RECORD OF DECISION

Jones Chemicals, Inc. Superfund Site
Caledonia, Livingston County, New York

826003

United States Environmental Protection Agency
Region II
New York, New York
September 2000

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DIVISION OF ENVIRONMENTAL REMEDIATION

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Jones Chemicals, Inc. Superfund Site
Caledonia, Livingston County, New York

Superfund Site Identification Number: NYD000813428
Operable Unit 1[1]

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's selection of a remedy for the Jones Chemicals, Inc. Superfund site (Site), which is chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §9601 *et seq.*, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300. This decision document explains the factual and legal basis for selecting the remedy for the Site. The attached index (see Appendix III) identifies the items that comprise the Administrative Record upon which the selection of the remedy is based.

The New York State Department of Environmental Conservation was consulted on the planned remedy in accordance with CERCLA Section 121(f), 42 U.S.C. §9621(f), and it concurs with the selected remedy (see Appendix IV).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

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[1] This response action applies a comprehensive approach; therefore, only one operable unit is required to remediate the site.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedy include the following:

- Treatment of soils in the Former Solvent Tank Source Area at the JCI Jones Chemicals, Inc. (Jones) plant grounds exceeding New York State soil cleanup objectives by in-situ soil vapor extraction;
- Extraction of contaminated groundwater in the Former Solvent Tank Source Area utilizing a network of recovery wells in the overburden and bedrock aquifers;
- Treatment of the extracted groundwater with the existing air stripper, which allows for the utilization of the treated water as noncontact cooling water within the Jones plant, and discharge of the noncontact cooling water to the on-Site lagoons until groundwater standards in the Former Solvent Tank Source Area are achieved;
- In-situ treatment of the dense nonaqueous phase liquid (DNAPL) in the aquifer underlying the Former Solvent Tank Source Area[2] with an oxidizing agent, such as potassium permanganate or hydrogen peroxide;
- Continued extraction and treatment of contaminated groundwater from the North Well;
- Discontinued pumping from the West Well to eliminate the potential to draw contaminants to deeper water-bearing zones;
- Monitored natural attenuation of the contaminated groundwater located outside the Former Solvent Tank Source Area and beyond the influence of the North Well; and
- Implementation of institutional controls (*i.e.*, deed restrictions) to limit future on-Site groundwater use to nonpotable purposes until groundwater cleanup standards are achieved.

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[2] The magnitude of the tetrachloroethylene (PCE) concentrations in the bedrock aquifer in the Former Solvent Tank Area indicates the potential presence of such PCE in the form of a DNAPL, a "principal threat waste." As noted above, this "principal threat waste" will be treated via the in-well injection of an oxidizing agent.

During the design phase, samples will be collected to optimize the placement of the extraction wells in the Former Solvent Tank Source Area and to better characterize the extent of the DNAPL contamination.

As part of a long-term groundwater monitoring program, groundwater samples will be collected and analyzed quarterly in order to verify that the level and extent of groundwater contaminants (*e.g.*, volatile organic compounds) are declining and that conditions are protective of human health and the environment. In addition, biodegradation parameters (*e.g.*, oxygen, nitrate, sulfate, methane, ethane, ethene, alkalinity, redox potential, pH, temperature, conductivity, chloride, and total organic carbon) will be used to assess the progress of the degradation process. If it is determined that monitored natural attenuation is not effective in restoring groundwater quality outside of the Former Solvent Tank Source Area in a reasonable time frame, then remedial actions, such as enhanced reductive dechlorination[3] or groundwater extraction and treatment, may be implemented.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy meets the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. §9621, in that it: 1) is protective of human health and the environment; 2) meets a level or standard of control of the hazardous substances, pollutants and contaminants, which at least attains the legally applicable or relevant and appropriate requirements under federal and state laws; 3) is cost-effective; and 4) utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In keeping with the statutory preference for treatment that reduces toxicity, mobility, or volume of contaminated media as a principal element of the remedy, the contaminated groundwater will be collected and treated. In addition, the contaminated soil in the Former Solvent Tank Source Area and the DNAPL in the aquifer underlying the Former Solvent Tank Source Area will be treated in-situ.

This remedy will result in the reduction of hazardous substances, pollutants, or contaminants on-Site to levels that will permit unlimited use of and unrestricted exposure to the Site. However, because it may take more than five years to attain cleanup levels in the groundwater, a Site

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[3] Under this process, microbes remove the chlorine from the volatile organic compounds, allowing the compounds to further degrade into carbon dioxide and water.

review may be conducted no less than once every five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The ROD contains the remedy selection information noted below. More details may be found in the Administrative Record file for this Site.

- Chemicals of concern and their respective concentrations (see ROD, pages 5-7);
- Baseline risk represented by the chemicals of concern (see ROD, pages 8-13);
- Cleanup levels established for chemicals of concern and the basis for these levels (see ROD, Appendix II, Table 7);
- How source materials constituting principal threats are addressed (see ROD, pages 7-8);
- 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 8);
- Potential *land and groundwater use that will be available at the Site* as a result of the selected remedy (see ROD, page 36);
- Estimated capital, annual operation and maintenance, and total present-worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (see ROD, pages 38-39); and
- 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, highlighting criteria key to the decision) (see ROD, pages 33-40).

AUTHORIZING SIGNATURE

Jeanne M. Fox
Regional Administrator

9/27/10
Date

RECORD OF DECISION FACT SHEET
EPA REGION II

Site	
Site name:	Jones Chemicals, Inc. Site
Site location:	Caledonia, Livingston County, New York
HRS score:	33.62
Listed on the NPL:	February 21, 1990
Record of Decision	
Date signed:	September 27, 2000
Selected remedy:	In-situ soil vapor extraction of the contaminated soil, groundwater extraction and treatment in the source area, in-situ dense nonaqueous phase liquid treatment, and monitored natural attenuation of the groundwater outside the source area.
Capital cost:	$844,000
Monitoring cost:	$237,000, annually
Present-worth cost:	$2.3 Million (7% discount rate for 15 years)
Lead	EPA
Primary Contact:	George Jacob, Remedial Project Manager, (212) 637-4266
Secondary Contact:	Joel Singerman, Chief, Central New York Remediation Section, (212) 637-4258
Main PRPs	JCI Jones Chemicals, Inc.
Waste	
Waste type:	Volatile organic compounds
Waste origin:	On-Site spills
Contaminated media:	Soil and groundwater

DECISION SUMMARY

Jones Chemicals, Inc. Superfund Site
Caledonia, Livingston County, New York

United States Environmental Protection Agency
Region II
New York, New York
September 2000

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ATTACHMENTS

SITE NAME, LOCATION, AND DESCRIPTION

The Jones Chemicals, Inc. site[1] (the "Site"), situated in a relatively flat, sparsely populated, lightly industrialized suburban area of the Village of Caledonia, includes the JCI Jones Chemicals, Inc. (Jones) plant. The site is bordered by Iroquois Road to the south, farmlands to the north, and homes to the east and west (see Figure 1). A construction company and a printing company are located immediately northwest of the plant. A golf course, baseball field, and tennis court are present immediately south of Iroquois Road. The site vicinity to the west and southwest is populated with light service industries, including hardware stores, gasoline stations, dry cleaners, restaurants, and other commercial businesses.

There are nine buildings located on the 10-acre manufacturing plant grounds, consisting of office space, drum storage sheds, interconnected warehouse buildings, a bleach manufacturing building, and a chlorine and sulfur dioxide repackaging building. The areas around the buildings are paved with asphalt. The Main Service Railway lines run west to east to the north of the buildings. A large area south of the buildings, facing Iroquois Road, is grass-covered. The area north of the buildings is known as the "North Property." The eastern portion of the North Property is covered by gravel; the western portion by grass. Three unlined lagoons are located to the northwest of the bleach manufacturing building. (See Figure 2.)

The plant property, which has been used for industrial purposes since 1939, is presently zoned industrial and light industrial; it is anticipated that the land use will not change in the future[2].

The United States Environmental Protection Agency (EPA) is the lead agency for this Site; the New York State Department of Environmental Conservation (NYSDEC) is the support agency. The investigatory work at this Site was performed by Jones, the identified potentially responsible party (PRP), under an Administrative Order on Consent (AOC) with EPA.

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[1] Superfund Site Identification Number: NYD000813428.

[2] Source: Letter from Michelle M. Chapman, Code Enforcement Officer, Village of Caledonia, Caledonia, New York, to Joel Singerman, Chief, Central New York Remediation Section, EPA, dated May 23, 2000. (This letter is included in the Administrative Record file for this Site.)

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Jones purchased the majority of the plant property in 1939, which, at the time, included an orchard, agricultural fields, and pasture lands. Soon after the purchase of the property, Jones began the production of sodium hypochlorite (bleach). In 1942, Jones purchased properties located adjacent to the plant to the north and east, and began repackaging chlorine from bulk sources to cylinders and 1-ton containers there. Titanium tetrachloride was briefly manufactured between 1942 and 1943 for the U.S. Government during World War II for use in smokescreen operations. Repackaging of anhydrous ammonia and acids began in 1947. The production of aqua ammonia and bulk storage of hydrochloric, sulfuric, nitric, and hydrofluosilicic acids started in 1953. Between 1960 and approximately 1977, volatile organic compounds (VOCs), including tetrachloroethene (PCE), trichloroethene (TCE), toluene, 1,1,1-trichloroethane (1,1,1-TCA), methylene chloride, and Stoddard solvent, were repackaged from bulk to smaller containers for sale/distribution. Aqua ammonia was produced by combining water and ammonia until 1995.

In 1971, Jones began to transport commercial hazardous wastes not generated by Jones. The hazardous waste materials were temporarily stored on-Site prior to transport and disposal off-Site. Jones discontinued the transportation and on-Site storage of hazardous wastes in 1980.

Repackaging of chemicals from bulk to small containers has been one of the primary activities at the plant. These repackaged chemicals not only include the chemicals manufactured at the plant, but also those that were brought in bulk loads for redistribution. Materials brought in bulk form were generally stored in shipping containers (i.e., railroad tank cars or tanker trucks), aboveground storage tanks, and underground storage tanks. The majority of these tanks were taken out of service and removed between 1981 and 1986.

Commercial activities at the Site presently include the manufacturing of sodium hypochlorite through the reaction of chlorine and dilute sodium hydroxide, manufacturing of sodium bisulfite through the reaction of dilute sodium hydroxide and sulfur dioxide, repackaging and distribution of chlorine, sulfur dioxide, sodium hydroxide, and various acids, such as muriatic acid and hydrofluosilicic acid, from bulk to small containers, and the distribution of various inorganic water treatment chemicals, such as soda ash and lime.

The principal waste stream from the plant has been wastewater from tank washings, floor washings, and other waste liquids from handling and packaging. This waste stream is first treated by the on-Site elementary neutralization system through the addition of sulfur dioxide or caustic soda. The wastewater is then mixed in an approximately 1-to-99 ratio with noncontact cooling water. This mixture is then discharged to the infiltration lagoon system in accordance with a New York State Pollutant Discharge Elimination System (SPDES) permit.

Available records indicate that the sludge that forms in the infiltration lagoons (which were constructed in the mid-1950s) has been excavated at least three times. The excavated sludge from the first two excavation events was spread on the ground in the vicinity of the lagoons, while the sludge from the third excavation event was disposed of in a municipal landfill.

VOCs were first reported in July 1981 in the production wells at the plant and in the discharge water to the lagoons. A subsequent hydrogeologic investigation by Jones indicated the presence of VOCs in the soil and groundwater underlying the plant's property. In June 1986, relatively high concentrations of PCE at 1,160 and 765 micrograms per liter (µg/l) were detected in the plant's production wells, referred to as the "North Well" and the "West Well," respectively (see Figure 2). The North Well, located in the northern portion of the plant property, has a capacity of 300 to 400 gallons per minute (gpm). The West Well, located in the western portion of the plant, has a capacity of approximately 15 gpm. The North Well and the West Well are screened in the overburden and bedrock aquifers, respectively.

Throughout the plant's operation, spills occurred during the handling of many of the above-mentioned chemicals, contaminating the Jones soil and underlying groundwater.

The Site was proposed for inclusion on the National Priorities List (NPL) in June 1988; it was listed on the NPL in February 1990.

On August 8, 1990, EPA notified Jones that EPA considered Jones a PRP with respect to the Site, and provided Jones with the opportunity to enter into an Administrative Order on Consent (AOC) with EPA to perform a remedial investigation and feasibility study (RI/FS) for the Site to determine the nature and extent of the contamination at and emanating from the Site and to identify and evaluate remedial alternatives. In March 1991, Jones entered into an AOC with EPA.

To comply with its SPDES permit and to collect data for treatability study work related to the RI/FS, in May 1996, Jones installed an air stripper to treat the noncontact cooling water from the North Well and the West Well prior to discharge to the lagoons. Monitoring of the discharge water indicates that VOCs are below detection limits after treatment.

The final RI and FS reports, completed by Jones' contractor pursuant to the 1991 AOC, were delivered to EPA in June and September 1999, respectively.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI report, FS report, and Proposed Plan for the Site were made available to the public in both the Administrative Record and information repositories maintained at the EPA Docket Room in the Region II New York City office and two local information repositories: the Village of Caledonia Library, 3108 Main Street, Caledonia, New York and the Village of Caledonia Clerks Office, 30-95 Main Street, Caledonia, New York. A notice of availability of the above-referenced documents was published in the *Livingston County News* on July 20, 2000. A public comment period was held from July 20, 2000 to August 19, 2000. On August 14, 2000, EPA conducted a public meeting at the Caledonia-Mumford Central School, 99 North Street, Caledonia, New York, to present the findings of the RI/FS and answer questions from the public about the Site and the remedial alternatives under consideration and the preferred soil and groundwater alternatives.

The public generally supports the selected remedy. Public comment was related to Site contaminants, the threat to public and private water supplies, the risks posed by the Site, the selected soil and groundwater treatment processes, and the financing of the project. Responses to the comments received at the public meeting (no written comments were received) are included in the Responsiveness Summary (see Appendix V).

Since it is not anticipated that the industrial zoning of the plant property will change in the future, efforts were not made to solicit the public's views on the assumptions about reasonably anticipated future land use. Although it is not likely that the groundwater underlying the plant will be used for potable purposes in the foreseeable future, at the public meeting, representatives from EPA solicited community input on the potential future beneficial groundwater uses at the Site as a whole.

SCOPE AND ROLE OF OPERABLE UNIT

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Section 300.5, defines an operable unit as a discrete action that comprises an incremental step toward comprehensively addressing Site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a Site can be divided into a number of operable units, depending on the complexity of the problems associated with the Site. Operable units may address geographical portions of a Site, specific Site problems, or initial phase of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a Site.

This response action applies a comprehensive approach; therefore, only one operable unit is required to remediate the Site. The primary objectives of this action are to control the sources of contamination at the Site, to minimize the migration of contaminants, to minimize any potential future health and environmental impacts, and to restore the groundwater to cleanup standards.

SUMMARY OF SITE CHARACTERISTICS

The purpose of the RI, conducted from 1991 to 1999, was to determine the nature and extent of the contamination at and emanating from the Site. The results of the RI are summarized below.

Surface and Subsurface Soils

The results of 19 soil samples collected across the Site showed PCE concentrations ranging from below detection to 330,000 micrograms per kilogram (µg/kg) and TCE concentrations ranging from below detection to 320 µg/kg. The highest soil concentrations of PCE and TCE were detected in a 150-foot by 20-foot area located at the Site of a former aboveground solvent tank (hereinafter, referred to the "Former Solvent Tank Area"), located in the western portion of the property. (See Figure 3.)

Groundwater

The Site is underlain by two distinct stratigraphic zones, an upper overburden zone and an underlying bedrock zone, as shown in Figure 4.

The overburden zone consists of approximately 30 to 70 feet of glacial deposits (a mixture of gravel, sand, and silt). Groundwater elevations measured at the Site indicate that the principal groundwater flow direction in the overburden zone is toward the northeast. (See Figure 5.)

Carbonate bedrock (dolomite) is found below the glacial deposits. The surface of the bedrock slopes steeply to the west. Cores taken at the Site indicate that the upper portion of the zone (10 feet or less) is highly weathered and fractured. The groundwater yield within the bedrock occurs primarily in the weathered portion and/or through fractures. Groundwater elevation data indicates that groundwater flow in the bedrock is both to the west and northeast. There also appears to be an upward vertical gradient indicating flow from the deeper to shallower water-bearing zones. (See Figure 6.)

An approximately 1,500-foot (along the northeast–southwest axis) by 720-foot (along the north–south axis) groundwater VOC plume, consisting of primarily PCE, and its degradation products TCE and 1,2-dichloroethene (1,2-DCE), extends from the Former Solvent Tank Source Area to the east and the northeastern property boundary. Vertically, the contamination extends to at least 48 feet below the ground surface in the source area. (See Figure 7.)

Groundwater sampling results from the overburden aquifer in the Former Solvent Tank Area showed concentrations of PCE and TCE as high as 5,500 µg/l and 130 µg/l, respectively. Although there is groundwater contamination in the overburden aquifer outside the Former Solvent Tank Area, it appears that the North Well has helped to limit the migration of the plume (while 140 µg/l PCE was detected at the North Well, PCE concentrations significantly taper off beyond it, ranging from below detection to 22 µg/l). (See Figure 8.)

In the bedrock aquifer in the vicinity of the Former Solvent Tank Area, PCE and TCE were detected at concentrations as high as 62,000 µg/l and 100 µg/l, respectively. With the exception of the detection of 340 µg/l PCE in the West Well, relatively low concentrations of PCE and TCE (less than 10 µg/l) were detected outside the Former Solvent Tank Area. (See Figure 9.)

Periodic sampling of the Village of Caledonia's water supply wells from 1983 through 1989 showed the presence of PCE, TCE, and 1,1,1-TCA. In 1991, the Village installed an air stripper to treat the water prior to distribution. The results from March 21, 2000 sampling indicate that the contaminant concentrations meet drinking water standards prior to treatment[3]. While the Jones plant's southern boundary is located approximately 700 feet from the Village of Caledonia's water supply wells, it has not been determined that the Site was the source of this contamination. Observing groundwater flow paths would ordinarily allow a determination as to whether or not the Site was a source of this contamination. However, since the groundwater flow path has been altered (the Village took a water supply well out of service in 1994 and the prolonged pumping of the on-Site production wells has altered the natural groundwater flow path), such a determination cannot be made.

There are two private residential wells located approximately one mile from the plant which have shown chlorinated solvent contamination. NYSDEC installed and is presently maintaining treatment systems on these wells. The contaminants found in these wells are only slightly above drinking water standards. Given the low levels of contamination and considering the distance of the wells from the Site, it is unlikely that the Site is the source. The source of the contamination of these wells has yet to be identified.

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 acts 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. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The magnitude of the PCE concentrations in the bedrock aquifer in the Former Solvent Tank Area indicates the potential presence of such PCE

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[3] The sample results are included in Table 1.

in the form of a DNAPL, a principal threat waste. Since much lower levels of PCE were detected in groundwater samples collected outside the Former Solvent Tank Area, it appears that the DNAPL may be limited to the source area.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The plant property, which has been used for industrial purposes since 1939, is presently zoned industrial and light industrial; it is anticipated that the land use will not change in the future[4].

The groundwater underlying the plant is contaminated. Although the plant's production wells provide noncontact cooling water for the plant after treatment, potable water for the plant is obtained from the Village of Caledonia's well system. Therefore, it is not likely that the groundwater underlying the plant will be used for potable purposes in the foreseeable future.

The Jones plant's southern boundary is located approximately 700 feet from the Village of Caledonia's water supply wells[5]. Based upon groundwater sampling results, it appears that the on-plant production wells are preventing the migration of contaminated groundwater beyond the property boundaries. Should the on-plant production wells cease to operate, the migration of contaminated groundwater beyond the plant boundaries might occur.

SUMMARY OF SITE RISKS

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future Site conditions. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by hazardous

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[4] Source: Letter from Michelle M. Chapman, Code Enforcement Officer, Village of Caledonia, Caledonia, New York, to Joel Singerman, Chief, Central New York Remediation Section, EPA, dated May 23, 2000. (This letter is included in the Administrative Record file for this Site.)

[5] Although the Village of Caledonia's water supply wells were contaminated in the past, they presently meet drinking water standards. It has not been determined that the Site was the source of this contamination.

substance releases from a Site in the absence of any actions to control or mitigate these under current and anticipated future land uses.

The complete risk information for this Site is available in the following documents, which are located in the Administrative Record: *Health Risk Assessment, Jones Chemicals, Inc. Facility, Caledonia, New York* (LFR Levine-Fricke, Inc., September 30, 1999) and *Jones Chemicals Site Risk Assessment for a Hypothetical Off-Plant Direct Contact with Contaminated Groundwater Scenario Where the On-Plant Production Wells Cease to Operate, Allowing the Migration of Contaminated Groundwater Beyond the Plant Boundaries* (U.S. Environmental Protection Agency, July 19, 2000).

Human Health Risk Assessment

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance exposure 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 the Site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

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

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

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of Site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for 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 noncancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which noncancer health effects are not expected to occur.

The baseline risk assessment began with selecting chemicals of concern in the various media that would be representative of Site risks. The primary COCs include PCE, TCE, and 1,2-DCE in the soil and groundwater media (see Table 2).

The potential human receptors evaluated were on-plant workers and off-plant adult and child residents (see Table 3). The baseline risk assessment evaluated the exposure that may potentially impact such receptors.

