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EPA Superfund
Record of Decision:

Stanley Kessler Superfund Site,
King of Prussia, PA,
~~9/29/94~~
9/30/94

RECORD OF DECISION
STANLEY KESSLER SUPERFUND SITE

DECLARATION

SITE NAME AND LOCATION

Stanley Kessler Superfund Site
Upper Merion Township, Montgomery County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the final selected remedial action for the Stanley Kessler 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 this Site.

The Commonwealth of Pennsylvania has concurred on this remedy.

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 the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Site will restore contaminated ground water to its beneficial use by cleaning up the ground water to background levels as established by EPA or to the appropriate Maximum Contaminant Levels ("MCLs") or non-zero Maximum Contaminant Level Goals ("MCLGs") established under the Federal Safe Drinking Water Act ("SDWA") whichever is more stringent. The selected remedy as described below is the only planned action for the Site.

The selected remedy includes the following major components:

- Ground water extraction to remove contaminated ground water from beneath the Site and to prevent contaminants from migrating further
- Installation, operation, and maintenance of granular activated carbon units to treat ground water to the required levels
- Periodic sampling of ground water and treated water to ensure that treatment components are effective and ground water remediation is progressing towards the required cleanup levels
- Deed Restrictions to prohibit the installation of new wells in areas of contamination which do not meet applicable or relevant and appropriate requirements ("ARARs"). These restrictions can be withdrawn when ARARs are achieved.

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. Implementation of the selected remedy will not involve extensive construction, excavation, or other remedial action measures that would pose any appreciable short-term risks to the public or to the workers during construction or implementation.

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.

Peter H. Kostmayer
Regional Administrator
Region III

9/30/94
Date

EPA REGION 3
SEPTEMBER, 1994

RECORD OF DECISION
STANLEY KESSLER SITE
KING OF PRUSSIA, PENNSYLVANIA

RECORD OF DECISION

STANLEY KESSLER SUPERFUND SITE

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RECORD OF DECISION
STANLEY KESSLER SUPERFUND

DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

The Stanley Kessler Site (the "Site") is located at 103 Queens Drive, King of Prussia, Upper Merion Township, Montgomery County, Pennsylvania. The Stanley Kessler Company operates a business at the Site on a 3.21 acre parcel within an industrilized area of King of Prussia. The property contains an approximate 14,760 square foot one story masonry building where wire is degreased and respooled. (Figure 1, Site Location Map)

Local physiography is characterized by low rolling hills and ridges of the Chester Valley, a subdivision of the Piedmont uplands, which generally trend in an east-west direction. The Chester Valley contains tightly folded carbonate rocks of Cambrian and Ordovician age. Sinkholes are commonly associated with the weathering characteristics of the limestone and dolomite bedrock and have been reported present in the vicinity of the Site.

The Schuylkill River, which flows to the east and south through this portion of the valley is located, at its closest point, approximately two (2) miles to the east of the site and is the principal regional drainage feature. A portion of an unnamed tributary of the Schuylkill River flows adjacent to portions of the Site.

The current source of drinking water for the businesses and homes in the Site vicinity is the Upper Merion Reservoir ("UMR"), which lies approximately 3500 feet north of the Site. Hazardous substances released to the ground water at and from the Site flow towards the UMR.

II. SITE HISTORY AND ENFORCEMENT ACTIVITY

Materials are stored on a level paved area south of the building onsite. This paved area is enclosed by an eight-foot high chain-link fence. The Stanley Kessler and Company, Inc. ("Kessler") conducts operations at the Site which consist of degreasing and repackaging welding wire. There are no manufacturing operations at the facility. Since approximately 1963, solvents have been used for degreasing at the Site; prior to 1963, acids and bases were used for cleaning metals. During the period when acids were used, splashed acid, or drag-out, from the acid-dip degreasers was washed down a series of floor drains inside the building to an onsite acid waste neutralization system. This neutralization system consisted of two tanks which have historically been referred to as the septic tank ("Tank 1") and cesspool ("Tank 2"). Tank 1 consisted of a concrete vessel, containing crushed limestone to neutralize the acid, with a baffled overflow to Tank 2. Tank 2 was a cinder block vessel which had no structural bottom and was open to native soils. Tank 2 was the most northerly of the two tanks that constituted the waste neutralization system.

In April 1979, trichloroethene ("TCE"), 1,2,3-trichloropropane, tetrachloroethene ("PCE") and other volatile organic compounds ("VOCs") were detected in the Upper Merion Reservoir ("UMR"). The UMR was formerly a dolomite quarry, known as the Bridgeport Quarry, and has served as a public water supply source operated by the Philadelphia Suburban Water Company since 1969. The reported presence of VOCs in the UMR prompted an area-wide investigation by PADER and the USEPA to identify potential sources of ground water contamination.

In July, 1979 the Pennsylvania Department of Environemntal Resources ("PADER") and USEPA personnel sampled Tank 2, the "cesspool", at the site. While onsite, approximately 30 drums, stored in an asphalt paved area adjacent to the east side of the building, were observed by USEPA and PADER. More than 20 drums reportedly contained water that was contaminated with trace amounts of solvents; some of the drums reportedly contained spent solvent, and some were empty.

In correspondence dated September 7, 1979, Kessler was notified by the PADER that the company was in violation of the Pennsylvania Clean Streams Law because TCE and other organic compounds had been detected in the cesspool water sample collected by USEPA/PADER. At that time, Kessler was directed by PADER to install monitoring wells to define the extent of ground water contamination, develop a recovery plan, eliminate all sources of ground water pollution, and prepare a Pollution Incident Prevention Plan for the facility. Five monitoring wells were installed and sampled. The analyses results indicated the presence of several organic contaminants in the ground water.

In 1981 the septic tank and cesspool were excavated. Grossly discolored, blue-green soils with a strong chemical odor were encountered beneath both the septic tank and cesspool. As the excavation progressed, soil samples were collected by EPA. Organic analyses of these soils showed that many volatile organic contaminants were present. The strongest concentration of contaminants was determined to be under the cesspool, where the soil contained 1,700 parts per million ("ppm") of 1,1,1-trichloroethane ("TCA"), 910 ppm of TCE, 460 ppm of toluene, and 52 ppm of PCE. The depth of the excavation was about 15 feet. In all, approximately 60 tons of soil were removed and transported offsite for disposal. The excavated area was filled with rocks and soil. Three vent pipes were installed, penetrating to a depth of about 12 feet.

The USEPA finalized the listing of the Site on the CERCLA National Priorities List ("NPL") in December 1982 (47 Fed. Reg. 58484) (December 30, 1982).

In 1984, Kessler installed an onsite ground water air stripping treatment system in response to a federal court order issued in March 1984. To create its ground water extraction and treatment system, Kessler converted an existing monitoring well located near the site of the excavated septic tank into a recovery well, RW-1. In June 1984 the recovery well began pumping ground water at the rate of 5 gallons per minute ("gpm"). The pumped-out ground water was treated in an air stripper. Treated water was then re-introduced to the subsurface through a discharge point, or "infiltration gallery", located where the septic tank and cesspool had been, in order to flush contaminants from the soil. Subsurface water levels could be monitored through the three vent pipes. Ground water and the treatment system were monitored monthly for TCE and PCE only. In 1984 samples collected from RW-1 at a depth of 90 - 100 feet below ground revealed concentrations up to 16,000 parts per billion ("ppb") of TCE. The ground water treatment and soil flushing program was discontinued in September 1990 in order to conduct the remedial investigation. The sampling conducted during the remedial investigation (1992) detected 600 ppb of TCE at RW-1 and 130 ppb TCE in monitoring well, MW-6. The data generated during this ground water withdrawal and soil flushing program indicate that pumping the ground water reduced the contaminant concentrations in the ground water. Despite the ground water remediation that was conducted from 1984 to 1990, contaminant concentrations at RW-1 and at monitoring wells downgradient of the former septic tank and cesspool area, are still significantly higher than drinking water quality standards and represent a threat to the Class IIA aquifer, which is affected by releases from this Site.

On July 5, 1994, EPA sent notice of the impending remedial design/remedial action ("RD/RA") negotiations to the Department of Interior ("DOI") and the National Oceanic and Atmospheric Administration. EPA sent a notice of the Proposed Remedial Action Plan to the Delaware River Basin Commission on August 5, 1994.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS report and the Proposed Plan for the Site were released to the public on June 20, 1994, in accordance with Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA, 42 U.S.C. §§9613(k)(2)(B), 9617(a), and 9621(f)(1)(G). These and other related documents were made available in the Administrative Record located at the U.S. EPA Region III Office, 841 Chestnut Building, Philadelphia, Pennsylvania, 19107; and at the Site

Repository, Upper Merion Township Library, 175 West Valley Forge Road, King of Prussia, Pennsylvania, 19406.

A public meeting was held on June 30, 1994 to discuss the results of the RI/FS and the preferred alternative as presented in the Proposed Plan for the Site. Notice of the Proposed Plan and public meeting was published in the Montgomery County Neighbors Section of The Philadelphia Inquirer on June 16th and June 23rd. Due to a request for an extension, the comment period was extended to 60 days, closing on August 18, 1994. EPA notified the public of the 30-day extension to the public comment period by placing a display advertisement in The Philadelphia Inquirer on June 30, 1994.

In accordance with 40 C.F.R. § 300.430 (f)(3)(F), all comments which were received by EPA prior to the end of the comment period, including those expressed verbally at the public meeting were considered and are addressed in the Responsiveness Summary which is part of this ROD.

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

The National Contingency Plan ("NCP") (40 C.F.R. § 300.430 (a)(1)(i)) states that the general goal of the remedy selection process is to select remedies that: are 1) protective of human health and the environment; 2) maintain protection over time; and 3) minimize untreated waste. In addition, Section 121 of CERCLA, 42 U.S.C. § 9621, includes general goals for remedial actions at all Superfund sites. The goals include: achieving a degree of cleanup which assures protection of human health and the environment (Section 121(d)(1)); selecting cost effective remedies (Sections 121(a) and 121 (b)(1)); preference for selecting remedial actions in which treatment that permanently and significantly reduces the volume, toxicity, or mobility of contaminants is a principal element (Section 121(b)); and requiring that the selected remedy complies with or attains the level of any applicable or relevant and appropriate requirements ("ARARs") of federal or State environmental laws (Section 121(d)(2)(A)). The remedy selected in this ROD is pumping and treating of the contaminated ground water emanating from the Site. This ROD is the only planned response action for the Site.

This ROD requires remediation of the ground water aquifer which has been contaminated by releases of hazardous substances at and from the Site. EPA has classified the affected aquifer at the Stanley Kessler Site as a Class IIA aquifer, a current source of drinking water, in accordance with the EPA document "Guidelines for Ground Water 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. MCLs are enforceable standards set for public water supply systems and are ARARs for the ground water at the Site which is a current source of drinking water. EPA ground water policy, as described in the document entitled "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites," require active restoration of ground water that is a current or potential source of drinking water through pumping and treatment.

The objectives of the selected response action are to 1) restore contaminated ground water to background concentrations, 2) prevent current or future exposure to contaminated ground water, and 3) protect uncontaminated ground water for current and future use. Pumping and treating ground water is the most expeditious way to reduce the contaminant levels that have been detected and inhibit further migration of the contaminant plume.

V. SUMMARY OF SITE CHARACTERISTICS AND EXTENT OF CONTAMINATION

A. SITE CHARACTERISTICS

1. Geology

Local physiography is characterized by low rolling hills and ridges of the Chester Valley, a subdivision of the Piedmont Uplands Section of the Piedmont Physiographic Province, which generally trends in an east-west direction. The Chester Valley contains tightly folded carbonate rocks of Cambrian and Ordovician age. Sinkholes are commonly associated with the weathering characteristics of the limestone and dolomite bedrock and have been reported present in the vicinity of the Site.

Geology of the Piedmont Upland Section in the study area is characterized by Precambrian to early Paleozoic crystalline metamorphic rocks (including schists and gneisses of the Wissahickon Formation) and sedimentary rocks (Cambro-Ordovician carbonates) which have undergone partial low-grade metamorphism. The Cambro-Ordovician carbonate sequence dominates the geology and hydrogeology at, and in the immediate vicinity of, the Site. This sequence of carbonate rocks consists of three distinct geologic formations which are, from oldest to youngest, the Ledger (dolomite), Elbrook (limestone), and Conestoga (limestone). The bedding strike of this carbonate sequence is reported as N80E in the vicinity of the Site with bedding dip at 50 - 55 degrees to the south-southeast.

The Site is underlain by the Conestoga Formation which consists of blue to gray, granular, thin-bedded, micaceous limestone, a middle dark graphitic member and basal beds that are conglomeratic containing pebbles and masses of marble in a limestone matrix. Underlying the Conestoga Formation and mapped as subcropping to the north of the Site is the Elbrook Formation. The Elbrook Formation is described as a thinly-bedded, light to light blue limestone. There are some beds of finely laminated, fine-grained marble as well. The Ledger Formation underlies the Elbrook Formation and is mapped as subcropping immediately north of the Elbrook Formation. The Ledger Formation mainly consists of a light gray to white dolomite that is often massive. A reservoir used as a major source of supply of drinking water for the Philadelphia Suburban Water Company known as the Upper Merion Reservoir (aka Bridgeport Quarry) is located approximately 3500 feet north of the Site and within the Ledger Dolomite (see Figure 1).

There have been several investigations in which measurements of linear structural features from quarry walls and rock outcrops in the Site vicinity were collected and analyzed to identify the average trend and dip of joint sets. The reported strike and dip of the joints measured in the Site vicinity are N16-30E with a dip of 70-90 degrees NW, N60W with a dip of 35-40 degrees NE, and N84W with a dip of 55 degrees SW.

A fracture trace analysis was performed through stereoscopic inspection of aerial photographs by the United States Geological Survey (USGS) in 1982. Many lineaments and fracture traces were mapped in the vicinity of the Upper Merion Reservoir. The trend of the mapped lineaments and fractures correspond to the reported measured trend of the joints in the study area. These interpreted lineaments are well developed and extend across the different contacts of the three carbonate formations at angles to the reported bedding trend.

The Site geology, based on monitoring well data, consists of saprolite and underlying limestone bedrock. Saprolite is the chemically weathered product of bedrock and ranges in thickness from 30 to 70 feet. The saprolite consists of brown, orange-brown, and olive green sandy silts, clayey silts, and silty clays with phyllite and limestone fragments. A larger amount of phyllite and limestone fragments are encountered with depth. Competent bedrock is described as blue-gray and brown, thickly bedded limestone which is consistent with the description of the Conestoga Limestone Formation.

Hydrogeology

The aquifer underlying the Site is a carbonate aquifer and regionally encompasses the Ledger, Elbrook, and Conestoga Formations. As is the case for all carbonate aquifers, ground water flows through secondary porosity features such as joints, fractures, and bedding planes which are enlarged through solutioning. Consequently, ground water flow will be influenced by the structural orientation and interconnectivity of fractures and joints. During a USGS study of the Valley Creek Basin in Chester Valley, five active quarries were inspected which revealed that most of the solution openings were horizontally enhanced vertical fractures whose width was less than one foot.

This carbonate aquifer has been described as anisotropic with a principal axis of highest transmissivity trending east-northeast. A pump test at the Henderson Road NPL site, which is located approximately 1000 feet north of the Stanley Kessler site, demonstrated the trend of the principal axis of transmissivity at about N60E. Water level data also indicate an elongate cone of depression surrounding the UMR in an east-northeast direction. The pump test at the Stanley Kessler Site also revealed an elliptical cone of depression oriented in an east-northeast direction. However, although ground water flows more readily along this axis of higher transmissivity under natural conditions, the extreme amount of withdrawal of water from the UMR in conjunction with the existence of almost north-south and northwest-southeast trending joints and fractures, causes ground water to migrate toward the UMR to the north.

Aquifer properties were determined from an aquifer test performed during the Remedial Investigation. The estimated average transmissivity was calculated as 13000 gpd/ft. Given that the aquifer test occurred within the top 100 feet of the saturated aquifer, the hydraulic conductivity was evaluated as 130 gpd/ft or 6.13 E-3 cm/sec. The hydraulic gradient was based on water elevation data collected during the RI and was calculated to be 0.05 ft/ft to the north-northwest. The effective porosity most likely ranges from 0.01 to 0.05. Therefore, the estimated average linear velocity would range from 17 ft/day to 87 ft/day.

