83454

SUPERFUND PROGRAM PROPOSED PLAN

Malvern TCE Superfund Site

Malvern, PA
Chester County, Pennsylvania

June 1997

EPA ANNOUNCES PROPOSED PLAN

The United States Environmental Protection Agency Region III (EPA) has identified the Preferred Alternative to address hazardous contamination in groundwater and soil at the Malvern TCE Superfund Site (Site) located in Malvern, Chester County, Pennsylvania. (Terms in ***bold*** print are defined in the Glossary.)

This Proposed Plan is based on Site-related documents contained in the ***Administrative Record*** for the Site including the Remedial Investigation, the Baseline Risk Assessment, the Ecological Risk Assessment, and the Feasibility Study. The Administrative Record is at the following locations:

Chester County Library
400 Exton Square Parkway
Exton, PA 19341
(610) 363-0884

U.S. EPA-Region III
Public Reading Room
Ms. Anna Butch
841 Chestnut Bldg, 9th Flr.
Philadelphia, PA 19107
(215) 566-3157

Dates to remember:
June 23-July 23, 1997
Public comment period on alternatives in Proposed Plan.

July 16, 1997
Public meeting at Great Valley H.S at 7:00 PM

INSIDE:

EPA and the Commonwealth of Pennsylvania encourage the public to review and comment on the Preferred Alternative, the Proposed Plan, and other documents in the Administrative Record file. The public comment period begins on June 23, 1997 and closes on July 23, 1997. On Wednesday, July 16, 1997, at 7:00 p.m., EPA will hold a public meeting to discuss the Proposed Plan at the Great Valley High School, 255 North Phoenixville Pike, Malvern, PA 19355. Written comments, postmarked no later than July 23, 1997, should be sent to:

Linda R. Dietz (3HW21)
Remedial Project Manager
U.S. Environmental Protection Agency
841 Chestnut Building
Philadelphia, PA 19107

Interested persons are encouraged to submit their comments on the Proposed Plan and the other documents in the Administrative Record to EPA during the public comment period. Although EPA has selected a preferred alternative, no final decision has been made. EPA may modify the Preferred Alternative, select another response action or develop another alternative, if public comment warrants such an action or if new material is presented. EPA, the lead agency, in consultation with the Pennsylvania Department of Environmental Protection (PADEP), the support agency, will make its final selection of a remedy for the contamination at the Site in a ***Record of Decision (ROD).***

This Proposed Plan fulfills the public notification requirements of Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of the ***Comprehensive Environmental Response, Compensation, and Liability Act*** of 1980, as amended (CERCLA) 42 U.S.C. §§ 9613(k)(2)(B), 9617(a), and 9621(f)(1)(G).

SCOPE AND ROLE OF RESPONSE ACTIONS

At the Main Plant Area, EPA is proposing to treat the soils using *InSitu* Soil Vapor Extraction, Cap the operational area, and pump and treat the groundwater. At the Former Disposal Area, EPA is proposing to excavate and consolidate the soils at the Main Plant Area where they will be treated using *InSitu* Soil Vapor Extraction and capped in addition to pumping and treating the groundwater. The total estimate cost of the Preferred Alternative is **$ 14,592,000.**

The primary objective of the remedy described in this Proposed Plan is to reduce or eliminate the potential for human or ecological exposure to contaminated soil and groundwater at the Site. The preferred cleanup outlined on pages 33 to 35 of this Proposed Plan will comprehensively address the risks posed by the release or threat of release of hazardous substances from the Site.

SITE BACKGROUND AND HISTORY

The Site is located in East Whiteland Township, Chester County, Pennsylvania (Figure 1). The Site is owned and operated by Chemclene Corporation, which presently sells hydraulic oil and industrial cleaning solvents from the 258 North Phoenixville Pike location. Malvern TCE encompasses approximately 5 acres along the southeast side of Bacton Hill, and consists


SITE AREA
FDA
PDA
MPA
CATANACH QUARRY
LEJO ENTERPRISES
FIGURE 1
SITE LOCATION MAP
MALVERN TCE

of a main plant area connected to a former disposal area by a narrow meadow corridor. A Transcontinental natural gas pipeline right-of-way extends along the southern boundary of the Site, with residential and undeveloped areas bordering the property to the west, north and east (Figure 2).

Existing facilities at the main plant include a former distillation building, a storage building which has collapsed, a concrete pad area, an open garage, and seven above-ground storage tanks (Figure 3). One 8,000-gallon tank contains hydrogen peroxide and the other six above-ground storage tanks are currently empty. In operation since 1952, Chemclene Corporation sold and reclaimed industrial cleaning solvents including trichloroethene (TCE); 1,1,1-trichloroethane (1,1,1-TCA); perchloroethylene (PCE, also called tetrachloroethene); and methylene chloride (MEC). These solvents were used by local industries for degreasing metal parts and other cleaning purposes. Chemclene used a distillation process to remove impurities from the chlorinated solvents, the distilled solvents were then returned to the customer for reuse.

The end products of processing waste solvents are the reclaimed solvents and chlorinated still bottoms. The chlorinated waste solvents are listed hazardous wastes pursuant to the ***Resource Conservation and Recovery Act (RCRA)*** and therefore, the resulting still bottoms are listed hazardous waste. In the past, drums containing the still bottom sludges were buried in the Former Disposal Area and Mounded Area, approximately 1,900 feet southwest of the main plant. For many years, these excavated areas were filled with discarded drums, derelict equipment, assorted rubbish, and excavated soil. This disposal practice reportedly ceased in 1976. The Former Disposal Area consists of two unlined earthen pits, approximately 30 feet by 50 feet by 15 feet deep. It is currently secured by an 8-foot high chain link fence. The Mounded Area, located on the western edge of the Former Disposal Area, is approximately 8 feet wide by 150 feet long.

In the spring of 1980, TCE was detected in groundwater from several wells in the vicinity of the Chemclene facility. At this time, Chemclene Corporation began sampling domestic wells in the immediate vicinity of the property. Sampling of private domestic wells and on-site monitoring wells by Pennsylvania's Department of Environmental Resources (PADER) and Chemclene in June 1980 and July 1981 revealed contamination of the underlying aquifer with chlorinated ***ethenes*** and related compounds. TCE was detected in wells at concentrations up to 12,600 micrograms per liter (ug/l), far exceeding the Maximum Contaminant Level (MCL) of 5.0 ug/l. The Site was listed on the ***National Priorities List (NPL)*** in September 1983. The contaminated home wells were located south of the Former Disposal Area, with several located in the Hillbrook Circle residential development. Chemclene furnished activated carbon filter units to 20 residential wells within the Hillbrook Circle Development and conducted periodic sampling of home wells in accordance with its Domestic Well Management Plan until November 1994. In February 1995, USEPA assumed control of maintenance activities of the carbon filter units and periodic sampling of the home wells, after

