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Superfund
Record of Decision:

A.O. Polymer, NJ

50272-101

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16. Abstract (Limit: 200 words)

The 4-acre A.O. Polymer site is an active resin manufacturer in Sparta, Sussex County, New Jersey. Land use in the area is semi-rural, and the facility is surrounded by wetlands. The A.O. Polymer site is one-half mile from Sparta High School which has an onsite well, and 500 feet southeast of the Wallkill River, a ground water discharge area. The ground water in the area is a current or potential source of drinking water. From the early 1960's to 1978, Mohawk Industries operated as a resin production facility and also reclaimed electronic component cleaning fluids. In 1978, the A.O. Polymer Corporation purchased the site, and onsite resin manufacturing operations continued to utilize the same storage vessels and laboratories previously owned by Mohawk Industries. State investigations in 1978 identified VOC-contamination in local drinking water, and in 1979 the affected residences were connected to the public water supply. Further State investigations in 1978 identified improper waste handling and storage practices including disposal of liquid wastes into unlined lagoons; improper storage of over 800 deteriorating drums; and buried, crushed, and open drums containing VOCs and organic compounds. In 1980 and 1981, the State excavated and removed 120 cubic yards of crushed drums and

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - A.O. Polymer, NJ
First Remedial Action - Final
Contaminated Media: soil, gw
Key Contaminants: VOCs (benzene, TCE, toluene, xylenes), other organics (PAHs, PCBs, pesticides and phenols)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 74
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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

debris, 1,700 cubic yards of associated contaminated soil, and 1,150 surface drums. In 1982, State investigations confirmed that these disposal practices had resulted in the contamination of potable ground water. This Record of Decision (ROD) addresses soil contamination in the former waste lagoon area and the contaminated ground water plume, and provides a final remedy for the site. The primary contaminants of concern affecting the soil and ground water are VOCs including benzene, TCE, toluene, and xylenes; and other organics including PAHs, PCBs, pesticides, and phenols.

The selected remedial action for this site includes treating contaminated soil onsite using vapor extraction, with control of off-gas emissions using activated carbon; treating minimal amounts of liquid condensate with an onsite ground water treatment unit, or disposing of liquid condensate offsite along with the spent carbon; onsite pumping and treatment of ground water using activated sludge in conjunction with a powdered activated carbon treatment, followed by filtration and a carbon polishing treatment; reinjecting the treated ground water onsite with a contingency for onsite discharge to surface water, if necessary; and disposing of residual sludge offsite. An ARAR waiver may be necessary if onsite discharge standards to surface water cannot be met. The estimated present worth cost for this remedial action is $4,577,000, which includes an annual O&M cost of $218,000 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Soil clean-up levels are based on State soil action levels including total VOCs 1 mg/kg and total organics 10 mg/kg. Ground water will be remediated to meet the more restrictive of State or Federal MCLs.

ROD FACT SHEET

SITE

Name: A.O. Polymer
Location/State: Sparta, Sussex County, New Jersey
EPA Region: II
HRS Score (date): 28.91 (2/91)
NPL Rank (date): 1039 (2/91)

ROD

Date Signed: June 28, 1991

Selected Remedy

Soils: Soil Vapor Extraction

Groundwater: Pump and Treat with a Powdered Activated Carbon Treatment System

Capital Cost: $ 2,186,000
O & M: $ 218,000
Present Worth: $ 4,577,000

LEAD

Enforcement, EPA
Primary Contact (phone): Rich Puvogel (212-264-9836)
Secondary Contact (phone): Kim O'Connell (212-264-8027)

WASTE

Type: Soil - toluene, trichloroethene,napthalene, 2-methylnaphthalene
Groundwater - trichloroethene,carbon tetrachloride, chlorobenzene, methylene chloride, 1,1,1-trichloroethane
Medium: Soil, groundwater
Origin: Pollution originated as a result of improper disposal of hazardous wastes at this location. Drums and liquid wastes were dumped into unlined lagoons.

DECLARATION STATEMENT

RECORD OF DECISION

A.O. POLYMER

FACILITY NAME AND LOCATION

A.O. Polymer
44 Station Road
Sparta, Sussex County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the A.O. Polymer Superfund site. The remedial action was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision document explains the factual and legal basis for selecting the remedy for this site.

The United States Environmental Protection Agency and the New Jersey Department of Environmental Protection concur with the selected remedy. Information which supports the remedy can be found within the administrative record for the site.

ASSESSMENT OF THE SITE

Releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The selected remedial action described in this document addresses the principal threats posed by the A.O. Polymer site. It addresses the remediation of contaminated soil and groundwater. No further remedial actions are planned for the site.

The selected remedy for the site includes the following components:

- Vapor extraction of organic compounds in soils;
- Pumping and treatment of contaminated groundwater utilizing a powdered activated carbon filtration system; and
- Implementation of an appropriate monitoring program to ensure the effectiveness of the remedy.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective.

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

Because the remedy will not result in hazardous substances remaining on the site above health-based levels, the five year review will not apply to this remedial action.

Constantine Sidamon-Eristoff
Regional Administrator
U.S. EPA Region II

6/25/91
Date

DECISION SUMMARY

A.O. POLYMER

Sparta, New Jersey

SITE DESCRIPTION

The A.O. Polymer site is an active facility, located at 44 Station Road in the Township of Sparta, Sussex County, New Jersey. The site occupies four acres near the Sparta Rail Road Station along the New York, Susquehanna and Western (NYS&W) Railway. Structures present at the site include office and laboratory facilities, a main reactor building, assorted storage buildings, and a non-contact water cooling water pond. The office, reactor building, and laboratory are currently used by A.O. Polymer in its present manufacturing processes. The cooling water pond, which is located in the southeast quadrant, has no surface outlet, and is lined with concrete. It is used for the recirculation of non-contact cooling water and is periodically replenished with water from an on-site production well.

The site is situated in a semi-rural area near the Wallkill River, about one-quarter mile from the commercial district of Sparta and one-half mile from the Sparta High School. The site is bounded to the north and east by Station Park, a municipal recreation area, to the southeast by Station Road, and to the south and west by the NYS&W Railway. Several small businesses and three homes are located near the site on Station Road. The Sparta High School lies one-half mile to the north-northeast and a private gun club is located 500 feet northwest of the site. The Wallkill River flows in a northerly direction and is located 500 feet to the southeast of the site (See Map, Attachment 1).

SITE HISTORY

Mohawk Industries began operations at the site in the early 1960's. Mohawk was involved in the production of resins using polymerization processes. Mohawk also engaged in the reclamation of electronic component cleaning fluids containing freon compounds in alcohol.

In 1978, the facility was purchased by A.O. Polymer Corporation. Along with the property, A.O. Polymer purchased the rights to manufacture resin products previously produced by Mohawk. A.O. Polymer continues to utilize the same processing machinery, storage vessels and laboratories used by Mohawk.

ENFORCEMENT

Complaints of odors emanating from well water and air near the site were first registered by citizens living or working near the site in 1973. Complaints of odors and bad smelling well water intensified in 1978, touching off formal investigations by the Sparta Health Department and the New Jersey Department of Environmental Protection (NJDEP). In December 1978, NJDEP inspectors and Sparta Health Department officials collected samples from potable wells surrounding the site. Analysis of these samples revealed the existence of volatile organic contamination in three domestic wells located along Station Road. In June 1979, the owners of the three affected wells filed damage claims with the New Jersey Hazardous Spill Fund, and in January of the following year, these homes were connected to the District No.1 water line which continues to provide the homes with municipal water.

In 1978, NJDEP began investigating reports of drum stockpiling at the site. These investigations identified on-site waste disposal and storage practices as the source of groundwater contamination in residential wells. Waste handling practices included disposal of liquid chemical waste into unlined lagoons, improper storage of over 800 deteriorating drums, and burial of crushed and open drums containing waste materials including volatile and semi-volatile organic compounds.

In 1980 and 1981, surficial cleanup at the site was initiated by NJDEP, including the removal of surface drums and the excavation and removal of contaminated soil located in the unlined lagoon area. The area was excavated to a depth of approximately 10 feet and backfilled with clean soil. This cleanup resulted in the removal of 1,150 drums, 1,700 cubic yards of contaminated soil, and 120 cubic yards of crushed drums and debris.

Concern regarding the extent of groundwater contamination resulted in additional investigations by NJDEP. In January 1982, NJDEP's Division of Water Resources installed 11 monitoring wells on and adjacent to the site to determine the extent of groundwater contamination. Sampling confirmed that contamination had reached the Allentown formation, which is a source of potable water in the area. Sampling also revealed that groundwater contamination had migrated to Station Park, 300 yards northeast of the site.

The site was placed on the National Priorities List (NPL) on September 1, 1983. In 1984, further investigation of the site was performed by the NJDEP's Division of Hazardous Site Mitigation. A Remedial Investigation and Feasibility Study (RI/FS) was performed by ICF Technology funded by the U.S.

Environmental Protection Agency (EPA) through a Cooperative Agreement with NJDEP.

Complaints of odors emanating from the site have continued throughout the 1980s and still continue. In response to repeated complaints from residents in the area, NJDEP Division of Environmental Quality has cited and fined the A.O. Polymer facility for air emission violations. NJDEP is continuing to investigate complaints concerning air emissions from the active facility.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

On April 25, 1991, NJDEP presented the Proposed Plan for site remediation, the RI/FS Reports, and other documents which comprise the administrative record for this final remedy for the site to the public for comment. These documents were made available to the public at the EPA Administrative Record File Room, Room, 26 Federal Plaza, New York, New York; at the Sparta Township Library, 22 Woodport Road, Sparta, New Jersey; and at NJDEP, 401 East State Street, Trenton, New Jersey.

On April 25, 1991, NJDEP also issued a notice in the Jersey Herald newspaper which contained information relevant to the public comment period for the site, including the duration of the comment period, the date of the public meeting and availability of the administrative record. The public comment period began on April 25, 1991 and was to end on May 24, 1991. However, based on a request for an extension, the public comment period was extended until June 7, 1991. A public meeting was held on May 9, 1991 at the Sparta Municipal Building located at 65 Main Street, Sparta, New Jersey. At that time, the public was given an opportunity to have questions and concerns about the site addressed by NJDEP. In addition, written comments were accepted during the public comment period. Responses to the significant comments received during the public comment period are included in the Responsiveness Summary (Attachment 4), which is part of this Record of Decision (ROD).

SCOPE AND ROLE OF RESPONSE ACTION

The remedial action described herein addresses the principal threats associated with the A.O. Polymer site. The remedial action has been divided into two parts, one which addresses soil contamination in the former waste lagoon area, and the other which addresses groundwater contamination. The soil contamination is believed to be the source of the groundwater contaminant plume and is addressed under a source control alternative. Groundwater contamination is addressed under a management of migration alternative.

The response action described in this ROD addresses all known soil and groundwater contamination at the site and is the final action contemplated for the A.O. Polymer site.

SUMMARY OF SITE CHARACTERISTICS

GEOLOGY

The region surrounding Sparta, New Jersey is underlain by many rock types. Pre-Cambrian rocks form the hills to the west and Sparta Mountains to the east of the town. The Wallkill River Valley is underlain by a combination of Cambrian Hardystone and Cambro-Ordovician Kittatinny Limestone of which the Allentown Formation is of most importance. The Allentown Formation is a thick, rhythmically bedded, impure dolomite that locally contains significant amounts of groundwater.

Sussex County is located in the New Jersey Highland Physiographic Province. This area is characterized by linear valleys and ridges, predominantly trending northeast and southwest. This linearity is the result of two major tectonic upheavals which severely deformed the entire region. As a result, bedrock is highly deformed by both folding and faulting.

The A.O. Polymer site is situated atop a small hill in the center of the valley, possibly a remnant of a stratified drift deposited by glacial meltwater. Water level measurements indicate that the top of the water table is approximately 20 and 30 feet below grade beneath the A.O. Polymer property. Depth to the top of the water table decreases to the north and east until, in Station Park next to the Wallkill River, it is only 2.6 feet below the ground surface. Glacial deposits consisting of silts, sands, gravel and boulders comprise the water table aquifer. The water table aquifer extends down to the top of the bedrock at a depth ranging from 17 to 123 feet. In addition to being highly fractured and weathered, the bedrock also has locally significant solution cavities. This bedrock, also known as the Allentown Formation, is a source of potable water in the Wallkill Valley.

SOILS

As mentioned above, surface soils from the former waste lagoons were remediated by NJDEP in 1980 and 1981. During this removal action, the top 10 feet of the contaminated soils in the lagoon area were excavated and disposed of off-site. The excavated area was then backfilled with clean fill, leaving behind unsaturated residual soil contamination between a depth of approximately 10 to 25 feet.

Residual soil contamination from the former lagoon disposal area is the major source of the groundwater contamination emanating from the site. The source area is located approximately 10 feet below the ground surface down to the water table at a depth of 25 feet. The estimated volume of contaminated soil is approximately 7,500 cubic yards. Subsurface soil analysis indicates that organic chemicals seeped from the lagoons into the unsaturated soil zone, also known as the vadose zone, and are now located within the pore spaces of the soil. The organic compounds retained in the soil pores are relatively mobile. These compounds desorb upon contact with infiltrated groundwater providing a relatively constant release of contamination to groundwater for as long as immersible liquids remain. As a result, the contaminated vadose zone soils are likely to constitute a prolonged and significant source of groundwater contamination.

On-site soil samples taken from 17 borings revealed the presence of various organic compounds significantly above background levels. Metals were detected at levels similar to background levels. The Volatile Organic Compounds (VOCs) detected most frequently and in highest concentrations include toluene at 61 parts per million (ppm), and trichloroethene at 27 ppm. Semi-volatiles compounds, including napthalene at 16 ppm, 4-methylphenol at 14 ppm, and 2-methlylnaphtalene at 9.6 ppm were also detected. These and other volatile and semi-volatile compounds were found between 10 and 25 feet below the ground surface underlying the former lagoon area. The compounds and detected ranges, as well as soil cleanup goals are listed in (Table 1A). These levels are above the New Jersey Soil Action Levels of 1 ppm for total VOCs and 10 ppm for total semi-VOCs.

Contaminants in subsurface soils, the source of groundwater contamination, are not readily accessible for human contact and, therefore do not pose a direct contact hazard. However, contaminants from this soil continue to be released into groundwater.

GROUNDWATER

The water table beneath the A.O. Polymer property is between 20 to 30 feet below grade. Depth to the water table decreases to the north and east of the property, until it is only 2.6 feet below the surface in Station Park next to the Wallkill River. RI data show that both the water table and bedrock aquifers are hydraulically interconnected and that groundwater contamination from the site has moved downward through the glacial overburden, and migrated from the site through the shallow portions of the Allentown formation. Groundwater contamination in the water table aquifer consists primarily of volatile organic compounds including carbon tetrachloride, chlorobenzene, methylene chloride, 1,1,1-trichloroethane. The compounds were detected at levels above the Federal and New Jersey Maximum Contaminant Levels (MCLs) for these compounds. A list of groundwater contaminants for both the water table and bedrock aquifer is presented in Table 1B.

The RI data has defined the latitudinal (east - west) and longitudinal (north - south) extent of the groundwater contaminant plume. The northernmost boundary of the plume is 400 feet north of the site, and the southernmost boundary of the plume does not appear to extend past the southern boundary of the site, refer to map, Attachment 2. Latitudinally, the plume appears to have stabilized. The plume emanates from the former disposal lagoon area and extends to the Wallkill River in the east/northeasterly direction. The plume is confined to relatively shallow portions of the groundwater flow system and is discharged to the river along with the normal groundwater flow. The downgradient extent of the plume from the former lagoon area is limited by the Wallkill River. Transport past the river is not indicated by the data and appears to be unlikely given present hydrologic conditions. The Wallkill River is a groundwater discharge area, a fact that is corroborated by the apparent convergence of piezometric contours at the river and the upward gradients observed along both sides of the river. Furthermore, contamination in the deep wells on the east side of the river (opposite the site) has not been detected, suggesting that the plume is confined to relatively shallow portions of the flow system and is thus discharged to the river along with the groundwater.