Due to the large amount of withdrawal (approximately seven million gallons per day ("mgd") from the Upper Merion Reservoir 3500 feet north of the Site), the water table has been lowered significantly and a large cone of depression has been identified based on ground water elevation data. This cone of depression extends beneath the Stanley Kessler Site and strongly influences the direction of ground water flow. (See Figure 2)

B. Nature And Extent Of Contamination

Environmental media were analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides/PCBs and metals as summarized in Table 1. Soil, surface water and sediment sampling locations are depicted in Figure 3. Ground water sampling locations are depicted in Figure 4. Additionally, select soil samples were analyzed for Total Organic Carbon ("TOC"), grain size distribution, permeability, in situ soil moisture, and density; surface water samples were analyzed in situ for Ph, temperature, Eh, dissolved oxygen, and specific conductivity; and sediment samples were analyzed for grain size distribution and TOC. Various water quality parameters were also measured in situ which included pH, temperatures, Eh, dissolved oxygen and specific conductivity.

Figure 5, the Conceptual Site Model, shows the mechanisms of contaminant release and potential transport mechanisms. The primary source of Site contamination was the disposal of waste solvents at the Site that were released into the ground water. As a result of the releases ground water has been contaminated significantly above Maximum Contaminant Levels.

1. Soils

A total of ninety-three soil gas samples were collected in the areas of the septic tank and cesspool and the former drum storage areas during the soil gas survey. TCE was the most frequently identified volatile chemical found in the soil gas samples. TCE was detected in nearly all the soil gas samples from the septic tank and cesspool area, and was also detected in the former drum storage areas. PCE and 1,1,1-TCA were identified to a lesser extent and vinyl chloride was randomly detected in 6 of 93 samples.

A total of eleven soil borings were installed during the subsurface soil investigation. Samples were collected on three foot intervals until no VOCs were detected using the portable gas chromatograph ("GC") in the two former drum storage areas (six borings total, three from each area) and on five foot intervals to bedrock in the waste neutralization area (five borings total). Site surface soil analytical data generally indicates nondectable concentrations, concentrations slightly above detection levels, and concentrations similar to the background sample for SVOCs, pesticides/PCBs, and inorganic metals. The highest concentration of site related volatiles (30 ppb TCE and 16 ppb 1,1,1-TCA) were detected in the southwest former drum storage area. These samples were collected below an asphalt cover at a depth of 3-5 feet. Acetone was detected in three soil boring samples above the PADER cleanup standard of 30 ppb at 5-7 feet (64 ppb), 13-15 feet (89 ppb) and at 15-19 feet (60 ppb) in soil boring 131 in the east former drum storage area. Tables 2 through 5 summarize the results of the soil investigation. Tables 6 and 7 are a comparison of the reported concentrations of the inorganics detected in the surface soil and subsurface soil samples with background values for the inorganics in soil. Beryllium was detected above the PADER cleanup guidance of 1 ppm in the following three soil samples SB-202-1112 at 3.1 ppm, SB-203-1113 at 3.7 ppm and at SB-204-1114 at 3.4 ppm at depths ranging from 34-54 feet in the former waste neutralization area. EPA does not believe the acetone or beryllium represent a threat to ground water because acetone was not detected in the monitoring well which is downgradient of this soil boring location. Beryllium was not detected in the filtered ground water samples which were collected in the former waste neutralization area.

2. Surface Water and Sediment

A total of five surface water samples and four sediment samples were collected in the intermittent stream and one of its tributaries. The low levels of semivolatiles, pesticides/PCBs, and metals that were detected were similar to background concentrations. Tables 8 through 12 summarize the results of the surface sampling and Tables 13 through 16 summarize the results of the sediment sampling.

3. Ground Water

TCE and 1,1,1-TCA were detected in all ground water samples at concentrations from 8.4 ppb at MW-3 to 600 ppb at RW-1 for TCE, and 1.4 ppb at MW-3 to 340 ppb at RW-1 for 1,1,1-TCA. The highest TCE hit was at the 149'-160' below ground interval at RW-1, and for 1,1,1-TCA at the 126'-138' interval at RW-1. Toluene was detected in only RW-1 during the depth discrete sampling ranging in concentration from .5 ppb to 46 ppb. The highest hit for toluene was detected at the 126'-138' interval. Tables 17, 18, and 19 summarize the results for volatile organics, total metals and dissolved metals. Table 20 summarizes the results of the depth discrete sampling of RW-1. At least five of the Site-related contaminants detected in the Class IIA aquifer exceed MCLs. The contaminants and their respective MCLs are summarized in the table below.

Concentrations of total metals in unfiltered ground water samples have at times exceeded MCLs, and Drinking Water Equivalent Levels for silver, barium, beryllium, cadmium, sodium, lead, and antimony. The dissolved metals concentrations were below these standards. Filtered samples represent dissolved metals concentration and are often more representative of mobile contamination. Monitoring wells sometimes produce turbid water (water containing solids). The turbidity can be due to disruption of the adjacent geologic formations during well purging. When particles containing metal species are suspended into the ground water and are not removed, they dissolve when the sample is preserved to a pH<2. Only the filtered ground water sampling results were used in the Risk Assessment.

Chemical	Maximum Concentration Observed (ppb)	SDWA MCL (ppb)	Monitoring Well Observed*
VOLATILE ORGANIC COMPOUNDS			
Benzene	7.3	5.0	MW-5A
Chlorobenzene	2.1	100	MW-5A
Chloroform	<0.5	100	MW-8
Cis-1,2-Dichloroethylene	4.6	70	RW-1
Dichloromethane	<0.5	5.0	MW-6
1,2-Dichloroethane	1.4	5.0	RW-1
1,1-Dichloroethene	37	7.0	RW-1
Tetrachloroethene	7.3	5.0	RW-1
1,1,2,-Trichloroethane	0.8	5.0	RW-1
1,1,1-Trichloroethane	340	200	RW-1
Trichloroethene	600	5.0	RW-1
Toluene	46	1000	RW-1

Summary of Organic Groundwater Sampling Results at the Stanley Kessler Site

*Indicates where the highest contaminant concentrations were detected.

VI. SUMMARY OF SITE RISKS

An assessment of the potential risks posed to human health and the environment was completed in accordance with the NCP [40 C.F.R. 300.430(d)]. This section of the ROD discusses the results of the human health and ecological baseline risk assessment. The results of the baseline risk assessments provide justification for performing the remedial action and assist in determining what exposure pathways need to be remediated.

A. ENVIRONMENTAL RISKS

EPA has classified the affected aquifer at the Stanley Kessler Site as a Class IIA aquifer, a current source of drinking water, in accordance with the EPA document "Guidelines for Ground Water 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. MCLs are enforceable standards set for public water supply systems and are relevant and appropriate for the ground water at the Site which is a current source of drinking water. EPA ground water policy, as described in the document entitled "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites," require active restoration of ground water that is a current or potential source of drinking water through pumping and treatment. The affected aquifer is a current source of drinking water which has been contaminated above acceptable drinking water standards. Therefore the environment has been adversely affected due to releases from the Site.

No known threatened or endangered plant or animal species have been identified in the immediate vicinity of the Site. Based on the industrial use of the Site and surrounding area, the presence of an extensive terrestrial community is unlikely. Terrestrial organisms that could inhabit the Site are birds and small wildlife. Most of the facility property is paved; and the unpaved areas are primarily covered with grass or vegetation.

The potential for areas immediately surrounding the Site to support a large wildlife population or a diverse community of terrestrial and aquatic life is low. The land use is mainly industrial, and there is substantial vehicular traffic on roads in the area. In addition, the surrounding area is an urban, well-populated area.

B. HUMAN HEALTH RISK EVALUATION

The potential human health risks posed by a Superfund Site if no remedial action is taken are calculated in a baseline risk assessment. In general, a site poses a potential human health risk if 1) the contaminants at the site may cause cancer or some other health effect at existing levels, 2) there is a route or pathway through which a receptor may be exposed, e.g., ingestion of contaminated soil, and 3) there is a receptor which can be exposed, e.g., a child ingesting soil. In a baseline human health risk assessment, the contaminants are evaluated, the exposure routes are characterized and the receptors are identified.

As described in detail below, the consumption of ground water at the Site would result in unacceptable risk to human health. Currently, there are no wells providing ground water at the Site, but the aquifer is a natural resource which could be used in the future. Additionally, the contaminated ground water from the Site flows to the UMR.

<u>Exposure Assessment</u>

The exposure assessment identified potential exposure pathways. Five exposure scenarios were examined under current and future use assumptions. Exposure of receptors to chemicals in potentially impacted media (surface soil, ground water, and air) were examined under Reasonable Maximum Exposure ("RME") assumptions.

Current surface land use in the vicinity of the Site is zoned limited industrial/light manufacturing. Industrial facilities are located directly to the northeast, southwest, and west of the Site. The nearest residential dwelling is approximately 1500 feet northeast of the Site and the nearest school is 0.5 miles south of the Site. Residential developments are located within one mile of the Site and include Henderson Park, Gulph Mills Village, Kingswood Apartment, and Hughes Park.

Future use of the Site is assumed to be residential, which includes domestic use of onsite ground water, for risk assessment purposes. Ground water beneath the Site is classified as a Class IIA aquifer, a current source of drinking water.

The Site and surrounding areas fall within the Philadelphia Suburban Water Company ("PSWCo") franchise area which supplies potable water to its customers. According to the Montgomery County Planning Commission water supply distribution mains for Montgomery County indicate that all surrounding properties are serviced by PSWCo or another water company. However, use of an exposure scenario based on future residential use is consistent with EPA Risk Assessment Guidance which requires consideration of hypothetical residential use. Moreover, EPA requires that ground water which is suitable for use as a water supply be protected and restored to its beneficial use.

Potential exposure pathways considered for the purpose of evaluating Site risks included: ingestion, dermal contact and vapor inhalation of contaminated ground water; inhalation of volatiles and particulates in air; and ingestion and dermal contact with surface soil. The potential exposure pathways for current and future land use scenarios are presented in Tables 21 and 22, respectively.

The next step in the exposure assessment process involved the quantification of the magnitude, frequency, and duration of exposure for the populations and exposure routes selected for evaluation. The contaminant intake equations and intake parameters were derived from standard literature equations and data from EPA guidance documents. Average Daily Doses ("ADD") and Lifetime Average Daily Doses ("LADD") were estimated for the contaminants in the baseline risk assessment.

Toxicity Assessment

The Reference Dose ("RFD") for a substance represents the level of intake which is unlikely to result in adverse non-carcinogenic health effects in individuals exposed for a chronic period of time. For carcinogens, the slope factor is used to estimate an upper-bound probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen.

Risk Characterization

The baseline risk assessment in the RI/FS quantified the potential carcinogenic and non-carcinogenic risks to human health posed by contaminants in several exposure media. The carcinogenic and non-carcinogenic risks were determined for soil, air and ground water.

Carcinogenic risk is presented as the incremental probability of an individual contracting some form of cancer over a lifetime as the 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 1.0×10^{-4}, and 1.0×10^{-6} 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 ADD to the 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 to be an unacceptable risk to human health. The current risks and future risks for each of the exposed populations are summarized in Tables 23 and 24.

Current Use Scenario

The excess lifetime cancer risk for onsite workers currently exposed is 1.8×10^{-6}. The noncarcinogenic hazard index is 0.006. The exposure pathways assume dermal contact with soil, ingestion of soil and inhalation of volatiles in indoor air.

For the trespassing scenario, the most sensitive receptor would be a child. The excess lifetime cancer risk for a child Site trespasser is 1.1×10^{-5}. The HI is 0.02. The exposure pathways assume soil and sediment ingestion, dermal contact with soil and sediment, and domestic use of ground water.

Future Use Scenario

The excess lifetime cancer risk for a future onsite construction worker is 2.6×10^{-7}. The HI is 0.02. The exposure pathways assume dermal contact with soil, ingestion of soil and inhalation of fugitive dust.

The excess lifetime cancer risks for an onsite adult resident is 2.2×10^{-4} and for an onsite child resident is 2.8×10^{-4}. The HIs are 0.15 for the adult and 1.25 for the child.
The exposure pathways assume dermal contact with soil, ingestion of soil, inhalation of volatiles in indoor air, and domestic use of Site ground water.

The risk from potential future use of Site ground water is unacceptable. Therefore remediation of the ground water is warranted. Actual or threatened releases of hazardous substances from this Site, if not addressed by the preferred alternative or one of the other remedial measures considered, present a current or potential threat to public health, welfare and the environment from the risk by contaminated ground water.

VII. DESCRIPTION OF REMEDIAL ACTION ALTERNATIVES

ALTERNATIVES FOR GROUND WATER

1: No action
2: Natural Attenuation/Institutional Controls
3: Extraction/Air Stripping
4: Extraction/Carbon Absorption
5: Extraction/Offsite disposal

Common Components

A ground water extraction system will be common to each alternative that includes ground water extraction (Alternatives 3, 4, and 5). The cost estimates for the ground water extraction system for the Site are based on the use of well RW-1; however, the actual number and locations of extraction wells will be determined in the remedial design.

One aspect of the ground water extraction alternatives is to remove the contaminants from the ground water aquifer. The removal of the contaminants will be accomplished by pumping the ground water. Removal through pumping is also a means of hydraulic containment. Pumping lowers the water table in the vicinity of the well and creates an artificial ground water flow gradient to prevent further migration of the contaminant plume.

Ground water monitoring is a common component of Alternatives 2, 3, 4 and 5. For costing purposes it has been assumed that sampling and analysis for volatile organics will be conducted on the following wells: RW-1, MW-2, MW-6, MW-7 and MW-8. The actual wells selected for the monitoring well network will be determined in the remedial design phase. For costing purposes the O&M time period was based on 30 years for all alternatives

ARARs for the Site

The goal of the remedy for the Site is to restore the quality of ground water to comply with Federal and State ARARs. The Commonwealth of Pennsylvania standards 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). Other ARARs are identified specific to the evaluated alternatives.

The ground water collected under Alternatives 3 and 4 shall be treated to comply with the substantive requirements of 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 §92.31), 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).

25 Pa. Code Section 123.31 is applicable to Alternatives 3, 4, and 5 and prohibits malodors detectable beyond the Site property line.

The resource recovery and offsite disposal activities shall comply with CERCLA § 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with §§ 3004 and 3005 of RCRA and all applicable State requirements.

25 Pa. Code Section 127.12(a)(5) is applicable to new point source air emissions that result from implementation of Alternative 3, 4 and 5. These Commonwealth of Pennsylvania 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.

25 Pa. Code Section 127.11 is applicable to Alternatives 3 and 4. This Commonwealth of Pennsylvania regulation requires a plan for approval for most air stripping and soil venting/ decontamination projects designed to remove volatile contaminants from soil, water, and other materials regardless of emission rate.

Regulations concerning well drilling as set forth in 25 Pa. Code Chapter 107 are 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 Delaware River Basin Commission (18 CFR Part 430) are applicable to Alternatives 3, 4 and 5. These regulations establish requirements for the extraction of ground water and discharge of water within the Delaware River Basin.

Alternative 1: NO ACTION

Estimated Capital Costs: $0
Estimated 30 Year Present Worth Total O&M Costs: $92,600.00
Estimated 30 Year Total Present Worth Costs: $92,600.00

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 associated with this alternative. The costs associated with this alternative include dismantlement of the existing air stripper, well abandonment, disposal of system components, and reporting. The total O&M costs include the closure costs. Under this alternative, no additional remedial activities or ground water monitoring would be conducted.

Alternative 2: NATURAL ATTENUATION/INSTITUTIONAL CONTROLS

Estimated Capital Costs: $0
Estimated 30 Year Present Worth Total O&M Costs: $364,800.00
Estimated 30 Year Total Present Worth Costs: $364,800.00

Under this alternative, institutional controls would be in the form of deed restrictions regarding ground water use at the Site to prevent human exposure to the ground water contaminants. This alternative does not include an active treatment component. Continued monitoring would be conducted to track natural attenuation and will be used to determine a Site-specific degradation rate. The total O&M costs include the following closure costs: system dismantlement, system component disposal, well abandonment, and closure reporting and ground water monitoring.

Because this alternative would result in contaminated ground water remaining on the Site, Five-Year Site Reviews pursuant to Section 121(c) of CERCLA would be required to monitor the effectiveness of this alternative.

