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EPA Superfund
Record of Decision:

A.I.W. FRANK/MID-COUNTY MUSTANG
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RECORD OF DECISION
AIW FRANK/MID-COUNTY MUSTANG SUPERFUND SITE

DECLARATION

SITE NAME AND LOCATION

AIW Frank/Mid-County Mustang Superfund Site
West Whiteland Township, Chester County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the final selected remedial action for the AIW Frank/Mid-County Mustang Superfund Site ("the Site"). The remedial action was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended by the Superfund Amendments and Reauthorization Act of 1986 ("SARA") and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"). This decision is based on the Administrative Record for the Site.

The Commonwealth of Pennsylvania agrees with the approach of the Selected Remedy set forth in this Record of Decision.

ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine pursuant to Section 106 of CERCLA, 42 U.S.C. §9606, that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision ("ROD"), may present an imminent and substantial endangerment to the public, health, welfare, or environment.

DESCRIPTION OF SELECTED REMEDY

The selected remedy described below is the only planned action for the Site. This remedy addresses excavation and disposal of contaminated soils and waste, groundwater remediation and an alternate water supply. Groundwater contamination represents a primary threat; therefore, the extraction and treatment of groundwater and an alternative water supply will be required. Soils and waste onsite represent a low-level threat that may through future site use adversely affect human health and groundwater quality; therefore an excavation and off-site disposal will be required.

The selected remedy includes the following major components:

1. Provision of Point of Use Carbon Filtration Units (until waterline is extended)

2. Installation of a water line;

3. Performance of a Phase I archeological survey prior to any intrusive remedial activities.

4. Excavation and off-site disposal of contaminated soils, following predesign soil investigations;

5. Removal, decontamination and off-site disposal of drums and sump;

6. Structure Demolition/Restoration

7. Institutional controls (to prevent the consumption of contaminated groundwater and creation of any hydraulically adverse influence on the extraction system operation, including deed restrictions)

8. Performance of an Additional Ecological Assessment;

9. Extraction and treatment via air stripping of groundwater with vapor phase carbon adsorption and subsequent discharge to either: 1) West Valley Creek, 2) the on site pond, or 3) the West Whiteland spray irrigation publically owned treatment works("POTW"), following a predesign hydrogeologic investigation;

10. Long Term Ground Water Monitoring.

It may become apparent during implementation or operation of the ground water extraction system and its modifications, that contaminant levels have ceased to decline and are remaining constant at levels higher than the Performance Standards established in this Record of Decision over some portion of the contaminant plume. If EPA, in consultation with the Commonwealth of Pennsylvania, determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the performance standards throughout the entire contaminant plume, EPA, in consultation with the Commonwealth may require that any or all of the following measures be taken, for an indefinite period of time, as further modification(s) of the existing system:

a) long-term gradient control provided by low level pumping, as a containment measure;

b) chemical-specific ARARs may be waived for those portions of the aquifer that EPA, in consultation with the Commonwealth determine that are technically impracticable to achieve further contaminant reduction, such determination shall be reevaluated at each subsequent five-year review;

c) institutional controls may be provided/maintained to restrict access to those portions of the aquifer where contaminants remain above performance standards; and

d) remedial technologies for ground water restoration may be reevaluated.

The decision to invoke any or all of these measures may be made during implementation or operation of the remedy or during the 5-year reviews of the remedial action. If such a decision is made, EPA shall amend the ROD or issue an Explanation of Significant Differences.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment and is cost effective. EPA believes that the selected remedy will comply with all Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action. The selected remedy utilizes a permanent solution to the maximum extent practicable and satisfies the statutory preference for a remedy that employs treatment that reduces toxicity, mobility, or volume.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review by EPA will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Thomas C. Voltaggio, Director
Hazardous Waste Management Division
Region III

Date

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RECORD OF DECISION
AIW FRANK/MID-COUNTY MUSTANG SUPERFUND SITE

DECISION SUMMARY

I. SITE NAME, LOCATION AND DESCRIPTION

The AIW Frank/Mid-County Mustang Superfund Site (the "Site") is located approximately one mile east of Exton on Route 30 in West Whiteland Township, Chester County, Pennsylvania. The Site consists of two adjoining properties in addition to the areal extent of contamination which includes the groundwater plume. The combined area of the two adjoining properties is 16 acres. The 16 acre site is bounded to the north-northwest by a Conrail rail line; to the south by Route 30; by open fields to the northwest, northeast and east-northeast; by Meridian Bank to the west-southwest; and by the Flotran/Industrial Hose property to the east-south east (see Figures 1 and 2; Note: all Figures and Tables are in Appendices A and B respectively).

Geographically, the Site is located within the Piedmont Physiographic province. Locally, the Site is approximately midway between North and South Valley Hills on the southern edge of the northeast to southwest trending Chester Valley. Chester Valley is approximately two miles wide. North and South Valley Hills are approximately 650 and 600 feet above mean sea level ("msl"), respectively and stand approximately 300 and 200 feet above the relatively flat lying Chester Valley. The major stream draining the area is West Valley Creek, a tributary of the Brandywine, which flows southwest across the northern edge of the Site. Site elevations range from 330 feet above msl in the northern portion of the Site to 375 feet msl in the southern portion. The Site is mapped in the Malvern, Pennsylvania 7.5 minute U.S. Geological Survey (USGS) quadrangle at approximately 40° 01' 50" N latitude and 75° 36' 04" W longitude.

The ground water table in the Site area generally reflects surface topographic slopes. Site specific data suggests that groundwater flows from local topographic highs in the former Site production areas, towards valley bottoms. Drinking water for the area within 2.2 miles of the Site is supplied by private residential wells, commercial wells and three water companies. The Philadelphia Suburban Water Company operates two public water supply wells directly down gradient from the Site and within several hundred feet of the leading edge of the contaminant plume. A number of local residences and businesses within the contaminant plume area have private wells that are currently or have been used in the past for drinking water supply and other uses.

The estimated population residing within one mile of the Site is approximately 916, which includes approximately 175 boarding school students. Approximately 4,680 people reside between one and two miles of the Site.

The AIW Frank portion of the Site property totals over 15 acres and was used in the past for the manufacture of styrofoam products and commercial refrigeration units. The former production areas of the AIW Frank facility are located in the southern half of the property near Route 30. There were, prior to 1991, two abandoned buildings, two parking areas, associated roadways and loading docks on this property. Immediately north of the parking area adjacent to Route 30 was a 180 foot by 160 foot one story building, referred to as the front building, which was used by the AIW Frank Corporation for manufacturing. On August 15, 1991, a fire of unknown origin destroyed the front building. All that remains of the building is the foundation. The second building, known as the rear building, lies 200 feet to the north-northeast of the front building. The rear building was used for both warehousing and manufacturing in the past. The rear building was gutted after manufacturing was discontinued and currently contains miscellaneous debris along with a number of water/gas lines formerly used for fire protection and manufacturing. The rear building roof partially collapsed during the winter of 1994/1995. Attached to the rear building was a small annex containing numerous decomposed concrete blocks. The annex was dismantled during demolition of the front building.

East of the rear building is the back parking lot area. In the southern portion of this parking area is the location of a former above ground waste solvent tank. A driveway and a paved area containing five to ten above ground tank pedestals lie in the space between the rear building and front building foundation. Nearby are several large pipes accessing three 20,000 gallon underground storage tanks outside the boiler room of the former front building. Liquid can been seen in the tanks standpipes. The tanks are believed to have been used for fuel oil storage in the past. A concrete lined drainage ditch crosses through this area, heading into a concrete culvert near the back parking lot. The drainage ditch was used to discharge boiler water to West Valley Creek during the AIW Frank manufacturing period at the Site.

The northern half of the facility is an open area overgrown with weeds, brush and small trees. West Valley Creek flows east to west, through the northernmost portion of the property, just south of the Conrail rail line. Downstream, West Valley Creek is a cold water fishery with protected trout fishing.

The creek has been impounded on the Site property to form a pond measuring approximately 310 feet by 60 feet (0.4 acres). A 300,000 gallon water tower, used in the past as a fire protection water supply for the facility, is also located in the overgrown area north of the rear building.

The Mid-County Mustang portion of the Site (currently Rex Carle Automotive Services) is less than one acre in size and consists of an auto garage, a parking lot, and a small lawn area. The Mid-County Mustang portion of the Site is bordered by the AIW Frank property and a private residence to the east; the former Pipe Maintenance Service (PMS) building to the north; a private residence to the west; and a small open field, Meridian Bank, and Route 30 to the south (see Figure 2). The area of concern on the Mid-County Mustang portion of the Site is a former tile field, located in the lawn area near the garage. Historical information indicates that previous operators of the auto garage had steamed and utilized solvents to clean auto engines. The liquid waste from the engine cleaning operation was then disposed of in floor drains in the garage building. From the floor drains the liquid waste was discharged into the on-site tile field which consisted of a stone filter bed.

II. SITE HISTORY AND ENFORCEMENT ACTIVITY

Based on sampling of local private water supply wells in 1982, the former Pennsylvania Department of Environmental Resources ("PADER"), now known as the Pennsylvania Department of Environmental Protection ("PADEP"), determined a pattern of elevated volatile organic contaminants including, trichloroethene ("TCE") in the ground water in the vicinity of the AIW Frank property.

Analytical results for samples collected from ground water wells and soils at the Site from 1982 through 1984 by the Department of Environmental Resources ("PADER") and contractors retained by the owners of both the Mid-County Mustang and AIW Frank portions of the Site revealed the presence of various volatile organic compounds ("VOCs"). The contaminants with the highest observed concentrations were trichloroethene ("TCE"), tetrachloroethene ("PCE") and 1,1,1 trichloroethane ("1,1,1 TCA").

As a result of the investigation conducted by the owner of the Mid-County Mustang property the contaminated stone filter bed and associated contaminated soils to a depth of 3 feet were excavated and disposed of off site under PADER oversight in 1984. Also, the floor drains in the garage areas were cemented to prevent future problems of a similar nature.

In the Fall of 1990, Continental Refrigeration Corporation, the owner of the AIW Frank portion of the Site at that time, removed and disposed of approximately 30 drums containing mostly methylene chloride from the rear building under PADER oversight.

An NUS Field Investigation Team under contract to EPA conducted a multimedia investigation of the Site property and some surrounding industrial sites in 1985. This study also found elevated levels of TCE, PCE and 1,1,1 TCA in ground water and soils. In 1987, EPA performed a hazard ranking system score for the AIW Frank/Mid-County Mustang Site. The Site was subsequently proposed for listing on the Superfund National Priorities List ("NPL") on June 24, 1988. The NPL is EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term clean up. The Site was officially listed on the NPL on October 24, 1989.

On May 9, 1990, EPA issued notice letters to, those parties who were considered to be Potentially Responsible Parties ("PRPs") for the contamination found at the AIW Frank/Mid-County Mustang Site. The letters also requested that the parties notify EPA within 14 days of receipt of the notice letter, whether the parties were interested in conducting the Remedial Investigation and Feasibility Study ("RI/FS") for the Site.

Several of the PRPs who received the May 9, 1990 notice letter showed initial interest in negotiations towards conducting the RI/FS. However, after limited negotiations EPA determined that the settlement procedures were not in the public interest at that time and would not expedite remedial action at the Site. On September 17, 1990 and September 25, 1990, EPA issued notification of special notice waiver letters to the PRPs identified for the Site setting out the Agency's decision to conclude the negotiations and proceed in conducting the RI/FS.

As mentioned above, on August 15, 1991 a fire destroyed one of the buildings on the AIW Frank property. As a result, the remaining portions of the building that were standing were demolished and the demolition debris was removed and disposed of at a demolition waste landfill by an EPA contractor.

EPA conducted a Remedial Investigation/Feasibility Study of the Site to identify in greater detail the types, quantities and locations of contaminants and to develop ways of addressing the contamination problems. Field work for the RI/FS was conducted between January 1991 and January 1993. The final RI/FS reports dated April 1995 are in the Site repositories. Additional residential well sampling was recently

conducted by EPA in February 1995.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Community interest and concern about the Site has been steady throughout EPA's involvement. EPA issued a Fact Sheet in October of 1990 which provided information concerning the removal and off site disposal of approximately 30 drums containing primarily methylene chloride. The October, 1990 Fact Sheet also provided information regarding the Superfund clean up process and activities which would take place at the Site.

On July 8, 1991, a Community Relations Plan was completed for the Site. The Plan highlighted issues, concerns and interests of the community located near the Site which were raised during interviews.

EPA issued a Fact Sheet in July 1992, providing an update of Site activities including planned field work for the Remedial Investigation and Feasibility Study ("RI/FS"). The Fact Sheet also announced a public meeting, which was held on August 5, 1992. The public meeting provided information to interested parties regarding the RI/FS field work which was about to begin at the Site.

In October, 1993 EPA issued a Fact Sheet to keep the community informed of Site related activities. The Fact Sheet briefly explained the initial findings of the RI, the Superfund Process, and the nature and extent of Site contamination.

Pursuant to CERCLA § 113(k)(2)(B)(i)-(v), the RI/FS reports and the Proposed Plan for the AIW Frank/Mid-County Mustang Site were released to the public for comment on June 16, 1995. These documents were made available to the public in the Administrative Record located at the EPA Docket Room in Region III's Philadelphia office, and the West Whiteland Township Building, Exton, Pennsylvania. The notice of availability of these documents was published in the Chester County Daily Local News and the Philadelphia Inquirer Chester County Neighbors Section on June 16, 1995.

A public comment period on the documents was held from June 16, 1995 to July 17, 1995. A timely request for a 30-day extension to the public comment period was made on June 28, 1995. As a result, the closing date for the public comment period was extended to August 15, 1995. In addition, a public meeting was held on June 29, 1995. At this meeting, representatives from EPA answered questions about conditions at the Site and the remedial alternatives under consideration. Also, on July 20, 1995, representatives of EPA met with a local civic association to answer questions about the remedial alternatives under consideration.

The responses to all comments received during the public comment periods are included in the Responsiveness Summary (Appendix E), which is part of this Record of Decision ("ROD").

This decision document presents the selected remedial action for the AIW Frank/Mid-County Mustang Site, West Whiteland Township, Chester County, Pennsylvania, chosen in accordance with CERCLA, SARA, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. The selection of the remedial action for this Site is based on the Administrative Record.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION WITH SITE STRATEGY

The Selected Remedy described in this Record of Decision will comprehensively address the threats posed by the release of hazardous substances at the Site. The principal threats posed by the Site are due to VOC contamination in the ground water and on-site surface and subsurface soils.

EPA has classified the affected aquifer at the Site as a Class IIA aquifer, a current source of drinking water, in accordance with the EPA Document "Guidelines for Groundwater Classification: (Final Draft, December 1986). The concentrations of contaminants in the ground water at the Site are above Maximum Contaminant Levels ("MCLs") which are enforceable, health-based drinking water standards established under the Safe Drinking Water Act ("SDWA"), 42 U.S.C. §§ 300f to 300j-26.

The primary objectives of EPA's action at the Site are: to prevent current or future human exposure to contaminants in the ground water, soils and sub-surface soils; to minimize migration of contaminated ground water; to restore ground water to MCLs; to protect uncontaminated ground water and surface water for current and future use, and to protect environmental receptors.

This ROD will: 1) address the ground water contamination; 2) provide a potable source of drinking water for affected and potentially affected residents; 3) address surface and subsurface soil contamination; and address the drums, sump and unsafe condition of structures on the AIW Frank property.

V. SUMMARY OF SITE CHARACTERISTICS AND EXTENT OF CONTAMINATION

A. Site Characteristics

1. Surface Features

The AIW Frank/Mid-County Mustang Site is located within the Piedmont Physiographic Province. The Piedmont Province is an extensive, southeastward-sloping region characterized by intense folding and faulting with a gently undulating topography. Landforms within the province are closely related to the lithology and structure of folded bedrock, characterized by long narrow valleys paralleling mountains and steep hills.

Locally, the site is approximately midway between the North and South Valley Hills on the southern edge of the northeast-southwest-trending Chester Valley. Chester Valley is approximately two miles wide and has an approximate elevation of 350 feet above msl. The major stream draining the area is West Valley Creek, which flows southwest across the northern edge of the AIW Frank property. Site elevations range from 330 feet above msl in the northern half of the site to 375 feet above msl in the southern half of the site.

2. Surface Hydrology

Several surface water streams and drainageways within the vicinity of the site are all related to and eventually discharge into West Valley Creek. Surface water runoff from the northern half of the site generally flows northward approximately 1,000 feet, eventually entering West Valley Creek and the portion of the creek that is impounded on the AIW Frank property. This surface water impoundment is approximately 0.4 acre in size. The surface impoundment area was determined to be a jurisdictional wetlands area during the RI. Figure 16 delineates the on site jurisdictional wetland area, as well as, off site wetland areas constructed by the Pennsylvania Department of Transportation as part of a wetlands mitigation project. A man-made drainage ditch located approximately 100 feet north and east of the two AIW Frank buildings, and several natural drainageways farther east of the buildings also drain surface water toward the north into the impoundment of West Valley Creek.

West Valley Creek has several tributaries in the area; however, only two tributaries outline the area of interest. One unnamed tributary to West Valley Creek, originating from two springs southwest of the site, flows northwest, passing through a culvert under Route 30 and eventually merging with West Valley Creek north of the Conrail (Reading Railroad) property and east of Ship Road. The unnamed tributary maintained a constant flow of surface water during field activities, and West Valley Creek and another unnamed tributary experienced dry periods. Another unnamed tributary located approximately 1,200 feet east of the AIW Frank warehouse defines the property line with the Church Farm School. This tributary originates south of Route 30 in the West Whiteland Business Center and flows to the north, entering West Valley Creek northeast of the site area. This tributary is usually dry except during periods of excessive rainfall. West Valley Creek flows west-southwestward for approximately 7.2 stream miles before discharging into the East Branch of Brandywine Creek [Figure 3].

The flow rate of West Valley Creek just west of North Ship Road during low flow conditions as measured at staff gauge G4 during the RI was .465 cubic feet per second. The width of the creek at this location is 6.4 feet and the measured depth of water was one and three quarters of an inch (1 3/4").

Flow rates of West Valley Creek, approximately 6.5 miles southwest (downstream) of the site (at Mullstein's Meadows near Downingtown), ranged from 0.05 to 12 cubic feet per second (cfs) between 1983 and 1988 (USGS, 1983-1989).

Stream flow rates and cross-sectional measurements were collected from each surface water/sediment sampling location [Figure 4].

Surface drainage in the region can be affected to some degree by karst features of the underlying carbonate bedrock. Although there are no obvious surficial karst features on-site, some karst-type depressions are evident southwest and north west of the site area.

3. General Site Geology

The geology of the study area consists of unconsolidated, silty, clay-rich soils overlying the bluish-gray limestone and dolomite of the Conestoga Limestone, Ledger Dolomite, and the Elbrook Formation. Based on borehole logs from the RI, overburden thickness ranges from six feet to 75 feet throughout the site. Locally, the overburden is known to be up to 90 feet thick. The soils are derived from weathering of the Conestoga Limestone and Ledger Dolomite (NUS, 1986).

Fracturing within the Conestoga Limestone is moderately abundant and poorly formed, with joints having an irregular pattern. Many of the fractures are open, but some are filled with secondary quartz and calcite. The formation has a moderate to low permeability with joints and some solution channel openings providing a secondary porosity of low magnitude (NUS, 1986). Five voids were encountered in monitoring wells MW-101, MW-103B, and MW-107B, all of which are drilled into the Conestoga Limestone. Two voids in MW-101 were encountered at depths of 80 to 84 feet below land surface and 97 to 100 feet below land surface. One void in MW-103B was encountered at a depth between 45 feet and 49 below land surface. The last two voids in MW-107B were encountered at depths of 43 to 47 feet below land surface and 54 to 56 feet below land surface.

Although surface irregularities typical of karst topography have not been observed at the site, several features that might indicate karst have been noted in the surrounding area. Specifically, there are what appear to be a few scattered sinkholes located to the southwest of the study area in the carbonate units along the margin of the Chester Valley. Regionally, karst topography has developed in the Conestoga Limestone and Ledger Dolomite in other areas. There is one swale depression into which groundwater in the northern portion of the site has been observed to be discharging. That feature may be karst related. Apparent fracture traces identified on aerial photographs may be associated with or have some control over karst features in the bedrock. Subsurface solution channels and voids were evident in most of the monitoring wells installed for the RI. Those karst features are undoubtedly a significant influence on hydraulic properties of the rock and the flow of groundwater and dissolved contaminants.

A total of 22 fracture traces were identified in the general study area during the course of the aerial photography analysis (EPIC, 1992). A figure was prepared using reproductions of aerial photographs for the study area with the confirmed fracture traces. These photographs were viewed with a stereoscope, and the linear features (i.e., the suspected fracture traces) were marked on an overlay. The linear features were field checked to eliminate man-made or other non-geologic features such as drainage ditches, unpaved roads, fences, and wildlife pathways. A final map, based on the field check, was also prepared. These fracture traces are shown on Figure 5.

4. Regional Hydrogeology

The regional limestone/dolomite formations (Conestoga and Ledger) constitute the major source of groundwater in the Chester Valley. Studies by the USGS indicate that those two formations plus the Elbrook (where present) act as a single hydrologic unit based on the observation that static water levels do not significantly change along lithologic contacts or faults and that the overall groundwater flow direction follows topography (Wood, 1984). As a result, the general groundwater migration pattern is expected to be from the valley margins to the central portion of the valley, then down valley to the southwest. Local flow directions will be controlled by fracture orientations and can be expected to vary from the overall pattern somewhat.

5. Local Hydrogeology

The local aquifer is formed by the carbonate bedrock units that underlie the area. These include the Conestoga Limestone and Ledger Dolomite at the site. Groundwater migration through these units is through fractures and solution channels and along bedding planes within the rock mass. Intergranular permeability and porosity are very low.

The water table at the site is found within the bedrock material. Depth to groundwater ranges from nine to 26 feet below ground surface throughout the study area.

A northwest- to-southeast-trending groundwater divide that bisects the AIW Frank portion of the site has been delineated. On the north side of this divide, groundwater flows from the center of the former production area at AIW Frank to the north and northwest for approximately 1,000 feet, then discharges into West Valley Creek. On the south side of the groundwater divide, groundwater flows to the west and southwest for approximately 900 feet and discharges into an unnamed tributary of West Valley Creek. The potentiometric surface map for the intermediate unit shows the reported orientation of the on-site groundwater divide [Figure 6].

The Conestoga Limestone displayed a greater abundance of solution cavities/voids than did the Ledger Dolomite in the site vicinity. However, the Ledger Dolomite appeared to have a greater abundance of fracture zones than the Conestoga Limestone. There did not appear to be any consistent change in hydraulic properties associated with contacts between various geologic stratigraphic units logged for the RI monitoring wells.

The water-table in the site area generally reflects surface topographic slopes. Site-specific data suggest that groundwater flows from the local topographic highs, including the former production area at

the site, toward valley bottoms. These water levels correspond to higher elevations than the nearby portions of West Valley Creek and its tributaries. The valley bottom streams often serve as discharge zones for groundwater. However, in some reaches of the streams (West Valley Creek, for example), the water-table is lower than the stream level. This local condition is probably caused by high-permeability solution channels in the bedrock parallel to the stream. Therefore, in general, shallow groundwater appears to be hydraulically connected to surface water in the local area and that the overall groundwater flow direction from the site is to the northwest and southwest, toward the local streams and then down the valley.

6. Groundwater Use

Drinking water in the vicinity of the site is supplied by individual residential wells, commercial wells, and three water companies.

In the Exton area, Philadelphia Suburban now operates the system formerly operated by the West Whiteland Municipal Authority. Water is obtained from two wells on Swedesford Road, 1/4 mile east of Route 100, that draw from the Ledger Dolomite. The local areas relying on private wells for their drinking water include the eastern, north-central, and west-central portions of West Whiteland Township (including the site area) and West Pikeland Township.

A number of local residences and businesses have private wells that are currently or have in the past been used for drinking water supply and/or other uses.

7. Summary of Aquifer Hydraulic Characteristics

As explained above, ground water flow and contaminant transport at the site and vicinity are controlled principally by secondary permeability features, such as fractures and solution channels in the carbonate rocks of the Conestoga Limestone and the Ledger Dolomite. On a large scale, in general, those formations have sufficient hydraulic conductivity to yield significant quantities of water to wells (commonly 10 to 100 gpm). However, on a smaller scale, due to the secondary and heterogeneous nature of the permeability features, there is a wide variance in hydraulic conductivity (or transmissivity) among individual wells. The significant large-scale hydraulic conductivity of the aquifer is confirmed by the lateral and longitudinal migration of groundwater contamination from the site.

8. Demography and Land Use

The study area exhibits a diverse array of land uses. Historically agricultural in nature, much of the area is still farmed. These areas are primarily located off Swedesford Road. The area along Route 30 is now primarily commercial and light industrial, with some residential units still present. The area immediately west of the study area becomes more residential in nature as Exton is approached.

Based primarily upon house count utilizing USGS topographic maps, the population residing within one mile of the approximate center of the study area is estimated to be approximately 916, which includes approximately 175 resident students at the Church Farm School. Approximately 4,680 people reside between one and two miles of the study area, and an additional 6,570 people reside between two and three miles. Thus, the total population within three miles of the center of the study area is more than 12,000.

B. Nature and Extent of Contamination

This section presents a summary of the nature and extent of contamination in the soil, groundwater, surface water, and sediment as well as potential sources such as USTs, drums, on-site building materials, and a sump. An asbestos survey and associated testing was also conducted on building materials collected from the front and rear buildings.

1. Underground Storage Tanks ("USTs")

Table 1 presents the results for the laboratory analyses of the samples collected from the five sampled USTs [Figure 7]. Samples TK-01, TK-02, and TK-03 are all from tanks located in close proximity to one another and will therefore be discussed together. In general, relatively few compounds were detected in the three tank samples and the analyte concentrations were also relatively low. Tank TK-01 had the fewest compounds, which included methylene chloride (4,964 mg/L), fluorene (9 mg/L), phenanthrene (8 mg/L), di-n-butyl phthalate (1 mg/L), and pyrene (2 mg/L).

Samples TK-02 and TK-03 had a greater number of compounds than sample TK-01. Most notable were the benzene, toluene, ethylbenzene, and total xylene (BTEX) components. BTEX compounds are common components of petroleum products, such as fuel oil. The remaining compounds were very similar to those found in

TK-01 with the exception of naphthalene-type compounds, which are also components of petroleum and coal-tar products. Tanks TK-01, TK-02, and TK-03 are believed to have been used for storing No. 6 fuel oil for heating.

Samples TK-04 (liquid) and TK-05 (solid) located next to the Rex Carle garage, also contained relatively few compounds, although concentrations, particularly in TK-04, were noticeably higher. Tanks TK-04 and TK-05 are also believed to have contained a petroleum-based heating oil. It should be noted that because these tanks contain petroleum product they are specifically excluded from Superfund authority and will not be addressed in the Superfund actions at the Site. The USTs will be referred to the appropriate State and Federal programs and will be appropriately addressed under those programs.

2. Drum Samples

As part of the building site visit conducted during the RI, four samples were obtained from drums containing a solid foam type substance that were located in the northeast corner of the rear building [Figure 7].

All of the compounds detected at low levels in the drums are consistent with the previous manufacturing activities at the site: Acetone is used largely as a solvent; 1,1,1-TCA is used primarily as a solvent for degreasing and metal cleaning; 4-methyl-2-pentanone is a solvent and denaturant with a wide variety of applications; styrene is a component of paints, adhesives, metal cleaners, and polystyrene; chlorobenzene is used as an industrial solvent and a solvent for pesticides; benzoic acid is used as a preservative and antimicrobial agent; butylbenzyl phthalate and bis(2-ethylhexyl) phthalate are components in plastics; di-n-octyl phthalate is a plasticizer for polyvinyl chloride; and Aroclor 1254 contains PCBs, which was formerly used in a variety of ways including electrical capacitors, electrical transformers, plasticizers, cutting oils, and pesticide extenders [Table 1].

3. Asbestos Sampling

20 samples were collected from various building materials suspected of containing asbestos. The locations of each asbestos samples are shown in Figure 8. The results of the asbestos analysis are summarized in Table 2.

Of the 20 asbestos samples analyzed, six indicated the presence of asbestos fibers from the front building at the AIW Frank property. All the asbestos containing building materials were removed from the Site during the front building demolition following the August 1991 fire. Sampling analysis results of samples collected from the rear building and water tower pump house did not indicate the presence of asbestos.

4. Sump Sampling

Two samples were collected from a sump located approximately 50 feet from the east property line and 50 feet from the southeast corner of the foundation [Figure 7]. One sample, SMD-01, was collected from the sediment in the bottom of the sump, and a second sample, SMP-01, was collected from the liquid contained by the sump [Table 1]. All of the compounds detected in the sump had previously been detected in either tank or drum samples.

Relatively few compounds were detected in the sump samples. The most significant finding is 670 mg/kg of Aroclor 1254 in sample SMD-01

5. Soil

During the RI, several activities were undertaken in an attempt to gain a better understanding of the extent and magnitude of soil contamination on site as well as to identify possible additional sources that could potentially contaminate other media. These activities involved both geophysical and soil-gas surveys which were designed to guide surficial and subsurface sampling activities.

The surveys resulted in a number of areas being targeted for further investigations including the former solvent tank area, the UST area on the AIW Frank property, and the former tile field on the Mid-County Mustang property.

6. Surficial Soil

Fourteen surficial soil samples (taken from the upper three inches of soil) were collected in order to assist in defining potential sources of contamination as well as the nature and extent of surficial contamination [Figure 9]. Two samples were collected from off-site background locations in the vicinity

of MW-101 (SO-15 and SO-16). Five samples were collected from the drainage ditch that, in the past, directed discharge waters from plant boilers northward to West Valley Creek (SO-4, -5, -6, -7, and -8). Organic compounds were detected at relatively low concentrations in the surficial soils. In general, the most common types of contaminants found were semivolatile organics and pesticides in the µg/kg (ppb) range.

Of particular interest is that almost all of the semivolatiles and pesticides found in the on-site samples were also detected in background sample SO-15 at comparable levels [Tables 3 & 4]. Low levels of pesticides are relatively well distributed among the samples, which suggests that they were dispersed relatively uniformly and may be related to long-time agricultural use near the site. Furthermore, Aroclor 1254, which was found in 10 of the 14 surficial soil samples, may be a remnant of pesticide applications where Aroclor was used in conjunction with pesticides to increase their effectiveness, however, it should be noted that Aroclor 1254 was not detected in surface soil background samples. Phthalates, which are also detected in nearly all the samples, are commonly used in industry as plasticizers. The widely dispersed nature of this contaminant suggests that it was also uniformly deposited, probably by the wind. The relatively wide distribution of pesticides and phthalates indicates that they should be classified as an areal rather than a point source regarding potential impacts on other media (e.g., groundwater, wetlands).

The samples from the former solvent tank area indicated only minimal levels of organic contaminants and two of the samples contained no VOCs. Sample SO-7 from the ditch contained some of the greatest organic compound levels found among all the surficial soil samples. However, those concentrations were still at low µg/kg levels.

Two other samples, SO-11 and SO-12 located immediately northeast of the rear building, also contained higher concentrations of organic compounds, primarily PAHs, than the other samples, yet still at low µg/kg levels.

The concentration of inorganic analyses for most samples were within the ranges found in the background samples.

For the metals that exceeded background levels, most show the exceedance in only one or two samples.

Five samples (SO-4, SO-5, SO-6, SO-7, and SO-8) were collected from the drainage ditch that, in the past, directed discharge waters from plant boilers.

One surficial soil sample, SO-04, had a mercury concentration of 1.1 mg/kg, which is slightly above the highest background level detected (0.8 mg/kg).

The inorganic analyses for surficial soils indicated somewhat elevated concentration of metals (copper, lead, nickel, and zinc) in the upper reaches of the former boiler water drainage ditch. Samples SO-12 from near the northeast corner of the rear building (near the ditch) also had elevated levels of some metals. No other patterns of inorganic contamination were at levels of potential environmental significance in surficial soils at the site.

7. Subsurface Soil

A total of nine subsurface samples (deeper than six inches below land surface) were collected for laboratory analysis. All of these samples were obtained from the general area of the former waste solvent tank [Figure 10].

Results of the organic analyses of subsurface soil samples are summarized in Table 5. Of the subsurface soil organic analytical results only TCE, 1,1,2-TCA, PCE, 1,1-DCE, 1,1-DCA and 1,1,1-TCA were present above site background levels.