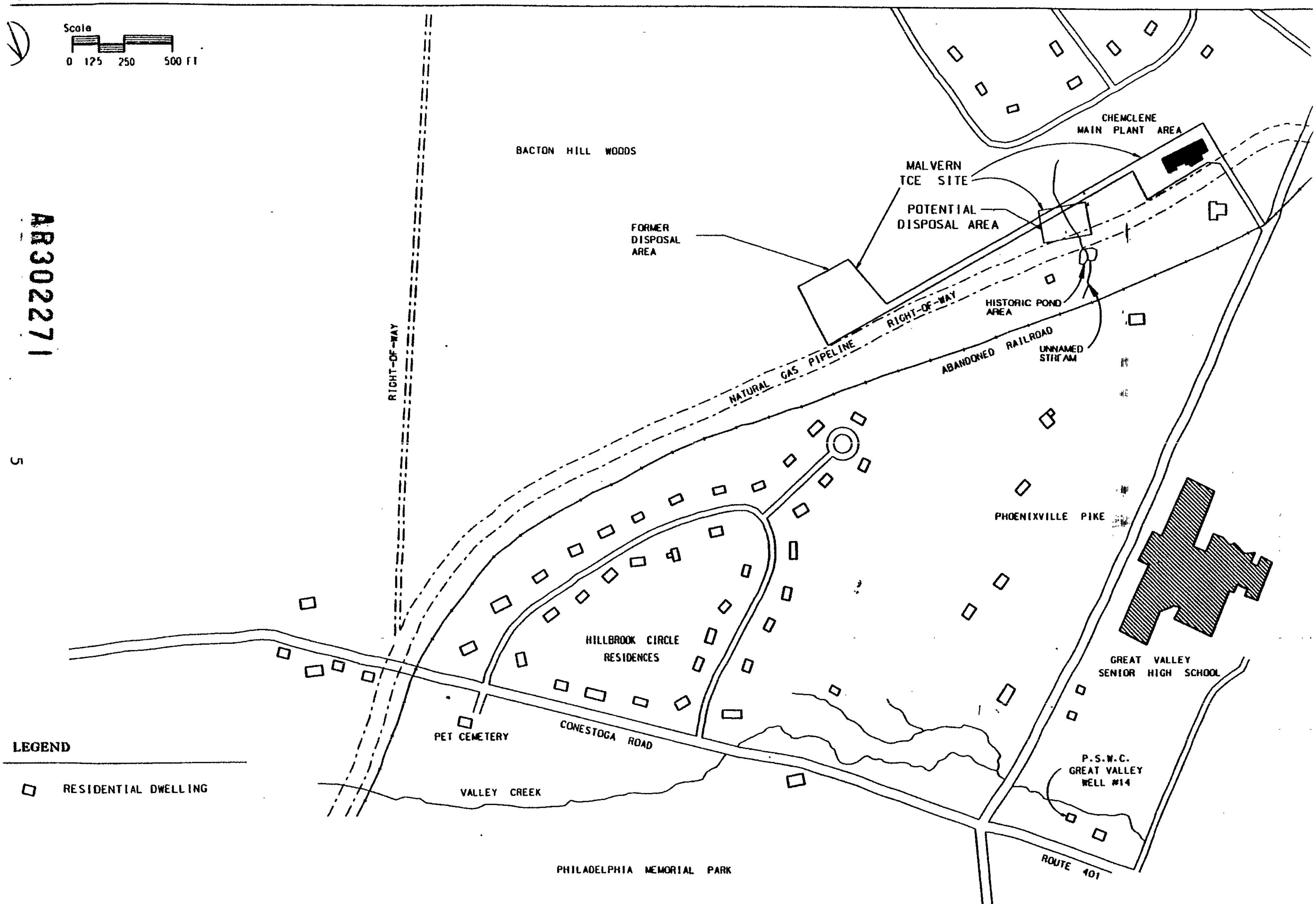

FIGURE 2
SITE MAP OF MALVERN TCE

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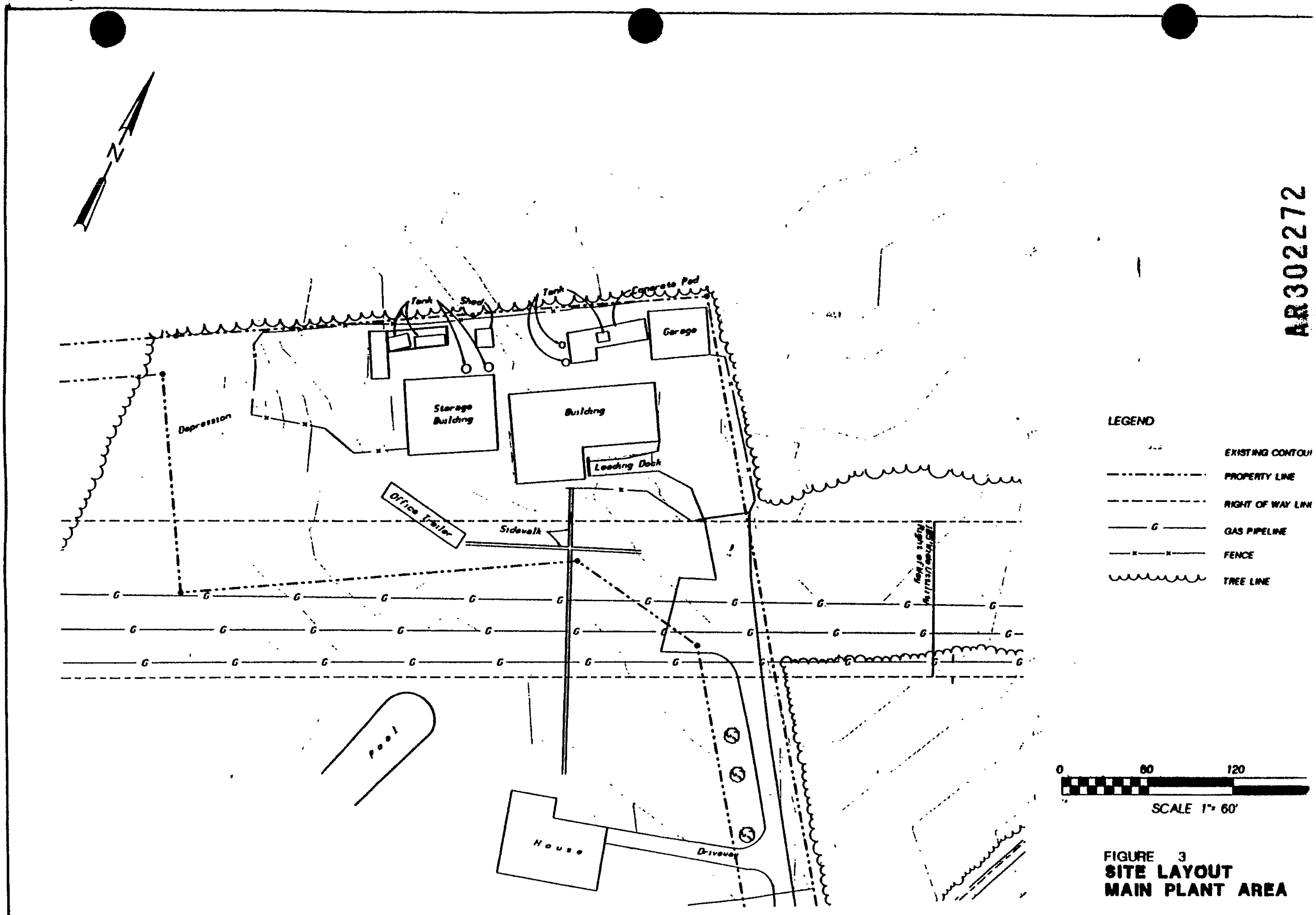

FIGURE 3
SITE LAYOUT
MAIN PLANT AREA

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it was determined that Chemclene was not following the procedures outlined in their Domestic Well Management Plan. In August 1995, several of the filter systems were upgraded by EPA in response to analytical results from residential well samples that showed contamination was passing through the existing filters into the water.

In addition to the installation of carbon filters, Chemclene conducted removal actions following the detection of soil and groundwater contamination in 1980. Debris and approximately 300 drums were removed from the Former Disposal Area excavations in a prolonged remedial effort from 1981 to 1984. Soils underlying the Former Disposal Area were excavated to a depth of 15 feet and transported for disposal at a RCRA permitted disposal facility. Additional drums were removed from the Mounded Area in late 1990.

Four underground storage tanks were removed from the main plant in 1986. Soil samples collected from below the excavation grade of the tanks exhibited elevated concentrations of TCE, PCE, and 1,1,1-TCA. In addition, elevated levels of ***volatile organic contaminants (VOCs)*** were detected in soil gas samples collected outside the distillation building in the Main Plant Area. These contaminant levels are believed to be related to past practices of discharging contaminated condensate from the recycling distillation process directly onto the ground surface.

As an operating facility, Chemclene Corporation entered into a consent order with EPA in 1987, pursuant to a RCRA Corrective Action order. A RCRA Facilities Investigation (RFI) Work Plan was approved for the Site in 1989. In August 1993, Chemclene withdrew its RCRA Part B Application as a treatment and storage facility, and stopped accepting spent TCE, 1,1,1-TCA, and PCE wastes. Chemclene continues to operate a hauling operation and sells hydraulic fluid, raw TCE, and hydrogen peroxide from the Site. This operation is regulated by the East Whiteland Township Fire Marshal's office.

Chemclene Corporation failed to complete the RCRA RFI and implement interim corrective measures. The USEPA Office of Superfund Programs assumed control of the remedial program at the Site in November 1993. All existing data was compiled and a report was developed entitled Data Summary Report, April 1995. Based on EPA's review of the existing information, data gaps were identified and EPA conducted a Remedial Investigation to complete the necessary data gathering at the Site. Both the Data Summary Report and the Remedial Investigation are available in the Administrative Record. The following discussion is the result of the most recent work performed under the Remedial Investigation.

Hydrogeologic Setting

The Site is located in the Chester Valley, underlain by carbonate and clastic rocks of Cambrian and Ordovician age. The immediate area of the Site is underlain by the Ledger Dolomite and Elbrook Limestone Formations. Recent overburden deposits across the Site consist of fine-grained soils overlying bedrock. Overburden deposits range in thickness from 30 to 120 feet.

The bedrock aquifer underlying the Site is generally unconfined and is ***recharged*** by local precipitation. Groundwater flows through a network of interconnected secondary openings that include joints, faults, bedding planes, and fractures. In May 1996, the mean depth to groundwater at the Main Plant Area was 70.32 feet.

Groundwater at the Main Plant Area flows to the northeast toward the Catanach Quarry at a gradient of 0.02 ft/ft. The regional potentiometric surface shows that there is a groundwater divide located between the Main Plant Area and the Former Disposal Area near monitoring well CC-11. Water level data suggests that the divide may move as a function of quarry activity and hydrogeologic conditions. Based on the hydraulic gradient and coefficients of hydraulic conductivity derived from the results of aquifer tests at monitoring wells CC-19 and CC-21, groundwater flows at a relatively rapid velocity of 0.66 ft/day.

Groundwater beneath the FDA/MA flows to the southwest toward the Hillbrook Circle development under a relatively flat gradient (0.001 ft/ft). Groundwater velocities range up to 5 ft/day.

NATURE AND EXTENT OF CONTAMINATION

MAIN PLANT AREA

Surface Soils

The level of contamination in surface soils at the Main Plant Area was determined by 24 samples collected across the Site. VOCs were compared to soil screening levels (SSLs), developed by EPA to quantify the potential transfer of contamination from soil to groundwater, and to PA Statewide Health Standards. Soil with contaminant concentrations greater than SSLs included 1,2-DCA, MEC, PCE and TCE. Total VOCs exceeded 200 ug/kg in only one sample. Although a number of Semi-Volatile Organic Compounds (SVOCs) were detected in surface soils, only benzo (a) anthracene and bis (2-ethylhexyl) phthalate exceeded SSLs. Several of the metals encountered in surface soils appeared above the SSLs, but are present in background samples, and therefore are believed to be naturally occurring in soils at the Site. Metals exceeding SSLs included barium, nickel, chromium, and thallium.

Subsurface Soils

Subsurface soil contamination at the Main Plant Area was characterized by 40 samples from 12 borings collected in the Main Plant Area and at locations between the Site and residential properties adjoining the Main Plant Area. Subsurface soil contamination occurs in three areas coincident with manufacturing, storage and disposal activities at the Site. These areas include the area where TCE distillate condensate was disposed on the ground surface, the underground storage tank area, and the above ground storage tank area. Subsurface soils were found to be contaminated with a variety of VOCs, and SSLs were exceeded for 1,1,1-TCA, 1,1,2,2-PCE, benzene, ethylbenzene, PCE, toluene, and xylene. Although a variety of SVOCs were detected in samples from the Main Plant Area, SSLs were exceeded only for bis (2-ethylhexyl) phthalate at sample boring MPA-6, 10-12 feet beneath the former underground storage area.

Subsurface soils exhibiting the greatest concentrations were encountered at shallow (6 to 8 feet below grade) to moderate depths below the former underground storage area. Highest concentrations of total VOCs exceeded 600,000 ug/kg (MPA 8/25-27'); TCE was found at concentrations of 420,000 ug/kg in this sample. The deepest subsurface soil contamination was encountered in a sample collected from 100 to 102 feet below grade in the aboveground storage area. VOCs in this sample totalled 869 ug/kg with TCE as the primary component of the mixture at 780 ug/kg.

Soil quality data indicated that the possible presence of ***Dense Non-Aqueous Phase Liquids (DNAPLs)*** may occur 10-12 feet below grade in boring MPA-6, and 25-27 feet below grade in boring MPA-8.