Alternative 3: EXTRACTION/AIR STRIPPING

Estimated Capital Costs: $125,000.00
Estimated 30 Year Present Worth Total O&M Costs: $556,500.00
Estimated 30 Year Total Present Worth Costs: $681,500.00

This alternative involves ground water extraction and treatment of the contaminated ground water by air stripping. The air and VOCs exiting the air stripping column would be treated by a carbon adsorption unit. The treated ground water discharge would comply with NPDES effluent limitations for discharge to the onsite intermittent creek. Ground water monitoring and institutional controls to restrict the use of ground water would be required. The total O&M costs also include the following closure costs: system dismantlement, system component disposal, well abandonment, and closure reporting.

In addition to the "ARARs for the Site" identified in Section 7 above, the following ARARs apply to this alternative.

Federal Clean Air Act requirements, 42 U.S.C. §§7401 et seq. are applicable to Alternatives 3 and must be met for the discharge of contaminants to the air. Pennsylvania's Air Pollution Control Act is also applicable, as are Pennsylvania's Air Pollution Control Regulations (25 Pa. Code Chapters 121-142) to Alternatives 3.

The requirements of Subpart AA (Air Emission Standards for Process Vents) and Subpart BB (Pumping Equipment Leaks) of the Federal RCRA regulations set forth at 40 CFR Part 264 are relevant and appropriate, and (depending upon the levels of organics in the extracted ground water and treatment residuals) may be applicable to the air stripping operations conducted as part of Alternative 3. These regulations require that total organic emissions from the air stripping process vents must be less than 1.4 kg/hr (3 lb/hr) and 2800 kg/yr (3.1 tons/yr).

Because this alternative would result in contaminated ground water remaining on the Site, Five-Year Site Reviews pursuant to Section 121(c) of CERCLA would be required to monitor the effectiveness of this alternative.

Alternative 4: EXTRACTION/GRANULAR ACTIVATED CARBON

Estimated Capital Costs: $75,000.00
Estimated 30 Year Present Worth Total O&M Costs: $547,300.00
Estimated 30 Year Total Present Worth Costs: $622,300.00

This alternative involves ground water extraction and a system to treat contaminated ground water with granular activated carbon

("GAC"). The effluent from the final GAC unit will be discharged to the intermittent stream onsite. Spent carbon will be shipped offsite for regeneration. Ground water monitoring and institutional controls would be required. The total O&M costs also include the following closure costs: system dismantlement, system component disposal, well abandonment, and closure reporting.

In addition to the "ARARs for the Site" identified in Section 7 above, the following ARARs apply to this alternative.

The requirements of Subpart AA (Air Emission Standards for Process Vents) and Subpart BB (Pumping Equipment Leaks) of the Federal RCRA regulations set forth at 40 CFR Part 264 are relevant and appropriate, and (depending upon the levels of organics in the extracted ground water and treatment residuals) may be applicable to the air stripping operations conducted as part of Alternative 3. These regulations require that total organic emissions from the air stripping process vents must be less than 1.4 kg/hr (3 lb/hr) and 2800 kg/yr (3.1 tons/yr).

Because this alternative would result in contaminated ground water remaining on the Site, Five-Year Site Reviews pursuant to Section 121(c) of CERCLA would be required to monitor the effectiveness of this alternative.

Alternative 5: EXTRACTION/OFFSITE DISPOSAL

Estimated Capital Costs: $40,000.00
Estimated 30 Year Present Worth Total O&M Costs: $689,700.00
Estimated 30 Year Total Present Worth Costs: $729,700.00

The ground water extraction and monitoring components are similar to Alternatives 3 and 4. This alternative does not include onsite treatment of contaminated ground water, but rather includes discharge of the ground water to the local Publicly Owned Treatment Works ("POTW") for treatment. Ground water monitoring and institutional controls would be required. The total O&M costs also include the following closure costs: system dismantlement, system component disposal, well abandonment, and closure reporting.

In addition to the "ARARs for the Site" identified in Section 7 above, the following ARARs apply to this alternative.

The discharge of effluent to the POTW shall 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.

Because this alternative would result in contaminated ground water remaining on the Site, Five-Year Site Reviews pursuant to Section 121(c) of CERCLA would be required to monitor the effectiveness of this alternative.

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, the no action alternative, does not include treatment or controls, provides no reduction in risk, and is not protective.

Alternatives 2, 3, 4, and 5 are protective of human health. Since Alternative 2 does not provide for treatment of contaminated ground water or prevent migration of contaminants to currently unaffected areas it is not as protective of potential future human health risks as Alternatives 3, 4 and 5 and is not protective of the Class IIA aquifer.

Alternatives 3, 4, and 5 include extraction and treatment of contaminated ground water. These alternatives would eventually restore contaminated ground water to background levels or MCLs, whichever is more stringent. Public and environmental risks from direct contact with, and ingestion of, contaminated ground water would be mitigated through treatment of the ground water plume. Alternatives 3, 4, and 5 would achieve a greater degree of overall protection of human health and the environment than Alternatives 1 and 2.

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 protection 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 and support 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.

Additionally, Alternatives 1 and 2 would not comply with the requirements of the Pennsylvania Hazardous Waste Management Regulations, 25 Pa. Code §§264.90-264.100 and in particular, 25 Pa. Code §§264.97(i)(j) and 264.100(a)(9), which require contaminated ground water to be remediated to background levels. Alternatives 1 and 2 do not involve any treatment of contaminated ground water. These regulations are relevant and appropriate to action taken at the Site.

With respect to location-specific ARARs, Alternatives 1 and 2 would not comply with EPA's Ground Water Protection Strategy Policy for a Class IIA aquifer, which is a TBC standard.

With respect to location-specific ARARs, Alternatives 3, 4 and 5 would comply with the EPA's Ground Water Protection Strategy Policy for a Class IIA aquifer, which is a TBC standard. Alternatives 3, 4 and 5 would protect current and potential sources of drinking water and waters having other beneficial uses.

With respect to location-specific ARARs, Alternatives 3, 4, and 5 would comply with the substantive requirements of the Delaware River Basin Commission (18 C.F.R. Part 430).

Alternatives 3, 4 and 5, which include ground water remediation, would meet the performance standards as set forth in Section IX.1.B of this ROD relating to ground water remediation and treatment.

Alternatives 3, 4, and 5 would meet all action-specific ARARs relating to activities performed as part of the remedy, including federal and State air emission requirements, federal Pretreatment Standards for discharges to a POTW, and federal and State treatment, storage, and disposal requirements for any hazardous and solid wastes generated during the ground water treatment process.

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.

Alternatives 1 and 2 are remedial actions that do not use treatment technologies. Therefore, Alternatives 1 and 2 would not reduce the toxicity, mobility, or volume of contaminants in the ground water plume at the Site. Over time, contaminant levels in the present areas of contamination may decrease gradually through natural attenuation, but the ground water plume itself may increase in area.

Alternatives 3, 4, and 5 involve extraction and treatment would result in active reduction of VOCs in the contaminated aquifer through removal.

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 alternatives evaluated are considered implementable and use technologies that have been recommended and used at other Superfund sites. Alternatives 2 through 5 require ground water monitoring and Alternatives 3 and 4, require monitoring of treated ground water discharge; Alternative 5 would require monitoring of the ground water prior to discharge to the POTW.

Alternative 1 which includes no additional work would be the easiest alternative to implement.

Alternative 2 can also be implemented easily.

Because Alternatives 3, 4, and 5 involve the extraction and treatment of ground water, there are more implementation and operation considerations associated with these alternatives. Alternatives 3, 4, and 5 present minimum technical difficulties in designing and constructing the treatment systems or pretreatment that may be required under Alternative 5.

The components of the air stripping and carbon adsorption systems (Alternatives 3 and 4) are readily implementable using existing technologies. The reliability of these treatment technologies has also been established and demonstrated successfully at other hazardous waste sites. No special materials or equipment would be required to implement Alternatives 3, 4, or 5. Operation and maintenance considerations can include, where applicable, cleaning and replacement of wells and well pumps; maintenance of blower units; cleaning of fouled packing; and regeneration of the carbon units.

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.

None of the alternatives evaluated involve extensive construction, excavation, or other remedial action measures that would pose any appreciable short-term risks to the community or to workers during construction or implementation. Workers will be required to wear appropriate levels of protection during installation of ground water extraction wells to avoid direct contact with contaminated ground water and during the sampling of the monitoring wells. During installation of the treatment systems and other Site activities, precautions mandated by the Occupational Safety and Health Act ("OSHA") for construction activities will be taken. Disposal of any wastes generated during construction and operation will follow proper handling practices and therefore should not have an adverse environmental impact.

F. LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence refers to the ability of a 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.

Since no actions would be taken to actively remediate the contaminated ground water under Alternative 1 and 2, the potential future human health risks remaining after implementation of this alternative would remain. Implementing Alternative 1 and 2 would result in more than minimal residual risk from ground water ingestion, dermal contact, and inhalation under the potential future residential use of site ground water scenario, since ground water would not be treated or contained.

Alternative 2 meets the objective of eliminating the public health risk associated with use of contaminated ground water, but does not involve the actual treatment or remediation of contaminated ground water. Therefore, it would not maintain reliable protection of the environment over time.

With respect to environmental risk, the contaminants in the ground water would continue to migrate over time under Alternatives 1 and 2.

Alternatives 3, 4 and 5 would provide the greatest degree of long-term effectiveness and permanence for ground water protection and remediation and would result in minimal residual risk by attaining ARARs for ground water.

G. COST

This criterion examines the estimated costs for each remedial alternative evaluated in the Feasibility Study Report. For comparison, capital, annual O&M, and present worth costs are shown in Table 25.

H. STATE ACCEPTANCE

The Pennsylvania Department of Environmental Resources concurs with EPA's selected remedy, Alternative 4.

I. COMMUNITY ACCEPTANCE

A public meeting on the Proposed Plan was held on June 30, 1994, in King of Prussia, Upper Merion 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. No residents who live in the Upper Merion Township have objected to the selected remedy.

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

A. GENERAL DESCRIPTION OF THE SELECTED REMEDY

EPA has selected Alternative 4 as the selected remedy for the Stanley Kessler Site. This remedy will restore the ground water in the area of attainment to background levels as established by EPA or to the appropriate MCLs or non-zero MCLGs whichever is more stringent. The area of attainment for the cleanup will be the area where the more stringent standard for the contaminants are exceeded. The exact location and the number of wells which comprise the ground water monitoring network will be determined by EPA in Consultation with PADER during the remedial design. 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 consist of the following components:

- Installation, operation and maintenance of ground water extraction well(s) to remove contaminated ground water from beneath the Site and to prevent contaminants from migrating further;

- Installation, operation and maintenance of granular activated carbon units at the ground water extraction well(s) to treat ground water to the required levels;

- Periodic sampling of ground water and treated water to ensure that treatment components are effective and that ground water remediation is progressing towards the required cleanup levels.

- Deed Restrictions to prohibit the installation of new wells in areas of contamination which do not meet ARARs. These restrictions can be withdrawn when ARARs are achieved.

Each component of the selected remedy and its performance standard(s) is described in detail below.

1. Extraction and Treatment of Ground water

A. Description of the Component of the Remedy

The ground water shall be remediated through extraction and treatment of the contaminated ground water throughout the area of attainment. The extraction shall create ground water zones where the contaminated ground water is hydraulically contained and prevent migration beyond the area of attainment. Ground water shall be treated using an onsite treatment system. The treatment system will be designed to reduce the Site-related contaminants in the extracted ground water, unattended, on a continuous, 24-hour-per-day performance basis. The exact location, size and number of well(s) shall be determined during the design of the ground water extraction system.

The treated ground water effluent will be discharged to the intermittent stream on Site through a new outfall pipe that shall be constructed as part of the remedial action. The treatment system will be designed to achieve 98 percent removal of VOCs in compliance with the substantive requirements of PADER's NPDES regulations. Final flow rates and GAC system dimensions will be determined by EPA during remedial design. 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 ground water plume as determined by EPA. Extraction and treatment will continue until EPA, in consultation with the Commonwealth of Pennsylvania, determines that the performance standard for each contaminant of concern in the ground water has been achieved.

Periodic monitoring of ground water will occur to determine the performance of the pump and treat system and the effectiveness of the selected remedy in meeting the performance standards.

B. Performance Standards

1. The performance standard for each contaminant of concern in the ground water shall be the MCL or the non-zero MCLG for that contaminant [40 C.F.R. Part 141] or background concentration of that contaminant [25 PA Code §§264.97(i), (j), and 264.100(a)(9)], whichever is more stringent. The background concentrations for each contaminant of concern shall be established in accordance with the procedures for ground water monitoring outlined in 25 PA Code §264.97. Establishment of background concentrations shall not delay ground water extraction and treatment. In the event that a contaminant of concern is not detected in samples taken for the establishment of background concentrations, the detection limit for the method of analysis utilized with respect to that contaminant shall constitute the "background" concentration of the contaminant.

2. The area of attainment for the cleanup will be the area where the more stringent standard for the contaminants are exceeded and will be determined in the remedial design. It should be noted that the remedy will address not only contaminants listed below but also other hazardous substances at the Site.

Contaminant	MCL(ug/l)	MCLG(ug/l)
TCE	5	0
1,1,1-TCA	200	200
1,1-Dichloroethene	7	7
Cis-1,2-Dichloroethene	70	70
1,1-Dichloroethane	810*	-
1,2-Dichloroethane	5	0
Tetrachloroethene	5	0
1,1,2-Trichloroethane	5	3
Benzene	5	0
Chlorobenzene	100	100
Dichloromethane	5	0
Chloroform	100	0
Toluene	1000	1000

*Non-carcinogenic health-based concentration

3. The performance standard for the treated ground water prior to discharge to the intermittent creek shall be in compliance with the substantive requirements of the NPDES discharge regulations set forth in 25 Pa. Code §92.31, and the Pennsylvania Water Quality Standards (25 Pa. Code §§93.1-93.9). Pursuant to the Pennsylvania Department of Environmental Resources' determination monitoring for all the hazardous substances shall also be required.

4. The management and ultimate disposition of the spent carbon and the associated hazardous substances from the granular activated carbon units shall not degrade air quality nor contribute to ground-level ozone formation and will be determined, subject to EPA approval, during the remedial design. Such management may entail treatment and/or disposal of the carbon filters. In the event these units are a hazardous waste, the following ARARS will apply as the Performance Standard for onsite activities: 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).

5. To the extent that the implementation of this portion of the remedy impacts ecological features on site (e.g stream vegetation) the performance standard shall include appropriate

measures to mitigate damage which may occur during the remedial design and remedial action.

C. **Ground Water Remedy Implementation**

Because the selected remedy will result in contaminants remaining on-site, 5-year Site reviews under Section 121(c) of CERCLA will be required until the performance standards are achieved.

An operation and maintenance plan for the ground water extraction and treatment system, including long-term ground water monitoring, shall also be required. 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 in 2.A. below, and the system may be modified, as warranted by the performance data collected during operation. These modifications may include, for example, alternate pumping of the extraction well(s) and the addition or elimination of certain extraction wells. In addition, all of the extraction/treatment alternatives 3 and 4 rated relatively evenly against all of the criteria except the cost criterion. Consequently, if, based on more detailed information gathered during remedy implementation or operation, variations occur, such as a change in the contaminant concentration or flow rate, the selected system may no longer be cost-effective when compared to one, or a combination, of the other extraction/ treatment alternatives. In that case, based on the final design parameters, EPA may consider the utilization of a combination of the ground water treatment technologies under Alternatives 3 and 4.

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 over some portion of the area of attainment. 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 attainment, 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 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. It is not a component of this ROD. If such a decision is made, EPA may amend the ROD or issue an Explanation of Significant Differences.

2. Long-Term Ground Water Monitoring

A. Description of the Component of the Remedy

A long-term ground water monitoring program shall be implemented to evaluate the effectiveness of the ground water pumping and treatment system. A 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. EPA will determine the number of monitoring wells necessary to verify the performance of the remedial action. The installation of additional monitoring wells may be required. Numbers and locations of these monitoring wells shall be subject to EPA approval during the remedial design, in consultation with the Commonwealth of Pennsylvania.

The wells shall be sampled quarterly for the first three years and semi-annually thereafter. 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 throughout the entire area of ground water contamination. 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 may be discontinued.

Semi-annual monitoring of the ground water shall continue for five years after the system is shutdown. If subsequent to an extraction system shutdown, monitoring shows that ground water concentrations of any contaminant of concern are above the performance standard, 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 standard for each contaminant of concern can be achieved on a continuing basis.