Results of the inorganic analyses of subsurface soil samples from the RI are presented in Table 6. The concentrations of inorganic analytes for most of the samples were within the ranges found in the background samples. However, the results indicate that the following metals were found in one or more samples at concentrations above the ranges of background samples: aluminum, arsenic, beryllium, chromium, cobalt, lead, nickel, silver, vanadium, and zinc. Aluminum, arsenic, beryllium, chromium, lead, and silver exceed site background in only one sample at relatively low concentrations. Therefore, it does not appear that site activities contributed to any significant contamination in regards to these metals.

The only inorganic hazardous substances that have concentrations that significantly exceed site background concentrations in more than one sample are cobalt, nickel, vanadium, and zinc. The elevated

concentrations of these metals could be a result of previous on-site activities.

Cobalt concentrations tended to be higher in all subsurface soil sample especially in SS-03 at 81.2 mg/kg which is significantly higher than site background concentrations ranging from 9.0 to 10.3 mg/kg.

Subsurface soil samples TP-01-B (119 mg/kg) and SS-03-01 (252 mg/kg) had the highest concentrations of nickel, although the majority of the samples had concentrations of nickel relatively close to the surficial soil background values.

Concentrations of vanadium in the subsurface soils were considerably greater than those measured in the site background samples. Two of the subsurface soil samples had vanadium concentrations significantly above background and two test pit samples had concentrations ranging from 234 mg/kg and 286 mg/kg (TP-01-02 and TP-01-01M).

In all subsurface soil samples, zinc ranged between 32.0 mg/kg and 58 mg/kg, with the exception of sample SS-03-01, which had a concentration of 380 mg/kg.

8. Groundwater

This section presents information on the nature and extent of groundwater contamination in the vicinity of the site. Data from the chemical analysis of groundwater samples collected from monitoring wells, and from off-site residential wells are presented.

9. Monitoring Wells

During the RI, 13 monitoring wells were installed on and off site to supplement information previously gathered from existing monitoring and residential wells [Figures 11 & 12]. The objective of the investigation was to provide an expanded assessment of the horizontal and vertical extent of groundwater contamination near the site. Each of the 13 monitoring wells was sampled twice. Monitoring wells were installed to various depths to allow both the vertical and areal extent of groundwater contamination to be assessed. The maximum concentrations of organic compounds are summarized in Table 7.

The maximum concentrations of inorganics (filtered and unfiltered) detected in the groundwater samples are summarized in Table 8.

Based upon the scattered distribution of metal concentrations in groundwater, and the poor correlation between inorganic and organic contaminants, there is no apparent wide-spread metals contamination attributable to former site activities or sources.

Figures 13, 14, and 15 provide isoconcentration contours of the TCE distribution in each of the three water bearing zones (depths). Also Table 9 summarizes the most frequently detected organic concentrations for each of the three depth classifications of the wells. In general, contaminant concentrations tend to decrease with distance west from the site boundary along Exner Lane. Also, contaminant concentrations tend to increase with depth, particularly among wells located in close proximity to the former solvent tank.

Site related ground water contaminants also have the potential to act as dense nonaqueous phase liquids ("DNAPLs"). DNAPLs are contaminants which do not readily dissolve in water, and are denser than water. DNAPL contaminants are heavier than water and sink in the aquifer. The DNAPL acts as a continuing source for dissolved contamination in the aquifer. DNAPLs are not believed to be present in the aquifer. EPA believes that sufficient information regarding ground water movement and contamination was collected during the RI to move ahead with this Record of Decision for the Site. The actual presence of DNAPL will be determined during the design phase of the remedy implementation.

10. Residential Wells

During the RI a total of 13 residential, municipal and commercial drinking water wells were sampled in the vicinity of the site in January, 1993 [See Figures 11 & 12]. The samples were analyzed for volatile organics, and three constituents were found in significant concentrations; 1,1 DCE, TCE and 1,1,1 TCA.

The drinking water well results correlate with the monitoring well concentrations in that the highest concentrations are in the vicinity of the Site and concentration steadily decrease downgradient of the Site to the west. The wells with the highest concentrations of contaminants are HW-06, HW-10 and HW-13. The results for the wells sampled in January 1993 are in Table 10.

In February, 1995 another round of residential and commercial drinking water well sampling was conducted. The results of the January 1993 sampling were confirmed by the February 1995 sampling. The results of the February 1995 sampling are in Table 11.

11. Surface Water

Unlike the ground water samples, the surface water samples analyzed contained relatively few organic and inorganic contaminants. Figure 4, shows the locations for surface water and sediment sampling during the RI. Tables 12 and 13 present the organic and inorganic surface water sampling results.

Only sampling location SW-10 and SW-01 were found to contain organic contaminants. TCE was identified in SW-10 at 39 ppb and SW-01 which is directly downstream of SW-10 contained TCE at 4 ppb. Sampling location SW-10 was in the location of a spring which feeds the unnamed tributary of West Valley Creek. It is believed that the organic sampling results at location SW-10 are more representative of shallow ground water because the spring in this location is in the downgradient portion of the Site plume. The level of TCE found in SW-10 is also comparable to levels found in nearby residential wells.

The results of the inorganic analyses of surface water samples show that aluminum is the only metal with a significantly elevated concentration. Aluminum was found in one filtered sample at location SW-06 which was a background sample. Three other unfiltered locations showed elevated aluminum levels, on of which, SW-09, also was a background sample. It is believed based on sampling locations and concentrations found that the elevated aluminum values, are most likely due to suspended clay.

12. Sediment

Figure 4, shows the locations for surface water and sediment sampling during the RI. Tables 14 and 15 present the organic and inorganic surface water sampling results.

Results of the organic analyses indicates that 10 out of the 11 sampling locations showed significantly increased concentrations of PAHs including: phenanthrene, flouranthene, pyrene, benz(a)anthracene, chrysene, benzo(b)flouranthene, benzo(k)flouranthene and benzo(a)pyrene. Only sample location SD-07 did not show levels of PAHs above detection limits.

The results of the inorganic sampling analyses indicates that concentrations for aluminum as in the surface water sampling results and lead were detected above background levels. Lead was found at comparable levels (i.e. less than a factor of 2), however, in all the background samples.

VI. SUMMARY OF SITE RISKS

A baseline Risk Assessment was prepared in order to identify and define possible existing and future health risks and potential environmental impacts associated with exposure to the chemicals present in the various media at the Site if no action were taken. The baseline Risk Assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. The entire baseline Risk Assessment can be found in the April 1995 Remedial Investigation Report for the AIW Frank/Mid-County Mustang Site, Section 6. It is comprised of 4 parts including: Selection of Chemicals of Concern (or, Hazard Evaluation); Exposure Assessment, Toxicity Assessment; and Risk Characterization.

A. Human Health Risk Evaluation

1. Selection of Chemicals of Concern

A total of 49 chemicals, including VOCs, semivolatiles, PAHs, metals and pesticides were detected in the environmental media sampled during the Remedial Investigation. Although many of the detected substances were found not to contribute significantly to overall public health risks, the risk assessment considered risks from all detected chemicals (i.e. all chemicals were considered of potential concern). The complete listing of chemicals of concern can be found in Section 6.1 of the Remedial Investigation report. The major contaminants of concern are listed below:

trichloroethene
1,1 dichloroethene
1,1,1 trichloroethane
1,1,2 trichloroethene
cis 1,2 dichloroethane
chloroform
manganese

Toxicological profiles for the major contaminants of concern can be found in Appendix C.

2. Exposure Assessment

The objective of the exposure assessment is to estimate the amount of each chemical of potential concern at a site that is actually taken into the body (i.e. the intake level or dose). There are three primary routes through which individuals may be exposed to site related contaminants: incidental ingestion, inhalation and dermal contact. The three receptor groups for which public health risks were evaluated at the site are as follows: adult resident, child resident and adult employee. There are currently no plans to develop the site for residential use, but because there are currently no prohibitions in place, a future residential use scenario was considered in the risk assessment.

Receptors can be either directly or indirectly exposed to site related contaminants via the four environmental media addressed in the Remedial Investigation -- ground water, surface water, soils (surface and subsurface) and sediment. Exposure routes involved include dermal contact, ingestion, and/or inhalation.

Carcinogenic risks are calculated as an incremental lifetime risk, and therefore incorporate terms to represent the exposure duration (years) over the course of a lifetime (70 years, or 25,550 days). Noncarcinogenic risks are calculated using the concept of an average annual exposure.

Three potential exposure routes are associated with potential future ground water use in the vicinity of the site. The exposure routes include ingestion, inhalation of vapors during showering, and dermal contact. Adult residents are assumed to ingest 2 liters of water per day, 350 days per year, over a 30 year exposure duration. Child residents are assumed to ingest 1 liter of water per day, 350 days per year for six (6) years. Bodyweights are specified as 70 kg for adults and 15 kg for children.

Inhalation exposures during showering are estimated using modeling techniques. The modeling techniques account for inhalation during showering for adults, as well as, after the shower while the receptor remains in the room. Dermal exposures during bathing for children are estimated assuming total body contact for .2 hours per day, 350 days per year for six years.

Actual current exposure to surface water and sediments through incidental ingestion, or dermal contact by adolescent children wading in West Valley Creek were assessed, as well as, actual current exposure to surface soil through incidental ingestion or dermal contact by adult or child resident, and potential future exposure to subsurface soil through incidental ingestion or dermal contact by adult or child resident.

3. Toxicity Assessment

The toxicity assessment characterizes the inherent toxicity of a compound and helps to identify the potential health hazard associated with exposure to each of the chemicals of concern. Toxicological values, reference doses (RfDs) for non-carcinogenic chemicals, and the non-carcinogenic effects of carcinogens, and cancer slope factors (CSFs) for known, suspected, and possible human carcinogens, derived by USEPA were used in the Risk Assessment.

RfDs have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

CSFs have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CSFs, 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 provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CSF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal to human extrapolation and uncertainty factors have been applied.

4. Risk Characterization

The baseline risk assessment in the Remedial Investigation report quantified the potential carcinogenic and non-carcinogenic risks to human health posed by contaminants in the various exposure media. The carcinogenic and non-carcinogenic risks were determined for ground water, surface water, soils (surface and subsurface) and sediment.

Carcinogenic risk is presented as the incremental probability of an individual contracting some form of cancer over a lifetime as a result of exposure to the carcinogen. For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) using information on the relationship between dose and response. Risk standards for non-carcinogenic compounds are established at acceptable levels and criteria considered protective of human populations from the possible adverse effects from exposure. The ratio of the average daily doses ("ADD") to the reference dose ("RfD") values, defined as the Hazard Quotient, provides an indication of the potential for systemic toxicity to occur. To assess the overall potential for non-carcinogenic effects posed by multiple chemicals, a Hazard Index ("HI") is derived by adding the individual hazard quotients for each chemical of concern. This approach assumes additivity of critical effects of multiple chemicals. EPA considers any HI exceeding one (1.0) to be an unacceptable risk to human health. A summary of the risks by exposure route at the AIW Frank/Mid-County Mustang Site are in Table 16.

a. Current Use Scenario

- Actual current exposure through ingestion, dermal contact and inhalation of vapors during showering of ground water via the existing drinking water wells;

Although several known or potentially carcinogenic chemicals were detected in the drinking water wells, the excess lifetime cancer risk estimates for the levels of contaminants detected in the wells do not exceed the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000). However, the excess lifetime cancer risk estimates for the levels of contaminants detected in residential wells, HW-06, HW-10, HW-11, HW-12 and HW-13 were all greater than 1.0 x 10-5 (or 1 in 100,000). Hazard quotient/Hazard Indices for scenarios associated with the current use of drinking water wells exceeded unity in only one location: HW-10 for both adult (HI = 1.12) and child residents (HI = 2.10).

- Actual current exposure to surface water through incidental ingestion, or dermal contact by adolescent children wading in West Valley Creek;

The excess lifetime cancer risk estimates for the levels of contaminants detected in surface water do not exceed the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) and in fact are less than the lower limit of the EPA risk goal (1 in 1,000,000). Hazard quotient/Hazard Indices for scenarios associated with the current exposure of adolescents to surface water do not exceed unity in any instance.

- Actual current exposure to sediments through incidental ingestion, or dermal contact by adolescent children wading in West Valley Creek;

The excess lifetime cancer risk estimates for the levels of contaminants detected in sediments do not exceed the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000). Hazard quotient/Hazard Indices for scenarios associated with the current exposure of adolescents to sediments do not exceed unity in any instance.

- Actual current exposure to surface soil through incidental ingestion or dermal contact by adult or child resident;

The excess lifetime cancer risk estimates for the levels of contaminants detected in surface soils do not exceed the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) via ingestion and dermal contact for adult residents, child resident, or adult employees. Hazard Quotient/Hazard Indices for scenarios associated with the current exposure of adult residents and adult employees to surface soils do not exceed unity in any instance. However, the Hazard Index for child residents (1.4) exceeds one (1) for dermal contact with surface soil. This is primarily due to the child's lower body weight.

b. Future Use Scenario

- Potential future exposure through ingestion, dermal contact and inhalation of vapors during showering of ground water based on the monitoring well analytical results;

The excess lifetime cancer risk estimates for the levels of contaminants of concern detected in monitoring wells via ingestion by an adult resident under this scenario exceeds the EPA target range of 1.0 x 10-4 (or 1 in 10,000) with an estimate of 8.0 x 10-4 (or 8 in 10,000). The contaminants of concern contributing most to the excess lifetime cancer risk estimate are chloroform and 1,1 dichloroethene.

The total Hazard Indices for adult residents exceed one via ingestion and inhalation of vapors during showering, indicating that adverse noncarcinogenic health effects may occur if contaminated ground water is used for domestic purposes some time in the future. For an adult resident under this scenario the ingestion HI totaled 35 and the inhalation HI equaled 2.0. The contaminants of concern contributing most to the Hazard Indices are cis 1,2 dichloroethane, trichloroethene and manganese.

The excess lifetime cancer risk estimates for the levels of contaminants of concern detected in monitoring wells via ingestion by a child resident under this scenario exceeds the EPA target range of 1.0 x 10-4 (or 1 in 10,000) with an estimate of 1.2. x 10-4 (or 1.2 in 10,000). The contaminants of concern contributing most to the excess lifetime cancer risk estimate are 1,1 dichloroethene and trichloroethene.

The total Hazard Indices for child residents exceed one for ingestion, indicating that adverse noncarcinogenic health effects may occur if contaminated ground water is used for domestic purposes some time in the future. For a child resident under this scenario the ingestion HI totaled 81. The contaminants of concern contributing most to the Hazard Indices are cis 1,2 dichloroethane, trichloroethene and manganese.

- Potential future exposure to subsurface soil through incidental ingestion or dermal contact by adult or child resident;

The excess lifetime cancer risk estimates for the levels of contaminants detected in subsurface soils do not exceed the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) for scenarios associated with the future exposure of adult residents, child residents and adult employees to subsurface soils via ingestion and inhalation of fugitive dusts. However, the excess lifetime cancer risk estimates for the levels of contaminants detected in subsurface soils do exceed the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) for scenarios associated with the future exposure of adult residents (2.7 x 10-4) and child residents (3.3 x 10-4) to subsurface soils via dermal contact. The contaminant of concern primarily contributing to the excess cancer risk is 1,1 dichloroethene. It should be noted, however, that 1,1 DCE is a volatile contaminant, which may volatilize rapidly when exposed to air.

Hazard Quotient/Hazard Indices for scenarios associated with the future exposure of adult residents, child residents and adult employees to subsurface soils do not exceed unity for ingestion or inhalation of fugitive dust. However, the Hazard Index for adult resident (2.4), child residents (12.5) and adult employees (1.7) all exceed one (1) for dermal contact with subsurface soil. The contaminants of concern primarily contributing to the Hazard Indices are 1,1 dichloroethene, 1,1,1 trichloroethane and 1,1,2 trichloroethene. It should be noted, however, that 1,1 dichloroethene, 1,1,1 trichloroethane and 1,1,2 trichloroethene are volatile contaminants, which may volatilize rapidly when exposed to air.

B. Environmental Risk Evaluation

The principal purpose of the ecological risk assessment is to determine the likelihood that biological species habitats in the site area are exposed to unacceptable risks from site contaminants. The ecological risk assessment consisted of three primary components; site characterization, exposure assessment, and risk characterization.

1. Site Characterization

The site characterization briefly describes the major plant and animal species that were observed or expected to inhabit or use the site area. The general habitats identified in the site area include stream and pond habitats for fish, water fowl, amphibian and other diverse aquatic biota; wetland/swale habitat for a wide range of wetland type bird, vegetation and other biota; upland habitat for deer, rodents, other mammals and birds. Observations indicate that some of the potential receptor wildlife type at the site may include, but not be limited to, deer, ducks, geese, raccoons, fish, rabbits, small rodents, raptors, amphibians, and many others.

No Federal listed endangered species are in the vicinity of the Site, however, it was determined that there was a possibility that some State listed/Federal candidate endangered species may exist in the Site area.

2. Exposure Assessment

The exposure assessment includes estimated environmental effects quotients ("EEQs") for chemicals in each medium of concern (i.e. surface water, sediment, etc...). Chemicals of concern were identified for surface water, and sediments. Chemicals identified in ground water were not considered in this assessment because no direct expression of ground water has been analyzed at the Site. The primary criterion used for verifying the selection of chemicals of concern was the toxicity for the specific chemical. The selected benchmark toxicity screening value for surface water was the chronic ambient water quality criteria ("AWQC") and for sediment was the effects range low ("ER-L") value.

Primary exposures represent those exposures to chemicals occur between the contaminated media and the initial biological receptor. Contaminants have been identified in surface water, soils and sediment which may facilitate the exposure of the local biota to chemicals of concern. From these media, possible routes of entry into biological systems include direct ingestion of contaminated soils, and water, absorption from contaminated soils and water, and inhalation of contaminated respirable dusts. In the case of aquatic organisms, exposure routes include whole body exposure through dermal absorption, respiration (skin, gills) and direct ingestion via water or sediment.

Secondary exposure results from the consumption of contaminated organisms. Through this mechanism, contaminants move through the food web from one trophic level to another. The extent to which a contaminant will survive in the biota through secondary exposure mechanisms is, in part, estimated through the bioconcentration factor.

3. Risk Characterization

The physical features of the Site indicate that four habitat types exist on the site. These are wetland/swale, West Valley Creek and its tributaries, on-site pond and old field habitats. Fish were observed in the pond. West Valley Creek approximately 1 mile west of the Site is classified as a cold water fishery trout stream.

Risk characterization involves comparing EEQs for chemicals to toxic, or hazardous concentration benchmark values. The following discusses the EEQs (as in the non-carcinogenic human health risk assessment an EEQ greater than one indicates a potentially unacceptable ecological risk and some type of action may be warranted) for water and sediments associated with the Site.

a. Surface Water

Surface water EEQs were calculated for TCE, heptachlor, lead and copper. An EEQ greater than one (1) was calculated for both copper (1.7) and lead (2.13). Neither organic constituent exceeded an EEQ of one.

b. Sediments

Sediments EEQs were calculated for arsenic, lead, benzo(a)pyrene and benzo(a)anthracene. An EEQ greater than one (1) was calculated for arsenic (2.7), lead (1.9) and benzo(a)pyrene (1.12).

The EEQs above are suggestive of some potential risk to ecological receptors, however, the results of the ecological risk assessment have not provided conclusive evidence that contaminants originating from the Site have reached any ecological receptor. However, these results indicate a potential for ecological receptors to be impacted via contaminated surface water runoff and contaminated sediment transport from the Site. A conclusive risk determination can only be made if additional information is collected and evaluated.

VII. DESCRIPTION OF REMEDIAL ACTION ALTERNATIVES

The Feasibility Study ("FS") Report discusses the alternatives considered for the cleanup of the contaminants of concern identified during the RI for the Site and provides supporting information leading to alternative selection by EPA. The following presents a summary of the remedial alternatives which were carried through a detailed analysis in the FS, except where noted. The alternatives presented below do not directly correspond with the numbers in the FS, however, EPA believes the presentation below to be, in general, more easily understandable.

Summary of Alternatives

Alternative 1: NO ACTION
Alternative 2: LIMITED ACTIONS
Alternative 3: LIMITED ACTIONS/PUBLIC WATER SUPPLY
Alternative 4: GROUND WATER AND SOIL REMEDIATION
Alternative 5: GROUND WATER; SOIL REMEDIATION & PUBLIC WATER SUPPLY

A. DESCRIPTION OF ALTERNATIVES

1. Alternative 1: NO ACTION

Estimated Capital Costs:	$ 0
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 0

The National Contingency Plan ("NCP") requires that EPA consider a "No Action" alternative for each site to establish a baseline for comparison to alternatives that do require action. There are no capital costs or Operation & Maintenance (O&M) costs associated with this alternative. Under this alternative, no additional remedial activities or ground water monitoring would be conducted.

2. Alternative 2: LIMITED ACTIONS, including:

1) Institutional Controls
2) Point of Use Carbon Filtration Units
3) Removal/Excavation and Disposal of Drums and Sump
4) Additional Ecological Assessment
5) Structure Demolition
6) Long Term Ground Water Monitoring

Estimated Capital Costs:	$429,000
Estimated Total O&M Costs:	$872,000
Estimated 30 Year Total Present Worth Costs:	$1,301,000

1) Under this alternative, institutional controls would be implemented limiting the future use of the property to prevent human exposure to the soil and ground water contamination present. Institutional controls in the form of site grading and fencing would be used to limit access to the Site and the contaminated surface and subsurface soils therein as well as reduce the potential for erosion which could lead to contaminated soils being transported to areas which were previously uncontaminated. This alternative does not include an active ground water treatment component.

2) Point of use carbon filtration units would be provided to residents whose wells have shown levels of contaminants above MCLs or whose well results show an unacceptable health risk.

3) Four drums in the rear building containing solid materials with low concentrations of solvents would be removed for off-site disposal at an appropriate off site RCRA Landfill or facility for treatment, following sampling and analysis for waste characterization. The sump located east of the front building pad also would be excavated. The contents would be sampled and analyzed for waste characterization prior to treatment and disposal off-site at an appropriate RCRA permitted facility. The concrete sump will be sampled and analyzed for wastes characterization for disposal as debris following the appropriate determinations under the RCRA land disposal restrictions, 40 C.F.R. §§ 268.45.

4) The potential presence of Pennsylvania listed endangered species was identified in the ecological risk assessment in the RI. A limited additional ecological assessment is needed to determine the actual presence of State listed endangered species in the Site area and to better determine the source and potential ecological impact of PCBs, mercury, copper, lead, zinc and PAHs in the soils at the Site.

5) Following finalization of the RI/FS in April, 1995 EPA was notified of the safety hazard presented by the partial collapse of the rear building and recent indications of vandalism on Site by Township authorities. The rear building and associated structures will pose a safety hazard to EPA personnel during future Site related activities. To eliminate the hazards to EPA personnel and contractors, as well as, site trespassers, posed by the structures on Site, the demolition of on site structures including the rear building and water tower will be part of the limited actions. Based on the costs

of the front building demolition and the relative size and complexity of the rear building and water tower demolition, EPA estimates that the demolition of on site structures would cost $250,000. The $250,000 costs for building demolition are in addition to the costs presented above under Alternative 2.

6) Continued monitoring would be conducted to track natural attenuation and would be used to determine a Site-specific degradation rate.

Five underground storage tanks ("USTs") containing fuel oil were identified during the RI. Three of the USTs are on the AIW Frank property and were used as fuel tanks for the boiler room. Two of the tanks are located on the Mid-County Mustang portion of the site and were apparently used for fuel oil storage. The RI did not clearly determine if the tanks on either property are currently leaking. A stated earlier, these fuel oil USTs are specifically excluded from Superfund authority and will not be addressed in the Superfund actions at the Site. The USTs will be referred to the appropriate State and Federal programs and will be addressed under those programs.

The total O&M costs include the following: long term monitoring of on and off site monitoring wells as well as residential wells in the area of concern; replacement/regeneration of the point of use carbon filters at least once per year; and periodic fence maintenance would need to be conducted. A detailed breakdown of capital and operation & maintenance costs for each alternative can be found in the Feasibility Study Report ("FS"). A copy of the FS can be found in the administrative record in the Site repositories.

3. Alternative 3: LIMITED ACTIONS/PUBLIC WATER SUPPLY, including:

1) Institutional Controls
2) Point of use Carbon Filtration Units (until water line is extended)
3) Removal/Excavation and disposal of drums and sump
4) Additional Ecological Assessment
5) Structure Demolition
6) Long Term Ground Water Monitoring
7) Extension of Water Line

Estimated Capital Costs:	$ 2,958,00
Estimated Total O&M Costs:	$ 136,000
Estimated 30 Year Total Present Worth Costs:	$ 3,101,000

In addition to the Limited Actions described above in Alternative 2, this alternative would provide a permanent source of potable water to affected and potentially affected residents by extending a municipal water line to the area in the vicinity of the Site. The Philadelphia Suburban Water Company currently supplies water to West Whiteland Township, and has sufficient capacity at this time to provide water. Under this alternative, a water line would be installed from the existing water mains on either Route 30 and N. Ship Road or Swedesford Road and N. Ship Road. Independent connections would then be brought into each of the affected or potentially affected residences and businesses. Fire hydrants would be installed along the line, in accordance with township fire prevention code. Only those users currently impacted or potentially impacted by the contamination in the ground water would be connected to the municipal water system. At this time approximately 12 residences and businesses, primarily along Exner Lane and N. Ship Road are considered affected or potentially affected. A final determination concerning which wells may be potentially impacted would be made in the future based on all information in EPA's possession at the time of implementation. As described above under Alternative 2, point of use carbon filtration units would be provided to residents whose wells have shown levels of contaminants above MCLs or whose well results show an unacceptable health risk until the water line is completed.

The O&M costs of this alternative are associated with the Limited Actions portion of this alternative and include the following: long term monitoring of on and off site monitoring wells as well as residential wells in the area of concern; replacement/regeneration of the point of use carbon filters at least once per year during the time the water line has not been completed; and periodic fence maintenance would need to be conducted if structure demolition is not chosen under limited actions.

ALTERNATIVES 4 & 5

4. Common Components of Alternatives 4 & 5

a. Soil Investigation

Alternatives 4 and 5 will each include a soil investigation to determine more accurately the areal and volumetric extent of subsurface soil VOC contamination. Also, additional soil and sediment sampling will be conducted in the on-site drainage ditch and behind the rear building to determine the source and extent of contamination which may be capable of causing adverse ecological effects as described under Alternative 2, 4)Additional Ecological Assessment above. The sampling results from the drainage ditch and from behind the rear building will be used to determine if additional soil excavation, or grading is necessary to prevent ecological receptors at the Site from being adversely affected.

b. Ground Water Pre-Design Study

All of the ground water treatment options under Alternatives 4 & 5 will be designed to reduce or remove the Site related VOCs in the extracted ground water, unattended, on a continuous, 24 hour-per-day performance basis. The ultimate objective of these ground water pump and treat alternatives is to restore the contaminated ground water plume to MCLs. The approximate areal extent of the ground water plume is illustrated in Figures 13, 14 & 15. [See Section V.B.9. for more detailed information on extent the ground water contamination.]

The proposed plan estimated a total system pumping rate of 300 gallons per minute ("gpm"), which would capture the estimated ground water plume. However, based on comments received during the public comment period, EPA conducted a more detailed site specific design evaluation of the number of wells and total pumping rate which would capture the ground water plume. As a result, EPA now estimates that the combined recovery well pumping rate that will capture the estimated ground water contaminant plume is approximately 150 gallons per minute ("gpm"). All the treatment systems will be designed to handle raw ground water at a rate of approximately 225 gpm. The systems will also have the flexibility to respond to varying concentrations and flow rates. The alternatives involving effluent discharge to West Valley Creek, a tributary of Brandywine Creek, will be designed to remove greater than 99% of the VOCs in order to comply with the PADEP's discharge requirements.

RI data indicates that arsenic concentrations may exceed the PADEP discharge requirements for West Valley Creek, therefore, if after further study during the remedial design, data continues to indicate that arsenic will exceed the effluent discharge requirements, the system will be designed such that raw water will be treated by coagulation/flocculation-precipitation to remove principally iron and manganese which will result in the co-precipitation of arsenic. This is currently the best available economically feasible technology for arsenic removal. However, if in the future another arsenic removal technology becomes available that will achieve the required PADEP NPDES discharge limits more economically it will be considered. If variations occur, such as increased contaminant concentration or increased flow rate, the selected system may not be capable of attaining the required effluent concentration limits. Options to address these potential variations will be evaluated as necessary during the detailed system design. Arsenic removal is not expected to be necessary in the alternatives with discharge to the POTW. The systems involving discharge to the POTW will comply with the Clean Water Act (33 U.S.C. §§1251 et seq.) General Pretreatment Regulations for Existing and New Sources of Pollution, as set forth at 40 CFR Part 403. However, RI water quality data indicates that pretreatment will not be warranted.

In addition to the above, all of the ground water treatment options under Alternatives 4 & 5 will require the following:

1) the performance of a hydrogeologic investigation including aquifer pumping tests and sampling to further delineate the vertical boundaries of the contaminated ground water plume; the presence of any potential Dense Non-Aqueous Phase Liquid ("DNAPL") contaminant source (See Section V.B.9. above for DNAPL discussion); and provide sufficient data to design an extraction system that will meet the objective to restore the contaminated ground water to MCLs;

2) abandonment of wells, in accordance with Commonwealth and local requirements, which serve no useful purpose in order to eliminate the possibility of these wells acting as a conduit for future ground water contamination;

3) performance of a Phase I archeological survey prior to any intrusive remedial activities;

4) periodic monitoring of ground water to determine the effectiveness of the selected ground water treatment alternative.

5. Alternative 4: GROUND WATER AND SOIL REMEDIATION

Alternative 4 below includes Alternative 2 and the common components described immediately above; plus, In-situ soil remediation and ground water extraction and treatment, as follows:

1) Institutional Controls
2) Point of use Carbon Filtration Units
3) Removal/Excavation and disposal of drums and sump
4) Additional Ecological Assessment
5) Structure Demolition
6) Long Term Ground Water Monitoring
7) Soil Investigation
8) Ground Water Pre-Design Study
9) In-situ vapor extraction and carbon adsorption
10) Ground water extraction and treatment via either air stripping, or granular activated carbon ("GAC") with discharge to West Valley Creek, or POTW.

Items 1) through 6) are described under Alternative 2 above. Items 7) & 8) are described in Subsections 4(a) & 4(b).

Item 9) In-situ vapor extraction and carbon adsorption, as follows.

Estimated Capital Costs:	$ 177,000
Estimated Total O&M Costs:	$ 279,000
Estimated 30 Year Total Present Worth Costs:	$ 456,000

Vacuum Extraction ("VE") is an in-situ process that requires minimal site disturbance prior to and during implementation. Under this alternative, VE wells would be installed to approximately 20 feet below grade in the area of concern. The wells would be connected to a vacuum. The VOCs in the subsurface soil would volatilize and be drawn to the extraction wells because of the induced vacuum. The vapor discharge from the VE system would pass through an off-gas vapor phase granular activated carbon ("GAC") treatment unit, to reduce contaminant concentrations in the air stream to allowable levels prior to discharge to the atmosphere. Discharge rates and VOC extraction concentrations would be monitored weekly for two months then monthly thereafter for two years or until the VOC concentrations being extracted are below the soil clean up standards. The soil clean up standards are set forth in Section IX.B.2.b.2. of this Record of Decision. The total O&M costs include the following: periodic air sampling to ensure compliance with air quality standards; At least two years of sampling to determine achievement of performance standards; periodic VE extraction well maintenance would be required; and periodic replacement/regeneration of the vapor phase carbon filtration unit in accordance with applicable regulations would be required.