In summary, as a result of the present extent of contamination and the assessment of contaminant fate and transport, it appears that present opportunities for exposures to site contaminants in groundwater are limited. Currently, groundwater contamination from the A.O. Polymer site is unlikely to present a direct threat to existing potable water supplies. All affected existing wells along Station Road, with the sole exception of the A.O. Polymer well used for production processes, have been replaced with municipal water supplies. Contaminant transport from the former lagoon area is believed to be approaching an almost steady state condition, and the plume may not continue to spread. Groundwater concentrations near the contaminant source have decreased since 1985 but have remained relatively stable for the last two monitoring episodes. This suggests a nearly constant input from residual contamination at the source. Downgradient from the source, near the center of the plume, a slow but gradual increase in concentration of contaminants was observed until 1987. The latest data indicates a decrease in groundwater contamination suggesting a levelling off trend. Such behavior is typical for a constant source and steady state conditions. Continued migration of the plume beyond its present boundaries is unlikely. Therefore, all known existing water supply wells, including the Sparta High School well, are currently at minimal risk of becoming contaminated.

Although there is minimal risk currently posed by contaminated groundwater at the site, potential risk would exist if a well is placed in the contaminated groundwater plume sometime in the future. The Allentown formation and the water table aquifer in the study area are important sources of water in the valley and it is possible that a potable well could be installed within or near enough to the plume to be affected. The ingestion of contaminated groundwater would cause unacceptable risks to human health.

SURFACE WATER

Surface water bodies in the vicinity of the site include the Wallkill River, a small wetland area located downstream of the site, and an unnamed tributary to the Wallkill River which is located approximately 500 feet to the north of the site. The A.O. Polymer facility lies on the surface water divide between the Wallkill River and the unnamed tributary, which joins the Wallkill River about one mile northeast of the site.

The main source of surface water contamination at the site is contaminated subsurface soils and groundwater. As residual subsurface soil contaminants enter the groundwater they eventually discharge to the wetland area and the Wallkill River.

The groundwater contaminant plume is presently discharging to the wetland area located on the west side of the river as well as the river itself, as evidenced by detections of 1,1-dichloroethene (1,1-DCE) and 1,2-dichloroehtene (1,2-DCE) in surface water samples from the wetland and river. Eight surface water samples were taken from four points in the river and wetland. Samples taken upstream from the contaminant discharge plume are consistent with background levels. The only organic contaminants detected upstream of the groundwater plume discharge area were methylene chloride and acetone. It is believed that most volatile organic compounds entering the Wallkill River from the contaminated groundwater are quickly attenuated by dilution, volatilization and degradation as reflected by the low levels detected in the downstream samples (see Table 1C). Direct contact with water in the Wallkill River and the wetland provide minor opportunity for exposure.

The wetland area is located 1,600 feet northeast of the site and extends along the side of the river approximately 1,200 feet. Surface water samples from the wetland area have higher contaminant concentrations than the surface water samples collected from the Wallkill River. Concentrations of volatile organic compounds, including 1,2-DCE, dichloroehtane, vinyl chloride, and trichloroethane in surface water samples collected from the wetland are presented in Table 1D.

SEDIMENTS

Four sediment samples from the Wallkill River indicate the presence of one volatile organic compound, toluene, and one semi-volatile compound, di-n-butylpthalate, at levels above background (Table 1E). Background levels were determined by sampling sediments upstream of where the contaminated groundwater plume discharges to the Wallkill River.

AIR

Sources of air contamination include contaminated subsurface soils, groundwater, surface water and ongoing operations at the A.O. Polymer facility. No air sampling was performed on the site during the RI. Air emissions from volatilization of contaminants from subsurface soils, groundwater, and surface waters were modeled. Due to the current operations at the facility, and other sources, it would be difficult to collect air samples that are representative of any contribution from VOCs detected in site soils, groundwater, surface water, or sediment. In addition, air emissions from the operations at the A.O. Polymer plant have in the past and continue to be investigated by NJDEP.

Volatile contaminants in subsurface soils, groundwater, or surface water can be transferred to air at rates dependent on atmospheric and chemical specific properties. Volatile organic contamination is present in on-site subsurface soils in high concentrations, but is present 10 feet or more below the soil surface. Some emissions of volatile organic vapors may occur, however, subsurface contamination is well below the surface and is localized in the former lagoon area at A.O. Polymer, a remote area, which is not frequented by people.

Volatile organic contamination in soils not only spreads to the groundwater, but volatile vapors from subsurface soils can also diffuse through the soil pore spaces in the vadose zone and be released into the atmosphere. Similarly, some volatilization from groundwater in the water table aquifer will occur for those contaminants that are volatile. Transfer of contaminants to the atmosphere from groundwater is most likely to occur in areas of Station Park where depth to the water table is shallow. Also, as contaminated groundwater discharges to the Wallkill River, some volatilization will occur there. It is expected that these volatile organic emmissions will be dispersed by air currents within a short distance, resulting in bulk air concentrations that are extremely low.

SUMMARY OF SITE RISKS

EPA conducted a baseline Risk Assessment (RA) of the "No Action" alternative to evaluate the potential risks to human health and the environment associated with the A.O. Polymer site in its current state. The RA focused on contaminants in the groundwater, surface water and air which are likely to pose significant risks to human health and the environment. contaminants of concern were identified for the site. The summary of the contaminants of concern in sampled matrices is listed in Table 1.

EPA's RA identified several potential exposure pathways by which the public may be exposed to contaminant releases at the site under current and future land-use conditions. A total of six exposure pathways were evaluated under present and future land uses (Table 2).

Under current EPA guidelines, the likelihood of carcinogenic (cancer-causing) and noncarcinogenic effects due to exposure to site chemicals are considered separately. Toxic effects of the site-related chemicals are additive. Thus, carcinogenic and non-carcinogenic risks associated with exposures to individual compounds of concern were summed to indicate the potential risks associated with mixtures of potential carcinogens and non-carcinogens, respectively.

Noncarcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and safe levels of intake (Reference Doses). Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects. RfDs, are expressed in units of milligrams per kilogram per day (mg/kg/day) which are thought to be safe over a lifetime of exposure (including sensitive individuals). Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) are compared with the RfD to derive the hazard quotient for the contaminant in the particular media. The HI is obtained by adding the hazard quotients for all compounds across all media.

A HI greater than 1 indicates that the potential exists for non-carcinogenic health effects to occur as a result of site-related exposures. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The reference doses for noncarcinogenic compounds of concern at the A.O. Polymer site are presented in Table 3. A summary of the noncarcinogenic risks associated with these chemicals across various exposure pathways is found in Table 4.

Since the HI is less than 1 for the current land use scenarios, non-carcinogenic adverse health effects are unlikely for the contaminants quantitatively assessed.

For a future groundwater ingestion scenario however, the potential hazard index under both the average and reasonable maximum exposure (RME) cases exceeds one, due primarily to the liver toxicants carbon tetrachloride, 1,2-dichloroethene, and trichloroethene.

Potential carcinogenic risks were evaluated using the cancer potency factors developed by EPA for the carcinogenic compounds of concern. Cancer slope factors (SFs) have been developed by EPA's Carcinogenic Risk Assessment Verification Endeavor for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. SFs, which are expressed in units of $(mg/kg/day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to generate an upper-bound estimate of the excess lifetime cancer risk associated with exposure to the compound at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes the underestimation of the risk highly unlikely. The SF's for the chemicals assessed are presented in Table 5.

For known or suspected carcinogens, EPA considers excess upperbound individual lifetime cancer risks of between 10^{-4} to 10^{-6} to be acceptable. This level indicates that an individual has no greater than one in ten thousand to one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year period under specific exposure conditions at the site.

The cumulative upper bound risk from all evaluated exposure pathways at the A.O. Polymer site is 4.7×10^{-4}. The breakdown of risk for each exposure pathway analyzed appears on Table 6. The risks for carcinogens at the site are at the high end of the acceptable risk range. Because of the presence of sensitive populations (i.e. children) that can potnetially be exposed, the point of departure for cancer risks was considered to be 1×10^{-6}. Residents ingesting contaminated groundwater within the groundwater plume emanating from the A.O. Polymer site would have a lifetime upper bound excess cancer risk of 2×10^{-4} under the average case, and 4×10^{-4} under the Reasonable Maximum Exposure (RME) case, primarily due to the compound 1,1-dichloroethene. These risks exceed EPA's Superfund risk range of 10^{-4} to 10^{-6}.

For local residents breathing the ambient air, the lifetime upper bound excess lifetime cancer risk is 8×10^{-6} under the average case and 6×10^{-5} under the RME case. For recreational users of Station Park breathing the ambient air, the upper bound excess lifetime cancer risk is 9×10^{-7} under the average case and 6×10^{-6} under the RME case. These risks associated with inhalation of volatile chemicals in the air are notably less than the acceptable risk range.

A qualititative risk assessment evaluated the risks to residents exposed via other pathways to the chemicals in groundwater during home use of groundwater. Most of the organic chemicals in groundwater are volatile and residents could be exposed via inhalation of chemicals that have volatilized during activities such as showering, cooking and washing clothes. Dermal absorption could result during bathing or washing. Exposure via these pathways would add to overall exposure and risk. The scientific literature on this subject indicates that the risk associated with these sources may be similar in magnitude to that associated with ingestion thus, for all practical purposes, the risks calculated for ingestion may be doubled to estimate the importance of this effect.

The upperbound excess lifetime cancer risk for children wading in the wetland area is 1×10^{-6}, due solely to vinyl chloride (Table 6). A qualitative risk assessment was also performed on the potential inhalation exposures and risks to children playing in the wetland area located on the west bank of the Wallkill River. These exposures and risks were evaluated by comparing them to those for recreational users of Station Park. The surface water concentrations of the volatile chemicals in the wetland area are similar to or lower than the RME concentrations for volatile chemicals in shallow groundwater which were used to estimate ambient air concentrations in the park. Also, children would be exposed less frequently and for fewer years than the park users. Therefore, inhalation risks to children playing in the wetland are probably less than those estimated for park recreational users.

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 uncertainty as to the actual levels present.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and 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 RA provides upper bound estimates of the risks to populations near the A.O. Polymer site, and is highly unlikely to underestimate the actual risks related to the site.

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

Actual or threatened releases of hazardous substances from this site, if not addressed by the preferred alternative or one of the other active remedial measures considered, present a potential threat to the public health, welfare, and the environment through the continued release of contaminants from the subsurface soil into the groundwater.

ECOLOGICAL ASSESSMENT

The ecological assessment performed at the A.O. Polymer site was limited to a qualitative evaluation of potential impacts associated with chemicals in surface water. The potential impacts associated with contamination in subsurface soil and groundwater were not evaluated because no pathways currently exist by which receptors can be exposed to chemicals in these media. The potential impacts associated with chemicals in air were not evaluated. The assessment was further limited to an evaluation of potential impacts in aquatic receptors, such as copepods, water fleas, crayfish, other decapods, and a variety of insects as well as several amphibian species, which inhabit the wetland area, because exposures and risks are potentially greatest in these receptors. This is based on the fact that surface water chemical concentrations are highest in the wetland area and that aquatic receptors could be continuously exposed to surface water contaminants for all or part of their lifetime. Environmental impacts of the groundwater discharge to the Wallkill River were measured by sampling the water quality of the stream. It was found that when compared to toxicity data, chemicals in the river are below concentrations associated with toxic effects. Surface water exposures in exclusively terrestrial species would be less because these species would only occasionally be exposed to chemicals in surface water. None of the wetland chemicals of concern are expected to bioaccumulate extensively, therefore, significant exposures in terrestrial wildlife, such as rabbits, mice, and deer, from occasional use of surface water is unlikely.

DESCRIPTION OF ALTERNATIVES

The remedial alternatives for the A.O. Polymer site can be divided into two groups of alternatives: source control (SC) alternatives to address soil contamination, and migration management (MM) alternatives to address groundwater contamination. In order to formulate a complete site remediation alternative, the selected source control and the selected management of migration alternative must be combined. Six source control and four management of migration alternatives can be combined to form a total of 19 potential site remediation alternatives.

The time to implement provided for each of the following alternatives represents actual construction and treatment time, where applicable, and does not include the time required to perform remedial design activities prior to construction.

Alternative SC-1: No Action

Capital Cost:	$ 0
Annual Operation and Maintenance (O & M) Costs :	$ 19,400
Present Worth:	$319,000
Time to Implement:	0 months

The NCP requires that the No Action alternative be evaluated at every site to establish a baseline for comparison of other alternatives. Under the No Action alternative, no action would be taken at the site to control migration of contaminants from soils to groundwater and the Wallkill River. Under this alternative existing and potential health and environmental risks would remain. The No Action alternative would include periodic monitoring of groundwater and soils.

Alternative SC-2: Capping

Capital Cost:	$ 81,000
Annual O & M Cost:	$ 6,100
Present Worth:	$135,000
Time to Implement:	8 months

Capping represents a containment alternative that does not utilize treatment. The proposed conceptual cap design includes (from bottom to top) a 6 inch layer of sand, a 60 millimeter high density polyethelene (HDPE) liner, synthetic flow net for drainage, a layer of filter fabric for separation, a 12 inch layer of sand and gravel, and a 2.5 inch layer of asphalt covering the former lagoon disposal area. The total thickness of the entire cap system would be approximately 21 inches. The dimensions of the cap would be approximately 70 feet by 185 feet, or an area of approximately 13,000 square feet. The capping alternative would include periodic monitoring of groundwater.

Alternative SC-3: Soil Flushing

Capital Costs:	$168,000
Annual O & M Costs:	$ 21,300
Present Worth:	$499,000
Time to Implement:	3 years

Soil flushing enhances the natural flushing and attenuation of contaminants by recharging the area with water. Water soluble contaminants, which are most prone to leaching, would be flushed from the soil by recharge into the groundwater. Since soil flushing further mobilizes the contaminants in soil, this alternative would be implemented in conjunction with a groundwater extraction and treatment alternative. Soil flushing would be implemented by constructing a subsurface recharge basin, or leach field. The subsurface recharge basin consists of a network of polyvinyl chloride (PVC) pipe laid in a 12 to 16 inch thick gravel bed. The gravel bed would have a 2 to 3 foot thick layer of gravel and soil over it to prevent freezing. Filter fabric would be used to separate the gravel layer from the surrounding soil. The recharge basin would be located above the soil contamination zone (the "east recharge basin") which is located near a local groundwater divide (see map, Attachment 3). The recharge basin would create a groundwater mounding effect, which would cause water from the recharge basin to flow in a westerly direction, and into a different drainage basin. To compensate for this, a second recharge basin would be placed outside of the contaminated zone on the west side of the groundwater divide (the "west recharge basin") to control the direction of flow from the east recharge basin. The flow rate to the west recharge basin would be larger than the flow rate to the east recharge basin, thus creating a larger groundwater mounding effect, forcing the water from the east recharge basin to flow in an easterly direction.

Periodic subsurface soil sampling and analysis would be required to monitor the progress of the soil flushing.