B. Performance Standards

The performance standard for this component of the remedy is the implementation and the completion of the long-term ground water monitoring program.

3. Deed Restrictions

Deed restrictions shall be developed and submitted to EPA for approval. Once approved, these deed restrictions shall be placed in the deed to the Site by filing said restrictions with the Recorder of Deeds of the appropriate County Court. The deed restrictions shall prohibit the use of ground water in the Site for as long as contamination remains above performance standards. The deed restrictions shall be valid and binding in the Township and Commonwealth in which the Site is located. The continuing need for these restrictions shall be re-evaluated during the Five-year Site reviews which are conducted under CERCLA Section 121(C), 42 U.S.C. Section 9621(c).

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 subject to EPA approval 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 Stanley Kessler Site meets these statutory requirements.

A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will provide adequate protection of human health and the environment by extracting and treating the contaminated ground water to achieve MCLs established under the SDWA or background levels, whichever is lower.

Implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts. The remedial technologies employed in the selected remedy are proven to reduce the concentrations of volatile organic compounds to acceptable levels.

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 and ambient air quality at the Site. The contaminants from the Stanley Kessler Site and their respective MCLs which are listed in Section IX.1.B of this ROD are relevant and appropriate for this remedial action. If a non-zero Maximum contaminant level goal ("MCLG") has been established, the MCLG shall be attained by the remedy.

The Commonwealth of Pennsylvania standards specify that all ground water containing hazardous substances must be remediated to "background" quality as set forth in 25 Pa. Code §§264.90 - 264.100, and in particular, 25 Pa. Code §§264.97(i) and (j), and 264.100(a)(9). The Commonwealth of Pennsylvania also maintains that the requirement to remediate to background is found in other legal authorities. This requirement that all ground water be remediated to background levels is an ARAR if background levels are determined to be more stringent than the appropriate MCLs or non-zero MCLGs. The method(s) by which background levels will be determined are set forth under the description of the selected remedial alternative. These background levels, if more stringent than the appropriate MCLs or the non-zero MCLGs, shall be attained as part of this remedial action. However, if EPA and the PADER determine that attaining such levels is technically impracticable, EPA may amend the ROD or issue an Explanation of Significant Differences to address this situation.

2. Location-Specific ARARs

The substantive requirements of the Delaware River Basin Commission (18 C.F.R. Part 430) are applicable. These regulations establish requirements for the extraction of ground water and dishcarge of water within the Delaware River Basin.

3. Action-Specific ARARs

25 Pa. Code Section 123.31 is applicable to the selected remedial alternative and prohibits malodors detectable beyond the Stanley Kessler property line.

25 Pa. Code Section 127.12(a)(5) will apply to new point source air emissions that result from implementation of the selected remedial alternative. These Commonwealth of Pennsylvania 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.

Regulations concerning well drilling as set forth in 25 Pa. Code Chapter 107 are applicable. These regulations are established pursuant to the Water Well Drillers License Act, 32 P.S.§ 645.1 et seq.

The ground water collection and treatment operations will constitute treatment of hazardous waste (i.e., the ground water containing hazardous waste), and will result in the generation of hazardous wastes derived from the treatment of the contaminated ground water. The remedy will be implemented consistently 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, Subpart J (in the event that hazardous waste is managed, treated or stored in tanks). 40 C.F.R. Part 264, Subpart AA (relating to air emissions from process vents) and Subpart BB (relating to pumping equipment leaks).

25 Pa. Code Chapter 264, Subchapter F, regarding ground water monitoring is applicable to the selected remedial alternative.

Any surface water discharge of treated effluent will comply with the substantive requirements of the 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 C.F.R. Parts 122-124, the Pennsylvania NPDES regulations (25 Pa. Code §92.31, and the Pennsylvania Water Quality Standards (25 Pa. Code §§93.1-93.9).

The Occupational Safety and Health Act ("OSHA") regulations codified at 29 C.F.R. Section 1910.170 are applicable for all activities conducted during this remedial action.

25 Pa. Code Sections 261.24 and 273.421 are applicable regulations for the handling of residual and other waste and for the determination of hazardous waste by the Toxic Characteristic Leaching Procedure ("TCLP").

This remedy will comply with CERCLA § 121(d)(3), and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility which is not in compliance with §§ 3004 and 3005 of RCRA and all applicable State requirements.

4. To Be Considered Standards

Pennsylvania's Ground Water Quality Protection Strategy, dated February 1992 is a "to be considered" standard.

EPA's Ground Water Protection Strategy, dated July 1991, is a "to be considered" standard.

C. COST-EFFECTIVENESS

The selected remedy is cost-effective in providing overall protection in proportion to cost, and meets all other requirements of CERCLA. The NCP, 40 C.F.R. Section 300.430(f)(ii)(D), 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 and volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and provides for overall effectiveness in proportion to its cost. The estimated present worth cost for the selected remedy is $622,300.00.

D. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

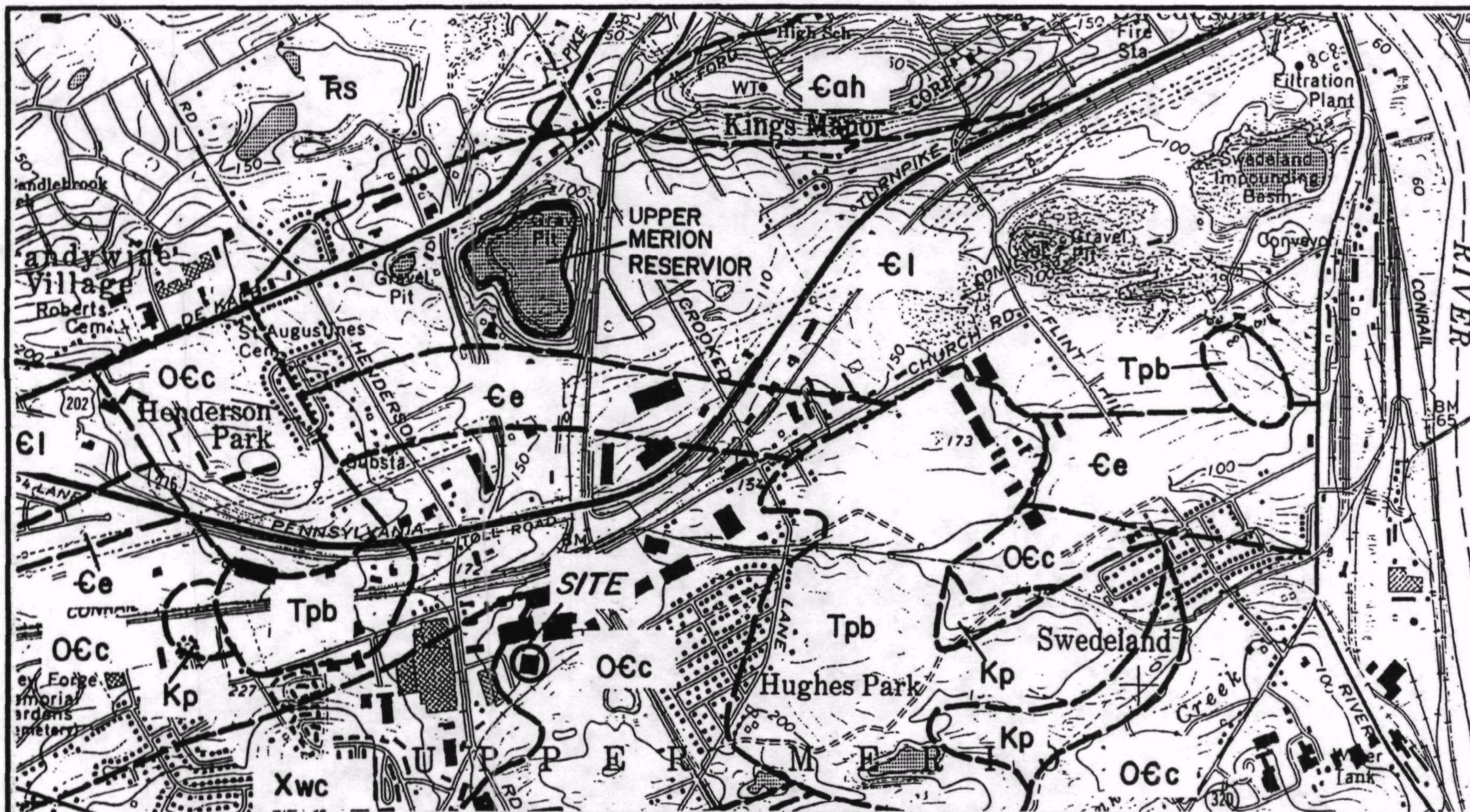
EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria. Of those alternatives evaluated that are protective of human health and the environment 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, treatment of the contaminated ground water using granular activated carbon units will provide a greater degree of reduction of toxicity, mobility, or volume than Alternatives 1 and 2. Alternative 4 will provide the same degree of reduction of toxicity, mobility or volume as Alternatives 3 and 5 but for lesser costs. Alternative 4 will reduce contaminant levels in the Class IIA aquifer, a current source of drinking water, and reduce the risks associated with direct contact and ingestion of the ground water to the maximum extent practicable, as well as provide long-term effectiveness.

E. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy satisfies the statutory preference for treatment as a principal element. Alternative 4 addresses the primary threat of potential future ingestion and potential future direct contact of contaminated ground water through treatment using granular activated carbon.

APPENDIX A
FIGURES
STANLEY KESSLER ROD



EXPLANATION

Tpb	PENSAUKEN AND BRIDGETON FMS.
Kp	PATAPSCO(?) FM.
Trs	STOCKTON FM.
OCc	CONESTOGA FM.
Ce	ELBROOK FM.
Cl	LEDGER FM.
Cah	ANTIETAM AND HARPERS FMS.
Xwc	WISSAHICKON FM., ALBITE–CHLORITE SCHIST

SOURCE: ATLAS OF PRELIMINARY GEOLOGIC QUADRANGLE MAPS OF PENNSYLVANIA MAP 61, 1981 pg.429.

SCALE 0 2,000 4,000 FEET

N

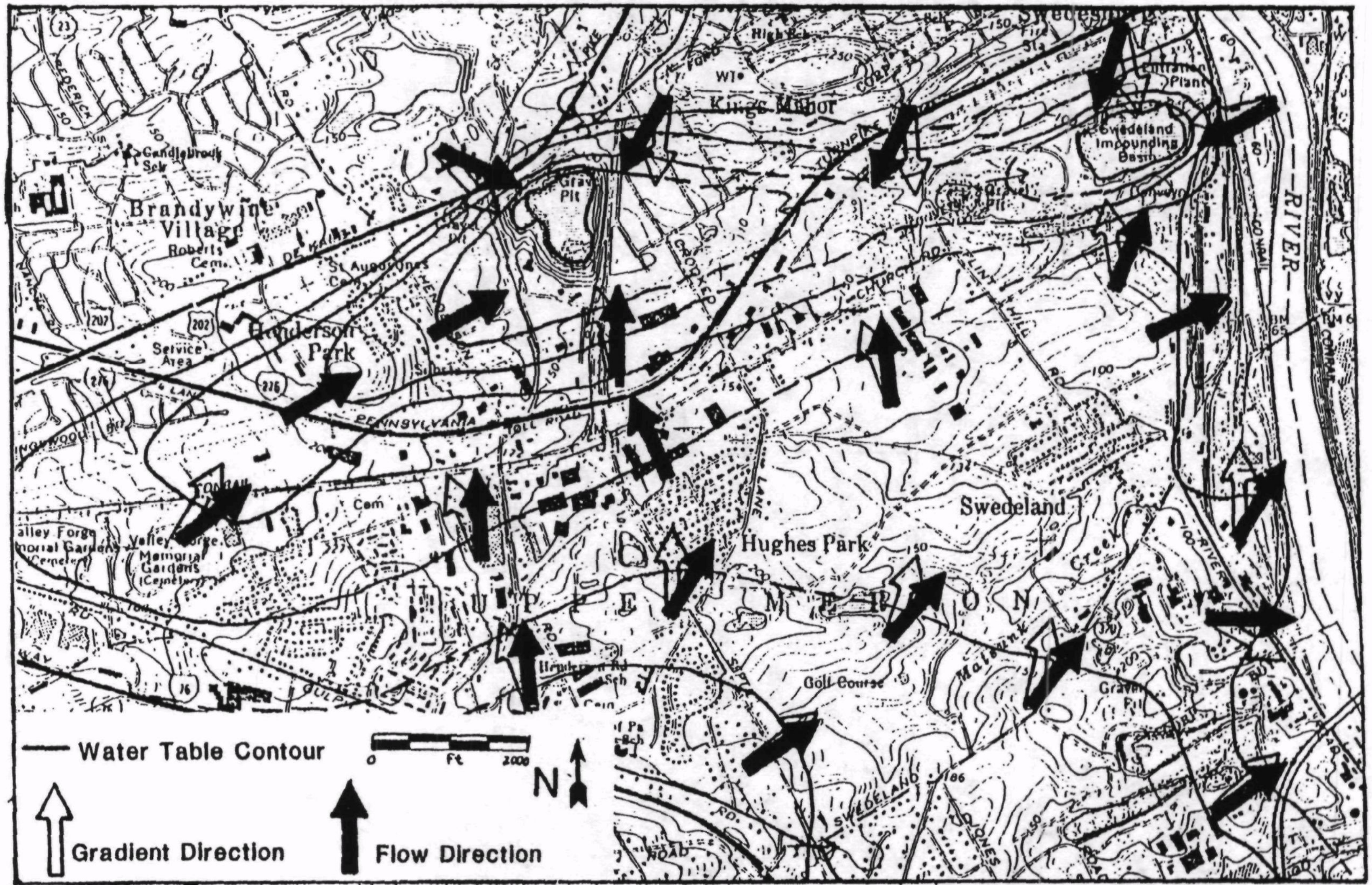
GROUNDWATER TECHNOLOGY
223 WILMINGTON WEST CHESTER PIKE
CHADDS FORD, PA 19317
(215) 558–1730