Item 10) Ground Water Extraction and Treatment, could be any one of the following (A,B,C, or D):

A. Ground water extraction and treatment (air-stripping with vapor-phase carbon adsorption) with discharge to West Valley Creek;

Estimated Capital Costs:	$2,380,000
Estimated Total O&M Costs:	$5,153,500
Estimated 30 Year Total Present Worth Costs:	$7,533,500

This alternative involves ground water extraction and treatment of the contaminated ground water by air stripping. The air stripping system would include a treatment building, controls and an air stripper tower with a blower, discharge-pump, instrumentation and controls. The air and VOCs exiting the air stripping column would be treated by a vapor phase carbon adsorption unit. The treatment building would have space reserved for additional process equipment as needed. Ground water would be pumped from the extraction wells through buried pipelines to the ground water pre-treatment system for arsenic removal, if necessary, then to the air stripper tower. The ground water would be introduced at the top of the tower, and would flow countercurrent to a clean air stream introduced at the base of the stripping tower. The effluent from the tower would be discharged to West Valley Creek, a tributary of Brandywine Creek. The tower would be designed to remove VOCs from the ground water so that effluent discharge would comply with PADER's NPDES effluent limitations for discharge to West Valley Creek. Long term ground water monitoring would be required. The total O&M costs include the following: periodic maintenance of the pre-treatment system and air stripper system, periodic replacement/regeneration of the vapor phase carbon filtration unit in accordance with applicable regulations, periodic extraction well maintenance, and long term sampling and analysis costs.

B. Ground water extraction and treatment (liquid-phase carbon adsorption) with discharge to West Valley Creek;

Estimated Capital Costs:	$ 2,247,000
Estimated Total O&M Costs:	$10,075,000
Estimated 30 Year Total Present Worth Costs:	$12,322,000

This alternative involves ground water extraction and a system to treat contaminated ground water with liquid phase carbon adsorption. The adsorbent would be granular activated carbon ("GAC"). The carbon adsorption system would include a treatment building, controls and two liquid phase carbon filtration units in series. Ground water would be pumped from the extraction wells through buried pipelines to the ground water pre-treatment system for arsenic removal, if necessary. Effluent from the pretreatment system would be applied directly to the top of the lead carbon unit and would flow through the unit under pressure. Effluent from the lead carbon unit would then be applied to the top of the second adsorption unit. Effluent from the final GAC unit would be discharged to West Valley Creek. The liquid phase carbon filtration system would be designed to remove VOCs from the ground water so that effluent discharge would comply with PADER's NPDES effluent limitations for discharge to West Valley Creek. Long term ground water monitoring would be required. Spent carbon units would be shipped offsite approximately once per year for regeneration/disposal in accordance with applicable laws and regulations. The total O&M costs include the following: periodic maintenance of the pre-treatment system, periodic replacement/regeneration carbon filtration units in accordance with applicable regulations, periodic extraction well maintenance, and long term sampling and analysis costs.

C. Ground water extraction and treatment (air-stripping with vapor-phase carbon adsorption) with discharge to POTW;

Estimated Capital Costs:	$1,800,000
Estimated Total O&M Costs:	$12,218,000
Estimated 30 Year Total Present Worth Costs:	$14,018,000

This alternative involves ground water extraction and treatment of the contaminated ground water by air stripping. The air stripping system would include a treatment building, controls and an air stripper tower with a blower, discharge pump, instrumentation and controls. The air and VOCs exiting the air stripping column would be treated by a vapor phase carbon adsorption unit. The treatment building would have space reserved for additional process equipment as needed. Ground water would be pumped from the extraction wells through buried pipelines to the air stripper tower. The ground water would be introduced at the top of the tower, and would flow countercurrent to a clean air stream introduced at the base of the stripping tower. Effluent from the tower would be discharged to the local POTW. The tower would be designed to remove VOCs from the ground water so that effluent discharge would comply with POTW discharge permit requirements. Long term ground water monitoring would be required. The total O&M costs include the following: periodic maintenance of the pre-treatment system and air stripper tower, periodic replacement/regeneration of the vapor phase carbon filtration unit, periodic extraction well maintenance, POTW sewer usage charge and long term sampling and analysis costs.

D. Ground water extraction and treatment (liquid-phase carbon adsorption) with discharge to POTW;

Estimated Capital Costs:	$1,670,000
Estimated Total 0&M Costs:	$17,751,000
Estimated 30 Year Total Present Worth Costs:	$19,421,000

This alternative involves ground water extraction and a system to treat contaminated ground water with liquid phase carbon adsorption. The adsorbent would be granular activated carbon ("GAC"). The carbon adsorption system would include a treatment building, controls and two liquid phase carbon filtration units in series. Ground water would be pumped from the extraction wells through buried pipelines to the ground water pre-treatment system consisting of sand filters for solids removal. Effluent from the pretreatment system would be applied directly to the top of the lead carbon unit and would flow through the unit under pressure. Effluent from the lead carbon unit would then be applied to the top of the second adsorption unit. Effluent from the final GAC unit would be discharged to the local POTW. The liquid phase carbon filtration system would be designed to remove VOCs from the ground water so that effluent discharge would comply with POTW discharge permit requirements. Long term ground water monitoring would be required. Spent carbon units would be shipped offsite approximately once per year for regeneration/disposal in accordance with applicable regulations. The total O&M costs include the following: periodic maintenance of the pre-treatment and carbon filtration systems, periodic replacement/regeneration carbon filtration units in accordance with applicable regulations, periodic extraction well maintenance, POTW sewer usage charge and long term sampling and analysis costs.

6. Alternative 5: GROUND WATER; SOIL REMEDIATION & PUBLIC WATER SUPPLY

Alternative 5 described below includes the Limited Actions of Alternative 2 and common components described above in Subsections 4(a) & 4(b); soil excavation and off site disposal; ground water extraction and treatment, and extension of a waterline, as follows:

1) Institutional Controls
2) Point of use Carbon Filtration Units
   (until water line is extended)
3) Removal/Excavation and disposal of drums and sump
4) Additional Ecological Assessment
5) Structure Demolition
6) Long Term Ground Water Monitoring
7) Soil Investigation
8) Ground Water Pre-Design Study
9) Soil excavation and off site disposal
10) Ground water extraction and treatment via either
    air stripping, or granular activated carbon ("GAC")
    with discharge to West Valley Creek, or POTW
11) Extension of waterline.

Items 1) through 6) are described under Alternative 2 above. Items 7) & 8) are described in Subsections 4(a) & 4(b). Item 10) is described immediately above and 11) is described under Alternative 3 above.

Item 9) Excavation, off-site treatment/disposal of soil and buried wastes, as follows.

Estimated Capital Costs:	$ 513,000
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 513,000

This Alternative entails the excavation and off-site treatment and disposal of soil contaminated with volatile organic compounds ("VOCs") including TCE and 1,1,1 TCA at a RCRA Subtitle C hazardous waste landfill in accordance with the substantive requirements of the relevant and appropriate regulations. All soil containing soil contaminants of concern with concentrations higher than the clean-up standards would be included in the excavation and disposal. The soil contaminants of concern are listed in the soil excavation performance standard section of the Selected Remedy section of this Record of Decision. Currently, the estimated volume of soil which would be excavated is 232 cubic yards. This is based on the results of soil and subsurface sampling during the RI. However, the final volume of soils to be excavated would be further delineated following additional soil and subsurface soil sampling. As the excavation occurs, the material would be sampled until the results indicate that the soils do not contain the contaminants of concern above clean up standards. Once the excavation is complete, additional clean borrow material would be brought in to restore the excavation to original grade. Under this Alternative no operation & maintenance would be necessary.

The limited actions, common components, ground water treatment options and waterline extension evaluated under Alternative 5 are identical to those summarized under Alternatives 2, 3 and 4, respectively. Please refer to the Alternative summaries above for a summary of each option.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Each of the remedial alternatives described above were evaluated using nine criteria. The resulting strengths and weaknesses of the alternatives were then weighed to identify the alternative providing the best balance among the nine criteria. These nine criteria are:

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements ("ARARs")

Primary Balancing Criteria

- Reduction of toxicity, mobility or volume
- Implementability
- Short-term effectiveness
- Long-term effectiveness and permanence
- Cost

Modifying Criteria

- State acceptance
- Community acceptance

A. Protection of Human Health and the Environment

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it eliminates, reduces or controls current and potential risks posed through each exposure\pathway to acceptable levels through treatment, engineering controls, or institutional controls.

Alternative 1 (No Action) will not protect human health or the environment. Alternative 2 (Limited Actions) will to a limited extent prevent human exposure to Site soil and ground water contaminants, but will not actively reduce the contaminants in the soil or ground water or prevent migration of contaminated ground water. Alternative 3 will provide a permanent alternative water supply to affected residences and businesses which will prevent human exposure to ground water contaminants, however, it will provide only limited reduction in human exposure to Site soils and will not actively reduce the contaminants in the soil or ground water, or prevent migration of contaminated ground water. All of the ground water options under Alternatives 4 and 5 would prevent migration of and remove contaminants in the ground water system. The soil vapor extraction soil remediation under Alternative 4 may not be effective in the clay soil environment found at the Site. The excavation and off site disposal/treatment of site soils under Alternative 5 will effectively and permanently protect against risks posed by Site soils. Only Alternative 5 will permanently prevent human exposure to Site ground water contaminants, and prevent migration of contaminants in the ground water system in addition to actively, effectively and permanently removing contaminants from soil and ground water.

B. Compliance with ARARs

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State standards, requirements, criteria and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA Section 121(d)(4). Applicable requirements are those substantive environmental requirements, criteria, or limitations promulgated under Federal or State laws that specifically address hazardous substances found at the site, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the Site.

Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the site. ARARs may relate to the substances addressed by the remedial action (chemical-specific), to the location of the site (location specific), or the manner in which the remedial action is implemented (action-specific).

In addition to applicable or relevant and appropriate requirements, the lead agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to be considered" ("TBC") category consists of advisories, criteria, or guidance that were developed by EPA, other federal agencies or states that may be useful in developing CERCLA remedies. [A detailed listing of ARARs for the Selected Remedy is in Section X.B. of this Record of Decision.]

The concentrations of VOCs currently in the ground water exceed Maximum Contaminant Levels in the Safe Drinking Water Act. Once ground water treatment is implemented, remediation of ground water to levels that meet Federal and State ARARs will be required. All Ground water remediation options under Alternatives 4 and 5 will comply with all applicable or both relevant and appropriate federal and State environmental regulations. The soil remediation under both Alternative 4 and 5 will comply with all ARARs. Alternatives 2 and 3 would not attain ground water Maximum Contaminant Levels ("MCLs") which are enforceable, health based drinking water standards established under the Safe Drinking Water Act. Under Alternative 1, no actions would be taken, therefore, no ARARs would be attained.

C. Reduction of Toxicity, Mobility, or Volume

This evaluation criterion addresses the degree to which a technology or remedial alternative reduces toxicity, mobility or volume of hazardous substances.

Alternative 1 provides no reduction in toxicity, mobility or volume of Site contaminants. Alternatives 2 and 3 provide only limited reduction in the mobility of surface soil contamination through grading to prevent surface erosion, however, neither provide any reduction in toxicity, or volume of Site contaminants. Alternatives 4 and 5 include recovery and treatment of the contaminated ground water and either on or off site treatment and disposal of contaminated soils and will therefore, significantly reduce the toxicity, mobility and volume of the contaminants of concern by removing them.

D. Implementability

Implementability refers to the technical and administrative feasibility of a remedy, from design through construction, operation and maintenance. It also includes coordination of federal, State, and local governments to clean up the Site.

All of the actions under Alternative 2 are easily implementable. Alternative 3 would use standard engineering construction techniques and materials that have been used for many similar public water extensions, therefore, it should be readily implementable. Sufficient information is currently available for preliminary sizing of the extraction and treatment systems' components; however, these components are subject to modification during the final design of the ground water options under Alternatives 4 and 5. Ground water extraction using recovery wells and treatment by air stripping and GAC are proven technologies for treating contaminated ground water. The implementability of the Alternative 4 and 5 ground water options including discharge to POTW is contingent on the POTW accepting the extracted ground water. Based on the uncertainties surrounding potential future POTW requirements regarding volume and pretreatment, these options are not as easily implemented as options including discharge to West Valley Creek, and depending on the capacity at the POTW, may not be implementable. Soil vapor extraction called for under Alternative 4 to remediate soils may not be implementable in the clay and mixed waste subsurface soil environment present at the Site. Soil excavation and off site treatment/disposal called for under Alternative 5 is a proven technology which has been implemented at numerous other Superfund sites and is easily implementable.

E. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to achieve protection of human health and the environment and any adverse impacts that may be posed during the construction and operation period until performance standards are achieved.

Alternative 1 will have no short-term impacts. Alternatives 2, 4 and 5 all have similar short-term impacts related to dermal hazards associated with workers contacting either on site soils or the contaminated ground water, physical hazards associated with installing the recovery systems and effluent distribution piping, physical hazards during soil excavation and potential hazards to on site personnel. Potential dermal contact hazards can be minimized using appropriate personal protective equipment when contact with on site soils or contaminated ground water is possible. Alternative 3 will have those short-term impacts associated with installation of the water line including possible temporary disruption of traffic on Route 30, N. Ship Road, or Exner Lane and physical hazards to workers during excavations for the main.

F. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of the remedy to maintain reliable protection of human health and the environment over time. This evaluation criterion includes the consideration of residual risk and the adequacy and reliability of controls.

Alternatives 1, 2 and 3 will not actively reduce contaminant concentrations in the soil or ground water at the Site. However, natural attenuation, dispersion, and degradation could result in a decrease in contaminant concentrations over time. Under Alternative 1 potential risks associated with ingestion of the contaminated ground water will continue until the natural degradation process is complete, if ever. Alternative 2 will provide limited protection against human exposure to ground water contaminants through deed restrictions prohibiting ground water use and point of use carbon filtration units. Alternative 3 will permanently protect against human exposure to contaminated ground water. Neither Alternative 2 or 3 effectively addresses the soil contamination at the Site. The soil vapor extraction soil remediation under Alternative 4 may not be effective in the clay and mixed waste environment found at the Site. The excavation and off site disposal/treatment of site soils under Alternative 5 will effectively and permanently protect against risks posed by Site soils. The effectiveness of Alternatives 4 and 5 ground water options will depend on the actual flow and chemical characteristics of the final recovered ground water and the discharge requirements for the selected system. The ground water recovery system would effectively control the migration of ground water contaminants. Its effectiveness in removing contaminants to MCLs will be highly dependent on the characteristics of the aquifer, and the rate of contaminant desorption from the aquifer matrix. Alternative 5 permanently protects against human exposure to contaminated ground water by providing affected residents and businesses with a public water supply in addition to actively removing contaminants from on site soils and restoring ground water to MCLs.

G. Cost

This criterion examines the estimated costs for each remedial alternative evaluated in the Feasibility Study Report. A summary comparison of capital, O&M, and Present Worth costs for each alternative are presented in Table 17. Detailed alternative cost estimates can be found in Appendix D of this Record of Decision.

Alternative 1 is obviously the least expensive option, however, no actions to remediate the contamination at the Site would be taken. Alternative 2 is less expensive than Alternative 3, however, Alternative 3 provides a permanent potable water supply to affected residences and businesses while also including the limited actions of Alternative 2. Alternatives 4 and 5 are substantially more expensive than Alternative 2 or 3. Alternative 5 is the most expensive in general because it includes costs for the public water supply and limited actions as well as soil and ground water remediation. The range of costs indicated for the ground water options under Alternatives 4 and 5 is attributable to the differences in costs between the two ground water treatment options (air stripping vs. GAC filtration) and between the two ground water discharge options (West Valley Creek vs. POTW).

Of the ground water options in Alternatives 4 and 5, liquid-phase carbon treatment is more expensive than air stripping with vapor-phase carbon treatment, because considerably less carbon would need to be maintained for the air stripping vapor-phase system while removing the same quantity of VOCs over the life of the system.

Discharge to a POTW as described in the proposed plan will be considerably more expensive than discharge to surface water unless arsenic removal costs become prohibitive. The POTW would charge a significant discharge fee that would not be an expense incurred for discharge to West Valley Creek or other surface water. For soil treatment, in situ vapor extraction is slightly less expensive than off site treatment and disposal, however, off site treatment and disposal does not require any pilot testing or operation & maintenance. Also, soil vapor extraction may not be effective in the clay and mixed waste environment found at the Site. Appendix D provides detailed cost breakdowns for each alternative.

H. State Acceptance

PADEP has assisted EPA in the review of reports and Site evaluations. The Commonwealth of Pennsylvania Department of Environmental Protection agrees with the approach of EPA's Selected Remedy as described in the Declaration above.

I. Community Acceptance

A public meeting on the Proposed Plan was held on June 16, 1995 at the West Whiteland Township building in Exton, West Whiteland Township, Pennsylvania. Comments received orally at the public meeting and in writing during the public comment period are referenced in the Responsiveness Summary attached to this Record of Decision.

The vast majority of comments received focused on the proposed treated water discharge to West Valley Creek. EPA's detailed responses to the comments received are in the Responsiveness Summary, as mentioned above, and a detailed discussion of the changes made in the Selected Remedy after consideration of the comments received are in the Documentation of Changes from Proposed Plan, Section XI of this Record of Decision below.

EPA's Selected Remedy includes a component for discharge of treated effluent water. EPA retains the discretion, as part of the Remedy, to utilize any one (or a combination) of three identified discharge locations: 1) discharge to West Valley Creek as described in the proposed plan, 2) discharge to the on site pond, or 3) discharge to the proposed West Whiteland spray irrigation POTW. EPA has concluded that each of these locations is appropriate under the NCP. The decision as to which discharge option will be implemented will be made during the remedial design in consultation with the Commonwealth of Pennsylvania. EPA will keep citizens informed of the discharge location selection process through distribution of fact sheets and periodic public meetings during the remedial design.

In summary, the Selected Remedy is believed to provide the best balance of trade-offs among the alternatives evaluated with respect to the nine criteria above. Based on the information available at this time, EPA believes the Selected Remedy will protect human health and the environment, will comply with ARARs and be cost-effective. In addition, permanent treatment options would be utilized to the maximum extent practicable.

IX. THE SELECTED REMEDY; DESCRIPTION, PERFORMANCE STANDARD(S) AND COSTS FOR EACH COMPONENT OF THE REMEDY

A. General Description of the Selected Remedy

EPA carefully considered state and community acceptance of the remedy prior to reaching the final decision regarding the remedy.

The Agency's preferred remedy is set forth below. Based on current information, this alternative provided the best balance among the alternatives with respect to the nine criteria EPA uses to evaluate each alternative. The selected remedy consists of the following components:

1. Extraction and treatment via air stripping of groundwater with vapor phase carbon adsorption and subsequent discharge to either: 1) West Valley Creek, 2) the on site pond, or 3) West Whiteland spray irrigation POTW, following a predesign hydrogeologic investigation;

2. Excavation and off-site disposal of contaminated soils, following predesign soil investigations;

3. Installation of a water line;

4. Removal, decontamination and off-site disposal of drums and sump;

5. Structure Demolition/Restoration

6. Institutional controls

7. Performance of an Additional Ecological Assessment;

8. Provision of Point of Use Carbon Filtration Units (until waterline is extended)

9. Performance of a Phase I archeological survey prior to any intrusive remedial activities.

10. Long Term Ground Water Monitoring.

Each component of the Selected Remedy and its Performance Standards and Costs are described below.

B. Description, Performance Standard(s) and Costs of Each Component of the Selected Remedy

1. Extraction and Treatment via Air Stripping of Groundwater with Vapor Phase Carbon Adsorption and subsequent discharge to either: 1) West Valley Creek, 2) the On Site Pond, or 3) West Whiteland Spray Irrigation POTW, following a predesign hydrogeologic investigation;

1.a. Description

The groundwater shall be remediated through extraction and treatment via air stripping with vapor phase carbon adsorption throughout the area of the contaminant plume.

The treated groundwater effluent will be discharged to either West Valley Creek, the on-site pond, or the proposed West Whiteland spray irrigation POTW. The spent carbon from the vapor phase carbon units will be sent off site periodically for regeneration or disposal.

1.b. Performance Standards

1.b.1. Extraction wells shall create groundwater capture zones where the contaminated groundwater is hydraulically contained and shall prevent migration beyond the existing plume area. The exact number and location of extraction wells will be determined during the remedial design phase. The extent of the groundwater plume shall be fully determined through the use of monitoring wells. The performance of the extraction and treatment system shall also be monitored through use of monitoring wells. EPA, in consultation with the Commonwealth of Pennsylvania, will determine if additional monitoring wells are necessary to determine the extent of the ground water plume or performance of the system.

1.b.2. At least one round of samples shall be collected from existing Site monitoring wells as well as any additional monitoring wells installed, during the predesign phase, and analyzed for volatile organic compounds, in order to determine the extent of the groundwater contaminant plume at that time.

1.b.3. Aquifer pumping tests shall be performed during the predesign phase in order to define aquifer characteristics and determine possible dewatering effects, if any, the extraction system may have on the on site jurisdictional wetlands. Figure 16 shows the location of the jurisdictional wetlands area. If dewatering occurs and affects any endangered species or their habitat, a consultation will be made with the Commonwealth of Pennsylvania and the U.S. Fish & Wildlife Service regarding mitigation.

1.b.4. Groundwater shall be treated using an on site air stripping treatment system. The treatment system shall reduce the Site-related contaminants in the extracted groundwater, unattended, on a continuous, 24-hour-per-day performance basis.

1.b.5. A system to treat contaminated groundwater via airstripping with vapor phase carbon adsorption shall achieve 99% (percent) removal of VOCs in compliance with the substantive requirements of PADEP's NPDES regulations for discharge to surface water, or with the federal Clean Water Act (33 U.S.C. §§1251 et seq.) pretreatment regulations for existing and new sources of pollution as set forth at 40 CFR Part 403, if discharged to the West Whiteland spray irrigation POTW. The final combined pumping rate and the exact location, size, and number of wells shall be based on the ability to hydraulically control the contaminated groundwater plume. Final flow rates and air stripper system dimensions will be determined by EPA in consultation with PADEP during remedial design.

1.b.6. If during predesign, arsenic is detected above the NPDES discharge requirements for the Site, the system shall co-precipitate arsenic from the groundwater prior to entering the air stripper system. The current best available technology for arsenic removal from groundwater is co-precipitation during coagulation and flocculation precipitation of the groundwater for iron and manganese removal.

1.b.7. The treated groundwater effluent will be discharged to either West Valley Creek, the on-site pond, or the proposed West Whiteland spray irrigation POTW, following predesign investigation of the treatment system flow capacity, substantive NPDES requirements, or POTW pretreatment requirements, and further determination of any potential adverse effects of the on site drainage ditch or dewatering of on site wetlands to ecological receptors. The discharge point shall be the location that best protects human health and the environment, considering the identified factors and cost and implementability. Treated effluent will be discharged through a new outfall, or through a piping system if spray irrigation through the POTW is implemented, that shall be constructed as part of the remedial action.

1.b.8. The extraction and treatment system shall avoid, minimize and mitigate impacts on floodplains and wetlands (e.g., dewatering wetlands, discharge to either West Valley Creek, the on site pond or connection to the West Whiteland spray irrigation POTW). The performance standard will be compliance with Executive Order No. 11988 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on floodplains), and Executive Order No. 11990 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on wetlands).

1.b.9. An operation and maintenance plan shall be developed for the groundwater extraction system during the remedial design phase. The operation and maintenance plan shall be developed and implemented to determine the operation and performance of the system within design criteria and achievement of performance standards. At a minimum, the influent and effluent from the treatment facility shall be sampled twice per month for volatile organic compounds. Operation and maintenance of the groundwater extraction system shall continue for an estimated 30 years or such other time period as EPA, in consultation with the Commonwealth of Pennsylvania, determines to be necessary, based on the statutory reviews of the remedial action which shall be conducted no less often than every five years from the initiation of the remedial action in accordance with the EPA guidance document, Structure and Components of Five-Year Reviews (OSWER Directive 9355.7-02, May 23, 1991). 5-year statutory reviews under Section 121(c) of CERCLA will be required, as long as hazardous substances remain onsite and prevent unlimited use and unrestricted access to the Site. The performance of the ground water extraction and treatment system shall be carefully monitored on a regular basis, as described in the long-term ground water monitoring component of this Selected Remedy. The system may be modified, as warranted by the performance data collected during operation to achieve Performance Standards. These modifications may include, for example, alternate pumping of the extraction well(s) and the addition or elimination of certain extraction wells.

1.b.10. The operation and maintenance plan shall be revised after construction of the collection system has been completed if it is determined to be necessary by EPA.

1.b.11. Neither the extraction system nor discharge of treated ground water shall adversely affect the thermal regime of West Valley Creek. A comprehensive analysis of the groundwater extraction system shall be made prior to implementation to determine the thermal effects the system may have on West Valley Creek. West Valley Creek will be monitored downstream of any discharge to ensure the requirements of Pennsylvania Water Quality Standards 25 Pa. Code Section 93.7 are maintained. The analysis shall include establishment of West Valley Creek background conditions, and modeling of the background data to

demonstrate the thermal effects of any dewatering of affected feeder springs and the discharging of the treated effluent. The establishment of background conditions for West Valley Creek shall include, at a minimum, temperature and flow readings from downstream locations, the exact number and locations to be determined during the remedial design in consultation with the Commonwealth of Pennsylvania. The exact frequency and duration of measurements and methods to be used also, will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase. The analysis shall include, if necessary, mitigation plans for maintaining the background thermal regime of West Valley Creek.

1.b.12. Existing pumping and monitoring wells which serve no useful purpose shall be properly plugged and abandoned consistent with PADEP's Public Water Supply Manual, Part II, Section 3.3.5.11 and Chester County Health Department Rules and Regulations Chapter 500, in order to eliminate the possibility of these wells acting as a conduit for future groundwater contamination. Wells which EPA determines are necessary for use during the long term monitoring program will not be plugged.

1.b.13. The ground water plume shall be pumped and treated until the Maximum Contaminant Level ("MCL") or the non zero MCLG for the contaminants of concern [40 C.F.R. part 141] whichever is more stringent is achieved.

The performance standard for major contaminants of concern in the groundwater are listed below:

Contaminant	MCL(ug/l)	MCLG (ug/l)
Trichloroethene	5	0
1,1,1-Trichloroethane	200	200
1,1-Dichloroethene	7	7
1,1-Dichloroethane	81*	-
1,1,2-Trichloroethane	5	3
cis-1,2 Dichloroethene	70	70
1,2-Dichloropropane	5	0
Tetrachloroethene	5	0
Vinyl Chloride	2	0
Toluene	1,000	1,000
Chloroform (THM)	100	0
Arsenic	50	-
Manganese	80*	-

*Non-carcinogenic health-based concentration

1.b.14. Discharge to either West Valley Creek, or the on site pond shall comply with the appropriate substantive requirements of the NPDES discharge regulations set forth in the Pennsylvania NPDES Regulations 25 Pa. Code §92.31, and the Pennsylvania Water Quality Standards (25 Pa. Code §§93.1-93.9). Pursuant to the PADEP's determination monitoring for all the other contaminants of concern shall take place.

1.b.15. Discharge to the POTW will comply with the Clean Water Act (33 U.S.C. §§1251 et seq.) pretreatment regulations for existing and new sources of pollution as set forth at 40 CFR Part 403. However, RI water quality data indicates that pretreatment will not be warranted.

1.b.16. Air emissions from the air stripping units shall meet the requirements of the Resource, Conservation & Recovery Act ("RCRA") regulations set forth at 40 C.F.R. Part 264, Subpart AA - (Air Emission Standards for Process Vents). The total organic emissions from all affected process vents at the Site are required to be below 1.4 kg/hr and 2800 kg/yr under this regulation. Any vinyl chloride air emissions from the groundwater treatment units will comply with Section 112 of the Clean Air Act, 42 U.S.C. §7412, National Emission Standard For Hazardous Air Pollutants (NESHAPs). The relevant and appropriate NESHAP for vinyl chloride is set forth at 40 C.F.R. Part 61, Subpart F. The air emissions will also comply with the Commonwealth of Pennsylvania regulations set forth at 25 Pa. Code, Chapter 127, Subchapter A. Those regulations require that emissions be reduced to the minimum obtainable levels through the use of Best Available Technology ("BAT"), as defined in 25 Pa. Code §121.1.

1.b.17. The off site shipment of spent vapor phase carbon units will comply with the requirements of: 25 Pa. Code Chapter 262 Subparts A (relating to hazardous waste determination and identification numbers), B (relating to manifesting requirements for off-site shipments of spent carbon or other hazardous wastes), and C (relating to pretransport requirements; 25 Pa. Code Chapter 263 (relating to transporters of hazardous wastes); and with respect to the operations at the Site generally, with the substantive requirements of 25 Pa. Code Chapter 264, Subparts B-D, I (in the event that hazardous waste generated as part of the remedy is managed in containers), 25 Pa. Code Chapter 264, Subpart J (in the

event that hazardous waste is managed, treated or stored in tanks). 40 C.F.R. 268 Subpart C, Section 268.30 and Subpart E (regarding prohibitions on land disposal and prohibitions on storage of hazardous waste).

1.c. Groundwater Remedy Implementation

It may become apparent during implementation or operation of the ground water extraction system and its modifications, that contaminant levels have ceased to decline and are remaining constant at levels higher than Performance Standards over some portion of the contaminant plume. If EPA, in consultation with the PADEP, determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the Performance Standards throughout the entire area of the contaminant plume, EPA, in consultation with the Commonwealth, may require that any or all of the following measures be taken, for an indefinite period of time, as further modification(s) of the existing system:

a) long-term gradient control provided by low level pumping, as a containment measure;

b) chemical-specific ARARs may be waived for those portions of the aquifer that EPA, in consultation with the Commonwealth determine that are technically impracticable to achieve further contaminant reduction such determinations shall be reevaluated at each subsequent five-year review;

c) institutional controls may be provided/maintained to restrict access to those portions of the aquifer where contaminants remain above performance standards; and

d) remedial technologies for ground water restoration may be reevaluated.

The decision to invoke any or all of these measures may be made during implementation or operation of the remedy or during the 5-year reviews of the remedial action. If such a decision is made, EPA shall amend the ROD or issue an Explanation of Significant Differences.

1.d. Estimated Costs

Estimated Capital Costs:	$2,380,000
Estimated Total O&M Costs:	$5,153,500
Estimated 30 Year Total Present Worth Costs:	$7,533,500

A detailed cost estimate of this portion of the Selected Remedy can be found in Appendix D. The estimate is titled Groundwater Alternative 4A(1) and 4B(1).

2. Excavation and Off-Site Disposal of Contaminated Soils

2.a. Description

This portion of the remedy consists of excavation and offsite disposal of an estimated 232 cubic yards of soil contaminated with VOCs including TCE and 1,1,1 TCA from the AIW Frank Corporation's former above ground solvent storage tank area.

2.b. Performance Standards

2.b.1. As part of the remedial design additional sub-surface soil samples shall be collected in the above ground solvent storage tank area, and analyzed to fully characterize the areal extent of the subsurface soil contamination and assess the need for additional excavation. Figure 2 illustrates the general location of this area. This area was not fully characterized in the Remedial Investigation. The number and location of the subsurface soil samples, and the analytical parameters and methods to be used will be determined by EPA, in consultation with the PADEP, during the remedial design phase.

2.b.2. All soils with concentrations of contaminants of concern that are above levels protective of groundwater from the AIW Frank former above ground solvent storage tank area shall be removed. Excavation will continue until the soil left in place meets the soil clean-up standards. The listing of the subsurface soil contaminants of concern at the Site and the appropriate soil clean-up standards are:

Contaminant	Soil Clean-up Standard (ug/l)
Trichloroethene	2000
1,1 dichloroethene	1000
1,1 dichlorethane	500
1,1,1 trichloroethane	1000
tetrachloroethene	2000

These levels are based on an amount of residual contamination that if left in the soil, would not cause the ground water to be contaminated above Maximum Contaminant Levels. These levels, if left in the surface and subsurface soils would also not pose a carcinogenic risk greater than EPA's risk range of 1 x 10-4 to 1 x 10-6 for ingestion and dermal contact exposure routes.

2.b.3. Any asphalt and subbase in the excavation area will be removed and staged for offsite disposal in accordance with applicable laws and regulations. Asphalt and subbase debris may be eligible for disposal as non hazardous under the land disposal restrictions "debris rule" 40 C.F.R. § 268.45 following the appropriate determinations.

2.b.4. Excavation will then begin in the AIW Frank former above ground solvent storage tank area using a backhoe, and the sides of the excavation area shall be cut back to a minimum 2 to 1 slope to prevent side wall failure. Structural stability shall be maintained with temporary shoring or engineering measures as appropriate.

2.b.5. Sediment and erosion controls and temporary covers will be installed to protect exposed soil from the effects of weather consistent with PADEP's Bureau of Soil and Water Conservation Erosion and Sediment Pollution Control Manual. Erosion potential shall be minimized. Further, controls in the form of Site grading to improve land grades, cover soils, vegetation, and drainage channels to reduce erosion potential from surface runoff may be required to minimize erosion. Contaminated soils shall be prevented from being washed into on site surface water and adjacent uncontaminated and uncontrolled wetland areas during remedial action implementation. The extent of erosion control necessary will be determined by EPA, in consultation with the PADEP, during the remedial design phase.