Alternative SC-4: Soil Vapor Extraction

Capital Cost:	$491,000
Annual O & M Cost:	$ 19,000
Present Worth:	$810,000
Time to Implement:	1 year

Soil vapor extraction would involve the installation of vents in the contaminated vadose zone. A vacuum is then applied through these venting wells to volatilize volatile organic compounds and, to a certain degree, semi-volatile compounds from the soil. As air is circulated through the soil, biodegradation and some volatilization of semi-volatiles would take place. The vapors would then be drawn into a collection system where they would subsequently be removed with an activated carbon off-gas treatment system. Treatment residuals from the soil vapor extraction process, including liquid condensate and spent carbon, may be considered hazardous waste and would be regulated, transported, and disposed under Resource Conservation and Recovery Act (RCRA).

A small amount of condensate liquid would be generated during the vapor extraction process. Condensate production volumes are estimated to be 10 to 15 gallons per day for the first two weeks of operation due to the reduction of the saturated soil's capillary fringe. Little to no condensate would be produced thereafter. With an on-site groundwater treatment alternative operating in conjunction with groundwater extraction and treatment, the condensate may be treated on-site at minimal additional cost. Off-site disposal of condensate would be necessary if this alternative is implemented before a water treatment system is built. An additional study on SVE would performed during the remedial design phase.

Subsurface soil sampling would be required to monitor the progress of the soil vapor extraction process.

<u>Alternative SC-5: Soil Vapor Extraction and Soil Flushing</u>

Capital Cost:	$ 685,000
Annual O & M Costs:	$ 21,300
Present Worth:	$1,016,000
Time to Implement:	4 years

This alternative combines the two alternatives described above. The soil flushing technology will remove most volatile and semi-volatile compounds relatively well, but may not be as effective in removing a group of volatile compounds known as monocyclic aromatic hydrocarbons. Vapor extraction, on the other hand, will perform well in removing monocyclic and aliphatic hydrocarbons, but will not be as effective for semi-volatile compounds which are present in soils only slightly above soil cleanup goals.

Soil vapor extraction would be performed first on the soil to remove volatile compounds. A soil sampling and analysis program would then be implemented to assess the success of the soil vapor extraction. Soil flushing, used to flush any remaining water soluble contaminants from the soil, would be implemented after soil vapor extraction, if necessary, to achieve soil cleanup levels.

Periodic subsurface soil sampling and analysis would be required to monitor the progress of the soil vapor extraction process, and the soil flushing process.

Alternative SC-6: Excavation and Low Temperature Thermal Desorption

Capital Cost:	$4,496,800
Annual O & M Cost:	$ 0
Present Worth:	$4,518,000
Time to Implement:	12-18 months

Low temperature thermal desorption is a mass transfer process in which excavated soils are passed through a thermal rotary dryer where volatile contaminants in soils are transferred to the gas phase. The off-gas is then passed through a carbon adsorption treatment system.

This alternative would involve excavation of contaminated soil and on-site treatment using low temperature thermal desorption. After the soil contaminants are removed to below action levels for soil, the treated soil would be used to backfill the excavation.

The low temperature thermal desorption system would consist of two main elements: an indirectly fired rotary dryer and an off-gas treatment system. Waste is fed into the rotary dryer where it is heated to a temperature of 450 to 850 degrees Fahrenheit. The thermal energy vaporizes the volatile and semi-volatile organic compounds from the soil. The off gas passes through a treatment system consisting of a liquid scrubber, a condenser, a particulate filter, and a carbon adsorption unit to ensure that emissions are within acceptable levels. Off-gas treatment products would be tested prior to disposal and may be considered hazardous waste and therefore, would be regulated, transported, and disposed under the Resource Conservation and Recovery Act (RCRA).

COMMON MAJOR ELEMENTS OF GROUNDWATER ALTERNATIVES

The remedial components described below are common to the majority of the groundwater remedial alternatives evaluated. Therefore, these components are described once and then referenced in the subsequent alternative descriptions.

Groundwater Extraction and Reinjection

Groundwater extraction and reinjection systems are being proposed for the handling of groundwater at the A.O. Polymer site, and can be combined with a groundwater treatment system.

The extraction system employed would use a row of pumping wells, positioned perpendicular to the direction of plume movement. The location of the extraction system would be such as to minimize negative effects to wetlands adjacent to the Wallkill River and to athletic fields located in Station Park. The extraction system will be designed to reduce the contaminant plume area to cleanup level goals over the largest area practicable. Solute transport modeling indicates that the time required to achieve a cleanup within the active restoration area under the extraction system would be approximately 7 to 9 years.

The maximum drawdown anticipated from implementing a pumping system is about 17 feet. This level approaches the practical limit for an aquifer approximately the thickness of the water table aquifer. Since the capture zone for the extraction system would be close to the Wallkill River, drawdowns may be moderated by induced recharge from the River, however, this could affect the performance of the pumping system and require much higher pumping rates to affect the desired capture zone. The exact number of wells, their placement, and pumping rates will be addressed in the design phase of the project.

Groundwater Treatment

Each of the remedial alternatives which involves groundwater extraction and reinjection also includes groundwater treatment. While the specific method of treatment considered for inclusion in each alternative is described in the individual alternative descriptions, other considerations are common to all groundwater treatment alternatives. These include the inorganics and potential impacts to the proposed treatment system. In particular, high levels of iron and calcium which are naturally present in groundwater in the area. The presence of these inorganics in the groundwater could potentially foul the proposed treatment processes without some method of pretreatment. Therefore, prior to the final design of the groundwater treatment system, the impact of inorganics on the treatment system must be defined and, if impacts are significant, pretreatment may be required.

Alternative MM-1: No Action

Capital Cost:	$ 32,200
Annual O & M Cost:	$ 17,000
Present Worth:	$385,000
Time to Implement:	0 months

Under this alternative, no remedial action would be implemented. This alternative represents a natural attenuation remedy that includes institutional controls and monitoring. This alternative would also include restrictions on future groundwater use and public awareness and education programs.

Periodic groundwater sampling and analysis would be required to monitor the progress of natural attenuation.

Alternative MM-2: Extraction and Treatment: Biological/Air Stripping/Carbon Adsorption

Capital Cost:	$1,223,100
Annual O & M Cost:	$ 610,800
Present Worth:	$7,122,000
Time to Implement:	7-9 years

This treatment alternative utilizes aerobic biological treatment as a first step to remove biodegradable compounds in groundwater. In this aerobic biological process, micro-organisms are used to degrade organic compounds in the presence of oxygen. This biological process would be followed by air stripping to remove any remaining volatile organic compounds. Air stripping is a mass transfer process in which volatile contaminants in water are transferred to the gaseous phase. This process works best on contaminants with high volatility and low solubility. Air stripping would be followed by activated carbon adsorption as a polishing step to remove any remaining organic compounds. Carbon adsorption removes organic compounds from waste water via surface attachment of organic solutes onto the activated carbon. The remedy involves recharge of treated water to the groundwater. Recharge would be implemented through the use of recharge basins or groundwater reinjection wells. A portion of the treated water may be discharged into the Wallkill River if recharge of all treated groundwater is not technically feasible. The exact amount of discharge to each would be determined during the remedial design. Treatment residuals, estimated to be 451 pounds a day, include sludge from biological treatment, spent carbon from air stripping off-gas treatment and spent carbon from liquid-phase carbon polishing. These treatment residuals may be considered hazardous waste and would be regulated, transported, and disposed of under RCRA.

Alternative MM-3: Extraction and Treatment: Powdered Activated Carbon Treatment (PACT)

Capital Cost:	$1,695,000
Annual O & M Cost:	$ 199,000
Present Worth:	$3,767,000
Time to Implement:	7-9 years

Powdered activated carbon treatment (PACT) is a biological approach, utilizing activated sludge in conjunction with powdered activated carbon. Powdered activated carbon is added to the aerator of the activated sludge system. The combined biological and activated carbon treatment is synergistic; the carbon enhances the biological treatment by adsorbing biodegradable compounds. Many compounds are adsorbed on the carbon which is removed and recycled along with the biomass in a clarifier. When compounds are adsorbed to the recycled activated carbon and biomass they have a much longer system retention time, allowing a greater degree of biological degradation. The presence of carbon in the aeration basin also acts as a buffer to protect the biological process against shock loading caused by sudden changes in influent concentration. Approximately 180 pounds of sludge a day, consisting of biomass, removed contaminants, and spent carbon will require dewatering and off-site disposal. Sludge from the PACT process may be considered a hazardous waste and would be regulated, transported and disposed under RCRA.

Batch PACT plants are single tank systems, and consist of an aeration tank containing micro-organisms and nutrients for biological treatment, and powdered activated carbon. An effluent stream would be continuously withdrawn from the reactor and pumped to a clarifier. The treated water from the top of the clarifier would require filtration or a carbon polishing step prior to reinjection into the groundwater and, as a contingency, some treated water may be discharged into the Wallkill River. The exact quantity of discharge to each would be determined in the remedial design.

Periodic groundwater sampling and analysis would be required to monitor the progress of this treatment alternative.

<u>Alternative MM-4: Extraction and Treatment: UV Oxidation</u>

Capital Cost:	$1,787,900
Annual O & M Cost:	$ 670,400
Present Worth:	$8,241,000
Time to Implement:	7-9 years

Ultraviolet (UV) Oxidation is an emerging technology for cleanup and destruction of organic compounds in groundwater. Commercial applications using hydrogen peroxide and ozone as the oxidant have been developed. In this process, ultraviolet light reacts with hydrogen peroxide and/or ozone molecules to form hydroxyl radicals. These very powerful chemical oxidants then react with the organic contaminants in water. This alternative would actively remove contaminants from the aquifer, and would gradually reduce the toxicity and volume of groundwater contaminants over the extraction and treatment period. If carried to completion, the end products of the oxidation process are carbon dioxide, water, and any other oxidized substances associated with the original organic wastes.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The alternatives identified above were initially evaluated on the basis of technical effectiveness and feasibility, public health and environmental effects, institutional issues, and costs, as presented in the Feasibility Study. Subsequently, these alternatives were also evaluated using criteria derived from the NCP and CERCLA, as amended by SARA, as presented in the Proposed Plan.

Overall Protection of Human Health and the Environment draws on the assessments conducted under other evaluation criteria and considers how the alternative addresses site risks through treatment, engineering, or institutional controls.

Compliance with ARARs evaluates the ability of an alternative to meet applicable or relevant and appropriate requirements (ARARs) established through Federal and State statutes and/or provides the basis for invoking a waiver.

Long-term Effectiveness and Permanence evaluates the ability of an alternative to provide long-term protection of human health and the environment and the magnitude of residual risk posed by untreated wastes or treatment residuals.

Reduction of Toxicity, Mobility or Volume Through Treatment evaluates the degree to which an alternative reduces risks through the use of treatment technologies.

Short-term Effectiveness addresses the cleanup time frame and any adverse impacts posed by the alternative during the construction and implementation phase, until cleanup goals are achieved.

Implementability is an evaluation of the technical feasibility, administrative feasibility, and availability of services and materials required to implement the alternative.

Cost includes an evaluation of capital costs, annual operation and maintenance costs, and net present worth costs.

State Acceptance indicates the State's response to the alternatives in terms of technical and administrative issues and concerns.

Community Acceptance evaluates the issues and concerns that the public may have regarding the alternatives.

A comparative discussion of the seven alternatives on the basis of the evaluation criteria presented above follows.

Overall Protection of Human Health and the Environment: SC-1, the no action alternative, does not provide protection of human health or the environment because contaminants will continue to leach to groundwater; it has been estimated that leaching will result in groundwater concentrations that exceed MCLs for 60 years or more. Therefore, the no action source control alternative is not protective of human health, since it provides no control of the source of the groundwater plume and no reduction in risks to human health posed by the potential future ingestion of contaminated groundwater. Because soil contaminants will continue to leach into the groundwater over a long period of time, cleaning up the groundwater will take longer to implement with the no action alternative. SC-2, the capping alternative, provides limited protection of human health by minimizing infiltration and reducing leachate generation. Since soil contaminants will remain at present concentrations for an indefinite period of time, contaminants will continue to reach the groundwater through fluctuation of the groundwater table. SC-3, the soil flushing alternative, SC-4, the soil vapor extraction alternative, SC-5, soil flushing and soil vapor extraction and SC-6, low temperature thermal desorption, reduce potential human health risks by utilizing treatment to remove contaminants from the soil.

MM-1, the no action alternative for groundwater, provides no immediate reduction in potential human health risks. This alternative relies heavily upon institutional controls to ensure its effectiveness. The time period for natural attenuation to occur has been estimated to be approximately 27 years, assuming that a source control alternative is implemented, and approximately 87 years without a source control alternative.

The level of protectiveness provided by extraction and treatment alternatives MM-2, MM-3, and MM-4 is primarily a function of the extraction system. All three treatment systems will treat groundwater to acceptable levels.

Compliance with ARARs: There are several types of ARARs: action-specific, chemical-specific, and location-specific (Table 9). Action-specific ARARs are technology or activity-specific requirements or limitations. Chemical-specific ARARs establish the amount or concentrations of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions placed on concentrations of hazardous substances found in specific locations, or the conduct of activities solely because they occur in a specific location.

No chemical-specific ARARs for soils have been identified. The action levels (1 ppm for volatiles and 10 ppm for semi-volatiles) are based on groundwater protection and are the New Jersey Soil Action Levels which are considered cleanup goals. Action-specific ARARs associated with soil treatment will be met for source control and management of migration alternatives.

Each management of migration alternative that includes extraction and treatment alternatives (MM-2 through MM-4) will treat extracted groundwater to MCLs. MCLs are ARARs for groundwater. Active restoration to below MCLs in areas within the capture zones of the extraction systems will be achieved in approximately 9 years.

Residual contamination that is not actively removed from the groundwater will be flushed naturally to the Wallkill River. To achieve total cleanup with the active restoration alternatives, the travel time required for non-extracted contaminated groundwater to discharge to the Wallkill River must also be considered. Travel time calculations indicate that this time is estimated to be 4 years. Therefore, the time needed to achieve total cleanup of the aquifer with active restoration is estimated to be 13 years. In MM-1, MCLs may be exceeded until natural restoration proceeds to completion, which is estimated to require approximately 27 years when used in conjunction with a source control alternative.

Both Alternatives MM-3 and MM-4 will be required to comply with ARARs dealing with the transport and disposal of hazardous waste with respect to residuals management and ARARs concerning effluent discharge to surface water. MM-2 will be required to comply with these ARARs in addition to ARARs regulating air emissions. Each treatment system can be designed to comply with the substantive requirements of the ARARs. In the event that groundwater reinjection is difficult to implement for all treated groundwater, discharge to surface water may be utilized and appropriate ARARS will be met.

Most location-specific ARARs regulate the extent of activity in wetlands, recreational lands or historic sites. Location specific ARARs also provide that where an action is taken because no other alternative is feasible, established procedures for mitigating or repairing any resulting damage must be employed. Informal consultation with the U.S. Fish and Wildlife Service has determined that the immediate site area does not contain critical habitats of rare or endangered species.

Long-term Effectiveness and Permanence: SC-1, no action, results in groundwater contamination that exceeds MCLs for the groundwater contaminants for approximately 87 years. The long-term effectiveness of the capping alternative, SC-2, is severely limited as the risk to groundwater continues to result from contaminants being left in place untreated at present concentrations for an indefinite period of time. Diligent maintenance of the cap and long-term monitoring are required. The goal of Alternatives SC-3, SC-4, and SC-5 is to reduce contaminants and subsequent migration into the groundwater by treatment to below remediation goals or NJDEP action levels. Long-term soil and groundwater monitoring would be required to ensure that any residual soil contaminants do not pose a groundwater threat. Therefore, Alternatives SC-3, SC-4, and SC-5 afford greater degrees of long-term effectiveness and permanence than SC-1 or SC-2. Alternative SC-6 offers the highest degree of long-term effectiveness and permanence since the potential for residuals to be above remedial goals is less than for Alternatives SC-3, SC-4, and SC-5.