Groundwater

Groundwater beneath the Main Plant Area is contaminated almost exclusively with chlorinated hydrocarbons. Compounds exceeding EPA MCLs include 1,1,1-TCA, 1,1,2-TCA, 1,1-DCE, 1,2-DCA carbon tetrachloride, chloroform, cis 1,2-DCE, MEC, PCE, TCE and vinyl chloride. The highest total VOC concentrations were encountered at monitoring wells CC-6 and CC-7 at 88,732 ug/l and 59,881 ug/l, respectively. SVOCs detected in groundwater samples included 1,2-dichlorobenzene, phenanthrene, di-n-butyl phthalate and bis (2-ethylhexyl) phthalate. None of the SVOCs were detected above MCLs.

The most elevated compounds at the Main Plant Area included the most chlorinated and halogenated forms (1,1,1-TCA, TCE, MEC and PCE). The continued presence of elevated contaminant concentrations in subsurface soils represents a continuing source of contamination to the groundwater at the Main Plant Area. Consequently, more chlorinated forms of the compounds are replenished to groundwater at a higher rate at the Main Plant Area than the Former Disposal Area/Mounded Area. This source of groundwater contamination could also result from the presence of DNAPLs.

A screening program to evaluate the potential presence of DNAPLs was performed at the Main Plant Area using groundwater quality data and visual observations from dye staining of groundwater. Results of the screening analysis indicated that DNAPLs may occur in, or upgradient of, monitoring wells CC-6, CC-7, and CC-13. All three wells are located directly downgradient of the former underground storage tank area.

Former Disposal Area/Mounded Area

Surface Soil

Surface soils at the Former Disposal Area/Mounded Area are contaminated with relatively low levels (less than 500 ug/kg) of VOCs including PCE, 1,1,1-TCA, 1,2-DCE and TCE. Methylene Chloride and acetone were also detected in surface soil samples, but were also detected in blank quality control samples. SVOCs were encountered at levels below EPA SSLs in surface soil samples; in addition, some Polychlorinated Biphenyls were also detected. Bis (2-ethylhexyl) phthalate was the most commonly encountered SVOC compound and exhibited the most elevated concentrations. The pervasive nature of metals in soil from both the Former Disposal Area/Mounded Area and Main Plant Area, and background samples suggests they occur naturally in the soils at the Site at concentrations above the SSLs. These metals included barium, chromium, cadmium and nickel.

Subsurface Soil

Subsurface soil contamination at the Former Disposal Area/Mounded Area was investigated by 19 samples in six borings ranging in depth from 27 to 62 feet below grade. Subsurface soils were contaminated above SSLs and Statewide Health Standards with PCE, TCE, 1,1,1-TCA, 1,1,2,2,-TCA, 1,1-DCA, 1,2 DCE, 1,2-DCE and xylene. Although SVOCs were detected in subsurface soil samples, their concentrations were below SSLs. Barium, chromium and thallium exceeded SSLs in several samples, but were generally not coincident with the samples exhibiting elevated organic contamination. These metals appear to be naturally occurring in soils at the Site at concentrations greater than the SSLs.

Subsurface soil samples exhibiting the highest contaminant concentrations were located in the central portion of the Mounded Area. This is the area where drums were removed by Chemclene in 1990 but contaminated soil was left in place. The sample exhibiting the highest contaminant concentrations occurred in boring FDA-5 at 10 to 12 feet below grade with total VOCs of 505,000 ug/kg. PCE was the dominant contaminant at 410,000 ug/kg.

Groundwater

Groundwater quality at the Former Disposal Area/Mounded Area was characterized using samples collected from nine monitoring wells. Groundwater beneath the Former Disposal Area/Mounded Area is contaminated with a number of contaminants including TCE, PCE, 1,1,1-TCA, cis 1,2-DCE, 1,1-DCE and 1,1-DCA at concentrations exceeding MCLs.

Monitoring well CC-5, immediately downgradient of the Former Disposal Area/Mounded Area, exhibits the most elevated concentrations with total VOC concentrations greater than 1,000 ug/l. In many monitoring wells at the Former Disposal Area/Mounded Area, less chlorinated and halogenated forms of contaminants are found. EPA has no current information that these compounds were disposed at the Former Disposal Area/Mounded Area, therefore, the elevated concentrations of these products suggests they are the result of breakdown of the more chlorinated forms that were disposed there. A contaminant plume extends to the southwest into the Hillbrook Circle development downgradient from the Former Disposal Area/Mounded Area. The contaminant plume in the development appears discontinuous because of the varying depth of the wells and the depth of the migrating contaminant plume. The contaminant plume appears to extend approximately 2,100 feet downgradient from the Former Disposal Area/Mounded Area.

SUMMARY OF SITE RISKS

As part of the Remedial Investigation process, EPA conducted an analysis to identify human health and environmental risks that could exist if no action were taken at the Site. This analysis, completed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), is referred to as the baseline risk assessment. This assessment provides the basis for taking cleanup action, if any, and indicates exposure pathways that need to be addressed by the remedial action. The Baseline Human Health Risk Assessment (BLRA) evaluated human health risks and the Ecological Risk Assessment (ERA) evaluated environmental impacts from the Site.

Baseline Human Health Risk Assessment

The BLRA assesses the toxicity, or degree of hazard, posed by contaminants related to the Site, and involves describing the routes by which humans and the environment could come into contact with these substances. Separate calculations are made for those substances that can cause cancer (carcinogens) and for those that can cause adverse health effects but are non-carcinogenic.

The NCP established acceptable levels of carcinogenic risk for Superfund sites ranging from one excess cancer case per 10,000 people exposed, to one excess cancer case per one million people exposed. This translates to a risk range of between one in 10,000 and one in 1,000,000 additional cancer cases. Expressed as scientific notation, this risk range is between 1.0E-04 and 1.0E-06. Remedial action is warranted at a site when the calculated cancer risk level exceeds 1.0E-04.

The NCP also states that sites should not pose a health threat due to a non-carcinogenic, but otherwise hazardous, chemical. EPA defines a non-carcinogenic threat by the ratio of the contaminant concentration at the Site that a person may encounter to the established safe concentration. If the ratio, called the ***Hazard Index (HI)***, exceeds one (1.0), there may be concern for the potential non-carcinogenic health effects associated with exposure to the chemicals. The HI identifies the potential for the most sensitive individuals to be adversely affected by the noncarcinogenic effects of chemicals. As a rule, the greater the value of the HI above 1.0, the greater the level of concern.

For the purpose of the risk assessment, the Malvern TCE Site has been divided into six potential source areas based on the nature of the Site's physical features and release history. Four of these areas are at the Main Plant Area, and two are at the Former Disposal Area/Mounded Area. These areas are:

- Underground Storage Tank area at the Main Plant
- Southeast of the Distillation building at the Main Plant
- Aboveground Storage Tank area at the Main Plant
- Area south of the garage at the Main Plant
- Excavations at the Former Disposal Area
- Mounded Area at the Former Disposal Area

Potential carcinogenic risks and non-carcinogenic hazards were calculated separately for each of these areas. Groundwater risks were evaluated for two separate contaminant plumes, the plume beneath the Main Plant Area and the plume at the Former Disposal Area. Groundwater risks were also evaluated for residents who use groundwater as their potable water supply.

Different combinations of the above routes of exposure were considered for various groups of individuals that could be exposed to Site contaminants. Table 1 summarizes the total risk levels from all appropriate exposure routes calculated for each group of individuals. Trespassers, Residents consuming groundwater which is currently uncontaminated, current workers at the main plant, and potential construction workers at the Former Disposal Area, are not exposed to unacceptable health risks. All other groups are at risk if Site contamination is not addressed and no restrictions are placed on future use of the Site. Actual or threatened releases of hazardous substances from this Site, if not addressed by EPA's preferred alternative or one of the other cleanup alternatives considered, may present a current or potential threat to human health or welfare.

Ecological Risk Assessment:

The ecological risk assessment was designed to evaluate the potential threats to ecological organisms from exposure to Site contaminants and to establish potential Site-specific clean-up level(s) for the contaminants of concern. The results of the ecological risk assessment suggest that Site-related contaminants at one sampling location in the pond located south of the Chemclene property are sufficient to pose a risk to aquatic organisms

The following tools were used to assess ecological risk at the Site:

- surface water bioassays with invertebrate and fish
- sediment bioassays with amphipods and midges
- soil bioassays with earthworms
- food chain modeling with birds and mammals.

The results indicate that surface water in the pond is toxic to invertebrates. This result implies that pond community structure and function may be impaired from Site contaminants. However, the fish and sediment organism bioassays did not indicate a risk.

Food chain modeling results suggest that levels of PCBs, aluminum, chromium, lead, manganese, and selenium are sufficient to pose a risk to survival of birds and mammals.

The Ecological Risk Assessment reveals little in terms of ecological risk at this site. The primary chemicals of concern (VOCs and isolated PCBs) were delineated in two source areas. The preferred alternative should eliminate the pathway to ecological receptors and therefore the risk.

In summary, the following environmental media pose a potential risk to human health and the environment

♦ Subsurface soils at the Former Disposal Area are a source of the contamination of groundwater
♦ Subsurface soils at the Main Plant Area are a source of the contamination of groundwater and also a risk to construction workers at the Main Plant Area.
♦ Groundwater at both the Former Disposal Area and Main Plant Area
♦ Groundwater downgradient of both the Former Disposal Area and Main Plant Area.

Therefore, any remedial alternative selected should minimize further leaching of contaminated soil to groundwater, prevent human health exposure to groundwater above MCLs, and mitigate risks posed by the potential exposure of construction workers to contaminated subsurface soils.

Table 1 Human Health Risks at the Site		
Group of Individuals	**Cancer Risk**	**Hazard Index**
Current Workers at Main Plant Area (Soils)	2.37E-05	0.57
Future Workers at the Main Plant Area (Soil & Groundwater)	**1.1E-02**	**140**
Future Workers at the Former Disposal Area (Soil & Groundwater)	**4.2E-04**	**5.7**
Trespasser (Child) at the Main Plant Area	2.5E-06	0.15
Trespasser (Adult) at the Main Plant Area	4.6E-06	0.10
Trespasser (Child) at the Former Disposal Area	1.4E-06	0.11
Trespasser (Adult) at the Former Disposal Area	2.7E-06	0.07
Current Residents without carbon filtration units consuming groundwater[1]	7.3E-06	0.008 Child 0.003 Adult
Future Residents with carbon filtration units consuming groundwater[2]	1.8E-04	2 (Child) 0.58 (Adult)
Construction Worker at the Main Plant	3.5E-06	**2.5**
Construction Worker at the Former Disposal Area	1.8E-06	0.76
Future Residents Living at the Main Plant Area (Soil & Groundwater)	**6.6E-02**	**580 (Adult) 1600 (Child)**
Future Residents Living at the Former Disposal Area (Soil & Groundwater)	**2.5E-03**	**23 (Adult) 69 (Child)**

Bold indicates pathway outside the acceptable risk range.