2.b.6. Excavation will continue to a depth of 8 feet or shallower if bedrock is encountered.

2.b.7. Post-excavation sampling will be performed after the excavation is completed pursuant to 2.b.6. above. Post-excavation samples will be obtained from the base and the sidewalls of the excavation to ensure that contamination is not present above the soil clean-up Performance Standards specified in 2.b.2. The location of the post-excavation samples will be selected based on visual observation of lithology and screening for VOCs using an appropriate organic vapor detector. The samples will be analyzed for VOCs on a quick turnaround basis using a method approved by EPA.

2.b.8. If the post-excavation sample concentrations are below the clean-up level, the excavation will be backfilled using clean soil. Clean borrow material will be brought in to restore the excavation to original grade. Backfilling will be performed, and the material will be compacted to minimize the potential for subsidence. The excavation area shall be covered with a layer of cover soil and revegetated with native plant material until a viable cover is established.

2.b.9. If VOCs are detected at levels above soil clean up performance standards in the post-excavation samples, additional material will be removed from the excavation area and new samples obtained for analysis as discussed in 2.b.7. Excavation and sampling activities will continue until the results indicate that the soils do not contain contaminants of concern above the performance standards. The excavation area will then be restored as described in 2.b.8.

2.b.10. Soil contaminated above the Performance Standards specified in 2.b.2 above will be transported for disposal at a permitted RCRA Subtitle C Hazardous Waste Landfill in accordance with applicable laws and regulations. The appropriate determinations will be made prior to disposal to determine if further treatment is necessary prior to disposal under RCRA land disposal restrictions.

2.c. Estimated Costs

Estimated Capital Costs:	$ 513,000
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 513,000

A detailed cost estimate of this portion of the Selected Remedy can be found in Appendix D. The estimate is titled Soil Remediation Alternative 4A.

3. Installation of a Water Line

3.a. Description

This portion of the remedy will provide a source of potable water to the affected and potentially affected residents and businesses by extending a municipal water line to the area of concern in the vicinity of the Site (see Figure 12). The Philadelphia Suburban Water Company currently supplies water to West Whiteland Township, and has sufficient capacity at this time to provide water. Only those residents and businesses currently impacted or potentially impacted by the contamination in the groundwater will be connected to the municipal water system.

3.b. Performance Standards

3.b.1. The water supply system shall be constructed in compliance with the requirements of the Philadelphia Suburban Water Company and local and State requirements, appropriate and authorized under CERCLA.

3.b.2. Connections shall be offered and provided to the residences and businesses determined by EPA in consultation with PADEP during the remedial design to be affected or potentially affected by the plume of contamination. Potentially affected wells include those that are within or near the boundaries of the contaminated groundwater plume and those that are hydraulically impacted by the remedial action.

3.b.3. The water line will be installed in a trench below the freeze line and brought into the area of the contaminated ground water plume so that all businesses and residents that EPA determines are affected and potentially affected by the ground water contaminant plume can be provided hook ups.

3.b.4. Independent connections will then be brought from the main into each of the businesses and residents affected and potentially affected by the contaminated ground water plume.

3.b.5. Following hook up, costs of public water usage shall be the responsibility of the appropriate residence or business.

3.b.6. Fire hydrants will be installed according to Township requirements along the water line.

3.b.7. All areas impacted by the construction activities during remedy implementation shall be graded, restored and revegetated, as necessary.

3.b.8. The existing residential wells shall be abandoned unless selected by EPA for long term monitoring, in accordance with the requirements of the Pennsylvania Safe Drinking Water Act 25 PA Code 109.602(c) and consistent with PADEP's Public Water Supply Manual, Part II, Section 3.3.5.11. and Chester County Health Department Rules and Regulations Chapter 500.

3.b.9. The installation of the water line shall avoid, minimize and mitigate impacts on floodplains and wetlands (e.g., installation of the municipal water line). The performance standard will be compliance with Executive Order No. 11988 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on floodplains), and Executive Order No. 11990 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on wetlands).

3.c. Estimated Costs

Estimated Capital Costs:	$ 2,529,000
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 2,529,000

This cost estimate was broken out of the detailed alternative costs for Alternative 3 Limited Actions and Connection to Public Water Supply which can be found in Appendix D. All costs for limited actions were subtracted to arrive at the estimated costs presented above.

4. Removal, Decontamination and Off-Site Disposal of Drums and Sump.

4.a. Description

This component of the remedy will include the removal, and off site disposal of four 55-gallon drums located in the AIW Frank Corporation's rear building. The second portion of this component of the selected remedy will be the removal of a contaminated sump through excavation and off-site treatment and disposal of the sump contents. The concrete sump is located approximately 50 feet from the east property

line and 50 feet from the southeast corner of the rear building foundation. The sump is approximately three feet by three feet with a depth of two feet.

4.b. Performance Standards

4.b.1. The drums and their contents will be treated and/or disposed of following sampling and analysis for waste characterization in accordance with 40 C.F.R. § 261.24 by the Toxic Characteristic Leaching Procedure ("TCLP") at an appropriate permitted RCRA landfill or other permitted disposal or treatment facility.

4.b.2. The sump contents will be sampled and analyzed for waste characterization prior to treatment and disposal off-site in accordance with 40 C.F.R. § 261.24 by the Toxic Characteristic Leaching Procedure ("TCLP") at the appropriate RCRA permitted treatment and/or disposal facility. The sump may be eligible for disposal as non hazardous under the land disposal restrictions "debris rule" 40 C.F.R. § 268.45 following the appropriate determinations.

4.b.3. If the drums and sump contents are determined to be hazardous wastes the remedy shall be implemented consistent with the following requirements, which are applicable, of PA Code §§ 262.11 and 262.12 (relating to hazardous waste determination and identification numbers), 25 PA Code 262.20-262.23 (relating to manifesting requirements for offsite shipments of spent carbon or other hazardous wastes), and 25 PA Code §§ 262.30 - 262.34 (relating to pretransport requirements); 25 PA Code §§ 263.10 - 263.31 (relating to transporters of hazardous wastes); and with respect to the operations at the Site generally, with the requirements of PA Code §§ 264.10 - 264.56 and 264.170 - 264.178 (in the event that hazardous waste generated as part of the remedy is managed in containers), 25 PA Code §§ 264.190 - 264.199 (in the event that hazardous waste is managed, treated, or stored in tanks); and if prohibited by land disposal restrictions, 40 CFR Part 268 Subparts A and C.

4.c. Estimated Costs

Estimated Capital Costs:	$ 57,816
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 57,816

This cost estimate was broken out of the detailed alternative costs for Alternative 2 Limited Actions which can be found in Appendix D. A detailed breakdown of the above estimate can also be found in Appendix D entitled Drum and Sump Removal Detailed Cost Estimate.

5. Structure Demolition or Restoration to code to allow unrestricted site access.

5.a. Description

The AIW Frank Corporation rear building, which is a one story concrete/corrugated structure measuring 180 feet by 160 feet, has been specifically cited as an unsafe structure by the West Whiteland Township building code officer. The rear building, and any other on site structure which poses a safety risk to on site workers when carrying out the remedy or interferes with implementation of the selected remedy called for in this ROD, will be demolished or restored to code in accordance with all appropriate federal, state and local regulations.

5.b. Performance Standards

5.b.1. The structure demolition or restoration to code will include all Site structures which pose a safety hazard to on site workers, or interferes with the implementation of the selected remedy.

5.b.2. Any restoration of existing Site structures shall comply with all Local codes.

5.b.3. Demolition debris waste will be disposed of at a permitted construction/demolition waste landfill as defined in 25 Pa Code Chapter 271.

5.c. Estimated Costs

Estimated Capital Costs:	$ 250,000
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 250,000

6. Institutional Controls to limit options for future Site use.

6.a. Description

Institutional controls will be used to identify the Site as property underlain by contaminated groundwater, and prevent the use of contaminated ground water until the remedy is completed.

6.b. Performance Standards

6.b.1. Until the Selected Remedy is completed, no newly commenced or expanded ground water pumping in the aquifer shall adversely affect the Performance Standards of hydraulic containment, prevention of plume migration and capture of contaminants as specified above.

6.b.2. Drinking water supply wells shall not be installed in the area of the contaminated ground water plume until the remedy is completed and the Performance Standards for ground water remediation are attained as specified in 1.b.12. above.

6.b.3. Deed restrictions shall be used to implement the requirements of 6.b.1. and 6.b.2., along with other appropriate means of achieving these requirements.

6.b.4. The deed restrictions will be appropriately recorded with the Chester County Recorder of Deeds.

6.c. Estimated Costs

Estimated Capital Costs:	$ 11,000
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 11,000

This cost estimate was broken out of the detailed alternative costs for Alternative 2 Limited Actions which can be found in Appendix D.

7. Additional Ecological Assessment

7.a. Description

The potential presence of a state-listed endangered species was identified in the ecological assessment conducted for the RI. A limited additional ecological assessment is needed to determine the actual presence of the state-listed endangered species in the Site area. The on site drainage ditch and the area north of the rear building were not fully characterized for their impact on ecological receptors in the Remedial Investigation. Sampling will be conducted to fully characterize the soils and sediment and assess the need for additional excavation or grading in the ditch.

7.b. Performance Standards

7.b.1. A qualified herpetologist will be retained to determine the presence of the endangered species. If present, EPA will consult with the U.S. Fish & Wildlife Service regarding potentially adverse impacts of remedial measures on the endangered species and or its habitat. If it is determined to be necessary the remedy will be modified as appropriate to avoid adverse impacts on the endangered species or its habitat.

7.b.2. Surficial soil samples as well as sediment samples shall be collected in the on site drainage ditch, north of the rear building areas, and from pond sediments where the ditch flow enters. The analytical parameters for sample analysis will include, but may not be limited to, PCBs, PAHs, mercury, copper, lead and zinc. The number and location of the soil and sediment samples, and the exact analytical parameters and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase.

7.b.3. The additional ecological assessment will include analysis of fish from the on site pond. The exact number, method and analytical parameters of the sampling will be determined by EPA in consultation with the Commonwealth of Pennsylvania during remedial design.

7.b.4. If it is determined by EPA, in consultation with the Commonwealth of Pennsylvania, that an unacceptable risk is posed to ecological receptors due to surface water runoff and/or treated effluent discharge to the on site pond via the on site drainage ditch, excavation, grading and revegetation, using the appropriate native vegetation, of the drainage ditch soils will be conducted. Excavation, grading and revegetation, if necessary, will be conducted prior to any treated water discharge to the on site

pond if the pond discharge option is implemented.

7.c. Estimated Costs

Estimated Capital Costs:	$ 48,240
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 48,240

A detailed breakdown of the above estimate can also be found in Appendix D entitled Additional Ecological Assessment Detailed Cost Estimate.

8. Provision of Point of Use Carbon Filtration Units

8.a. Description

This portion of the remedy will require the provision and maintenance of point of use carbon filtration units to those affected residents and businesses whose wells have been found to have contaminants of concern above Maximum Contaminant Levels.

8.b. Performance Standards

8.b.1. Point of use carbon filtration units shall be installed for any residence or business whose well has been found to have contaminants of concern above MCLs. The point of use carbon filtration units shall be maintained to insure that contaminants of concern are removed in conformance with requirements of the SDWA, until such time as the waterline extension has been implemented at which time the units will be removed.

8.b.2. The carbon filtration units will be sampled bi-annually for volatile organic contaminants using EPA method 524.1, or an equivalent method to ensure that breakthrough of contaminants has not occurred.

8.b.3. If the bi-annual sampling indicates that breakthrough has occurred the spent carbon unit will be replaced and the spent carbon will be sent for regeneration, or disposal in compliance with all State and Federal regulations.

8.c. Estimated costs

Estimated Capital Costs:	$ 6,000
Estimated Total O&M Costs:	$ 13,500
Estimated 30 Year Total Present Worth Costs:	$ 19,500

A detailed breakdown of the above estimate can also be found in Appendix D entitled Provision of Carbon Filtration Units Detailed Cost Estimate.

9. Performance of a Phase I archeological survey prior to any intrusive remedial activities.

9.a. Description

This portion of the remedy calls for the performance of a Phase I archeological survey prior to any intrusive remedial activities.

9.b. Performance Standards

9.b.1. The Phase I archeological survey will be conducted prior to any intrusive remedial activities and will be in accordance to and compliance with the National Historic Preservation Act of 1986 16 U.S.C. § 470 (Chapters 106 and 110 (f) and 36 CFR part 800) and the Archeological and Historic Preservation Act of 1974 (16 U.S.C. § 469a-1).

9.b.2. The remedy will be adjusted, as necessary, during implementation of the remedy to comply with the substantive requirements of the National Historic Preservation Act of 1986 16 U.S.C. § 470 (Chapters 106 and 110(f) and 36 CFR part 800) and the Archeological and Historic Preservation Act of 1974 (16 U.S.C. § 469a-1).

9.c. Estimated Costs

Estimated Capital Costs:	$ 5,000
Estimated Total O&M Costs:	$ 0
Estimated 30 Year Total Present Worth Costs:	$ 5,000

10. Long Term Groundwater Monitoring

10.a. Description

This portion of the remedy calls for a long term sampling plan to evaluate the effectiveness of the ground water extraction and treatment system.

10.b. Performance Standards

10.b.1. A long-term ground water monitoring program shall be implemented to evaluate the effectiveness of the ground water pumping and treatment system.

10.b.2. The plan for the long-term ground water monitoring program shall be included in the operation and maintenance plan for the ground water extraction and treatment system. The plan shall include the sampling of a sufficient number of wells to monitor the effectiveness of extraction and treatment system. EPA, in consultation with PADEP, will determine the number and location of monitoring wells necessary to verify the performance of the remedial action.

10.b.3. The installation of additional monitoring wells may be required. Numbers and locations of these monitoring wells shall be determined by EPA during the remedial design, in consultation with the PADEP.

10.b.4. The wells shall be sampled quarterly for the first three years. Based on the findings of the first three years of sampling, the appropriate sampling frequency for subsequent years will be determined by EPA in consultation with the PADEP.

10.b.5. Sampling and operation and maintenance shall continue until such time as EPA, in consultation with the Commonwealth of Pennsylvania, determine that the performance standard for each contaminant of concern has been achieved to the extent technically practicable throughout the entire area of ground water contamination.

10.b.6. If EPA and the Commonwealth make such a determination, the wells shall be sampled for twelve consecutive quarters throughout the entire plume and if contaminants remain at or below the performance standards, the operation of the extraction system shall be shut down.

10.b.7. Annual monitoring of the ground water shall continue for five years after the system is shutdown.

10.b.8. If subsequent to an extraction system shutdown, annual monitoring shows that ground water concentrations of any contaminant of concern are above the Performance Standard set forth in 1.b.12. above, the system shall be restarted and continued until the performance standards have once more been attained for twelve consecutive quarters. Semi-annual monitoring shall continue until EPA determines, in consultation with the Commonwealth of Pennsylvania, that the Performance Standards in 1.b.12. for each contaminant of concern has been achieved on a continuing basis.

10.c. Estimated Costs

The estimated costs for long term ground water monitoring are included in the cost estimate for the ground water extraction and treatment system listed in 1.c. above.

Worker Safety

During all Site work, Occupational Safety and Health Administration ("OSHA") standards set forth at 29 C.F.R. Parts 1910, 1926 and 1904 governing worker safety during hazardous waste operations, shall be complied with.

Five-Year Reviews

Five-year reviews shall be conducted after the remedy is implemented to assure that the remedy continues to protect human health and the environment. A 5-Year Review Work Plan shall be required and shall be approved by EPA in consultation with the PADER.

X. STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. Section 121 of CERCLA also requires that the selected remedial action comply with ARARs, be cost effective, and utilize permanent treatment technologies to the maximum extent practicable. The following sections discuss how the selected remedy for the AIW Frank/Mid-County Mustang Site meets these statutory requirements.

A. Protection of Human Health and the Environment

Based on the baseline Human Health Risk Assessment for the Site, measures should be considered to reduce potential risk from the following sources: (1) VOCs in the ground water, (2) VOCs in on site surface and subsurface soils. These media and contaminants were selected because potential health hazards for some exposure scenarios exceeded the EPA target range of 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) for lifetime cancer risk or a non-cancer Hazard Index of one (1). The results of the Ecological Risk Assessment show the potential for risk to ecological receptors, however, additional characterization is need before a final determination can be made.

The extension of a public water supply called for in the selected remedy will provide a permanent alternative water supply to affected and potentially affected residences and businesses which will prevent current human exposure to ground water contaminants, however, it will provide only limited reduction in human exposure to Site soils and will not actively reduce the contaminants in the soil or ground water, or prevent migration of contaminated ground water. The ground water pump and treat system will reduce the contamination in the ground water.

The selected remedy protects human health and the environment by reducing levels of contaminants in the ground water to those levels required by ARARs through extraction and treatment. The groundwater extraction and treatment system shall reduce the levels of contaminants of concern in the groundwater to achieve MCLs as required by the Safe Drinking Water Act, 42 U.S.C. §§ 300(f) - 300(j), and 40 C.F.R. § 141.61. Discharge of the treated water through any of the discharge point options will not adversely affect human health or the environment, provided that all Performance Standards and ARARs are met.

The excavation of soil on site will protect human health and the environment by removing the contaminated soil, thereby eliminating the potential for contaminant migration to the ground water and preventing future exposure through ingestion, inhalation and dermal contact.

Implementation of the selected remedy will not pose any unacceptable short term risks or cross media impacts to the Site, or the community.

B. Compliance with and Attainment of Applicable or Relevant and Appropriate Requirements ("ARARs")

The selected remedy will comply with all applicable or relevant and appropriate chemical-specific, location-specific and action specific ARARs. Those ARARs are:

1. Chemical Specific ARARs

The selected remedy will be designed to achieve compliance with chemical-specific ARARs related to ground water at the site. The contaminants of concern from the AIW Frank/Mid-County Mustang Site and their respective MCLs which are listed under the performance standards of the Ground Water Extraction and Treatment Section of the Selected Remedy of this ROD, are applicable for this action. The groundwater extraction and treatment system shall reduce the levels of contaminants of concern in the groundwater to achieve MCLs as required by the Safe Drinking Water Act, 42 U.S.C. §§ 300(f) - 300(j), and 40 C.F.R. § 141. If a non-zero Maximum Contaminant Level Goal ("MCLG") has been established and is more stringent than the MCL, the MCLG shall be attained.

2. Location Specific ARARs

The Pennsylvania Erosion Control Regulations, 25 PA Code §§ 102.1 - 102.5, 102.11 - 102.13, and 102.21 -102.24, regulate erosion and sedimentation control. These regulation are applicable to the grading and excavation activities associated with the selected remedy.

The National Historic Preservation Act of 1986, 16 U.S.C. § 470 (Chapters 106 and 110(f), and 36 CFR part 800) and the Archeological and Historic Preservation Act of 1974 (16 U.S.C. § 469a-1) are applicable to the performance Phase I archeological survey. The selected remedy shall comply with the applicable substantive requirements of theses statutes.

No Federally listed endangered species are in the vicinity of the Site. However, it was determined that there was a possibility that some State listed/Federal candidate endangered species may exist in the Site area. Therefore, the Endangered Species Act, 16 U.S.C. 1531, will be applicable if the State listed/Federal candidate endangered species are present to provide for appropriate consultation and prevent the taking of the protected species and the destruction of habitat.

The Dam Safety and Waterway Management Act, 25 PA Code §§ 105.1 - 105.3, 105.12, and 105.19 are location-specific regulations for the drainage ditch as it is considered a water of the Commonwealth.

40 C.F.R. § 6.302 Subpart C (a), (b) and (g) addressing wetlands, floodplain, and fish and wildlife apply to the ground water, drainage ditch and wetlands.

3. Action Specific ARARs

Section 402 of the Clean Water Act, 33 U.S.C. §1342, and the National Pollutant Discharge Elimination System ("NPDES") discharge regulations set forth at 40 CFR §§ 122.41-122.50, the Pennsylvania NPDES regulations (25 PA Code §§ 92.1 and 92.31), the Pennsylvania Wastewater Treatment Regulations (25 PA Code §§95.1 - 95.3), and the Pennsylvania Water Quality Standards (25 PA Code §§93.1 - 93.9) are applicable. Ground water collected under the selected remedy shall be treated to comply with these applicable substantive requirements prior to discharge.

Any treated effluent discharge to the POTW will comply with the federal Clean Water Act (33 U.S.C. §§ 1251 et seq.) pretreatment regulations for existing and new sources of pollution as set forth at 40 CFR Part 403.

VOC emissions from the air stripper tower will be governed by the Pennsylvania Department Of Environmental Protection air pollution regulations. Air Emissions will also comply with 40 C.F.R. §§ 264.1030 - 264.1034 (Air Emissions Standards for Process Vents), and with 40 C.F.R. §§ 264.1050 - 264.1063 (Air Emissions Standards for Equipment Leaks). Air emissions of Vinyl Chloride will comply with 40 C.F.R. Parts 61.60 - 61.69, National Emission Standards for Hazardous Air Pollutants (NESHAPS).

Federal Clean Air Act requirements, 42 U.S.C. §§7401 et seq., are applicable and must be met for the discharge of contaminants to the air. Air permitting and emissions ARARs are outlined in 25 PA Code §§ 121.1 - 121.3, 121.7, 123.1, 123.2, 123.31, 123.41, 127.1, 127.11, 127.12, and 131.1 - 131.4. 25 PA Code § 127.12 requires all new air emission sources to achieve minimum attainable emissions using the best available technology ("BAT"). In addition, the PADEP air permitting guidelines for remediation projects require all air stripping and vapor extraction units to include emission control equipment.

Fugitive dust emissions generated during remedial activities will be controlled in order to comply with fugitive dust regulations in the federally-approved State Implementation Plan ("SIP") for the Commonwealth of Pennsylvania, 25 PA Code §§ 123.1 - 123.2. and the National Ambient Air Quality Standards for Particulate Matter in 40 C.F.R. §§ 50.6 and PA Code §§ 131.2 and 131.3

25 PA Code §§ 123.31 and 123.41 which prohibits malodors detectable beyond the AIW Frank/Mid-County Mustang property line is applicable to the selected remedial alternative.

25 PA Code § 264.90 - 264.100 (Subchapter F), regarding groundwater monitoring is applicable to the selected remedial alternative.

RCRA listed constituents (TCE, 1,1,1 TCA, etc.) will exist in the excavated soil, therefore, the remedy will be implemented consistent with the following substantive requirements, which are applicable to on site activities, of PA Code §§ 262.11 - 262.13 (relating to hazardous waste determination and identification numbers), 25 PA Code § 262.34 (relating to pretransport requirements); 25 Pa. Code Chapter 263 (relating to transporters of hazardous wastes); and with respect to the operations at the Site generally, with the substantive requirements of 25 Pa. Code Chapter 264, Subparts B-D, I (in the event that hazardous waste generated as part of the remedy is managed in containers); and 40 C.F.R. §§ 268.1 - 268.7 and 268.40 (RCRA land disposal restrictions).

25 Pa. Code Chapter 107 is applicable to the drilling of any new wells at the Site. These regulations are established pursuant to the Water Well Drillers License Act, 32 P.S.§ 645.1 et seq.

The substantive requirements of the PADEP's Public Water Supply Manual, Part II, Section 3.3.5.11 and Chester County Health Department Rules and Regulations Chapter 500, regarding the proper plugging and abandonment of existing pumping and monitoring wells are relevant and appropriate in order to eliminate the possibility of these wells acting as a conduit for future groundwater contamination.

The substantive requirements of the Delaware River Basin Commission (18 CFR Part 430) are applicable. These regulations establish requirements for the extraction and discharge of ground water within the Delaware River Basin. However, no modifications to the Selected Remedy are expected due to the extraction and discharge called for in the remedy.

4. To Be Considered ("TBC") Standards

Pennsylvania's Ground Water Quality Protection Strategy, dated February 1992 and EPA's Ground Water Protection Strategy, dated July 1991 are TBCs.

OWSER Directive #9355.0-28, Control of Air Emissions from Superfund Air Strippers at Superfund Ground Water Sites, is a "to be considered" (TBC) requirement.

OWSER Directive #9355.7-04, Land Use in the CERCLA Remediation Selection Process, is a "to be considered" (TBC) requirement.

OWSER Directive #9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration, is a "to be considered" (TBC) requirement.

The PADEP document entitled "Cleanup Standards for Contaminated Soils", dated December 1993, is a TBC requirement that establishes soil cleanup standards deemed to be acceptable under the residual waste regulations.

Sediment and erosion controls and temporary covers will be installed to protect exposed soil from the effects of weather in accordance with PADEP, Bureau of Soil and Water Conservation's Erosion and Sediment Pollution Control Manual which is a "to be considered" (TBC) requirement.

Any on site landscaping will be in accordance with Office of the Federal Executive; Guidance for Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds, 60 Fed. Reg. 40837 (August 10, 1995) which is a "to be considered" (TBC) requirement.

C. Cost-Effectiveness

The selected remedy is cost-effective in providing overall protection in proportion to cost, and meets all other requirements of CERCLA. Section 300.430(f) (ii) (D) of the NCP requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria - protection of human health and the environment and compliance with ARARs - against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and provides for overall effectiveness in proportion to its cost. The combined estimated present worth cost for the selected remedy presented in this Record of decision is $10,967,056. The proposed plan estimated that the preferred alternative would costs $11,400,000. The difference in estimated costs from the proposed plan to this Record of Decision is primarily do to the proposed plan estimating that 18 residents would require carbon filtration units and the associated sampling, analysis and periodic replacement of the carbon units, whereas, the selected remedy estimates that at most 5 carbon units would be required. Also, the proposed plan estimate mistakenly counted the costs of installing and analyzing additional monitoring wells for predesign studies and long term ground water monitoring, as well as, the 30 yr sampling & analysis costs associated with long term ground water monitoring. Detailed capital and O&M cost estimates for the alternatives included in the selected remedy are shown in Appendix D.

The treated ground water discharge options will each have their own unique costs. At this time, depending on whether the treatment system can attain the substantive requirements of the NPDES permit requirements, discharge to the on site pond appears to be the most cost effective option when compared to direct discharge to West Valley Creek at the location described in the proposed plan. This is a result of the decreased piping and excavation required. However, discharge to the proposed West Whiteland spray irrigation POTW would likely not require pretreatment for Arsenic which could lower the cost of the Selected Remedy by $500,000 (the estimated cost for pretreatment). Because the spray irrigation POTW is in the conceptual design phase EPA does not have sufficient information to determine the exact costs of this discharge option, however. As the specific costs for each option becomes available during the remedial design they will be carefully evaluated and weighed against the cost effectiveness of the other discharge options.

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

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria. Of those alternatives evaluated that are protective of human health and the environment and meet ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term and short-term effectiveness and permanence, cost, implementability, reduction in toxicity, mobility, or volume through treatment, State and community acceptance, and preference for treatment as a principal element.

Under the selected remedy, groundwater extraction through source and migration control wells and treatment of groundwater using air stripping is more cost-effective than the other alternatives evaluated. The selected remedy will reduce contaminant levels in the Class IIA aquifer, a known source of drinking water, and reduce the risks associated with ingestion and inhalation of the groundwater to the maximum extent practicable, as well as provide long-term effectiveness.

The selection of excavation and offsite disposal of contaminated soils, provides the best balance of trade offs among the nine NCP selection criteria. The remedy provides the highest degree of long-term effectiveness and permanence, reduces mobility and reduces risk to human health and the environment.

E. Preference for Treatment as a Principal Element

The selected remedy satisfies, in part, the statutory preference for treatment as a principal element. The contaminated groundwater alternative addresses the primary threat of future ingestion and inhalation of contaminated groundwater through treatment using air stripping.

XI. DOCUMENTATION OF CHANGES FROM PROPOSED PLAN

A. Treated Ground Water Discharge Options

The treated groundwater effluent will be discharged to either: 1) West Valley Creek as described in the proposed plan, 2) the on-site pond, or 3) the proposed West Whiteland spray irrigation POTW, following predesign investigation of the treatment system flow capacity, substantive NPDES requirements, or POTW pretreatment requirements, and further determination of any potential adverse effects of surface water runoff from the on site drainage ditch and any dewatering of on site wetlands to ecological receptors. The preferred alternative presented in the June 16, 1995 proposed plan included discharge to West Valley Creek. However, comments and concerns were raised during the public comment period concerning this discharge point led EPA to build more flexibility in the Selected Remedy concerning the exact discharge location. The Selected Remedy does still include a West Valley Creek discharge component, but it could be any one (or a combination) of the three identified locations. A selection as to which discharge option will be implemented will be made by EPA in consultation with PADEP during the remedial design. EPA will keep citizens informed of the final discharge decision process through distribution of fact sheets and periodic public meetings during the remedial design.

Treated effluent will be discharged through a new outfall, or through a piping system if discharge is to the spray irrigation POTW, that shall be constructed as part of the remedial action.

Discharge to West Valley Creek at the location just west of North Ship Road as contemplated in the June 16, 1995 Proposed Plan has been retained as a discharge option. A comprehensive analysis of the groundwater extraction system will be made prior to implementation to determine the thermal and flow effects the system may have on West Valley Creek. West Valley Creek will be monitored downstream of any discharge to ensure the requirements for temperature and dissolved oxygen are maintained. Corrective measures will be implemented if it is determined that the temperature and dissolved oxygen content of the stream are adversely affected. The establishment of background conditions for West Valley Creek shall include, at a minimum, temperature, dissolved oxygen and flow readings from downstream locations, the exact number and locations to be determined during the remedial design. The analysis shall include, if necessary, mitigation plans for maintaining the background thermal regime of West Valley Creek. The primary mitigation tool available would be the return of treated effluent directly to the stream via direct discharge if the effluent is within temperature requirements.

Discharge to the on site pond was selected as a discharge option following comments received during the public comment period. The comments focused on avoidance of direct stream discharge and preferences for discharge options which partially recharge the aquifer in the vicinity of the site, if possible. Discharge to the on site pond, if the substantive requirements of the NPDES permit can be attained, would provide partial recharge of the aquifer through the intermittent portion of West Valley Creek west of the

pond and the pond wetland area itself. The partial aquifer recharge along with surface evaporation in the pond will reduce the amount of actual discharge to the perennial portion of West Valley Creek.

Discharge to the West Whiteland spray irrigation POTW was selected as a discharge option following comments received during the public comment period. However, at this time, the West Whiteland POTW spray irrigation sewer treatment system is in the conceptual design phase. EPA currently does not have sufficient information regarding the spray irrigation discharge option, but will continue to investigate and evaluate it during remedial design. EPA will remain in contact with West Whiteland Township officials and their contractors during the remedial design in order to assess the viability of discharge to the West Whiteland spray irrigation POTW system. EPA will select the actual discharge location in consultation with PADEP, after careful consideration of all identified community concerns and technical factors. (See Responsiveness Summary, Appendix E)

B. Land Recycling and Environmental Remediation Standards Act (now referred to as Act 2)

The June 16, 1995 Proposed Plan discussed the Commonwealth of Pennsylvania relevant and appropriate standards for ground water. At the time of the proposed plan the relevant and appropriate standards specified that all ground water containing hazardous substances must be remediated to "background" quality pursuant to 25 PA code §§ 264.97 (i), (j), and 264.100(a)(9). However, when the proposed plan was issued, Pennsylvania Senate Bill #1, referred to as the Land Recycling and Environmental Remediation Standards Act (now referred to as Act 2) was signed into law by Governor Ridge on May 19, 1995 and became effective on July 18, 1995, which was during the comment period for the AIW Frank/Mid-County Mustang Site Proposed Plan. EPA has had time to review and evaluate the applicability of Act 2 to the selected remedy. EPA does not consider the Land Recycling and Environmental Remediation Standards Act to be an ARAR for the AIW Frank/Mid-County Mustang Site at this time.