Alternative MM-1 relies heavily on institutional controls to be effective in the long-term. Since human health risks are identified based on potential future use, restrictions on future groundwater use could be used to manage long-term risks associated with ingestion of contaminated groundwater under the no action, MM-1, alternative. Groundwater use restrictions would be implemented at the site for approximately 27 years, if soil source control is implemented, or 87 years, if no soil source control is implemented.

Alternatives MM-2, MM-3, and MM-4 provide for active extraction systems which will remove the most contaminated part of the plume. These active treatment and extraction alternatives reduce the potential risk posed by the site by achieving groundwater cleanup goals. In conjunction with a source control alternative, these extraction and treatment alternatives will significantly expedite the restoration of a once potable aquifer for future use.

Short-term Effectiveness: Alternatives SC-3, SC-4, and SC-5 involve activities such as drilling and excavation, however, the major components in each alternative would not disturb the contaminated subsurface soils to any significant degree. Potential risks to workers could be managed easily by procedures outlined in site-specific health and safety plans. Few short-term impacts to human health or the environment are anticipated for these alternatives.

Alternative SC-6 involves the excavation of approximately 7,500 cubic yards of contaminated subsurface soils and will take 12 to 18 months to implement. Diligent control of fugitive dust and storm water would be required to prevent the spread of contamination from exposed contaminated soils to currently uncontaminated areas. Controls would be implemented to minimize volatilization from these soils and short-term impacts. Potential risks to human health during implementation are higher for SC-6 than for other source control alternatives.

It is estimated that over 60 years would be required to achieve soil cleanup goals for the SC-1 alternative. Of the source control alternatives, SC-2 through SC-5, Alternative SC-4, soil vapor extraction, takes the least amount of time to achieve cleanup goals (approximately 1 year). It has been estimated that source control Alternatives SC-3 and SC-5 can achieve remediation objectives within 18 months and 4 years, respectively. Due to the complex hydrogeological and chemical processes employed in SC-3 and SC-5, however, this time period is difficult to estimate precisely.

All extraction and treatment alternatives for groundwater involve little disturbance to contaminated subsurface areas, therefore the potential risks to site workers during cleanup activities would be minor and could be easily managed. The potential short-term risks to human health and the environment are anticipated to be low for each of these management of migration alternatives.

Implementability: All of the source control alternatives would be implementable. All source control alternatives use standard construction techniques and materials. Alternatives SC-1 and SC-2 would be the easiest to implement. The potential impacts that SC-3 and SC-5 may have on groundwater flow regimes make these alternatives more complex and difficult to implement than SC-4. The soil flushing alternatives, SC-3 and SC-5, require the coordination of recharge between two separate recharge basins separated by a groundwater mound. No groundwater reinjection would be used in SC-4, thus making this alternative less complex and easier to manage than Alternatives SC-3 and SC-5. SC-6 is the most difficult to implement because site space constraints pose safety concerns for site workers. The engineering controls that will be needed to manage fugitive dust or storm water runoff also make this alternative the most difficult to implement.

The treatment components of MM-2 and MM-3 are proven effective for contaminants of concern and should be the easiest to implement because they rely on well understood and readily available commercial components. Alternative MM-4 relies on an innovative technology for treatment and, therefore, would be more difficult to implement. Treatability studies would be required to determine the level of effectiveness that can be provided by MM-2, MM-3, and MM-4. More extensive testing, requiring more costs and time, would be involved with Alternative MM-4 since it is an innovative technology.

Reduction of Toxicity, Mobility or Volume: Alternatives SC-1 and SC-2 do not utilize treatment to reduce the toxicity, mobility or volume of contaminants. SC-3 and SC-5 remove contaminants from the soil by actually increasing their mobility, and must be implemented in conjunction with a groundwater extraction and treatment alternative.

Alternatives SC-4 and SC-5 remove and concentrate contaminants from on-site soils for later disposal or toxicity reduction. SC-6 provides the highest efficiency of removal of contaminants from the soil.

MM-1 would not actively reduce the toxicity, mobility or volume of the groundwater contaminants. MM-2 through MM-4 would actively remove contaminants from the aquifer, and would gradually reduce the toxicity and volume of groundwater contaminants over the extraction and treatment period.

Cost: Six source control and four management of migration alternatives can be combined to form a total of 19 potential site remedial alternatives. The cost of a complete site remedial alternative is the sum of the costs of the selected source control and management of migration alternatives. The least expensive remedial alternative combination of soil capping and no action for the management of migration is approximately $520,000 (present worth cost). The no action alternative for soils, SC-1, would be more expensive than capping due to the more intensive and longer term monitoing involved with the no action alternative. The most expensive remedial alternative combination is the excavation/thermal treatment of the contaminated soil combined with UV oxidation of groundwater, which costs approximately $12,759,000. See Table 10 for comparison of all source control and management of migration alternatives. Besides the no action alternative for groundwater, MM-3 is the least expensive. MM-4 costs approximately twice as much as MM-3. For source control involving treatment, SC-4, soil vapor extraction, is the second least expensive alternative compared to all other source control alternatives.

State Acceptance: NJDEP has concurred with the selected remedy.

Community Acceptance: Based upon public comments addressed in the responsiveness summary (Attachment 4), the community concurs with the selected remedy.

SELECTED REMEDY

Based on the results of the RI/FS, and after careful consideration of all reasonable alternatives, EPA and NJDEP presented SC-4, Soil Vapor Extraction (SVE), and MM-3, Powdered Activated Carbon Treatment (PACT) as the preferred remedy for addressing site contamination at the May 9, 1991 public meeting. After considering public comments, the selected remedy is implementation of the combination of Alternatives SC-4 (SVE) and MM-3 (PACT).

The selected remedy is the combination of Alternatives SC-4 and MM-3: soil vapor extraction, and powdered activated carbon treatment. This combination of alternatives represents the best balance with respect to the evaluation criteria and it meets the statutory requirements of CERCLA Section 121(b), which are: to protect human health and the environment, to comply with ARARs, and to be cost effective. The selected remedy utilizes permanent solutions and alternative technologies to the maximum extent practicable and satisfies the statutory preference for treatment as a principle element.

By reducing the soil contaminants to NJDEP Interim Soil Action Levels through Soil Vapor Extraction, they will no longer be a significant source of groundwater contamination. Soil Vapor Extraction also reduces the amount of time necessary to perform groundwater extraction and treatment to reach groundwater levels that are protective of human health and the environment. Soil

Vapor Extraction utilizes treatment to reduce the volume and mobility of contaminants by removing them from the soil.

Groundwater treatment will be conducted concurrent with soil treatment. Groundwater will be extracted by groundwater extraction wells. The groundwater will be processed through a powdered activated carbon treatment system, utilizing activated sludge in conjunction with powdered activated carbon. This alternative offers protectiveness, short-term as well as long-term effectiveness and reduction of toxicity, mobility, and volume of contaminants. Both groundwater and soil treatment systems, including the emissions control units, will be designed to meet the substantive requirements of New Jersey air pollution control regulations.

Once treated, the water extracted from the aquifer will be reinjected into the groundwater through injection wells or recharge basins. To meet cleanup standards, it was estimated that extraction of groundwater will be required for a period of nine years. As a contingency, if it is not possible to return all the treated groundwater to the aquifer some treated water would be discharged to the Wallkill River.

A cost estimate for Alternative SC-4, soil vapor extraction, is presented in Table 7. A cost estimate for Alternative MM-3, Powdered Activated Carbon Treatment, is presented in Table 8. These cost estimates are based on a preliminary design of the remedial systems.

STATUTORY DETERMINATIONS

Under Section 121 of CERCLA and Section 300.430(f) of the NCP, selected remedies must meet certain statutory and regulatory requirements. These requirements and a description of how the selected remedy satisfies each requirement are presented below.

Protection of Human Health and the Environment

The selected alternative will fully protect human health and the environment through treatment of each contaminated media while also meeting ARARs and minimizing short-term risks. Contaminated soils will be treated using soil vapor extraction, resulting in minor short-term risks, but no long-term risks associated with on-site treatment residuals. Groundwater treatment through the PACT system will similarly remediate contaminants to acceptable levels in the groundwater with little or no associated short-term risks.

Compliance with ARARs

The proposed remedy has been developed to meet Federal and State ARARs for drinking water. Pursuant to the New Jersey Ground

Water Quality Standards, N.J.A.C. 7:9-6 et seq., the groundwater at the A.O. Polymer site is classified as GW-2, which means it is a current or potential source of drinking water. Groundwater cleanup criteria have been developed for the A.O. Polymer site pursuant to N.J.A.C. 7:9-6 et seq. and N.J.A.C. 7:14A-1 et seq. and are listed in Table 9 under Chemical-Specific ARARs. The more restrictive of Federal or New Jersey MCLs will be used as the cleanup levels for groundwater. As a contingency, if all the water is not able to be reinjected to the aquifer, surface water discharge to the Wallkill River will meet all ARARs listed in Table 9. If it is determined that the selected groundwater treatment system is unable to meet the surface water discharge ARARs, despite design modifications and/or additional polishing steps, the Agency may propose a waiver of these requirements. The waiver process would include appropriate public participation requirements pursuant to CERCLA. Because no chemical-specific ARARs applicable to soil contamination were identified, soil cleanup levels for volatile and semi-volatile organic compounds are based on NJDEP Soil Action Levels, which are not ARARs, but are To Be Considered (TBC) criteria. These TBCs for soil are 10 ppm for total semi-volatiles and 1 ppm for total volatile organic compounds.

Cost-Effectiveness

The selected remedy provides effective treatment of contaminated soil and groundwater and is cost-effective compared to other alternatives. The combination provides the best balance among the nine evaluation criteria utilized by EPA. The treatment methods included in the alternative have been proven effective in the treatment of similar contaminated materials and are expected to attain ARARs at the A.O. Polymer site.

Utilization of Permanent Solutions and Alternative Treatment Technologies

EPA and NJDEP have determined that the selected remedy utilizes permanent solutions and treatment technologies to the maximum extent practicable. This determination was made based on the comparative evaluation of alternatives with respect to long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability, and cost, as well as the statutory preference for treatment as a principal element, and State and community acceptance.

A high degree of success is anticipated using the selected soil remedy, SC-4 (Soil Vapor Extraction). Similar projects have shown the soil vapor extraction technique to be highly successful in removing volatile organics from soils, particularly in sandy soil matrices such as those found at the A.O. Polymer site. Soil concentrations of semi-volatiles are slightly above New Jersey

Soil Action Levels. It is anticipated that SVE will volatilize and enhance biodegredation of semi-volatiles thus reducing their concentrations below action levels. Alternative MM-3, Powdered Activated Carbon Treatment system, is capable of treating contaminated groundwater at the site to meet MCLs.

State and Community Acceptance

The State of New Jersey and community concur with the selected remedy for the A.O. Polymer site.

Preference for Treatment as a Principal Element

The principal threats at the A.O. Polymer site include the presence of organic compounds in the soil and groundwater. The selected remedy satisfies the statutory preference for treatment as a principal element in addressing the human health and environmental threats posed by contamination in both soil and groundwater.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the A.O. Polymer site was released for public comment on April 25, 1991. The Proposed Plan identified Alternative SC-4 and MM-3 (soil vapor extraction and Powdered Activated Carbon Treatment) as the preferred response action. All written and verbal comments submitted during the public comment period were reviewed by EPA. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

TABLE 1

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN FOR THE A.O. POLYMER SITE

Surface Soil

- Beta-BHC
- Bis(2-ethylhexyl)phthalate
- 2-Butanone
- Butylbenzylphthalate
- Di-n-butylphthalate
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Ethylbenzene
- Heptachlor epoxide
- PAHs (carcinogenic)
- PAHs (noncarcinogenic)
- Tetrachloroethene
- 1,1,1-Trichloroethane
- Toluene
- Vinyl acetate
- Xylenes (total)

Subsurface Soil

- Benzoic acid
- Bis(2-ethylhexyl)phthalate
- 2-Butanone
- Butylbenzylphthalate
- Chlorobenzene
- 1,2-Dichlorobenzene
- trans-1,2-Dichloroethene
- 2,4-Dimethylphenol
- Di-n-butylphthalate
- Ethylbenzene
- 2-Methylphenol
- 4-Methylphenol
- N-nitrosodiphenylamine
- PAHs (carcinogenic)
- PAHs (noncarcinogenic)
- Phenol
- Tetrachloroethene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Trichlorofluoromethane
- Xylenes (total)

Groundwater

- Acetone
- alpha-BHC
- beta-BHC
- Benzene
- Benzoic acid
- Bis(2-ethylhexyl)phthalate
- 2-Butanone
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chloroform
- Di-n-butylphthalate
- 1,2-Dichlorobenzene
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichloroethene (total)
- 1,2-Dichloropropane
- Ethylbenzene
- 2-Hexanone
- 4-Methyl-2-pentanone
- Methylene chloride
- 4-Methylphenol
- PAHs (noncarcinogenic)
- Phenol
- Tetrachloroethene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Trichlorofluoromethane
- Xylenes (total)

Sediment

- None

Surface Water

Wallkill River:

- 1,2-Dichloroethene (total)

Wetland

- Acetone
- Benzene
- 2-Butanone
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chloroform
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichloroethene
- Ethylbenzene
- Methylene chloride
- Tetrachloroethene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Vinyl chloride
- Xylenes (total)

Cooling Pond:

- Xylenes (total)

TABLE 1A
Organic Chemical Summary For Surface and Subsurface Soil Samples
A.O. Polymer Site Remedial Investigation

CLASS	TARGET COMPOUND	Minimum Detected Value (ug/kg)	Maximum Detected Value (ug/kg)
	-----HALOGENATED ALIPHATIC HYDROCARBONS-----		
V	TETRACHLOROETHENE	2.6	2600
V	1,1,1-TRICHLOROETHANE	7.5	32000
V	TRICHLOROETHENE	14	27000
V	TRANS-1,2-DICHLOROETHENE	2.7	5100
V	1,1,2-TRICHLOROETHANE	500	
V	TRICHLOROFLUOROMETHANE	53000	
	-----MONOCYCLIC AROMATIC HYDROCARBONS-----		
V	TOLUENE	2	61000
V	XYLENES (TOTAL)	51	34000
V	ETHYLBENZENE	35	15000
V	CHLOROBENZENE	970	1500
	-----KETONES-----		
V	2-BUTANONE	3.2	13
	-----POLYCYCLIC AROMATIC HYDROCARBONS-----		
B	PHENANTHRENE	95	5800
B	2-METHYLNAPHTHALENE	66	9600
B	CHRYSENE	64	560
B	FLUORENE	37	4200
B	PYRENE	130	740
B	NAPHTHALENE	35	16000
B	ACENAPHTHENE	46	2600
B	FLUORANTHENE	57	960
B	BENZO(K)FLUORANTHENE	64	880
B	BENZO(B)FLUORANTHENE	64	880
B	BENZO(A)ANTHRACENE	110	590
B	BENZO(A)PYRENE	100	520
B	BENZO(G,H,I)PERYLENE	150	290
B	INDENO(1,2,3-CD)PYRENE	120	260
B	DIBENZ(A,H)ANTHRACENE	120	
	-------PHTHALATE ESTERS-------		
B	BIS(2-ETHYLHEXYL)PHTHALATE	75	41000
B	DI-N-BUTYLPHTHALATE	38	260
B	BUTYLBENZYLPHTHALATE	77	290
	-------PHENOLIC COMPOUNDS-------		
A	4-METHYLPHENOL	96	14000
A	PHENOL	150	2600
A	2-METHYLPHENOL	1700	
A	2,4-DIMETHYLPHENOL	760	
	-------MISCELANEOUS COMPOUNDS-------		
B	DIBENZOFURAN	1900	4600
B	N-NITROSODIPHENYLAMINE(1)	46	120
B	1,2-DICHLOROBENZENE	1100	
B	2,4-DINITROTOLUENE	300	
B	2,6-DINITROTOLUENE	64	
V	VINYL ACETATE	1.2	
A	BENZOIC ACID	1300	
P	BETA-BHC	44	
P	HEPTACHLOR EPOXIDE	58	