Based upon groundwater sampling results, it appears that the on-plant production wells are preventing the migration of contaminated groundwater beyond the property boundaries. The risk assessment evaluated the threat posed by a hypothetical off-plant direct contact with contaminated groundwater (*e.g.*, through ingestion of groundwater and inhalation of volatiles released into indoor air from groundwater while showering in an enclosed space) where the on-plant production wells cease to operate, allowing the migration of contaminated groundwater beyond the plant boundaries.

The results of the risk assessment indicate that the estimated excess cancer risks for on-plant workers (see Table 4) and adult off-plant residents (see Table 5) were lower than or within the acceptable excess cancer risk range of 10^{-4} to 10^{-6} (the highest total cancer risk was attributable to an adult off-plant resident at 2.91 x 10^{-5}).

The estimated excess cancer risks for off-plant receptors under the hypothetical future-use scenario where the on-plant production wells are turned off, thus allowing contaminated groundwater to migrate off-plant, poses an unacceptable risk. The carcinogenic risk from exposure to contaminants in the overburden aquifer is 2.0 x 10^{-3} for the adult resident (1.9 x 10^{-3} from ingestion and 1.4 x 10^{-4} from inhalation of volatiles while showering), and 1.3 x 10^{-3} for the child resident (1.1 x 10^{-3} from ingestion and 1.9 x 10^{-4} from inhalation of volatiles while showering). The risk to a resident over the entire exposure duration of 30 years is 3.3 x 10^{-3} (3.0 x 10^{-3} from ingestion and 3.3 x 10^{-4} from inhalation of volatiles while showering). The primary risk driver is PCE. In the assessment of risk from exposure to contaminants in the bedrock aquifer, the carcinogenic risk to the adult resident is 1.6 x 10^{-4} (1.5 x 10^{-4} from ingestion and 1.1 x 10^{-5} from inhalation of volatiles while showering), and the risk to the child resident is 1.0 x 10^{-4} (8.5 x 10^{-5} from ingestion and 1.6 x 10^{-5} from inhalation of volatiles while showering). The risk to a resident over the entire exposure duration of 30 years is 2.6 x 10^{-4} (2.4 x 10^{-4} from ingestion and 2.7 x 10^{-5} from inhalation of volatiles while showering). As is the case with the overburden aquifer, the primary risk driver in the bedrock aquifer is PCE (see Table 6).

Total estimated HI values for individual chemicals and combinations of chemicals under current and future on-plant worker and adult off-plant residents exposure scenarios at the Site range up to a maximum of 0.1939 (attributable to an adult off-plant resident) (see Table 5). Since the total estimated HI is less than unity (1.0), there is not a concern for potential chronic adverse noncancer health effects to such receptors.

The estimated HI for off-plant receptors under the hypothetical future-use direct contact with contaminated groundwater scenario (where the on-plant production wells are turned off) is estimated to exceed unity. In the overburden aquifer, the HI value for the adult resident is 15. For the child resident, the HI is 58. In the bedrock aquifer, the hazard to the adult resident is 1.1, while the hazard to the child resident is 4. (See Table 6.)

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
- 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 uncertainty 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 will actually come in contact with the chemicals of concern, the period of time over which such exposure will occur, and in 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.

Ecological Risk Assessment

Information from the NYSDEC Bureau of Wildlife indicates that there are no endangered or threatened plant or animal species at or in the vicinity of the Site. Therefore, EPA evaluated potential exposure pathways of the chemicals of concern (primarily PCE) for nonendangered and nonthreatened animal and plant species.

Since the Site includes an industrial facility, there is minimal habitat available for ecological receptors; however, the grassy areas could support some soil invertebrates, terrestrial mammals, and birds.

Soil samples from the Former Solvent Tank Source Area contained volatile organic compounds, some of which (*e.g.*, PCE) are present in concentrations greater than conservative screening criteria considered protective of soil invertebrate species. Therefore, there is a potential for an unacceptable risk to burrowing animals that come into contact with these contaminated surface soils (zero to a two-foot depth).

Considering the depth to the surface of the groundwater (not less than 8 feet below the ground surface), direct contact with groundwater by ecological receptors is unlikely. Since there are no wetlands or surface water bodies in the immediate vicinity of the Site, there is no potential for contaminated groundwater to discharge into surface water. Therefore, groundwater is not considered to be an exposure pathway for ecological receptors.

Basis for Action

Based upon the human health and ecological risk assessments, EPA has determined that the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances from the Site into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives 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) and risk-based levels established in the risk assessment.

The following remedial action objectives have been established for the Site:

- Restore groundwater to levels which meet state and federal standards within a reasonable time frame;
- Mitigate the potential for chemicals to migrate from soils into groundwater; and
- Mitigate the migration of the affected groundwater.

DESCRIPTION OF ALTERNATIVES

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

As was noted previously, principal threat wastes are those source materials that act as a reservoir for the migration of contamination to groundwater (such as the DNAPL potentially present in the source area at the Site). Principal threat wastes are those source materials considered to be highly toxic and present a significant risk to human health or the environment should exposure occur, or are highly mobile such that they, generally, cannot be reliably contained. 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. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element[6].

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the FS report. The FS report presents four soil remediation alternatives and five groundwater remediation alternatives. To facilitate the presentation and evaluation of these alternatives, the FS report's nine alternatives were reorganized in formulating the remedial alternatives discussed below.

The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with the responsible parties, or procure contracts for design and construction. The present-worth costs for the alternatives discussed

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[6] *A Guide to Principal Threat and Low Level Threat Wastes*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 9380.3-06FS, November 1991.

below are calculated using a discount rate of seven percent and a 15-year time interval.

The remedial alternatives are:

Soil Remedial Alternatives

Alternative S-1: No Action

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

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative does not include any physical remedial measures that address the contaminated soils in the Former Solvent Tank Source Area.

Because this alternative would result in contaminants remaining on-Site, CERCLA requires that the Site be reviewed at least once every five years. If justified by this assessment, remedial actions may be implemented in the future to remove or treat the waste.

Alternative S-2: Treatment of Contaminated Soils Using Soil Vapor Extraction

Capital Cost:	$365,000
Annual Operation and Maintenance Cost:	$122,000
Present-Worth Cost:	$684,000
Construction Time:	3 months

Under this alternative, VOC-contaminated soils in the Former Solvent Tank Source Area would be remediated by soil vapor extraction (SVE). Under this treatment process, air would be drawn through a series of wells to volatilize the solvents contaminating the soils in the unsaturated zone (above the water table). The extracted vapors would then be treated by granular activated carbon before being vented to the atmosphere.

The approximate dimensions of the source area are 150 feet long, 20 feet wide, and 15 feet deep, yielding an estimated volume of 1,700 cubic yards of contaminated soil.

While the actual period of operation of the SVE system would be based upon soil sampling results which demonstrate that the affected soils have been treated to the soil cleanup objectives as specified in the New York State Technical and Administrative Guidance Memorandum No. 94-HWR-4046 (TAGM), it is estimated that the system would operate for a period of three years.

Fencing would be installed around the source area for the duration of the treatment process to minimize worker exposure.

Alternative S-3: Excavation of Contaminated Soils and Off-Site Treatment/Disposal

Capital Cost:	$3,269,000
Annual Operation and Maintenance Cost:	$0
Present-Worth Cost:	$3,269,000
Construction Time:	1 year

This alternative includes excavating approximately 1,700 cubic yards of soil in the Former Solvent Tank Source Area which exceed soil TAGM objectives. The actual extent of the excavation and the volume of the excavated material would be based on post-excavation confirmatory sampling. Shoring of the excavation and extraction and treatment of any water that enters the trench would be necessary.

The excavated areas would be backfilled with clean fill and revegetated. All excavated material would be characterized and transported for treatment/disposal at an off-Site Resource Conservation and Recovery Act (RCRA)-compliant facility. Because of the high levels of PCE that would be present in the excavated soil, it is likely that incineration would be the only viable form of treatment.

Alternative S-4: Excavation of Contaminated Soils, On-Site Treatment via Low Temperature Thermal Desorption, and Redeposition

Capital Cost:	$1,154,000
Annual Operation and Maintenance Cost:	$0
Present Worth Cost:	$1,154,000
Construction Time:	1 year

This alternative includes excavating approximately 1,700 cubic yards of soil in the Former Solvent Tank Source Area which exceed soil cleanup objectives as specified in the TAGM. The actual extent of the excavation and the volume of the excavated material would be based on post-excavation confirmatory sampling. Shoring of the excavation and extraction and treatment of any water that enters the trench would be necessary.

The excavated soil would be fed to a mobile Low Temperature Thermal Desorption (LTTD) unit brought to the Site, where hot air injected at a temperature above the boiling points of the organic contaminants of concern would allow them to be volatilized into gases and escape from the soil. The organic vapors extracted from the soil would then be either condensed, transferred to another medium (such as granular activated carbon), or thermally treated in an afterburner operated to ensure complete destruction of the volatile organics. The off-gases would be filtered through a carbon vessel. Once the treated soil achieved soil TAGM objectives, it would be tested in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) to determine whether it constitutes a RCRA hazardous waste and, provided that it passes the test, it would be used as backfill material for the excavated area. Soil above TCLP levels would be either re-treated or disposed of at an approved off-Site facility, as appropriate.

Groundwater Remedial Alternatives

Alternative GW-1: No Further Action and Long-Term Monitoring

Capital Cost:	$3,000
Annual Monitoring Cost:	$51,000
Present-Worth Cost:	$633,000
Construction Time:	3 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives.

The no further action remedial alternative would not include any physical remedial measures to address the groundwater contamination at the Site[7]. This alternative would, however include a long-term groundwater monitoring program and the installation of some additional monitoring wells. Under this monitoring program, groundwater samples would be collected and analyzed annually.

Because this alternative would result in contaminants remaining on-Site, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented in the future.

Alternative GW-2: Source Area Extraction and Treatment, Monitored Natural Attenuation of the Plume Outside the Source Area, and Institutional Controls

Capital Cost:	$362,000
Annual Monitoring Cost:	$81,000
Present-Worth Cost:	$1,366,000
Construction Time:	4 months

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[7] Although, since May 1996, contaminated groundwater has been extracted from the North Well and the West Well, used as noncontact cooling water, treated, and discharged, the no further action alternative assumes that groundwater is no longer extracted from these wells.

Under this alternative, the affected groundwater in the Former Solvent Tank Source Area would be addressed through an extraction system in the overburden and bedrock aquifers. It is estimated that the groundwater extraction system would utilize one bedrock and two overburden wells to withdraw 400 gpm of contaminated groundwater. In addition, contaminated groundwater would continue to be extracted from the North Well, which would facilitate the capture of the plume beyond the Former Solvent Tank Source Area. The extracted groundwater would be treated by the existing air stripper and would then be used as noncontact cooling water within the plant prior to being discharged to the on-Site lagoons. To comply with New York State air guidelines, granular activated carbon treatment of the air stripper air exhaust stream may be necessary.

The contaminated groundwater located outside the Former Solvent Tank Source Area and beyond the influence of the North Well would be addressed through monitored natural attenuation, a variety of physical, chemical and biological processes which, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants. Evidence of biodegradation of the PCE in the groundwater at the Site includes the presence of its breakdown products, TCE and 1-2 dichloroethene.

While preliminary modeling results indicate that it may take up to seven years to remediate the aqueous phase of the PCE in the Former Solvent Tank Source Area plume through groundwater extraction and treatment, and from 10 to 15 years for the contaminant plume located outside of the Former Solvent Tank Source Area to be restored through natural attenuation, the total remediation time for this alternative is expected to be much greater, since residual PCE DNAPL is suspected to be present in the Former Solvent Tank Source Area. Groundwater extraction and treatment can be effective in hydraulically containing DNAPL source zones, however, it is generally not completely effective in remediating these zones to groundwater standards.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed quarterly in order to verify that the level and extent of groundwater contaminants (*e.g.*, VOCs) are declining and that conditions are protective of human health and the environment. In addition, biodegradation parameters (*e.g.*, oxygen, nitrate, sulfate, methane, ethane, ethene, alkalinity, redox potential, pH, temperature, conductivity, chloride, and total organic carbon) would be used to assess the progress of the degradation process.

Institutional controls, such as deed restrictions limiting future groundwater use to nonpotable purposes only, would be established. Additionally, because of the potential that pumping of the West Well would draw contaminants to deeper water-bearing zones, pumping from the West Well would be discontinued.

Under this alternative, biodegradation parameters would be used to assess the progress of the degradation process. If it is determined that monitored natural attenuation is not effective in restoring groundwater quality outside of the Former Solvent Tank Source Area in a reasonable time frame, then more aggressive remedial action approaches, such as enhanced reductive dechlorination[8] or groundwater extraction and treatment, may be implemented.

Because this alternative would result in contaminants remaining on-Site, CERCLA requires that the Site be reviewed at least once every five years.

Alternative GW-3: Site-Wide Groundwater Extraction and Treatment, In-Situ Treatment of DNAPL, and Institutional Controls

Capital Cost:	$1,533,000
Annual Operation and Maintenance Cost:	$215,200
Present-Worth Cost:	$3,324,000
Construction Time:	6 months

Under this alternative, the affected groundwater would be addressed through an extraction system in the overburden and bedrock aquifers. It is estimated that the groundwater extraction system would utilize 10 overburden and six bedrock wells to withdraw 1,200 gpm of contaminated groundwater. These wells would be placed northeast of the lagoon system and in the vicinity of the Former Solvent Tank Source

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[8] Under this process, microbes remove the chlorine from the VOCs, allowing the compounds to further degrade into carbon dioxide and water.

Area. In addition, contaminated groundwater would continue to be extracted from the North Well, which would facilitate the capture of the plume beyond the Former Solvent Tank Source Area. A portion of the extracted water would be treated by the existing air stripper and would be used as noncontact cooling water within the plant prior to being discharged to the on-Site lagoons.

Because the present capacity of the air stripper would be exceeded, an additional air stripper would be constructed to treat the balance of the extracted groundwater. The treated water that was not used for noncontact cooling would be discharged to an infiltration gallery to be constructed to the northeast of the lagoon system. To comply with New York State air guidelines, granular activated carbon treatment of the air strippers' air exhaust streams may be necessary.

Preliminary modeling results indicate that, through groundwater extraction and treatment, it may take up to seven years to remediate the aqueous phase of the PCE in the Former Solvent Tank Source Area plume and up to eight years to remediate the contaminant plume located outside of the Former Solvent Tank Source Area.

To enhance the treatment of the residual DNAPL in the bedrock beneath the Former Solvent Tank Source Area, an oxidizing agent, such as potassium permanganate ($KMnO_4$) or hydrogen peroxide (H_2O_2), would be injected via a well. It has been estimated that the residual DNAPL would be treated within five years.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed quarterly in order to verify that the level and extent of groundwater contaminants (*e.g.*, VOCs) are declining and that conditions are protective of human health and the environment.

Institutional controls, such as deed restrictions limiting future groundwater use to nonpotable purposes only, would be established. Additionally, because of the potential that pumping of the West Well would draw contaminants to deeper water-bearing zones, pumping from the West Well would be discontinued.

Because this alternative would result in contaminants remaining on-Site above health-based levels, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented in the future.

Alternative GW-4: Source Area Extraction and Treatment, In-Situ Treatment of DNAPL, Monitored Natural Attenuation of the Plume Outside the Source Area, and Institutional Controls

Capital Cost:	\$479,000
Annual Monitoring Cost:	\$115,000
Present-Worth Cost:	\$1,623,000
Construction Time:	4 months

This alternative would be the same as Alternative GW-2, except, to enhance the treatment of the residual DNAPL in the bedrock beneath the Former Solvent Tank Source Area, an oxidizing agent, such as $KMnO_4$ or H_2O_2, would be injected via a well.

Preliminary modeling results indicate it may take up to seven years to remediate the aqueous phase of the PCE in the Former Solvent Tank Source Area plume through groundwater extraction and treatment and from 10 to 15 years for the contaminant plume located outside of the Former Solvent Tank Source Area to be restored through natural attenuation. It has been estimated that the residual DNAPL would be treated within five years.

Under this alternative, biodegradation parameters would be used to assess the progress of the degradation process. If it is determined that monitored natural attenuation is not effective in restoring groundwater quality outside of the Former Solvent Tank Source Area in a reasonable time frame, then more aggressive remedial action approaches, such as enhanced reductive dechlorination or groundwater extraction and treatment, may be implemented.

Because this alternative would result in contaminants remaining on-Site above health-based levels, CERCLA requires that the Site be reviewed at least once every five years.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, EPA considered the factors set out in CERCLA Section 121, 42 U.S.C. §9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR §300.430(e)(9) and OSWER Directive 9355.3-01 (*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA: Interim Final*, October 1988). The detailed analysis consisted 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.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

1. *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.

2. Compliance with ARARs 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. Other federal or state advisories, criteria, or guidance are To-Be-Considered (TBCs). TBCs are not required by the NCP, but may be very useful in determining what is protective of a Site or how to carry out certain actions or requirements.

The following "primary balancing" criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

3. *Long-term effectiveness and permanence* refers 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.

4. *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.

5. *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.

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

7. *Cost* includes estimated capital and O&M costs, and net present-worth costs.

The following "modifying" criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may prompt modification of the preferred remedy that was presented in the Proposed Plan:

8. *State acceptance* indicates whether, based on its review of the RI/FS reports and Proposed Plan, the State concurs with, opposes, or has no comments on the selected remedy.

9. *Community acceptance* refers to the public's general response to the alternatives described in the RI/FS reports and Proposed Plan.

A comparative analysis of these alternatives based upon the evaluation criteria noted above, follows.

Overall Protection of Human Health and the Environment

Alternative S-1 (no action) would not be protective of human health and the environment, since it would not actively address the contaminated soils, which are a source of groundwater contamination.

Alternative S-2 (soil vapor extraction), Alternative S-3 (excavation of contaminated soils and off-Site treatment/disposal), and Alternative S-4 (excavation of contaminated soils and on-Site treatment via LTTD) would be protective of human health and the environment, since each alternative relies upon a remedial strategy and/or treatment technology capable of removing the source of groundwater contamination in the unsaturated zone. Under these alternatives, the contaminants would either be treated on-Site or treated/disposed of off-Site.

Alternative GW-1 (no further action) would be the least protective groundwater alternative in that it would result in no affirmative steps to restore groundwater quality to drinking water standards. Therefore, under this alternative, the restoration of the groundwater would take a significantly longer time in comparison to Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the remainder of the plume), Alternative GW-3 (Site-wide extraction and treatment of the contaminated groundwater and in-situ DNAPL treatment), and Alternative GW-4 (source area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume). Alternative GW-2 would be significantly more protective than Alternative GW-1 in that it would provide hydraulic containment and treatment of the affected groundwater at the source. This alternative would, however, rely upon natural attenuation to address the groundwater contamination outside the Former Solvent Tank Source Area. While Alternative GW-4 would result in the restoration of water quality in the aquifer more effectively than Alternative GW-2, since it would actively address the DNAPL, it would not restore the water quality in the plume as quickly as Alternative GW-3.

Compliance with ARARs

There are currently no federal or state promulgated standards for contaminant levels in soils, only New York State soil cleanup objectives as specified in the TAGM (which are used as TBCs). Table 7 summarizes the soil cleanup objectives for the contaminants that are present in the soil at the Site.

Since the contaminated soils would not be addressed under Alternative S-1 (no action), this alternative would not comply with the soil cleanup objectives. Alternative S-2 (soil vapor extraction), Alternative S-3 (excavation of contaminated soils and off-Site treatment/disposal), and Alternative S-4 (excavation of contaminated soils and on-Site treatment via LTTD) would be implemented to attain the soil cleanup objectives specified in TAGM.

Under Alternative S-2, spent granular activated carbon from the SVE units would need to be managed in compliance with RCRA treatment/disposal requirements.

Alternative S-3 would be subject to New York State and federal regulations related to the transportation and off-Site treatment/disposal of wastes. Alternatives S-3 and S-4 would involve the excavation of contaminated soils, and would, therefore, require compliance with fugitive dust and VOC emission regulations. In the case of Alternative S-4, compliance with air emission standards would be required at the LTTD unit, as well. Specifically, treatment of off-gases would have to comply with New York State Air Guide 1 for the Control of Toxic Ambient Air Emissions and would be required 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.*).

EPA and NYSDEC have promulgated health-based protective Maximum Contaminant Levels (MCLs)(40 CFR Part 141), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). Although the groundwater at the Site is not presently being utilized as a potable water source, achieving MCLs in the groundwater is relevant and appropriate, because the groundwater at the Site is a potential source of drinking water. Table 7 summarizes the MCLs for the constituents present in the groundwater at the Site. The aquifer is classified as Class GA (6 NYCRR 701.18).

Alternative GW-1 (no further action) does not provide for any direct remediation of the groundwater and would, therefore, involve no actions to achieve chemical-specific ARARs. Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the remainder of the plume) would be effective in reducing groundwater contaminant concentrations below MCLs in the Former Solvent Tank Source Area by treating the dissolved-phase chemicals and hydraulically containing the affected groundwater at the source; however, this alternative would not be as effective in meeting ARARs as Alternative GW-4 (source area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume), which would employ a more aggressive approach to addressing the DNAPL. Both alternatives would rely upon natural attenuation to address a portion of the contaminated groundwater in the plume. Alternative GW-3 (Site-wide groundwater extraction and treatment and in-situ DNAPL treatment) would be the most effective in reducing groundwater contaminant concentrations below MCLs, since it would include an aggressive approach to address the DNAPL and would include the collection and treatment of contaminated groundwater throughout the Site. Therefore, this alternative would achieve ARARs in the shortest period of time.