APPENDIX A

FIGURES

<IMG SRC 0395202>
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<IMGS SRC 0395202C>
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Appendix B

TABLES

SUMMARY OF ORGANIC ANALYTICAL RESULTS - POTENTIAL CONTAMINATION SOURCES (mg/L for liquids or mg/kg for solids)

Analyte	Tank Samples TK-01 (Liquid) Sampled 1/92	TK-02 (Liquid) Sampled 1/92	TK-03 (Liquid) Sampled 1/92	TK-04 (Liquid) Sampled 1/93	TK-04 (Solid) Sampled 1/93	TK-05 (Liquid) Sampled 1/93	DR
Methylene Chloride	4964	15			95	38	7
Acetone							53
Carbon Disulfide						0.16J	
1,2-Dichloroethane			1.55J		0.27J	2J	
1,1,1-Trichlorethane					18		
Trichlorofluoromethane							
Benzene	5	3J	0.650J		1J		
4-Methyl-2-pentanone					5		
2-Hexanone			0.32J				
Toluene	27	20	19.5		0.16J	2J	2J
Chlorobenzene					2J	8	1J
Ethylbenzene	41	25	1.25J		0.12J		
Styrene				1J			
Total Xylenes		179	112	28		5.9	2J
Benzoic Acid						20J	
Naphthalene	730	400	57D		3,800D	1.5D	
2-Methylnaphthalene		1400	1100	70.5D	3,600D	1.6D	

Analyte	Building Samples BD-01 (Solid) Sampled 1/92	BD-02 (Solid) Sampled 1/92	BD-03 (Solid) Sampled 1/92	BD-04 (Solid) Sampled 1/93	Sump Samples SMP (Liquid) Sampled 1/93	SMD (Solid) Sampled 1/93	DR-04 (Sol Sampled 1/
Methylene Chloride	5	5	6				
Acetone							
Carbon Disulfide							
1,2-Dichloroethane							
1,1,1-Trichlorethane							
Trichlorofluoromethane							
Benzene							
4-Methyl-2-pentanone							
2-Hexanone							
Toluene							
Chlorobenzene							
Ethylbenzene							
Styrene							
Total Xylenes							
Benzoic Acid							
Naphthalene							
2-Methylnaphthalene							

*Arithmetic average of analytical results from TK-04 and its dupl

J - Analyte present. Reported value may not be accurate or

D - Analyte sample was diluted.

L - Analyte present. Reported value may be biased low. Ac to be higher.

Reference: Appendix C-2 and C-3 for data summary tables an

Table 1.
SUMMARY OF ORGANIC ANALYTICAL RESULTS - POTENTIAL CONTAMINATION SOURCES (mg/L for liquids or mg/kg for solids)

	Tank Samples						Building Samples		Sump Samples
	TK-01	TK-02	TK-03	TK-04*	TK-04	TK-05	DR-03	DR-04	BD-01
	(Liquid)	(Liquid)	(Liquid)	(Liquid)	(Solid)	(Liquid)	(Solid)	(Solid)	(Solid)
Analyte	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled
	1/92	1/92	1/92	1/93	1/93	1/92	1/92	1/92	1/92
Acenaphthylene	150J								
Acenaphthene		100J	8J						
Diethylphthalate									
Fluorene	9J	290	310	2.5J					
N-Nitrosodiphenylamine									
Phenanthrene	8J	700J	710	0.265J	5.2J	0.009J			
Anthracene	110J	110J							
Di-n-butyl phthalate	1J	3J			0.007J				
Fluoranthene	20J	50J	1.1J						
Pyrene	2J	220	1.3J			1J	2J	4L	2J
Butylbenzyl phthalate					2J	40J	2J	1.5J	
Chrysene	140J	140J							
bis(2-ethylhexyl) phthalate			0.018J	8J	70J				
Di-n-octyl phthalate				60	3J				
Benzo(a)pyrene	20J	70J							
Methoxychlor		50J							
Aroclor 1254				18J					

*Arithmetic average of anlaytical results from TK-04 and its du
TK-04-D
J - Analyte present. Reported value may not be accurate or pre
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual
be higher.
Reference Appendix C-2 and C-3 for data summary tables and labo

Table 1. continued...

SUMMARY OF POSITIVE ASBESTOS ANALYTICAL RESULTS
POTENTIAL CONTAMINATION SOURCES (PERCENT)

	Asbestos Samples (Percent)					
Analyte	FF015	FF016	FF017	FF018	FF019	FF013
Amosite	0	0	0	0	0	0
Chrysotile	Trace	Trace	2	1	1	2
Crocidolite	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total	Trace	Trace	2	1	1	2

Table 2.
ORGANIC ANLYATICAL RESULTS FOR SURFICIAL SOILS(1) (µg/kg)

Compound	Concentration (µg/kg) SO-01	SO-02	SO-03	SO-04	SO-05	SO-06	SO-07	SO-10	SO-11	SO-12	SO-15	SO-16
Chloroform		3J	2J		1J		1	2J				
2-Methylphenol												
2-Methylnaphthalene					53J							
4-Nitrophenol							84					
Diethyl phthalate	350	47J	63J			43J						
Phenanthrene				170J			400J					
Di-n-butylphthalate	55J	36J	40J		150J		62J	77J	230J			
Fluoranthene			47J	200J			140J					
Pyrene		130J	91J	170J			160J	290J				
Butylbenzyl phthalate	49J											
1,1,1-Trichloroethane	3											
Benzo(a)anthracene				87J			140J	263.5J	130J			
Chrysene			89J			150J		395J		160J		
Benzo(b)fluoranthene				150J			3					
Benzo(k)fluoranthene				150J			3					
Benzo(a)pyrene			67J				210J	80J		160J		
Indeno(1,2,3-cd)pyrene						200J	9					
Dibenz(a,h)anthracene							50J					
Benzo(g,h,i)perylene							230J					
Bis(2-ethylhexyl)phthenlate							1					

(') Surficial soils are defined in this study as soils within three surface.

J - Analyte present. Reported value may not be accurate or precise

D - Analyte sample was diluted.

L - Analyte present. Reported value may be biased low. Actual val higher.

* Arithmetic average of analytical results from a sample and its dupl

Blanks indicate anlytes were not present in the sample at the CR

CRQL - Contract Required Quantation Limit

Reference Appendix C-2 and C-3 for data summary tables and labor

Table 3.

ORGANIC ANALYTICAL RESULTS FOR SURFICIAL SOILS(1) (µg/kg)

Compound	Concentration (µg/kg) SO-01	SO-02	SO-03	SO-04	SO-05	SO-06	SO-07	SO-10	SO-11	SO-12*	SO-15	SO-16
alpha-BHC							0.05					
beta-BHC				0.34J								
delta-BHC		0.11J	1.2J	0.11J	0.19J		0					
Aldrin		0.24J	0.096J	0.21	0.17J	1.0J	0.18					
Heptachlor Epoxide	5.2L		0.46J									
Endosulfan I		0.17J										
Dieldrin					1.9J							
4,4'-DDE					0.80J							
Endrin				0.43J								
Endosulfan II		3.2J										
4,4'-DDD												
Endosulfan Sulfate			5.9J					1.8J	3.85J	0.81J		
4,4'-DDT		1.2J			1.4J							
Endrin Ketone			0.22J	1.1J		0.22J	0.43					
Endrin Aldehyde	0.23J			0.94J	0.25J							
alpha-Chlordane	2.1J	0.0981J				0.22J						
gamma-Chlordane	1.1J	0.25J	0.42J					0.08J	0.089J			
Aroclor 1254	90L	17J	230	970	120	150	60	35J	120	340		
Aroclor 1260		58J						30J				

(1) Surficial soils are defined in this study as soils within three inc
surface.

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higher.

* Arithmetic average of analytical results from a sample and its dupl
Blanks indicate anlytes were not present in the sample at the CR
CRQL - Contract Required Quantation Limit.
Reference Appendix C-2 and C-3 for data summary tables and labor

Table 3. continued...

IN ORGANIC ANALYTICAL RESULTS OF SURFICIAL SOILS(1) (mg/kg)

Compound	Concentration (mg/kg) SO-01	SO-02	SO-03	SO-04	SO-05	SO-06	S
SO-09	SO-10	SO-11	SO-12*	SO-15	SO-16		
Aluminum	3,410	718	1,310	389	9,880	18,700	11,60
17,400	15,100	9,050	19,200	16,800			
Arsenic	4.4	2.1	3.0	1.8	11.3	5.2	4.6
5.7	6.6						
Barium	19.1K	6.1K	8.1K	78.7K	107	44.2K	50.0K
Beryllium	0.4	0.13	0.44	1.1	1.5	1.7	1.0
Cadmium	5.5L						
Calcium	117,000	152,000	161,000	266,000	32,100	10,500	39,70
Chromium	7.3	22.8	30.5	23.5	24.6	25.6	27.
Cobalt	9.2	10.7	10.5	13.0	14.1	12.3	11.7L
Copper	1,620	16.6J	33.3J				
Iron	10,500	5,180	7,040	18,800	19,800	40,700	30,3
30,200	24,600	34,300	52,300	25,850	23,700	28,300	
Lead	27.9L	71.8L	143L	27.1L	36.5L		
Magnesium	65,400	82,000	91,900	26,300	15,300	2,900	8,780
Manganese	249	111	133	165	693	312	538
372							
Mercury	1.1	0.06					
Nickel	61.2J	4.2J	6.6J	97.0J	41.6J	18.6J	31.1J
Potassium	513	423	772	82.3	1,340	753	660
900							
Silver	0.67L	1.7K	1.8K				
Sodium	707K						
Vanadium	292J	11.4J	56.0J	145J	162J	65.5J	96.3J
Zinc	125	44.1	46.0	463	1,610	88.8	146
71.3							

(1) Surficial soils are defined in this study as soils within three inc
surface.

J - Analyte present. Reported value may not be accurate or precise.

D - Analyte sample was diluted.

L - Analyte present. Reported value may be biased low. Actual valu
higher.

* Arithmetic average of analytical results from a sample and its dupl
Blanks indicate analytes were not present in the sample at the C
CRQL - Contract Required Quantation Limit
Reference Appendix C-2 and C-3 for data summary tables and labor

ORGANIC ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES AND ASSOCIATED WASTES (µg/kg)

Analyte	SS-01	SS-02	SS-03	TP-01-01	T
Depth	3' 6"	3' 9"	3' 10'	2.5-3.0'	8.0
Trichloroethylene	11				
1,1,2-Trichloroethane	1J			25J	
Tetrachloroethylene	3J				
Benzene				150J	
Toluene		2,000J	2J		1
Ethylbenzene					3,30
1,1-Dichloroethylene	16				
1,1-Dichloroethane	3J				
Chloroform		3J	2J	2J	
1,1,1-Trichloroethane	5,500	3J	38	110,000	105
Diethyl phthalate			3,600J	168J	
Di-n-butyl phthalate	43J				42J
Fluoranthene			37J		
Styrene				3,800J	
Pyrene			43J		
Xylene				740J	
Butylbenzyl phthalate	38J				
bis(2-ethylhexyl)phthalate		10,000J			
alpha-BHC	0.46J				
1,2-Dichloroethane					
Total 1,2-Dichloroethane					

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value is higher.
*Arithmetic average of analytical results from a sample and its duplicat
Blanks indicate analytes were not present in the sample at the Contract Quantitation Limit (CRQL).
Reference Appendix C-2 and C-3 for data summary tables and laboratory re

Table 5.

ORGANIC ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES AND ASSOCIATED WASTES (µg/kg)

Analyte	Subsurface Soils				
	SS-01	SS-02	SS-03	TP-01-01	
Depth	3' 5"	3' 9"	3' 10"	2.5-3.0'	8.0
beta-BHC			0.42J		
delta-BHC			0.50J		
gamma-BHC (Lindane)	0.13J				0
Total 1,2-Dichloroethane					
1,2-Dichloroethane					
Heptachlor			0.063J		0.02
Heptachlor Epoxide				0.22J	
Dieldrin		0.19J			
Endrin	0.11J	0.12J	3.2J	0.255J	
Endosulfan II				0.20J	
Endosulfan Sulfate				0.77J	
4,4'-DDT	0.41J	0.28J		0.27J	
gamma-Chlordane	0.15J			0.155J	0.26J
Aroclor 1254					
21J					

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value is higher.
*Arithmetic average of analytical results from a sample and its duplicat
Blanks indicate analytes were not present in the sample at the Contract Quantitation Limit (CRQL).
Reference Appendix C-2 and C-3 for data summary tables and laboratory re

Table 5. continued...

ORGANIC ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES AND ASSOCIATED WASTES (mg/kg)

Analyte	Subsurface Soils											
	SS-01		SS-02		SS-03		TP-01-01					
Depth	3' 6"		3' 9"		3' 10"		2.5-3.0'		8.0			
Aluminum	11,300		11,700		26,600		1,330		8,			
Arsenic	5.4	6.8	10.1		2.0		3.7		2.2			
Barium	12.9K		15.1K		74.1K		8.1K		15.4K		4.5	
Beryllium	0.98	1.4	5.8		0.31		1.7		0			
Cadmium									3.5L			
Calcium	1.51	1,170	9,400		87,800							
5,320	157,000		156,000									
Chromium	8.5	7.6	35.7								1	
Cobalt	18.8	44.1	81.2		4.3		25.4		1			
Copper									941			
Iron	33,000		41,800		115,000		5,320		31			
5,220	11,500											
Lead			21.4L		78.3L							
Magnesium	880		880		3,010		42,000		5,235			
90,000	65,500											
Manganese	138		423		3,750		77.4		524			
Mercury	0.17											
Nickel	16.3J		22.9J		252J		119J		22.9J			
Potassium	400		397		518		430		1,279		586	
Selenium												
Silver	1.1L		0.89L		3.7L				0.59L			
Sodium												
Thallium			1.0									
Vanadium	40.4J		55.1J		206J		286J					
Zinc	35.1		53.5		380		58.1		33.0			

K - Analyte present. Reported value may be biased high. Actual value is lower.
J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value is higher.
* Arithmetic average of analytical results from a sample and its duplic
Blanks indicate analytes were not present in the sample at the Contra
Quantitation Limits (CRQL).
Reference Appendix C-2 and C-3 for data summary tables and laboratory

Table 6.

MAXIMUM CONCENTRATIONS OF ORGANIC ANALYTICAL RESULTS
GROUNDWATER
(µg/L)

Analyte	CRQL/NQL	MW-1	MW-2	MW-3	MW-103A	MW-103B
Vinyl Chloride	1/5					
Chloroethane	1/5					
Trichlorfluoromethane	1/5	1.0	1.3	0.4J		
1,1-Dichloroethylene	1/5		2.0			
Carbon Disulfide	1/5			8.9J		
Acetone	5/5			30.0		
Methylene Chloride	1/5					
Trans-1,2-Dichloroethylene	1/5					
1,1-Dichloroethane	1/5		0.6	1.3		
cis-1,2-Dichloroethylene	1/5		0.6	0.5J		
Chloroform	1/5					
1,1,1-Trichloroethane	1/5	7.1	16.0	2.1		
1,2-Dichloroethane	1/5					
Trichloroethylene	1/5	0.6J	13.1	1.2		
1,2-Dichloropropane	1/5					
Toluene	1/5					
1,1,2-Trichloroethane	1/5					
Tetrachloroethylene	1/5	0.1J	3.6			
Ethyl benzene	1/5					
M&P-Xylene Isomers	1/5					
Isopropylbenzene	1/5			0.2		
N-Propylbenzene	1/5					
1,3,5-Trimethylbenzene	1/5			0.2		
Tert-Butylbenzene	1/5			0.2		
1,2,4-Trimethylbenzene	1/5		1.8			
Sec-Butylbenzene	1/5			0.2		
P-Isopropyltoluene	1/5			2.9		
N-Butylbenzene	1/5	0.3				0.5

Refer to Appendices C-2 and C-3 for complete analytical data.
NQL = Nominal Quantitation Limits
See Table 4.8 for explination of other qualifier symbols.

Table 7.

MAXIMUM CONCENTRATIONS OF ORGANIC ANALYTICAL RESULTS
GROUNDWATER
(µg/L)

Analyte	CRDL/NQ	MW-104A	MW-104B	MW-105B	MW-106	MW-107A	MW-L
Vinyl Chloride	1/5						
Chloroethane	1/5						
Trichlorofluoromethane	1/5		2.1	0.8J			
1,1-Dichloroethylene	1/5	2.5	4.3	4.6			
Carbon Disulfide	1/5						
Acetone	5/5						
Methylene Chloride	1/5						
Trans-1,2-Dichloroethylene	1/5						
1,1-Dichloroethane	1/5		0.6J				
cis-1,2-Dichloroethylene	1/5			0.9J	1.6		
Chloroform	1/5						
1,1,1-Trichloroethane	1/5	9.9		18.0	16.7		
1,2-Dichloroethane	1/5						1.7
Trichloroethylene	1/5	1.0	8.2	24.7	30.4	3.8	5.5
1,2-Dichloropropane	1/5						
Toluene	1/5		5.0	0.2J			
1,1,2-Trichloroethane	1/5						
Tetrachloroethylene	1/5		0.3J	10.5			
Ethyl benzene	1/5	0.1					
M&P-Xylene Isomers	1/5	0.3J	0.2	J			
O-Xylene	1/5						
Isopropylbenzene	1/5						
1,3,5-Trimethylbenzene	1/5						
Tert-Butylbenzene	1/5						
1,2,4-Trimethylbenzene	1/5						
Sec-Butylbenzene	1/5						
N-Butylbenzene	1/5						

Refer to Appendices C-2 and C-3 for complete analytical data.
NQL = Nominal Quantitation Limits
See Table 4.8 for explaination of other qualifier symbols.

Table 7. continued...

MAXIMUM CONCENTRATIONS OF ORGANIC ANALYTICAL RESULTS
GROUNDWATER
(µg/L)

Analyte	CRQL/NQL	MW-108A	MW-109A	M	MW-F2	MW-P1
Vinyl Chloride	1/5	22.3				
Chloroethane	1/5	1.3				
Trichlorofluoromethane	1/5	6.1				
1,1-Dichloroethylene	1/5	1,900				
Carbon Disulfide	1/5					
Acetone	5/5					
Methylene Chloride	1/5	13.2J				
Trans-1,2-Dichloroethylene	1/5	10.3				
1,1-Dichloroethane	1/5	780.0				
cis-1,2-Dichloroethylene	1/5	10,400				
Chloroform	1/5	2.2				
1,1,1-Trichloroethane	1/5	500.0				
1,2-Dichloroethane	1/5	27.0				
Trichloroethylene	1/5	6,850	0.4J	0.4J		
1,2-Dichloropropane	1/5	12.5				
Toluene	1/5	1,400				
1,1,2-Trichloroethane	1/5	15.7				
Tetrachlorethylene	1/5	67.6				
Ethyl benzene	1/5	27.4				
M&P-Xylene Isomers	1/5	43.5	0.07J			
O-Xylene Isomers	1/5	24.0				
Isopropylbenzene	1/5	1.1				
N-Propylbenzene	1/5	1.6				
1,3,5-Trimethylbenzene	1/5	2.6				
Tert-Butylbenzene	1/5	0.4J				
1,2,4-Trimethylbenzene	1/5	4.8				
Sec-Butylbenzene	1/5	0.5J				
N-Butylbenzene	1/5	1.1				

Refer to Appendices C-2 and C-3 for complete analytical data.
NQL = Nominal Quantation Limits
See Table 4.8 for explaination of other qualifier symbols.

Table 7. continued...

MAXIMUM CONCENTRATION OF INORGANIC ANALYTICAL RESULTS

GROUNDWATER (FILTERED AND UNFILTERED) (µg/L)

Analyte	MW-1		MW-2		MW-3		MW-103A	
	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered
Aluminum	208L	275	85.5B	13,300	62.6B			
Arsenic	UL							
Barium	17.3L	15.4	45.6	292	37.1	39.1		
Beryllium	UL		7.6		0.94B	9.9		1.7
Cadmium	UL			9.3				
Calcium	66,600	77,500	30,900	117,000	63,400	67,L		
Chromium	UL		15.1		10.2	5		
Colbalt	UL			15.7	2.4B	10.6		
Copper	UL	20.0		67.5	9.5B	26.4		
Iron	247L	3,380	112B	51,200	240			
Lead	2.4B		3.,5B	132	5.1B	7.2B	86.7	
Magnesium	37,500	44,500	1,700	69,800	28,900	51,900	24,600	58,700
Manganese	3.1L	32.3	2.7	2,930	134	55.33	2,210	12.7 1,520
Mercury	UL							0.2
Nickel	UL		66.9	7.3B	9.0			
Potassium	637	515	4,800	7,100	2,840			
Silver	UL							
Sodium	2,710B	2,420	27,100	25,500	11,100			
Vanadium	2.9B		45.0	19.1	105			
Zinc	13.6B	48.0B	2,600	50.0B	42.			

*Arithmetic average of a sample and its duplicate sample.
Refer to Appendices C-2 and C-3 for complete analytical data.
See Table 4.8 for description of other qualifier symbols.
Blank space means analyte not detected at CRQL.

Table 8.

MAXIMUM CONCENTRATION OF INORGANIC ANALYTICAL RESULTS
GROUNDWATER (FILTERED AND UNFILTERED) (µg/L)

Analyte	MW-103B		MW-104A		MW-104B		MW-105A	MW-105B	
	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfilt	Unfiltered	Filtered	Unfiltered
Aluminum	18.2B	264		1,500			43.4B	2,300	
Arsenic									
Barium	31.2	33.2	18.2	25.6	14.55				
Beryllium									
Cadmium									
Calcium	68,500	71,700	77,200	239,000	72,150				
Chromium									
Cobalt				4.6					
Copper	5.2		11.2						
Iron	13,900		14,300	894	14,750				
Lead									
Magnesium	27,900	29,900	50,500	152,000	51,250				
Manganese	177	242	12.7	252	77.65	128			
Mercury		4.0							
Nickel	8.0								
Potassium	4,570	4,670	3,040	3,640	3,000	2			
Silver									
Sodium	18,2000	17,100	25,600	22,400	41,050				
		00		00					
Vanadium		4.0		7.7		4.35			
Zinc	1,080	4,140		88.3		38.3			

* Arithmetic average of a sample and its duplicate sample.
Refer to Appendices C-2 and C-3 for complete analytical data.
See Table 4.8 for description of other qualifier symbols. Blank space m
detected at
Blank space means analyte not detected at CRQL.

Table 8. continued...

MAXIMUM CONCENTRATION OF INORGANIC ANALYTICAL RESULTS
GROUNDWATER (FILTERED AND UNFILTERED) (µg/L)

Analyte	MW-106		MW-107A		MW-107		MW-108a	MW-109A	
	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfilt	Unfiltered	Filtered	Unfiltered
Aluminum	28.0B	469	27.6B	957	2,232.5	58,050			
Arsenic	UL			2.5L		5.5			
Barium	20.4	26.1	23.1L	26.1	76.35L	287			
Beryllium			UL			2.2L	18.4		
Cadmium		UL		UL					
Calcium	79,800	468,000	60,500L	93,100	276,000	628,L			
Chromium		7.4	8.8L	13.2		218L			
Cobalt			1.6B	4.0		UL			
Copper		5.0	16.2B	8.0		16B	454		
Iron		8,120	36.6B	8,930		377L			
Lead			5.1B		4.2B	85		5	
Magnesium	48,800	300,000	31,200L	49,700	7,630L	182,			
Manganese	27.2	271	5.4L	245	144L	4,985		1	
Mercury			UL			UL			
Nickel			5.7B	6.9	UL	193.5			
Potassium	2,510	2,640	4,270L	4,530	87,250J	94,700	6,690	7,780	10,200	18,300
Selenium			3.9L		5.15L				
Silver			UL		UL				
Sodium	14,700	14,700	17,100L	17,100	43,300J	43,550	21,600	21,400	26,300	26,600
Vanadium		6.8	UL	8.1	UL	166.5			
Zinc		141	70.5B	77.9	118J	729	81.4	61.7B	1,640	

*Arithmetic average of a sample and its duplicate sample.
Refer to Appendices C-2 and C-3 for complete analytical data.
See Table 4.8 for description of other qualifier symbols.
Blank space means analyte not detected at CRQL.

Table 8. continued...

MAXIMUM CONCENTRATION OF INORGANIC ANALYTICAL RESULTS
GROUNDWATER (FILTERED AND UNFILTERED) (µg/L)

Analyte	MW-109B		MW-F1		MW-F2	
	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfilt
Unfiltered						
Aluminum	46.0B	2080		136B	12.2	
Arsenic						
Barium	11.9	27.3	13.1	17.0		72.
Beryllium					2.4B	
Cadmium						
Calcium	17,300	16,000	48,000	46,200	53,700	
Chromium		8.4				
Cobalt						
Copper						
Iron	34.7B	15,000	4,550		484	4,430
Lead	3.6B			5.0B		7.7B
Magnesium	15,300	103,000	29,000	27,500	31,300	
Manganese	44.5	429	12.7	114	10.4	113
Mercury						
Nickel					7.4	
Potassium	13,300	13,800	995	962	1,190	1,400
Selenium					UL	
Silver					3.1B	
Sodium	33,300	33,200	19,200	17,700	18,900	
Vanadium		7.5			4.3	
6.6						
Zinc	23.5B	79.4		221	31.5B	
2,330						

*Arithmetic average of a sample and its duplicate sample.
Refer to Appendices C-2 and C-3 for complete analytical data.
See Table 4.8 for description of other qualifier symbols.
Blank space means analyte not detected at CRQL.

Table 8. continued...

SUMMARY OF ELEVATED CONTAMINATION CONCENTRATIONS IN MONITORING WELLS IN EACH WATER-BEARING ZONE (µg/L)

Overburden/Shallow Wells (µg/L)

Analyte	Background	MW-1	MW-2	MW-3	MW-103A	MW-107A	MW-109B
							(µg/L)
1,1,1-Trichloroethane	7.1	16	2.1	8.4	9.6	ND	
Trichloroethylene	0.6J	13.1	1.2	13.3	3.8	0.4J	
cis-1,2-Dichloroethylene		ND	0.6J	0.5J	0.7J	ND	N
1,1-Dichloroethylene		ND	2J	ND	4.3	1.2	N
1,1-Dichloroethane		ND	0.6	1.3	1.3	ND	N
Tetrachloroethylene		0.1J	3.6	ND	1.1	0.3J	ND

Intermediate Wells (µg/L)

Site						
Analyte	MW-103B	MW-104A	MW-105A	MW-106	MW-107B	P-1
1,1,1-Trichloroethane	11	9.9	16.7	796	4.3	
Trichloroethylene	5.9	1.0	24.7	30	5.5	
cis-1,2-Dichloroethylene	0.6J	ND	1.6	0.3J	3.9	
1,1-Dichloroethylene	6.2	2.5	4.6	28.8	1.2	
1,1-Dichloroethane	0.6J	ND		ND	4.0	
Tetrachloroethylene	0.6J	ND		10.5J	16.2	0

Analyte	Deep Wells (µg/L)				Range of Site B
	MW-104B	MW-105B	MW-108A	F-2	
1,1,1-Trichloroethane	18.0	10	500	5.1	<1.0-1.6
Trichloroethylene	8.2		20.4	6,850	ND
cis-1,2-Dichloroethylene	0.9J	6.2	10,400	ND	<1.
1,1-Dichloroethylene	4.3	3.0	1,900	0.8J	<1.0
1,1-Dichloroethane	0.6J	15	780	ND	<1.0
Tetrachloroethylene	0.3J		0.4J	67.6	ND

ND - Not detected.
J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value is ex higher.
Background samples include MW-101, MW-F-1, HW-03, HW-07, and HW-08.
Reference: Appendices C-2 and C-3.

Table 9.

VOLATILE ORGANIC COMPOUNDS - RESIDENTIAL WELLS (µg/L

Analyte	HW-01 Sampled 1/93	HW-02 Sampled 1/93	HW-03 Sampled 1/93	HW-04 Sampled 1/93	HW-05 Sampled 1/93	HW-06 Sampled 1/93	H
Chloromethane							
1,1-Dichloroethylene					9		
Carbon Disulfide					2		
Acetone				17J			
cis-1,2-Dichloroethylene					3		
Chloroform				1J	5	0.6J	
1,1,1-Trichloroethane	0.8J	0.9J			31		
1,2-Dichloroethane					0.7J		
Trichloroethylene	0.7J	2			57		
1,2-Dichloropropane							
Chlorobenzene		0.6			2		
1,4-Dichlorobenzene		3					
Dibromodichloromethane						0.9J	
Carbon Tetrachloride							
Benzene				1			

HW-08	HW-09	HW-10 Sampled 1/93	HW-11 Sampled 1/93	HW-12 Sampled 1/93	HW-13 Sampled 1/93

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actua
be higher.
Reference: Appendices C-2 and C-3.

Table 10.
February 1995 Residential Well
Sampling Results

(all results in ppb)

CONTAMINANT	HW-01	HW-06	HW-10	HW-11	HW-13
trichloroethane	2.9	32	150	2.9	32
1,1,1 trichloroethane		17	31		13
cis-1,2 dichloroethene		3.1	3.5		2.7
trichlorofluoromethane		1.5			1.4
1,1 dichloroethene		5.1	14		
1,1 dichloroethane			3.8		
1,2 dichloropropane			6.9		
tetrachloroethene		4.3			

blank = not detected

Table 11.

SURFACE WATER ORGANICS (µg/L)

Analyte	CRQL (µg/L)	SW-01	SW-02 (Background)	SW-04 (Background)	SW-05 (Background)	SW-06 (Background)
Methylene Chloride	2	3				
1,1-Dichloroethylene	1					
1,1-Dichloroethane	1					
1,1,1-Trichloroethane	1					
cis-1,2-Dichloroethylene	1					
Trichloroethylene	1	4				
2-Hexanone	5					
Tetrachloroethylene	1					
Trichlorofluoromethane	1					

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value i
higher.
*Arithmetic average of a sample and its duplicate
Blanks indicate that the analyte was not present at the CRQL of a µg/L
CRQL - Contract Required Quantitation Limit
Reference: Appendix C-2 and C-3 for data summary sheets and laboratory

Table 12.
SURFACE WATER INORGANICS (Filtered) (µg/L)

Analyte	CRQL (µg/L)	SW-01 (Background)	SW-02* (Background)	SW-04 (Background)	SW-05 (Background)	SW-06 (Background)	SW-08	SW-09	SW-10
Aluminum	200						277		
Barium	200	33.7	31.8	20.6	20.6	37.4	41.1		
Calcium	5,000	63,800	30,600	33,400	38,500				
Cobalt	50								
Copper	25								
Iron	100		121						
Lead	3								
Magnesium	5,000	14,200	10,650	12,100	14,400	14,7			
Manganese	15	29.6	5.4			19.	30.4		
Nickel	40								
Potassium	5,000	960	2,000	1,430	1,220	1,250			
Sodium	5,000	16,600	23,250	27,900	33,000	33,40			
Zinc	20						218		

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value i higher.
*Arithmetic average of a sample and its duplicate.
Blanks indicate that the analyte was not present at the CRQL of a µg/L
CRQL - Contract Required Quantitation Limit
Reference: Appendix C-2 and C-3 for data summary sheets and laboratory

Table 13.

