it is not likely that the groundwater underlying the Site will be used for potable purposes without proper treatment in the foreseeable future. However, since the aquifer system is designated as a sole-source aquifer, and the Site groundwater is being used as a source of drinking water, potential exposure to groundwater was evaluated.

Based on this analysis, carcinogenic risk and/or noncarcinogenic hazards fell above the acceptable carcinogenic risk (CR) range of $10^{-6}$ to $10^{-4}$ or the noncarcinogenic hazard index (HI) of 1 for the following chemicals and exposure pathways.

| Population | Pathway | CR | HI |
|---|---|---|---|
| Adult resident – TCE and PCE | Ingestion/dermal absorption | $3 \times 10^{-3}$ | 8 |
| | Inhalation from shower | $6 \times 10^{-4}$ | NA |
| | **Total** | **$4 \times 10^{-3}$** | **8** |
| Child resident – TCE and PCE | Ingestion/dermal absorption | $6 \times 10^{-4}$ | 22 |
| | Inhalation from shower | $2 \times 10^{-4}$ | NA |
| | **Total** | **$2 \times 10^{-3}$** | **22** |
| Commercial Worker – TCE and PCE | Ingestion/dermal absorption | $7 \times 10^{-4}$ | 2.4 |

NA – Non-carcinogenic hazards were not estimated due to the lack of inhalation toxicity values for the COPCs.

These calculated risks to human health require EPA to undertake remedial measures to reduce the risks associated with the observed contamination and restore the groundwater to beneficial use. OU2 will further evaluate vapor intrusion as a potential exposure pathway. As part of the OU2 investigation, a soil gas investigation and possible indoor air testing will also be done in the vicinity of the Fulton Property.

***Ecological Risk Assessment***

The potential risk to ecological receptors was evaluated. For there to be an exposure, there must be a pathway through which a receptor (e.g. person, animal) comes into contact with one or more of the COPCs. Without a complete pathway or receptor, there is no exposure and hence, no risk.

Based on a review of existing data, there are no potential exposure pathways for ecological receptors at the Site. As noted above, the Fulton Property itself is less than 1 acre in size and is located in the GCPIA within a highly developed area. The entire Fulton Property is paved or covered with buildings. The depth to ground water (the medium of concern) is approximately 50 ft and is unlikely to affect any surface water bodies.

***REMEDIAL ACTION OBJECTIVES***

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards such as Applicable or Relevant and Appropriate Requirements (ARARs) for drinking water.

The following RAOs were established for this Site:

- Reduce contaminant levels in the drinking water aquifer to ARARs
- Prevent further migration of contaminated groundwater

As this is an interim remedial action, EPA is using an "observational" approach to evaluate whether the action will meet the RAOs. The effects of the interim action will be monitored to evaluate whether additional actions may be necessary in order to meet the goal of aquifer restoration.

***SUMMARY OF REMEDIAL ALTERNATIVES***

CERCLA 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.

The FS evaluated a number of alternatives to address groundwater contamination. However, as described in the FS Addendum, EPA determined that two alternatives were not appropriate and should be described, but not evaluated further in this Proposed Plan.

Alternative 1 in the FS is a "No Action Alternative" which involves taking no actions to address the Site, and includes the removal of the current wellhead treatment from the public water supply wells. This is not appropriate as evaluated because this treatment must remain on the wells in order to meet drinking water standards, thus removal would not occur. Therefore, this alternative was not carried though into this proposed plan for further evaluation.

Alternative 4 in the FS is an alternative that would consist of the injection of iron particles to form a permeable wall that the contaminant plume would migrate through which would break down the organic contaminants into non-hazardous compounds in conjunction with the injection of an oxidant. This permeable wall is not a proven technology for a plume depth beyond 100 feet and therefore its implementability is questionable in this situation. Considering the uncertainties involved with the technology along with the related costs, this alternative should not be evaluated further.

The alternatives described below have been renumbered from the FS and FS Addendum to facilitate the presentation of the analysis.

***Common Element for All Alternatives***

Recent groundwater data immediately upgradient of Garden City potable water supply wells 13 and 14 show an increase in the levels of contamination. All alternatives presented in this Proposed Plan include upgrading the wellhead treatment at these wells to protect the water supply wells from the increasing levels of the PCE-dominant contamination from the Site plume. This wellhead treatment system will be maintained until it has been determined that these public supply wells are no longer being impacted by the Site-related contaminants above health-based standards.

In addition, all action alternatives would include institutional controls that restrict future use of groundwater at the Site. Specifically, the New York State Department of Health State Sanitary Code regulates installation of private potable water supply wells in Nassau County. The Fulton Property would also be restricted to commercial industrial use based on its current zoning. If a change in land use is proposed, additional investigation of soils at the Fulton Property would be necessary to support the land use change.