Long-Term Effectiveness and Permanence

Alternative S-1 (no action) would involve no active remedial measures and, therefore, would not be effective in eliminating the potential for contaminants to continue to migrate in soil and groundwater. Alternative S-2 (soil vapor extraction), Alternative S-3 (excavation of contaminated soils and off-Site treatment/disposal), and Alternative S-4 (excavation of contaminated soils and on-Site treatment via LTTD) would all be effective in the long term and would provide permanent remediation by either removing the wastes from the Site or treating them on-Site.

Alternatives S-2 and S-4 would generate treatment residuals which would have to be appropriately handled; Alternative S-3 would not generate such residuals.

Alternative GW-1 (no further action) would be only minimally effective in the long-term in restoring groundwater quality, since it would not rely on active measures. Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the remainder of the plume) would be significantly more effective than Alternative GW-1 in restoring groundwater quality. Although groundwater extraction and treatment can be effective in hydraulically containing DNAPL source zones, it is generally not completely effective in remediating these zones to groundwater standards. Therefore, since Alternative GW-2 would rely upon groundwater extraction to address the residual DNAPL, it would not be as effective as Alternative GW-3 (Site-wide groundwater extraction and treatment and in-situ DNAPL treatment) and Alternative GW-4 (source area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the remaining plume), which both would utilize aggressive in-situ DNAPL treatment. Under Alternative GW-4, by aggressively addressing the contamination at the source area, it is expected that low levels of PCE (less than 22 µg/l) outside the source area would attenuate naturally in a reasonable time frame. Alternative GW-4 would not, however, provide the same long-term effectiveness and permanence with regard to this contamination as Alternative GW-3, which would actively remove contaminants from the entire plume. Alternative GW-3 would achieve drinking water standards outside the Former Solvent Tank Source Area more quickly than Alternative GW-4.

Alternatives GW-2, GW-3, and GW-4 would generate treatment residuals which would have to be appropriately handled; Alternative GW-1 would not generate such residuals.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative S-1 (no action) would provide no reduction in toxicity, mobility or volume. Under Alternative S-2 (soil vapor extraction) and Alternative S-4 (excavation of contaminated soils and on-Site treatment via LTTD), the toxicity, mobility, and volume of contaminants would be reduced through on-Site treatment. Under Alternative S-3 (excavation of contaminated soils and off-Site treatment/disposal), the toxicity, mobility, and volume of the contaminants would be reduced by removing the contaminated soil from the Site for treatment.

Alternative GW-1 (no further action) would be the least effective alternative in reducing the toxicity, mobility, or volume of contaminants in the groundwater through treatment, as this alternative involves no active remedial measures. All of the action alternatives would, to varying degrees, reduce the toxicity, mobility, or volume of contaminants in the groundwater through treatment, thereby satisfying CERCLA's preference for treatment. Collecting and treating contaminated groundwater in the Former Solvent Tank Source Area under Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the plume) would actively reduce the toxicity, mobility, and volume of contaminants in this area. The addition of an oxidizing agent to address the DNAPL under Alternative GW-4 (source area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume) would provide substantially greater reduction of the toxicity, mobility, and volume of contaminants than Alternative GW-2. Collecting and treating contaminated groundwater in the Former Solvent Tank Source Area and the remaining plume, and using an oxidizing agent to address the DNAPL under Alternative GW-3 (Site-wide groundwater extraction and treatment and in-situ DNAPL treatment) would provide the greatest reduction of toxicity, mobility, and volume of contaminants through treatment.

Short-Term Effectiveness

Alternative S-1 (no action) does not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to on-Site workers or the community as a result of its implementation. Alternative S-2 (soil vapor extraction) could result in some adverse impacts to on-Site workers through dermal contact and inhalation related to the installation of SVE wells through contaminated soils. In addition, interim and post-remediation soil sampling activities would pose some risk. Similarly, Alternatives S-3 (excavation of contaminated soils and off-Site treatment/disposal) and S-4 (excavation of contaminated soils and on-Site treatment via LTTD) could present some limited adverse impact to on-Site workers through dermal contact and inhalation related to post-excavation sampling activities. The risks to on-Site workers under all of the alternatives could, however, be mitigated by utilizing proper protective equipment.

Alternative S-3 would require the off-Site transport of contaminated waste material, which may pose the potential for traffic accidents, which could result in releases of hazardous substances.

Under Alternatives S-3 and S-4, disturbance of the land during excavation activities could affect the surface water hydrology of the Site. There is a potential for increased stormwater runoff and erosion during excavation and construction activities that would have to be properly managed to prevent or minimize any adverse impacts. For these alternatives, appropriate measures would have to be taken during excavation activities to prevent transport of fugitive dust and exposure of workers and downgradient receptors to volatile organic compounds.

Since no actions would be performed under Alternative S-1, there would be no implementation time. It is estimated that Alternative S-2 would require 3 months to install the SVE system and would require an estimated 3 years to achieve soil cleanup objectives. It is estimated that it would take one year to excavate and transport the contaminated soils to an EPA-approved treatment/disposal facility under Alternative S-3, and one year to excavate and treat the contaminated soils under Alternative S-4.

All of the groundwater alternatives could present some limited adverse impacts to on-Site workers through dermal contact and inhalation related to groundwater sampling activities. Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the plume), Alternative GW-3 (Site-wide groundwater extraction and treatment and in-situ DNAPL treatment), and Alternative GW-4 (source area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume) could present slightly greater adverse impacts to on-Site workers, since these alternatives would involve the installation of extraction wells through potentially contaminated soils and groundwater. (Alternative GW-3 could pose the greatest risk since it would require the installation of the most extraction wells.) The risks to on-Site workers under all of the alternatives could, however, be minimized by utilizing proper protective equipment.

It is estimated that Alternative GW-1 would require three months to implement, since developing a long-term groundwater monitoring program and installing several monitoring wells would be the only activities that would be required. It is estimated that the groundwater remediation systems under Alternatives GW-2, GW-3, and GW-4 would be constructed in four, six, and four months, respectively.

Preliminary modeling results indicate it may take up to seven years to remediate the aqueous phase of the PCE in the Former Solvent Tank Source Area plume under Alternatives GW-2, GW-3, and GW-4. Residual PCE DNAPL is suspected to be present in the Former Solvent Tank Source Area. While groundwater extraction and treatment can be effective in hydraulically containing DNAPL source zones, it is generally not completely effective in remediating these zones to groundwater standards. Therefore, for Alternative GW-2, it is likely that the total remediation time frame for the aqueous phase of the PCE in the Former Solvent Tank Source Area plume would be significantly greater than the estimated 7-year time frame.

Under Alternative GW-3, it is estimated that it may take up to eight years to remediate the contaminant plume located outside of the Former

Solvent Tank Source Area through extraction and treatment. Under Alternatives GW-2 and GW-4, it is estimated that natural attenuation would address the contaminated groundwater located outside of the Former Solvent Tank Source Area in 10 to 15 years. Remediation time frames were not developed for Alternative GW-1 because of the difficulties in estimating a natural attenuation rate for the DNAPL in the Former Solvent Tank Source Area.

Under Alternatives GW-3 and GW-4, it is estimated that it would take five years to remediate the DNAPL via $KMnO_4$ or H_2O_2 injection.

The estimated time for the groundwater to be remediated Site-wide under all of the alternatives would have to be refined based on the results of groundwater monitoring and additional groundwater modeling.

Implementability

Alternative S-1 (no action) would be easy to implement, as there are no activities to undertake. Alternative S-2 (soil vapor extraction), would be less difficult to implement than Alternative S-3 (excavation of contaminated soils and off-Site treatment) and Alternative S-4 (excavation of contaminated soils and on-Site treatment via LTTD), since contaminated soil excavation and handling would not be required. All three action alternatives would employ technologies known to be reliable and can be readily implemented. In addition, equipment, services, and materials needed for all three of these alternatives are readily available, and the actions under these alternatives would be administratively feasible. Sufficient facilities are available for the treatment/disposal of the excavated soils under Alternative S-3.

Monitoring the effectiveness of the SVE system under Alternative S-2 would be easily accomplished through vapor and soil sampling and analysis. Under Alternative S-3, monitoring the effectiveness of the excavation could be easily accomplished through post-excavation soil sampling and analysis. Monitoring the effectiveness of the LTTD system under Alternative S-4 could be easily accomplished through post-excavation and post-treatment soil sampling and analysis.

Alternative GW-1 (no further action) would be the easiest to implement as the only activity would be installing some additional monitoring wells and establishing a monitoring program. Since only a limited number of extraction wells would need to be installed, and since the existing groundwater treatment system would be utilized, the groundwater extraction systems related to Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the plume) and

Alternative GW-4 (source area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume) would be relatively easy to implement. Alternative GW-3 (Site-wide groundwater extraction and treatment and in-situ DNAPL treatment), which would require the installation of more extraction wells than Alternatives GW-2 and GW-4 and the construction of an additional treatment system, would be slightly more difficult to implement than these alternatives.

Alternatives GW-2 and GW-4 would also involve monitoring of natural attenuation parameters to demonstrate that natural attenuation is reliably achieving the specified remedial goals. Alternatives GW-3 and GW-4 would be more complicated to implement than Alternative GW-2, since they would also require the injection of $KMnO_4$ or H_2O_2 to address the PCE DNAPL.

The groundwater extraction and treatment systems that would be used for Alternatives GW-2, GW-3, and GW-4 have been implemented successfully at numerous Sites to extract, treat, and hydraulically control contaminated groundwater.

The air stripping technology that would be used for Alternatives GW-2, GW-3, and GW-4 is proven and reliable in achieving the specified performance goals and is readily available.

The $KMnO_4$ or H_2O_2 injection technologies that would be used for Alternative GW-4 are emerging technologies that have been successfully implemented at a few Sites across the United States to treat DNAPL. Mixing tanks for $KMnO_4$, and injection pumps and all necessary appurtenances for $KMnO_4$ and H_2O_2 are readily available. Field tests may be required prior to designing a full-scale system. While utilizing $KMnO_4$ would likely result in the introduction of trace metal impurities and manganese salts into the groundwater, it is expected that the levels would be below groundwater standards.

Cost

The present-worth costs associated with the soil remedies are calculated using a discount rate of seven percent and a 3-year time interval. The present-worth costs associated with the groundwater remedies are calculated using a discount rate of seven percent and a 15-year time interval.

The estimated capital, operation, maintenance, and monitoring (OM&M), and present-worth costs for each of the alternatives are presented below.

Alternative	Capital Cost	Annual OM&M Cost	Present-Worth Cost
S-1	$0	$0	$0
S-2	$365,000	$122,000	$684,000
S-3	$3,269,000	$0	$3,269,000
S-4	$1,154,000	$0	$1,154,000
GW-1	$3,000	$51,000	$633,000
GW-2	$362,000	$81,000	$1,366,000
GW-3	$1,533,000	$215,200	$3,324,000
GW-4	$479,000	$115,000	$1,623,000

As can be seen by the cost estimates, Alternative S-1 (no action) is the least costly soil alternative at $0. Alternative S-3 (excavation of contaminated soils and off-Site treatment) is the most costly soil alternative at $3,269,000. The least costly groundwater remedy is Alternative GW-1, no further action, at a present-worth cost of $630,000. Alternative GW-3 (Site-wide groundwater extraction and treatment and in-situ DNAPL treatment) is the most costly groundwater alternative at a present-worth cost of $3,324,000. The significant difference in the cost of this alternative as compared to the other action alternatives is mainly attributable to the construction and operation of an additional groundwater treatment system under Alternative GW-3.

State Acceptance

NYSDEC concurs with the selected remedy; a letter of concurrence is attached (see Appendix IV).

Community Acceptance

Comments received during the public comment period indicate that the public generally supports the selected remedy.

Comments received during the public comment period are summarized and addressed in the Responsiveness Summary, which is attached as Appendix V to this document.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, EPA and NYSDEC have determined that Alternative S-2 (SVE) and Alternative GW-4 (Former Solvent Tank Source Area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume outside of the Former Solvent Tank Source Area) best satisfy the requirements of CERCLA Section 121, 42 U.S.C. §9621 and provide the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, 40 CFR §300.430(e)(9).

While all of the soil action alternatives would effectively achieve the soil cleanup levels, Alternative S-3, excavation of contaminated soils and off-Site treatment/disposal, and Alternative S-4, excavation and on-Site treatment, would be considerably more expensive than Alternative S-2. On the other hand, Alternative S-2 would take somewhat longer to achieve the soil cleanup objectives than the other action alternatives (3 years for SVE, as compared to 1 year for excavation and off-Site treatment/disposal and 1 year for on-Site treatment). While the contaminated soils are a continuing source of groundwater contamination, there are no immediate risks to human health or ecological risks posed by the contaminated soils. Considering the fact that the groundwater component of the selected remedy will address the contaminated groundwater, the increase in the time needed to clean up the soil will not be a significant concern. Therefore, EPA believes that Alternative S-2 will effectuate the soil cleanup while providing the best balance of tradeoffs among the alternatives with respect to the evaluating criteria.

Residual PCE DNAPL is suspected to be present in the bedrock aquifer underlying the Former Solvent Tank Source Area. While Alternative GW-2 (source area extraction and treatment and monitored natural attenuation of the remainder of the plume) would be effective in hydraulically containing the DNAPL source zone, it would not likely be effective in remediating this zone to groundwater standards.

Although Alternative GW-3 would provide Site-wide groundwater extraction and treatment, making it the most effective groundwater remediation alternative, EPA believes that Alternative GW-4 will result in the remediation of the contaminated groundwater located both in the Former Solvent Tank Source Area and outside of the Former Solvent Tank Source Area via a combination of in-situ treatment of the DNAPL, groundwater extraction and treatment, and monitored natural attenuation, respectively, in a reasonable time frame and at a significantly lower cost than *groundwater extraction and treatment under* Alternative GW-3.

Description of the Selected Remedy

The selected remedy involves:

- Treatment of soils in the Former Solvent Tank Source Area at the Jones plant grounds exceeding New York State soil cleanup objectives by in-situ SVE;
- Extraction of contaminated groundwater in the Former Solvent Tank Source Area utilizing a network of recovery wells in the overburden and bedrock aquifers;
- Treatment of the extracted groundwater with the existing air stripper, which allows for the utilization of the treated water as noncontact cooling water within the plant, and discharge of the noncontact cooling water to the on-Site lagoons until groundwater standards in the Former Solvent Tank Source Area are achieved;
- In-situ treatment of the DNAPL in the aquifer underlying the Former Solvent Tank Source Area with an oxidizing agent, such as $KMnO_4$ or H_2O_2;
- Continued extraction and treatment of contaminated groundwater from the North Well;
- Discontinued pumping from the West Well to eliminate the potential to draw contaminants to deeper water-bearing zones;
- Monitored natural attenuation of the contaminated groundwater located outside the Former Solvent Tank Source Area and beyond the influence of the North Well; and
- Implementation of institutional controls (*i.e.*, deed restrictions) to limit future on-Site groundwater use to nonpotable purposes only until groundwater cleanup standards are achieved.

During the design phase, samples will be collected to optimize the placement of the extraction wells in the Former Solvent Tank Source Area and to better characterize the extent of the DNAPL contamination.

As part of a long-term groundwater monitoring program, groundwater samples will be collected and analyzed quarterly in order to verify that the level and extent of groundwater contaminants (*e.g.*, volatile organic compounds) are declining and that conditions are protective of human health and the environment. In addition, biodegradation parameters (*e.g.*, oxygen, nitrate, sulfate, methane, ethane, ethene, alkalinity, redox potential, pH, temperature, conductivity, chloride, and total organic carbon) will be used to assess the progress of the degradation process. If it is determined that monitored natural attenuation is not effective in restoring groundwater quality outside of the Former Solvent Tank Source Area in a reasonable time frame, then remedial actions, such as enhanced reductive dechlorination[9] or groundwater extraction and treatment, may be implemented.

The selected remedy is believed to be able to achieve the ARARs more quickly, or as quickly as the other alternatives, but at a lower cost. Therefore, the selected remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria. EPA and the NYSDEC believe that the selected remedy will be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy will meet the statutory preference for the use of treatment as a principal element.

Summary of the Estimated Remedy Costs

The estimated capital, annual O&M, and present-worth costs for the selected soil remedy are $365,000, $122,000, and $684,000, respectively. The estimated capital, annual O&M and monitoring, and present-worth costs for the selected groundwater remedy are $479,000, $115,000, and $1,623,000, respectively. Tables 8 and 9 provide the basis for these cost estimates.

It should be noted that these cost estimates are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project cost. These cost estimates are based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedy.

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[9] Under this process, microbes remove the chlorine from the VOCs, allowing the compounds to further degrade into carbon dioxide and water.

Expected Outcomes of the Selected Remedy

The results of the risk assessment indicate that under the hypothetical off-plant groundwater-use scenario, where the on-plant production wells are turned off, there is an unacceptable excess cancer risk and a chronic adverse noncancer health effect to such receptors. In addition, the ecological risk assessment indicated that the presence of contaminated surface soil in the Former Solvent Tank Source Area poses a potentially unacceptable risk to ecological receptors.

Under the selected remedy, the treatment of the contaminated soils, which will eliminate the source of the groundwater contamination, in combination with groundwater extraction and treatment in the source area, in-situ DNAPL treatment, and monitored natural attenuation of the groundwater outside the source area, will result in the restoration of water quality in the aquifer. The treatment of the contaminated soils will also eliminate the potential threat to ecological receptors.

The plant is presently used for light industry, and the plant's reasonably-anticipated future land use is industrial. Therefore, it is not anticipated that achieving the performance standards will alter that land use in the future. In addition, although on-plant wells provide noncontact cooling water for the plant after treatment, potable water for the plant is obtained from the Village of Caledonia's well system. Therefore, it is not likely that the groundwater underlying the plant will be used for potable purposes in the foreseeable future. Beyond the plant's property boundary, downgradient water supply wells could be used for potable purposes at present and in the future (until groundwater standards are met on-plant), due to the continued operation of the plant's production wells.

Under the selected remedy, it is estimated that it will require 3 years to achieve soil cleanup objectives and 10 to 15 years to achieve groundwater standards both in the Former Solvent Tank Source Area and beyond.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies 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 a Site.

For the reasons discussed below, EPA has determined that the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy will be protective of the environment in that the treatment of contaminated soil will eliminate contaminant-related concerns related to ecological receptors and will eliminate the source of the groundwater contamination. Groundwater extraction and treatment, in-situ DNAPL treatment in the Former Solvent Tank Source Area, and monitored natural attenuation of the groundwater outside the Former Solvent Tank Source Area will eventually achieve groundwater standards. The selected remedy will reduce exposure levels to protective ARAR levels or to within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for noncarcinogens in the groundwater. The implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts that cannot possibly be mitigated. The selected remedy will also provide overall protection by reducing the toxicity, mobility, and volume of contamination through the treatment of the contaminated soils and the extraction/treatment of the contaminated groundwater.

Compliance with Applicable or Relevant and Appropriate Requirements of Environmental Laws

While there are no federal or New York State soil ARARs, one of the remedial action goals is to meet NYSDEC soil cleanup objectives as TBCs. A summary of action-specific, chemical-specific, and location-specific ARARs which will be complied with during implementation of the selected remedy is presented below.

Action-specific ARARs:

- National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61)
- 6 NYCRR Part 257, Air Quality Standards
- 6 NYCRR Part 200, New York State Regulations for Prevention and Control of Air Contamination and Air Pollution

- 6 NYCRR Part 376, Land Disposal Restrictions
- 40 CFR 50, Air Quality Standards
- New York State Pollutant Discharge Elimination System (6 NYCRR Parts 750-758)
- Resource Conservation and Recovery Act (42 U.S.C. § 6901 *et seq.*)

Chemical-specific ARARs:

- Safe Drinking Water Act (SDWA) MCLs and nonzero MCLGs (40 CFR Part 141)
- 6 NYCRR Parts 700-705 Groundwater and Surface Water Quality Regulations
- 10 NYCRR Part 5 State Sanitary Code

Location-specific ARARs:

- Fish and Wildlife Coordination Act, 16 U.S.C. 661

Other Criteria, Advisories, or Guidance To-Be-Considereds (TBCs):

- New York State Air Guide—1 for the Control of Toxic Ambient Air Emissions
- New York *Guidelines for Soil Erosion and Sediment Control*
- New York State Air Cleanup Criteria, January 1990
- SDWA Proposed MCLs and nonzero MCL Goals
- NYSDEC Technical and Operational Guidance Series 1.1.1, November 1991
- Soil cleanup objectives specified in NYSDEC Technical Administrative Guidance Memorandum No. 94-HWR-4046.

Cost-Effectiveness

For the foregoing reasons, it has been determined that the selected remedy provides for overall effectiveness in proportion to its cost.

The estimated present-worth cost of the soil component of the selected remedy is $684,000.

While all of the soil action alternatives would effectively achieve the soil cleanup levels, Alternative S-3, excavation of contaminated soils and off-Site treatment/disposal, and Alternative S-4, excavation and on-Site treatment, would be considerably more expensive than Alternative S-2, the selected soil alternative. On the other hand, Alternative S-2 will take somewhat longer to achieve the soil cleanup objectives than the other action alternatives (3 years for SVE, as compared to 1 year for excavation and off-Site treatment/disposal and 1 year for on-Site treatment). While the contaminated soils are a continuing source of groundwater contamination, there are no immediate risks to human health or ecological risks posed by the contaminated soils. Considering the fact that the groundwater component of the selected remedy will address the contaminated groundwater, the increase in the time needed to clean up the soil will not be a significant concern. Therefore, EPA believes that Alternative S-2 will effectuate the soil cleanup while providing the best balance of tradeoffs among the alternatives with respect to the evaluating criteria.