ORGANIC ANALYTICAL RESULTS FOR SEDIMENT (µg/kg)

Analyte	Concentration (µg/kg)					
	SD-01	SD-02	SD-03	SD-04*	SD-0	
SD-09	SD-10	SD-11*	SO-12			
Phenanthrene	65J	100J	75J	125J	190J	90J
Anthracene			23J			
Carbazole						
Fluoranthene	230J	210J	190J	320J	37	
Pyrene	250J	290J	210J	405J	39	
140J	55J	210J				
Benzo(a)anthracene	330J	200J	100J	200J	18	
330J	80J	120J				
Chrysene	160J	230J	100J	175J	160J	140J
Benzo(b)fluoranthene	320J	180J	340J	210J	3	
Benzo(k)fluoranthene				70J		
Benzo(a)pyrene	120J	88J	150J	130J	140J	
Indeno(1,2,3-cd)pyrene						
Benzo(g,h,i)perylene						
alpha-BHC						
beta-BHC						
0.15J						
delta-BHC	0.21J	0.17J	0.35J	0.14J		
gamma-BHC (Lindane)	1.3J	0.54J	1.0J			
1.0J	0.61J	0.86J				
Heptachlor						
0.60J						

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value i
higher.
*Arithmetic average of analytical results from a sample and its duplica
Blanks indicate analytes were not present in the sample at the Contract
Quantitation Limit (CRQL).
Reference: Appendix C-2 and C-3 for data summary sheets and laboratory

Table 14.
INORGANIC ANALYTICAL RESULTS FOR SEDIME

Analyte	Concentration (									
	SD-01	SD-02	SD-03	SD-04	SD-05	SD-06	SD-08	SD-09	SD-10	SD-11*	SD-12
Aldrin	0.067J	0.26J	0.21J	0.24J	0.18J	0.32J	0.28	0.12J	0.25J		
Heptachlor Epoxide	0.074J	0.29J	0.35J	0.26J	0.16J	0.097	0.62J	0.071J	0.16J		
Endosulfan I	0.098J	0.22J	0.17J	0.18J	0.048J						
Dieldrin			0.52J		0.030J	0.68J	0.12J				
4,4'-DDE	4.0J	2.2J	3.5J	1.6J	1.1J	0.71J					
Endrin	0.12J	0.51J	0.23J	0.36J	0.16J	2.7J	0.11J	0.20J			
Endosulfan II	0.21J	0.63J	0.24J	0.18J	0.077	0.23J					
4,4'-DDD	0.29J	0.52J	0.76J	0.61J	0.70J	2.7	0.98J	0.24J	0.66J		
Endosulfan Sulfate	0.14J	0.38J	0.62J	0.18J	0.30J	7.4J	0.52J				
4,4'-DDT	0.10J	1.3J	0.76J	0.71J	2.0J	0.22J	0.57J				
Methoxychlor			0.34J		0.26J	0.37J	2.5J	0.26J	0.21J		
Endrin Ketone		0.094J			6.1J	0.074J					
Endrin Aldehyde			0.47J	1.04J	0.74J	0.35J					
alpha-Chlordane				0.23J		0.081	2.1	0.55J			
gamma-Chlordane	0.34J	0.15J	0.19J	0.16J	0.25J	0.10	0.075J				

J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value higher.
* Arithmetic average of analytical results from a sample and its du
Blanks indicate analytes were not present in the sample at the Co Quantitation Limit (CRQL).
Reference Appendix C-2 and C-3 for data summary tables and labora

Table 14. continued

INORGANIC ANALYTICAL RESULTS FOR SEDIME

Concentration (mg/kg

Analyte	SD-01	SD-02	SD-03	SD-04*	SD-05	SD-06	SD-07	SD-08	SD-09	SD-10	SD-11*	SD-12
Aluminum	12,500	19,200	19,400	20,000	14,300	7,230	17,000	4,320	15,550	18,500		
Arsenic	7.0	4.8	6.4	4.9	6.0	5.3						
Barium	33.2K	110	101	122	95.9K	31.6K	46.2K	118K	20.4	99.2	114	
Beryllium	0.80L	1.6	1.2	1.4	2.1L	0.90L	1.1L	1.3L	0.81	1.1	1.2	
Calcium	5,120	2,000	28,100	22,000	2,950	1,760	1,610	2,940	7,220	8,360	2,845	2,920
Chromium	24.7	26.2	33.8	36.0	32.7	24.7						
Cobalt	25.2K	12.0	17.8	15.9	17.4K	10.6K	20.9K	17.6K	10.3	12.8	12.7	
Copper	32.7K	34.8	51.2	47.6	38.0K	26.4K	55.6K	22.2K	38.3	26.3	24.2	
Iron	37,900	25,900	31,200	28,700	43,400	53,100	41,900	29,600	19,000	25,600	27,200	
Lead	27.7	33.1J	55.9	60.0	26.5	22.6						
Magnesium	7,100	2,810	6,000	5,200	2,770	2,450	2,310	3,720	7,320	5,840	2,915	2,930
Manganese	726	384	457	287	760	392						
Nickel	31.0K	19.8	25.8	24.3	25.0K	21.8K	32.4K	21.9K	15.5	16.6	17.0	
Potassium	573	840	968	526	1,020							
Selenium												
Silver	2.6J	2.4L	3.5L	5.8J	2.6J							
Vanadium	25.6K	35.9	39.8	39.1	42.6K	18.4K	29.0K	31.8K	10.6	30.0	35.0	
Zinc	162	106	164	165	196	124						

K - Analyte present. Reported value may be biased high. Actual valu
lower.
J - Analyte present. Reported value may not be accurate or precise.
D - Analyte sample was diluted.
L - Analyte present. Reported value may be biased low. Actual value
higher.
* Arithmetic average or analytical results from a sample and its du
Blanks indicate analytes were not present in the sample at the Co
Quantitation Limit (CRQL).
Reference Appendix C-2 and C-3 for data summary tables and labora

Table 15.
SUMMARY OF RISK BY EXPOSURE ROUTE
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

Exposure Route		Adult Resident		Child Resident		Adult Employee	Adolescent
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk		
Groundwater	Ingestion	3.5E+01	8.0E+04	8.1E+01	3.00E-01	3.00E-06	-- --
	Dermal	7.30E-01	5.6E-06	7.30E-01	2.40E-06	4.30E-02	5.50E-07 -- --
	Inhalation	2.0E-00	4.5E-06	--	--		
	Total	3.7E+01	8.1E-04	8.2E+01	1.2E-04		
Surface Water	Ingestion	--	--	--	--	1.0E-03	1.8E-07
	Dermal	--	--	--	--	1.2E-03	3.0E-07
	Total	--	--	--	--	4.8E-07	
Sediment	Ingestion	--	--	--	--	8.4E-04	7.2E-06
	Dermal	--	--	--	--	3.4E-10	
	Total	--	--	--	--	8.5E-04	7.2E-06
Surface Soil	Ingestion	1.0E-01	1.1E-05	9.7E-01	2	3.9E-06	-- --
	Dermal	2.9E-01	2.1E-05	1.4E-00	9.3E-06	1.5E-05	-- --
	Total	3.9E-01	3.2E-05	2.4E+0	3.4E-05	1.9E-05	-- --
Subsurface	Ingestion	5.6E-02	6.10E-06	5.20E-02	2.30E-06	-- --	
Soil	Dermal	2.4E-00	2.70E-04	1.25E+01	3.3	7.80E-05	-- --
	Fugitive Dust (Oral)	1.1E-09	4.6E-15	5.2E-09	4.3E-15	2.70E-15	-- --
	Fugitive Dust (Inh)	7E-11	5.5E-14	3.35E-10	1.3E-14	7.3E-14	
	Total	2.5E-00	2.76-00	1.2E+1	3.4E-04	8.0E-05	
Fish	Ingestion	2.4E-07	1.9E-11	--	--		
	Total	2.4E-07	1.9E-11	--	–		

Table 16.
COMPARISON OF ALTERNATIVE COSTS
AIW FRANK/MID-COUNTY MUSTANG

Alternative Number	Capital Costs	Operation & Maintenance	Total Value
1. NO ACTION	$ 0	$ 0	$ 0
2. LIMITED ACTIONS	$ 429,000	$ 872,000	$ 1,301,000
3. PUBLIC WATER SUPPLY/LIMITED ACTION	$ 2,958,000	$ 136,000	$
4. SOIL - VACUUM EXTRACTION	$ 177,000	$ 279,000	
A. - AIR STRIPPING w/DISCHARGE TO VALLEY CREEK	$ 2,380,000	$ 5,154,000	$
B. - GAC FILTERS w/DISCHARGE TO VALLEY CREEK	$ 2,247,000	$ 10,075,000	$
C. - AIR STRIPPING w/DISCHARGE TO POTW	$ 1,800,000	$ 12,218,000	$
D. - GAC FILTERS w/DISCHARGE TO POTW	$ 1,670,000	$ 17,751,000	$
5. SOIL - EXCAVATION OFFSITE DISPOSAL	$ 513,000	$ 0	
A. - AIR STRIPPING w/DISCHARGE TO VALLEY CREEK	$ 2,380,000	$ 5,154,000	$ 7,53
B. - GAC FILTERS w/DISCHARGE TO VALLEY CREEK	$ 2,247,000	$ 10,075,000	$ 12,3
C. - AIR STRIPPING w/DISCHARGE TO POTW	$ 1,800,000	$ 12,218,000	$
D. - GAC FILTERS w/DISCHARGE TO POTW	$ 1,670,000	$ 17,751,000	$
plus, PUBLIC WATER SUPPLY/LIMITED ACTION	$ 2,958,000	$ 136,000	$

Table 17.

Appendix C

Toxicological Profiles

Trichloroethene: is a colorless, nonflammable, noncorrosive liquid primarily used as a solvent in vapor degreasing. It is also used as a dry-cleaning agent, and as a chemical intermediate in the production of paints and varnishes and other chemicals. Trichloroethene has low acute toxicity. Chronic inhalation exposure to trichloroethene has been shown to cause liver, kidney, and nervous system disorders and skin irritation in animals. The EPA has classified trichloroethene as a B2-C carcinogen.

1,1-Dichloroethylene: caused kidney tumors in male mice, and leukemia in both male and female mice in separate inhalation studies. Negative results were obtained in oral studies involving rats and mice. 1,1-Dichloroethylene is therefore considered to be a possible human carcinogen. It has been found to be embryotoxic and fetotoxic in rats and rabbits via inhalation. Chronic exposure by rats to low oral doses caused liver changes. Acute exposure to high doses causes central nervous system depression.

1,1,1-Trichloroethane: is a colorless, nonflammable liquid with an odor similar to chloroform. In recent years it has been used as a substitute for carbon tetrachloride. In liquid form it is used as a degreaser and for cold cleaning, dip-cleaning, and bucket cleaning of metals. 1,1,1-trichloroethane is a solvent used in dry-cleaning, vapor degreasing, and as a propellant.

1,1,1-Trichloroethane is irritating to the eyes on contact with either liquid or vapor phases. This effect is usually first noted in acute exposures. Mild conjunctivitis may develop but recovery is usually rapid. The solvent's defatting properties may produce a dry, scaly dermatitis upon repeated contact with the skin. Acute exposures may lead to dizziness, drowsiness, increased reaction time, incoordination, unconsciousness, and death. Inhalation exposure to high concentrations of 1,1,1-trichloroethane depress the central nervous system; affect cardiovascular function; and damage the lungs, liver, and kidneys in animals and humans. Mucous membranes may also be irritated by exposure to this solvent.

Chloroform: has a molecular weight of 119.38, and exists at room temperature as a clear, colorless liquid with a boiling point of 61.7 C. It is widely used in industry as a solvent, feedstock, and sterilizing agent, and is found in all chlorinated public water supplies (because it is a by-product of the chlorination process). Chloroform is soluble in water, acetone, and non-polar solvents, and volatilizes readily from solution. It is readily taken into the body by inhalation, ingestion, and dermal or eye contact.

Chloroform is a Class B2 carcinogen, because it causes increases in kidney tumors in rats, and in liver tumors in mice. There is also suggestive evidence from epidemiological studies that exposure to chloroform and other trihalomethanes is associated with an increased incidence of bladder tumors in humans. Other toxic effects of chloroform include central nervous system depression; eye, skin, and gastrointestinal irritation; and damage to the liver, heart, and kidney.

Tetrachloroethylene: (PCE) is a clear, colorless, nonflammable liquid with a characteristic odor. The odor is noticeable at 50 ppm, but may become inconspicuous after a short period of exposure. PCE is widely used as a solvent in dry-cleaning, as a chemical intermediate, as a fumigant, and medically as an anthelmintic.

PCE has been found to cause liver cancer in male and female mice. Animals exposed to PCE by inhalation may exhibit liver, kidney, and central nervous system depression. Repeated contact may cause a dry scaly dermatitis. High concentrations may produce eye and nose irritation. Symptoms of overexposure include malaise, dizziness, headache, increased perspiration, fatigue, staggering gait, and slowing of mental ability. Acute exposure may cause central nervous system depression, hepatic injury, and anesthetic death. The EPA considers PCE to be a B2 carcinogen.

Arsenic is a metal that is present in the environment as a constituent of many organic and inorganic compounds. Arsenic is a known human carcinogen implicated in skin cancer in humans. Inhalation of arsenic by workers is known to cause lung cancer. Arsenic compounds cause chromosome damage in animals, and humans exposed to arsenic compounds have an increased incidence of chromosomal aberrations. Arsenic compounds are reported to be teratogenic, fetoxic, and embryotoxic in some animal species. Dermatitis and associated lesions are attributable to arsenic coming into contact with the skin, with acute dermatitis being more common than chronic. Chronic industrial exposures may be characterized by hyperkeratosis, and an accompanying hyperhidrosis (excessive sweating usually of the palms and soles of the feet).

Manganese is a steel-gray, hard, brittle metal that is naturally-occurring in the earth's crust. Manganese is used in the iron and steel industry, and in the manufacture of dry cell batteries, paints,

dyes, matches and fireworks. Although manganese has a relatively low order of toxicity, chronic exposure can cause degenerative changes in the central nervous system. Symptoms of manganese toxicity include apathy, anorexia, headache, weakness of the legs, irritability, mental confusion, and aggressiveness. As manganese exposure continues, the symptoms of toxicity become indistinguishable from classical Parkinson's disease.

Toluene: has been shown to be embryotoxic in experimental animals. Chronic inhalation exposures to high levels of toluene produce central nervous system depression and narcosis in humans. Chronic exposure to toluene at high concentrations by mammals may produce cerebellar degeneration and an irreversible encephalopathy. Co- administration of toluene along with benzene or styrene has been shown to suppress the metabolism of benzene or styrene in rats. In humans toluene may cause irritation to the eyes, respiratory tract, and skin. Acute exposure to toluene causes central nervous system depression, the symptoms of which include headache, dizziness, fatigue, muscular weakness, drowsiness, incoordination with staggering gait, skin paresthesia, collapse, and coma. Toluene is a clear, colorless, noncorrosive liquid with a sweet, pungent, benzene like odor. Toluene may be encountered in the manufactures of benzene. It is used as a chemical feed for toluene diisocyanate, phenol, benzyl and benzoyl derivatives, benzoic acid, toluene sulfonates, nitrotoluenes, vinyltoluenes, and saccharin. As a solvent, toluene is used for paints and coatings. It is also used as a component of automobile and aviation fuels.

Vinyl Chloride: is a gas used to manufacture polyvinyl chloride (PVC) which is contained in many plastic and vinyl products. It is recognized by the EPA as a class A carcinogen. Chronic exposure to vinyl chloride has been shown to cause angiosarcoma of the liver, a form of cancer. Increased risk of cancer of the brain, lungs, other organs as well as possible miscarriages have also been associated with inhalation of vinyl chloride. In humans, acute inhalation exposure to 0.8 to 2.0% vinyl chloride has been associated with central nervous system depression resembling mild alcohol intoxication.

Appendix D

Detailed Alternative Costs

Alternative 2
Limited Actions
Site Name: AIW Frank/Mid County Mustang Site

CAPITAL COST

Quantity	Unit Price	Total Cost	Item Description
			Site Preparation
			Fencing lump sum
			Temporary Facilities lump sum
			Deed Restrictions lump sum
			Grading lump sum
			Additional Ecological Survey lump sum
			Off-Site Waste Disposal
			Excavation
			Disposal Drums
drum	4	$400.00	$1,800.00
			Disposal Sump
ton	15	$1,800.00	$27,000.00
			Sampling/Analysis lump sum
			Transportation
load	3	$350.00	$1,060.00
			Carbon Filters For Point-of-Use Treatment
filter	18	$900.00	$16,200.00
			Backfilling Excavation cu. yd.
			Backfill & Compaction cu. yd.
			Monitoring Well Construction in. ft.
			Labor Costs hourly
			Laboratory Analysis sample
			Sampling hourly 160
			Subtotal
			Engineering and Administration - C
			Subtotal
			Contingency - Cost Based on 20% of Subtotal
			Total Capital Cost

OPERATION AND MAINTENANCE

Item Description	Unit	Quantity	Unit Pri	Annual Cost	Time (yrs) Begin Year	Number	Present Worth
MONITORING AND ANALYSIS							
Groundwater Sampling	hours	54	$32.0	$1,728.00	30	1	$27,142.08
Laboratory Analysis	sample	72	$210.00	$15,120.00	30	1	$237,483.24
Report Preparation	hours	120	$55.00	$8,600.00	30	1	$103,667.68
POINT-OF-USE CARBON FILTER							
Replace Carbon	replacement	36	$200.00	$7,500.00	30	1	$24,126.30
Drinking Water Sampling	hours	48	$32.00				
Laboratory Analysis	sample	36	$210.00				
5-Year Reviews	lump sum	1	$15,000.00				
Subtotal				$54,744.00			$726,997.87
Contingency - Cost Based on 20% of Subtotal			$1				
Total			$8				

PRESENT WORTH

Total Capital Cost	
Present Worth of O&M Cost	
TOTAL PRESENT WORTH COST	

Alternative 3
Limited Actions And Connection to Public Water Supply
Site Name: AIW Frank/Mid County Mustang Site

CAPITAL COST

Item Description	Quantity	Unit Price	Total Cost
Subtotal From Alternative 2			
Extension of Water Main	6,600	$255.00	$1,683,000.00
Individual Building Connection in.	1,465	$50.00	$73,250.00
Subtotal			
Engineering and Administration - Cost Based on 20 of Subtotal			$410,814.00
Subtotal			
Contingency - Cost Based on 20% of Subtotal			
Total Capital Cost			

OPERATION AND MAINTENANCE

Item Description	Cost		
Subtotal Alternative 2 (3 years only)	$39,744.00		$113,369.76
Contingency - Cost Based on 20% of Subtotal	$7,948.80		$22,673.95
Total			

PRESENT WORTH

Total Capital Cost	
Present Worth of O&M Cost	
TOTAL PRESENT WORTH COST	$3

Soil Remediation Alternative 4A
Excavation Off-Site Treatment and Disposal, Soil and Subsu
Waste
Site Name: AIW Frank/Mid County Mustang Site

CAPITAL COST

Item Description	Quantity	Unit Price	Total Cost
Site Preparation			
EXCAVATION, DISPOSAL			
Excavation			cu. yd.
Sampling/Analysis			
lump sum	1	$1,100.00	$1,100.00
Disposal (Off-Site Incineration)			tons
Transportation			load
Road Tax			cu. yd.
BACKFILL EXCAVATION			
Material (Sand)			cu. yd.
Backfill and Compaction			cu. yd.
Subtotal			
Legal Fees, License & Permits - Cost Based on 10%			
Capital			$32,891.50
Engineering & Administrative - Cost Based on 20%			
Capital			$65,783.00
Subtotal			
Contingency - Cost Based on 20% of Subtotal			
Total Capital Cost			

PRESENT WORTH

TOTAL PRESENT WORTH COST
$513,107.40

Soil Remediation Alternative 4B
Soil Vapor Extraction and Carbon Treatment
Site Name: AIW Frank/Mid County Mustang Site

CAPITAL COST

Item Description	Quantity	Unit Price	Total Cost
Site Preparation			lump sum
Fencing			lump sum
VAPOR EXTRACTION SYSTEM INSTALLATION			
Vapor Extraction Wells			in. ft.
Labor			hours
Vapor Extraction and Carbon Treatment System			
Piping, Valves, and Fittings			in. ft.
Vapor Extraction Pilot Test			lump sum
Other Equipment, Supplies & Service			lum
Subtotal			
Legal Fees, License & Permits - Cost Based on 10% Capital			$11,360.00
Engineering & Administrative - Cost Based on 20% Capital			$22,720.00
Subtotal			
Contingency - Cost Based on 20% of Subtotal			
Total Construction Cost			

OPERATION AND MAINTENANCE

Item Description	Unit	Quantity	Unit Pri	Annual Cost	Time (yrs)	Begin Year	Present Worth	Number
SOIL VAPOR EXTRACTION AND TREATMENT								
Carbon Replacement	lbs.	12000	$2.10					
Personnel	hours	300	$32.00	$9,6				
Electrical Costs	inch	53,000	$0.10					
Maintenance	each	1	$10,000.00					
Laboratory Analysis	sample	220	$210.00					
Reporting	each	12	$3,500.00	$42,0				
5-Year Reviews	each	1	$12,000.00	$12,000.00	2	$12,000.00		
Subtotal							$125,100.00	
Contingency - Cost Based on 20% of Subtotal								
Total							$150.120.00	

PRESENT WORTH

Total Construction Cost	
Present Worth of O & M Cost	
TOTAL PRESENT WORTH COST	

Groundwater Alternative 4A(1) and 4B(1)
Total Extraction, Air Stripping, Discharge to Surface Wate
Site Name: AIW Frank/Mid County Mustang Site
Flow = 300 gpm

CAPITAL COST

Quantity		Unit Price	Item Description / Total Cost		
			Site Preparation		lump sum
			Temporary Facilities		lump sum
			Monitoring Wells		in. ft.
			Labor	hours	
			Laboratory Analysis	sample	
			GROUNDWATER EXTRACTION		
			Extraction Wells		in. ft.
			Labor	hours	
			Submersible Pumps	each	
			Electrical	lump sum	1
			Pump Test	lump sum	
			Pipeline	in. ft.	4500
			Bore & Jack	lump	
sum	1	$1,600.00	$1,600.00		
			Other Equipment & Supplies	lump	
sum	1	$10,000.00	$10,000.00		
			GROUNDWATER TREATMENT		
			Groundwater Pre-Treatment System		lump
			Air Stripping System	lump	
sum	1	$95,000.00	$95,000.00		
			Piping	in. ft.	200
			Other Equipment, Supplies & Services		lump
sum	1	$12,000.00	$12,000.00		
			GROUNDWATEER DISCHARGE		
			Piping	in. ft.	1000
			Other Equipment & Supplies	lump	
sum	1	$10,000.00	$10,000.00		
			VAPOR PHASE CARBON TREATMENT		
			Carbon Adsorbers	lump sum	
			Subtotal		
			Legal Fees, Licence & Permits - Cost Based on 10%		
Capital			$152,563.00		
			Engineering & Administrative - Cost Based on 20%		
Capital			$305,126.00		
			Subtotal		
			Contingency - Cost Based on 20% of Subtotal		
			Total Construction Cost		

OPERATION AND MAINTENANCE

Item Description	Unit	Quantity	Annual Cost	Time (yrs) Begin Year	Present Worth	Number
GROUNDWATER EXTRACTION AND TREATMENT						
Personnel	hour	800	$32.00	$25,600.00	25	1 $369,973.54
Electrical Costs	inch	500,000				$0.
Well Maintenance	each	9				$1,1
Groundwater Pre-Treatment System	lump sum	1	$50,000.00	$50,000.00	25	1 $722,610.43
Laboratory Cost	sample	212				$200.
VAPOR PHASE CARBON TREATMENT						
Carbon Replacement	lbs.	24,000				$2.10
Laboratory Analysis	sample	160				$210.00
LONG-TERM MONITORING						
Sampling	hours	160	$55.00	$8,800.00	30	1 $138,223.58
Laboratory Analysis	sample	68				$210.
Report Preparation	hours	120	$55.00	$6,600.00	30	1 $103,667.68
5-Year Reviews	lump sum		$15,000.00	$15,000.00	25	5 $43,356.63
Subtotal						$261,900.00
Contingency - Cost Based on 20% of Subtotal						
Total						$314,28

Groundwater Alternative 4A(2) and 4B(2)
Total Extraction, Carbon Adsorption, Discharge to Surface
Site Name: AIW Frank/Mid County Mustang Site
Flow = 300 gpm

Quantity	Unit Price	Total Cost	Item Description
			Site Preparation lump sum
			GROUNDWATER EXTRACTION
			Extraction Wells in. ft.
2,600	$170.00	$442,000.00	
			Labor hours
			Submersible Pumps each
			Electrical lump sum
			Pump Test
lump sum	1	$11,000.00	$11,000.00
			Pipeline in. ft.
4,500	$32.00	$144,000.00	
			Bore & Jack lump sum
			Other Equipment & Supplies lump sum
			GROUNDWATER TREATMENT
			Groundwater Pre-Treatment System
lump sum	1	$500.000.00	$500,000.00
			Carbon Adsorbers
lump sum	4	$43,000.00	$172,000.00
			Piping in. ft. 200
			Other Equipment Supplies & Services lum
			GROUNDWATER DISCHARGE
			Piping in. ft.
1,000	$32.00	$32,000.00	
			Other Equipment & Supplies lump sum
			Subtotal
			Legal Fees, Licence & Permits - Cost Based on 10%
Capital		$144,035.00	
			Engineering & Administrative - Cost Based on 20%
Capital		$288,070.00	
			Subtotal
			Contingency - Cost Based on 20% of Subtotal
			Total Construction Cost

OPERATION AND MAINTENANCE

Item Description	Unit	Qu	Cost		Number		
GROUNDWATER EXTRACTION AND TREATMENT							
Carbon Replacement	lbs.	160,000					
			$2.10	$336,000.00	25	1	$4,855,942.07
Personnel	hours	800					
			$32.00	$25,600.00	25	1	$369,976.54
Electrical Costs	inch	360,000					
			$0.10	$36,000.00	25	1	$520,279.51
Well Maintenance	each	9					
			$1,100.00	$9,900.00	25	1	$143,076.88
Groundwater Pre-Treatment System	lump sum	1	$50				
Laboratory Cost	sample	420					
LONG-TERM MONITORING							
Sampling	hours	160					
			$55.00	$8,800.00	30	1	$138,223.58
Laboratory Analysis	sample	68	$210.				
Report Preparation	hours	120					
			$56.00	$6,600.00	30	1	$103,667,68
5-Year Reviews	lump sum	$15,000.					
Subtotal							
			$590,380.00				$8,396,117.25
Contingency - Cost Based on 20% of Subtotal							
Total		$7					

Total Construction Cost
Present Worth of O & M Cost
TOTAL PRESENT WORTH COST

Groundwater Alternative 4A(3) and 4B(3)
Total Extraction, Air Stripping, Discharge to POTW
Site Name: AIW Frank/Mid County Mustang Site
Flow = 300 gpm

Quantity	Unit Price	Total Cost	Item Description
			Site Preparation lump sum
			Temporary Facilities lump sum
			Monitoring Wells in. ft.
			Labor hours
			Laboratory Analysis sample
			GROUNDWATER EXTRACTION
			Extraction Wells in. ft.
			Labor hours
			Submersible Pumps each
			Electrical lump sum
			Pump Test
lump sum	1	$11,000.00	$11,000.00
			Pipeline in. ft.
4500	$32.00		$144,000.00
			Bore & Jack lump sum
			Other Equipment & Supplies lump sum
			GROUNDWATER TREATMENT
			Groundwater Pre-Treatment System
lump sum	1	$22,000.00	$22,000.00
			Airstripping System lump sum
			Piping in. ft.
			Building Improvements lum
			Other Equipment Supplies & Services lum
			GROUNDWATER DISCHARGE
			Piping in. ft.
200	$32.00		$6,400.00
			Tapping Fee lump sum
			Other Equipment & Supplies lump sum
			VAPOR PHASE CARBON TREATMENT
			Carbon Adsorbers
lump sum	2	$8,000.00	$16,000.00
			Subtotal
			Legal Fees, Licence & Permits - Cost Based on 10%
Capital			$115,403.00
			Engineering & Administrative - Cost Based on 20%
Capital			$230,806.00
			Subtotal
			Contingency - Cost Based on 20% of Subtotal
			Total Construction Cost

OPERATION AND MAINTENANCE

Item Description	Unit	Qu	Cost	Number			
GROUNDWATER EXTRACTION AND TREATMENT							
Personnel	hours	800					
$32.00	$25,600.00	25	1	$369,976.54			
Electrical Costs	inch	500,000					
$0.10	$50,000.00	25	1	$722,610.43			
Well Maintenance	each	9					
$1,100.00	$9,900.00	25	1	$143,076.86			
Laboratory Cost	sample	212					
Sewer Use Charge (POTW)	1000 gal	160,000					
VAPOR PHASE CARBON TREATMENT							
Carbon Replacement	lbs.	24,000					$2.
Chemical Feed System	lump sum	1					$11,000.
Laboratory Analysis	sample	160					
$210.00	$33,600.00	25	1	$485,584.21			
LONG-TERM MONITORING							
Sampling	hours	160					
$55.00	$8,800.00	30	1	$138,223.58			
Laboratory Analysis	sample	68					$210.
Report Preparation	hours	120					
$56.00	$6,600.00	30	1	$103,667,68			
5-Year Reviews	lump sum						$15,000.
Subtotal							
$704,500.00				$10,181,580.91			
Contingency - Cost Based on 20% of Subtotal							
Total							$8

Total Construction Cost
Present Worth of O & M Cost
TOTAL PRESENT WORTH COST

Groundwater Alternative 4A(4) and 4B(4)
Total Extraction, Air Stripping, Discharge to POTW
Site Name: AIW Frank/Mid County Mustang Site
Flow = 300 gpm

Quantity	Unit Price	Item Description	Total Cost
		Site Preparation	lump sum
		GROUNDWATER EXTRACTION	
		Extraction Wells	in. ft.
		Labor	hours
		Submersible Pumps	each
		Electrical	lump sum
		Pump Test	
lump sum	1	$11,000.00	$11,000.00
		Pipeline	in. ft.
4,500	$32.00		$144,000.00
		Bore & Jack	lump sum
		Other Equipment & Supplies	lump sum
		GROUNDWATER TREATMENT	
		Groundwater Pre-Treatment System	
lump sum	1	$22,000.00	$22,000.00
		Carbon Adsorbers	
lump sum	4	$43,000.00	$172,000.00
		Piping	in. ft.
		Building Improvements	lum
		Other Equipment Supplies & Services	lum
		GROUNDWATER DISCHARGE	
		Piping	in. ft.
200	$32.00		$6,400.00
		Tapping Fee	lump sum
		Other Equipment & Supplies	lump sum
		Subtotal	
		Legal Fees, Licence & Permits - Cost Based on 10%	
Capital			$107,075.00
		Engineering & Administrative - Cost Based on 20%	
Capital			$214,150.00
		Subtotal	
		Contingency - Cost Based on 20% of Subtotal	
		Total Construction Cost	

OPERATION AND MAINTENANCE

Item Description	Unit	Qu	Cost	Number				
GROUNDWATER EXTRACTION AND TREATMENT								
Carbon Replacement	lbs.	160,000						$2.
Personnel	hours	800						
			$32.00	$25,600.00	25	1	$369,976.54	
Electrical Costs	inch	360,000						
			$0.10	$36,000.00	25	1	$520,279.51	
Well Maintenance	each	9						
			$1,100.00	$9,900.00	25	1	$143,076.88	
Groundwater Pre-Treatment System	lump sum	1						$11
Sewer Use Charge (POTW)	1000 gal	160,000						
Laboratory Cost	sample	420						
LONG-TERM MONITORING								
Sampling	hours	160						
			$55.00	$8,800.00	30	1	$138,223.58	
Laboratory Analysis	sample	68						$210.
Report Preparation	hours	120						
			$56.00	$6,600.00	30	1	$103,687,68	
5-Year Reviews	lump sum							$15,000.
Subtotal								
			$1,032,980.00				$14,792,664.75	
Contingency - Cost Based on 20% of Subtotal								
Total								$1,2

Total Construction Cost
Present Worth of O & M Cost
TOTAL PRESENT WORTH COST

Alternative 4A TOTA

CAPITAL COST

GROUNDWATER TREATMENT AND DISCHARGE OPTION

Remedy Component	1. Liquid - Phase Carbon	Vapor
	1. Discharge to Surface Water	Discharge to POTW	1. Discharge to	2. Discharge to
1. Institutional Controls/ Limited Action	$428,860.80	$428
2. Groundwater Extraction, Treatment, and Discharge	$2,246,946.00	$1	$2,379,982.80	$1,800,286.80
3. Soil Excavation, Treatment, and Off-Site Disposal	$513,107.40			
Total Capital Cost	$3,188,914.20	$	$3,321,951.00	$2,742,255.00

OPERATION AND MAINTENANCE

GROUNDWATER TREATMENT AND DISCHARGE OPTION

Remedy Component	1. Liquid - Phase Carbon	Vapor
	1. Discharge to Surface Water	Discharge to POTW	1. Discharge to	2. Discharge to
1. Institutional Controls/ Limited Action	$872,397.45	$872
2. Groundwater Extraction, Treatment, and Discharge	$10,075,340.71	$17	$5,153,496.57	$12,217,897.10
3. Soil Excavation, Treatment, and Off-Site Disposal	$0.00	$0.00	$0.00	$0.00
Total Capital Cost	$10,947,738.15	$1	$6,025,894.01	$13,090,294.55

PRESENT WORTH

	1. Discharge to Surface Water	Discharge to POTW	1. Discharge to	2. Discharge to
Total Capital Cost	$3,188,914.20	$2,612,33	$3,321,951.00	$2,742,255.00
Present Worth of O&M Cost	$10,947,738.15	$18,623,59		
TOTAL PRESENT WORTH COST	$14,136,652.35	$21,235,933.35		

Alternative 4B TOTA

CAPITAL COST

GROUNDWATER TREATMENT AND DISCHARGE OPTION

Remedy Component	1. Liquid - Phase Carbon	Vapor
	1. Discharge to Surface Water	Discharge to POTW	1. Discharge to	2. Discharge to
1. Institutional Controls/ Limited Action	$428,860.80	$428
2. Groundwater Extraction, Treatment, and Discharge	$2,246,946.00	$1	$2,379,982.80	$1,800,286.80
3. Soil Excavation, Treatment, and Off-Site Disposal	$177,216.00	
Total Capital Cost	$2,853,022.80	$	$2,986,059.60	$2,406,363.60

OPERATION AND MAINTENANCE

GROUNDWATER TREATMENT AND DISCHARGE OPTION

Remedy Component	1. Liquid - Phase Carbon	Vapor
	1. Discharge to Surface Water	Discharge to POTW	1. Discharge to	2. Discharge to
1. Institutional Controls/ Limited Action	$872,397.45	$872
2. Groundwater Extraction, Treatment, and Discharge	$10,075,340.71	$17	$5,153,496.57	$12,217,897.10
3. Soil Vapor Excavation, Treatment, (In-Site)	$279,054.00	$279
Total Capital Cost	$11,226,792.15	$	$6,304,948.01	$13,369,348.55

PRESENT WORTH

	1. Discharge to Surface Water	Discharge to POTW	1. Discharge to	2. Discharge to
Total Capital Cost	$2,853,022.80	$2,276,44	$2,986,059.60	$2,406,363.60
Present Worth of O&M Cost	$11,226,792.15	$18,902,64		
TOTAL PRESENT WORTH COST	$14,079,814.95	$21,179,095.95		

Drum and Sump Removal Detailed Cost Estimate

Estimated Capital Costs: $ 57,816
Estimated Total O&M Costs: $ 0
Estimated 30 Year Total Present Worth Costs: $ 57,816

Item Description	Total Cost
Excavation of Sump	$ 5,000
Disposal of Drums (4)	$ 1,600
Disposal of Sump and Contents	$ 27,000
Sampling & Analysis	$ 5,000
Transportation	$ 1,050
Backfill	$ 500
Subtotal	$ 40,150
Engineering and Administration (20% of Subtotal)	$ 8,030
Subtotal	$ 48,180
Contingency (20% of Subtotal)	$ 9,636
Total Costs	$ 57,816

Additional Ecological Assessment Detailed Cost Estimate

Estimated Capital Costs: $ 48,240
Estimated Total O&M Costs: $ 0
Estimated 30 Year Total Present Worth Costs: $ 48,240

Item Description	Total Cost
Endangered Species Survey	$ 5,000
Sampling & Analysis	$ 15,000
Grading	$ 10,000
Excavation	$ 1,500
Backfill	$ 1,000
Transportation	$ 500
Revegetation	$ 500
Subtotal	$ 33,500
Engineering and Administration (20% of Subtotal)	$ 6,700
Subtotal	$ 40,200
Contingency (20% of Subtotal)	$ 8,040
Total Costs	$ 48,240

Provision of Carbon Filtration Units Detailed Cost Estimate

Estimated Capital Costs: $ 6,000
Estimated Total O&M Costs: $ 13,500
Estimated 30 Year Total Present Worth Costs: $19,500

Capital Costs

Item Description	Total Cost
Carbon Filtration Units (5)	$ 6,000
Subtotal	$ 6,000

Operation & Maintenance

Item Description	Total Cost
Sampling & Analysis (3 Yrs)	$ 10,500
Carbon Replacement (once per year for 3 Yrs)	$ 3,000
Subtotal	$ 13,500
Total Costs	$ 19,500

APPENDIX E

RESPONSIVENESS SUMMARY
FOR THE PROPOSED REMEDIAL ACTION PLAN
AT THE
AIW FRANK/MID-COUNTY MUSTANG SUPERFUND SITE
EXTON, PENNSYLVANIA

Public Comment Period:
June 16, 1995 thru August 15, 1995

TABLE OF CONTENTS

RESPONSIVENESS SUMMARY
AIW FRANK/MID-COUNTY MUSTANG SITE
EXTON, PENNSYLVANIA

This community relations responsiveness summary is divided into the following sections:

Overview: This section discusses EPA's preferred alternative for remedial action.