NOTES:
V = Volatile organic compound
A = Acid extractable compound
B = Base/Nuetral Compound
P = PCB/Pesticides

POOR QUALITY
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TABLE 1B

SUMMARY OF CHEMICALS DETECTED IN
GROUNDWATER AT THE A.O. POLYMER SITE (a)

(Concentration in ug/L)

Chemical (b)	Range of Detected Concentrations	MCL
Acetone	5.0 - 4900	-
alpha-BHC	0.1	-
beta-BHC	1.1	-
Benzene	3.3 - 14	1
Benzoic acid	14	-
Bis(2-ethylhexyl)phthalate	97	-
2-Butanone	5.0 - 9200	-
Carbon disulfide	3.8	-
Carbon tetrachloride	19 - 23	2
Chlorobenzene	2.3 - 82	4
Chloroform	2.3 - 320	-
Di-n-butylphthalate	5.8	-
1,2-Dichlorobenzene	2.2	600
1,1-Dichloroethane	2.5 - 600	-
1,1-Dichloroethene	2.3 - 310	2
1,2-Dichloroethene (total)	1.8 - 4000	10
1,2-Dichloropropane	6.3	-
Ethylbenzene	4.5 - 130	-
2-Hexanone	4.5 - 12	-
3-Methyl-2-pentanone	4.0 - 1800	-
Methylene chloride	2.0 - 800	2
4-Methylphenol	5.4 - 11	-
PAHs (noncarcinogenic)	3.0	-
2-Methylnaphthalene	3.0	-
Phenol	5.1 - 200	-
Tetrachloroethene	1.8 - 400	1
Toluene	1.8 - 780	-
1,1,1-Trichloroethane	1.8 - 2400	26
1,1,2-Trichloroethane	2.0	-
Trichloroethene	2.0 - 2600	1
Trichlorofluoromethane	3.7	-
Xylenes (total)	2.0 - 350	44

(a) Includes all samples collected from water table and bedrock groundwater wells.
(b) Only organic chemicals are listed. Inorganic chemicals detected in groundwater are generally at concnetrations within the range of background concentrations and are not believed to be site related All listed chemicals are selected as chemicals of potential concern.

TABLE 1C

SUMMARY OF CHEMICALS DETECTED IN WALLKILL RIVER SURFACE WATER
AT THE A.O. POLMER SITE

(Concentrations in ug/L)

Chemical (a)	Range of Detected Concentrations		
	Stations 2 & 3	Stations 4 & 5	Background (Station 1)
Acetone	20	18 - 29	18
1,1-Dichloroethane	ND(5)	1 - 2	ND (5)
1,2-Dichloroethene (total)	ND(5)	5.2 - 6	ND(5)
Methylene chloride	2	2.8 - 3	2.8
Vinyl chloride	ND (5)	1	ND (5)

ND = Not detected. Detection limit shown in parentheses.

TABLE 1D

Organic Chemical Summary For Surface Water Samples in the Wetland Area
A.O. Polymer Remedial Invesigation

(Concentrations in ug/L)

	Maximum Detected Value	MCL
1,2-DICHLOROETHENE(Total)	850	10
1,1-DICHLOROETHANE	260	-
VINYL CHLORIDE	280	2
TRICHLOROETHENE	22	1
1,1,1-TRICHLOROETHANE	130	26
CHLOROFORM	15	-
TETRACHLOROETHENE	6	1
1,1-DICHLOROETHENE	14	-
1,1,2-TRICHLOROETHANE	1	-
CARBON TETRACHLORIDE	20	2
XYLENE	18	44
BENZENE	5	1
TOLUENE	22	-
CHLOROBENZENE	9	4
ETHYLBENZENE	3	-
ACETONE	32	-
2-BUTANONE	10	-
METHYLENE CHLORIDE	13	2
CARBON DISULFIDE	1	-

TABLE 1E

Organic Chemicals In Benthic Sediment Samples
A.O. Polymer Site Remedial Invesigation

(Concentrations in ug/L)

TARGET COMPOUND	BACKGROUND	MINIMUM DETECTED VALUE	MAXIMUM DETECTED VALUE	AVERAGE VALUE
TOLUENE	ND	3	3	3.00
ANTHRACENE	56	56	56	56.00
BENZO(A)ANTHRACENE	180	91	180	130.25
BENZO(A)PYRENE	190	78	190	124.50
BENZO(B)FLUORANTHENE	320	140	320	212.50
BENZO(K)FLUORANTHENE	320	140	320	212.50
CHRYSENE	210	91	210	142.75
DI-N-BUTYLPHTHALATE	ND	57	57	57.00
FLUORANTHENE	320	160	320	207.50
PHENANTHRENE	250	83	250	150.75
PYRENE	260	160	260	240.00
BIS(2-ETHYLHEXYL)PHTHALATE	310	130	310	182.50

ND - Not Detected

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TABLE 2

EXPOSURE PATHWAYS SELECTED FOR EVALUATION
AT THE A.O. POLYMER SITE

Exposure Medium	Potentially Exposed Population	Exposure Route
Groundwater	Residents	Future ingestion
	Residents	Future dermal contact during in-home use of groundwater
Air	Residents, recreational	Current inhalation of chemical users of Station Park that votilize from groundwater through soil to ambient air
	Residents	Current inhalation of chemicals that volatilize during in-home use of groundwater
Surface Water	Children playing in	Current inhalation of chemicals from the wetland area that volatilize from the wetland area
	Children playing in	Current dermal contact in the wetland area

EXPOSURE PATHWAYS SELECTED FOR EVALUATION AT THE A.O. POLYMER SITE

Exposure Medium	Potentially Exposed Population	Exposure Route	Type of Evaluation
Groundwater	Residents	Ingestion	Quantitative
	Residents	Dermal contact during in-home use of groundwater	Qualitative
Air	Residents, recreational users of Station Park	Inhalation of chemicals that volatilize from groundwater through soil to ambient air	Quantitative
	Residents	Inhalation of chemicals that volatilize during in-home use of groundwater	Qualitative
Surface Water	Children playing in the wetland	Inhalation of chemicals that volatilize from the seep	Qualitative
	Children playing in the wetland	Dermal contact	Quantitative

TABLE 3

ORAL

Chemical (a)	Chronic Reference Dose (RfD) (mg/kg-day)	Safety Factor (b)	Target Organ (c)	RfD Source (d)
Acetone	1E-01	1,000	Liver, kidney	IRIS
Benzene	--	--	--	--
Benzoic acid	4E+00	1	Nervous system	IRIS
alpha-BHC	--	--	--	--
beta-BHC	--	--	--	--
Bis(2-ethylhexyl)phthalate	2E-02	1,000	Liver	IRIS
2-Butanone	5E-02	1,000	Fetus	IRIS
Carbon disulfide	1E-01	100	Fetus	IRIS
Carbon tetrachloride	7E-04	1,000	Liver	IRIS
Chlorobenzene	2E-02	1,000	Liver, kidney	IRIS
Chloroform	1E-02	1,000	Liver	IRIS
1,2-Dichlorobenzene	9E-02	1,000	Liver	IRIS
1,1-Dichloroethane	1E-01	1,000	Kidney	HEAST
1,1-Dichloroethene	9E-03	1,000	Liver	IRIS
1,2-Dichloroethene				
cis-	1E-02	1,000	Liver	HA
trans-	2E-02	1,000	Blood	IRIS
1,2-Dichloropropane	--	--	--	HEAST
Di-n-butylphthalate	1E-01	1,000	Mortality	IRIS
Ethylbenzene	1E-01	1,000	Liver, kidney	IRIS
4-Methyl-2-pentanone	5E-02	1,000	Liver, kidney	IRIS
Methylene chloride	6E-02	100	Liver	IRIS
4-Methylphenol	5E-02	1,000	Body weight, CNS	IRIS
PAHs (noncarcinogenic) (f)	4E-03	10,000	Eyes, internal organs	Other
Phenol	6E-01	100	Fetus body weight	IRIS
Tetrachloroethene	1E-02	1,000	Liver	IRIS
Toluene	3E-01	100	CNS	IRIS
1,1,1-Trichloroethane	9E-02	1,000	Liver	IRIS
1,1,2-Trichloroethane	4E-03	1,000	Clinical chemistry	IRIS
Trichloroethene	7.4E-03	1,000	Liver	HA
Trichlorofluoromethane	3E-01	1,000	Mortality	HEAST
Vinyl chloride	--	--	--	-
Xylene	2E+00	100	CNS, body weight, mortality	IRIS

(a) Toxicity criteria are presented only for those chemicals for which chronic and exposures are being evaluated quantitatively. No oral toxicity criteria are available for 2-hexanone.

(b) Safety factors used to develop reference doses are the products of uncertainty and modifying factors. Uncertainty factors consist of multiples of 10, with each factor representing a specific area of uncertainty in the data available. The standard uncertainty factors include:
- a 10-fold factor to account for the variation in sensitivity among the members of the human population;
- a 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a 10-fold factor to account for the uncertainty in extrapolating from less-than-chronic NOAELs to chronic NOAELs; and
- a 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

(c) A target organ is the organ most sensitive to a chemical's toxic effect. RfDs are based on toxic effects in the target organ. If an RfD was based on a study in which a target organ was not identified, the organ listed is one known to be affected by the particular chemical of concern.

(d) IRIS = the chemical files of EPA's Integrated Risk Information System (as of 5/1/90); HEAST = Health Effects Assessment Summary Tables (2/1/89); HA = Health Advisory (Office of Drinking Water, 3/31/87); and Other = Memo from P.F. Hurst, ECAO, Cincinnati, dated June 28, 1990.

INHALATION

Chemical (a)	Chronic Reference Dose (RfD) (mg/kg-day)	Safety Factor (b)	Target Organ (c)	Source (d)
Benzene	--	--	--	--
Carbon tetrachloride	--	--	--	--
Chlorobenzene	5E-03	10,000	Liver, kidney	HEAST
Chloroform	--	--	--	--
1,1-Dichloroethane	1E-01	1,000	Kidney	--
1,1-Dichloroethene	--	--	--	--
Methylene chloride	9E-01 (f)	100	Liver	HEAST
Toluene	6E-02 (f)	100	CNS	HEAST
Tetrachloroethene	--	--	--	--
1,1,1-Trichloroethane	3E-01	1,000	Liver	HEAST
1,1,2-Trichloroethane	--	--	--	IRIS
Trichloroethene	--	--	--	--
Trichlorofluoromethane	2E-01	10,000	Kidney, lung	HEAST
Xylenes (total)	9E-02 (f)	100	CNS, respiratory tract	HEAST

SUBCHRONIC ORAL REFERENCE DOSES FOR A SUBSET OF CHEMICALS OF POTENTIAL CONCERN AT THE A.O. POLYMER SITE

Chemical (a)	Subchronic Reference Dose (RfD)	Safety Factor (b)	Target Organ (c)	Source (d)
Acetone	1E+00	100	Liver, kidney	HEAST
2-Butanone	5E-01	100	Fetus	HEAST
Carbon tetrachloride	7E-03	100	Liver	HEAST
Chlorobenzene	2E-01	100	Liver, kidney	HEAST
Chloroform	1E-02	1,000	Liver	HEAST
1,1-Dichloroethane	1E+00	100	Kidney	HEAST
1,1-Dichloroethene	9E-03	1,000	Liver	HEAST
1,2-Dichloroethene	2E-01	100	Blood	HEAST
Methylene chloride	6E-02	100	Liver	HEAST
Tetrachloroethene	1E-01	100	Liver	HEAST
Toluene	4E-01	100	CNS	HEAST
1,1,1-Trichloroethane	9E-01	100	Liver	HEAST
1,1,2-Trichloroethane	4E-02	100	Clinical chemistry	HEAST
Xylene	4E+00	100	CNS, body weight	HEAST

(a) Subchronic RfDs are presented only for those chemicals detected in th[illegible] Seep surface water, for which subchronic exposures are being evaluated. [illegible]hronic RfDs have been developed for carbon disulfide, trichloroethene, and ethyl[illegible]. Chronic RfDs will be used to evaluate noncarcinogenic effects associated with [illegible]chronic

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TABLE 4

NONCANCER RISK ESTIMATES

	Hazard Index for Noncarcinogenic Effects	
	Average Case Exposure	Reasonable Maximum Case Exposure
Furture Land-Use		
I. Exposure to Groundwater		
Ingestion of Chemicals in Groundwater	2	5
Dermal contact during in-home use of groundwater.	NA	NA
Current Land-Use		
I. Exposure to Air		
Inhalation Exposure of Volatile Chemicals in Ambient Air for Local Residence	.008	.04
Recreational Users Inhalations Exposure of Volatile Chemicals in Ambient Air	.002	.009
II. Exposure to Surface Water		
Direct Contact with wetland Surface Water for Children	NA	.04
Inhalation of chemicals from the wetland area that volatilize from the wetland.	NA	NA

NA: exposure pathway not quantitatively assessed

Table 5

ORAL

Chemical (a)	Slope Factor (SF) (mg/kg-day)-1	Weight of Evidence (e)	SF Source (d)
Acetone	--	D	--
Benzene	2.9E-02	A	IRIS
Benzoic acid	--	D	--
alpha-BHC	6.3E+00	B2	IRIS
beta-BHC	1.8E+00	C	IRIS
Bis(2-ethylhexyl)phthalat	1.4E-02	B2	IRIS
2-Butanone	--	D	--
Carbon disulfide	--	D	--
Carbon tetrachloride	1.3E-01	B2	--
Chlorobenzene	--	D	--
Chloroform	6.1E-03	B2	HEAST
1,2-Dichlorobenzene	--	D	--
1,1-Dichloroethane	9.1E-02	B2	HEAST
1,1-Dichloroethene	6E-01	C	IRIS
1,2-Dichloroethene			
cis-	--	D	--
trans-	--	D	--
1,2-Dichloropropane	6.8E-01	B2	IRIS
Di-n-butylphthalate	--	D	--
Ethylbenzene	--	D	--
4-Methyl-2-pentanone	--	D	--
Methylene chloride	7.5E-03	B2	IRIS
4-Methylphenol	--	D	--
PAHs (noncarcinogenic) (	--	D	--
Phenol	--	D	--
Tetrachloroethene	5E-02	B2	IRIS
Toluene	--	D	--
1,1,1-Trichloroethane		D	IRIS
1,1,2-Trichloroethane	5.7E-02	C	IRIS
Trichloroethene	1.1E-02	B2	HEAST
Trichlorofluoromethane	--	D	--
Vinyl chloride	2.3E+00	A	HEAST
Xylene	--	D	--

INHALATION

Chemical	Slope Factor (SF) (mg/kg-day)-1	Weight of Evidence (e)	Source (d)
Benzene	2.9E-02	A	IRIS
Carbon tetrachloride	1.3E-01	B2	IRIS
Chlorobenzene	--	D	--
Chloroform	8.1E-02	B2	IRIS
1,1-Dichloroethane	--	D	--
1,1-Dichloroethene	1.2E+00	C	IRIS
Methylene chloride	1.4E-02	B2	IRIS
Toluene	--	D	--
Tetrachloroethene	3.3E-03	B2	HEAST
1,1,1-Trichloroethane	--	D	--
1,1,2-Trichloroethane	5.7E-02	C	--
Trichloroethene	1.7E-02	B2	HEAST
Trichlorofluoromethane	--	D	--
Xylenes (total)	--	D	--

(a) Toxicity criteria are presented only for those chemicals for which chronic and exposures are being evaluated quantitatively. No oral toxicity criteria are available for 2-hexanone.