The estimated present-worth cost of the groundwater component of the selected remedy, using a discount rate of seven percent and a 15-year time interval, is $1,623,000. Although Alternative GW-3 would provide Site-wide groundwater extraction and treatment, making it the most effective groundwater remediation alternative, EPA believes that Alternative GW-4 will result in the remediation of the contaminated groundwater located both in the Former Solvent Tank Source Area and outside of the Former Solvent Tank Source Area via a combination of in-situ treatment of the DNAPL, groundwater extraction and treatment, and monitored natural attenuation in a reasonable time frame and at a significantly lower cost than groundwater extraction and treatment under Alternative GW-3.

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

The selected remedy provides the best balance of tradeoffs among the alternatives with respect to the five balancing criteria set forth in NCP §300.430(f)(1)(i)(B), such that it represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site.

The soil component of the selected remedy will employ an alternative treatment technology (SVE) to reduce the toxicity, mobility, and volume of the contaminants in the soil in the Former Solvent Tank Source Area. The selected remedy will permanently address this soil contamination.

With regard to the groundwater, the selected remedy will provide a permanent remedy and will employ treatment technologies to reduce the toxicity, mobility, and volume of the contaminants in the groundwater.

Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a principal element is satisfied under the selected remedy in that contaminated soils will be treated in-situ and treatment will be used to reduce the volume of contaminated groundwater in the aquifer and achieve cleanup goals.

Five-Year Review Requirements

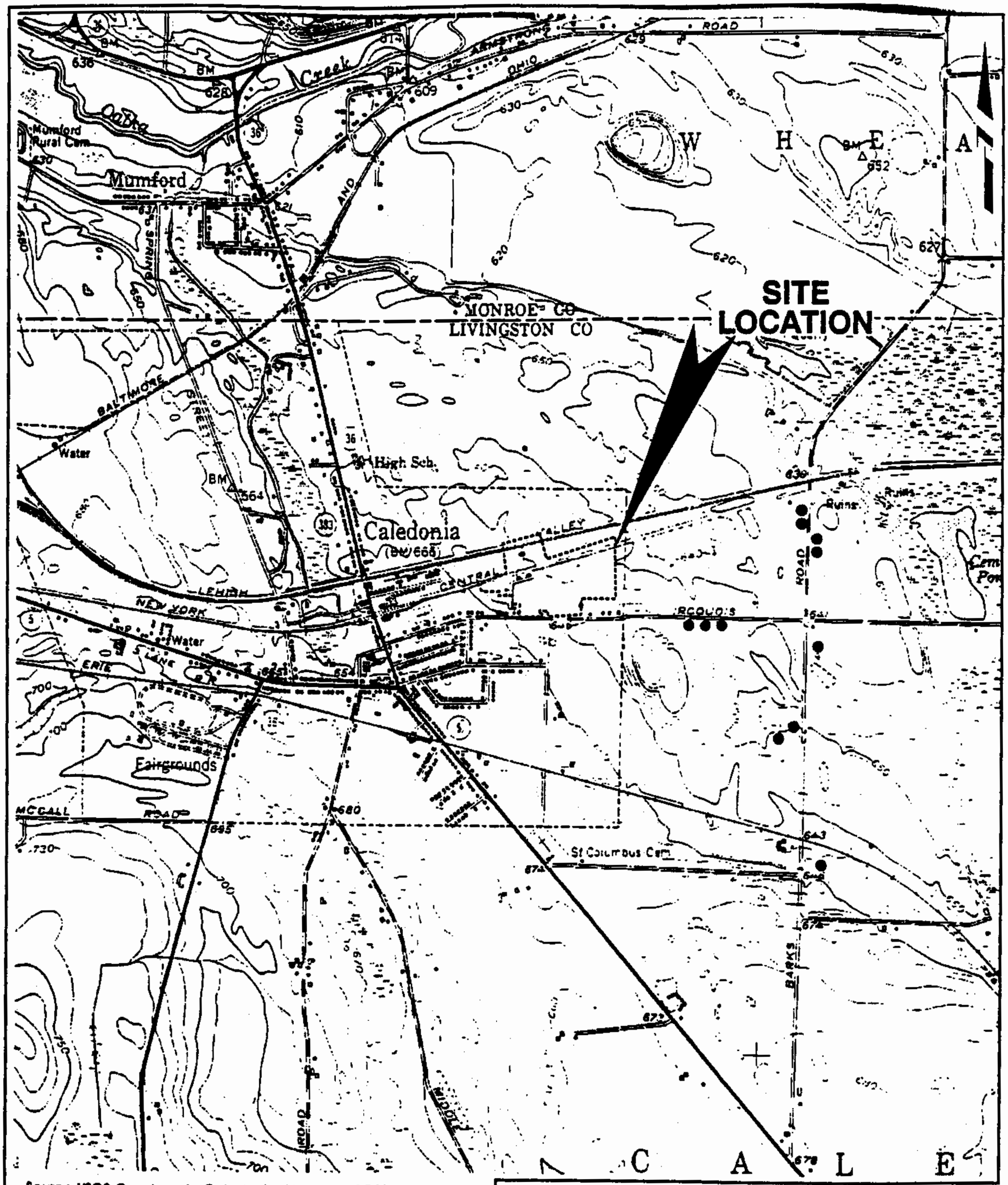
The selected remedy, once fully implemented, will not result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure. However, it may take more than five years to attain remedial action objectives and cleanup levels for the groundwater. Consequently, a policy review may be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan, released for public comment on July 20, 2000, identified Alternative S-2, SVE, for the soil remedy. For the groundwater remedy, it identified Alternative GW-4, Former Solvent Tank Source Area extraction and treatment, in-situ DNAPL treatment, and monitored natural attenuation of the plume outside of the Former Solvent Tank Source Area. Based upon its review of the written and verbal comments submitted during the public comment period, EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

APPENDIX I
FIGURES

FIGURES



Source USGS Quadrangle Caledonia, New York, 1950.
Photorevised 1987.

LEGEND

● Residential wells sampled NYSDOH, 1996.

0 2000 FEET

JCI/Jones Chemicals, Inc.

Site Location Map

LFR
LEVINE · FRICKE
Project No. 3165.01

Figure 1

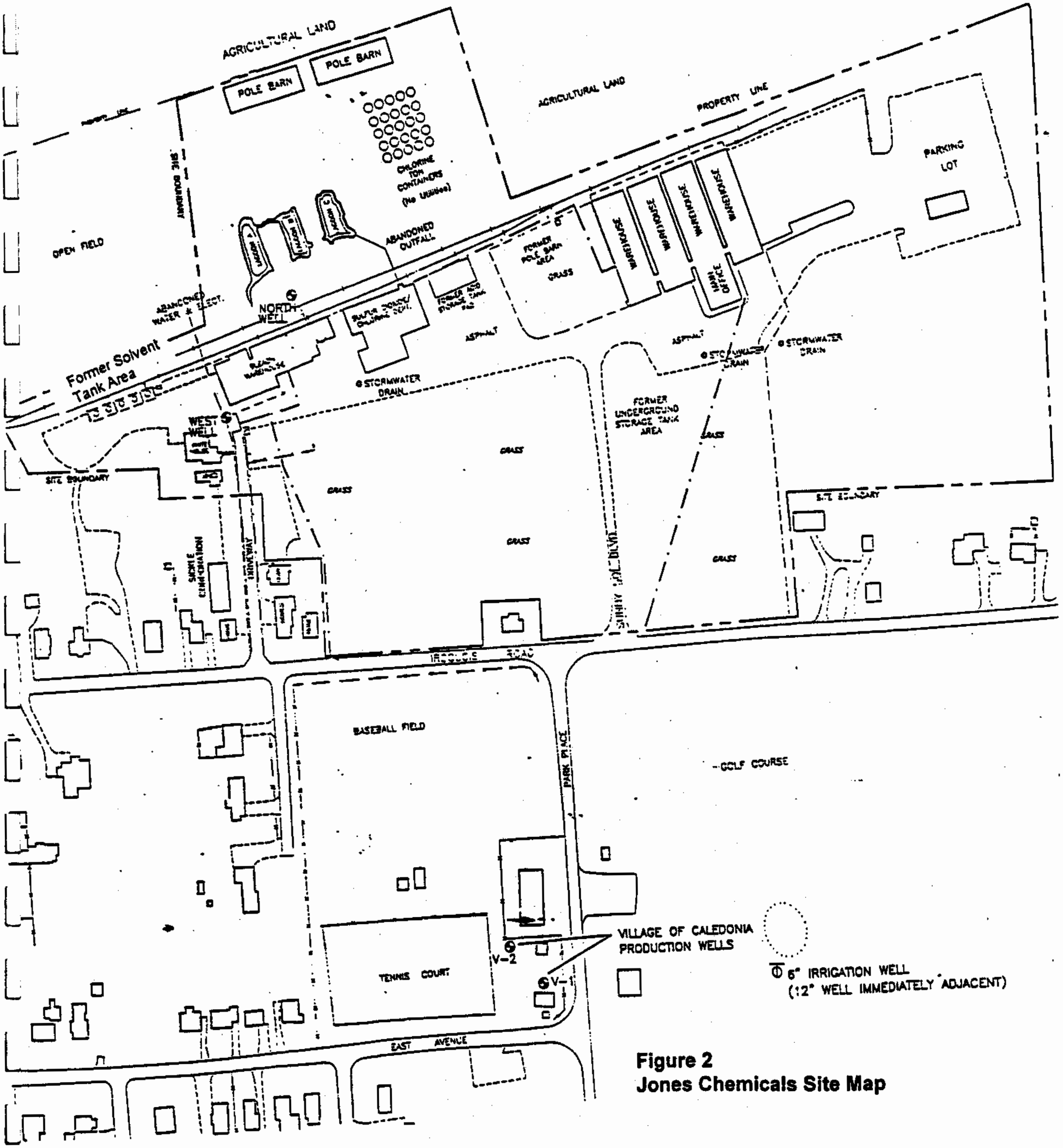
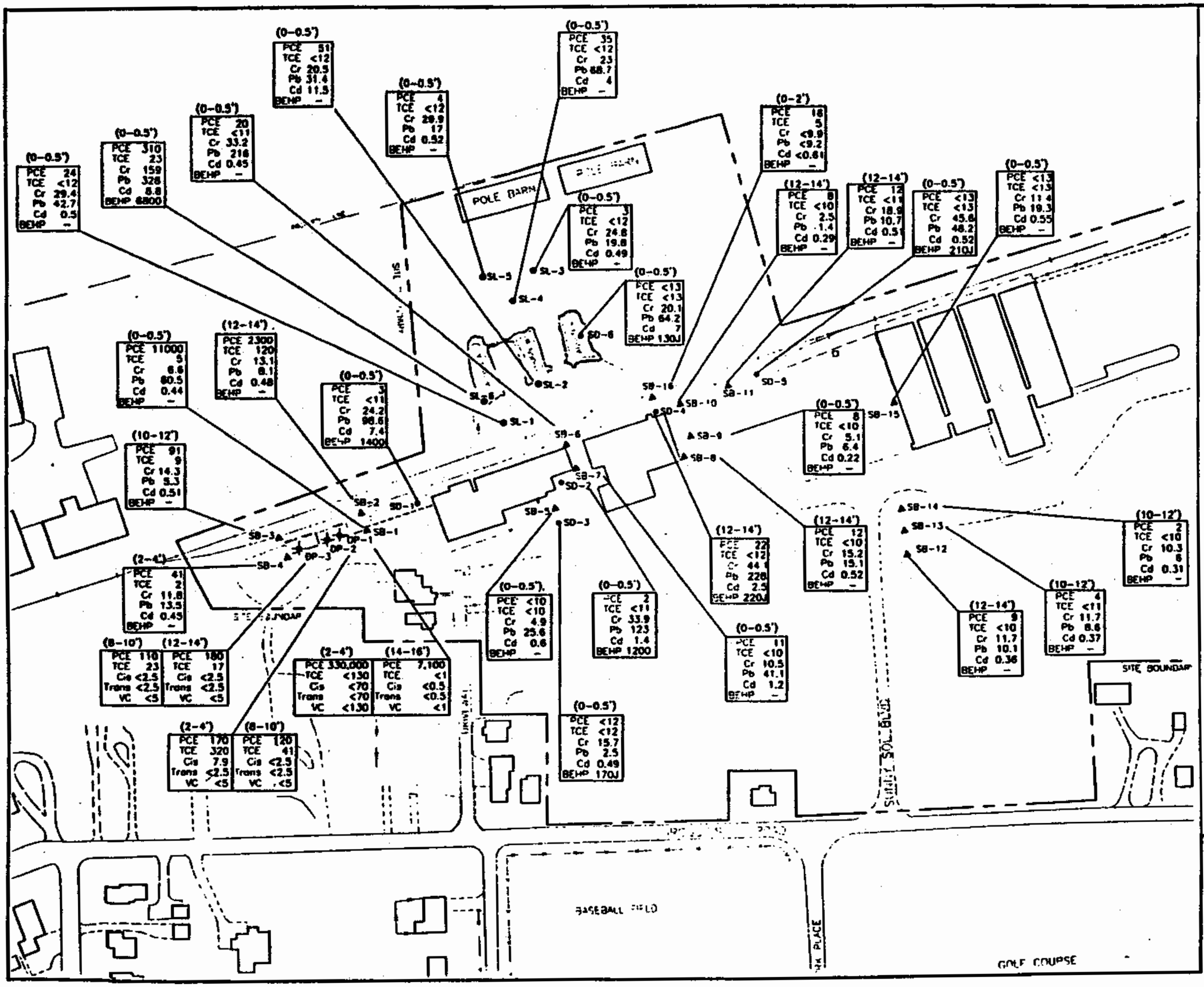


Figure 2
Jones Chemicals Site Map



LEGEND

N

———— Site boundary Jones Chemicals, Inc.

SB-1 ▲	Soil boring location
SD-1 ●	Sediment sample location
SL-1 ●	Sludge sample location
DP-1 ✛	Direct-Push sample locations
(0-0.5')	Sample depth in feet
PCE	Tetrachloroethene
TCE	Trichloroethene
Cr	Chromium
Pb	Lead
Cd	Cadmium
BEHP	Bis(2-Ethylhexyl) phthalate
Cis	Cis-1,2 Dichloroethene
Trans	Trans-1,2 Dichloroethene
VC	Vinyl Chloride
<11	Below detection limits; value shown is the detection limit
–	Not Analyzed

Organic compounds in micrograms per kilogram (µg/kg)

Metals in milligrams per kilogram (mg/kg)

0 160 FEET

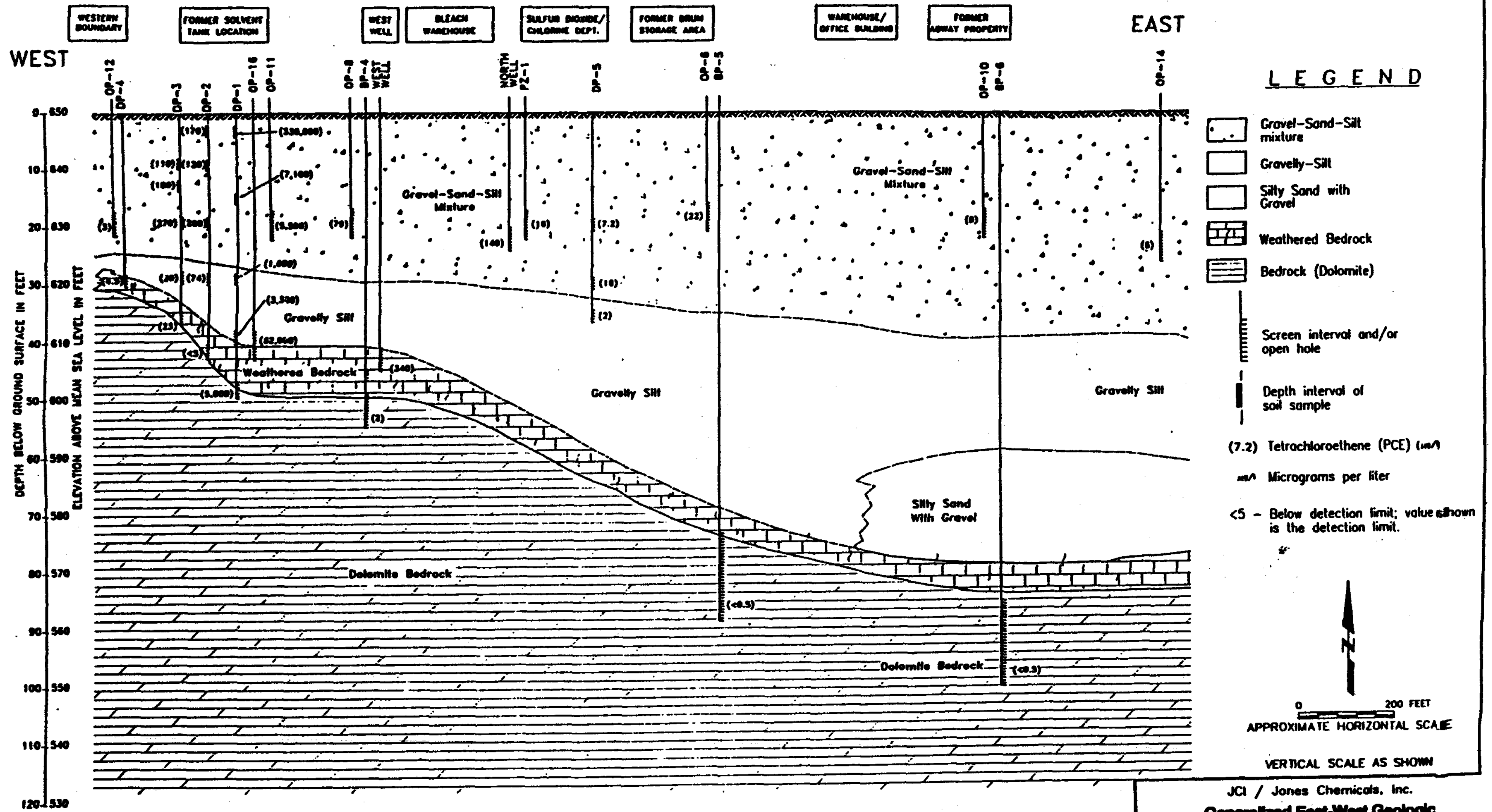
JCI / Jones Chemicals, Inc

Selected Analyte Concentrations in Soil Borings, Sediment, Sludge, and Direct-push Soil Samples

LFR LEVINE·FRICKE

Project No. 3165.01

Figure 3



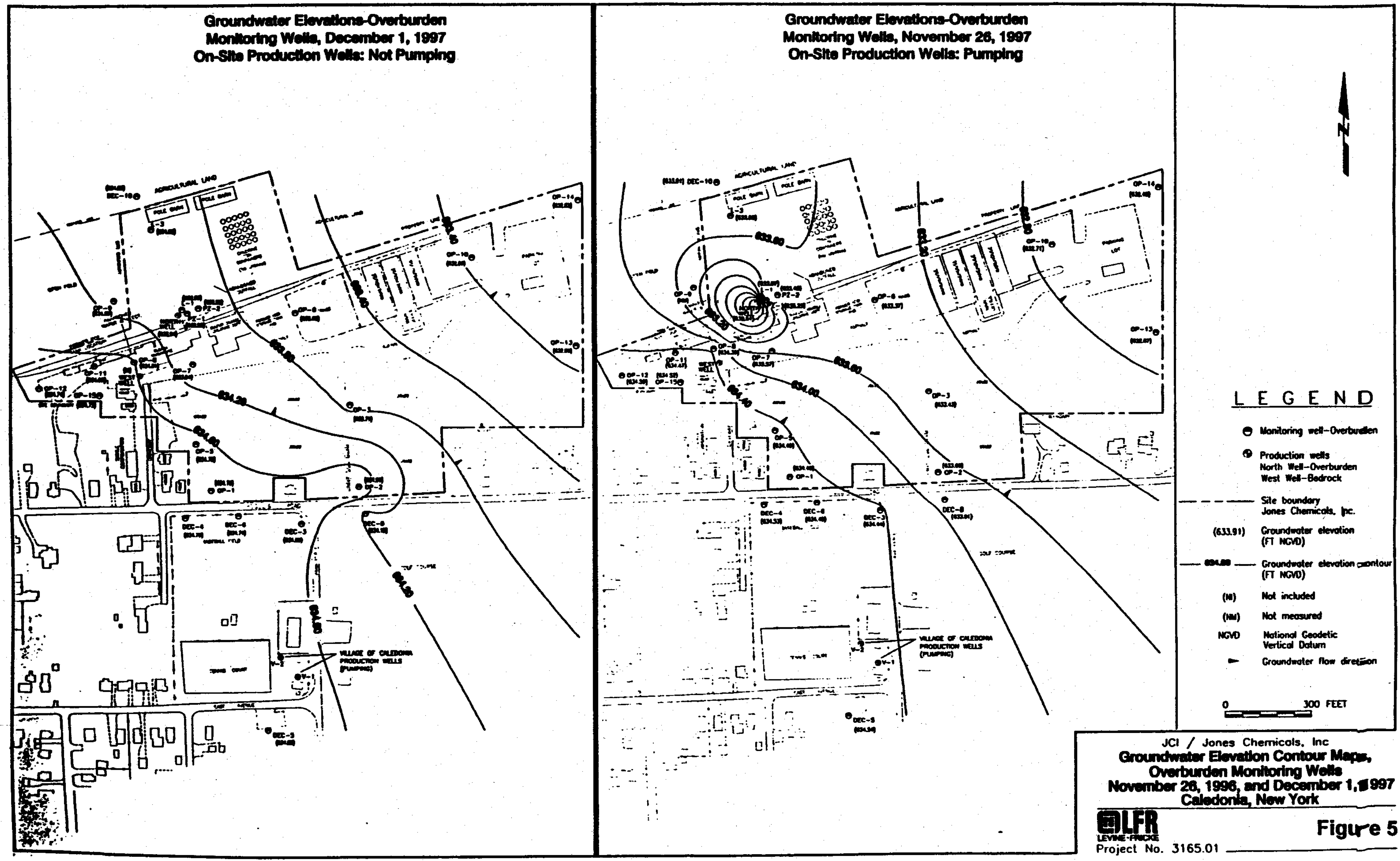
JCI / Jones Chemicals, Inc.