A site management plan (SMP) would also be developed and would provide for the proper management of all Site remedy components post-construction, such as institutional controls, and shall also include: (a) monitoring of Site groundwater to ensure that, following remedy implementation, the groundwater quality improves; (b) conducting an evaluation of the potential for vapor intrusion, and mitigation, if necessary, in the event of future construction at the Fulton Property; (c) provision for any operation and maintenance required of the components of the remedy; and (d) periodic certifications by the owner/operator or other person implementing the remedy that any institutional and engineering controls are in place.

**GW-1: No Further Action – Limited Action**

The Superfund program requires that a "No Action" alternative be considered as a baseline for comparison with the other alternatives. While such a comparison was made in the FS using Alternative GW-1 in the FS Report, for purposes of this Proposed Plan we use the following "No Further Action" alternative as a baseline for the reasons described above.

| | |
|---|---|
| Capital Cost | $633,418 |
| O & M Cost | $2,710,431 |
| Present Worth Cost | $3,343,849 |
| Construction Time | N/A |
| Duration | Approximately 73 years |

Under this alternative (alternative GW-2 in the FS), EPA would take no further action at the Site to prevent exposure to groundwater contamination. This alternative would only be considered in this evaluation as a baseline to compare other alternatives. The costs associated with this alternative are related to the replacement of the well head treatment system as the equipment wears out and the operation of it.

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.

**GW-2: In-Situ Chemical Oxidation**

| | |
|---|---|
| Capital Cost | $4,994,320 |
| O & M Cost | $2,735,523 |
| Present Worth cost | $7,729,843 |
| Construction Time | 6 months |
| Duration | Approximately 59 years |

This alternative (alternative GW-3 in the FS), would use in-situ chemical oxidation (ISCO) which entails injecting an oxidant (potassium permanganate) directly into the PCE-dominant contaminant plume to convert the organic contamination chemically into nonhazardous compounds. Multiple injections over time may be needed for this action to be fully effective. The oxidant will be injected into the areas of the PCE-dominant contaminant plume where the contamination is highest.

**GW-3: Groundwater Extraction and Treatment**

| | |
|---|---|
| Capital Cost | $3,203,634 |
| O & M Cost | $5,718,758 |
| Present Worth cost | $8,922,392 |
| Construction Time | 10 months |
| Duration | Over 30 years |

Under this alternative (alternative 5 in the FS), three groundwater extraction wells would be installed into the PCE-dominant contaminant plume. Locations of these wells would be made during the design of the remedy to assure optimum placement. The extracted groundwater would be treated via an air stripping system to be located at the Garden City Bird Sanctuary (GCBS) on Tanners Pond Road. The treated water would be discharged into an existing infiltration basin at GCBS for recharge. If the GCBS were unavailable, a comparable form of groundwater recharge would be utilized.

The groundwater extraction system would be pumped at a rate that will draw back the PCE-dominant plume from the hydraulic influence of Garden City potable water supply wells 13 and 14. In addition, a broader monitoring well network would be necessary in order to monitor the effectiveness of the remediation of the contaminant plume as well as to observe changes to the flow dynamics of the aquifer system.

**GW-4: Groundwater Extraction and Treatment and Focused In Situ Chemical Oxidation at Source Area**

| | |
|---|---|
| Capital Cost | $4,978,102 |
| O & M Cost | $5,718,758 |
| Present Worth Cost | $10,696,860 |
| Construction Time | 10 months |
| Duration | Less than 30 years |

Alternative GW-4 (found in the FS Addendum as GW-6), would be a combined action which includes the actions presented as Alternative GW-3 herein, along with a modified version (reduced and focused) of Alternative GW-2 herein. As described in Alternative GW-3, groundwater would be extracted and treated for discharge into the existing infiltration basin at GCBS for recharge.

Also, the groundwater extraction system would be pumped and monitored as described in Alternative GW-3. In addition to the groundwater extraction and treatment system Alternative 4 would include a focused effort to inject an oxidant, as described in Alternative GW-2 herein, directly into the vicinity of the identified source area to chemically convert the organic contamination into nonhazardous compounds. This action would be of smaller scale than the previously described action described in Alternative GW-2 herein because its purpose would be to treat the high-concentration source material in the groundwater, not the entire PCE-dominant plume. This action would reduce the amount of time the groundwater extraction system would have to operate by destroying a substantial amount of the residual PCE source contamination. Multiple injections over time may be needed.

For cost estimating purposes, a 30-year time frame was assumed as the duration of this alternative. It is expected however that the actual duration will be less.

***EVALUATION OF ALTERNATIVES***

In selecting a remedy for a site, EPA considers the factors set forth in CERCLA § 121, 42 U.S.C. § 9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR § 300.430(e)(9) and 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.