(e) EPA weight of evidence classification scheme for carcinogens:
A = Human Carcinogen, sufficient evidence from human epidemiological studies;
B1 = Probable Human Carcinogen, limited evidence from epidemiological studies;
B2 = Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies;
C = Possible Human Carcinogen, limited evidence in animals in the absence of human data; and
D = Not classified.

(f) Value listed is for naphthalene.

-- = Criterion has not been developed for this chemical.

TABLE 6
CANCER RISK ESTIMATES

	Upper Bound Excess Lifetime Cancer Risk	
	Average Reasonable Case Exposure	Resonable Maximum Case Exposure
Future Land-Use		
I. Exposure to Groundwater		
Ingestion of Chemicals in Groundwater	2E-04	4E-04
Dermal contact during in-home use of groundwater	NA	NA
Current Land-Use		
I. Exposure to Air		
Inhalation Exposure of Volatile Chemicals in Ambient Air for Local Residences	8E-06	6E-05
Recreational Users Inhalation Exposure of Volatile Chemicals in Ambient Air	9E-07	6E-06
II. Exposure to Surface Water		
Direct Contact with East Seep Surface Water for Children	NA	1E-06
Inhalation of chemicals from the wetland area that volatilize from the wetland	NA	NA

NA: exposure pathway not quantitatively assessed

TABLE 7
COST ESTIMATE SUMMARY
ALTERNATIVE SC-4
SOIL VAPOR EXTRACTION
A. O. POLYMER FEASIBILITY STUDY

ITEM	Capital %	O & M %	Quantity	Capital Cost	Annual O & M	Present Worth of Annual O&M Costs Rate = 5%	Present Worth of Annual O&M Costs Rate = 10%
I. SOIL VAPOR EXTRACTION TREATMENT (11000 CY)							
Capital Costs:							
1. System Installation/Mobilization			Lump Sum	$193,000			
2. Off-gas treatment (activated carbon)			Lump Sum	$79,200			
3. Liquid Condensate Treatment			150 gallons	$3,300			
4. Soil Sampling Program			30 samples	$32,500			
Subtotal:				$308,000	$0	$0	$0
II. LONG TERM MONITORING & REVIEW (30 YEARS)							
1. Subsurface Soil Sampling & Analysis					$15,500	$238,300	$146,100
2. 5-Year Reviews						$20,800	$11,600
Subtotal:				$0	$15,500	$259,100	$157,700
CONSTRUCTION SUBTOTAL				$308,000			
ANNUAL O & M					$15,500	$259,100	$157,700
Health and Safety	5%	5%		$15,400	$775	$11,900	$7,300
Bid Contingency	20%	5%		$61,600	$775	$11,900	$7,300
Scope Contingency	20%	15%		$61,600	$2,325	$35,700	$21,900
CONSTRUCTION TOTAL				$446,600	$19,400	$318,600	$194,200
Permitting & Legal	5%			$22,330			
Services During Construction	5%			$22,330			
TOTAL IMPLEMENTATION COST				$491,300			
Engineering & Design	**			$0			
TOTAL CAPITAL COSTS				$491,300			
TOTAL PRESENT WORTH						$810,000	$686,000

* Half of the cost of each 5-year review ($7500) is included in SC Alternatives. Reviews at t = 5 yr, 10 yr, 15 yr, 20 yr, 25 yr, and 30 yr.

** Engineering and design included in item I. (1) System installation/mobilization

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TABLE 8
COST ESTIMATE SUMMARY
ALTERNATIVE MM-4 (B)
EXTRACTION AND TREATMENT
POWDERED ACTIVATED CARBON TREATMENT (PACT)
A. O. POLYMER FEASIBILITY STUDY

ITEM	Quantity	Capital Cost	Annual O & M	Present Worth of Annual O&M Costs 5% Discount	10% Discount
I. EXTRACTION/DISCHARGE SYSTEM					
1. New Extraction Wells	7 Wells	$46,700			
2. Submersible Pumps	7 Pumps	$2,900	$1,400	$10,000	$8,100
3. Collection/Discharge Piping	1050 LF	$18,840			
4. Electrical Connections/Electric Power	Lump Sum	$14,475	$4,570	$32,500	$26,300
5. System Controls	Lump Sum	$13,405			
Subtotal:	.	$96,320	$5,970	$42,500	$34,400
II. SITE PREPARATION/TREATMENT BUILDING					
1. Construct Treatment Building	5000 SF	$300,000			
2. Building Lighting/Heating	Lump Sum		$3,600	$25,600	$20,700
3. Construct Parking/Staging Area	Lump Sum	$8,000			
Subtotal:		$308,000	$3,600	$25,600	$20,700
III. WATER TREATMENT SYSTEM					
1. Model 8140 (Batch) Pact System and Auxiliary Equipment/Delivery/Set-up		$600,000			
2. Multi-Media Post-Filtration Unit		$50,000			
3. Filter Press (sludge dewatering)		$20,000			
4. O & M Costs:					
a. Electricity			$25,550	$181,600	$147,100
b. Carbon Usage			$54,750	$389,200	$315,300
c. Sludge Disposal			$22,500	$159,900	$129,600
c. Polymer			$900	$6,400	$5,200
5. Full-Time System Operator			$50,000	$355,400	$288,000
Subtotal		$670,000	$153,700	$1,092,500	$885,200
IV. TREATED WATER DISCHARGE					
1. NPDES Permit		$7,500			
2. Weekly Effluent Sampling	*		$19,500	$138,600	$112,300
Subtotal:		$7,500	$19,500	$138,600	$112,300
V. INSTITUTIONAL ACTIONS					
1. Public Awareness/Education Program & Groundwater Use Restrictions		$25,000			
Subtotal:		$25,000		$0	$0
VI. LONG TERM MONITORING & REVIEW (30 YEARS)					
1. Install additional monitoring well		$3,000			
2. Semi-annual Groundwater Monitoring	**		$17,000	$261,300	$160,300
3. Five-Year Reviews	***			$20,800	$11,600
Subtotal:		$3,000	$17,000	$282,100	$171,900
CONSTRUCTION SUBTOTAL		$1,109,800	$199,800	$1,581,300	$1,224,500

-table continued on next page-

POOR QUALITY ORIGINAL

TABLE 8

	Capital	O&M			
Health and Safety	1%	1%	$11,098	$15,813	$12,245
Bid Contingency	15%	15%	$166,470	$237,195	$183,675
Scope Contingency	15%	15%	$166,470	$237,195	$183,675
CONSTRUCTION TOTAL			$1,453,800	$2,071,500	$1,604,100
Permitting & Legal	3%		$43,614		
Services During Construction	6%		$87,228		
TOTAL IMPLEMENTATION COST			$1,584,600		
Engineering & Design	7%		$110,922		
TOTAL CAPITAL COSTS			$1,695,500		
TOTAL PRESENT WORTH				$3,767,000	$3,300,000

NOTE: Cost estimate assumes a 9-year period of operation for the extraction and treatment system.

* Weekly effluent sampling for 9 years.
Analysis performed is for VOCs.

** Monitoring Period of 30 Years:
10 monitoring wells samples semi-annually.
Analysis performed is for VOCs.

*** Half of the cost of each 5-year review ($7500) is included in each MM Alternative.
Reviews @ t = 5 yr, 10 yr, 15 yr, 20 yr, 25 yr, and 30 yr.

Table 9
POTENTIAL ACTION-SPECIFIC ARARS AND TBCS
A.O. POLYMER FEASIBILITY STUDY

Standard, Requirement, Criteria or Limitation	Citation	Description
RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices.	40 C.F.R Part 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment and thereby constitute prohibited open dumps.
RCRA Hazardous Waste Management Systems General	40 C.F.R Part 260	Establishes procedures and criteria for modification or revocation of any provision in 40 C.F.R. Part 260-265.
RCRA Standards Applicable to Generators of Hazardous Waste	40 C.F.R Part 262	Establishes standards for generators of hazardous waste.
RCRA Standards Applicable to Transporters of Hazardous Waste	40 C.F.R Part 263	Establishes standards which apply to persons transporting hazardous waste within the U.S. if the transportation requires a manifest under 40 C.F.R Part 262
RCRA Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 C.F.R Part 264	Establishes minimum national standards which define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste.
Resource Conservation and Recovery Act (RCRA) -Miscellaneous Units	40 C.F.R. Part 264.600 Subpart X	Establishes environmental performance standards of facilities that treat, store, or dispose of hazardous waste in miscellaneous units.
RCRA Land Disposal	40 C.F.R. Part 268	Established a timetable for restriction of burial of wastes and other hazardous [illegible]

Standard, Requirement, Criteria or Limitation	Citation	Description
<u>Clean Water Act</u>	33 U.S.C. 1251 40 C.F.R.	Restriction and maintenance of the chemical, physical and biological integrity of the nation's water
Effluent Limitations	Section 301	Technology-based discharge limitations for point sources of conventional, nonconventional and toxic pollutants.
Water Quality Related Effluent Limitations	Section 302	Protection of intended uses of receiving waters (e.g., public water supply, recreational uses).
Toxic and Pretreatment Effluent Standards	Section 307	Establishes list of toxic pollutants and promulgates pretreatment standards for discharge into POTWs.
National Pollutant Discharge Elimination System (NPDES)	Section 402	Issues permits for discharge into navigable waters.
<u>Safe Drinking Water Act</u>		
Underground Injection	40 C.F.R. 144-147	Provide requirements for an Underground Injection Control (UIC) plan and establishes classification of wells.

Table 9 (Continued)
Potential Action-Specific ARARs and TBCS

Standard, Requirement, Criteria or Limitation	Citation	Description
Other		
Occupational Safety and Health Act	29 U.S.C. ss 651-678 29 C.F.R. 1910, 1926, 1904	Regulates worker health and safety.
Hazardous Materials Transportation Act	49 C.F.R. Parts 100-177	Regulates transportation of hazardous materials.
Clean Air Act		
National Ambient Air Quality Standard	40 C.F.R. 50	Establishes discharge limits for seven pollutants.
Listing Criteria	Section 112	Establishes health basis to list pollutants as hazardous.

Table 9 (Continued)
Potential Action-Specific ARARs and TBCS
Page 4

Standard, Requirement, Criteria or Limitation	Citation	Description
Air Pollution Controls		
Permit Conditions	Letter to Robert Palasits, Elizabethtown Water Company 6/17/85	Amended permit conditions with respect to total flow rate, emissions rates and testing.
Air Pollution Control	Memo from Milton Polakovic on air stripping of contaminated water, 12/8/82.	Controls and prohibits air pollution, particle emissions and VO emissions.
Air Stripping Guidelines	Memo from Assistant Comm. Tyler	Criteria for air pollution control requirements and exemptions.
N.J. Air Pollution controls Regulations	Memo from William O'Sullivan, 3/23/87	Information required for air pollution control permits must be submitted for review; approved equipment must be used in hazardous waste site cleanups.
Air Pollution Control Guidelines for Resource Recovery Facilities and Incinerators	2/83 - Addendum 3/1/84	Specifies maximum air contaminant emissions rates, testing requirements, and minimum design standards.

Table 9 (Continued)
Potential Action-Specific ARARs and TBCS
Page 5

Standard, Requirement, Criteria or Limitation	Citation	Description
Incinerator Permit Conditions	Permit and Certificate No. 60320, Rollins Environmental Services	Specifies requirements for operating, analytical and reporting, and waste analysis halogen limit on waste feeds, stack emission testing, performance standards and monitoring and inspection requirements.
<u>Groundwater Controls</u>		
Groundwater Quality Criteria	NJAC 7:9-6 NJAC 7:14A-6.14	Protection and enhancement of groundwater resources.
Requirements for Groundwater Monitoring	NJAC 7:26-9	Groundwater monitoring system requirements.
<u>Discharges to Surface Water</u>		
New Jersey Pollutant Discharge Elimination System (NJPDES)	NJAC 7:14A	Issue NJPDES permits for discharge to surface water and groundwater.
Water Quality Standards	NJAC 7:9-4.1 <u>et.seq.</u>	Protection and enhancement of surface water resources.
Policy/Procedures for Discharge to Surface Waters (DSW) from Superfund Sites	Memo from Ed Post, 11/1/83	Information required for a Superfund Site DSW permit.
Checklist for Development of Best Professional Judgement Permits	Memo from Ed Post, 3/1/83	Consideration used in preparing NJPDES-DSW Permit.

Table 9 . (Continued)
Potential Action-Specific ARARs and TBCS
Page 6

Standard, Requirement, Criteria or Limitation	Citation	Description
Wastewater Discharge Requirements	NJAC 7:9-5.1 et.seq.	Minimum treatment requirements and effluent standards for discharge to surface water.
New Jersey Safe Drinking Water Act	NJAC 7:10	Sets standards for drinking water including MCLS, disinfection requirements, secondary drinking water regulations and monitoring requirements.
<u>Other</u>		
Emergency Response Notice of Release of Hazardous Substance to Atmosphere	NJSA 26:2C-19	Control exposure to air pollution by immediate notification to the department hotline of any air release incident.
Water Pollution Control	NJAC 7:21(E)	Immediate notification of any spill of hazardous substances.
Air Pollution Control	NJAC 7:27	Lists requirements for control of air pollution.
Noise Control Act	NJSA 13:1G-1 et.seq.	Prohibits and restricts noise which unnecessarily degrades the quality of life.
Noise Pollution	NJAC 7:29-1	Sets maximum limits of sound from any industrial, commercial, public service or community service facility.

Table 9 (Continued)
Potential Action-Specific ARARs and TBCS
Page 7

Standard, Requirement, Criteria or Limitation	Citation	Description
Well Drilling and Sealing and Pump Installation		
General Requirements for Permitting Wells	NJAC 7:9-7	Regulates permit procedures, general requirements for drilling and installation of wells, licensing of well driller and pump installer, construction specifications, and well casing.
Sealing of Abandoned Wells	NJAC 7:9-9	General requirements for sealing of all wells (e.g., single cased; multiple cased, hand dug, test wells, boreholes and monitoring wells, abandoned wells).
Well Drillers and Pump Installers Act	NJSA 58:4A-5 et.seq.	Well drillers licensing, supervision, inspection and sampling.
Soil Decontamination		
Permit Requirements	Pre-application Conf. Terra-Vac Corp. (memo from Joel Leon, 12/2/86)	Proposed permit requirements for portable soil decontamination operations.

Table 9

POTENTIAL CHEMICAL-SPECIFIC ARARS AND TBCS
A. O. POLYMER FEASIBILITY STUDY

Standard, Requirement, Criteria or Limitation	Citation	Description
Resource Conservation and Recovery Act (RCRA) - Identification and Listing of Hazardous Waste	40 C.F.R. Part 264.1	Defines those solid wastes which are subject to regulations as hazardous wastes under 40 C.F.R. parts 262-265 and Parts 124, 270.271.
Safe Drinking Water Act National Primary Water Standards	40 C.F.R. Part 141	Establishes health-based standards for public water system.
SDWA Maximum Contaminant Level Goal (MCGs)	40 C.F.S., 141.11 - 141.16	Establishes drinking water quality goals set at levels of anticipated adverse health effects, with an adequate margin of safety.
Clean Water Act Water Quality Criteria	40 C.F.R., Part 131	Sets criteria for water quality based on toxicity to aquatic organisms and human health.