Generalized East-West Geologic Cross Section

LFR LEVINE·FRICKE

Project No. 3165.01

Figure 4

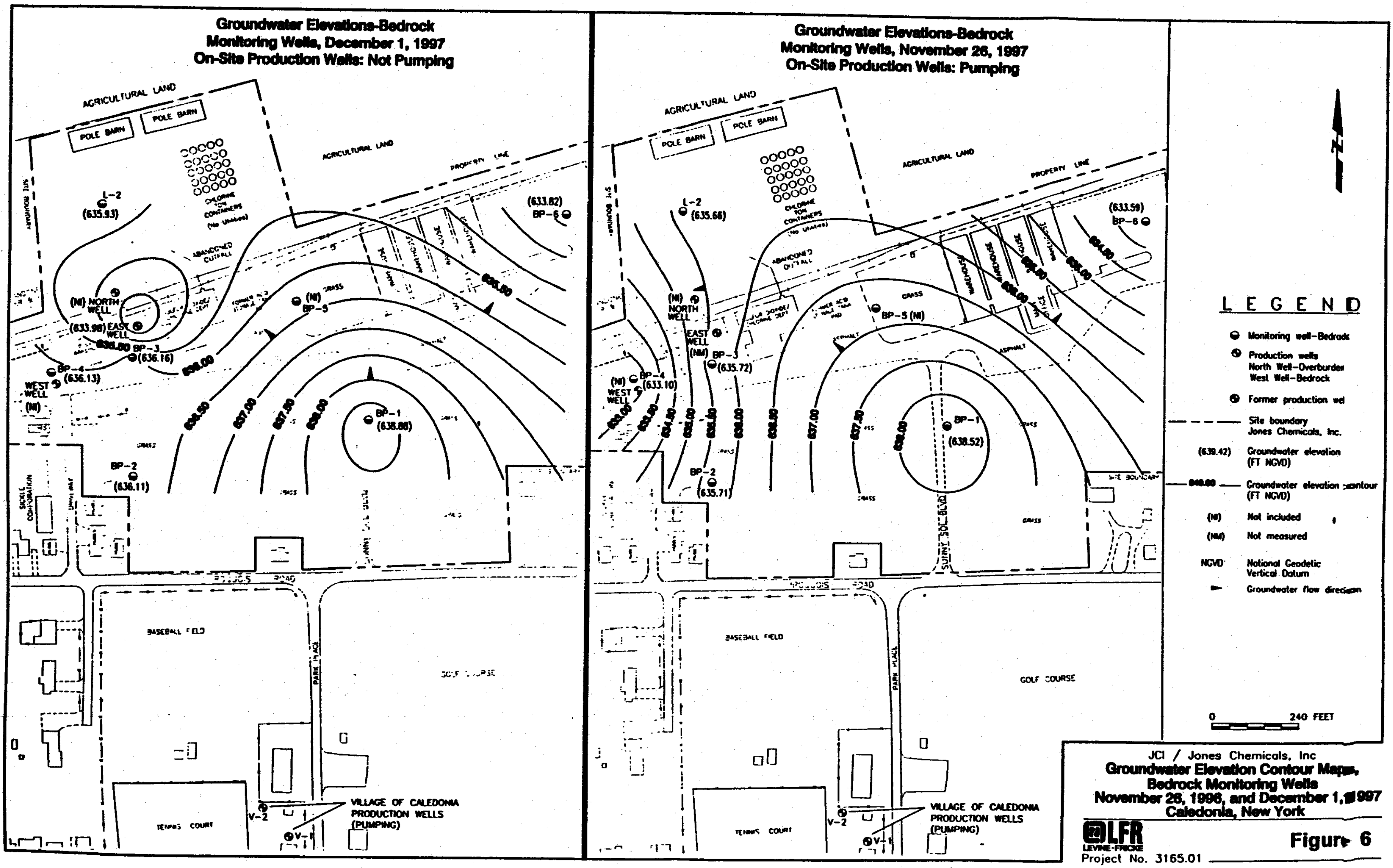

Groundwater Elevations-Overburden
Monitoring Wells, December 1, 1997
On-Site Production Wells: Not Pumping

Groundwater Elevations-Overburden
Monitoring Wells, November 26, 1997
On-Site Production Wells: Pumping

JCI / Jones Chemicals, Inc
Groundwater Elevation Contour Maps,
Overburden Monitoring Wells
November 26, 1996, and December 1, 1997
Caledonia, New York

LFR
LEVINE·FRICKE
Project No. 3165.01

Figure 5



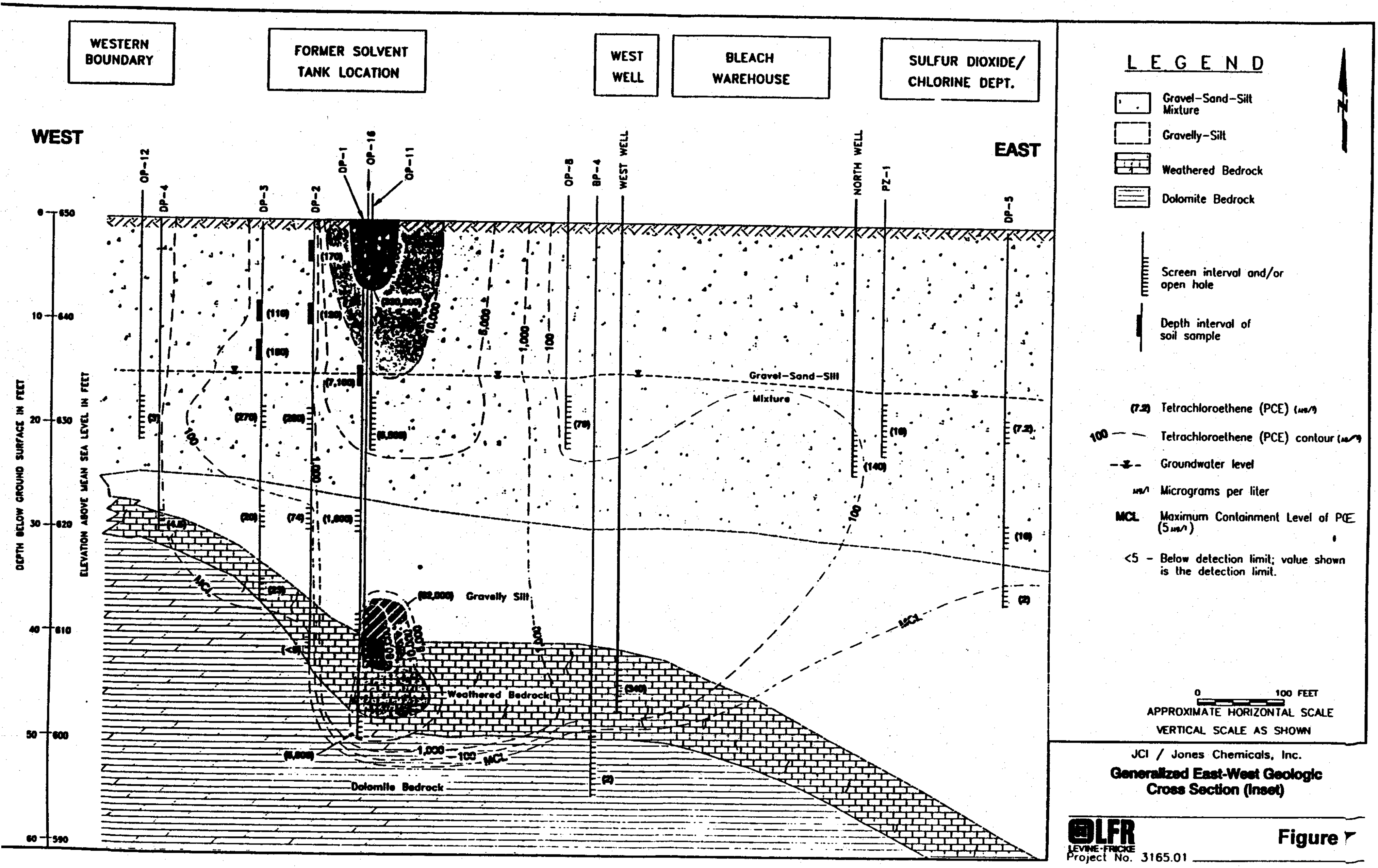
JCI / Jones Chemicals, Inc

Groundwater Elevation Contour Maps, Bedrock Monitoring Wells November 26, 1996, and December 1, 1997 Caledonia, New York

LFR LEVINE-FRICKE

Project No. 3165.01

Figure 6

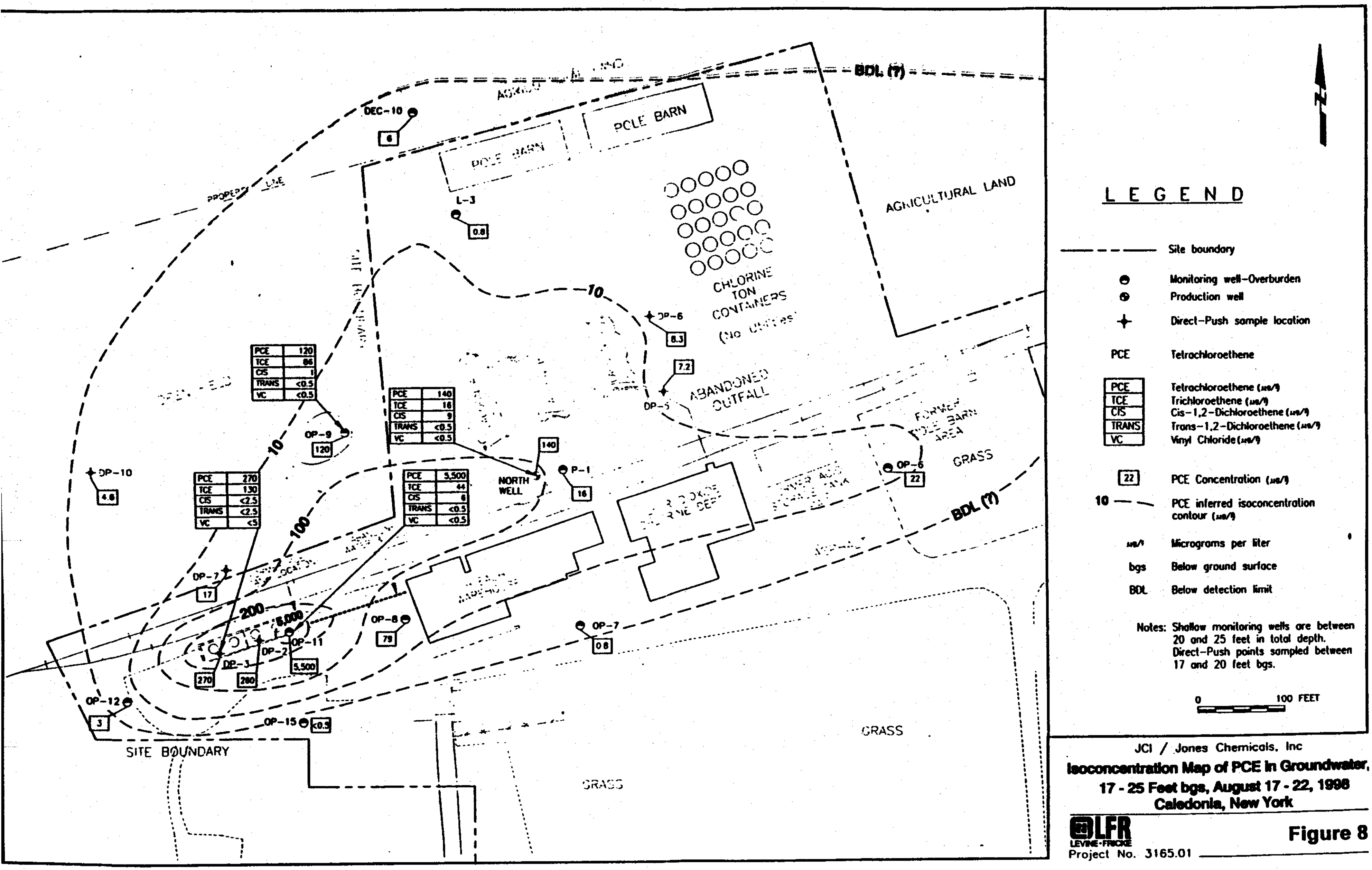


JCI / Jones Chemicals, Inc.

Generalized East-West Geologic Cross Section (Inset)

LFR
LEVINE·FRICKE
Project No. 3165.01

Figure



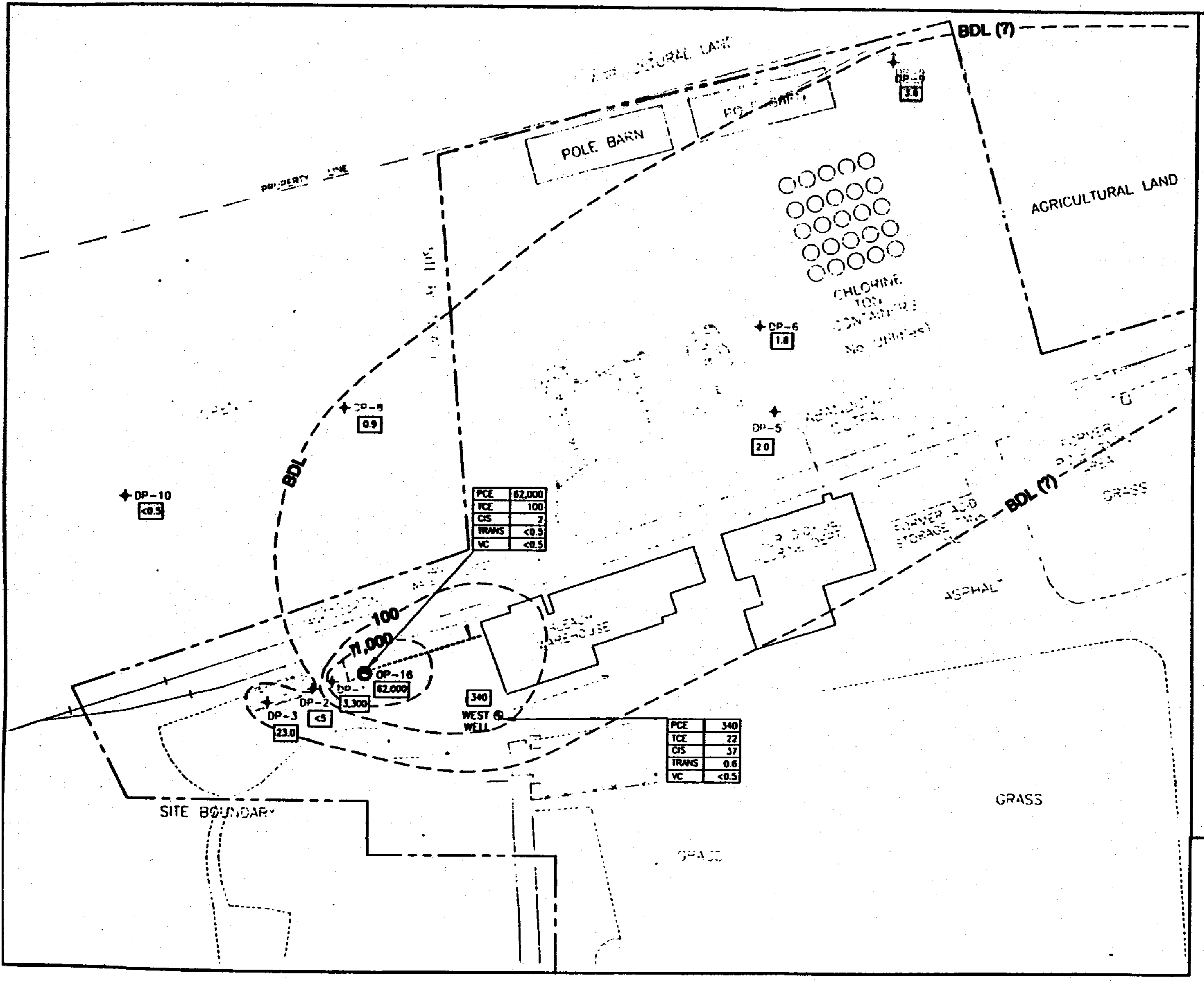
JCI / Jones Chemicals, Inc

Isoconcentration Map of PCE in Groundwater, 17 - 25 Feet bgs, August 17 - 22, 1998 Caledonia, New York

LFR LEVINE·FRICKE

Project No. 3165.01

Figure 8



N

LEGEND

— — —	Site boundary Jones Chemicals, Inc.
●	Monitoring well-Overburden
⊕	Production well
✦	Direct-Push sample locations
PCE	Tetrachloroethene
PCE TCE CIS TRANS VC	Tetrachloroethene (µg/l) Trichloroethene (µg/l) Cis-1,2-Dichloroethene (µg/l) Trans-1,2-Dichloroethene (µg/l) Vinyl Chloride (µg/l)
2.0	PCE Concentration (µg/l)
10 — —	PCE inferred isoconcentration contour (µg/l)
µg/l	Micrograms per liter
bgs	Below ground surface
BDL	Below detection limit

Note: OP-16 is 44 feet in total depth and West well is 48.3 feet in total depth.
Direct-Push points sampled between 35 and 40 feet bgs.

0 100 FEET

JCI / Jones Chemicals, Inc

Isoconcentration Map of PCE in Groundwater
35 - 48 Feet bgs, August 17 - 21, 1998
Caledonia, New York

LFR LEVINE·FRICKE
Project No. 3165.01

Figure 9

APPENDIX II
TABLES

TABLES

Wayland Laboratory Services **ELAP#11338**

Lisa Nartier Votypka, MT(ASCP)
Laboratory Director
2341 State Route 63
P.O. Box 543
Wayland, N.Y. 14572-0543

Telephone (716)728-3850
Fax (716)728-3482

CLIENT: Village of Caledonia
3095 West Main Street
Caledonia, N.Y. 14423

FEDERAL ID#: 2501013
COUNTY: Livingston
MATRIX: Drinking Water

SAMPLE NUMBER: M032100-7
SAMPLE DATE/TIME: 3/21/00 07:30
DATE/TIME RECEIVED: 3/21/00 14:30
DATE REPORTED: 4/6/00
SAMPLED BY: R. Frew
SAMPLE LOCATION: side Treatment Plant

****

Volatile Organic Contaminants
(EPA 502.2, units=ug/L)

Analyte	**Result**
Benzene	<0.5
Bromobenzene	<0.5
Bromochloromethane	<0.5
Bromomethane	<0.5
n-Butylbenzene	<0.5
sec-Butylbenzene	<0.5
tert-Butylbenzene	<0.5
Carbon Tetrachloride	<0.5
Chlorobenzene	<0.5
Chloroethane	<0.5
Chloromethane	<0 5
2-Chlorotoluene	<0.5
4-Chlorotoluene	<0.5
Dibromomethane	<0.5
1,2-Dichlorobenzene	<0.5
1,3-Dichlorobenzene	<0.5
1,4-Dichlorobenzene	<0.5
Dichlorodifluoromethane	<0.5
1,1-Dichloroethane	<0.5
1,2-Dichloroethane	<0.5
1,1-Dichloroethene	<0.5
cis-1,2-Dichloroethene	<0.5
trans-1,2-Dichloroethene	<0.5
1,2-Dichloropropane	<0 5

continued on next page.......... .. ..