PROJECT NO.: 01303–5026
ACAD FILE: 50263–4
DRAWING DATE: 9/92
DESIGNED: SAC
DETAILED: DCC
CHECKED: MJW

REGIONAL GEOLOGY

CLIENT/LOCATION: STANLEY KESSLER NPL SITE UPPER MERION, PENNSYLVANIA

FIGURE: 1



Source : Christian, 1989

Generalized Regional Water Table Map

Figure 2

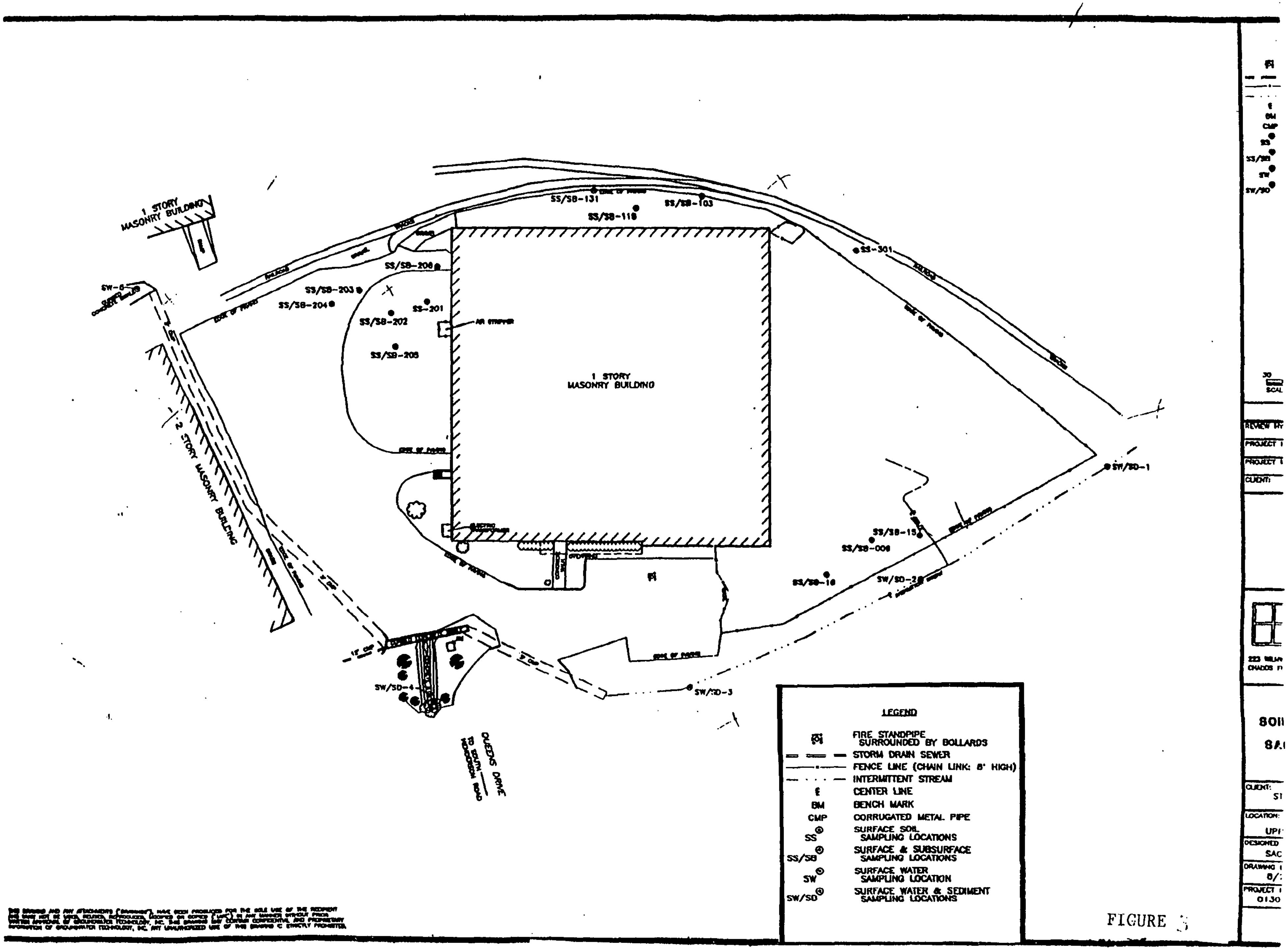

1 STORY MASONRY BUILDING
1 STORY MASONRY BUILDING
2 STORY MASONRY BUILDING
SS/SB-131
SS/SB-118
SS/SB-103
SS-301
SS/SB-206
SS/SB-203
SS/SB-204
SS-201
SS/SB-202
SS/SB-205
AIR STRIPPER
EDGE OF PAVING
SW-5
SW/SD-1
SW/SD-2
SW/SD-3
SW/SD-4
SS/SB-15
SS/SB-009
SS/SB-16
QUEENS DRIVE
TO SOUTH HENDERSON ROAD
LEGEND
FIRE STANDPIPE SURROUNDED BY BOLLARDS
STORM DRAIN SEWER
FENCE LINE (CHAIN LINK: 8' HIGH)
INTERMITTENT STREAM
℄ CENTER LINE
BM BENCH MARK
CMP CORRUGATED METAL PIPE
SS SURFACE SOIL SAMPLING LOCATIONS
SS/SB SURFACE & SUBSURFACE SAMPLING LOCATIONS
SW SURFACE WATER SAMPLING LOCATION
SW/SD SURFACE WATER & SEDIMENT SAMPLING LOCATIONS

FIGURE 3

Stanley Kessler Superfund Site
Areas of TCE Concentrations

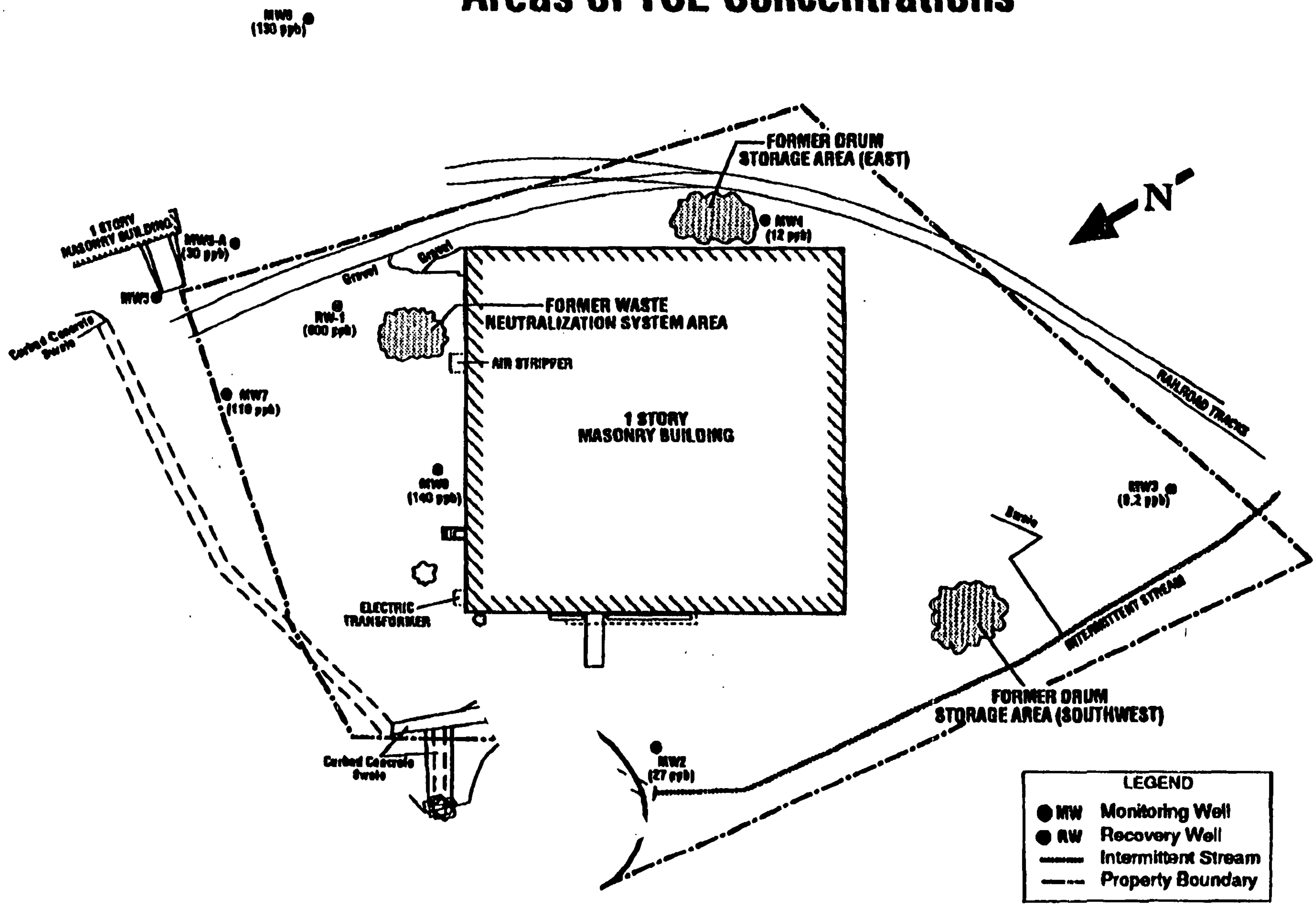
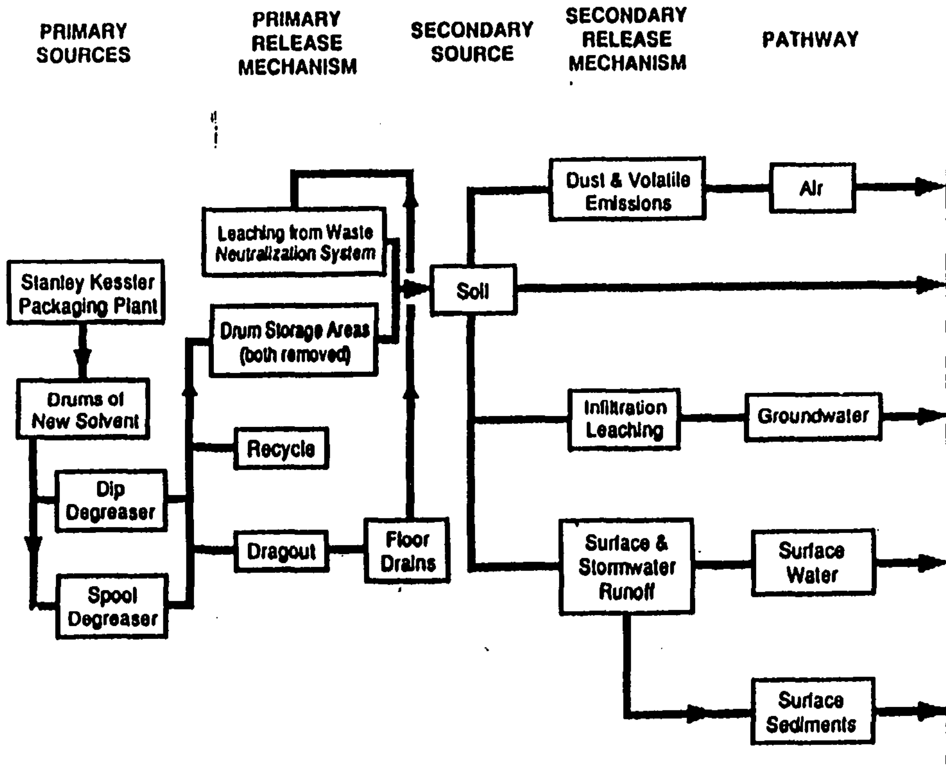


Figure 4



Pathway	Potential Exposure	Human: Residential Industrial Neighbors	Human: Site Workers, Contractors	Biota: Avian	Biota: Aquatic	Biota: Terrestrial
Air	Ingestion		•			
	Inhalation		•			
Soil	Ingestion		•	•		•
	Dermal Contact		•	•		•
Groundwater	Ingestion	•				
	Inhalation	•				
	Dermal Contact	•				
Surface Water	Ingestion	•		•	•	•
	Inhalation	•	•	•		•
	Dermal Contact	•	•	•	•	•
Surface Sediments	Ingestion	•	•	•	•	•
	Inhalation	•	•	•		•
	Dermal Contact	•	•	•	•	•

GROUNDWATER TECHNOLOGY
223 WILMINGTON WEST CHESTER PIKE
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PROJECT NO.: 01303-5026	ACAD FILE: 50261-5a	DRAWING DATE: 3/93
DESIGNED: SAC	**CONCEPTUAL SITE MODEL**	
DETAILED: DCC		
CHECKED: MJW	CLIENT/LOCATION: STANLEY KESSLER NPL SITE UPPER MERION, PENNSYLVANIA	FIGURE: 5

APPENDIX B
TABLES
STANLEY KESSLER ROD

Summary of Analytical Parameters for Each Media Investigated

MEDIA	ANALYTICAL PARAMETERS
Surface Soil	TCL VOAs TCL SVOCs TCL Pesticides & PCBs TAL Metals
Subsurface Soil	TCL VOAs TCL SVOCs TCL Pesticides & PCBs TAL Metals TOC Geotechnical Moisture content pH
Soil Gas	Vinyl Chloride 1,1,1-TCA TCE PCE
Groundwater	TCL VOAs TAL Total Metals TAL Dissolved Metals
Surface Water	TCL VOAs TCL SVOCs TAL Total Metals TAL Dissolved Metals Surface Water TCL Pesticides & PCBs
Sediments	TCL VOAs TCL SVOCs TCL Pesticides & PCBs TAL Metals Grain Size TOC

Notes:

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TABLE 1

TABLE 2

Volatile Organic Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Volatile Organic Compounds (ug/kg) Acetone	Benzene	2-Butanone	Carbon Disulfide	Chloro-methane	1,1-Dichloro-ethane	Total 1,2-Di-chloroethene	4-Methyl-2-pentanone
Southwest Former Drum Storage Area									
SS-009-1107	2 - 3	34 B	<12 U	<12 U	5 B	<12 U	5 J	1 J	<12 U
SB-009-1107	3.5 - 5.5	29	<11 U	<11 U	5 B	<11 U	<11 U	<11 U	<11 U
SB-009-1107	6.5 - 8.5A	51 B	<12 U	<12 U	2 B	<12 U	<12 U	<12 U	<12 U
SB-009-1107	6.5 - 8.5B	41 B	1 B	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U
SS-015-1108	1.5 - 2.5	79 B	1 B	<11 U	2 B	<11 U	<11 U	<11 U	<11 U
SB-015-1108	3 - 5	12 B	2 J	<11 U	3 B	<11 U	<11 U	<11 U	<11 U
SB-015-1108	6 - 8	41 B	<12 U	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U
SS-018-1106	1.5 - 2.5	39 B	3 J	<12 U	<12 U	<12 U	5 J	<12 U	<12 U
SB-018-1106	3 - 5	20 B	2 J	<12 U	<12 U	<12 U	6 J	1 J	<12 U
SB-018-1107	6 - 8	39 B	<11 U	<11 U	<11 U	<11 U	4 J	<11 U	<11 U
East Former Drum Storage Area									
SS-103-1106	0.5 - 1.5	14 B	<12 U	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SB-103-1106	2 - 4	<12 U	<12 U	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SB-103-1106	5 - 7	90 B	<12 U	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SS-118-1105	0.5 - 1.5	19 B	<12 U	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U
SB-118-1105	2 - 4	13 B	<12 U	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SB-118-1105	5 - 7	11 B	2 J	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U
SS-131-1105	1 - 2	<12 U	1 J	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SB-131-1105	2 - 4	<12 U	3 J	<12 U	<12 U	<12 UJ	<12 U	5 J	<12 U
SB-131-1105	5 - 7	64	<12 U	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SB-131-1105	13 - 15	89	<12 U	<12 U	<12 UJ	<12 UJ	<12 U	<12 U	<12 U
SB-131-1105	15 - 19	60	<11 U	<11 U	<11 UJ	<11 UJ	<11 U	<11 U	<11 U

TABLE 2 (continued) **Volatile Organic Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Volatile Organic Compounds (ug/kg) Methylene Chloride	Tetrachloro-ethene	1,1,1-Tri-chloroethane	1,1,2-Tri-chloroethane	Trichloro-ethene	Vinyl Chloride
Southwest Former Drum Storage Area							
SS-009-1107	2 - 3	8 B	<12 U	<12 U	<12 U	4 J	<12 UJ
SB-009-1107	3.5 - 5.5	8 B	<11 U	<11 U	<11 U	<11 U	<11 UJ
SB-009-1107	6.5 - 8.5A	19	<12 U	<12 U	<12 U	<12 U	<12 UJ
SB-009-1107	6.5 - 8.5B	24	<12 U	<12 U	<12 U	<12 U	<12 UJ
SS-015-1108	1.5 - 2.5	5 J	<11 U	<11 U	<11 U	<11 U	<11 UJ
SB-015-1108	3 - 5	6 B	<11 U	<11 U	<11 U	<11 U	<11 UJ
SB-015-1108	6 - 8	21	<12 U	<12 U	<12 U	<12 U	<12 UJ
SS-018-1106	1.5 - 2.5	7 B	15	16	3 J	5 J	<12 U
SB-018-1106	3 - 5	7 B	39	47	3 J	15	<12 U
SB-018-1107	6 - 8	<11 U	<11 U	<11 U	<11 U	<11 U	<11 UJ
East Former Drum Storage Area							
SS-103-1106	0.5 - 1.5	8 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-103-1106	2 - 4	6 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-103-1106	5 - 7	10 B	<12 U	<12 U	<12 U	<12 U	<12 U
SS-118-1105	0.5 - 1.5	9 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-118-1105	2 - 4	6 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-118-1105	5 - 7	6 B	<12 U	<12 U	<12 U	<12 U	<12 U
SS-131-1105	1 - 2	7 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-131-1105	2 - 4	6 B	<12 U	<12 U	<12 U	18	<12 U
SB-131-1105	5 - 7	9 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-131-1105	13 - 15	10 B	<12 U	<12 U	<12 U	3 J	<12 U
SB-131-1105	15 - 19	9 B	<11 U	<11 U	<11 U	<11 U	<11 U