[1] The data evaluated for this group of individuals was from home wells that have not been contaminated by the Site. The current homes that have been impacted already have filters removing the contaminants.

[2] The data used to evaluate this group of individuals assumed that the home wells currently contaminated which are equipped with filters had failure of the filter and contaminants in their water.

SUMMARY OF REMEDIAL ALTERNATIVES

The Feasibility Study (FS) discusses a series of alternatives to address the subsurface soil and groundwater at the Main Plant Area and Former Disposal Area and groundwater contamination south of the Chemclene property. The FS and Addendum (May 29, 1997) also provide supporting information relating to the alternatives in this Proposed Plan. Reviewers are encouraged to comment on the additional alternatives presented in the FS as well as those included in this Proposed Plan.

Four to eight alternatives for each of the media at the two locations were identified as possible response actions. These are numbered to correspond with those found in the FS. The alternatives will be discussed via the following sections; water supply alternatives for both areas will be discussed first, followed by the Main Plant Area soils and groundwater, and FDA soils and groundwater.

WATER SUPPLY

Alternative WS-G-3a:	**Public Water Supply**
Capital Cost:	*$408,600*
Operation and Maintenance:	*$ 97,371*
Total:	*$505,971*

The objective of this alternative is to prevent contact with contaminants at the residences affected or potentially affected by the Site. This objective can be accomplished by connecting residences already on filters and those potentially affected by the Site to a public drinking water supply. Establishment of a permanent connection to a public water supply would eliminate the use of contaminated groundwater as drinking water at affected residences. Affected residential wells would be abandoned upon connection to a public water supply. By the end of 1997, Philadelphia Suburban Water Company plans to install water mains in Phoenixville Pike from Aston Road to Conestoga Road, and to extend the existing main in Conestoga Road north to Bacton Hill Road.

Because contaminated media would be left on the Site, a review of the Site conditions would be required every five years, as specified in the NCP.

Alternative WS-G-3b: Well Head Treatment

Capital Cost:	*$113,676*
Annual Operation and Maintenance:	*$42,000*
Operation and Maintenance Period:	*30 Years*
Total Cost:	*$979,647*

The objective of well head treatment would be to reduce the concentrations of VOC contaminants in residential drinking water to meet drinking water standards. Well head treatment would include the purchase, installation, maintenance, and monitoring of carbon filters at each of the affected residences.

Residences hydraulically downgradient of the Former Disposal Area/Mounded Area include homes in the Hillbrook Circle development and nearly all residences along Conestoga Road and Phoenixville Pike. Only one residence is hydraulically downgradient of the Main Plant Area (DW-10). Presently, 19 residences in Hillbrook Circle and on Phoenixville Pike are equipped with either single or double canister unit filters.

Under this alternative contaminated media would be left on the Site and a review of the Site conditions would be required every 5 years.

MAIN PLANT AREA

Soil Alternatives

MPA S-1:	No Action
MPA S-2:	Institutional Controls
MPA S-3:	Capping
MPA S-4:	InSitu Soil Vapor Extraction

Alternative MPA-S-1: No Action

Capital Cost:	*$0*
Operation and Maintenance:	*$0*
Total Cost:	*$0*

The NCP requires that EPA consider a "No Action" alternative for every Superfund site to establish a baseline or reference point against which each of the remedial action alternatives are compared. In the event that the other identified alternatives do not offer substantial benefits in the reduction of toxicity, mobility, or volume of the constituents of concern, the No Action alternative may be considered a feasible approach.

Alternative MPA-S-2: Institutional Controls

Capital Cost:	*$89,000*
Operation and Maintenance:	*$56,000*
Operation and Maintenance Period:	*30 Years*
Total Cost:	*$1,145,000*

The purpose of the institutional controls is to prohibit temporarily or permanently certain activities on parts of the Site that pose unacceptable risk. Institutional controls protect human health to some degree by diminishing the potential for exposure. Institutional controls would include deed restrictions to limit future use of the Site, fencing to restrict access, and Site reviews every five years.

Alternative MPA-S-3: Capping

Capital Cost:	*$343,000*
Operation and Maintenance:	*$30,000*
Operation and Maintenance Period:	*30 Years*
Total Cost:	*$940,441*

This alternative consists of installation of a ***cap*** over the Main Plant Area soils which have concentrations of contaminants which are above the preliminary remediation goals and pose a source of contamination to groundwater. For purposes of the cost evaluation, it has been assumed that the cap would be constructed of concrete and the capped area goes around the existing buildings. This would allow the existing business to remain in operation. This cap would reduce the rate at which precipitation infiltrates through the soil which then reduces the leaching of contaminants to groundwater. The cap would also reduce the risk of direct exposure to the soil contaminants and control migration of contaminated soils. The actual size and locations of the capped areas would be determined during the remedial design phase of the project. Key elements of this alternative include site grading, installation of a cap in the Main Plant Area, including stormwater controls, vapor monitoring points, and long-term monitoring.

Alternative MPA-S-4: In-Situ Soil Vapor Extraction (SVE)

Capital Cost:	*$827,000*
Annual Operation and Maintenance:	*$352,000*
Operation and Maintenance Period:	*5 Years*
Total Cost:	*$2,351,000*

The purpose of ***in-situ*** SVE is to reduce the mass and concentration of VOC contaminants in the soil which are acting as a source of contamination to groundwater. The VOC contaminants would be removed from the Main Plant Area soils. Key elements of this alternative include installation of extraction wells (the depth and number of wells to be determined during remedial design), construction of a manifold, air treatment, disposal of the treatment wastes, and quarterly VOC monitoring. These factors, and the effectiveness of the technology for the area of concern would be evaluated by a pilot study. SVE is generally combined with capping to enhance recovery efficiency.

Groundwater Alternatives

MPA-G-1:	No Action
MPA-G-2:	Institutional Controls
MPA-G-4:	Natural Attenuation
MPA-G-5:	Groundwater Collection, Treatment & Discharge
MPA-G-6:	Groundwater Collection, Treatment of Source Area & Discharge

Alternative MPA-G-1: No Action

Capital Cost:	*$0*
Operation and Maintenance:	*$0*
Total Cost:	*$0*

Under this alternative, no further effort or resources would be expended. Consideration of this alternative is required, as stated above. A review of Site conditions would be required every five years, since under this alternative waste would be left in place.

Alternative MPA-G-2: Institutional Controls

Capital Cost:	*$59,000*
Annual Operation and Maintenance:	*$28,000*
Operation and Maintenance Period:	*30*
Total Cost:	*$684,000*

The purpose of institutional controls is to prevent the use of contaminated water-bearing units as a source of drinking water and/or to prevent the spread of contamination caused by groundwater pumping. Institutional controls protect human health to some degree by diminishing the potential for exposure. Key elements of this alternative include the legal requirements of the deed restrictions for groundwater use.

Alternative MPA-G-4: Natural Attenuation

Capital Cost:	*$223,000*
Annual Operation and Maintenance:	*$41,000*
Operation and Maintenance Period:	*30*
Total Cost:	*$986,116*

Natural attenuation relies upon naturally occurring processes, particularly bioremediation, dilution and dispersion to reduce concentrations of contaminants in the subsurface to below levels that pose little or no potential risk to human health and the environment. Under this alternative, groundwater samples are collected and analyzed for biological and chemical indicators to confirm contaminant biodegradation is reducing contaminant mass, mobility, and risk at an acceptable rate. Key elements of this alternative include the number, depth, and construction of additional monitoring wells, quarterly monitoring for natural attenuation indicator parameters, preparation of trend analyses, and annual monitoring report preparation.

Alternative MPA-G-5: Groundwater Collection, Treatment and Discharge

Capital Cost:	*$1,167,000*
Annual Operation and Maintenance:	*$316,000*
Operation and Maintenance Period:	*30*
Total Cost:	*$6,213,637*

This alternative reduces the mass and concentration of contaminants in groundwater to MCLs by pumping and treating of groundwater at selected wells. A principal effect will be to reduce the extent of the existing plumes. The overall pumping rate, and the number, depth, and location of wells were selected to minimize the lifetime costs of treatment. The objective of this groundwater extraction system would be to "capture" the contaminant plume by pumping the extraction wells to keep the contaminant plume from migrating further from the Main Plant Area.

To achieve discharge limits, extracted groundwater would be treated on-site using air stripping followed by either activated carbon or U/V oxidation. After treatment of groundwater, the effluent would be discharged by one of the methods below.

- direct discharge to Valley Creek
- on-site spray irrigation of forested areas
- re-injection to groundwater
- trucking to a Publicly Owned Treatment Works
- discharge to a water purveyor (including the costs of a main extension by the purveyor).

Groundwater reinjection and spray irrigation are the most likely discharge alternatives due to the Exceptional Quality designation of Valley Creek, the cost effectiveness of trucking discharge to a POTW, and the potential infeasibility of discharge to a water purveyor.

Alternative MPA-G-6: Groundwater Collection, Treatment of Source Area, and Discharge

Capital Cost:	*$1,233,000*
Annual Operation and Maintenance:	*$ 316,000*
Operation and Maintenance Period:	*30*
Total Cost:	*$6,280,000*

This alternative reduces mass and concentration of contaminants, similar to Alternative MPA-G-5; MPA-G-6 differs in the location of selected wells for groundwater withdrawal. This alternative evaluates pumping at the two locations where DNAPLs are suspected. The strategy would be to collect contaminants in the dissolved phase along with any DNAPLs that are encountered. This alternative was modeled by pumping two wells believed to be a source area and two wells located off the main plant property. This pumping configuration will contain the plume on or near the property boundary of the main plant. Groundwater treatment and discharge alternatives are the same as MPA-G-5 above.