WAYLAND LABORATORY SERVICES **ELAP #11338**

Report Continued...
Sample Number:M032100-7

1,3-Dichloropropane	<0.5
2,2-Dichloropropane	<0.5
1,1-Dichloropropene	<0.5
cis-1,3-Dichloropropene	<0.5
trans-1,3-Dichloropropene	<0.5
Ethylbenzene	<0.5
Hexachlorobutadiene	<0.5
Isopropylbenzene	<0.5
4-Isopropyltoluene	<0.5
Methylene Chloride	<0.5
n-Propylbenzene	<0.5
Styrene	<0.5
1,1,1,2-Tetrachloroethane	<0.5
1,1,2,2-Tetrachloroethane	<0.5
Tetrachloroethene	<0.5
Toluene	<0.5
1,2,3-Trichlorobenzene	<0.5
1,2,4-Trichlorobenzene	<0.5
1,1,1-Trichloroethane	<0.5
1,1,2-Trichloroethane	<0.5
Trichloroethene	<0.5
Trichlorofluoromethane	<0.5
1,2,3-Trichloropropane	<0.5
1,2,4-Trimethylbenzene	<0.5
1,3,5-Trimethylbenzene	<0.5
Vinyl Chloride	<0.5
o-Xylene	<0.5
m-Xylene	<0.5
p-Xylene	<0.5

Testing performed at ELAP#10248
Date of Analysis: *3/28/00*

Results released by: Lisa N. Vetypka

P.O. Box 543, 2341 State Route 63, Wayland, NY 14572. Phone(716)728-3850

Table 2. Approximate Concentrations of Potential Chemicals of Concern JCI Jones Chemicals, Inc. Site, Caledonia, New York

Potential Chemicals of Concern	Unsaturated Soil (mg/kg)	Groundwater Overburden Zone (µg/l)	Groundwater Bedrock Zone (µg/l)
Tetrachloroethene (PCE)	0.002–330	<1–62,000	<1–2
Trichloroethene (TCE)	0.002–0.320	<1–100	<1–8
1,2-Dichloroethene (1,2-DCE)	0.002– 0.010	<1–37	<1–26
1,1-Dichloroethene (1,1-DCE)	<0.005	<1–2	<1
Vinyl Chloride	<0.005	<1	<1

Notes:

bgs = below ground surface

mg/kg = milligrams per kilogram

µg/l = micrograms per liter
< = compound not detected; value is below the detection limit

SELECTION OF EXPOSURE PATHWAYS

JONES CHEMICALS, CALEDONIA, NY., SOURCE MANGEMENT ZONE

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil	Soil	Source Management Zone	Worker*	Adult	Ingestion	On-Site	Quant	Soil is within industrial facility
						Dermal	On-Site	Quant	Soil is within industrial facility
				Resident	Adult	Ingestion	Off-Site	None	Soil is within industrial facility
						Dermal	Off-Site	None	Soil is within industrial facility
					Child	Ingestion	Off-Site	None	Soil is within industrial facility
						Dermal	Off-Site	None	Soil is within industrial facility
		Indoor Air	Volatiles (from soil) and dust particles in ambient air	Outdoor Worker	Adult	Inhalation	On-Site	Quant	Soil is within industrial facility
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
	Groundwater	Groundwater	Well Water	Indoor Worker	Adult	Ingestion	On-Site	None	Workers only have contact with treated groundwater
						Dermal	On-Site	None	Workers only have contact with treated groundwater
				Resident	Adult	Combined**	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
					Child	Combined**	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
		Indoor Air	Vapors from chemicals dissolved in groundwater	Outdoor Worker	Adult	Inhalation	On-Site	Quant	Site is an industrial facility
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
Future	Soil	Soil	Source Management Zone	Worker*	Adult	Ingestion	On-Site	Quant	Site is expected to remain industrial
						Dermal	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Ingestion	On-Site	None	No on-site residents expected in the immediate future
						Dermal	On-Site	None	No on-site residents expected in the immediate future
					Child	Ingestion	On-Site	None	No on-site residents expected in the immediate future
						Dermal	On-Site	None	No on-site residents expected in the immediate future
		Indoor Air	Volatiles (from soil) and dust particles in ambient air	Outdoor Worker	Adult	Inhalation	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
	Groundwater	Groundwater	Well Water	Outdoor Worker	Adult	Ingestion	On-Site	None	On-site workers only have contact with treated groundwater
						Dermal	On-Site	None	On-site workers only have contact with treated groundwater
				Resident	Adult	Combined**	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
					Child	Combined**	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
		Indoor Air	Vapors from chemicals dissolved in groundwater	Outdoor Worker	Adult	Inhalation	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor

Notes: * The "worker" receptor will include on-site workers plus a typical maintenance worker working on a trench.

** Combined exposure through the ingestion and inhalation routes

SELECTION OF EXPOSURE PATHWAYS
JONES CHEMICALS, CALEDONIA, NY., LAGOON MANGEMENT ZONE

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil	Soil	Lagoon Management Zone	Maintenance Worker*	Adult	Ingestion	On-Site	Quant	Soil is within industrial facility
						Dermal	On-Site	Quant	Soil is within industrial facility
				Resident	Adult	Ingestion	Off-Site	None	Soil is within industrial facility
						Dermal	Off-Site	None	Soil is within industrial facility
					Child	Ingestion	Off-Site	None	Soil is within industrial facility
						Dermal	Off-Site	None	Soil is within industrial facility
		Outdoor Air	Volatiles (from soil) and dust particles in ambient air	Maint. Worker	Adult	Inhalation	On-Site	Quant	Soil is within industrial facility
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
	Surface water	Surface water	Surface water	Maintenance Worker*	Adult	Ingestion	On-Site	None	Maintenance workers do not have contact with surface water
						Dermal	On-Site	None	Maintenance workers do not have contact with surface water
				Resident	Adult	Combined	Off-Site	None	Surface water from lagoons do not migrates to off-site
						Dermal	Off-Site	None	Surface water from lagoons do not migrates to off-site
					Child	Combined	Off-Site	None	Surface water from lagoons do not migrates to off-site
						Dermal	Off-Site	None	Surface water from lagoons do not migrates to off-site
		Outdoor Air	Vapors from chemicals dissolved in groundwater	Maint. Worker	Adult	Inhalation	On-Site	Quant	Maintenace workers sporadically visit the site
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
Future	Soil	Soil	Lagoon Management Zone	Maintenance Worker*	Adult	Ingestion	On-Site	Quant	Site is expected to remain industrial
						Dermal	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Ingestion	On-Site	None	No on-site residents expected in the immediate future
						Dermal	On-Site	None	No on-site residents expected in the immediate future
					Child	Ingestion	On-Site	None	No on-site residents expected in the immediate future
						Dermal	On-Site	None	No on-site residents expected in the immediate future
		Outdoor Air	Volatiles (from soil) and dust particles in ambient air	Maint. Worker	Adult	Inhalation	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
	Surface water	Surface water	Surface water	Maintenance Worker*	Adult	Ingestion	On-Site	None	Maintenance workers will not have contact with surface water
						Dermal	On-Site	None	Maintenance workers will not have contact with surface water
				Resident	Adult	Combined	Off-Site	None	Surface water from lagoons do not migrates to off-site
						Dermal	Off-Site	None	Surface water from lagoons do not migrates to off-site
					Child	Combined	Off-Site	None	Surface water from lagoons do not migrates to off-site
						Dermal	Off-Site	None	Surface water from lagoons do not migrates to off-site
		Outdoor Air	Vapors from chemicals dissolved in groundwater	Maint. Worker	Adult	Inhalation	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor

Notes: * There are no workers in the Lagoon Management Area. However, maintenance workers may be sporadically present in the area.

** Combined exposure includes ingestion and inhalation.

SELECTION OF EXPOSURE PATHWAYS

JONES CHEMICALS, CALEDONIA, NY., SITE MANGEMENT ZONE

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil	Soil	Site Management Zone	Worker*	Adult	Ingestion	On-Site	Quant	Soil is within industrial facility
						Dermal	On-Site	Quant	Soil is within industrial facility
				Resident	Adult	Ingestion	Off-Site	None	Soil is within industrial facility
						Dermal	Off-Site	None	Soil is within industrial facility
					Child	Ingestion	Off-Site	None	Soil is within industrial facility
						Dermal	Off-Site	None	Soil is within industrial facility
		Indoor Air	Volatiles (from soil) and dust particles in ambient air	Indoor Worker	Adult	Inhalation	On-Site	Quant	Soil is within industrial facility
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
	Groundwater	Groundwater	Well Water	Indoor Worker	Adult	Ingestion	On-Site	None	Workers only have contact with treated groundwater
						Dermal	On-Site	None	Workers only have contact with treated groundwater
				Resident	Adult	Combined	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
					Child	Combined	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents currently live next to site where wells tap into shallow aquifer
		Indoor Air	Vapors from chemicals dissolved in groundwater	Indoor Worker	Adult	Inhalation	On-Site	Quant	Site is an industrial facility
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
Future	Soil	Soil	Site Management Zone	Worker*	Adult	Ingestion	On-Site	Quant	Site is expected to remain industrial
						Dermal	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Ingestion	On-Site	None	No on-site residents expected in the immediate future
						Dermal	On-Site	None	No on-site residents expected in the immediate future
					Child	Ingestion	On-Site	None	No on-site residents expected in the immediate future
						Dermal	On-Site	None	No on-site residents expected in the immediate future
		Indoor Air	Volatiles (from soil) and dust particles in ambient air	Indoor Worker	Adult	Inhalation	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
	Groundwater	Groundwater	Well Water	Indoor Worker	Adult	Ingestion	On-Site	None	On-site workers only have contact with treated groundwater
						Dermal	On-Site	None	On-site workers only have contact with treated groundwater
				Resident	Adult	Combined	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
					Child	Combined	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
						Dermal	Off-Site	Quant	Residents live next to site where wells tap into shallow aquifer
		Indoor Air	Vapors from chemicals dissolved in groundwater	Indoor Worker	Adult	Inhalation	On-Site	Quant	Site is expected to remain industrial
				Resident	Adult	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor
					Child	Inhalation	Off-Site	Quant	Volatiles may migrate in ambient air to an off-site receptor

Notes:
- * The "worker" receptor will include on-site workers plus a typical maintenance worker working on a trench.
- ** Combined exposure through the ingestion and inhalation routes.

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SOURCE MANAGEMENT ZONE, JONES CHEMICALS, CALEDONIA, NY

Scenario Timeframe:	Current/Future
Receptor Population:	On-Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Tetrachloroethene	3.00E-06	--	2.20E-06	5.20E-06	Tetrachloroethene	Liver	1.61E-02	--	1.18E-02	2.79E-02
			Trichloroethene	5.38E-10	--	3.94E-10	9.32E-10	Trichloroethene	Liver	2.28E-05	--	1.67E-05	3.95E-05
			(Total)	3.00E-06	--	2.20E-06	5.20E-06		(Total)	1.61E-02	--	1.18E-02	2.79E-02
Soil and Groundwater	Air	Outdoor Air	1,1,1,2-Tetrachloroethane	--	2.21E-11	--	2.21E-11	1,1,1,2-Tetrachloroethane	Liver/Kidney	--	7.92E-08	--	7.92E-08
			Tetrachloroethene	--	1.40E-05	--	1.40E-05	Tetrachloroethene	Liver	--	1.78E-01	--	1.78E-01
			Trichloroethene	--	2.44E-08	--	2.44E-08	Trichloroethene	Liver	--	1.89E-03	--	1.89E-03
			1,2,4-Trimethylbenzene	--	NC	--	NC	1,2,4-Trimethylbenzene	Kidney	--	2.43E-04	--	2.43E-04
			(Total)	--	1.40E-05	--	1.40E-05		(Total)	--	1.80E-01	--	1.80E-01

Total Risk Across Soil and Groundwater: 1.9E-05

Total Risk Across All Media and All Exposure Routes: 1.9E-05

Total Hazard Index Across All Media and All Exposure Routes: 2.08E-01

Total [Liver] HI = 2.08E-01

Total [Kidney] HI = 2.43E-04

Notes:

NC = Not carcinogenic

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE MANAGEMENT ZONE, JONES CHEMICALS, CALEDONIA, NY

Scenario Timeframe:	Current/Future
Receptor Population:	On-Site Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Benzo[a]pyrene	2.42E-06	--	1.77E-06	4.19E-06	Chloroform	Liver	6.36E-07	--	4.66E-07	1.10E-06
			Chloroform	1.39E-11		1.01E-11	2.40E-11	Hexachlorobenzene	Liver	7.34E-04	--	5.37E-04	1.27E-03
			Dibenzo[a,h]anthracene	4.57E-07		3.36E-07	7.93E-07	Tetrachloroethene	Liver	5.87E-07	--	4.30E-07	1.02E-06
			Hexachlorobenzene	3.35E-07		2.46E-07	5.81E-07	Trichloroethene	Liver	6.12E-07	--	4.48E-07	1.06E-06
			Tetrachloroethene	1.09E-10		7.98E-11	1.89E-10	--	--	--	--	--	--
			Trichloroethene	1.44E-11	--	1.06E-11	2.50E-11	--	--	--	--	--	--
			(Total)	3.21E-06	--	2.35E-06	5.56E-06	(Total)	(Total)	7.36E-04	--	5.38E-04	1.27E-03
Soil and Groundwater	Air	Indoor Air	Benzo[a]pyrene	--	2.72E-08	--	2.72E-08	cis-1,2-Dichloroethene	Blood	--	2.22E-03	--	2.22E-03
			Chloroform	--	1.94E-08	--	1.94E-08	Chloroform	Liver	--	6.72E-05	--	6.72E-05
			Dibenzo[a,h]anthracene	--	5.15E-09	--	5.15E-09	Hexachlorobenzene	Liver	--	1.94E-05	--	1.94E-05
			Hexachlorobenzene	--	8.86E-09	--	8.86E-09	Tetrachloroethene	Liver	--	2.02E-02	--	2.02E-02
			Tetrachloroethene	--	1.59E-06	--	1.59E-06	Trichloroethene	Liver	--	1.47E-02	--	1.47E-02
			Trichloroethene	--	1.89E-07	--	1.89E-07	--	--	--	--	--	--
			(Total)	--	1.84E-06	--	1.84E-06	(Total)	(Total)	--	3.72E-02	--	3.72E-02
			Total Risk Across Soil and Groundwater				7.4E-06	Total Hazard Index Across All Media and All Exposure Routes					3.85E-02
			Total Risk Across All Media and All Exposure Routes				7.4E-06						

Total [Liver] HI = 3.63E-02

Total [Blood] HI = 2.22E-03

Notes:

NC = Not carcinogenic

Table 4
Page 2 of 2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SOURCE MANAGEMENT ZONE, JONES CHEMICALS, CALEDONIA, NY

Scenario Timeframe:	Current/Future
Receptor Population:	Off-Site Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Tetrachloroethene	NCEP	--	NCEP	--	Tetrachloroethene	Liver	NCEP	--	NCEP	--
			Trichloroethene	NCEP	--	NCEP	--	Trichloroethene	Liver	NCEP	--	NCEP	--
			(Total)	--	--	--	--		(Total)	--	--	--	--
Soil and Groundwater	Air	Outdoor Air	1,1,1,2-Tetrachloroethane	--	2.80E-11	--	2.80E-11	1,1,1,2-Tetrachloroethane	Liver/Kidney	--	8.37E-08	--	8.37E-08
			Tetrachloroethene	--	1.78E-05	--	1.78E-05	Tetrachloroethene	Liver	--	1.89E-01	--	1.89E-01
			Trichloroethene	--	3.09E-08	--	3.09E-08	Trichloroethene	Liver	--	2.00E-03	--	2.00E-03
			1,2,4-Trimethylbenzene	--	NC	--	NC	1,2,4-Trimethylbenzene	Kidney	--	2.57E-04	--	2.57E-04
			(Total)	--	1.78E-05	--	1.78E-05		(Total)	--	1.91E-01	--	1.91E-01

Total Risk Across Soil and Groundwater: 1.8E-05

Total Risk Across All Media and All Exposure Routes: 1.8E-05

Total Hazard Index Across All Media and All Exposure Routes: 1.91E-01

Total [Liver] HI = 1.91E-01

Total [Kidney] HI = 2.57E-04

Notes:

NCEP = Not a complete exposure pathway

NC = Not carcinogenic

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
LAGOON MANAGEMENT ZONE, JONES CHEMICALS, CALEDONIA, NY

Scenario Timeframe:	Current/Future
Receptor Population:	Off-Site Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	1,2-Dichloroethene (total)	NCEP	--	NCEP	--	1,2-Dichloroethene (total)		NCEP	--	NCEP	--
			Tetrachloroethene	NCEP	--	NCEP	--	Tetrachloroethene	Liver	NCEP	--	NCEP	--
			Trichloroethene	NCEP	--	NCEP	--	Trichloroethene	Liver	NCEP	--	NCEP	--
			(Total)	--	--	--	--		(Total)	--	--	--	--
Soil and Groundwater	Air	Outdoor Air	1,2-Dichloroethene (total)	--	NC	--	NC	1,2-Dichloroethene (total)	Liver	--	1.39E-03	--	1.39E-03
			cis-1,2-Dichoroethene	--	NC	--	NC	cis-1,2-Dichoroethene	Blood	--	3.27E-04	--	3.27E-04
			Tetrachloroethene	--	4 58E-08	--	4 58E-08	Tetrachloroethene	Liver	--	4.86E-04	--	4 86E-04
			Trichloroethene	--	8 42E-10	--	8 42E-10	Trichloroethene	Liver	--	5.46E-05	--	5.46E-05
			Vinyl Chloride	--	1.13E-05	--	1.13E-05						
			(Total)	--	1.13E-05	--	1.13E-05		(Total)	--	2.26E-03	--	2 26E-03
						Total Risk Across Soil and Groundwater	1.1E-05					Total Hazard Index Across All Media and All Exposure Routes	2.26E-03
						Total Risk Across All Media and All Exposure Routes	1.1E-05						
												Total [Liver] HI =	1.93E-03
												Total [Blood] HI =	3 27E-04

Notes:

NCEP = Not a complete exposure pathway

NC = Not carcinogenic

Table 5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE MANAGEMENT ZONE, JONES CHEMICALS, CALEDONIA, NY

Scenario Timeframe:	Current/Future
Receptor Population:	Off-Site Receptor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Benzo[a]pyrene	NCEP	--	NCEP	--	Chloroform	Liver	NCEP	--	NCEP	--
			Chloroform	NCEP	--	NCEP	--	Hexachlorobenzene	Liver	NCEP	--	NCEP	--
			Dibenzo[a,h]anthracene	NCEP	--	NCEP	--	Tetrachloroethene	Liver	NCEP	--	NCEP	--
			Hexachlorobenzene	NCEP	--	NCEP	--	Trichloroethene	Liver	NCEP	--	NCEP	--
			Tetrachloroethene	NCEP	--	NCEP	--	--	--	NCEP	--	NCEP	--
			Trichloroethene	NCEP	--	NCEP	--	--	--	NCEP	--	NCEP	--
			(Total)	--	--	--	--	(Total)	(Total)	--	--	--	--
Soil and Groundwater	Air	Outdoor Air	Benzo[a]pyrene	--	3.44E-08	--	3.44E-08	cis-1,2-Dichloroethene	Blood	--	2.35E-05	--	2.35E-05
			Chloroform	--	2.46E-08	--	2.46E-08	Chloroform	Liver	--	7.09E-05	--	7.09E-05
			Dibenzo[a,h]anthracene	--	6.53E-09	--	6.53E-09	Hexachlorobenzene	Liver	--	2.05E-05	--	2.05E-05
			Hexachlorobenzene	--	1.12E-08	--	1.12E-08	Tetrachloroethene	Liver	--	2.19E-04	--	2.19E-04
			Tetrachloroethene	--	2.06E-08	--	2.06E-08	Trichloroethene	Liver	--	1.91E-04	--	1.91E-04
			Trichloroethene	--	2.94E-09	--	2.94E-09	--	--	--	--	--	--
			(Total)	--	1.00E-07	--	1.00E-07	(Total)	(Total)	--	5.25E-04	--	5.25E-04

Total Risk Across Soil and Groundwater: 1.0E-07

Total Risk Across All Media and All Exposure Routes: 1.0E-07

Total Hazard Index Across All Media and All Exposure Routes: 5.25E-04

Total [Liver] HI = 5.01E-04

Total [Blood] HI = 2.35E-05

Notes:

NCEP = Not a complete exposure pathway

NC = Not carcinogenic

Table 6, Page 1 of 6: Future Groundwater Use: Overburden Aquifer

RESIDENTIAL INGESTION OF TAP WATER: ADULT

TOTAL 30 YR CANCER RISK : 3.03E-003

EXPOSURE PARAMETERS:

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	24	24
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INGESTION RATE (L/DAY)	2	2
AVERAGING TIME (D)	25550	8760
BODY WEIGHT (KG)	70	70

TOTAL CANCER RISK	1.91E-003
TOTAL HI:	1.10E+001

COMPOUND	Groundwater Conc. (MG/L)	CANCER DOSE (MG/KG/D)	CPF	CANCER RISK	NONCANCER DOSE (MG/KG/D)	RfD	HQ
cis-1,2-dichloroethen	0.038	3.57E-004			1.04E-003	1.00E-002	1.04E-001
Chloroform	0.0038	3.57E-005	6.1E-003	2.18E-007	1.04E-004	1.00E-002	1.04E-002
trichloroethene	0.049	4.60E-004	1.1E-002	5.06E-006	1.34E-003	6.00E-003	2.24E-001
PCE	3.902	3.67E-002	5.2E-002	1.91E-003	1.07E-001	1.0E-002	1.07E+001
Dibromochlorometha	0.0012	1.13E-005	8.4E-002	9.47E-007	3.29E-005	2.00E-002	1.64E-003

RESIDENTIAL INGESTION OF DRINKING WATER: CHILD (AGE 0 - 6)

EXPOSURE PARAMETERS:

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	6	6
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INGESTION RATE (L/DAY)	1	1
AVERAGING TIME (D)	25550	2190
BODY WEIGHT (KG)	15	15

TOTAL CANCER RISK	1.12E-003
TOTAL HI:	2.57E+001

COMPOUND	Groundwater Conc. (MG/L)	CANCER DOSE (MG/KG/D)	CPF	CANCER RISK	NONCANCER DOSE (MG/KG/D)	RfD	HQ
cis-1,2-dichloroethen	0.038	2.08E-004			2.43E-003	1.00E-002	2.43E-001
Chloroform	0.0038	2.08E-005	6.1E-003	1.27E-007	2.43E-004	1.00E-002	2.43E-002
trichloroethene	0.049	2.68E-004	1.1E-002	2.95E-006	3.13E-003	6.00E-003	5.22E-001
PCE	3.902	2.14E-002	5.2E-002	1.11E-003	2.49E-001	1.0E-002	2.49E+001
Dibromochlorometha	0.0012	6.58E-006	8.4E-002	5.52E-007	7.67E-005	2.00E-002	3.84E-003

Jones Chemical

Table 6, Page 2 of 6: Future Groundwater Use: Overburden Aquifer

RESIDENTIAL: INHALATION OF VAPORS AT THE SHOWER HEAD: ADULT

EXPOSURE PARAMETERS:

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	24	24
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INHALATION RATE (M3/HR)	0.83	0.83
TIME OF SHOWER (HR)	0.25	0.25
TIME AFTER SHOWER (HR)	0.33	0.33
WATER FLOW RATE (L/HR)	750	750
BATHROOM VOLUME (M3)	12	12
AVERAGING TIME (D)	25550	8760
BODY WEIGHT (KG)	70	70