Background: This section provides a brief history of community interest and concerns raised during remedial planning at the AIW Frank/Mid-County Mustang Site.

Part I: This section provides a summary of commentors' major issues and concerns, and expressly acknowledges and responds to those raised by the local community. "Local community" may include local homeowners, businesses, the municipality, and potentially responsible parties (PRPs).

Part II: This section provides a comprehensive response to all significant comments and is comprised primarily of the specific legal and technical questions raised during the public comment period. If necessary, this section will provide technical detail to answers responded to in Part I.

Any points of conflict or ambiguity between information provided in Parts I and II of this responsiveness summary will be resolved in favor of the detailed technical and legal presentation contained in Part II.

Overview

On June 16, 1995, EPA announced the opening of the public comment period and published its preferred alternative for the AIW Frank/Mid-County Mustang Site, located in Exton, Chester County, Pennsylvania. EPA screened several possible alternatives to remediate the Site contamination, giving consideration to nine key evaluation criteria:

- Threshold criteria, including;
  --Overall protection of human health and the environment;
  --Compliance with Federal, state, and local environmental and health laws;

- Balancing criteria, including;
  --Long-term effectiveness and permanence;
  --Reduction of mobility, toxicity, or volume of contaminants;
  --Short-term effectiveness;
  --Ability to implement;
  --Cost; and

- Modifying criteria, including;
  --State acceptance; and
  --Community acceptance.

EPA carefully considered state and community acceptance of the remedy prior to reaching the final decision regarding the remedy.

The Agency's preferred remedy is outlined below. Based on current information, this alternative provides the best balance among the alternatives with respect to the nine criteria EPA uses to evaluate each alternative. The selected remedy consists of the following components:

1. Extraction and treatment via air stripping of groundwater with vapor phase carbon-adsorption and subsequent discharge to either: 1) West Valley Creek, 2) the on site pond, or 3) West Whiteland spray irrigation POTW, following a predesign hydrogeologic investigation;

2. Excavation and off-site disposal of contaminated soils, following predesign soil investigations;

3. Installation of a water line;

4. Removal, decontamination and off-site disposal of drums and sump;

5. Structure Demolition/Restoration

6. Institutional controls

7. Performance of an Additional Ecological Assessment;

8. Provision of Point of Use Carbon Filtration Units (until waterline is extended)

9. Performance of a Phase I archeological survey prior to any intrusive remedial activities.

10. Long Term Ground Water Monitoring.

Background

Community interest and concern about the Site has been steady throughout EPA involvement. EPA issued a Fact Sheet in October, 1990 which provided information concerning the removal and off site disposal of approximately 30 drums containing primarily methylene chloride. The October, 1990 Fact Sheet also provided information regarding the Superfund clean up process and activities which would take place at the Site.

On July 8, 1991, a Community Relations Plan was completed for the Site. The Plan highlighted issues, concerns and interests of the community located near the Site which were raised during interviews.

EPA issued a Fact Sheet in July 1992, providing an update of Site activities including planned field work for the Remedial Investigation and Feasibility Study ("RI/FS"). The Fact Sheet also announced a public meeting, which was held on August 5, 1992. The public meeting provided information to interested parties regarding the RI/FS field work which was about to begin at the Site.

In October, 1993 EPA issued a Fact Sheet to keep the community informed of Site related activities. The Fact Sheet briefly explained the initial findings of the RI, the Superfund Process, and the nature and extent of Site contamination.

Pursuant to CERCLA § 113(k)(2)(B)(i)-(v), the RI/FS reports and the Proposed Plan for the AIW Frank/Mid-County Mustang Site were released to the public for comment on June 16, 1995. These documents were made available to the public in the Administrative Record located at the EPA Docket Room in Region III's Philadelphia office, and the West Whiteland Township Building, Exton, Pennsylvania. The notice of availability of these documents was published in the Chester County Daily Local News and the Philadelphia Inquirer Chester County Neighbors Section on June 16, 1995.

A public comment period on the documents was held from June 16, 1995 to July 17, 1995. A timely request for a 30-day extension to the public comment period was made on June 28, 1995. As a result, the closing date for the public comment period was extended to August 15, 1995. In addition, a public meeting was held on June 29, 1995. At this meeting, representatives from EPA answered questions about conditions at the Site and the remedial alternatives under consideration. Also, on July 20, 1995, representatives of EPA met with a local civic association to answer questions about the remedial alternatives under consideration.

Part I: SUMMARY OF COMMENTORS' MAJOR ISSUES AND CONCERNS

This section provides a summary of commentors' major issues and concerns, and expressly acknowledges and responds to those raised by the local community. The major issues and concerns about the proposed remedy for the AIW Frank/Mid-County Mustang Site received at the public meeting on October 19, 1994, and during the public comment period, can be grouped into three categories:

A. Treated Water Discharge Issues
B. Implementation of the Remedy
C. Health Concerns

The questions, comments, and responses are summarized below.

A. Treated Water Discharge Issues

1. How will the volume of water being-discharged affect the level of West Valley Creek.

EPA Response: Based on comments received during the public comment period, EPA has considered alternative discharge options for the treatment system discharge including: 1) discharge to West Valley Creek as described in the proposed plan; 2) discharge to the on Site pond; and 3) spray irrigation of the treated water in the proposed West Whiteland Township spray irrigation POTW system. The final discharge method could be any one or a combination of the three options described above. A complete discussion of these discharge options can be found in section XI.A. of the ROD. Discharge to West Valley Creek has

been retained as an option, primarily because of the thermal mitigation benefits (i.e. discharging cool treated water directly to the Creek) it would provide in the event that the extraction system does impact the thermal regime of West Valley Creek.

Thus it is possible that in implementing the remedy EPA may not discharge directly to West Valley Creek. However, in the event that this option is implemented, the exact amount of water that will be discharged will vary during the operation of the pump and treat system. The actual capacity of the pump and treat system will be determined during the Remedial Design. The Proposed Plan estimated that the system would treat a maximum of 300 gallons per minute ("gpm"). Based on comments received during the public comment period, EPA conducted a more detailed design like reevaluation of the volume of water to be treated. As a result, it is currently estimated that the system will routinely treat and discharge approximately 140 gpm. This translates into slightly more than 200,000 gallons per day. West Valley Creek currently has a flow rate of .465 cubic feet per second ("cfs") at the discharge point contemplated in the Proposed Plan, during typical low flow conditions (mid to late summer). The stream is 6.4 feet wide at that location and during low flow conditions contains approximately 1 3/4 inches of water. The 140 gpm discharge translates into an additional flow of .307 cfs, which would account for 39% of the total stream flow during low flow conditions. The depth of water in the Creek at the discharge location would likely increase by 3/4 to 1 inch, again during low flow conditions. During normal and high flow conditions the percent increase in flow due to treated effluent discharge would significantly decrease.

2. Was spray irrigation of the treated water discharge evaluated by EPA?

EPA Response: Spray irrigation was not specifically evaluated by EPA in the Feasibility Study Report. However, based on comments received during the public comment period, EPA has considered alternative methods for the treatment system discharge including spray irrigation. Spray irrigation could potentially provide an alternative to direct stream discharge and provide for aquifer recharge. However, EPA has learned that most spray irrigation systems in operation do require a limited stream discharge under certain conditions to control costs. The proposed West Whiteland spray irrigation POTW is in the conceptual design phase, therefore, at this time, EPA does not have enough detailed information to accurately weigh this discharge option against the other discharge alternatives. However, EPA has selected spray irrigation through the West Whiteland POTW system as one of the discharge points it may utilize as part of the Selected Remedy. If after more detailed information is available it is determined during the remedial design that spray irrigation provides the best balance of tradeoffs when weighed against the other two discharge point options it will be incorporated into the design and implemented.

3. Can the treated water be discharged to the Pennsylvania Department of Transportation ("PENNDOT") wetlands mitigation project, or to the ponds in the vicinity of the Site?

EPA Response: Possibly. However, discharge to the PENNDOT wetlands mitigation areas was not specifically evaluated by EPA in the Feasibility Study Report. Based on comments received during the public comment period, EPA has considered alternative methods for the treatment system discharge including discharge to the on site pond. The potential benefits to discharging to the PENNDOT wetlands area would include avoidance of direct discharge to West Valley Creek and partial recharge of the aquifer. However, discharge to the on site pond provides the same benefits regarding avoidance of direct discharge to West Valley Creek and partial recharge of the aquifer though the pond area and through the intermittent portion of West Valley Creek just west of the pond and east of Ship Road, while minimizing the impacts on the wetlands areas on and off site. Discharge to the on site pond would reduce the eventual total amount of discharge directly to West Valley Creek through evaporation, as well as, through ground water recharge. Discharge to the on site pond is still dependent on the attainment of the NPDES effluent discharge requirements established by PADEP.

4. Was reinjection of the treated water discharge evaluated by EPA?

EPA Response: Reinjection of the treated water discharge was not specifically evaluated by EPA in the Feasibility Study Report. However, based on comments received during the public comment period, EPA has considered alternative methods for the treatment system discharge including reinjection. Deep well reinjection was suggested as a method of restoring the ground water aquifer and preventing direct discharge to West Valley Creek. EPA agrees that partially restoring the aquifer and avoiding total stream discharge are objectives which are very important to this community. However, the Agency feels that the discharge options chosen in the Selected Remedy will accomplish the best balance of tradeoffs.

Discharge to the on site pond will partially restore the aquifer, as well as, limit the amount of direct discharge to West Valley Creek. Discharge to the proposed West Whiteland POTW if it is ultimately utilized would also accomplish these objectives. Discharge via reinjection would be a costly and possibly technically challenging discharge option. The additional wells and piping involved would essentially double the costs of those items when compared to the discharge options under the Selected Remedy. Also, reinjection in the karst geology of the region may have a more unpredictable effect than

the more natural aquifer replenishment of spray irrigation or discharge to the on site pond.

5. Is the sale of the treated water to Philadelphia Suburban Water Company an option for EPA?

EPA Response: Sale of the treated effluent to Philadelphia Suburban Water Company ("PSWC") was not specifically evaluated by EPA in the Feasibility Study Report. However, based on comments received during the public comment period, EPA contacted and provided detailed information regarding the extraction and treatment system proposed to representatives of PSWC, to determine their potential interest in such an arrangement. In a letter dated August 17, 1995 PSWC responded to EPA's inquiry. In summary the letter states, "... PSWC could not at this time seriously entertain a proposal to use the discharge from the ground water remediation as a potable water source. The disparate goals of ensuring a high quality public water supply and achieving site clean up under strict EPA requirements present serious complications and obstacles (technical, legal and political) to such a proposal." Therefore, EPA has determined that sale of the treated water discharge is not an implementable option. A complete copy of the August 17, 1995 PSWC letter can be found in the Administrative Record.

6. Will the extraction of ground water and discharge to a location which does not recharge the aquifer as contemplated in the Proposed Plan cause the collapse of existing sinkholes and create additional sinkholes in the area?

EPA Response: EPA understands and recognizes the particular concern of citizens and the local municipality regarding sinkholes in this area. It should be recognized that discharge to West Valley Creek would provide for limited recharge of the aquifer west of the discharge location described in the proposed plan. Additionally, EPA recognized the potential for sinkholes in the vicinity of the Site during the remedial investigation and specifically contracted with the United States Geological Survey ("USGS") to provide expert assistance in developing regional and site specific geological information which was presented in the Remedial Investigation Report and used in the Feasibility Study Report. The remedial investigation efforts specifically noted that there are what appear to be a few scattered sinkholes located to the southwest of the study area. More recently, EPA has noted the development of a sinkhole west of the site. However, collection of ground water through extraction wells is a highly reliable, proven technology, commonly used to remediate ground water contamination in areas with similar geologic conditions as the Site.

The extraction system will be designed using existing historic regional hydrogeologic data along with the Site specific data collected during the RI and predesign studies to develop well formulas to describe flow conditions and calculate drawdown at the well and the radius of pumping influence. The well formulas are used to calculate cumulative drawdown curves, which are then used to determine the number, location of wells (well spacing) and pumping rates required to contain contaminant migration while not significantly drawing down the ground water table in any one location. By not significantly drawing down the water table in any single location the possibility of the formation of sinkholes is greatly reduced. Also, discharge options in the selected remedy including discharge to the on site pond and spray irrigation would provide for partial aquifer recharge which could further reduce the potential for sinkholes.

7. What thermal effects will the extraction and treatment system have on West Valley Creek?

EPA Response: EPA understands and shares the concern that citizens have regarding the protection of the water quality, and recreational uses of West Valley Creek. As a cold water fishery downstream of the Site, West Valley Creek has strict temperature and dissolved oxygen content requirements which the discharge must meet. The requirements are part of the NPDES permitting requirements, which are established by the Pennsylvania Department of Environmental Protection and are required to be met. Effluent and downstream temperature sampling will be required prior to and during the operation of the system in order to ensure that the thermal conditions of the stream are not altered. The exact number and locations for downstream sampling will be determined during the Remedial Design. If sampling data indicates that conditions in the stream may be altered by the treatment system, actions will be taken to assure that the treated effluent discharge will comply with the NPDES requirements listed as ARARs to the ROD.

B. Implementation of the Remedy

1. Several citizens requested a time frame for the cleanup.

EPA Response: Once the Record of Decision has been issued, the Remedial Design (the detailed implementation plan) for accomplishing the Site cleanup will begin. For some portions of the selected remedy (i.e. the ground water extraction and treatment system) the Remedial Design could take over a year to develop. Other portions of the selected remedy may be able to be designed and implemented more quickly. The Remedial Action, which is the actual cleanup, can begin as soon as the Remedial Design is

complete. At this point in time, EPA cannot anticipate exactly how long the Remedial Action will take, however, it is estimated that the ground water extraction and treatment system will operate for 25 to 30 years.

Following remedial design the installation of the waterline should take approximately 6 months. Similarly, the drum and sump removal, building demolition/restoration, as well as, the soil excavation remedial actions should take approximately 6 months to one year to implement after the remedial design is complete.

A schedule for cleanup activities will be developed during the Remedial Design. EPA will keep citizens informed of the time table for implementation of the selected remedy through distribution of fact sheets and periodic public meetings.

2. Will there be 24 hour surveillance by an engineer/chemist on Site during the operational years of the system?

EPA Response: The air stripping treatment system will be designed to operate unattended on a 24 hour per day basis for approximately 25 to 30 years. There will be periodic on site operation and maintenance of the system (typically 3-4 hours per day) by a qualified contractor throughout the systems' operation to ensure the proper operation of the system and to collect the required influent and effluent water and air emissions samples for analysis. Typically, the operation and maintenance contractor will be on site on a part time daily basis and then provides a twenty four hour on call service in the event any system alarms have occurred.

3. What protective measures are in effect in the event there is a failure by the system to extract pollutants?

EPA Response: In the event that the system fails to extract pollutants from the influent ground water or effluent air as designed the system will be shut down until such time that the cause of the failure can be determined and repaired.

C. Health Concerns

1. What will be the quality of the water discharged into West Valley Creek?

EPA Response: EPA understands and shares the concern that local citizens have regarding the protection of the water quality of West Valley Creek. As a cold water fishery downstream of the Site, West Valley Creek has strict water quality, temperature and dissolved oxygen content requirements which the discharge must meet. The requirements are part of the NPDES requirements, which are established by the Pennsylvania Department of Environmental Protection and are required to be met as ARARs for the Selected Remedy. The NPDES discharge requirements include limits on total suspended solids, total dissolved solids, pH, metals and organic contaminants. Many of the limits meet or exceed drinking water standards, however, others do not, such as, the total dissolved solids and total suspended solids limits. While these limits will be protective of the aquatic life in the stream they would not be acceptable for a potable water supply. It is expected that the air stripping treatment system will accomplish at least 99% removal of all site related contaminants, and that the resulting treated effluent will comply with the NPDES requirements.

2. How frequently will the air be monitored to protect the population?

EPA Response: Contaminants in the emitted air from the air stripping system will be captured by a vapor phase carbon adsorption unit. Air emissions from the air stripping tower must be reduced to the minimum attainable level through the use of the Best Available Technology (BAT), 25 PA Code § 127.12(a)(5). Those regulations require that emissions be reduced to the minimum levels possible. At these levels any residual risk posed by emissions from the air stripping tower are far below the acceptable risk level established by EPA of 1.0 x 10-6 (or 1 in 1,000,000). The vapor phase carbon adsorption units will be monitored (twice per month) and replaced on a periodic basis which will ensure that no contaminant breakthrough will occur.

PART II: COMPREHENSIVE, TECHNICAL, AND LEGAL RESPONSE TO COMMENTS

This section provides technical detail in response to comments or questions on the AIW Frank/Mid-County Mustang Site. These comments or questions were received at the June 16, 1995 public meeting or by mail or telephone during the public comment period, and may have been covered in a more general fashion in Part I of this Responsiveness Summary. The following specific comments are addressed:

A. Comments of Duane, Morris & Heckscher on behalf of CDS Investments
B. Comments of Stevens & Lee on behalf of Lewis and Ruth Frame
C. Comments of Valley Forge Chapter of Trout Unlimited
D. Comments of West Chester Fish, Game & Wildlife Association
E. Comments of West Whiteland Township officials
F. Comments of Brandywine Conservancy
G. Comments of Clean Water Action
H. Comments of West Chester Municipal Authority
I. Comments of Pennsylvania Department of Environmental Protection

A. Comments of Duane, Morris & Heckscher on behalf of CDS Investments

In an 8-page document dated July 13, 1995, Duane, Morris & Heckscher commented on the Proposed Plan on behalf of CDS Investments. The document included several specific legal and technical comments regarding the Proposed Plan. These specific legal and technical comments follow:

1. The proposed plan bases the selection of Alternative 5 on assumptions about exposure which are unfounded and inconsistent with CERCLA, Pennsylvania's Land Recycling and Environmental Remediation Standards Act (Act 2 of 1995), and U.S. EPA OSWER Directive No. 9355.7-04, entitled "Land Use in the CERCLA Remedy Selection Process." In so doing, the proposed plan fails to meet the CERCLA threshold criteria of compliance with ARARs.

a. Apart from explaining that several ground water wells exist, the Proposed Plan is devoid of any factual information concerning actual exposure or planned future land use which would result in exposure.

EPA Response: Although they are not ARARs, EPA has carefully considered Act 2 of 1995 and the cited U.S. EPA OSWER Directive during the remedy selection process. To EPA's knowledge the current zoning of the AIW Frank portion of the Site property is zoned for commercial/light industrial use. However, the Mid-County Mustang portion of the Site is currently a mixed residential/commercial property with two residential dwellings along with Rex Carle Automotive and the former Pipe Maintenance Service buildings. In fact, the nearest residential dwelling is less than 30 feet from the Site boundary and the most highly contaminated monitoring well (MW-108). Also, there are no controls in place to limit the future rezoning for residential use of the site properties. The Risk Assessment performed for the Site evaluated the potential risk associated with current land use and future use regarding exposure to on site residents and employees. EPA believes that the Baseline Risk Assessment properly characterizes current and future exposure at the Site. The entire Baseline Risk Assessment which can be found in the Remedial Investigation Report was placed in the Administrative Record for the AIW Frank/Mid-County Mustang Site prior to the Proposed Plan comment period and has since been available for review. The proposed plan and Record of Decision correctly summarized the risks associated with exposure at the site and carefully considered ACT 2 of 7995 and the cited OSWER Directive.

b. To the extent that the Proposed Plan does not include Pennsylvania's Land Recycling and Environmental Remediation Standards Act (Act 2 of 1995), it is defective on this basis alone.

EPA Response: On page seven (7) of the Proposed Plan in the Section titled "Major ARARs for the Site" the following is set forth: Currently, the Commonwealth of Pennsylvania relevant and appropriate standards for ground water specify that all ground water containing hazardous substances must be remediated to "background" quality pursuant to 25 PA code §§ 264.97 (i), (j), and 264.100(a)(9). Nonetheless, Pennsylvania Senate Bill #1 (SB1), referred to as the Land Recycling and Environmental Remediation Standards Act was signed into law by Governor Ridge on May 19, 1995 and became effective on July 19, 1995. Act 2 of 1995 was not effective at the time of issuance of the Proposed Plan, nevertheless, it was considered by EPA even though the Commonwealth of Pennsylvania did not identify it as an ARAR at that time. EPA has had time to review and evaluate the applicability of Act 2 to the selected remedy. EPA does not consider the Land Recycling and Environmental Remediation Standards Act to be an ARAR for the AIW Frank/Mid-County Mustang Site at this time. The Record of Decision for the AIW Frank/Mid-County Mustang site does properly present and the Selected Remedy will attain the substantive requirements of all ARARs. See Section XI.B. of the Record of Decision for a discussion of Act 2.

2. The proposed plan fails to give appropriate weight to the CERCLA primary balancing criteria of implementability and cost, and fails to comply with U.S. EPA OSWER Directive 9234.2-25, entitled "Guidance for Evaluating the Technical Impracticability of Ground Water Restoration."

EPA Response: EPA has given the appropriate weight to the CERCLA balancing criteria of implementability and cost in the proposed plan and further in the Record of Decision for the Site. Based on current information, which can be found in the Administrative Record for the Site, the Selected Remedy described in the Record of Decision for the AIW Frank/Mid-County Mustang Site provides the best balance among the

alternatives with respect to the nine criteria EPA uses to evaluate each alternative.

Further, the Record of Decision does properly comply with the cited OSWER Directive by directly addressing the technical impracticability issue in the following manner. If EPA, in consultation with the Commonwealth of Pennsylvania, determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the performance standards throughout the entire area of the contaminant plume, EPA, in consultation with the Commonwealth may require that any or all of the following measures be taken, for an indefinite period of time, as further modification(s) of the existing system:

a) long-term gradient control provided by low level pumping, as a containment measure;

b) chemical-specific ARARs may be waived for those portions of the aquifer that EPA, in consultation with the Commonwealth determine that are technically impracticable to achieve further contaminant reduction;

c) institutional controls may be provided/maintained to restrict access to those portions of the aquifer where contaminants remain above performance standards; and

d) remedial technologies for ground water restoration may be reevaluated.

The decision to invoke any or all of these measures may be made during implementation or operation of the remedy or during the 5-year reviews of the remedial action. If such a decision is made, EPA shall amend the ROD or issue an Explanation of Significant Differences.

B. Comments of Stevens & Lee on behalf of Lewis and Ruth Frame

In a 7-page document dated August 16, 1995, Stevens & Lee commented on the Proposed Plan on behalf of Lewis and Ruth Frame. Also submitted was a 17 page document of specific technical comments on the RI/FS and Proposed Plan prepared by consultants for Lewis and Ruth Frame. Together the documents include specific legal and technical comments regarding the Proposed Plan. These specific legal and technical comments follow:

EPA's proposed decision to extract, treat and discharge contaminated ground water at the Site into West Valley Creek may be impracticable, and is arbitrary, capricious, an abuse of discretion, not in accordance with law, and unsupported by the evidence in EPA's administrative record.

a. Provision of public water to the 12 residences and businesses affected or potentially affected by groundwater contamination eliminates the need for a groundwater extraction, treatment and discharge system.

EPA Response: Several requirements apply to this important water resource. The National Contingency Plan ("NCP") at 40 C.F.R. Section 300.430 requires that ground water be restored to its beneficial use, which at the AIW Frank/Mid-County Mustang Site is a current drinking water supply, as properly noted in the Proposed Plan and ROD. Also, the Selected Remedy must meet all ARARs which require remediation of ground water to MCLs.

b. EPA has not properly identified the source of groundwater contamination at the Site.

EPA Response: The data collected during the Remedial investigation ("RI"), which can be found in the administrative record clearly identifies the source of ground water contamination. The AIW Frank/Mid-County Mustang RI clearly identifies a plume of TCE and 1,1,1 TCA, as well as other volatile contaminants with a source area on the AIW Frank/Mid-County Mustang Site properties. The ground water data from the RI shows the highest concentration of 1,1,1 TCA (796 ppb) in MW-106 which is just a few feet from the former AIW Frank Corporation's above ground solvent tank location. 1,1,1 TCA is known to have been used as a solvent by the AIW Frank Corporation. MW-108, which is located near the former Mid-County Mustang/Pipe Maintenance Service underground tile field, was the most highly contaminated well sampled. TCE was detected at 6,850 ppb, and cis-1,2 dichloroethylene was detected at 10,400 ppb in HW-108. From the source location on site, the plume extends approximately ½ mile to the west along Exner Lane with the concentrations of these same contaminants decreasing the farther from MW-106 and MW-108 that samples were collected. Upgradient (background) monitoring wells and residential wells such as MW-101 and the "Drexel Heating" well, which are located downgradient of the former Autocar facility and upgradient of the Site did not show any level of detection for these contaminants. Thus it is appropriate to conclude that the Site properties are source areas for the contamination.

c. EPA's risk assessment in the RI/FS concerning the groundwater contamination at the Site is called into question by certain internal EPA and ATSDR documents.

EPA Response: In 1992, the EPA Remedial Project Manager assigned to the AIW Frank/Mid-County Mustang Site requested the Superfund Removal Program to evaluate the necessity of conducting an emergency removal action to extend existing water lines to residents and businesses affected by the AIW Frank/Mid-County Mustang contaminant plume. An analysis of the existing ground water data at that time indicated that there was not an imminent threat to human health or the environment posed by ground water which would require an immediate removal action. However, EPA's toxicologist did at that time determine that a long term or chronic threat to human health existed and that long term remedial action was necessary. The Remedial Investigation ("RI") which was performed from 1993 to 1995, included additional sampling and analysis results which were used to perform a Baseline Risk Assessment which indicated that there is an increased risk to future on site adults and children due to the ingestion and inhalation of contaminated ground water at the Site. The RI which includes the sampling results and the Baseline Risk Assessment is in the Administrative Record for the Site.

d. The levels and areal extent of groundwater contamination appear to be diminishing.

EPA Response: EPA agrees that when sampling results from 1982 are compared to sampling results from the RI the plume does appear to have diminished to some degree. However, concentrations of contaminants in wells in close proximity to the Site have shown fairly steady levels of contamination over time. EPA cannot predict whether this trend will continue.

e. Maximum Contaminant Levels ("MCLs") under the Safe Drinking Water Act should not be considered Applicable or Relevant and Appropriate Requirements ("ARARs") for groundwater at this Site.

EPA Response: As properly stated in the proposed plan and ROD, EPA has classified the affected aquifer at the Site as a Class IIA aquifer, a current source of drinking water, in accordance with the EPA Document "Guidelines for Groundwater Classification: (Final Draft, December 1986)". The concentrations of contaminants in the ground water at the Site are above Maximum Contaminant Levels ("MCLs") which are enforceable, health-based drinking water standards established under the Safe Drinking Water Act ("SWDA"), 42 U.S.C. §§ 300f to 300j-26.

f. EPA has not properly determined the cost of the groundwater extraction, treatment and discharge system.

EPA Response: The assumptions made in the Feasibility Study Report ("FS") regarding the ground water extraction, treatment and discharge system are consistent with prior experience and standard engineering practice. If dense non-aqueous phase liquid ("DNAPL") is present (See Section V.B.9. of the Record of Decision for discussion of DNAPL), which EPA does not believe to be the case, and which will be further evaluated during predesign hydrogeologic studies, the cost of the extraction and treatment may increase and/or the remedy may have to be modified. The ROD specifically addresses such a determination (See Section IX.B.1.c.) Further, see response in Part II, Section A, response #2 above. The Feasibility Study Report is in the Administrative Record for the Site.

g. EPA's proposed groundwater extraction, treatment and discharge system may have adverse impacts upon the West Valley Creek, nearby wetlands, and the surrounding community.

EPA Response: See responses in Part I, Section A of this responsiveness summary and Section IX.B.1 of the Record of Decision.

h. EPA did not properly evaluate the 9 remedy selection criteria required by the National Contingency Plan.

EPA Response: EPA carefully and appropriately evaluated the nine (9) remedy selection criteria required by the NCP prior to reaching the remedial action decision presented in the Record of Decision. See Section VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES of the Record of Decision. Further, based on current information, which is in the Administrative Record for the Site, the Selected Remedy described in the Record of Decision for the AIW Frank/Mid-County Mustang Site provides the best balance among the alternatives with respect to the nine (9) NCP criteria EPA uses to evaluate each alternative.

i. EPA's RI/FS is deficient in several key areas and seriously calls into question the lawfulness and credibility of the Proposed Plan.