FORMER DISPOSAL AREA/MOUNDED AREA

Soil Alternatives

FDA-S-1:	No Action
FDA-S-2:	Institutional Controls
FDA-S-3:	Capping
FDA-S-4:	Excavation, Offsite Thermal Treatment, Disposal at a Subtitle C Landfill
FDA-S-5:	Excavation, ExSitu Volatilization, & Reuse as Backfill
FDA-S-6:	Excavation, OnSite Thermal Treatment, and Reuse as Backfill
FDA-S-7:	InSitu Soil Vapor Extraction
FDA-S-8:	Excavation, Consolidation of Soils at the Main Plant

Alternative FDA-S-1: No Action

Capital Cost:	*$0*
Operation and Maintenance	*$0*
Total Cost:	*$0*

Under this alternative, as stated previously, no further effort or resources would be expended.

Alternative FDA-S-2: Institutional Controls

Capital Cost:	*$94,000*
Annual Operation and Maintenance:	*$56,000*
Operation and Maintenance Period:	*30*
Total Cost:	*$1,150,000*

The purpose of institutional controls is to prohibit temporarily or permanently certain activities on parts of the Site that contain hazardous materials. Institutional controls protect human health to some degree by diminishing the potential for exposure. Institutional controls would include deed restrictions to limit future use of the Former Disposal Area and fencing to restrict access. Key elements of this alternative include the location and costs of the fencing and the legal requirements of the deed restrictions.

Alternative FDA-S-3: Capping

Capital Cost:	*$434,000*
Annual Operation and Maintenance:	*$30,000*
Operation and Maintenance Period:	*30*
Total Cost:	*$974,285*

The purpose of capping is to immobilize soil contaminants in the unsaturated soil. This objective is accomplished by minimizing infiltration of rainfall and associated leaching of contaminants which are localized in the unsaturated soil zone. A gradual reduction in mass and concentration of contaminants in soil may occur as a result of natural attenuation processes. A cap can also be used to prevent exposure via direct contact with contaminated soils. Key elements of this alternative include grading, import of off-site borrow material, installation of a clay, linear low density polyethylene membrane or bituminous concrete cap in the Former Disposal Area/Mounded Area, stormwater controls, soil vapor monitoring points and long-term monitoring.

Common Components for Alternatives FDA-S-4, FDA-S-5, FDA-S-6, and FDA-S-8

A common component for the excavation alternatives includes geoprobe exploration to more closely delineate volumes of soil which exceed preliminary remediation goals, followed by excavation. The excavations will be unsupported and will conform to Occupational Safety and Health Act requirements. Excavations will be above the water table and clean fill will be used to regrade the area. The principal factor for this alternative is the volume of material to be excavated. The volume of the excavated material was determined by the areal extent and depth of soils with contaminant concentrations which exceeded the preliminary remediation goals established for soil.

Alternative FDA-S-4: Excavation, Off-Site Thermal Treatment, Disposal at Hazardous Waste Landfill

Capital Cost:	*$7,016,000*
Total Cost:	$7,016,000

The objective of excavation is to remove the mass of VOC contaminants in the vadose zone. Key elements of this alternative evaluated including geoprobe exploration, excavation and off-site disposal to a hazardous waste landfill, backfill, regrading, and land stabilization. The excavations will be unsupported and will conform to OSHA requirements.

Alternative FDA-S-5: **Excavation, *Ex-Situ* Volatilization, and Re-Use as Backfill**

Capital Cost: *$2,351,000*
Annual Operation and Maintenance: *$390,000*
Operation and Maintenance Period: *1 year*
Total Cost: $2,787,000

The objective of excavation is to remove the mass of VOC contaminants in the vadose zone. Key elements of this alternative evaluated including geoprobe exploration, excavation, *ex-situ* volatilization, and re-use of treated soils as backfill, regrading, and land stabilization. Because the soils contain RCRA listed hazardous waste, once treated, soils must meet certain levels in order to place the soil back onto the ground. These requirements are referred to as Land Disposal Restrictions (LDRs). A future pilot study would be required to determine if *ex-situ* volatilization can treat soils to below LDRs.

Alternative FDA-S-6: **Excavation, On-Site Thermal Treatment, and Re-Use as Backfill**

Capital Cost: *$3,858,000*
Annual Operation and Maintenance: *$0*
Operation and Maintenance Period: *< 1 year*
Total Cost: $3,858,000

The objective of excavation is to remove the mass of VOC contaminants in the vadose zone. Key elements of this alternative evaluated including geoprobe exploration, excavation, on-site thermal desorption, and re-use of treated soils as backfill, regrading, and land stabilization. Because the soils contain RCRA listed hazardous waste, once treated, soils must meet LDRs in order to place the soil back onto the ground. A future pilot study would be required to determine if on-site thermal desorption can treat soils to below LDRs.

Alternative FDA-S-7: ***In-Situ* Soil Vapor Extraction**

Capital Cost: *$1,308,000*
Annual Operation and Maintenance: *$581,560*
Operation and Maintenance Period: *5 years*
Total Cost: $3,873,503

The objective of ***in-situ*** SVE is to reduce the mass and concentration of VOC contaminants in the vadose zone. SVE will greatly accelerate the rate at which the PRG concentrations can be attained. VOC contaminants will be removed from the subsurface soils. Key elements of this alternative include installation of extraction wells (the depth and number of wells will be determined during remedial design), air treatment, disposal of the treatment wastes, and quarterly VOC monitoring. The factors considered in sizing the treatment unit are the air conductivity of soil, mass of contaminants, and the concentration of VOCs recoverable in air.

These factors were estimated for the FS. These factors would be evaluated by a future pilot study.

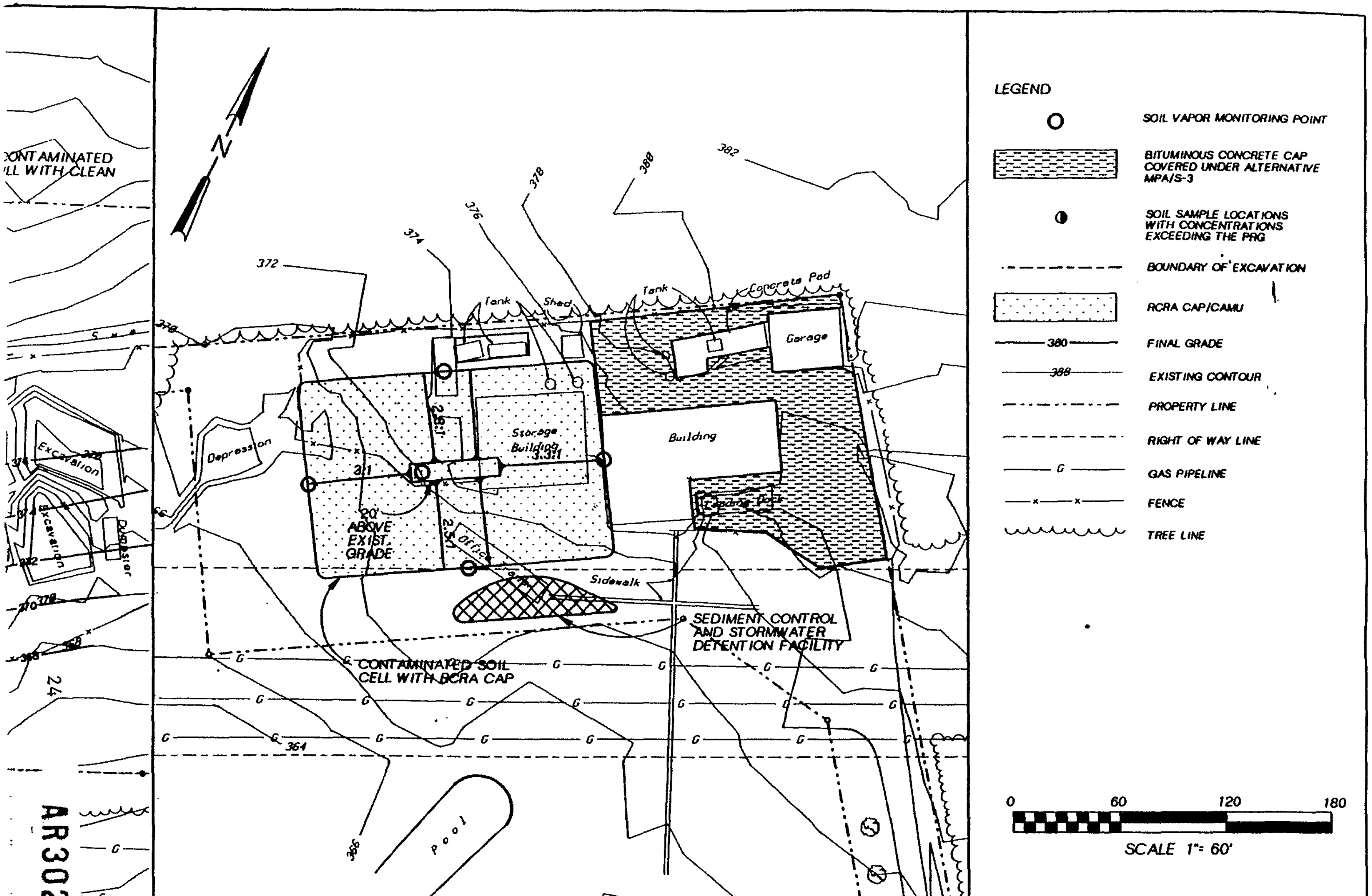
Alternative FDA-S-8: Excavation with Consolidation at the Main Plant Area CAMU

Option 1		**Option 2**	
Capital Cost:	$684,319	*Capital Cost:*	*$777,762*
Operation and Maintenance:	*$30,000*	*O&M:*	*$30,000*
O&M Period:	*30 Years*	*O&M Period:*	*30 Years*
Total Cost:	*$1,242,924*	*Total Cost:*	*$1,336,367*

The objective of this alternative is to remove contaminated soils from the Former Disposal Area/Mounded Area. The estimated 5,700 cubic yards of soil will be transported to the Main Plant Area where it will be covered with a RCRA cap. Key elements of this alternative include geoprobe exploration, excavation and removal of contaminated soil to the Main Plant Area, removal of the collapsed quonset hut storage building, relocation of the office trailer, consolidation of soil and capping. In-situ treatment of contaminated soils by vapor extraction at the Main Plant Area was evaluated under Alternative MPA-S4 (*InSitu* SVE). If Alternatives MPA-S-4 and FDA S-8 are both selected and pre-design pilot studies are favorable, the design of the *InSitu* SVE system will be configured to treat soils transferred from the Former Disposal Area/Mounded Area to the Main Plant Area in addition to contaminated subsurface soils beneath source areas at the Main Plant Area.