Table 9 (Continued)
Potential Chemical-Specific ARARs and TBCs
Page 2

Standard, Requirement, Criteria or Limitation	Citation	Description
SOLIDS		
Sludge Quality Criteria	NJAC 7:14 - 4 appendix B-1	New Jersey Water Pollution Control Act Contaminant Indicators.
New Jersey Department of Environment	June 1, 1988 Document	Cleanup based on background levels for inorganics, and risk assessment for organics including total volatile organics, total semi-volatile organics (base neutral(s), and total petroleum hydrocarbons
GROUNDWATER		
Safe Drinking Water Act Maximum Contaminant Levels	A-280 Amendments	State criteria for drinking water
Groundwater Protection	NJPDES	Standards when written into NJDEPS permits
Groundwater Standards	NJAC 7:9-6 NJAC 7:14 A-6:15	New Jersey Water Pollution Control Act standards for groundwater
SURFACE WATER		
Surface Water Criteria	NJAC 7:9-4	Criteria for surface water classes; SE (saline estuarian), SC (saline coastal), and FW2 (general freshwater).

Table 9
POTENTIAL LOCATION-SPECIFIC ARARS AND TBCS
A.O. POLYMER FEASIBILITY STUDY

Standard, Requirement, Criteria or Limitation	Citation	Description
Clean Water Act	Section 404 40 C.F.R 230, 231	Prohibits discharge of dredged or fill material into wetlands without permit. Preserves and enhances wetlands.
National Historic Preservation Act	16 U.S.C. s 470 40 C.F.R. s 6:301 (b) 36 C.F.R Part 800	Requires federal agencies to take into account the effect of any federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or is eligible for inclusion in the National Register of Historic Places.
Executive Order Protecting Wetlands	Executive Order No. 11990	Requires federal agencies to minimize the destruction, loss, or degradation of wetlands on Federal property.
Fish and Wildlife Coordination Act	16 U.S.C. 661 40 C.F.R. s 6:302 (g)	Requires consultation when federal department or agency proposes or authorizes any modification of any stream or other water body, and adequate provision for protection of fish and wildlife resources.

Standard, Requirement, Criteria or Limitation	Citation	Description
Wetland Act of 1970	NJSA 13:9A-1 <u>et.seq.</u>	Listing and permit requirements for regulated activities.
Open Lands Management	NJAC 7:2-12.1 <u>et.seq.</u>	Considers impact on recreational projects funded by Open Lands Management Grants.
Endangered Plant/Animal Species Habitats		New Jersey's Threatened Plant/Animal Species. List of threatened habitats where they occur.

ATTACHMENT 4

RESPONSIVENESS SUMMARY
A.O. POLYMER SUPERFUND SITE
SPARTA, NEW JERSEY

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for the A.O. Polymer site and New Jersey Department of Environmental Protection's (NJDEP's) and the U.S. Environmental Protection Agency's (EPA's) responses to those comments. At the time of the public comment period, NJDEP and EPA had selected a preferred alternative for controlling soil and groundwater contamination at the site.

NJDEP held a public comment period from April 25, 1991 through May 24, 1991 to provide interested parties the opportunity to comment on the Proposed Plan for the A.O. Polymer site. A request for an extension of the public comment period was granted and the public comment period was extended to June 7, 1991.

NJDEP held a public meeting to present the preferred remedial alternative for controlling soil and groundwater contamination at the A.O. Polymer site. The meeting was held at the Sparta Municipal Building, 65 Main Street, Sparta, New Jersey on May 9, 1991 at 7:00 pm.

Judging from the comments received during the public comment period, the residents and the town council of Sparta were responsive to the Proposed Plan and it appears they support the preferred alternative for controlling soil and groundwater contamination. No objections to the Proposed Plan or preferred alternatives were raised at the public meeting.

This Responsiveness Summary is divided into the following sections:

I. RESPONSIVENESS SUMMARY OVERVIEW: This section briefly describes the site background and preferred remedial alternative for controlling soil and groundwater contamination.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community concerns and interests regarding the A.O. Polymer site.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES: This section summarizes the oral comments received by NJDEP at the public meeting, and NJDEP's responses as well as responses to written comments received during the public comment period.

I. OVERVIEW

The A.O. Polymer Superfund site, which is located at 44 Station Road in the Township of Sparta, New Jersey, occupies approximately four acres near Sparta Station along the New York, Susquehanna and Western (NYS&W) Railway. It is bounded to the north and east by Station Park, a municipal recreation area, to the southeast by Station Road, and to the south and west by the NYS&W Railway. Several small businesses and three homes are located near the site on Station Road. The Sparta High School is approximately one-half mile to the north-northeast and a private gun club is located 500 feet northwest of the site. The Wallkill River flows 500 feet to the southeast of the site.

The A.O. Polymer complex has been operating as a specialty polymer and resin manufacturing facility for approximately 30 years. Mohawk Industries began operations at the site in the early 1960s and was involved in the production of various resins using polymerization processes. Mohawk also engaged in the reclamation of electronic component cleaning fluids containing various freon compounds in alcohol.

In December 1978, NJDEP inspectors and Sparta Health Department officials began collecting water samples from potable wells surrounding the site. Analysis of these samples revealed the presence of volatile organic comtaminants in three private domestic wells located along Station Road. In June 1979, the owners of the three affected wells filed damage claims with the New Jersey Spill Fund, and in January of the following year, these homes were connected to the public water line.

In 1980, NJDEP began investigating reports of drum stockpiling at the site. These investigations identified on-site waste disposal and storage practices as the source of the groundwater contamination. Waste handling practices included disposal of liquid chemical waste into unlined lagoons, improper storage of over 800 deteriorating drums, and the burial of crushed and open drums containing waste materials.

Between 1980 and 1981, a surface cleanup of the site was initiated by NJDEP, including the removal of surface drums and the excavation and removal of contaminated soil in the lagoon area to a depth of approximately 10 feet. After excavation of this lagoon area, the area was backfilled with clean soil. This cleanup resulted in the removal of 1,150 drums, 1,700 cubic yards of contaminated soils and 120 cubic yards of crushed drums and debris.

Concern regarding groundwater contamination at the site resulted in additional investigations by NJDEP. In January 1982, NJDEP's Division of Water Resources installed 11 monitoring wells on and adjacent to the site to determine the extent of groundwater contamination. Sampling confirmed that groundwater contamination had reached the Allentown Formation, which is a source of potable water. Sampling also revealed that contamination had migrated under Station Park, approximately 300 yards northeast of the site.

The site was placed on the National Priorities List on September 1, 1983. In 1984, an investigation of the site was initiated by the NJDEP's Division of Hazardous Site Mitigation. In December 1986, a contract to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the site was awarded to ICF Technology Incorporated.

The RI included sampling of groundwater, soils, surface waters, and sediment at the site; the FS presented a detailed review of the alternatives considered in remediation of the site. The RI/FS was completed in April 1991. On April 25, 1991 the public comment period commenced with NJDEP's release of the RI/FS findings and the Proposed Plan. NJDEP identified its preferred remedial alternative in a public notice which appeared in the New Jersey Herald and in a mailing to NJDEP contacts for the site. A public meeting to present the Proposed Plan to the public was held on May 9, 1991.

The selected remedy specified in the Record of Decision (ROD) involves remediation of soils using soil vapor extraction. Groundwater is to be remedied by pumping and and then treatment by use of Powdered Activated Carbon Treatment followed by reinjection of treated water to the groundwater by use of recharge basins.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Community concerns have centered around odor complaints, the threat of contamination of the high school drinking well, the park playing fields, and surface water pollution of the Wallkill River.

Although the threat of contamination to the high school drinking well, contamination of the park playing fields, and pollution of the Wallkill River are being addressed by the Superfund response action outlined in the Proposed Plan, the air emissions from the continued operation of the A.O. Polymer plant are being addressed by NJDEP's Division of Environmental Quality (DEQ). DEQ has been responsive to community complaints concerning emissions from the active facility.

Additional community concerns regarding site clean-up activities were raised during the May 9 public meeting and are summarized in Section III below.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS,

AND RESPONSES

This section summarizes comments received from the public during the public comment period, and NJDEP's responses.

A. SUMMARY OF QUESTIONS AND NJDEP's RESPONSES FROM THE PUBLIC MEETING CONCERNING THE A.O. POLYMER SITE - MAY 9, 1991

A public meeting was held May 9, 1991 at 7:00 p.m. at the Town Hall, 65 Main Street, Sparta, New Jersey. Following a brief presentation of the RI/FS findings, NJDEP's Remedial Project Manager, Zoe Kelman, presented the Proposed Plan and preferred alternative for the A.O. Polymer site. Comments raised by the public following Ms. Kelman's presentation are categorized by relevant topics and presented as follows:

1. Impact of Remediation on the Wallkill River, Franklin Pond, and the Surrounding Community
2. Air Concerns
3. Groundwater Concerns
4. Health Concerns
5. Hazardous Materials at the Site
6. Length of Time Involved in Studying and Cleaning the Site
7. Current Plant Operations and Emissions
8. Cost and Liabilities

1. Impact of Remediation on Wallkill River, Franklin Pond, and the Surrounding Community

Comment: As part of the preferred alternative, contaminated groundwater would be pumped from the ground, treated, and reinjected. Several questions were posed with regard to the handling of treated groundwater including: where the discharge of the treated water would be going; where, how, and how often the treated discharge water would be sampled and tested; if the discharged groundwater would in any way negatively impact the Wallkill River or Franklin Reservoir.

Response: Most of the treated groundwater will be placed in recharge basins to be constructed on-site, and filter back into the ground. In the event that the recharge basins are not able to handle the volume of treated water, some amount of treated water may be discharged to the Wallkill River. The details of how and how often the treated discharge water would be tested will be worked out during the design stage; testing of treated water would occur before any treated water is released into the groundwater or the Wallkill River. Any discharge of treated water to the Wallkill River will have no significant negative impact to the river or to Franklin Resevoir, located downstream. The treated water which will be reinjected will be treated to levels lower than Maximum Contaminant Levels (MCLs) which are limits established for drinking water.

Comment: Is there a potential for disruption of local activities by the remediation of the site? Also, what effect will increased traffic from the site remediation have on local businesses? Will the positioning of groundwater extraction wells in Station Park interfere with park activities?

Response: Increased traffic due to the remediation of the site is not anticipated to have an impact on commerce in the surrounding area. Traffic to and from the site would be scheduled to minimize any disruption to the surrounding community and commerce in the area. This concern will be considered in greater detail during the design stage. The conceptual design presented at the public meeting showed that the location of the pumping wells was located on the soccer fields. The design presented is preliminary and another more detailed phase of the design process would have to be performed before it is known for certain where the exact location of the extraction wells will be. Although there are engineering considerations that must be weighed to determine where extraction wells must be placed to be most effective, efforts will be made to minimize, to every extent possible, the disturbance to the park activities.

2. Air Concerns

Comment: Since no air sampling has been conducted at the site how can a risk assessment be considered complete?

Response: The air exposure pathway evaluated in the risk assessment examined the evaporation of volatile organics from the groundwater and migration of volatile organics from the groundwater through the soil into the air, as well as their impact on the health of residents and people using the park. Due to the difficulty and inaccuracies encountered with air sampling, the exposure pathway of air contaminants from these media was evaluated using a mathematical model. The evaluation indicated that air contamination resulting from the groundwater and soil contamination at the A.O. Polymer site poses no significant risk to residents or park users.

During the Remedial Investigation (RI), while installing monitoring wells and collecting sub-surface soil samples, air monitoring was conducted on-site. The readings from this monitoring indicated no significant risks existed.

Air emissions from the A.O. Polymer active facility are regulated by the NJDEP's Division of Environmental Quality.

Comment: Earlier in the public meeting a statement was made that there is no risk to residents posed by the air from the A.O. Polymer Superfund site but there exists considerable concern about emissions coming from the A.O. Polymer active facility.

Response: The role of the public meeting was to address concerns about the Superfund aspect of the site i.e. the site cleanup with regard to the contaminated soil and groundwater. Air emissions from the active facility are not related to the Superfund cleanup process of the contaminated soil and groundwater. Air emissions, as they are related to the groundwater and soil contamination at the site pose acceptable levels of risk to human health or the environment.

Although the air concerns regarding the current operating facility were not addressed in the Proposed Plan to remediate the contaminated groundwater and soils, by no means was this area of concern overlooked. Current air emissions from the A.O. Polymer plant are being addressed separately by NJDEP's Division of Environmental Quality (DEQ). Jeff Meyer, a representative from DEQ, was present at this public meeting to provide information about air emissions from the A.O. Polymer active facility.

Jeff Meyer stated that A.O. Polymer is subject to provisions of the New Jersey Air Pollution Control Act of 1968 and has been cited and fined for violations of air emissions standards. The company has requested a hearing with NJDEP regarding these violations and the action is under review.

NJDEP will continue to inspect and take appropriate enforcement actions at the site to ensure compliance with all applicable laws.

Comment: Would the emissions from the Soil Vapor Extraction (SVE) treatment system, proposed as part of the preferred alternative, contribute to the air pollution of the area and what method would be used to test air emissons from the SVE process?

Response: The SVE treatment system would not contribute to air pollution in the area. The emissions from the SVE treatment system are subject to regulations which must meet both Federal and State air quality standards before the system could run continuously. Sampling and analysis would be conducted prior to full-time operation to ensure that emissions do not exceed permissible levels.

The actual method for sampling the SVE treatment system would be consistent with the current requirements of the New Jersey Department of Environmental Protection's Division of Environmental Quality.

3. Groundwater Concerns

Comment: Does the groundwater contamination relate to the septic system of the facility?

Response: No link between the septic system and the groundwater plume has been identified. Although the septic tank is no longer being used by the facility, there may be a problem with contaminants in it. The septic tank will be either cleaned out or removed.

Comment: What would be the potential health risk to people of the community if the Eagle's Nest Municipal Well Facility is activated?

Response: The well in question is being installed on the opposite side of the Wallkill River in relation to the site. The river acts as a boundary preventing the contaminated groundwater plume from moving to the opposite side of the River where the municipal well was installed. Initial tests performed on the municipal well showed that it had no effect on the wells installed at the A.O. Polymer site. It is anticipated that pumping from this well will not affect the contaminated groundwater plume which discharges to the Wallkill River.

4. Health Concerns

Comment: A comment was made concerning an apparent discrepancy between a Health Assessment Report written for the federal Agency for Toxic Substance and Disease Registry (ATSDR) by the New Jersey Department of Health (DOH), and the Risk Assessment of the Remedial Investigation. The commenter was concerned that the Health Assessment concluded that the A.O. Polymer site should be considered a public health concern, while the Risk Assessment part of the Remedial Investigation Report concluded that there is an acceptable level of risk posed by the site.

Response: The Health Assessment report the commenter was refering to is a report which based its recommendations on preliminary data and does not include the findings of the completed RI/FS. Extensive data was collected and compiled after the ATSDR report was issued. This data shows that with the exception of ingesting the contaminated groundwater, the current risks associated with the Superfund site are within EPA acceptable limits. In addition, the NMJDOH will be re-evaluating and amending the health assessment based on the complete findings of the RI/FS.

Comment: Has there been a thorough risk assessment performed for the site with regard to air exposures, and the cumulative and synergistic effects of chemicals?

Response: A thorough risk assessment was performed for the A.O. Polymer site in which the synergistic and cumulative effects of chemicals were taken into account when calcultaing risks to the people who use the park, as well as residents of the area. This risk assessment was based on data from the subsurface soil and groundwater investigation and considered potential air emissions from these sources.

5. Hazardous Materials at the Site

Comment: Concerns were raised regarding drums on site: are drums still present from the 1981 cleanup, if not, what was the fate of those drums, also, how are the drums on the site labeled, and are drums on the property still being dumped into the lagoon area?