- Overall Protection of Human Health and the Environment

As this is an interim remedy, all of the action alternatives would contribute to the overall protection of human health and the environment at the completion of OU2. All alternatives except GW-1 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 contamination at the Site. The aquifer system is designated a sole-source aquifer and the Site groundwater is being used as a source of drinking water. The future and present use carcinogenic risks at the Site are not within EPA's acceptable risk range.

- Compliance with ARARs

For Alternatives GW-2, GW-3, and GW-4, ARARs for drinking water would be achieved over time in the PCE-dominant plume with respect to PCE. For TCE, all of the alternatives would make significant progress toward achieving ARARs. Compliance with ARARs would be evaluated through an annual monitoring program. Due to the interim nature of the OU-1 remedy, ARARs for TCE would be met in conjunction with OU2.

Alternatives GW-3 and GW-4 are expected to go the furthest in meeting chemical-specific ARARs for the groundwater. However, once pump and treat operations are discontinued, the resumption of contact between potential residual contamination and the groundwater may cause chemical-specific groundwater ARARs to be exceeded. Injecting an oxidant as described in GW-4 should minimize the likelihood of that occurrence.

- Long-Term Effectiveness and Permanence

Because this in an interim action, all alternatives would achieve similar degrees of long-term effectiveness and permanence. Alternatives GW-3 and GW-4 are expected, over time, to provide the same level of long-term effectiveness and permanence as Alternative GW-2. It is expected however, that the time frame for the remediation through Alternative GW-4 would be significantly shortened because of the addition of the focused ISCO action.

- Reduction in Toxicity, Mobility or Volume

GW-1 would provide potable water but would not provide further reduction in toxicity, mobility or volume of contaminants through treatment.

Alternative GW-2 would reduce the volume and toxicity of the contaminants by chemically breaking down the bulk of the dissolved VOC contamination as it migrates through the aquifer. The VOC contaminants would be converted into nonhazardous materials, therefore eliminating the hazardous constituents. The mobility of contaminants in the groundwater, however, would not be affected.

Alternatives GW-3 and GW-4 would both reduce the toxicity, mobility, and volume of contaminated groundwater through removal and treatment.

The addition of the chemical oxidant, as presented as part of Alternative GW-4 would both do a better job than GW-3 of reducing the contaminant loading from the source area by destroying the residual contamination upgradient of the treatment system's extraction wells.

- Short-Term Effectiveness

Alternative GW-1 would present virtually no change to the short-term impacts to human health and the environment since no construction is involved. The construction activities required to implement Alternative GW-2, would potentially pose a risk of worker exposure to the oxidant when injected into the aquifer and would take approximately 4 months to inject the oxidant. The possibility of having to administer additional oxidant in future injections is likely. Alternatives GW-3 and GW-4 would potentially result in greater short-term exposure to contaminants by workers who may come into contact with the contaminated groundwater treatment system. Installation of the extraction wells and associated piping is estimated to be completed in 8-12 months. Alternative GW-4 would pose a combined short-term risk of these concerns coupled with those described for GW-2.

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.

- 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.

It is possible that substantially changing the flow within the aquifer under Alternatives GW-3 and GW-4 could redistribute contaminated groundwater within the local aquifer system. Additional monitoring wells would need to be installed to monitor these effects on the flow dynamics in the vicinity, if either of these alternatives were selected.

- Cost

The estimated capital, annual operation and maintenance (O&M) (including monitoring), and present-worth costs for each of the alternatives are presented:

Cost Comparison

| Alternative | Capital Cost | Annual O&M | Present Worth |
|---|---|---|---|
| GW-1 | $633,418 | $2,710,431 | $3,343,849 |
| GW-2 | $4,994,320 | $2,735,523 | $7,729,843 |
| GW-3 | $3,203,634 | $5,718,758 | $8,922,392 |
| GW-4 | $4,978,634 | $5,718,758 | $10,696,860 |

According to the capital cost, O&M cost and present worth cost estimates, Alternative GW-1 has the lowest cost compared to Alternative GW-2, GW-3, and GW-4.

- State Acceptance

  NYSDEC concurs with the preferred alternative.

- Community Acceptance

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

***PREFERRED ALTERNATIVE***

Based upon an evaluation of the various alternatives, EPA recommends Alternative GW-4, Groundwater Extraction and Treatment with Focused ISCO, as the preferred alternative. This alternative would include a modified application of ISCO as presented in Alternative GW-2, which would substantially reduce the amount of time the groundwater extraction and treatment system would need to operate. For cost-estimating purposes, a 30-year time frame was assumed as the duration of this alternative. It is expected, however, that the actual duration will be less.

Also, the well-head treatment system at Garden City Water District wells 13 and 14 would be replaced as soon as possible in order to protect these public supply wells from the increasing levels of contamination observed at the MW-21 location.

Alternative GW-4 would provide the best balance of trade-offs among the four alternatives with respect to the evaluating criteria. EPA believes that the preferred alternative will be protective of human health and the environment, will comply with ARARs, will be cost-effective, and will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.