Two options were evaluated for constructing a fill containing 5,700 cubic yards of contaminated soil. Option 1 involves razing and/or relocating several auxiliary structures at the Main Plant Area which are believed not to impact the current operation at the facility, including a former storage building which has collapsed in place, miscellaneous tanks and an office trailer. The completed fill will occupy approximately 0.43 acres will have a maximum height of 20 feet with maximum side slopes of 2.5 to 1. This area would be capped separately from the proposed area in MPA-S3. Option 2 would require the razing of all existing structures at the Main Plant Area. Because Option 2 provides more surface area, the completed fill will occupy 0.8 acres and will rise a maximum of 7 feet above existing grade. The maximum side slopes for Option 2 will be 4:1. If Option 2 were selected, the surface area of the cap will include the majority of the main plant and therefore the cap included under MPA-S3 would not be required and would result in a significant cost savings. (See Figure 4)

For both Options 1 and 2, the northern boundary of the capped fill lies over 30 feet inside the northern property line. Locating the fill in this manner will accommodate keeping the easement open between the Former Disposal Area/Mounded Area and Main Plant Area, and should prevent problems regarding access and easements if the property is ultimately sold.



NOTE

GROUNDWATER MONITORING ACTIVITIES AND COSTS COVERED UNDER ALTERNATIVES MPA/G-4,5 OR 6.

FIGURE 4
ALTERNATIVE FDA/MA S-8, EXCAVATION, ONSITE DISPOSAL OPTION 1
MALVERN TC

However, the exact area of the cap will be finalized during remedial design.

The concept of the Corrective Action Management Unit (CAMU) is a critical element to this alternative. The federal CAMU regulation, which was effective in April 1993, can be applicable to CERCLA sites as an ***Applicable or Relevant and Appropriate Requirements*** *(ARAR)*. A CAMU is an area within a facility that is designated by the Regional Administrator under 40 CFR Part 264 subpart S, for the purposes of implementing corrective action. A CAMU shall only be used for the management of remediation waste.

In this alternative, a CAMU will be used to consolidate contaminated soil from the Former Disposal Area into a single area at the Main Plant Area. This action would enlarge the surface area affected by contaminated soil at the Main Plant Area but would have no impact on the groundwater cleanup at the Main Plant Area. However, contaminated soil and remediation wastes would be effectively removed from the Former Disposal Area/Mounded Area which would reduce the timeframe for groundwater cleanup at the Former Disposal Area. To comply with closure requirements, the relocated material would be covered with a RCRA cap. PADEP is also in the process of identifying any additional requirements under its residual and hazardous waste regulations. Designation of a CAMU for managing wastes at this Site requires approval of the Regional Administrator.

Groundwater Alternatives

FDA-G-1:	No Action
FDA-G-2:	Institutional Controls
FDA-G-4:	Natural Attenuation
FDA-G-5:	Groundwater Collection, Treatment, and Discharge
FDA-G-6:	Groundwater Collection, Treatment (Single Well), and Discharge

Alternative FDA-G-1: No Action

Capital Cost:	*$0*
Operation and Maintenance:	*$0*
Total Cost:	*$0*

Under this alternative, as stated previously, no further effort or resources would be expended on the groundwater at the Former Disposal Area.

Alternative FDA-G-2: Institutional Controls

Capital Cost:	*$59,000*
Operation and Maintenance:	*$28,000*
Operation and Maintenance Period:	*30 Years*
Total Cost:	*$684,000*

The purpose of institutional controls is to prevent the use of contaminated water-bearing units as a source of drinking water or to prevent the spread of contamination caused by groundwater pumping through administrative means. Institutional controls protect human health to some degree by diminishing the potential for exposure. Key elements of this alternative include the legal requirements of the deed restrictions for groundwater.

Alternative FDA-G-4: Natural Attenuation

Capital Cost:	*$227,000*
Annual Operation and Maintenance:	*$42,000*
Operation and Maintenance Period:	*30 Years*
Total Cost:	*$979,647*

Contaminants are presently migrating within a groundwater plume toward Hillbrook Circle, located southwest of the Former Disposal Area/Mounded Area. A review of historical data indicates the area occupied by this plume has been at a steady-state or receding since drummed waste and contaminated soil were removed in the early 1980s. Groundwater sampling and analysis has suggested that the contaminant plume was receding over this time period due to the drum and soil removal activities.

A receding contaminant plume occurs, in the absence of active remediation, when the rate of natural attenuation of contamination exceeds the rate at which contaminants enter the groundwater from a source. Typically, under receding conditions, the contaminant plume has expanded to a maximum extent and then the leading edge recedes as natural attenuation occurs along the periphery of the plume. The conditions at the Former Disposal Area/Mounded Area would suggest that the contaminant plume is approaching equilibrium with residual contamination which remains in the soil.

Alternative FDA-G-5: Groundwater Collection, Treatment and Discharge

Capital Cost:	$2,869,000
Operation and Maintenance:	$2,898,000
Operation and Maintenance Period:	*2 Years*
Total Cost:	$8,258,000

This alternative includes the collection, on-site treatment, and discharge of contaminated groundwater at the Former Disposal Area/Mounded Area. Because of the large area of the plume (extending from the Former Disposal Area to the residential area), and the high ***transmissivity*** of the aquifer, it is difficult to select a well configuration to capture the complete plume. Different scenarios were modeled, but recovery well locations that would de-water the residential wells were rejected. Modeling indicated that a pumping rate of 2,000 gallons per minute from the four extraction wells along the property boundary would prevent migration of the majority (approximately 80%) of the plume. Though some of the plume on the property and in the Hillbrook Circle would not be captured, the outlying plume area would be reduced by natural attenuation, especially when isolated from the source of higher levels of contamination. The existing wells are not capable of this yield and actual implementation of this alternative will require installation of larger diameter extraction wells.

Several methods of disposal of treated water, as discussed in Alternative MPA-G-5, were considered. Re-injection was considered most plausible. It was determined that reinjection down gradient of the property could cause contamination to migrate to previously uncontaminated areas and residences in Hillbrook Circle. Injection into eight wells upgradient of the extraction wells was determined to be more effective. The disposal method would help flush contaminants around monitoring well CC-14 toward the extraction wells. Extracted groundwater would be treated using air stripping combined with either activated carbon or U/V oxidation before re-injection. It is estimated that cleanup would take two years.

Alternative FDA-G-6: Groundwater Collection (Single Well), Treatment, and Discharge

Capital Cost:	*$1,599,000*
Annual Operation and Maintenance:	*$846,000*
Operation and Maintenance Period:	*7 Years*
Total Cost:	*$3,269,802*

This alternative includes the collection, on-site treatment, and discharge of contaminated groundwater at the Former Disposal Area/Mounded Area. Alternative FDA-G-6 also relies on natural attenuation mechanisms to ultimately reduce groundwater contaminant concentrations below MCLs (5 ug/l for TCE). The intention of this alternative is to significantly reduce concentrations within the most highly contaminated portion of the plume. The pumping well would be shut off after two years and the plume would degrade to the MCL through natural attenuation.

In this alternative, contaminated groundwater would be intercepted at a single extraction well located downgradient of the Former Disposal Area/Mounded Area pumping at 500 gallons per day. The exact location for the extraction well would be determined during design. There is a potential for two wells if deemed necessary. Treated groundwater would be disposed by injecting groundwater in two injection wells located hydraulically upgradient of the Former Disposal Area/Mounded Area.

Results of the modeling indicated that concentrations in the central portion of the contaminant plume decreased from greater than 1,000 ug/l to around 100 ug/l after two years of pumping. Concentrations in the central portion of the plume reached the cleanup level of 5 ug/l (MCL for TCE) in seven years.

Extracted groundwater would be treated at the plant with identical treatment and discharge processes as discussed for the Main Plant Area. The volume requiring treatment is estimated at 720,000 gallons/day.

COMPARATIVE EVALUATION OF ALTERNATIVES

Each of the remedial alternatives summarized in this plan has been evaluated with respect to the nine (9) evaluation criteria set forth in the NCP, 40 C.F.R. Section 300.430(e)(9). These nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description of the evaluation criteria is presented below:

Threshold Criteria:

1. *Overall Protection of Human Health and the Environment* addresses whether a remedy provides adequate protection and describes how risks are eliminated, reduced, or controlled.
2. *Compliance with Applicable or Relevant and Appropriate Requirements* (ARARs) . Any cleanup alternative considered by EPA must comply with all applicable or relevant and appropriate federal and state environmental requirements. *Applicable* requirements are those substantive environmental standards, requirements, criteria, or limitations promulgated under federal or state law that are legally applicable to the remedial action to be implemented at the Site. *Relevant and appropriate* requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site. There are three classification of ARARs: chemical specific, location specific, and action specific.

Primary Balancing Criteria:

3. *Long-term Effectiveness* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals are achieved.
4. *Reduction of Toxicity, Mobility, or Volume through Treatment* addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume of contaminants.
5. *Short-term Effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during the construction and implementation period until cleanup goals are achieved.
6. *Implementability* addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
7. *Cost* includes estimated capital, operation and maintenance costs, and present worth costs.

Modifying Criteria:

8. *State Acceptance* indicates whether, based on its review of supporting documents and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.
9. *Community Acceptance* will be assessed in the Record of Decision following a review of public comments received on the Proposed Plan and supporting documents included in the Administrative Record.

In the following analysis, the remedial alternatives for each area are evaluated in relation to one another for each of the seven criteria. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

MAIN PLANT AREA
Comparison of Soil Alternatives

Of the four alternatives considered for remediation of the Main Plant Area soils, only Alternative MPA-S-3, capping, and Alternative MPA-S-4, *In-Situ* SVE, would potentially achieve overall protection of human health and the environment. In the case of *in-situ* SVE, effectiveness needs to be demonstrated through a treatability study. The MPA-S-1, No Action and MPA-S-2, Institutional Control, would not be protective since remedial action objectives would not be met. Institutional Controls might be a viable component of enhancing the effectiveness of another more comprehensive alternative.

Alternative MPA-S-3, Capping, is the only one which will provide an immediate benefit by minimizing the release of contamination to groundwater from the extensively contaminated soils. This benefit is achieved by reducing the rate at which contaminants are leached by infiltrating rainfall. However, this alternative has the disadvantage that long-term maintenance would be required. If at some time in the future the integrity of the cap is compromised, the contaminants which will still reside in the underlying soil would be reactivated as a source of groundwater contamination.