Response: No drums from the 1981 cleanup are present on the site. These drums were shipped off-site for disposal. There are drums on site, which are lawfully present, containing raw materials to be used for processing at the active plant. Other drums on-site contain the remanants of protective clothing worn by technicians who conducted the remedial investigation or contain water and soil generated when soil samples were collected and monitoring wells were drilled, developed, and sampled during RI activities. NJDEP has issued a contract, which will go into effect within the next six to eight months, that provides for the removal of all drums associated with the remedial investigation of the site.

All the drums on the site relating to the Remedial Investigation are labeled "Sample," and are numbered.

The lagoon area, which was remediated by NJDEP in 1980, has not been used as a disposal area after the 1981 clean-up.

Comment: What are volatile organic compounds, and how long does it take for them to breakdown?

Response: Volatile organic compounds that were found at the A.O. Polymer site are common industrial solvents used in industries across the country. They include trichloroethene, which is used for degreasing and cleaning. Other volatile organic compounds found at the site are typical gasoline components such as toluene and xylenes. The amount of time it takes for these chemicals to break down is site specific. For the A.O. Polymer site, it is estimated that the contaminants found in the soil could leach into the groundwater and discharge into the Wallkill River for up to 90 years if no remediation is conducted.

6. Length of Time Involved in Studying and Cleaning the Site

Comment: Several commenters expressed frustration over the amount of time involved with studying and planning remediation at the site.

Response: The process of cleaning up hazardous waste sites does take a long time because cleanup of these sites often become encumbered by very complex technical, administrative, and financial issues. Also, the length of time taken to study the site ensures that the extent of contamination is accurately known and that the chosen treatment technology will be the most effective remedy available. However, immediate hazards to the public or environment are addressed early on in the Superfund process. In this case, the 1981 cleanup and hookup of affected properties to a public water supply addressed immediate health threats posed by contaminated groundwater.

7. Current Plant Operations and Emissions

Comment: Concerns were raised regarding the current operating facility. Specifically, concerns pertaining to the plant's possible adverse impact on the health of residents and workers of the surrounding area as well as recreational users of the park who are subjected to the plant's air emissions.

Response: The cleanup of soils and groundwater at the site is being addressed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) otherwise known as Superfund. Superfund addresses the threat to human health and environment posed by the contaminated groundwater and soils at the A.O. Polymer site.

As described above, NJDEP has and will continue to take enforcement action against A.O.Polymer to ensure compliance with the Air Pollution Control Act.

Comment: One commenter reported that she had witnessed a discharge from the A.O. Polymer facility to the Wallkill River. This person raised the concern over the handling of materials, including waste material, at the site.

Response: The A.O. Polymer facility has been issued a restraining order to stop any discharge into the groundwater and, in the future, if any person believes that this restraining order is not being complied with, they sould report it to the NJDEP hotline, which is available 24 hours a day, at (609) 292-7172.

8. Cost and Liabilities

Comment: There were concerns about who would be liable for additional expenses associated with capping of wells, installation of water meters, and the cost of using municipal water incurred by businesses in the area.

Response: The Spill Compensation and Control Act (NJSA Title 58:10-23.11) provides a mechanism for filing damage claims through the New Jersey Environmental Claims Administration located at 506 East State Street, Trenton, New Jersey 08625, (609) 633-2947.

Comment: What funding for business and residential relocation is available during the remediation process?

Response: Based on anticipated activities, there would be no need to relocate anyone during the remediation of the site. Air emissions from treatment facilites would be monitored and are not expected to exceed maximum allowable limits.

B. WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comments and concerns which were not addressed at the public meeting were accepted in writing during the public comment period and are answered in the following part of the Responsiveness Summary. These written comments are categorized by relevant topics and presented as follows:

1. Alternative SC-6, Excavation and Low Temperature Thermal Desorption
2. Alternative MM-2, Extraction and Treatment: Biological/Air Stripping/Carbon Adsorption
3. SC-4, Soil Vapor Extraction
4. Health Concerns
5. Location of Remedial Structures and Wells
6. Current Plant Operations and Related Environmental Problems
7. Findings of the RI Report

1. Alternative SC-6, Excavation and Low Temperature Thermal Desorption

Comment: The Proposed Plan does not address potential difficulties associated wth excavation of soil as related to Alternative SC-6, Excavation and Low Temperature Thermal Desorption.

Response: The Proposed Plan does consider the difficulties in executing such excavation activities and states this in the "Analysis of Criteria" section of the Proposed Plan under the Implementability subsection. Further detail regarding problems associated with implementing SC-6 may be found in the FS report. The Feasibility Study is available to the public in the public repositories located at the following locations:

Sparta Township Library
22 Woodport Road
Sparta, New Jersey 07871,
(201) 792-3101

NJDEP
401 East State Street
Trenton, New Jersey 08625
(609) 984-2902

U.S. EPA - Region II
26 Federal Plaza
Room 13100
New York, New York 10278
(212)264-9836

Comment: As part of the excavation alternative, would saturated material also be excavated if the heavier phases of the contaminants are dispersed in the soil layer containing groundwater? Feeding saturated materials into a thermal treatment unit may present capacity problems. No data is presented in the Proposed Plan to indicate that thermal desorption would reduce the component concentrations to below the required treatment levels.

Response: Saturated soil would not be excavated and fed into the thermal treatment unit; excavation of contaminated soil would cease once the area of saturated soil layer is reached. No data is presented about the reduction capacity of the thermal treatment unit in the Proposed Plan. The effectiveness of the thermal desorption treatment process is discussed in section 4.2.6 of the Feasibility Study. More exact figures regarding the effectiveness of the thermal desorption treatment process would have been discussed in the design phase, if this alternative was chosen.

2. Alternative MM-2, Extraction and Treatment: Biological/Air Stripping/Carbon Adsorption

Comment: Alternative MM-2 does not describe the proposed biological treatment system in enough detail to determine whether the release of volatiles to the atmosphere would present a problem.

Response: It is anticipated that release of volatiles to the atmosphere would not be a problem with regard to alternative MM-2. Air stripping emissions would be regulated under the Federal Clean Air Act. The State of New Jersey also regulates particle and volatile organic emissions from air strippers. Air pollution control permits are requirements met for all air strippers in the State of New Jersey.

Comment: Would the vent gas from the biological reactor pass to the air stripper and on through the carbon treatment system or would the biological reactor be vented through a separate vent treatment system?

Response: It is anticipated that the gas from the biological reactor would pass to the air stripper and then through the carbon treatment system.

3. SC-4, Soil Vapor Extraction

Comment: The description of SC-4, the Soil Vapor Extraction system, does not explain whether extraction will be by vertical wells or from horizontal (lateral) collection headers.

Response: Since the contaminated soils lie between approximately 10 feet and 25 feet below the soil surface, it is anticipated that a vertical extraction well system will be implemented to extract volatile organic compounds from unsaturated soils. Specific details will be determined during the design phase of the project.

Comment: The vapor extraction and groundwater pump and treat methods both suffer from the same physical problems in that movement of contaminants is retarded by the soil structure thus making the removal of contaminants increasingly difficult as the distance increases from the collection point. Installation details of a vapor extraction system along with a better characterization of the soil geology would aid in understanding how effective vapor extraction is going to be.

Resonse: The lowlands in Station Park, on either side of the Wallkill River, are mapped as alluvial land. This is a land type typified by flat, poorly drained soils. Parent material, soil texture, and other properties vary significantly over short distances and they are prone to frequent flooding. About 15 to 20 percent of the study area is in this land type. About 15 to 20 percent of the soils in the Station Park are classified as Riverhead sandy loam. These are deep, well drained soils with a sandy loam surface layer generally underlain by glacilal-fluvial deposits of sand and gravel. The permeability of the soil is moderately rapid. Riverhead sandy loam occurs in the northern regions of Station Park on slopes varying from 3 to 8 percent. From 20 to 40 percent of Station Park, and part of the A.O. Polymer site are underlain by Palmyra gravelly fine sandy loam. This is composed of deep, well to excessively well drained upland soils formed on glacial outwash deposits. The Palmyra series has a moderate to rapid permeability. The remaining portion of Station Park and most of A.O. Polymer are underlain by the Otisville gravelly, loamy sand series. The texture, parent material and permeability of this series are similar to the Palmyra series. However, the Otisville soils are not as well developed with lower fertility, cation exchange capacity and pH. The Otisville series occupies upland areas in Station Park adjacent to A.O. Polymer.

Overall, the soil at the A.O. Polymer site has relatively high permeability and thus is expected to lend itself to the selected soil vapor extraction and groundwater pumping systems. Highly permeable soils will have high diffusion rates to allow large quantities of air and water to be passed through the soil matrix. Specific details of how far apart and where wells will be placed will be determined after a treatability study is performed during the design phase of the project.

4. Health Concerns

Comment: Two recent newspaper articles were cited as saying no health risks exist to the people on the Station Park ball field. Who was verifying this information?

Response: The risk assessment in the RI, which evaluated risks solely associated with the Superfund site, found current health risks to people using the park to be at acceptable levels. This risk assessment was then reviewed by NJDEP's Bureau of Environmental Evaluation and Risk Assessment as well as risk assessment specialists at USEPA. Both agencies found the risk assessment to be correct in stating that current health risks to people using the park are within acceptable limits.

Comment: An Agency for Toxic Substance and Disease Registry (ATSDR) report was cited which recommended that soil and air sampling be performed, the report also stated that the community is probably being exposed. Why were no soil and air samples taken?

Response: Extensive soil sampling was performed on the A.O. Polymer property to determine the extent of the source of groundwater contamination. The data from these samples indicated that the area of soil contamination responsible for groundwater contamination was limited to the A.O. Polymer property. Station Park soils were sampled in Phase I of the RI. Although groundwater contamination is present beneath Station Park, results of the inhalation exposure scenario from the risk assessment conducted during the RI showed an acceptable level of risk to recreational users of the park.

The air exposure pathway evaluated in the risk assessment examined the evaporation of volatile organics from the groundwater and migration of volatile organics from the groundwater into the air, as well as their impact on the health of residents and people using the park. The exposure pathway of air contaminants from these media was evaluated using a mathematical model provided by EPA. The evaluation indicated that air emissions from the volatilization of organic compounds in the groundwater are currently well within the EPA acceptable risk range to both residents and recreational park users.

5. Location of Remedial Structures and Wells

Comment: The proposed placement of wells on soccer fields in Station Park, as depicted in the Feasibility Study, shows one of the wells to be in the same location as a municipal maintenance building.

Response: The location of wells depicted in the Feasibility Study is not anticipated to be the final location of the wells. The Feasibility Study presented a conceptual design of the groundwater extraction system and the exact location of the well system was not chosen at that time. The final location of wells and treatment units will be determined in the design phase of the project. Every effort will be made to minimize the interference of park activities by the location of the wells and treatment systems.

6. Current Plant Operations and Related Environmental Problems

Comment: The Remedial Investigation and Feasibility Study Report did not adequately address the current use of the A.O. Polymer site and did not include any proposed action to correct the continuing source of environmental problems caused by its operation, particularly with regard to air pollution and improper discharge to the septic system.

Response: Cleanup of soils and groundwater at the site is being addressed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) otherwise known as Superfund.

Although the air concerns regarding the current facility were not addressed in the Proposed Plan, by no means has this area of concern been overlooked. Air emissions from the A.O. Polymer plant are being addressed by NJDEP's Division of Environmental Quality.

There has been no link found between the septic system and the contaminated groundwater plume. Discharges to the septic system have been haulted by a court order and the septic system may be cleaned, but not as component of the selected remedy.

Comment: Would there be significant exposure to park users resulting from excavation of soils for the development of a maintenance building in an area where transfer of gases from the groundwater to air was characterized as high.

Response: Transfer of contaminants to the atmosphere from groundwater is likely to be most significant in areas of Station Park where groundwater contaminant concentrations are high and the depth to water is shallow. The air emissions exposure pathway was evaluated as part of the Superfund risk assessment using a mathematical model. The risk assessment indicated air emissions related to the Superfund site are curently well within the EPA acceptable risk range.

7. Findings of the RI Report.

Comment: The conclusion that the plume has reached a steady state condition is not completely substantiated. The recommendation that additional wells, and a wetland study be conducted suggests that future investigative work is necessary. These recommendations, as well as the lack of soil gas data as it relates to the design of the soil vapor extraction system, leads one to believe the investigation is incomplete.

Response: Data obtained during the RI was adequate to characterize the site and perform detailed evaluations of alternatives in the feasibility study. Results of a soil gas study performed at the site indicated that little additional benefit would be gained by further soil gas investigation. Therefore, plans to expand the soil gas study were dispensed with. Future data gathering, as it relates to the design phase of the project, is necessary and will be performed as appropriate in the design phase of the project.

Comment: The RI report does not adequately identify the source of the groundwater mound beneath the site.

Response: The data in the RI report indicate that a zone of perched water is responsible for the groundwater mound beneath a portion of the A.O. Polymer site. The area of perched water is caused by a localized silt and clay layer. This is stated in the RI report in Section 3.7.1.

Comment: The RI report notes that groundwater flows to the Wallkill River, although it appears that some groundwater adjacent to the former waste lagoons flows to the north. Would this northward flow of groundwater affect groundwater remediation?

Response: While there is a northward flow component of groundwater, this will not affect the remediation of the contaminated groundwater since the contaminated groundwater plume is moving in a northwestly direction toward the Wallkill River.

Comment: Secondary sources of contamination such as the railroad tracks, septic tanks and cooling ponds have generally been discounted in the RI report. Discounting these sources makes it difficult to determine their contribution to the total contaminant load.

Response: The most significant source of contamination on the A.O. Polymer site is the former lagoon disposal area. The secondary sources have been discounted because it is believed that they do not significantly contribute to the contaminant load.

Comment: The RI has not fully documented the activities of Mohawk Industries.

Response: Mohawk Industries was involved in the production of resins using polymerization processes. Mohawk also engaged in the reclamation of electronic component cleaning fluids containing freon compounds in alcohol. EPA is currently conducting further investigations to obtain additional information regarding the activities of Mohawk Industries.

Comment: Will subsurface structural pathways modify the projected capture zones presented in the feasibility study? Aquifer performance testing (i.e., pump testing) was not performed for the evaluation of hydraulic conductivity. Is slug testing to be the only tool used for the evaluation of hydraulic conductivity when considering the design of the remediation systems?

Response: Structural pathways as well as other factors may modify the projected groundwater capture zones. These considerations will be evaluated in detail during the design phase of the project. It is anticipated that pump testing will take place during the remedial design stage.

Comment: The groundwater remediation goal of 50 parts per billion (ppb) established for the combined levels of various chemicals found at the site as well as remedial soil action levels for volatile and semi-volatiles are established in the absence of risk assessment based action levels.

Response: In situations where a promulgated standard is not available the NJDEP has the regulatory authority to determine an appropriate standard of cleanup based on the health effects of the compound. These recommended levels are standards considered protective of human health and are: 50 ppb for combined levels of various chemicals found in groundwater, and 1 parts per million (ppm) for total volatile organics in soil and 10 ppm for total semi-volatile organic compounds in soil.

Comment: Pre-design bench scale and field pilot tests have not been completed as part of the FS which may cause data gaps for screening remedies and for determining realistic estimates of cost and time to cleanup.

Response: Pre-design bench scale tests can be performed as part of the design phase of the project. Pilot scale tests are usually done on a remedy once it has been selected in order to obtain data on the performance of the remedy. A treatability study is usually considered appropriate for screening data on various remedial alternatives. However, in this case, a literature search was conducted on the remedial alternatives and data retrieved from this search was considered adequate to perform the screening of remedial alternatives.