TABLE 2 (continued) Volatile Organic Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Volatile Organic Compounds (ug/kg)							
		Acetone	Benzene	2-Butanone	Carbon Disulfide	Chloro-methane	1,1-Dichloro-ethane	Total 1,2-Di-chloroethene	4-Methyl-2-pentanone
Former Waste Neutralization System									
SS-201-1108	0.5 - 1.5	16 B	1 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U
SS-202-1108	0.5 - 1.5	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U
SB-202-1108	16 - 18A	20 B	<12 U	<12 UJ	2 J	<12 U	<12 U	<12 U	<12 UJ
SB-202-1108	16 - 18B	8 B	2 J	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U
SB-202-1112	28 - 30	17 B	<11 U	<11 UJ	2 J	<11 U	<11 U	<11 U	<11 UJ
SB-202-1112	34 - 36	16 B	<12 U	<12 UJ	3 J	<12 U	<12 U	<12 U	<12 UJ
SB-202-1112	40 - 42	18 B	2 B	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U
SB-202-1112	46 - 48	21 B	1 B	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U
SB-203-1113	10 - 12	<12	1 B	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U
SB-203-1113	28 - 30	12 B	1 B	<12 U	2 B	<12 U	<12 U	<12 U	<12 U
SB-203-1113	40 - 42	<12	1 B	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U
SB-203-1113	46 - 48	11 B	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U
SB-204-1114	4 - 6	20 B	<11 U	<11 U	<11 UJ	<11 U	<11 U	<11 U	<11 U
SB-204-1114	22 - 24	20 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U
SB-204-1114	40 - 42	32 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U
SB-204-1114	52 - 54	14 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U
SS-205-1114	1.5 - 2.5	10 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U
SB-205-1114	22 - 24	36 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U
SB-205-1114	40 - 42	12 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U
SB-205-1114	52 - 54	22 B	<12 U	<12 U	<12 UJ	<12 U	<12 U	<12 U	<12 U

TABLE 2(continued) **Volatile Organic Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Volatile Organic Compounds (ug/kg)					
		Methylene Chloride	Tetrachloro-ethene	1,1,1-Tri-chloroethane	1,1,2-Tri-chloroethane	Trichloro-ethene	Vinyl Chloride
Former Waste Neutralization System							
SS-201-1108	0.5 - 1.5	25	<12 U	<12 U	<12 U	<12 U	<12 UJ
SS-202-1108	0.5 - 1.5	6 J	<12 U	<12 U	<12 U	<12 U	<12 U
SB-202-1108	16 - 18A	6 B	<12 U	<12 U	<12 U	3 J	<12 U
SB-202-1108	16 - 18B	3 J	<11 U	5 J	<11 U	8 J	<11 U
SB-202-1112	28 - 30	5 B	<11 U	<11 U	<11 U	<11 U	<11 U
SB-202-1112	34 - 36	6 B	<12 U	11 J	<12 U	30	<12 U
SB-202-1112	40 - 42	2 B	<11 U	<11 U	<11 U	<11 U	<11 U
SB-202-1112	46 - 48	2 B	<11 U	<11 U	<11 U	<11 U	<11 U
SB-203-1113	10 - 12	2 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-203-1113	28 - 30	<12 U	<12 U	<12 U	<12 U	<12 U	<12 U
SB-203-1113	40 - 42	2 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-203-1113	46 - 48	<11 U	<11 U	<11 U	<11 U	<11 U	<11 U
SB-204-1114	4 - 6	5 B	<11 U	<11 U	<11 U	<11 U	<11 U
SB-204-1114	22 - 24	7 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-204-1114	40 - 42	9 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-204-1114	52 - 54	8 B	<12 U	16	<12 U	6 J	<12 U
SS-205-1114	1.5 - 2.5	12 B	<12 U	12 U	<12 U	<12 U	<12 U
SB-205-1114	22 - 24	9 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-205-1114	40 - 42	4 B	<12 U	<12 U	<12 U	<12 U	<12 U
SB-205-1114	52 - 54	7 B	<12 U	<12 U	<12 U	<12 U	<12 U

TABLE 2 (continued)

Volatile Organic Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Volatile Organic Compounds (ug/kg) Methylene Chloride	Tetrachloro-ethene	1,1,1-Tri-chloroethane	1,1,2-Tri-chloroethane	Trichloro-ethene	Vinyl Chloride
SB-206-1115	10 - 12	5 J	<13 U	<13 U	<13 U	<13 U	<13 U
SB-206-1115	22 - 24	4 J	<11 U	<11 U	<11 U	<11 U	<11 U
SB-206-1115	40 - 42	6 J	<12 U	1 J	<12 U	<12 U	<12 U
SB-206-1115	46 - 48	5 J	<12 U	2 J	<12 U	<12 U	<12 U
Upgradient Background							
SS-301-1106	0.5 - 1.5	6 B	<12 U	<12 U	<12 U	<12 U	<12 UJ

NOTES:

Compounds which were nondetected for all samples are not listed.

B - Blank Contamination

J - Estimated value below detection limit

U - Undetected at stated value

UJ - Not detected, estimated value may be inaccurate or imprecise

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TABLE 3 **Semi-Volatile Organic Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Semi-volatile Organic Compounds (ug/kg) Anthracene	Benzo(a)-anthracene	Benzo(a)-pyrene	Benzo(g,h)-perylene	Benzo(b)-fluoranthene	bis(2-Ethyl-hexyl)phthalate	Chrysene	Dibenz(a,h)-anthracene
Southwest Former Drum Storage Area									
SS-009-1107	2 - 3	<390 U	<390 U	<390 U	<390 U	<390 U	53 B	<390 U	<390 U
SB-009-1107	3.5 - 5.5	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SS-015-1108	1.5 - 2.5	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SB-015-1108	3 - 5	<370 U	<370 U	<370 U	<370 U	<370 U	39 B	<370 U	<370 U
SS-018-1106	1.5 - 2.5	<380 U	<380 U	<380 U	<380 U	48 J	<380 U	<380 U	<380 U
SB-018-1106	3 - 5	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U
East Former Drum Storage Area									
SS-103-1106	0.5 - 1.5	<400 U	<400 U	<400 U	<400 U	<400 U	89 B	<400 U	<400 U
SB-103-1106	2 - 4	<390 U	<390 U	<390 U	<390 U	<390 U	66 B	<390 U	<390 U
SS-118-1105	0.5 - 1.5	<400 U	<400 U	<400 U	<400 UJ	<400 U	<400 U	<400 U	<400 UJ
SB-118-1105	2 - 4	<100 U	<100 U	<100 U	<100 UJ	<100 U	<100 U	<100 U	<100 UJ
SS-131-1105	1 - 2	<390 U	<390 U	<390 U	<390 UJ	<390 U	56 J	<390 U	<390 UJ
SB-131-1105	2 - 4	<390 U	<390 U	<390 U	<390 UJ	<390 U	<390 U	<390 U	<390 UJ
Former Waste Neutralization System									
SB-202-1108	16 - 18A	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SB-202-1108	16 - 18B	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SB-202-1112	28 - 30	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SB-202-1112	34 - 36	<390 U	<390 U	<390 U	<390 U	<390 U	39 J	<390 U	<390 U
SB-202-1112	46 - 48	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U

TABLE 3 (continued) Semi-Volatile Organic Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Semi-volatile Organic Compounds (ug/kg)							
		3,3'-Dichloro-benzidine	Diethyl-phthalate	Dimethyl-phthalate	Di-n-butyl-phthalate	Di-n-octyl-phthalate	Fluor-anthene	Hexachloro-cyclopent-adiene	Indeno(1,2,-3-cd)pyrene
Southwest Former Drum Storage Area									
SS-009-1107	2 - 3	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U
SB-009-1107	3.5 - 5.5	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SS-015-1108	1.5 - 2.5	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SB-015-1108	3 - 5	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SS-018-1106	1.5 - 2.5	<380 U	<380 U	<380 U	<380 U	110 J	42 J	<380 U	<380 U
SB-018-1106	3 - 5	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U
East Former Drum Storage Area									
SS-103-1106	0.5 - 1.5	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U
SB-103-1106	2 - 4	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U
SS-118-1105	0.5 - 1.5	<400 UJ	<400 U	51 J	<400 U	91 J	<400 U	<400 U	<400 UJ
SB-118-1105	2 - 4	<100 UJ	<100 U	<100 U	<100 U	53 J	<100 U	<100 U	<100 UJ
SS-131-1105	1 - 2	<390 UJ	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 UJ
SB-131-1105	2 - 4	<390 UJ	<390 U	46 J	<390 U	<390 U	<390 U	<390 U	<390 UJ
Former Waste Neutralization System									
SB-202-1108	16 - 18A	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SB-202-1108	16 - 18B	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SB-202-1112	28 - 30	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U	<370 U
SB-202-1112	34 - 36	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U
SB-202-1112	46 - 48	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U

TABLE 3 (continued) Semi-Volatile Organic Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Semi-volatile Organic Compounds (ug/kg)					
		2-Methyl-naphthalene	2-Nitro-aniline	3-Nitro-aniline	4-Nitro-aniline	Phenan-threne	Pyrene
Southwest Former Drum Storage Area							
SS-009-1107	2 - 3	<390 U	<980 U	<980 U	<980 U	<390 U	<390 U
SB-009-1107	3.5 - 5.5	<370 U	<920 U	<920 U	<920 U	<370 U	<370 U
SS-015-1108	1.5 - 2.5	<380 U	<950 U	<950 U	<950 U	<380 U	<380 U
SB-015-1108	3 - 5	<370 U	<930 U	<930 U	<930 U	<370 U	<370 U
SS-018-1106	1.5 - 2.5	<380 U	<960 U	<960 U	<960 U	<380 U	<380 U
SB-018-1106	3 - 5	<400 U	<1000 U	<1000 U	<1000 U	<400 U	<400 U
East Former Drum Storage Area							
SS-103-1106	0.5 - 1.5	<400 U	<990 U	<990 U	<990 U	<400 U	<400 U
SB-103-1106	2 - 4	<390 U	<990 U	<990 U	<990 U	<390 U	<390 U
SS-118-1105	0.5 - 1.5	<400 U	<1000 U	<1000 UJ	<1000 U	<400 U	<400 U
SB-118-1105	2 - 4	<100 U	<1000 U	<1000 UJ	<1000 U	<100 U	<100 U
SS-131-1105	1 - 2	<390 U	<980 U	<980 UJ	<980 U	<390 U	<390 U
SB-131-1105	2 - 4	<390 U	<970 U	<970 UJ	<970 U	<390 U	<390 U
Former Waste Neutralization System							
SB-202-1108	16 - 18A	<380 UJ	<960 U	<960 UJ	<960 U	<380 U	<380 U
SB-202-1108	16 - 18B	<370 UJ	<930 U	<930 UJ	<930 U	<370 U	<370 U
SB-202-1112	28 - 30	<370 UJ	<920 U	<920 UJ	<920 U	<370 U	<370 U
SB-202-1112	34 - 36	<390 UJ	<970 U	<970 UJ	<970 U	<390 U	<390 U
SB-202-1112	46 - 48	<380 UJ	<940 U	<940 UJ	<940 U	<380 U	<380 U

TABLE 3 (continued) Semi-Volatile Organic Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Semi-volatile Organic Compounds (ug/kg)							
		Anthracene	Benzo(a)-anthracene	Benzo(a)-pyrene	Benzo(g,h)-perylene	Benzo(b)-fluoranthene	bis(2-Ethyl-hexyl)phthalate	Chrysene	Dibenz(a,h)-anthracene
SB-203-1113	28 - 30	<400 U	<400 U	<400 U	<400 U	<400 U	44 J	<400 U	<400 U
SB-203-1113	40 - 42	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SB-204-1114	52 - 54	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SS-205-1114	1.5 - 2.5	<410 U	<410 U	<410 U	<410 U	<410 U	100 J	<410 U	<410 U
SB-205-1114	52 - 54	<390 U	<390 U	<390 U	<390 U	<390 U	59 J	<390 U	<390 U
SB-206-1115	40 - 42	<410 U	<410 U	<410 U	<410 U	<410 U	83 B	<410 U	<410 U
Upgradient Background									
SS-301-1106	0.5 - 1.5	<400 U	74 J	79 J	56 J	170 J	52 B	85 J	<400 U

TABLE 3 (continued) **Semi-Volatile Organic Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Semi-volatile Organic Compounds (ug/kg)							
		3,3'-Dichloro-benzidine	Diethyl-phthalate	Dimethyl-phthalate	Di-n-butyl-phthalate	Di-n-octyl-phthalate	Fluor-anthene	Hexachloro-cyclopent-adiene	Indeno(1,2,-3-cd)pyrene
SB-203-1113	28 - 30	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U	<400 U
SB-203-1113	40 - 42	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SB-204-1114	52 - 54	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U	<380 U
SS-205-1114	1.5 - 2.5	<410 U	130 J	<410 U	170 J	66 J	<410 U	<410 U	<410 U
SB-205-1114	52 - 54	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U	<390 U
SB-206-1115	40 - 42	<410 U	<410 U	<410 U	<410 U	<410 U	<410 U	<410 UJ	<410 U
Upgradient Background									
SS-301-1106	0.5 - 1.5	<400 U	<400 U	70 J	<400 U	<400 U	170 J	<400 U	61 J

TABLE 3 (continued) **Semi-Volatile Organic Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Semi-volatile Organic Compounds (ug/kg) 2-Methyl-naphthalene	2-Nitro-aniline	3-Nitro-aniline	4-Nitro-aniline	Phenan-threne	Pyrene
SB-203-1113	28 - 30	<400 UJ	<1000 U	<1000 UJ	<1000 U	<400 U	<400 U
SB-203-1113	40 - 42	<380 UJ	<950 U	<950 UJ	<950 U	<380 U	<380 U
SB-204-1114	52 - 54	<380 U	<960 UJ	<960 UJ	<960 UJ	<380 U	<380 U
SS-205-1114	1.5 - 2.5	<410 U	<1000 UJ	<1000 UJ	<1000 UJ	<410 U	<410 U
SB-205-1114	52 - 54	<390 U	<980 UJ	<980 UJ	<980 UJ	<390 U	<390 U
SB-206-1115	40 - 42	<410 U	<1000 U	<1000 U	<1000 UJ	<410 U	<410 U
Upgradient Background							
SS-301-1106	0.5 - 1.5	<400 U	<1000 U	<1000 U	<1000 U	72 J	120 J

NOTES:

Compounds which were nondetected for all samples are not listed.

B - Blank Contamination

J - Estimated value below detection limit

U - Undetected at stated value

UJ - Not detected, estimated value may be inaccurate or imprecise

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TABLE 4 **Pesticide and PCBs Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Pesticide Compounds (ug/kg) 4,4'-DDT	Delta-BHC	Dieldrin	Endrin	Gamma-BHC (Lindane)	Heptachlor	Heptachlor Epoxide
Southwest Former Drum Storage Area								
SS-009-0109	2 - 3	<4 U	<2.1 U	<4 U	<4 U	<2.1 U	<2.1 U	<2.1 U
SB-009-0109	3.5 - 5.5	<3.7 U	<1.9 U	<3.7 U	<3.7 U	<1.9 U	<1.9 U	<1.9 U
SS-015-0109	1.5 - 2.5	<3.9 U	<2 U	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
SB-015-0109	3 - 5	<3.7 U	<1.9 U	<3.7 U	<3.7 U	<1.9 U	<1.9 U	<1.9 U
SS-018-0109	1.5 - 2.5	<3.9 U	0.49 J	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
SB-018-0109	3 - 5	<4.3 U	<2.2 U	<4.3 U	<4.3 U	<2.2 U	<2.2 U	<2.2 U
East Former Drum Storage Area								
SS-103-0109	0.5 - 1.5A	<3.9 U	<2 U	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
SS-103-0109	0.5 - 1.5B	1.5 J	<2 U	1.4 J	0.72 J	0.69 J	0.61 J	0.82 J
SB-103-0109	2 - 4A	<3.9 U	<2 U	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
SB-103-0109	2 - 4B	<3.9 U	<2 U	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
SS-118-0109	0.5 - 1.5	<4.1 U	<2.1 U	<4.1 U	<4.1 U	<2.1 U	<2.1 U	<2.1 U
SB-118-0109	2 - 4	<4 U	<2.1 U	<4 U	<4 U	<2.1 U	<2.1 U	<2.1 U
SS-131-0109	1 - 2	<3.9 U	<2 U	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
SB-131-0109	2 - 4	<3.9 U	<2 U	<3.9 U	<3.9 U	<2 U	<2 U	<2 U
Upgradient Background								
SS-301-0109	0.5 - 1.5	<4 U	<2.1 U	<4 U	<2.1 U	<2.1 U	<2.1 U	<2.1 U

NOTES:

Compounds which were nondetected for all samples are not listed.