EPA Response: EPA does not believe that the Remedial Investigation and Feasibility Study reports ("RI/FS") prepared for the Site are deficient. The RI/FS for the AIW Frank/Mid-County Mustang Site was conducted in accordance with EPA guidance and policies. Work plans for these activities were thoroughly reviewed and approved by EPA in consultation with PADEP. These plans were developed based on a review of historical data, site visits, and the results of discussions held among EPA, PADEP and USGS during the RI/FS scoping process.

The goals of the RI/FS were to characterize the nature and extent of environmental contamination due to past practices at the Site, characterize any current or future risks to human health and the environment posed by the Site, and evaluate potential remedial measures to clean up the Site. EPA believes that these goals were met by the final April, 1995 AIW Frank/Mid-County Mustang Site RI/FS reports.

The RI for the Site clearly identifies a ground water plume of TCE, and 1,1,1 TCA, as well as several other VOCs, with a source area on the AIW Frank/Mid-County Mustang Site properties. See EPA response presented in Part II, Section B, Comment (b). Likewise, the RI report establishes that an area of elevated chemical concentrations exists in the subsurface soils near the former above ground solvent tank area at the Site. The full extent of both ground water and soil contamination will be determined during pre-design investigations as part of remedial design.

EPA acknowledges that there are uncertainties regarding the local hydrogeology at the Site, particularly with respect to the possible presence of underlying fractures, sinkholes, and solution channels in the vicinity of the Site. These aquifer characteristics will be further determined during pre-design investigations. However, EPA believes there is sufficient information available at this time to select the remedy for addressing the contamination present at the Site. The Selected Remedy is set forth in the Record Of Decision.

The analytical results generated during the RI were based on data of known quality. These data were thoroughly reviewed and evaluated to determine or quantify any uncertainties in the analytical results. The levels of data quality were selected during the RI/FS scoping process in order to meet the intended use of the data (e.g. risk assessment purposes). All data were validated in accordance with EPA guidelines, depending on analytical parameters. EPA does not believe that the use of these data biases the risk assessment performed for the Site.

As a conservative approach and consistent with EPA guidance, the risk assessment assumed that future land use at the Site could involve a residential scenario for both adult and child residents. False positive chemical detections and analytical results for contaminated blanks were not used in the risk assessment. See also EPA response presented in Part II, Section A, Comment (1a).

The FS report evaluated potential remedial alternatives to address contaminated media of concern at the Site using standard engineering practice and EPA's previous experience with site remediation. Sufficient information is available regarding the nature and extent of contamination at the Site to select the remedy for addressing the contamination present at the Site.

Based on the RI results, the FS assumed that VOCs and metals were the ground water contaminants of concern associated with the Site. At this time, EPA does not believe that semi-volatile organic compounds or DNAPLs are of concern for the ground water contamination present at the Site. Therefore the ground water extraction and treatment system set forth in the ROD includes components to primarily address VOCs and metals. If Site related contaminants which the Selected Remedy fails to remediate are identified in the future, the ROD specifically addresses such a determination. See EPA response presented in Part II, Section B, Comment (f).

i. On page 15 of the Proposed Plan, which sets forth EPA's preferred alternative, EPA proposes to demolish the structure located on the AIW Frank property. We believe it would be more beneficial to both the environment and the productive use of the property to simply leave the structure, rather than demolish it, so that it can be renovated and put back to good use in the future. Furthermore, we do not believe CERCLA authorizes demolition of the structure, given that there is no evidence of a release of a hazardous substance from the structure into the environment.

EPA Response: The AIW Frank Corporation rear building, which is a one story concrete/corrugated structure measuring 180 feet by 160 feet, has been specifically cited as an unsafe structure by the West Whiteland Township building code officer. EPA agrees that the building could possibly be restored to productive use in the future, therefore, the Selected Remedy set forth in the Record of Decision calls for the rear building, and any other on site structure which poses a safety risk to on site workers when carrying out the remedy or interferes with implementation of the selected remedy called for in this ROD, to be demolished or restored to code in accordance with all appropriate federal, state and local regulations. Demolition of the rear building would be appropriate and authorized under CERCLA in order to ensure proper clean up of hazardous substances.

C. Comments of Valley Forge Chapter of Trout Unlimited

In three 2-page letters dated July 13, 14 & 15, 1995 respectively and a one page letter dated August 10, 1995, representatives of the Valley Forge Chapter of Trout Unlimited (VFCTU) commented on the Proposed Plan for the Site. The letters raised concerns regarding the discharge of the treated groundwater to West Valley Creek, in particular that the potential for thermal degradation of West Valley Creek as a

result of the actions described in the Proposed Plan has not been adequately addressed. The VFCTU letter suggested that other discharge alternatives be considered to prevent any further thermal degradation to West Valley Creek. Specifically suggested discharge alternatives were: spray irrigation, injection back into the aquifer, sale of the water to Philadelphia Suburban Water Company, and discharge to PennDOT wetland mitigation.

EPA Response: EPA understands and shares the concern that the members of Trout Unlimited have regarding the protection of the water quality, and recreational uses of West Valley Creek. As a cold water fishery downstream of the Site, West Valley Creek has strict temperature and dissolved oxygen content requirements which the discharge must meet. Effluent and downstream temperature sampling will be required prior to and during the operation of the system in order to ensure that the thermal conditions of the stream are not altered. If sampling data indicates that conditions in the stream may be altered by the treatment system, actions will be taken to assure that the treated effluent discharge will comply with the NPDES requirements listed as ARARs to the ROD.

Based on comments received during the public comment period, EPA has considered alternative discharge options for the treatment system discharge including: 1) discharge to West Valley Creek as described in the proposed plan; 2) discharge to the on Site pond; and 3) spray irrigation of the treated water in the proposed West Whiteland Township spray irrigation POTW system. The final discharge method could be any one or a combination of the three options described above. A complete discussion of these discharge options can be found in Section XI.A. of the ROD.

Discharge to West Valley Creek has been retained as an option, because of the thermal mitigation benefits (i.e. discharging cool treated water directly to the Creek) it would provide in the event that the extraction and treatment system does impact the thermal regime of West Valley Creek. Also, see EPA responses presented in Part I, Section A, Responses #2, #3, #4, #5 & #7 for further information and details.

D. Comments of West Chester Fish, Game & Wildlife Association

In a 3-page letter dated July 13, 1995 the West Chester Fish, Game & Wildlife Association (W.C.F.G. & W.) commented on the Proposed Plan for the Site. The W.C.F.G & W. letter raised several concerns regarding the potential impacts of the discharge of treated groundwater described in the Proposed Plan. The concerns are as follows:

1. The removal of 432,000 gallons per day from the groundwater aquifer and sending it downstream has to adversely effect the aquifer, because of the lack of recharge.

2. An additional flow into West Valley Creek of 432,000 gallons per day at the clean up site, will cause bank erosion and thus increase sedimentation.

3. We oppose sending the treated groundwater to a public sewer system.

4. We recommend the use of spray irrigation or deep well injection in another area to get maximum groundwater recharge.

EPA Response: EPA recognizes the concerns that the members of W.C.F.G & W. have regarding the protection of the water quality, and recreational uses of West Valley Creek and the aquifer in the Site vicinity. Based on comments received during the public comment period, EPA conducted a more detailed design-like reevaluation of the volume of water to be treated. As a result, it is currently estimated that the system will routinely treat and discharge approximately 140 gpm. This translates into slightly more than 200,000 gallons per day. West Valley Creek currently has a flow rate of .465 cubic feet per second ("cfs") at the discharge point contemplated in the Proposed Plan, during typical low flow conditions (mid to late summer). The 140 gpm discharge translates into an additional flow of .307 cfs, which would account for 39% of the total stream flow during low flow conditions. The depth of water in the Creek at the discharge location would likely increase by 3/4 to 1 inch, again during low flow conditions. During normal and high flow conditions the percent increase in flow due to treated effluent discharge would significantly decrease. Therefore bank erosion and increased sedimentation would not occur as a result of the treated water effluent. Typically, bank erosion and sedimentation occurs during very high flow events.

Based on comments received during the public comment period, EPA has considered alternative discharge options for the treatment system discharge including: 1) discharge to West Valley Creek as described in the proposed plan; 2) discharge to the on Site pond; and 3) spray irrigation of the treated water in the proposed West Whiteland Township spray irrigation POTW system. The final discharge method could be any one or a combination of the three options described above. A complete discussion of these discharge options is in Section XI.A. of the ROD. Also, see EPA responses presented above in Part I, Section A,

Responses #2, #4, & #7 for further information and details.

The W.C.F.G & W. letter also suggests that EPA consider the following discharge alternative:

> We urge EPA to work with Philadelphia Suburban Water Company and West Whiteland Township to use treated water from the cleanup project. A current Philadelphia Suburban well could be shut down to conserve groundwater and your treated, safe, drinkable water could be sold to the water company for additional processing and then resold to the general public. It would ultimately be returned to the aquifer by land application.

EPA Response: Sale of the treated effluent to Philadelphia Suburban Water Company ("PSWC") was not specifically evaluated by EPA in the Feasibility Study Report. However, based on comments received during the public comment period, EPA contacted and provided detailed information regarding the extraction and treatment system proposed to representatives of PSWC, to determine their potential interest in such an arrangement. In a letter dated August 17, 1995 PSWC responded to EPA's inquiry. In summary the letter states, "... PSWC could not at this time seriously entertain a proposal to use the discharge from the ground water remediation as a potable water source. The disparate goals of ensuring a high quality public water supply and achieving site clean up under strict EPA requirements present serious complications and obstacles (technical, legal and political) to such a proposal." Therefore, EPA has determined that sale of the treated water discharge is not an implementable option. A complete copy of the August 17, 1995 PSWC letter is in the Administrative Record.

E. Comments of West Whiteland Township officials

In a two page letter dated July 10, 1995, the West Whiteland Township Board of Supervisors raised concerns regarding the disposition of the treated water. The letter states that stream discharge of all the water appears to be extremely wasteful and unacceptable when other more desirable options exist such as:

1. Return of some portion of the water to the wetlands as needed to maintain them.

2. Return of some portion of the water to the 12 mile pond (the pond is located on Church Farm School property) especially in summer to maintain its viability.

3. Spray irrigation to recharge groundwater.

4. Return of some portion of the water as discharge to Valley Creek to maintain low enough temperature (cool) and flow for trout viability and health.

5. Return some water directly to groundwater via wells or injection.

6. If high enough quality, consider selling water to Philadelphia Suburban Water Company.

The letter suggests that a combination of some or all of the above options is preferable to total stream discharge.

EPA Response: EPA understands the concerns Township officials have regarding the treated effluent discharge. Based on comments received during the public comment period, EPA has considered alternative discharge options for the treatment system discharge including: 1) discharge to West Valley Creek as described in the proposed plan; 2) discharge to the on Site pond; and 3) spray irrigation of the treated water in the proposed West Whiteland Township spray irrigation POTW system. The final discharge method could be any one or a combination of the three options described above. A complete discussion of these discharge options can be found in Section XI.A. of the ROD.

Discharge to West Valley Creek has been retained as an option, because of the thermal mitigation benefits (i.e. discharging cool treated water directly to the Creek) it would provide in the event that the extraction and treatment system does impact the thermal regime of West Valley Creek.

Spray irrigation could potentially provide an alternative to direct stream discharge and provide for aquifer recharge. However, EPA has learned that most spray irrigation systems in operation do require a limited stream discharge under certain conditions to control costs. The proposed West Whiteland spray irrigation POTW is in the conceptual design phase, therefore, at this time, EPA does not have enough detailed information to accurately weigh this discharge option against the other discharge alternatives. However, EPA has selected spray irrigation through the West Whiteland POTW system as one of the discharge points it may utilize as part of the Selected Remedy. If after more detailed information is available it is determined during the remedial design that spray irrigation provides the best balance of tradeoffs when weighed against the other two discharge point options it will be incorporated into the design and

implemented.

The potential benefits to discharging to the PENNDOT wetlands area would include avoidance of direct discharge to West Valley Creek and partial recharge of the aquifer. However, discharge to the on site pond provides the same benefits regarding avoidance of direct discharge to West Valley Creek and partial recharge of the aquifer though the pond area and through the intermittent portion of West Valley Creek just west of the pond and east of Ship Road, while minimizing the impacts on the wetlands areas on and off site. Discharge to the on site pond would reduce the eventual total amount of discharge directly to West Valley Creek through evaporation, as well as through ground water recharge. See EPA responses presented in Part I, Section A, Responses #1, #2, #3, #4, #5 & #7 for further information and details.

In a one page letter dated July 14, 1995, the West Whiteland Township Planning Commission raised concerns regarding the discharge of treated groundwater to West Valley Creek as described in the Proposed Plan. The letter suggests the following discharge alternatives:

1. Spray Irrigation;
2. Injection back into the aquifer (wells);
3. Pond, or wetland disposal (two new ponds and two new areas of wetland are in the area).

EPA Response: EPA shares these concerns. Please see EPA response presented immediately above. Also, see EPA responses presented in Part I, Section A, Responses #2, #3, & #4.

Attached to both the Planning Commission letter and the Board of Supervisors letter were the following "Question/Comments for the Environmental Protection Agency (EPA) regarding the A.I.W.F. Remediation":

1. West Whiteland Township is definitely concerned with the impact of drawing three hundred gallons per minute on the carbonate geological structure in that area. Please investigate this issue and advise us on the impact of this drawdown on the carbonate structure. Being sensitive to the issue of sinkholes and carbonate rock formation, West Whiteland Township was a leader in developing ordinance protection since the early 1980's. This general area already contains many sinkholes.

EPA Response: EPA recognizes and appreciates that sinkholes are a legitimate concern in the Site vicinity. Please see EPA response presented in Part I, Section A, Response #6 above regarding sinkholes.

2. West Whiteland township will be facing problems in the near future with sewage capacity at the Downingtown Area Regional Authority ("DARA")treatment facility. You should be advised that the Township is not in favor, at this time, of sending the treated effluent from the AIWF site through our public sewer system to DARA.

EPA Response: Discharge to the DARA POTW was considered and carried through the detailed analysis portion of the Feasibility Study Report for the Site. However, due to implementability and cost concerns raised prior to the issuance of the Proposed Plan, discharge to the DARA POTW was not a component of the preferred alternative presented in the Proposed Plan and is not a component of the Selected Remedy presented in the Record of Decision. It should be noted that the Selected Remedy does include the possibility of discharging to the proposed West Whiteland spray irrigation POTW.

3. You advised us that there would be a twenty-five to thirty year time frame for this remedial project to be completed. Could you provide us with an estimated time frame with special emphasis on the first few years indicating when the design will begin, when it will end, when construction will begin, when waterline placement and house connections will be done, etc., etc.

EPA Response: EPA understands and shares the Townships' and local citizens concerns regarding prompt implementation of the Selected Remedy. However, at this time it is difficult to predict when remedial design and remedial action will occur. Following the issuance of the Record of Decision, EPA will begin formal negotiations with Potentially Responsible Parties ("PRPs") which EPA has concluded are responsible for contamination found at the Site. The negotiations will be conducted in an attempt to have the PRPs consensually implement the Selected Remedy described in the Record of Decision. Typically the negotiation process takes approximately 3 to 6 months. Also, at this time it is impossible to predict if the EPA budget for 1996 will provide EPA the ability to fund the implementation of the Selected Remedy should PRPs not do the work.

For some portions of the Selected Remedy (i.e. the ground water extraction and treatment system) the Remedial Design could take over a year to develop. Other portions of the Selected Remedy may be able to be designed and implemented more quickly. Following remedial design, the installation of the waterline should take approximately 6 months. Similarly, the drum and sump removal, building demolition/

restoration, as well as the soil excavation remedial actions should take approximately 6 months to one year to implement after the remedial design is complete.

A schedule for cleanup activities will be developed during the Remedial Design. EPA will keep citizens informed of the time table for implementation of the selected remedy through distribution of fact sheets and periodic public meetings.

4. We are very concerned with the impact of the quantity of discharge to Valley Creek on the existing stream and at the pond in the middle of Meadowbrook Manor. Kindly provide information as to the percent increase in stream volume of this three hundred gallons per minute as well as what impact it will have on the existing pond. Also, provide information on how the remediation process will stop during heavy flooding so as not to cause additional flooding to those residents in Meadowbrook Manor.

EPA Response: EPA understands the concerns Township officials have regarding the treated effluent discharge and any potential impact it may have on the Meadowbrook Manor pond. Based on comments received during the public comment period, EPA has considered alternative discharge options for the treatment system discharge including: 1) discharge to West Valley Creek as described in the proposed plan; 2) discharge to the on Site pond; and 3) spray irrigation of the treated water in the proposed West Whiteland Township spray irrigation POTW system. The final discharge method could be any one or a combination of the three options described above. EPA may not discharge directly to West Valley Creek. However, in the event that this option is implemented, it should be noted that the exact amount of water that will be discharged will be determined during the Remedial Design. The Proposed Plan estimated that the system would treat a maximum of 300 gallons per minute ("gpm"). Based on comments received during the public comment period, EPA conducted a more detailed design-like reevaluation of the volume of water to be treated. As a result, it is currently estimated that the system will routinely treat and discharge approximately 140 gpm. This translates into slightly more than 200,000 gallons per day. West Valley Creek currently has a flow rate of .465 cubic feet per second ("cfs") at the discharge point contemplated in the Proposed Plan, during typical low flow conditions (mid to late summer). The 140 gpm discharge translates into an additional flow of .307 cts, which would account for 39% of the total stream flow during low flow conditions. The depth of water in the Creek at the discharge location would likely increase by 3/4 to 1 inch, again during low flow conditions. During normal and high flow conditions the percent increase in flow due to treated effluent discharge would significantly decrease. The depth of water in the Creek at the discharge location would likely increase by 3/4 to 1 inch, again during low flow conditions. During normal and high flow conditions (flooding) the percent increase in flow due to treated effluent discharge would significantly decrease. The Selected Remedy must avoid, minimize and mitigate impacts on floodplains, so to the extent the Meadowbrook Manor pond is determined to be in a floodplain the Selected Remedy performance standards will be met (see ROD Section IX.B.1.).

5. West Whiteland is just beginning investigation into treating sanitary sewage on the portion of Church Farm School north of the Chester Valley Rail Line and south of Swedesford Road via spray irrigation. In lieu of a Valley Creek discharge on the west side of Ship Road, would EPA consider spraying at least a portion of this treated effluent in that area or even the area north of Swedesford Road? Could EPA consider joining with West Whiteland Township to add spray irrigation 430,000 gpd to the spray irrigation study which is presently being performed by Tatman & Lee as an option?

EPA Response: Based on comments received during the public comment period, EPA has considered alternative methods for the treatment system discharge including spray irrigation. Spray irrigation could potentially provide an alternative to direct stream discharge and provide for aquifer recharge. However, EPA has learned that most spray irrigation systems in operation do require a limited stream discharge under certain conditions to control costs. The proposed West Whiteland spray irrigation POTW is in the conceptual design phase, therefore, at this time, EPA does not have enough detailed information to accurately weigh this discharge option against the other discharge alternatives. However, EPA has selected spray irrigation through the West Whiteland POTW system as one of the discharge points it may utilize as part of the Selected Remedy. If after more detailed information is available it is determined during the remedial design that spray irrigation provides the best balance of tradeoffs when weighed against the other two discharge point options it will be incorporated into the design and implemented.

6. Have you considered possibly dredging a portion of Meadowbrook Manor Pond so that it will hold more water and provide freeboard for this additional water (i.e. act as a detention basin) which you are proposing to discharge into Valley Creek upstream of Meadowbrook Manor.

EPA Response: Dredging the Meadowbrook Manor pond was not specifically evaluated by EPA. Based on comments received during the proposed plan public comment period EPA considered the dredging of the Meadowbrook Manor pond and has determined that it will not be part of the Selected Remedy. However, the Selected Remedy must avoid, minimize and mitigate impacts on floodplains so to the extent the Meadowbrook Manor pond is determined to be in a floodplain, which is impacted by the Selected Remedy, it will be addressed (see ROD Section IX.B.1.).

7. PennDOT has constructed wetlands immediately downstream in the vicinity of AIWF property on the east side of Ship Road. These wetlands are not yet established and are currently dry. They are presently constructing additional wetlands on the west side of Ship Road. What is the possibility of either discharging or spraying some of this effluent into these wetland areas to serve the purpose of primarily a detention type facility as wells any other positive aspects which the wetlands might provide in this discharge?

EPA Response: Based on comments received during the proposed plan public comment period EPA evaluated this possibility. Please see EPA response presented in Part I, Section A, Response #3.

8. What is the actual quality of water which will be discharged as it relates to drinking water. In other words, is this treated effluent drinkable? Further, are fish edible which would consume and live in this water?

EPA Response: EPA understands and shares the concern that local citizens have regarding the protection of the water quality of West Valley Creek. As a cold water fishery downstream of the Site, West Valley Creek has strict water quality, temperature and dissolved oxygen content requirements which the discharge must meet. The requirements are part of the NPDES requirements, which are established by the Pennsylvania Department of Environmental Protection and are required to be met as ARARs for the Selected Remedy. The NPDES discharge requirements include limits on total suspended solids, total dissolved solids, pH, metals and organic contaminants. Many of the limits meet or exceed drinking water standards. However, others do not, such as the total dissolved solids and total suspended solids limits. Further, this Selected Remedy does not address the bacteriological contamination which would be required to be addressed by a supplier of public drinking water. While these limits will be protective of the aquatic life in the stream they would not be acceptable for a potable water supply. It is expected that the air stripping treatment system will accomplish at least 99% removal of all site related contaminants, and that the resulting treated effluent will comply with the NPDES requirements.

Based on surface water and sediment sampling conducted as part of the remedial investigation downstream of the site, there is no reason to believe that fish in West Valley Creek have been contaminated by Site related hazardous substances.

9. During the initial construction of the wells, the building demolition, etc., please advise as to the manner in which the site will be accessed and egressed from the public road system.

EPA Response: It is expected that the Site will be accessed from Business Route 30 during Remedial Design and Remedial Action ("RD/RA") activities. However, not all RD/RA activities will be conducted on site such as monitoring and extraction well installation, sampling, pump tests, water line construction, etc. Access for these activities will be arranged based on the location of the activity and access agreements with any property owners involved. EPA recognizes the potential for traffic delays on Business Route 30 in the Site area and will attempt to minimize any Site related traffic disturbance.

10. With regard to the construction of the wells, the waterlines, the remedial building and stripping tower, as well as the actual operation of the pumps and stripping facility, what impact will this have on neighbors with regard to noise, dust, odor, and other similar negative impacts?

EPA Response: Remedial Design/Remedial Action ("RD/RA") activities involving the use of heavy equipment and drilling rigs will in the short term create elevated activity and location specific noise. Well drilling is typically completed in a matter of days. However, the excavation, grading and building demolition activities may take several months to complete once remedial action has begun. The long term operation of the air stripper tower and its associated blower and pumps should not create noise levels outside of the treatment building, or off site. The long term operation of the air stripper treatment system should not create odors. Dust control measures will be taken during the building demolition, soil excavation and other construction activities called for in the selected remedy. All off site areas impacted by the construction activities during remedy design, implementation and operation and maintenance shall be graded, restored and revegetated.

11. What will be done to protect pedestrian interest and providing their safety from the site?

EPA Response: While permanent fencing is not part of the Selected Remedy for the Site set forth in the ROD, EPA expects that during remedy implementation temporary fencing will be erected by contractors performing the work to prevent pedestrian access to the on site equipment and work areas.

12. We are concerned about other safety impacts to the "neighbors" of this facility especially with regard to inhaling fumes from the stripping tower and drinking water in the interim before they are tied into the public water system, etc. Please advise as to how EPA will address these concerns.

EPA Response: Contaminants in the emitted air from the air stripping system will be captured by a vapor phase carbon adsorption unit. Air emissions from the air stripping tower must be reduced to the minimum attainable level through the use of the Best Available Technology (BAT), 25 PA Code § 127.12(a)(5). Those regulations require that emissions be reduced to the minimum levels possible. At these levels any residual risk posed by emissions from the air stripping tower are far below the acceptable risk level established by EPA of 1.0 x 10-6 (or 1 in 1,000,000). The vapor phase carbon adsorption units will be monitored (twice per month) and replaced on a periodic basis which will ensure that no contaminant breakthrough will occur.

The selected remedy described in the Record of Decision for the Site includes the provision of point of use carbon filtration units to those residents/businesses whose wells have shown levels of contaminants of concern above maximum contaminant levels ("MCLs") until such time as those residents/businesses are connected to the public water line.

13. What is the ultimate disposition of the site once everything at the AIWF property and the Mid-County Mustang property is complete? Will it be sold? By whom? Who will be the beneficiary of the funds received in the acquisition?

EPA Response: EPA is not the current owner of the Site properties. EPA has, however, placed a lien on a portion of the Site which would have to be satisfied before ownership of the property could be transferred. The owners of record are free to sell these properties at any time: EPA's investigations and response actions are not intended to interfere with those actions. Except for satisfying any liens, the property owners will receive the proceeds of any sale. However, the site owners may be considered Responsible Parties for the Site, and thus liable for clean up costs.

14. You have indicated that there would be deed restrictions on future owners of this property. Do these deed restrictions go beyond the drilling of wells on the site to the extent that it may not be able to be used for a nursery, agricultural uses, or any other uses which would use the soil? Further, will there be impacts on the structural stability of the soil as a result of the remedial action taken? The Township should be aware of this in the issuance of future permits for structures and uses at that site.

EPA Response: The Selected Remedy described in the Record of Decision for the Site when fully implemented is intended to allow reuse of the properties; indeed, removing on site contamination through implementation of the Selected Remedy will allow for more flexible use of Site properties. Except for avoiding activities that will interfere with the remediation of the Site, current and future owners are free to use the Site properties in a manner consistent with current land use and zoning laws. The Selected Remedy includes institutional controls which will identify the Site as property underlain by contaminated ground water. The restrictions will prohibit installation of wells and use of ground water in the area of the contaminant plume. There should be no impacts on the structural stability of the Site soils once the Selected Remedy is completed.

15. It should be noted that West Whiteland Township is in favor of the demolition of the building, water tower, and any other structures on site including the removal of the five existing, buried fuel oil tanks. Is there anything which the Township can do to assure that these will be done?

EPA Response: EPA understands the concerns of the Township and appreciates their willingness to assist the agency. The selected remedy described in the Record of Decision for the Site includes demolition or restoration to code of Site structures. The rear building, and any other on site structure which poses a safety risk to on site workers when carrying out the remedy or interferes with implementation of the selected remedy called for in this ROD, will be demolished or restored to code in accordance with all appropriate federal, state and local regulations. The fuel oil underground storage tanks are specifically excluded from Superfund authority and will not be addressed in the Superfund actions at the Site. However, the USTs will be referred to the appropriate State and Federal programs and will be addressed under those programs in coordination with the Superfund activities at the Site.

16. What is the potential of injecting the treated effluent back into the ground to eliminate the discharge all together?

EPA Response: Please refer to the EPA response presented in Part I, Section A, response #4.

17. Have you considered disposing of the treated effluent in different ways depending on seasonal and weather changes such as stream discharge along with wetlands used, along with pond storage, as well as spray irrigation, and injecting the treated effluent into the ground?

EPA Response: EPA did not consider the discharge of treated effluent in different ways depending on seasonal and weather changes in the Feasibility Study Report. However, the combination of several

treated effluent discharge options based on seasonal and weather changes would unacceptably increase the total capital costs for discharge, as well as present significant operational control difficulties. The Selected Remedy described in the Record of Decision for the site includes several discharge points of the treated effluent. Based on comments received during the public comment period, EPA has considered alternative methods for the treatment system discharge including: 1) discharge to West Valley Creek; 2) discharge to the on Site pond; and 3) spray irrigation of the treated water in the proposed West Whiteland Township sewer spray irrigation system. A complete discussion of these discharge alternatives can be found in Section XI.A. of the ROD. Also, see EPA responses presented in Part I, Section A, responses #2, #3 and #4 above.

18. The Township and the County have purchased 200+ acres of the Church Farm School property including the 12 mile pond, for recreational purposes at a cost of twelve million dollars. The pond is very shallow; therefore, the Township and the county are concerned that draw down of the aquifer will damage or cause the pond to dry. What insurances will EPA give that this will not happen?

EPA Response: The 12 mile pond is located up gradient of the contaminant plume and it is not anticipated that extraction wells will be located near the pond, therefore, it is highly unlikely that the treatment system will have an impact on water levels in the pond. EPA can not give assurances that the pond will not dry up, however, because the potential drying of the pond is a natural occurrence as evidenced when the pond level lowered significantly this summer due to drought conditions resulting in a fish kill.

F. Comments of Brandywine Conservancy

In a 3-page letter dated July 17, 1995, H. William Sellers of the Brandywine Conservancy commented on the Proposed Plan for the Site. The letter raised concerns that the potential for existing sinkhole collapse and creation of additional sinkholes, along with depletion of the aquifer as a result of the extraction and treatment actions described in the Proposed Plan has not been adequately addressed. The letter also raises the concern that during warm weather the airstripper will raise the temperature of the treated groundwater to the extent that discharge of the water to West Valley Creek will have an adverse effect on aquatic life in the cold water fishery. The Brandywine Conservancy suggested that EPA join with West Whiteland Township in the Township's proposed sewer treatment spray irrigation system or discharge a portion of the treated water to the 12 mile pond on the former Church Farm School property.

EPA Response: EPA appreciated and seriously considered the comments submitted by the Brandywine Conservancy. Please refer to EPA responses presented in Part I, section A, responses #2, #6, and #7 above for a discussion of these points.

G. Comments of Clean Water Action

In a one page letter dated July 18, 1995 Clean Water Action raised concerns regarding the discharge of treated groundwater discharge options described in the Proposed Plan. The specific questions and concerns raised follow:

1. What is the rationale for disposing of treated water into Valley Creek, or DARA's sewage treatment plant?

EPA Response: The treated effluent discharge options in the proposed plan included discharge to West Valley Creek and to the local POTW (DARA). EPA believed the preferred alternative including discharge to West Valley Creek provided the best balance of trade-offs among the alternatives evaluated with respect to the nine NCP criteria. EPA carefully considered state and community acceptance of the preferred alternative prior to reaching the final decision regarding the remedy and treated effluent discharge. In summary, the Selected Remedy described in the Record of Decision including the discharge options described in Part I, Section A, response #1 of this responsiveness summary is believed to provide the best balance of trade-offs among the alternatives evaluated with respect to the nine NCP criteria.

2. Does dumping 324,000 gpd into Valley Creek, a tributary of the Brandywine River, add to the River's constant flooding problems?

EPA Response: EPA does not believe that the Selected Remedy set forth in the Record of Decision will add to the flooding problems of the Brandywine River. Also, please refer to the EPA response presented in Part I, Section A, responses #1 for a detailed discussion of this point.

3. Is holding the water in lagoons and slowly releasing it into Valley Creek or even spraying it on the land an option?

EPA Response: Possibly. Based on comments received during the public comment period, EPA has considered alternative methods for the treatment system discharge including spray irrigation. Spray irrigation

could potentially provide an alternative to direct stream discharge and provide for aquifer recharge. However, EPA has learned that most spray irrigation systems in operation do require a limited stream discharge under certain conditions to control costs. The proposed West Whiteland spray irrigation POTW is in the conceptual design phase, therefore, at this time, EPA does not have enough detailed information to accurately weigh this discharge option against the other discharge alternatives. However, EPA has selected spray irrigation through the West Whiteland POTW system as one of the discharge points it may utilize as part of the Selected Remedy. If after more detailed information is available it is determined during the remedial design that spray irrigation provides the best balance of tradeoffs when weighed against the other two discharge point options it will be incorporated into the design and implemented. See EPA response presented in Part I, Section A, response #2.

The letter also suggests that some of the water could be directed to the PennDOT wetlands mitigation project and urges EPA to work closely with West Whiteland Township Supervisors in developing the final plan.

EPA Response: Please refer to the EPA response presented in Part I, Section A, response #3 regarding discharge to the PennDOT wetlands. EPA intends to keep the West Whiteland Township Supervisors informed of Site activities, as well as working with them to the greatest extent possible during remedial design and implementation.

H. Comments of West Chester Area Municipal Authority

In a one page letter dated August 14, 1995, The West Chester Area Municipal Authority raised concerns regarding the discharge of treated groundwater discharge options described in the Proposed Plan. The letter requests that EPA reconsider deep well re injection or spray irrigation as discharge alternatives.

EPA Response: EPA understands the concerns of the Authority and has carefully considered the discharge alternative suggested. Please see EPA responses presented in Part I, Section A, responses #2, and #4 above for detailed responses.