Alternative MPA-S-4, *In-Situ* SVE, offers the best opportunity to reduce the mass of contaminants in the soil and permanently remove a source of contaminant releases. SVE has the disadvantage that it will take a number of years before the removal is effectively complete. Excavation of contaminated soils at the Main Plant Area is not practical due to the depth of the contamination (*i.e.*, over 50 feet) and the limited area to perform the remedial action because of the operating main plant facilities.

Comparison of Groundwater Alternatives

Six alternatives were evaluated as discussed in the previous section. Neither Alternative

MPA-G-1, No Action, nor Alternative MPA-G-2, Institutional Controls, alone would provide long-term effective protection to human health and the environment. Institutional Controls may be a viable way to enhance the effectiveness of other alternatives.

MPA-G-4, Natural Attenuation, has been shown to be effective in reducing the downgradient extension of the plume of contaminated groundwater. However, the data also indicates that the release of contaminants to groundwater is an on-going process at the Main Plant Area. Without other measures to control the sources of contamination, it is likely that the plume will persist for an extended period of time. Due to the apparent strength of the contaminant sources at the Main Plant Area, natural attenuation (Alternative MPA-G-4) cannot be relied upon to achieve the cleanup levels.

Groundwater extraction and treatment (Alternatives MPA-G-5 and MPA-G-6) will effectively eliminate the influence of contaminant sources on the longevity of the plume. With the implementation of groundwater extraction the plume should immediately begin to contract in response to the combined effects of groundwater within the capture zone flowing toward the extraction wells and degradation of contaminants within the plume by the processes of natural attenuation.

With Alternative MPA-G-5 or MPA-G-6 in place, groundwater concentrations just outside the Main Plant property are predicted to fall below the MCLs within about 20 years. If DNAPLs are present it may be necessary to pump for a prolonged period of time until the sources are exhausted.

Significant cost savings will be realized if treated groundwater effluent can be disposed by groundwater reinjection. However, this option will require the cooperation of downgradient property owners for installation and maintenance of the injection wells. If the legal difficulties associated with an off-site discharge prove insurmountable, an alternative location for the reinjection wells could be at the Former Disposal Area/Mounded Area.

Alternative MPA-G-6, which incorporates pumping from the source area, does not involve significant additional cost and could be implemented as effectively as MPA-G-5. The advantage of MPA-G-6 over MPA-G-5 is that pumping will take place directly from an identified source area and may be able to reduce volume and mass of contaminants more effectively than MPA-G-5.

FORMER DISPOSAL AREA/MOUNDED AREA

Comparison of Soil Alternatives

Eight alternatives were considered for remediating soils in the Former Disposal Area/Mounded Area. Out of the eight alternatives that were considered, Alternative FDA-S-

1, No Action, and Alternative FDA-S-2, Institutional Controls, would not be protective since cleanup objectives would not be met. Institutional Controls might be a viable component of enhancing the effectiveness of another, more comprehensive, alternative.

Alternative FDA-S-3, Capping, would minimize leaching by reducing infiltration of rainfall to the groundwater. However, it has the disadvantage that long-term maintenance is required. At the Former Disposal Area/Mounded Area the task of maintaining the integrity of a cap is made more difficult, since the cap will be surrounded by a forested area, the site is remote from the main plant area and main roads, and there is no on-going use for the area.

Therefore, any proposal which includes Alternative FDA-S-3 must provide assurances that the cap will be regularly maintained to prevent colonization by woody, deep-rooted plants derived from the adjacent forest. This will require regular mowing and possible use of herbicides to control incursion by weeds and forest plants. Without maintenance, the cap will also be vulnerable to damage by the combined effects of weathering and invasive plants.

From a long-term perspective, natural attenuation (even without a cap) may progressively reduce the area of influence of the plume over a period of decades, until it is no longer a threat to potential users of groundwater. Other means of addressing long-term environmental risks include Excavation, Off-Site Thermal Treatment, Disposal at a Subtitle C Landfill (FDA-S-4), Excavation, OnSite Ex-Situ Volatilization, and Reuse as Backfill (FDA-S-5), Excavation, OnSite Thermal Treatment, and Reuse as Backfill (FDA-S-6), SVE (Alternative FDA-S-7), and Excavation with OnSite Consolidation CAMU (FDA-S-8).

Excavation and Off-site treatment and disposal of contaminated soils (FDA-S-4), which is unquestionably the most effective at reducing contaminant mass at the Former Disposal Area, would be more costly than the other available alternatives.

Excavation and On-Site Treatment (ExSitu Volatilization (FDA-S-5) or Thermal Treatment (FDA-S-6) would be effective in reducing contaminant mass but have several disadvantages. One disadvantage is the close proximity of the Former Disposal Area to the residential properties surrounding the Site. Additionally, since the soil is contaminated with RCRA listed hazardous waste, it is regulated as a listed hazardous waste. Therefore, even after treatment, the land disposal of the soil back to the ground is restricted and could add significant costs to the estimates.

Alternative FDA-S-7, *InSitu* SVE, offers a cost effective approach to reducing the mass of contaminants in the soil and will permanently remove a source of contaminant releases. However, it has the disadvantage that it will take a number of years before the removal of contaminants is effectively complete. Also, the nature of soil type (which contains clay & silt) and contamination at this Site, which is shallow, low in concentration, and distributed across a wide area, may make SVE less efficient. Furthermore, until the program is instituted, and the performance can be monitored for a period of time, the overall effectiveness remains uncertain. Some cost savings can be obtained if *InSitu* SVE is applied at both the Main Plant Area and Former Disposal Area/Mounded Area and a common Site-wide treatment facility can be used.

Alternative FDA-S-8, Excavation with On-Site Consolidation, would be effective in removal of contaminant mass at the Former Disposal Area, but soils would be consolidated at the Main Plant Area. Treatment of the Former Disposal Area soils would take place at the Main Plant provided Soil Vapor Extraction (MPA-S4) is also selected. Even if the Former Disposal Area soils are not treated, consolidation at the Main Plant Area would not add any appreciable increase in contamination to the Main Plant Area which is already extensively contaminated. One major advantage of FDA-S-8 would be the ability to manage potential soil treatment and cap at one location. This would result in a significant cost savings. Additionally, by implementing this alternative with the CAMU, the restrictions on placing soil back to the ground are not triggered.

Comparison of Groundwater Alternatives (*Includes discussion of water supply)*

Six alternatives were evaluated for remediation of groundwater in the Former Disposal Area/Mounded Area. Out of the six alternatives, neither Alternative FDA-G-1, No Action, nor Alternative FDA-G-2, Institutional Controls, alone would provide long-term effective protection to human health and the environment. Institutional Controls may be a viable way to enhance the effectiveness of other alternatives.

At the Former Disposal Area/Mounded Area, the combination of previous removal operations and on-going processes of natural attenuation may be achieving a reduction in the extent of groundwater contamination. For this reason Alternative FDA-G-4, Natural Attenuation, may be a viable and effective solution which will satisfy cleanup of groundwater off the property in the long-term. In the short term, to maintain adequate protection of human health, natural attenuation would need to be augmented with institutional controls and well head treatment (WS-3a), or connecting residences to the public water supply (WS-3b).

Regardless of which proposals are accepted for control of groundwater contamination, it will be necessary to continue the implementation of well head treatment for residences in Hillbrook Circle and the immediate vicinity. Therefore, public water supply or wellhead protection would become an element of any site-wide alternative at the Former Disposal Area/Mounded Area. The duration of the period over which well head treatment will be required will depend upon whether additional measures are instituted to accelerate improvements in groundwater quality (*e.g.*, groundwater extraction, capping, and SVE).

Groundwater alternatives should not be considered in isolation from soil alternatives. By minimizing on-going leaching of contaminants from the soil to the groundwater these soil alternatives perform a critical function in remediating groundwater.

Groundwater extraction and treatment (Alternatives FDA-G-5 and FDA-G-6) would achieve overall protection of human health and the environment and will effectively eliminate the influence of contaminant sources at the Former Disposal Area on the longevity of the plume.

The duration of a pumping program under FDA-G-5 is estimated to be two years as a result of the high extraction rates. The only viable method for disposing of treated groundwater effluent derived from the Former Disposal Area/Mounded Area is groundwater reinjection. With Alternative FDA-G-5, groundwater concentrations are predicted to fall below the MCLs within about 2 years.

Groundwater extraction and Treatment of the Source Area using a Single Well, Alternative-FDA-G-6, will effectively eliminate the influence of contaminant sources at the Former Disposal Area on the longevity of the plume. Alternative FDA-G-6 also relies on natural attenuation mechanisms to ultimately reduce groundwater contaminant concentrations below MCL's (5 ug/l for TCE). The intention of this alternative is to significantly reduce concentrations within the contaminant plume by pumping at a high rate (approximately 500 gallons/minute) for two years. With the highest concentrations of groundwater contamination eliminated, concentrations in the central portion of the plume would achieve the cleanup level of 5 ug/l (MCL for TCE) within seven years.

PREFERRED REMEDIAL ALTERNATIVE

Based on the comparison of the nine evaluation criteria for each of the alternatives at the Former Disposal Area and Main Plant Area in this Proposed Plan, EPA has selected a combination of the alternatives above as the Preferred Remedial Alternative. EPA believes this combination of alternatives meets the threshold criteria of overall protection to human health and the environment and compliance with ARARs.

At the Main Plant Area, EPA is proposing to treat the soils using *InSitu* Soil Vapor Extraction, Cap the operational area, and pump and treat the groundwater. At the Former Disposal Area, EPA is proposing to excavate and consolidate the soils at the Main Plant Area where they will be capped and treated using *InSitu* SVE in addition to pumping and treating the groundwater.