J - Estimated value below detection limit   U - Undetected at stated value

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TABLE 5 **Inorganic Metal Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Inorganic Compounds (mg/kg)											
		Ag	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Hg
Southwest Former Drum Storage Area													
SS-009-1107	2 - 3	<1 U	6760	0.88 J	46.4	<0.6 U	<0.6 U	717	9.9	5	5.2 J	16000 J	<0.1 U
SB-009-1107	3.5 - 5.5	<1 U	4340	1.6 J	16.5	<0.6 U	<0.6 U	480	18.3	5	21.2 J	67100 J	<0.1 U
SS-015-1108	1.5 - 2.5	<1 U	3680	0.82 J	24.5	<0.6 U	<0.6 U	479	14.4	6	6.9 J	39800 J	<0.1 U
SB-015-1108	3 - 5	<1 U	3410	0.52 J	17.8	<0.6 U	<0.6 U	344	12.3	14.6	13.1 J	33400 J	<0.1 U
SS-018-1106	1.5 - 2.5	<1 U	5630	1.3 J	33.9	<0.6 U	<0.6 U	1220	9.3	12.7	17.2 J	43300 J	<0.1 U
SB-018-1106	3 - 5	<1 U	6470	0.96 J	72.3	0.65	<0.6 U	1120	9.3	8.4	11.6 J	26100 J	<0.1 U
SS-103-1106	0.5 - 1.5	<1 U	10200	1.3 R	29.4	0.49	<0.6 U	765	14.1	11	22	21400	<0.1 U
SB-103-1106	2 - 4	<1 U	7390	0.72 R	54.6	1.4	<0.6 U	5400	8	50.9	28.6	41000	<0.1 U
East Former Drum Storage Area													
SS-118-1105	0.5 - 1.5	1	6480	<2 R	17.4	0.61	<0.6 U	608	5.9	39.7	30.6	43700	<0.1 U
SB-118-1105	2 - 4	<1 U	8340	0.71 R	27.4	1.7	<0.6 U	235	7.8	32.4	30.2	46000	0.06
SS-131-1105	1 - 2	0.99	4350	0.64 R	17.6	0.58	<0.6 U	11700	21	6.2 B	56.3	27800	<0.1 U
SB-131-1105	2 - 4	<1 U	6020	<2 R	21.3	1.2	<0.6 U	426	7.1	15.1	63.4	38600	<0.1 U
Former Waste Neutralization System													
SB-202-1108	16 - 18A	<1 U	4810 J	3.5 J	29.8	0.55	5.8 J	640	12.7 J	62.1 J	29.1 J	28300 J	0.08 J
SB-202-1108	16 - 18B	<1 U	3420 J	1.9 J	26.3	0.47	5.5 J	580	11.3 J	221 J	36 J	26200 J	0.1 B
SB-202-1112	28 - 30	<1 U	4000 J	6.8 J	11.7 B	1.1	4.7 J	279	4	8.4 J	21.6 J	22700 J	0.05 B
SB-202-1112	34 - 36	<1 U	6950 J	4.4 J	44.2	3.1	9.2 J	672	4	20 J	36.4 J	40800 J	0.09 B
SB-203-1113	28 - 30	<1 U	5500 J	4.6 J	26.9	3.7	8.2 J	596	3	21.2 J	29 J	38100 J	0.09 B
SB-204-1114	52 - 54	<1 U	5540	1.5	40.8	3.4	<0.6 U	2260	4.2 B	14.7	20.5	27700	0.07

TABLE 5 (continued) **Inorganic Metal Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Inorganic Compounds (mg/kg)										
		K	Mg	Mn	Na	Ni	Pb	Sb	Se	Tl	V	Zn
Southwest Former Drum Storage Area												
SS-009-1107	2 - 3	301	921	160	71.3	5.3	7.5 J	<6 U	<1 R	<2 U	14.6	16.4
SB-009-1107	3.5 - 5.5	259	416	93.9	40.5	5.7	7.7 J	<6 U	<1 R	<2 U	17.1	30.2
SS-015-1108	1.5 - 2.5	262	496	165	62	3.7	6.8 J	<6 U	<1 R	<2 U	15	14.3
SB-015-1108	3 - 5	175	188	462	53.2	3.8	8 J	<6 U	<1 R	<2 U	15.7	15.4
SS-018-1106	1.5 - 2.5	357	1170	339	70.5	7.8	10.2 J	<6 U	<1 R	<2 U	19.4	48.9
SB-018-1106	3 - 5	299	814	310	58	7.8	23.3 J	<6 U	<1 R	<2 U	14.8	31.1
SS-103-1106	0.5 - 1.5	653	1860	162 J	43.6	9.1	10.7 J	<6 UJ	<1 R	<2 U	27.6	48.9 J
SB-103-1106	2 - 4	317	3130	1370 J	41.4	36.8	17.7 J	<6 UJ	<1 R	0.7	22.4	138 J
East Former Drum Storage Area												
SS-118-1105	0.5 - 1.5	326	435	589 J	42.9	19.5	28 J	<6 UJ	<1 R	<2 U	24.5	101 J
SB-118-1105	2 - 4	317	236	1090 J	67.5	42.4	16.5 J	<6 UJ	<1 R	0.55	26.5	103 J
SS-131-1105	1 - 2	382	1990	654 J	71.5	18.8	11.5 J	<6 UJ	<1 R	<2 U	29.3	162 J
SB-131-1105	2 - 4	368	261	162 J	30.4	32.8	5.6 J	<6 UJ	<1 R	<2 U	17.9	276 J
Former Waste Neutralization System												
SB-202-1108	16 - 18A	414	221	598 J	<60 U	31.5 J	21.8 J	<6 UJ	<1 R	<2 U	19	224 J
SB-202-1108	16 - 18B	217	157	2080 J	<60 U	46.5 J	6.2 J	<6 UJ	<1 R	<2 U	15.7	241 J
SB-202-1112	28 - 30	269 B	139	459 J	<60 U	42.9 J	8.9 J	<6 UJ	<1 R	<2 U	3.6	168 J
SB-202-1112	34 - 36	274 B	302	1010 J	<60 U	50.3 J	11.5 J	<6 UJ	<1 R	<2 U	16	266 J
SB-203-1113	28 - 30	319	262	837 J	<60 U	71.2 J	23.7 J	<6 UJ	<1 R	0.78	10.9	519 J
SB-204-1114	52 - 54	483	3060	724	29.3	41.3	<1.1	<6 UJ	<1 UJ	<2 U	10.2	187

TABLE 5 (continued) Inorganic Metal Analytical Results for Surface and Subsurface Soil Samples

Sample Id	Depth (FT)	Inorganic Compounds (mg/kg)											
		Ag	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Hg
SS-205-1114	1.5 - 2.5	<1 U	18100	2.8	43.4	0.5	<0.6 U	849	26.5	8	17.3	28700	<0.1 U
SB-205-1114	52 - 54	<1 U	3270	9.2	42.9	2.8	<0.6 U	25900	<2 U	17.2	20	25700	0.16
SB-206-1115	40 - 42	<1 U	2730	1.6	25.1	4.3	<0.6 U	84.2	4.1 B	13.7	16.5	37900	0.1
Upgradient Background													
SS-301-1106	0.5-1.5	<1 U	6190	2.1 R	56.3	0.63	<0.6 U	2240	9.9	36.2	25.5	27400	0.06

TABLE 5 (continued) **Inorganic Metal Analytical Results for Surface and Subsurface Soil Samples**

Sample Id	Depth (FT)	Inorganic Compounds (mg/kg)										
		K	Mg	Mn	Na	Ni	Pb	Sb	Se	Tl	V	Zn
SS-205-1114	1.5 - 2.5	895	2670	160	49.2	14	10.4 J	<6 UJ	<1 UJ	<2 U	44.6	62.2
SB-205-1114	52 - 54	693	4150	762	59.3	39.1	<1	<6 UJ	2.1 J	<2 U	10	172
SB-206-1115	40 - 42	300	412	1060	47.7	39.1	<1	<6 UJ	<1 UJ	<2 U	9.4	286
Upgradient Background												
SS-301-1106	0.5-1.5	349	966	820 J	36.3	21.8	24.5 J	<6 UJ	<1 R	0.72	21.4	106 J

NOTES:

B - Blank Contamination
J - Estimated value
R - Unusable result
U - Undetected at stated value
UJ - Not detected, estimated value may be inaccurate or imprecise

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TABLE 6

Comparison of Reported Concentrations for Inorganics Detected in Surface Soil With Background Values

Compound	Range of Reported Concentrations (mg/kg)	Background (1) (mg/kg)	Pennsylvania US Geological Survey (2) (mg/kg)	Native Soil (3) (mg/kg)
Silver	0.99 - 1.0	< 1	ND	0.1 - 5.0
Aluminum	3,680 - 18,100	6,190	70,000	10,000 - 300,000
Arsenic	0.82 - 2.8	ND	6.5	1 - 4
Barium	17.4 - 46.4	56.3	500	100 - 3,500
Beryllium	0.49 - 0.61	0.6	1.0 - 1.5	0.1 - 40
Calcium	479 - 11,700	2,240	350 - 520	100 - 400,000
Chromium	5.9 - 26.5	9.9	50	5.0 - 3,000
Cobalt	5 - 39.7	36.2	15 - 70	1 - 40
Copper	5.2 - 56.3	25.5	50 - 700	2 - 100
Iron	16,000 - 43,700	27,400	ND	7,000 - 550,000
Potassium	262 - 895	349	ND	400 - 30,000
Magnesium	435 - 2,670	966	500 - 700	600 - 6,000
Manganese	160 - 654	820	1,000 - 7,000	100 - 4,000
Sodium	42.9 - 71.5	36.3	700	750 - 7,500
Nickel	3.7 - 19.5	21.8	30 - 700	5 - 1,000
Lead	6.8 - 28	24.5	30 - 70	2 - 200
Vanadium	14.6 - 44.6	21.4	150 - 500	20 - 500
Zinc	14.3 - 162	106	120 - 3,500	10 - 300

Notes:

ND = No Data
1 = SS-301
2 = Shacklette, T.H., (1984)
3 = Dragun, James, (1988)

TABLE 7

Comparison of Reported Concentrations for Inorganics Detected in Subsurface Soil with Background Values

Compound	Range of Reported Concentrations (mg/kg)	Site-Specific Background (1) (mg/kg)	US Geological Survey (2) (mg/kg)	Native Soil (3) (mg/kg)
Silver	0.99 - 1	< 1	ND	0.1 - 5
Aluminum	3,410 - 18,100	6,190	70,000	10,000 - 300,000
Arsenic	0.52 - 3.5	ND	6.5	1 - 4
Barium	16.5 - 72.3	56.3	500	100 - 3,500
Beryllium	0.49 - 1.7	0.6	1 - 1.5	0.1 - 40
Cadmium	5.8	< 0.6	ND	0.01 - 45
Calcium	235 - 11,700	2,240	350 - 520	100 - 400,000
Chromium	5.9 - 26.5	9.9	50	5 - 3,000
Cobalt	5 - 221	36.2	15 - 70	1 - 40
Copper	5.2 - 63.4	25.5	50 - 700	2 - 100
Iron	16,000 - 67,100	27,400	ND	7,000 - 550,000
Mercury	0.06 - 0.1	0.1	0.082 - 0.13	ND
Potassium	175 - 895	349	ND	400 - 30,000
Magnesium	139 - 3,130	966	500 - 700	600 - 6,000
Manganese	93.9 - 2,080	820	1,000 - 7,000	100 - 4,000
Sodium	30.4 - 71.5	36.3	700	750 - 7,500
Nickel	3.7 - 46.5	21.8	30 - 700	5 - 1,000
Lead	5.6 - 28	24.5	30 - 70	2 - 200
Thallium	0.55 - 1	0.7	ND	ND
Vanadium	14.6 - 44.6	21.4	150 - 500	20 - 500
Zinc	14.3 - 276	106	120 - 3,500	10 - 300

Notes:

ND = No Data
1 = SS-301
2 = Shacklette, T.H., (1984).
3 = Dragun, James, (1988).

TABLE 8 **Volatile Organic Results for Surface Water Samples**

Sample Id	Volatile Organic Compounds (ug/L)							
	Bromoform	Chloro-methane	Methylene chloride	Toluene	Trans-1,3-dichloropropene	Vinyl chloride	o-xylene	m-xylene
SW-2	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U
SW-3-A	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U
SW-3-B	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U
SW-4	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5	< 0.5 UJ	< 0.5 UJ	< 0.5	< 0.5
SW-5	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U
Upgradient Background								
SW-1	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U

NOTES:

All compounds which were nondetected for all samples are not listed.

SW-3-A and SW-3-B are duplicate samples.

J - Estimated Value

UJ - Not detected, estimated value may be inaccurate or imprecise

U - Undetected at reported value

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TABLE 9 **Semi-Volatile Organic Results for Surface Water Samples**

Sample Id	Semi-volatile Organic Compounds (ng/L)				
	bis(2-Ethylhexyl)-phthalate	Diethyl-phthalate	Fluoranthene	4-Methyl-phenol	Pyrene
SW-2	2 B	< 10 U	< 10 U	< 10 UJ	< 10 U
SW-3-A	9 B	1 J	< 10 U	< 10 U	< 10 U
SW-3-B	6 B	1 J	< 10 U	< 10 U	< 10 U
SW-4	3 B	< 10 U	< 10 U	< 10 UJ	< 10 U
SW-5	4 B	< 10 U	1 J	< 10 UJ	1 J
Upgradient Background					
SW-1	2 B	< 10 U	< 10 U	< 10 UJ	< 10 U

NOTES:

Compounds which were nondetected for all samples are not listed.

SW-3-A and SW-3-B are duplicate samples.

B - Blank Contamination U - Undetected at stated value

J - Estimated Value UJ - Not detected, estimated value may be inaccurate and imprecise

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TABLE 10 **Pesticide and PCB Results for Surface Water Samples**

	Pesticide and PCB Compounds (ug/L)		
Sample Id	Arochlor-1254	Endosulfan II	gamma-Chlordane
SW-2	0.21 J	< 0.1 U	0.0073 J
SW-3-A	0.22 J	< 0.1 U	< 0.05 U
SW-3-B	< 1 U	< 0.1 U	< 0.05 U
SW-4	0.27 J	< 0.1 U	< 0.05 U
SW-5	< 1 U	0.015 J	< 0.05 U
Upgradient Background			
SW-1	< 1 U	< 0.1 U	< 0.05 U

NOTES:

Compounds which were nondetectable for all samples are not listed.

SW-3-A and SW-3-B are duplicate samples.

J - Estimated Value U - Undetected at stated value

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TABLE 11 **Total Inorganic Metal Analytical Results for Surface Water Samples**

Sample Id	Inorganic Compounds (ug/L)											
	Ag	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Hg
SW-2	< 4 U	13500	< 2 UJ	81.9	< 1 U	4.7 B	14100	13.7	8.5	34.6 B	18700	0.2 B
SW-3-A	< 4 U	675	< 2 UJ	23.3	< 1 U	2.5 B	11000	< 6 U	< 7 U	11.6	1400	0.23 B
SW-3-B	< 4 U	715	< 2 UJ	30.2	< 1 U	< 2 U	11000	< 6 U	< 7 U	11.4	1460	0.24 B
SW-4	< 4 U	< 45 U	< 2 UJ	32.5	< 1 U	< 2 U	6680	< 6 U	< 7 U	5.2	61.1 B	< 0.10 U
SW-5	< 4 U	1120	< 2 UJ	23.3	< 1 U	< 2 U	7770	< 6 U	< 7 U	14.7	2280	0.19 B
Upgradient Background												
SW-1	< 4 U	13500	< 2 UJ	77.2	< 1 U	6.5 B	14300	13.6	< 7 U	30.3 B	18200	0.2 B

Sample Id	Inorganic Compounds (ug/L)										
	K	Mg	Mn	Na	Ni	Pb	Sb	Se	Tl	V	Zn
SW-2	4030	5720	293	3530	14.2	71.2 J	< 14 U	1.3	< 1 UJ	24.9	150
SW-3-A	2320	3260	39	5620	< 9 U	9.8 B	< 14 U	< 1 UJ	< 1 U	< 6 U	91.7 B
SW-3-B	2340	3220	39	5600	< 9 U	9.5 B	< 14 U	< 1 UJ	< 1 U	< 6 U	100 B
SW-4	789	1870	14.3	2290	< 9 U	< 1 U	< 14 U	< 1 UJ	< 1 U	< 6 U	58.9 B
SW-5	1540	2780	48.2	3710	< 9 U	12.3 J	< 14 U	< 1 UJ	< 1 U	6.5	88 B
Upgradient Background											
SW-1	4000	5690	250	3790	10.9	58.7 J	14.5 B	2	< 1 UJ	23	138

NOTES:

SW-3-A and SW-3-B are duplicate samples.