TOTAL CANCER RISK: 1.16E-004

TOTAL HI: 2.91E+000

TOTAL 30 YR CANCER RIS 3.35E-004

					CANCER			NONCANCER		
COMPOUND	GW CONC (MG/L)	VOL. FRX (UNITLESS)	C(aMAX)	AIR CONC. (MG/M3)	DOSE (MG/KG/D)	CPF	CANCER RISK	DOSE (MG/KG/D)	RfD	HQ
cis-1,2-dichloroethene	0.038	0.5	0.296875	0.23289331897	5.27E-004			1.54E-003		
Chloroform	0.0038	0.5	0.0296875	0.0232893319	5.27E-005	8.10E-002	4.27E-006	1.54E-004	8.6E-005	1.79E+000
trichloroethene	0.049	0.5	0.3828125	0.30030980603	6.79E-004	6.00E-003	4.07E-006	1.98E-003		
PCE	3.902	0.5	30.484375	23.9144665948	5.41E-002	2.0E-003	1.08E-004	1.58E-001	1.40E-001	1.13E+000
Dibromochloromethane	0.0012	0.5	0.009375	0.00735452586	1.66E-005			4.85E-005		

Table 6, Page 3 of 6: Future Groundwater Use: Overburden Aquifer

RESIDENTIAL SHOWER SCENARIO: Child (0 to 6 years old)

EXPOSURE PARAMETERS:

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	6	6
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INHALATION RATE (M3/HR)	0.42	0.42
TIME OF SHOWER (HR)	0.5	0.5
TIME AFTER SHOWER (HR)	0.5	0.5
WATER FLOW RATE (L/HR)	750	750
BATHROOM VOLUME (M3)	12	12
AVERAGING TIME (D)	25550	2190
BODY WEIGHT (KG)	15	15

TOTAL CANCER RISK: 2.18E-004

TOTAL HI: 2.27E+001

					CANCER			NONCANCER		
COMPOUND	GW CONC (MG/L)	VOL. FRX (UNITLESS)	C(aMAX)	AIR CONC. (MG/M3)	DOSE (MG/KG/D)	CPF	CANCER RISK	DOSE (MG/KG/D)	RfD	HQ
cis-1,2-dichloroethene	0.038	0.5	0.59375	0.4453125	1.02E-003			1.20E-002		
Chloroform	0.0038	0.5	0.059375	0.04453125	1.02E-004	8.10E-002		1.20E-003	8.6E-005	1.39E+001
trichloroethene	0.049	0.5	0.765625	0.57421875	1.32E-003	6.00E-003	7.93E-006	1.54E-002		
PCE	3.902	0.5	60.96875	45.7265625	1.05E-001	2.0E-003	2.10E-004	1.23E+000	1.40E-001	8.77E+000
Dibromochloromethane	0.0012	0.5	0.01875	0.0140625	3.24E-005			3.78E-004		

Table 6, Page 4 of 6: Future Groundwater Use: Bedrock Aquifer

RESIDENTIAL INGESTION OF TAP WATER: ADULT

EXPOSURE PARAMETERS:

TOTAL 30 YR CANCER RISK : 2.32E-004

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	24	24
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INGESTION RATE (L/DAY)	2	2
AVERAGING TIME (D)	25550	8760
BODY WEIGHT (KG)	70	70

TOTAL CANCER RISK	1.46E-004
TOTAL HI:	9.61E-001

COMPOUND	Groundwater Conc. (MG/L)	CANCER DOSE (MG/KG/D)	CANCER CPF	CANCER RISK	NONCANCER DOSE (MG/KG/D)	NONCANCER RfD	NONCANCER HQ
cis-1,2-dichloroethen	0.037	3.48E-004			1.01E-003	1.00E-002	1.01E-001
Benzene	0.0011	1.03E-005	5.5E-002	5.68E-007	3.01E-005	3.00E-003	1.00E-002
trichloroethene	0.0078	7.33E-005	1.1E-002	8.06E-007	2.14E-004	6.00E-003	3.56E-002
PCE	0.297	2.79E-003	5.2E-002	1.45E-004	8.14E-003	1.0E-002	8.14E-001

RESIDENTIAL INGESTION OF DRINKING WATER: CHILD (AGE 0 - 6)

EXPOSURE PARAMETERS:

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	6	6
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INGESTION RATE (L/DAY)	1	1
AVERAGING TIME (D)	25550	2190
BODY WEIGHT (KG)	15	15

TOTAL CANCER RISK	8.54E-005
TOTAL HI:	2.24E+000

COMPOUND	Groundwater Conc. (MG/L)	CANCER DOSE (MG/KG/D)	CANCER CPF	CANCER RISK	NONCANCER DOSE (MG/KG/D)	NONCANCER RfD	NONCANCER HQ
cis-1,2-dichloroethen	0.037	2.03E-004			2.37E-003	1.00E-002	2.37E-001
Benzene	0.0011	6.03E-006	5.5E-002	3.32E-007	7.03E-005	3.00E-003	2.34E-002
trichloroethene	0.0078	4.27E-005	1.1E-002	4.70E-007	4.99E-004	6.00E-003	8.31E-002
PCE	0.297	1.63E-003	5.2E-002	8.46E-005	1.90E-002	1.0E-002	1.90E+000

Table 6, Page 5 of 6: Future Groundwater Use: Bedrock Aquifer

RESIDENTIAL: INHALATION OF VAPORS AT THE SHOWER HEAD: ADULT

EXPOSURE PARAMETERS:

	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	24	24
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INHALATION RATE (M3/HR)	0.83	0.83
TIME OF SHOWER (HR)	0.25	0.25
TIME AFTER SHOWER (HR)	0.33	0.33
WATER FLOW RATE (L/HR)	750	750
BATHROOM VOLUME (M3)	12	12
AVERAGING TIME (D)	25550	8760
BODY WEIGHT (KG)	70	70

TOTAL CANCER RISK : 9.32E-006

TOTAL 30 YR CANCER RIS 2.75E-005

TOTAL HI: 1.12E-001

					CANCER			NONCANCER		
COMPOUND	GW CONC (MG/L)	VOL. FRX (UNITLESS)	C(aMAX)	AIR CONC. (MG/M3)	DOSE (MG/KG/D)	CPF	CANCER RISK	DOSE (MG/KG/D)	RfD	HQ
cis-1,2-dichloroeth	0.037	0.5	0.2890625	0.226764547414	5.13E-004			1.50E-003		
Benzene	0.0011	0.5	0.00859375	0.006741648707	1.52E-005	2.90E-002	4.42E-007	4.45E-005	1.7E-003	2.62E-002
trichloroethene	0.0078	0.5	0.0609375	0.047804418103	1.08E-004	6.00E-003	6.49E-007	3.15E-004		
PCE	0.297	0.5	2.3203125	1.820245150862	4.12E-003	2.0E-003	8.23E-006	1.20E-002	1.40E-001	8.57E-002

Table 6, Page 6 of 6: Future Groundwater Use: Bedrock Aquifer

RESIDENTIAL SHOWER SCENARIO: Child (0 to 6 years old)

EXPOSURE PARAMETERS:	CANCER	NONCANCER
EXPOSURE DURATION (YEARS)	6	6
EXPOSURE FREQUENCY (DAYS/Y)	350	350
INHALATION RATE (M3/HR)	0.42	0.42
TIME OF SHOWER (HR)	0.5	0.5
TIME AFTER SHOWER (HR)	0.5	0.5
WATER FLOW RATE (L/HR)	750	750
BATHROOM VOLUME (M3)	12	12
AVERAGING TIME (D)	25550	2190
BODY WEIGHT (KG)	15	15

TOTAL CANCER RISK: 1.81E-005

TOTAL HI: 8.71E-001

					CANCER			NONCANCER		
COMPOUND	GW CONC (MG/L)	VOL. FRX (UNITLESS)	C(aMAX)	AIR CONC. (MG/M3)	DOSE (MG/KG/D)	CPF	CANCER RISK	DOSE (MG/KG/D)	RfD	HQ
cis-1,2-dichloroeth	0.037	0.5	0.578125	0.43359375	9.98E-004			1.16E-002		
Benzene	0.0011	0.5	0.0171875	0.012890625	2.97E-005	2.90E-002	8.60E-007	3.46E-004	1.7E-003	2.04E-001
trichloroethene	0.0078	0.5	0.121875	0.09140625	2.10E-004	6.00E-003	1.26E-006	2.45E-003		
PCE	0.297	0.5	4.640625	3.48046875	8.01E-003	2.0E-003	1.60E-005	9.34E-002	1.40E-001	6.67E-001

Table 7
Summary of Soil and Groundwater Remediation Goals
JCI Jones Chemicals, Inc.
Caledonia, New York

Parameter	Soil Medium (mg/kg)[1]	Groundwater Medium (μg/l)[2]
Tetrachloroethene	1.4	5
Trichloroethene	0.7	5
cis-1,2-Dichloroethene	NA	5
Trans-1,2-Dichloroethene	0.3	5
1,1-Dichloroethene	0.4	5
Vinyl Chloride	0.2	2

[1] Values are based on NYSDEC TAGM #HWR-94-4046: Soil Cleanup Objectives to Protect Groundwater Quality. Concentrations are presented in milligrams per kilogram.

[2] MCL values are based on New York State Groundwater Quality Standards 6 NYCRR Part 703.5. Concentrations are presented in micrograms per liter.

TABLE 8

Soil Vapor Extraction

Costs

Direct Capital Costs

Soil Vapor Extraction Well Installation

Seven, 4-inch diameter PVC wells @ $1,000 each	$7,000
IDW disposal (as D039 code) @ $350 per drum x 10 drums	$3,500
Mobilization and demobilization	$1,000
Per Diem – 3 person crew @ $125 per day x 3 days	$1,125

Soil Vapor Extraction Piping and Vaults

Surface removal and disposal @ $2.00 per square foot (sf) x 400 sf	$800
Surface repair – $3.00 per sf x 400 sf	$1,200
Excavation, backfill, and compaction of the trench – $10 per ft x 200 linear feet (lf)	$2,000
Pipe installation and testing – $30 per foot x 200 feet	$6,000
SVE well vaults, gauges, valves, well head connections, and concrete – $1,500 per well x 7 wells	$10,500
SVE equipment installation (lump sum)	$10,000

Equipment Costs

SVE system (e.g., structure, moisture, gauges, valves controls, and mufflers)	$35,000
GAC purchase and disposal costs @ $4.50 per pound x 4,000 pounds	$18,000
Transportation	$4,000

Electrical Modifications

Lump sum	$15,000
Site restoration	$5,000

Confirmatory Direct-Push Soil Sampling

Mobilization/Demobilization	$500
Soil sampling – $200 per boring x 10 borings	$2,000
Analysis by USEPA Method 8021	

Twelve samples x $110 per sample	$1,320
Two QA/QC samples x $110 per sample	$220
Sample shipping	$150

Subtotal	$124,315
Contingency @ 20%	$24,863
TOTAL	**$149,178**

A4-3: Indirect Capital Costs

Engineering design documents	$40,000
Project management	$15,000
Air permitting	$10,000

Construction and Well Installation Oversight

Staff Engineer @ 12 hours per day x 15 days x $85 per hour	$15,300
Per diem, lodging, and vehicle – $150 per day x 15 days	$2,250
Travel to and from the site @ 20 hours x $85 per hour, plus $1,000 for airfare	$2,700

System Startup and Shakedown

Staff Engineer @ 12 hours per day x 5 days x $85 per hour	$5,100
Technician @ 12 hours per day x 5 days x $70 per hour	$4,200
Per diem, lodging, and vehicle @ $150 per day x 5 days x 2 people	$1,500
Travel to and from the site @ 20 hours x $155 per hour, plus $2,000 for airfare	$5,100
Startup equipment and sampling equipment	$1,000
Off-gas sample analysis – 12 samples x $300 per sample	$3,600
Sample shipping – three shipments @ $100 each	$300
Construction completion and startup reporting	$10,000

Confirmatory Direct Push Soil Sampling

Staff Engineer @ 12 hours per day x 2 days x $85 per hour	$2,040
Per diem, lodging, and vehicle @ $150 per day x 2 days	$300
Travel to and from the site @ 20 hours x $85 per hour, plus $1,000 for airfare	$2,700
Sampling report	$10,000

TOTAL	**$131,090**

A4-4: Operation, Maintenance, and Monitoring

Monthly Visits

Two technicians @ $70 per hour x 12 hours each per visit x 12 visits	$20,160
Per diem, expendables, and field equipment – $500 per visit x 12 visits	$6,000

Sample Analysis

Influent, effluent, and duplicate samples – $250 each x 12 visits	$9,000
Shipping – $100 per event x 12 visits	$1,200

Electricity – 30 horsepower @ $800 per horsepower per year	$24,000
Annual repair costs	$6,000

GAC Replacement

Replacement and disposal of spent GAC – $4.50 per pound x 4,000 pounds	$18,000
Transportation	$2,000

Annual report	$15,000

Subtotal	$101,360
Contingency @ 20%	$20,272
TOTAL	**$121,632**

The net present value of OM&M over the anticipated three years of the SVE system operation is $319,201.

TABLE 9

Source Area Extraction and Treatment, In-Situ Treatment of DNAPL, Monitored Natural Attenuation of the Plume Outside the Source Area, and Institutional Controls

COSTS

Institutional Controls/Other Controls

Direct Capital Costs

It is assumed that this technology will have no mobilization-associated costs.

Staff Engineer @ 12 hours per day x 5 days x $85 per hour	$5,100
Per diem, lodging, and vehicle – $150 per day x 5 days	$750
Lagoon area fencing – 8-feet high, 900 linear feet x $30/linear foot	$27,000
Source area fencing – 8-feet high, 500 feet long @ $30/linear foot	$15,000
Warning signs	$2,000
Subtotal	$49,850
Contingency @ 20%	$9,970
TOTAL	**$59,820**

Indirect Capital Costs

Engineering and project management	$10,000
Legal fees for deed restrictions	$15,000
TOTAL	**$25,000**

Operation, Maintenance, and Monitoring Costs

It is assumed that there will be no operation or maintenance costs for this technology. It is also assumed that this technology will not be used as a stand-alone technology; therefore, it does not have any monitoring costs.

Monitored Natural Attenuation

Capital Costs

It is assumed that there would be no direct or indirect capital costs for implementing this technology.

Operation, Maintenance, and Monitoring Costs

It is assumed that there would be no operation or maintenance costs for this alternative. It is assumed that groundwater samples will be collected quarterly for the first 2 years and then semiannually for 28 years from up to 20 groundwater monitoring wells. It is also assumed that the most Natural Attenuation Indicative Parameters will be analyzed at a laboratory, and that no additional shipping charges will be required.

Quarterly Monitoring

Two technicians @ $70 per hour x 68 hours each per visit x 4 visits	$38,080
Per Diem @ $125 per day x 2 people x 4 visits x 5 days per visit	$5,000
Vehicle @ $400 per week x 4 weeks per year	$1,600
Sampling equipment and materials @ $1,800 per visit x 4 visits	$7,200
Analysis by United States Environmental Protection Agency Method (EPA Method) 8021	
Twenty samples from monitoring wells - $110 each x 4 visits	$8,800
Four QA/QC samples - $110 each x 4 visits	$1,600
Shipping - $250 per visit x 4 visits	$1,000
Analysis of Natural Attenuation Indicative Parameters	
Twenty samples from monitoring wells @ $200 each x 2 visits	$8,000
Four QA/QC samples @ $200 each x 2 visits	$1,600
Annual Report	$30,000
Quarterly subtotal	$102,880
Contingency @ 20%	$20,576
Quarterly Total	**$123,456**

Assuming 2 years of quarterly monitored natural attenuation and groundwater monitoring, the net present value of the quarterly sampling is $223,211.

Semiannual Monitoring

Two technicians @ $70 per hour x 68 hours each per visit x 2 visits	$19,040
Per Diem @ $125 per day x 2 people x 2 visits x 5 days per visit	$2,500
Vehicle @ $400 per week x 2 weeks per year	$800
Sampling equipment and materials @ $1,800 per visit x 2 visits	$3,600
Analysis by United States Environmental Protection Agency Method (EPA Method) 8021	
Twenty samples from monitoring wells @ $110 each x 2 visits	$4,400
Four QA/QC samples @ $110 each x 2 visits	$880
Shipping @ $250 (each visit)	$500
Analysis of Natural Attenuation Indicative Parameters	
Twenty samples from monitoring wells @ $200 each x 2 visits	$8,000
Four QA/QC samples @ $200 each x 2 visits	$1,600
Annual Report	$20,000
Semiannual subtotal	$61,320
Contingency @ 20%	$12,264
Semiannual total	**$73,584**

Assuming 28 years of monitoring, the net present value for semiannual monitoring is $780,064. This number is derived by calculating the semiannual NPV for 30 years and subtracting the semiannual NPV for the initial 2 years that are addressed in the quarterly monitoring section.

The total net present value for 30 years of operation, maintenance, and monitoring for this technology is $1,003,275.

Source Area Pump and Treat

Direct Capital Costs

Well Installation

Two 10-inch diameter wells to 30 feet bgs – $12,000 each	$24,000
One 6-inch diameter well to 55 feet bgs – lump sum	$10,000
IDW disposal – 40 drums @ $350 each	$14,000
Convert existing west well to a monitoring well	$1,000

Piping Trench (2 feet wide x 3.5 feet deep x 350 feet long)

Excavation – 350 feet long @ $10 per foot	$3,500
Piping – $28 per foot x 350 feet x 2 wells	$19,600
Electric conduit – $7.75 per linear foot x 350 feet x 2 wells	$5,425
Backfill and compaction – $5 per foot x 350 feet	$1,750
Surface replacement – $5 per sf x 700 sf	$3,500

Well Vaults

Installation – $1,500 each x 3	$4,500
Piping and appurtenances – $1,200 each x 3	$3,600

Extraction Pumps

Two Gravel well pumps – $2,000 each	$4,000
Bedrock zone well pump	$1,500

Air Stripping Tower Modifications

Piping – Lump sum	$6,000
Controls – Lump sum	$10,000
Discharge – Lump sum	$10,000

Surface Replacement

Six-inch pavement base @ $1.11/sf x 1,000 sf	$1,110
Two-inch asphalt pavement @ $1.87/sf x 1,000 sf	$1,870

Electrical Modifications

Lump sum	$10,000
Site restoration	$5,000

Subtotal	$140,355
Contingency @ 20%	$28,071
TOTAL	**$168,426**

Indirect Implementation Costs

Engineering design documents	$50,000
Project management	$10,000
Air permitting (modifications to the existing air stripper)	$10,000

Construction Oversight

Staff Engineer @ 12 hours per day x 5 days x $85 per hour	$5,100
Per diem, lodging, and vehicle - $150 per day x 5 days	$750
Travel to and from the Site - 20 hours x $85 per hour, plus $1,000 for airfare	$2,700

System Startup and Shakedown

Staff Engineer - 12 hours per day x 3 days x $85 per hour	$3,060
Technician - 12 hours per day x 3 days x $70 per hour	$2,520
Per diem, lodging, and vehicle @ $250 per day x 3 days	$750
Technician travel to and from Site - 20 hours x $70 per hour, plus $1,000 for airfare	$2,400
Start-up equipment	$1,000
Influent and effluent sample analysis - 6 samples x $110 per sample	$660
Sample shipping	$100
Construction completion reporting	$20,000
TOTAL	**$109,040**

Operation, Maintenance, and Monitoring Costs

It is assumed that JCI will use the treated groundwater for its processes at the facility. It is also assumed that JCI personnel would conduct operation, maintenance and monitoring activities as part of their existing process. No additional labor costs or expenses will be caused by this technology for operation, maintenance, and monitoring during the anticipated 15 years for this technology to achieve remediation objectives. Groundwater monitoring costs associated with this technology are addressed in Monitored Natural Attenuation.

Potassium Permanganate Injection Cost Estimate

Direct Capital Costs

Well Installations

Mobilization/Demobilization	$500
Per Diem and lodging, 2 man crew - $50 per man per day x 3 days	$300
Injection Wells	
One 4-inch diameter well to 25 feet bgs	$1,000
One 4-inch diameter well to 50 feet bgs	$2,200
IDW disposal - 8 drums @ $350 each	$2,800

Monitoring Wells

Two 2-inch diameter wells to 25 feet bgs – $500 each	$1,000
Two 2-inch diameter wells to 50 feet bgs – $1,200 each	$2,400
IDW disposal – 20 drums @ $350 each	$7,000

Well Vaults and Piping

Installation, piping and appurtenances – $1,500 each x 6 wells	$9,000

Mixing System and Equipment

System and equipment – Lump sum	$10,000
System and equipment installation – Lump sum	$15,000

Subtotal	$51,200
Contingency @ 20%	$10,240
TOTAL	**$61,440**

A9-2: Indirect Implementation Costs

Engineering design documents	$10,000
Project management	$2,500
Injection permit and regulatory variance	$10,000

Construction Oversight

Staff Engineer @ 12 hours per day x 5 days x $85 per hour	$5,100
Per diem, lodging, and vehicle – $150 per day x 5 days	$750
Travel to and from Site – 20 hours x $85 per hour, plus $1,000 for airfare	$2,700

System Startup and Shakedown

Staff Engineer – 12 hours per day x 2 days x $85 per hour	$2,040
Technician – 12 hours per day x 2 days x $70 per hour	$1,680
Per diem, lodging, and vehicle @ $250 per day x 2 days	$500
Travel to and from the Site – 20 hours x $155 per hour, plus $2,000 for airfare	$5,100
Start-up equipment	$1,500
Groundwater sample analysis – 12 samples x $200 per sample	$2,400
QA/QC samples – 2 samples x $200 per sample	$400
Sample shipping– $100 per event x 2 events	$200
Construction completion reporting	$10,000

TOTAL	**$54,870**

Operation, Maintenance, and Monitoring Costs

Monitoring – Annual Visit

Two technicians @ $70 per hour x 10 hours each per day x 8 days	$5,600
Per diem, expendables, and field equipment ($500 per day x 8 days)	$4,000
Annual Report/ Project Management	$10,000

Operation

Annual $KMnO_4$ – purchase and transportation	$4,000
Utilities (water and electricity)	$2,000

Maintenance

Annual repair costs	$3,000

Subtotal	$28,600
Contingency @ 20%	$5,720
TOTAL	**$34,320**

APPENDIX III
ADMINISTRATIVE RECORD INDEX

JONES CHEMICALS, INC. FACILITY SITE
ADMINISTRATIVE RECORD
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.4 Site Investigation Reports

P. 100001 - 100091 Report: Figure 1, Hazardous Ranking System Cover Sneet, Jones Chemicals, Inc., Revised: June 20, 1987, 2nd Revision: September 18, 1987.