<u>Main Plant Area</u>
Soil Vapor Extraction (MPA-S-4) ($ 2,351,000)
Capping of Main Plant (Operational Area) (MPA-S-3) ($ 940,441)
Groundwater Collection and Treatment of Source Area (MPA-G-6) ($ 6,280,000)

At the Main Plant Area, *InSitu* SVE offers the best opportunity to reduce the mass of contaminants in the soil and permanently remove a source of contaminant releases. In addition, EPA prefers capping, Alternative MPA-S-3, because it is the only alternative which will provide an immediate benefit by minimizing the release of contamination to groundwater from the extensively contaminated soils. This benefit is achieved by reducing the rate at which contaminants are leached by infiltrating rainfall. Because the area requiring a cap will be retained as an active facility, the cap material must be appropriately evaluated. EPA has considered a concrete cap in the Feasibility Study. The combination of *InSitu* SVE and capping at the Main Plant Area will provide both short- and long-term benefits. Furthermore, capping will improve the performance of *InSitu* SVE.

For the groundwater alternatives at the Main Plant Area, EPA prefers MPA-G-6. With MPA-G-6 in place, groundwater concentrations just outside the main plant property are predicted to fall below the MCLs within about 20 years. If DNAPLs are present at the main plant it may be necessary to pump for a prolonged period of time, until the sources are exhausted. However, as long as pumping continues, sources of contamination at the Main Plant Area, including DNAPLs, will cease to contribute to groundwater contamination outside the main plant property. EPA prefers MPA-G-6 because pumping will take place directly from an identified source area and may be able to reduce volume and mass of contaminants more effectively than MPA-G-5.

Former Disposal Area
Excavation, On-Site Consolidation of Soils (FDA-S-8-CAMU-Option 1) ($ 1,243,000)
Groundwater, Collection and Treatment of Source Well (FDA-G-6) ($ 3,272,000)

EPA prefers Alternative FDA-S-8, Excavation with On-Site Consolidation using the CAMU concept because it will be the most effective soil remedy at the Former Disposal Area which meets the evaluation criteria. In addition, this remedy is the most cost effective for the entire Site. Removal of soils at the Former Disposal Area will reduce the time required to remediate the contaminated groundwater which impacts downgradient residents and also reduce the operation and maintenance requirements. Soils would be consolidated and capped in place in the area west of the distillation building at the Main Plant so as not to significantly impact the current operation of the facility. The consolidation of soils in this area would not add any appreciable increase in contamination to the Main Plant because it is already extensively contaminated. This alternative, in combination with the *InSitu* Soil Vapor Extraction (MPA-S-4) proposed above, will also provide for treatment of soils. The major advantages of FDA-S-8 is that complete removal of impacted soils from the Former Disposal Area allows the area to be left unrestricted for access and the removal will expedite the groundwater cleanup at the Former Disposal Area which results in a more effective remedy.

day public comment period beginning on June 23, 1997 and ending on July 23, 1997, to encourage public participation in the selection process. EPA will conduct a public meeting during the comment period in order to present the Proposed Plan and supporting information, answer questions, and accept both oral and written comments from the public. The public meeting will be held on July 16, 1997, at 7:00 p.m at the Great Valley High School Auditorium, 255 North Phoenixville Pike, Malvern, PA.

cooperatively to promote flexible approaches in the implementation of the CAMU. PADEP is currently reviewing this proposal and will provide, during the public comment period, comments on this aspect of the Proposed Plan.

If PADEP and EPA determine the use of the CAMU will not comply with Pennsylvania regulations, EPA is proposing a contingent remedy to address the soils at the Former Disposal Area. The contingent proposal will be FDA-S-4, Excavation, Off-Site Thermal Treatment and Disposal. FDA-S-4 has been evaluated above against seven of the nine criteria and EPA believes this remedy will also be an effective choice because the removal of contaminant mass would eliminate the source of contamination to groundwater at the Former Disposal Area. This contingent remedy for the Former Disposal Area soils is $7,016,000.

EPA prefers Groundwater extraction and treatment of Source Area using a single well, Alternative FDA-G-6, because it will effectively eliminate the influence of contaminant sources at the Former Disposal Area. It will reduce groundwater contaminant concentrations below MCL (5 ug/l for TCE) at the Former Disposal Area within 7 years and is the most cost effective of the groundwater alternatives that meet the threshold criteria.

Water Supply

EPA prefers connecting affected residents to a public water supply (WS-G-3a) ($506,000). By the end of 1997, Philadelphia Suburban Water Company plans to install water mains in Phoenixville Pike from Aston Road to Conestoga Road, and to extend the existing main in Conestoga Road north to Bacton Hill Road. This remedy is more reliable and cost effective than maintaining filtration units and sampling home wells for 30 years.

The estimated cost of this Preferred Alternative is $ 14,592,000. This cost could be reduced by an estimated $ 500,000 if one water treatment plant is constructed to treat both groundwater plumes at the Former Disposal Area and Main Plant Area.

However, if EPA selects the contingent remedy for the Former Disposal Area soils, the total estimated cost of the Preferred Alternative is $20,365,000.

In considering the balancing criteria, EPA believes this combination of alternatives can be readily implemented, achieves long-term effectiveness and permanence at a reasonable cost, minimizes the short-term impacts, and effectively reduces the mobility of Site contaminants through both engineering controls and treatment.

THE ROLE OF COMMUNITY IN THE SELECTION PROCESS

This Proposed Plan is being distributed to solicit public comment on the appropriate cleanup action for the Site. EPA relies on public input so that the remedy selected for each Superfund site meets the needs and concerns of the local community. EPA is providing a 30-

day public comment period beginning on June 23, 1997 and ending on July 23, 1997, to encourage public participation in the selection process. EPA will conduct a public meeting during the comment period in order to present the Proposed Plan and supporting information, answer questions, and accept both oral and written comments from the public. The public meeting will be held on July 16, 1997, at 7:00 p.m at the Great Valley High School Auditorium, 255 North Phoenixville Pike, Malvern, PA.

EPA will summarize and respond to comments received at the public meeting and written comments post-marked by July 23, 1997, in the Responsiveness Summary section of the Record of Decision, which documents EPA's final selection for cleanup. To obtain additional information relating to this Proposed Plan, please contact either of the following EPA representatives:

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GLOSSARY

Administrative Record - EPA's official compilation of documents, data, reports, and other information that is considered important to the status of, and decisions made, relative to a Superfund site. The record is placed in the information repository to allow public access to the material.

Aquifer - An underground geologic formation, or group of formations, containing useable amounts of ground water that can supply wells and springs.

ARARs - Applicable or relevant and appropriate requirements of Federal and State environmental statutes.

Baseline Risk Assessment ("BRA") - The BRA is an essential component of the Remedial Investigation Report. This portion of the RI evaluates the carcinogenic and non-carcinogenic risks presented by the contaminants at the site. Risk is calculated both for current uses and potential future uses of the property by a defined population i.e. on- and off-site residents, trespassers, etc.

Cap- A cover of soil or synthetic material placed on the ground to reduce infiltration of rainfall into the subsurface.

Carcinogen - A cancer-causing agent.

CFR - The Code of Federal Regulations. For example, the citation 40 CFR 260 means Title 40 of the Code of Federal Regulations, Part 260.

DNAPL - Dense Non-Aqueous Phase Liquids, contaminants which do not readily dissolve in water, and are heavier than water. DNAPLs sink in the aquifer and act as a continuing source of groundwater contamination.

Ethenes - Also known as ethylene. A hydrocarbon compound with the chemical formula C_2H_4.

Granular Activated Carbon ("GAC") - Carbon in a powdered form which filters organic contaminants by absorbing the compounds from the air or water that passes through the carbon.

Groundwater - Water found beneath the earth's surface that fills bedrock fractures and pores between soil, sand, and gravel particles to the point of saturation. Groundwater often flows more slowly than surface water. When it occurs in sufficient quantity, groundwater can be used as a water supply.

Hazard Index ("HI") - a numeric representation of non-carcinogenic risk, or toxic equivalency. A HI exceeding one (1) is considered an unacceptable non-carcinogenic risk.

Hydraulic Barrier - prevents or restricts the movement of fluid, in this case water.

Information Repository - A location where documents and data related to the Superfund project are placed by EPA to allow the public access to the material.

Listed Hazardous Waste - A solid waste deemed hazardous if it is named on one of three lists developed by EPA: 1) Non-specific source wastes 2) Specific source wastes 3) Commercial chemical products.

Maximum Contaminant Levels ("MCLs") - enforceable, health-based drinking water standards established under the Safe Drinking Water Act.

National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") - The Federal regulation that guides the determination and manner in which sites will be cleaned up under the Superfund program.

National Priorities List ("NPL") - EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response action under Superfund.

Plume - The three dimensional area of contamination in a particular media, such as ground water. A plume can expand due to groundwater movement.

Potentially Responsible Parties ("PRPs") - Parties who may be legally responsible for the cleanup of hazardous substances at a Superfund Site.

ppb - parts per billion. Five parts per billion is a fractional representation of 5 parts in 1 billion parts. For solids, ppb is a fraction based on weight, for example 5 pounds of a contaminant in a billion pounds (500,000 tons) of soil. For liquids ppb is based on volume, for example 5 tablespoons of a contaminant in a billion tablespoons (3,906,250 gallons) of water.

ppm - parts per million. Five ppm is a fractional representation of 5 parts in 1 million.

POTW- Publicly Owned Treatment Works

RCRA (Resource Conservation and Recovery Act) - A statute under which EPA and authorized States regulate the management of hazardous waste.

Recharge- infiltration of precipitation to groundwater, or contribution from streams or lakes.

Record of Decision ("ROD") - A legal document that describes the remedial actions selected for a Superfund site, why certain remedial actions were chosen as opposed to others, how much they will cost, and how the public responded.

Remedial Investigation and Feasibility Study ("RI/FS") - A report composed of two scientific studies, the RI and the FS. The RI is the study to determine the nature and extent of contaminants present at a Site and the problems caused by their release. The FS is conducted to develop and evaluate options for the cleanup of a Site.

Scientific Notation - In dealing with particularly large or small numbers, scientists and engineers have developed a "short hand" means of expressing numerical values. For example, 1,000,000 can be written as 1×10^{6} and 1/1,000,000 can be written as 1×10^{-6}.

SUPERFUND (Comprehensive Environmental Response Compensation and Liability Act) - A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The Act, among other things, created a Trust Fund, known as Superfund, which is available to EPA to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Transmissivity- Flow through a vertical strip of aquifer one unit wide.

Volatile Organic Compounds ("VOCs") - Chemical compounds containing carbon that readily volatilize or evaporate when exposed to air. These compounds can be used as solvents by industry. Chlorinated ethenes are a class of VOCs that contain chlorine such as Trichloroethene (TCE), and 1,1,1-Trichloroethane (TCA).