3.0 REMEDIAL INVESTIGATION

3.3 Work Plans

P. 300001 - 300032 Plan: Treatability Study Work Plan, Review of Available Groundwater Treatment Technologies, Design and Operational Parameters for a Pilot Air Stripping System, Jones Chemicals, Inc., Caledonia, New York, prepared by Conestoga-Rovers & Associates, prepared for U.S. EPA, Region II, March 1991.

P. 300033 - 300383 Plan: Work Plan, Supplemental Remedial Investigation/Feasibility Study, Jones Chemicals, Inc., Caledonia, New York, prepared by Conestoga-Rovers & Associates, prepared for U.S. EPA, Region II, March 1991.

P. 300384 - 300450 Plan: Field Operations Plan, Supplemental RI/FS, Volume I: Sampling and Analysis Plan (SAP), Jones Chemicals, Inc., Caledonia, New York, prepared by Conestoga-Rovers & Associates, prepared for U.S. EPA, Region II, June 1991.

P. 300451 - 300541 Plan: Field Operations Plan, Supplemental RI/FS, Volume II: Quality Assurance Project Plan (QAPP), Jones Chemicals, Inc., Caledonia, New York, prepared by Conestoga-Rovers & Associates, prepared for U.S. EPA, Region II, June 1991.

P. 300542 - 300643 Plan: Field Operations Plan, Supplemental RI/FS, Volume III: Health & Safety Plan (HSP), Jones Chemicals, Inc., Caledonia, New York, prepared by Conestoga-Rovers & Associates, prepared for U.S. EPA, Region II, June 1991.

3.4 Remedial Investigation Reports

P. 300644 - 300810 Report: Site Summary Report, Remedial Investigation, Jones Chemicals, Inc. Facility, Caledonia, New York, Administrative Order on Consent, Index No. II, CERCLA-10210, prepared by Levine·Fricke·Recon Inc., prepared for Jones Chemicals, Inc., November 11, 1996.

P. 300811 - 301012 Report: Remedial Investigation Report, JCI/Jones Chemicals, Inc. Facility, Caledonia, New York, Administrative Order on Consent, Index No. II CERCLA-10210, prepared by LFR Levine·Fricke, prepared for JCI/Jones Chemicals, Inc., June 8, 1999.

3.5 Correspondence

P. 301013 - 301015 Facsimile note to Mr. George Jacob, Remedial Project Manager, U.S. EPA Region II, from Mr. Vance Puffer, Village of Caledonia, re: Sample data report of Volatile Organic Contaminants prepared by Wayland Laboratory Services, July 7, 2000.

4.0 FEASIBILITY STUDY

4.3 Feasibility Study Reports

P. 400001 - 400068 Report: Treatability Study Evaluation Report, Jones Chemicals, Inc. Facility, Caledonia, New York, Administrative Order on Consent, Index No.

II, CERCLA-102110, prepared by Levine·Fricke·Recon Inc., prepared for Jones Chemicals, Inc., January 23, 1997.

P. 400069 - 400207 Report: Final Feasibility Study Report for JCI Jones Chemicals, Inc. Facility, Caledonia, New York, Administrative Order on Consent, Index No. II, CERCLA 10210, prepared by LFR Levine·Fricke, prepared for JCI Jones Chemicals, Inc., February 22, 2000.

4.6 Correspondence

P. 400208 - 400215 Facsimile transmittal to Mr. George Jacob, Remedial Project Manager, U.S. EPA, Region II, from Shekhar Melkote, P.G., Senior Hydrogeologist, LFR Levine Fricke, March 31, 2000. (Attachment: Letter (with attachments) to Mr. George Jacob, Remedial Project Manager, U.S. EPA, Region II, from E. Cambeiro, for Shekhar R. Melkote, P.G., Senior Hydrogeologist, re: JCI Jones Chemicals, Inc. Superfund Site; Caledonia, New York, Administrative Order on Consent, Index No. II, CERCLA-10210, Feasibility Study Report: Bridge Document, March 31, 2000.)

7.0 ENFORCEMENT

7.3 Administrative Orders

P. 700001 - 700029 Administrative Order on Consent for Remedial Investigation/Feasibility Study, In the Matter of: The Jones Chemicals Site, Caledonia, New York, Jones Chemicals, Inc., Respondent, Index No. II CERCLA-10210, March 29, 1991.

8.0 HEALTH ASSESSMENTS

8.2 Toxicological Profiles

P. 800001 - 800250 Report: Health Risk Assessment, Jones Chemicals, Inc. Facility, Caledonia, New York, prepared by LFR Levine·Fricke Inc., prepared for Jones Chemicals, Inc., September 30, 1999.

8.3 Correspondence

P. 800251 - 800251 Memorandum to Mr. George Jacob, Remedial Project Manager, ERRD, New York Remediation Branch, from Ms. Gina Ferreira, Environmental Scientist, ERRD, Program Support Branch, re: Jones Chemical Proposed Plan, July 19, 2000.

P. 800252 - 800259 Jones Chemicals Site, Risk Assessment for a Hypothetical Off-Plant Groundwater Scenario, memorandum prepared by U.S. EPA, Region II, July 19, 2000.

P. 800260 - 800260 Jones Chemicals Site, Groundwater Remediation Time Frames, memorandum prepared by U.S. EPA, Region II, July 19, 2000.

10.0 PUBLIC PARTICIPATION

10.9 Proposed Plan

P. 10.00001 - 10.00018 Plan: <u>Superfund Proposed Plan, Jones Chemicals, Inc. Superfund Site, Caledonia, Livingston County, New York</u>, prepared by U.S. EPA, Region II, July 2000.

10.10 Correspondence

P. 10.00019 - 10.00019 Letter to Mr. Joel Singerman, U.S. EPA, Region II, from Ms. Michelle M. Chapman, Code Enforcement Officer, Village of Caledonia, New York, re: Zoning status of Jones Chemicals property, May 23, 2000.

P. 10.00020 - 10.00020 Letter to Mr. Richard L. Caspe, Director, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. Michael J. O'Toole, Jr., Director, Division of Environmental Remediation, New York State Department of Environmental Conservation, re: Jones Chemicals, ID No. 8-26-003, Proposed Plan, July 18, 2000.

APPENDIX IV
STATE LETTER OF CONCURRENCE

New York State Department of Environmental Conservation
Division of Environmental Remediation, Room 260B
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-5861 • FAX: (518) 485-8404
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

SEP 2 2 2000

Post-it® Fax Note 7671	Date 9/22 # of pages ▸ 1
To Joel Singerman	From Joe Moloughney
Co./Dept. USEPA	Co. NYSDEC
Phone #	Phone #
Fax # 212 637 3966	Fax #

Mr. Richard L. Caspe
Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency, Region II
Floor 19 - E38
290 Broadway
New York, New York 10007-1866

Dear Mr. Caspe:

Re: Jones Chemicals, ID No. 8-26-003
Record of Decision

The New York State Department of Environmental Conservation (NYSDEC) and Department of Health (NYSDOH) have reviewed the Record of Decision dated September 2000 prepared by the EPA for this site. We understand the EPA's remedy for the site (Soil Alternative S-2, and Groundwater Alternative GW-4) includes vapor extraction of VOC contaminants from the Former Solvent Tank Source Area, in-situ DNAPL treatment via advanced oxidation, and the extraction and treatment of contaminated groundwater from the on-site plume. The extraction of groundwater will take place in the Former Solvent Tank Source Area. The extracted groundwater will be treated by the plant air stripper and discharged to the on-site lagoons. This discharge will meet the requirements of the existing NYSDEC SPDES Permit. We understand that the remaining on-site and off-site groundwater plume will not be collected but that a long-term groundwater mon0itoring program will be conducted to determine if groundwater quality improves sufficiently under natural conditions. If monitoring indicates that natural attenuation is not effective in remediating off-site groundwater contamination, active remedial measures will be considered. With this understanding, we concur with the Record of Decision for Jones Chemicals.

If you have any questions or need additional information, please contact Mr. Joseph Moloughney at (518) 457-0315.

Sincerely,

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

cc: J. Singerman/G. Jacob, USEPA
A. Carlson/M. VanValkenburg, NYSDOH
D. Napier, NYSDOH
R. Van Houten, Livingston Co. DOH

APPENDIX V
RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
Jones Chemical Superfund Site

INTRODUCTION

This Responsiveness Summary provides a summary of citizens' comments and concerns received during the public comment period related to the Jones Chemicals, Inc. site (Site) remedial investigation and feasibility study (RI/FS) and the Proposed Plan, and provides the responses of the U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC) to those comments and concerns. All comments summarized in this document have been considered in EPA and NYSDEC's final decision in the selection of a remedy to address the contamination at the Site.

SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

The July 2000 Proposed Plan, which identified EPA and NYSDEC's preferred remedy and the basis for that preference, and the RI/FS reports were made available to the public in both the Administrative Record and information repositories maintained at the EPA Docket Room in the Region II New York City office and two local information repositories: the Village of Caledonia Library, 3108 Main Street, Caledonia, New York and the Village of Caledonia Clerks Office, 30-95 Main Street, Caledonia, New York. The notice of availability for these documents was published in the *Livingston County News* on July 20, 2000. A public comment period was held from July 20, 2000 to August 19, 2000. On August 14, 2000, EPA conducted a public meeting at the *Caledonia-Mumford Central School*, 99 North Street, Caledonia, New York, to present the findings of the RI/FS and answer questions from the public about the Site and the remedial alternatives under consideration. Sixteen people, consisting of local residents, a representative of the media, a potentially responsible party (PRP) representative, and state and local government officials, attended the public meeting.

OVERVIEW

The public generally supports the selected remedy, which includes, among other things, in-situ soil vapor extraction (SVE) to address the contaminated soil and groundwater extraction and treatment in the source area, in-situ dense nonaqueous phase liquid treatment, and monitored natural attenuation of the groundwater outside the source area to address the contaminated groundwater.

Responses to the comments received at the public meeting (no written comments were received) are summarized below. Attached to this

Responsiveness Summary are the following Appendices:

Appendix V-a -	Proposed Plan (July 2000)
Appendix V-b -	Public Notice published in the *Livingston County News* on July 20, 2000
Appendix V-c -	August 14, 2000 Public Meeting Sign-In Sheet
Appendix V-d -	August 14, 2000 Public Meeting Transcript

SUMMARY OF COMMENTS AND RESPONSES

A summary of the comments provided at the August 14, 2000 public meeting, as well as EPA and NYSDEC's responses to them thereto, are provided below. The comments and responses have been organized into the following topics:

- Site Contaminants
- Threat to Public and Private Water Supplies
- Risks Posed by the Site
- Soil and Groundwater Treatment Processes
- Financing of the Project

Site Contaminants

Comment #1: A commenter asked what contaminants are present on-Site and whether the extent of the soil and groundwater contamination has been clearly defined.

Response #1: Site soils and groundwater are contaminated, primarily, with tetrachloroethylene (PCE) and trichloroethylene (TCE). The results of soil samples collected across the Site showed PCE concentrations ranging from below detection to 330,000 micrograms per kilogram (µg/kg) and TCE concentrations ranging from below detection to 320 µg/kg. The highest soil concentrations of PCE and TCE were detected in a 150-foot by 20-foot area located at the Site of a former aboveground solvent tank area referred to as the "Former Solvent Tank Source Area," on the western portion of the property.

An approximately 1,500-foot (along the northeast–southwest axis) by 720-foot (along the north–south axis) groundwater VOC plume, consisting of primarily PCE, and its degradation products TCE and 1,2-dichloroethene (1,2-DCE), extends from the Former Solvent Tank Source Area to the east and to the northeastern property boundary. Vertically, the contamination extends to at least 48 feet below the ground surface in the source area.

Groundwater sampling results from the overburden aquifer in the Former Solvent Tank Area showed concentrations of PCE and TCE as high as 5,500 micrograms per liter (µg/l) and 130 µg/l, respectively. Although there is groundwater contamination in the overburden aquifer outside the Former Solvent Tank Area, it appears that the North Well (an on-plant production well) has helped to limit the migration of the plume (while 140 µg/l PCE was detected at the North Well, PCE concentrations significantly taper off beyond the well, ranging from below detection to 22 µg/l). Based upon the data, it does not appear that contamination is migrating beyond JCI Jones Chemicals, Inc.'s property boundaries.

In the bedrock aquifer in the vicinity of the Former Solvent Tank Area, PCE and TCE were detected at concentrations as high as 62,000 µg/l and 100 µg/l, respectively. With the exception of the detection of 340 µg/l PCE in the West Well, relatively low concentrations of PCE and TCE (less than 10 µg/l) were detected outside the Former Solvent Tank Area.

Based upon the data summarized above, EPA believes that the nature and extent of the soil and groundwater contamination have been clearly defined.

Threat to Public and Private Water Supplies

Comment #2: Several commenters inquired as to whether the Site poses a threat to the public and private water supplies located in the vicinity of the Site.

Response #2: The Site does not pose a threat to the public and private water supplies located in the vicinity of the Site.

Periodic sampling of the Village of Caledonia's water supply wells from 1983 through 1989 showed the presence of PCE, TCE, and 1,1,1-trichloroethane. In 1991, the Village installed an air stripper to treat the water prior to distribution. The latest sampling results (June 6, 2000) indicate that the contaminant concentrations meet drinking water standards prior to treatment.

While the Site's southern boundary is located approximately 700 feet from the Village of Caledonia's water supply wells, it has not been determined that the Site was the source of this contamination. Observing groundwater flow paths would ordinarily allow a determination as to whether or not the Site was a source of this contamination. However, since the groundwater flow path has been altered (the Village took a water supply well out of service in 1994 and the prolonged pumping of the on-Site production wells has altered the natural groundwater flow path), such a determination cannot be made.

There are two private residential wells located approximately one mile from the plant which have shown chlorinated solvent contamination. NYSDEC installed and is presently maintaining treatment systems on these wells. The contaminants found in these wells are only slightly above drinking water standards. Given the low levels of contamination and considering the distance of the wells from the Site, it is unlikely that the Site is the source. The source of the contamination of these wells has yet to be identified.

No other private wells located in the vicinity of the Site show evidence of Site-related contamination.

Risks Posed by the Site

Comment #3: A commenter asked what are the risks that the Site poses.

Response #3: Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future Site conditions. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and anticipated future land uses.

The potential human receptors evaluated were plant workers and off-Site adult and child residents. The baseline risk assessment evaluated the exposure that may potentially impact such receptors.

The results of the risk assessment indicate that the estimated excess risks for plant workers and trespassers were lower than or within the acceptable risk range.

Based upon the groundwater sampling results, it appears that the on-Site production wells are preventing the migration of contaminated groundwater beyond the property boundaries. The risk assessment evaluated the threat posed by a hypothetical scenario where the plant production wells cease to operate, allowing the migration of contaminated groundwater beyond the plant boundaries.

The estimated risks for off-Site residents under a hypothetical future-use scenario where the on-plant production wells are turned off, thus allowing contaminated groundwater to migrate off-Site, poses an unacceptable risk.

With regard to ecological receptors, soil samples from the Former Solvent Tank Source Area contained volatile organic compounds, some of which (*e.g.*, PCE) are present in concentrations greater than conservative screening criteria considered protective of soil invertebrate species. Therefore, there is a potential for an unacceptable risk to burrowing animals that come into contact with these contaminated surface soils (zero to a two-foot depth).

Because the groundwater is about 8 feet below the ground surface, direct contact with groundwater by ecological receptors is unlikely. Since there are no wetlands or surface water bodies in the immediate vicinity of the Site, there is no potential for contaminated groundwater to discharge into surface water. Therefore, groundwater is not considered to be an exposure pathway for ecological receptors.

Soil and Groundwater Treatment Processes

Comment #4: A commenter asked about the safety of the selected soil and groundwater treatment processes. They also asked whether these processes would adversely impact the air or groundwater.

Response #4: The selected soil and groundwater treatment processes could result in some adverse impacts to on-Site remediation workers, but all of these potential risks would be readily mitigated by utilizing proper protective equipment.

Specifically, the selected soil remedy, SVE, could result in some adverse impacts to on-Site workers through dermal contact and inhalation related to the installation of SVE wells through contaminated soils. The selected groundwater remedy, source area extraction and treatment and monitored natural attenuation of the plume, could result in some adverse impacts to on-Site workers, since it involves the installation of extraction wells through potentially contaminated soils and groundwater. This alternative could also present some limited adverse impacts to on-Site workers through dermal contact and inhalation related to groundwater sampling activities.

The vapors extracted by the SVE process will be treated by granular activated carbon before being vented to the atmosphere. The extracted groundwater will be treated by an air stripper and, if necessary, granular activated carbon, prior to its use as noncontact cooling water within the plant. As such, the soil and groundwater treatment processes will not pose a threat to the public and will not adversely impact the air or groundwater.

Comment #5: A commenter asked where Jones Chemicals, Inc.'s wastewater is presently discharged. Another commenter asked whether the wastewater is tested prior to discharge.

Response #5: The principal waste stream from the plant is wastewater, which is comprised of wash water and other waste liquids generated from handling and packaging. This waste stream is first neutralized and then mixed in an approximately 1-to-99 ratio with noncontact cooling water, which is extracted from two on-Site production wells. This mixture is then discharged to an infiltration lagoon system in accordance with a New York State Pollutant Discharge Elimination System permit. In May 1996, JCI Jones Chemicals, Inc. installed an air stripper to treat the noncontact cooling water prior to discharge to the lagoons. Periodic monitoring of the noncontact cooling water is performed. This monitoring indicates that volatile organic contamination is below detection limits after treatment.

Comment #6: Since the estimated volume of contaminated soil is only 1,700 cubic yards, a commenter asked why EPA is not proposing to excavate it and take it off-Site, rather than treating it in-situ.

Response #6: While excavation of the contaminated soils and off-Site treatment/disposal would effectively achieve the soil cleanup levels in approximately one year, as compared to 3 years for SVE, at a cost of $3,269,000, the excavation and off-Site treatment/disposal alternative would be considerably more expensive than SVE ($684,000). Although the contaminated soils are a continuing source of groundwater contamination, they do not pose an immediate human health or ecological risk. Considering the fact that the groundwater component of the selected remedy will address the contaminated groundwater, the increase in the time needed to clean up the soil would, therefore, not be a significant concern. Consequently, EPA believes that SVE would effectuate the soil cleanup while providing the best balance of tradeoffs among the alternatives with respect to the evaluating criteria.

Comment #7: A commenter asked for details as to how the SVE process works. Another commenter asked whether SVE is a proven technology and whether it has been used to remediate any sites.

Response #7: Under the SVE process, air is drawn through a series of underground, perforated pipes to volatilize the solvents contaminating the soils in the unsaturated zone (above the water table). The extracted vapors are then collected and treated by granular activated carbon before being vented to the atmosphere. The spent carbon is transported off-Site for treatment. While the SVE process is working, the concentrations of volatile organic compounds (VOCs) being recovered will be monitored. Based upon these data, when it appears that the recovery of volatile organic compounds has tapered off, soil borings will be collected to verify that the cleanup objectives have been met.

SVE is a proven technology that has been widely used at Superfund and non-Superfund sites nationwide. In New

York State, SVE was used at the Genzale Plating Company Superfund site, a metal-plating facility located in Franklin Square, New York with VOC contamination. After approximately one year of operation, confirmatory soil sampling established that the VOC cleanup levels had been met and the unit was shut down. SVE units are currently operating at the Mattiace Petrochemical Company Superfund site, an inactive chemical distribution facility located in Glen Cove, New York, the Pasley Solvents and Chemicals Superfund site, a former tank farm used for the storage of oils, solvents and chemicals in Uniondale, New York, the Rowe Industries Groundwater Contamination Superfund site, a motor and transformer manufacturer located in Sag Harbor, New York, the Solvent Savers Superfund site, a chemical waste recovery facility located in Lincklaen, New York, and in an industrial park associated with the Vestal Wellfield Superfund site, located in Vestal, New York.

Financing of the Project

Comment #8: A commenter asked who paid for the RI/FS and who will be paying to implement the selected remedy.

Response #8: In March 1991, JCI Jones Chemicals, Inc. entered into an Administrative Order on Consent (AOC) with EPA to perform an RI/FS for the Site to determine the nature and extent of the contamination at and emanating from the Site and to identify and evaluate remedial alternatives. Pursuant to the requirements of the AOC, JCI Jones Chemicals, Inc. also agreed to reimburse EPA for its oversight of the RI/FS. After the remedy is selected, EPA intends to commence negotiations with JCI Jones Chemicals, Inc. for the company's performance of the design and construction of the remedy.