B – Blank Contamination **U – Undetected at stated value**

J – Estimated Value **UJ – Not detected, estimated value may be inaccurate or imprecise**

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TABLE 12 Dissolved Inorganic Metal Analytical Results for Surface Water Samples

Sample Id	Inorganic Compounds (ug/L)											
	Ag	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Hg
SW-2	< 4 U	76.9 B	< 2 U	23.2	< 1 U	< 2 U	9830	< 6 U	< 7 U	< 5 U	87 B	< 0.10 U
SW-3-A	< 4 U	< 45 U	< 2 U	38.7	< 1 U	< 2 U	10000	30.1 B	< 7 U	5.8 B	176 B	0.11 B
SW-3-B	< 4 U	< 45 U	< 2 U	37.2	< 1 U	< 2 U	10000	< 6 U	< 7 U	6.4 B	66.8 B	< 0.10 U
SW-4	< 4 U	339 B	< 2 U	7 B	< 1 U	< 2 U	6700	< 6 U	< 7 U	< 5 U	501	< 0.10 U
SW-5	< 4 U	< 45 U	< 2 U	37.2	< 1 U	< 2 U	5810	9.5 B	< 7 U	5.4 B	81.3 B	< 0.10 U
Upgradient Background												
SW-1	< 4 U	189 B	< 2 U	54.2	< 1 U	< 2 U	10900	7.4 B	< 7 U	6.2 B	203 B	< 0.10 U

Sample Id	Inorganic Compounds (ug/L)										
	K	Mg	Mn	Na	Ni	Pb	Sb	Se	Tl	V	Zn
SW-2	2760	2750	11.7	3590	< 9 U	< 1 U	< 14 U	< 1 UJ	1.3 B	< 6 U	14 B
SW-3-A	2130	2660	26.1	5740	17.4 B	1.7	< 14 U	< 1 UJ	2.6 B	< 6 U	80.1 B
SW-3-B	2170	2660	23.4	5700	< 9 U	1.4	< 14 U	< 1 UJ	< 1 U	< 6 U	66.6 B
SW-4	813	1960	19.5	1950	< 9 U	3.4	< 14 U	< 1 UJ	2 B	< 6 U	63.6 B
SW-5	1370	1560	19.6	3570	18 B	< 1 U	14.8 B	< 1 UJ	1.5 B	< 6 U	42.4 B
Upgradient Background											
SW-1	2660	3020	9.7	4250	9.3 B	< 1 U	< 14 U	< 1 UJ	< 1 U	< 6 U	147 B

NOTES:

SW-3-A and SW-3-B are duplicate samples.

B - Blank Contamination
U - Undetected at stated value
J - Estimated Value
UJ - Not detected, estimated value may be inaccurate or imprecise

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TABLE 13 **Volatile Organic Results for Sediment Samples**

	Volatile Organic Compounds (ug/kg)	
Sample Id	Methylene Chloride	Acetone
SD-2	3 B	4 B
SD-3-A	< 11 U	2 B
SD-3-B	< 11 U	< 11 U
SD-4	< 11 U	< 11 U
Upgradient Background		
SD-1	4 B	8 B

NOTES:

Compounds which were nondetectable for all samples are not listed.

SD-3-A and SD-3-B are duplicate samples.

B - Blank Contamination

U - Undetected at reported value

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TABLE 14 Semi-Volatile Organic Results for Sediment Samples

Sample Id	Semi-volatile Organic Compounds (ug/kg)						
	Acenaphthene	Anthracene	Benzo(a)-anthracene	Benzo(a)-pyrene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(g,h,i)-perylene
SD-2	190 J	380 J	1900 J	1500 J	4800 J	< 410 UJ	2600 J
SD-3-A	90 J	300 J	920 J	800 J	2500 J	< 370 UJ	1000 J
SD-3-B	65 J	53 J	480	130 J	< 980 UJ	340 J	520 J
SD-4	110 J	130 J	850	460 J	1700 J	530 J	950 J
Upgradient Background							
SD-1	< 370 U	< 370 U	350 J	280 J	1000 J	< 370 UJ	390 J

Sample Id	Semi-volatile Organic Compounds (ug/kg)						
	Bis(2-Ethylhexyl)-phthalate	Butylbenzyl-phthalate	Carbazole	2-Chloro-phenol	4-Chloro-3-methyl phenol	Chrysene	Dibenz(a,h)-anthracene
SD-2	160 J	< 410 UJ	320 J	< 410 UR	< 410 UR	2500 J	640 J
SD-3-A	160 J	< 370 UJ	170 J	< 370 UR	< 370 UR	1300 J	550 J
SD-3-B	120 J	< 390 U	120 J	< 390 UR	< 390 UR	690	< 390 UJ
SD-4	310 J	< 380 U	160 J	< 380 UR	< 380 UR	1200	120 J
Upgradient Background							
SD-1	60 J	< 370 UJ	< 370 U	< 370 UR	< 370 UR	500 J	160 J

TABLE 14 (continued) Semi-Volatile Organic Results for Sediment Samples

Sample Id	Semi-volatile Organic Compounds (ug/kg)						
	Dibenzo-furan	3,3'-Dichloro-benzidine	2,4-Dichloro-phenol	2,4-Dimethyl-phenol	Di-n-butyl-phthalate	2,4-Dinitro-phenol	4,6-Dinitro-2-methylphenol
SD-2	100 J	< 410 UJ	< 410 UR	< 410 UR	< 410 U	< 1000 UR	< 1000 UR
SD-3-A	46 J	< 370 UJ	< 370 UR	< 370 UR	220 J	< 930 UR	< 930 UR
SD-3-B	40 J	< 390 UJ	< 390 UR	< 390 UR	< 390 U	< 980 UR	< 980 UR
SD-4	60 J	< 380 UJ	< 380 UR	< 380 UR	< 380 U	< 940 UR	< 940 UR
Upgradient Background							
SD-1	< 370 U	< 370 UJ	< 370 UR	< 370 UR	< 370 U	< 920 UR	< 920 UR

Sample Id	Semi-volatile Organic Compounds (ug/kg)						
	Di-n-octyl-phthalate	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	2-Methyl phenol	4-Methyl phenol	2-Nitro-phenol
SD-2	< 410 UJ	3000	270 J	2500 J	< 410 UR	< 410 UR	< 410 UR
SD-3-A	< 370 UJ	1600	110 J	1200 J	< 370 UR	< 370 UR	< 370 UR
SD-3-B	< 390 UJ	1700	78 J	520 J	< 390 UR	< 390 UR	< 390 UR
SD-4	62 J	2500	120 J	1000 J	< 380 UR	< 380 UR	< 380 UR
Upgradient Background							
SD-1	< 370 UJ	730	46 J	520 J	< 370 UR	< 370 UR	< 370 UR

TABLE 14 (continued) **Semi-Volatile Organic Results for Sediment Samples**

Sample Id	Semi-volatile Organic Compounds (ug/kg)						
	4-Nitro-phenol	Pentachloro-phenol	Phenanthrene	Phenol	Pyrene	2,4,5-Trichloro-phenol	2,4,6-Trichloro-phenol
SD-2	< 1000 UR	< 1000 UR	2800	< 410 UR	4700 J	< 1000 UR	< 1000 UR
SD-3-A	< 930 UR	< 930 UR	1400	< 370 UR	2300 J	< 930 UR	< 930 UR
SD-3-B	< 980 UR	< 980 UR	1100	< 390 UR	1300	< 980 UR	< 980 UR
SD-4	< 940 UR	< 940 UR	1700	< 380 UR	2100	< 940 UR	< 940 UR
Upgradient Background							
SD-1	< 920 UR	< 920 UR	700	< 370 UR	1100 J	< 920 UR	< 920 UR

NOTES:

Compounds which were nondetectable for all samples are not listed.

SD-3-A and SD-3-B are duplicate samples.

B - Blank Contamination

J - Estimated Value

R - Unusable value due to poor surrogate recoveries

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U - Undetected at stated value

UJ - Not detected, estimated value may be inaccurate or imprecise

UR - Not detected, value is unusable

TABLE 15 **Pesticide and PCB Results for Sediment Samples**

Sample Id	Pesticide and PCB Compounds (ug/kg)									
	Alpha-Chlordane	Arochlor 1260	4,4'-DDE	4,4'-DDT	Dieldrin	Endosulfan Sulfate	Endrin Ketone	Gamma-Chlordane	Heptachlor	Heptachlor Epoxide
SD-2	1.2 J	53	0.73 J	3.2 J	0.64 J	2.3 J	3.3 J	< 2.1 U	< 2.1 U	< 2.1 U
SD-3-A	1.2 J	24 J	< 3.7 U	1.1 J	< 3.7 U	1.2 J	< 3.7 U	1.1 J	0.72 J	0.4 J
SD-3-B	0.73 J	29 J	< 3.9 U	0.95 J	< 3.9 U	1.4 J	1.9 J	< 2.0 U	< 2.0 U	< 2.0 U
SD-4	< 1.9 UR	< 37 UR	< 3.7 UR	< 3.7 UR	< 3.7 UR	< 3.7 UR	< 3.7 UR	< 1.9 UR	< 1.9 UR	< 1.9 UR
Upgradient Background										
SD-1	0.7 J	21 J	< 3.6 U	0.77 J	< 3.6 U	< 3.6 U	1.3 J	< 1.9 U	0.8 J	< 1.9 U

NOTES:

Compounds which were nondetectable for all samples are not listed.

SD-3-A and SD-3-B are duplicate samples.

J - Estimated value

UR - Not detected, value is unusable

U - Undetected at stated value

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TABLE 16 **Total Inorganic Metal Analytical Results for Sediment Samples**

Sample Id	Inorganic Compounds (mg/kg)											
	Ag	Al	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Hg
SD-2	< 0.59 U	3200 J	1.4 B	30.7	0.9	0.47	32800 J	192 J	8.5	24 J	26900 J	< 0.05 U
SD-3-A	< 0.58 U	2100 J	1.8	19.9	0.8	0.3	21900 J	31.3 J	5.3	20 J	11900 J	< 0.04 U
SD-3-B	< 0.7 U	2360 J	2.6	19.1	0.97	0.37	19900 J	47.2 J	8.2	23 J	18800 J	< 0.05 U
SD-4	< 0.68 U	2160 J	2.1	21.5	0.94	0.67	48500 J	19.2 J	5.8	24.4 J	12200 J	< 0.05 U
Upgradient Background												
SD-1	< 0.56 U	4120 J	2.2	26.6	1.2	0.25	49900 J	43.3 J	38.6	30 J	17600 J	< 0.05 U

Sample Id	Inorganic Compounds (mg/kg)										
	K	Mg	Mn	Na	Ni	Pb	Sb	Se	Tl	V	Zn
SD-2	181	13500 J	1390 J	79.6 B	11.4	69.2 J	< 2.8 U	< 0.24 UJ	< 0.24 U	110 B	127
SD-3-A	214	12400 J	370 J	57 B	15	37.5 J	< 2.7 U	< 0.21 UJ	< 0.21 U	13.6 B	85.6
SD-3-B	304	10400 J	538 J	46.9 B	11.8	36 J	< 3.3 U	< 0.24 UJ	< 0.24 U	17.8 B	141
SD-4	291	29400 J	494 J	90.5 B	9.7	63.4 J	< 3.2 U	< 0.2 UJ	< 0.2 UJ	17.1 B	180
Upgradient Background											
SD-1	329	26400 J	446 J	92.3 B	14.9	12.3 J	< 2.6 U	< 0.97 UJ	< 0.19 UJ	12.5 B	103

NOTES:

SD-3-A and SD-3-B are duplicate samples.

B - Blank Contamination **U - Undetected at stated value**

J - Estimated Value **UJ - Not detected, estimated value may be inaccurate or imprecise**

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Table 17 **Volatile Organic Results for Groundwater Samples**

Sample Id	Volatile Organic Compounds (ug/L)							
	Benzene	Bromoform	Chloro-benzene	Chloro-form	Chloro-methane	cis-1,2-Di-chloroethylene	Dichloro-methane	1,1-Dichloro-ethane
RW-1	3.4	< 0.5 UJ	2.2	< 0.5 U	< 0.5 UJ	4.6	0.9 B	8.6
MW-2	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 UJ	16
MW-4	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 UJ	< 0.5 U
MW-5A	7.3	< 0.5 UJ	3.5	< 0.5 U	< 0.5 UJ	0.6	< 0.5 UJ	4.6
MW-6	< 0.5	< 0.5 UJ	0.6	< 0.5 U	< 0.5 UJ	0.6	< 0.5	1.1
MW-7	3.7	< 0.5 UJ	2.1	< 0.5 U	< 0.5 UJ	0.7	0.6 B	1.9
MW-8	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5	< 0.5 UJ	2.7	< 0.5 UJ	1
Upgradient Background								
MW-3-A	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 UJ	0.6	< 0.5 UJ	1.2
MW-3-B	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 UJ	0.6	< 0.5 UJ	1.4

Table 17 continued **Volatile Organic Results for Groundwater Samples**

Sample Id	Volatile Organic Compounds (ug/L)							
	1,1-Dichloro-ethene	1,2-Dichloro-ethane	Tetrachloro-ethene	Trans-1,3-Dichloropropene	1,1,1-Tri-chloroethane	1,1,2-Tri-chloroethane	Trichloro-ethene	Vinyl chloride
RW-1	37	1.4	7.3	< 0.5 UJ	240	0.8	360	< 0.5 UJ
MW-2	< 0.5 U	< 0.5 U	1.4	< 0.5 UJ	67	< 0.5 U	27	< 0.5 UJ
MW-4	2.5	< 0.5 U	1.6	< 0.5 UJ	11	< 0.5 U	12	< 0.5 UJ
MW-5A	2.8	< 0.5 U	0.6	< 0.5 UJ	24	< 0.5 U	30	< 0.5 UJ
MW-6	8.4	< 0.5 U	1.9	< 0.5 UJ	100	< 0.5 U	130	< 0.5 UJ
MW-7	11	0.6	2.2	< 0.5 UJ	90	< 0.5	110	< 0.5 UJ
MW-8	25	< 0.5	2.3	< 0.5 UJ	97	< 0.5	140	< 0.5 UJ
Upgradient Background								
MW-3-A	1.3	< 0.5 U	< 0.5	< 0.5 UJ	1.3	< 0.5 U	7.9	< 0.5 UJ
MW-3-B	1.5	< 0.5 U	< 0.5 U	< 0.5 UJ	1.4	< 0.5 U	8.4	< 0.5 UJ

NOTES:

MW-3-A and MW-3-B are duplicate samples.

B - Blank Contamination U - Undetected at stated value

J - Estimated Value UJ - Not detected, estimated value may be inaccurate or imprecise

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TABLE 18 **Data Evaluation Summary of Total Inorganic Metals in Groundwater**

Compound	Number of Detects	Number of Samples	Minimum Detected (ug/L)	Maximum Detected (ug/L)	Mean (ug/L)	Standard Deviation (ug/L)	95% UCL (1) (ug/L)	Upgradient (3) (ug/L)
Silver	1	7	324	324	48.0	121.7	137.4	< 4
Aluminum	5	7	991	64400	10797.1	23710.2	28209.5	<2040
Arsenic	0	7						< 2
Barium	6	7	50.9	3440	686.3	1224.7	1585.7	<130
Beryllium	2	7	1	24.8	4.0	9.2	10.8	< 1
Cadmium	1	7	64	64	10.0	23.8	27.5	< 2
Calcium	6	7	48000	127000	79028.6	25293.9	97604.0	<73500
Chromium	1	7	6.9	6.9	5.3	4.5	8.6 (2)	<30.5
Cobalt	1	7	91.2	91.2	16.0	33.1	40.4	< 7
Copper	1	7	199	199	34.0	72.8	87.5	<4.8
Iron	7	7	1210	218000	35370.0	80597.6	94559.7	<3150
Mercury	2	7	0.68	1.3	0.4	0.5	0.7	<0.36
Potassium	6	7	2640	4730	3576.4	811.6	4172.4	<1920
Magnesium	6	7	22100	29700	23928.6	5926.7	28281.0	<34300
Manganese	6	7	51.5	5440	1495.4	1928.4	2911.6	<43.8
Sodium	6	7	19800	43500	27428.6	7474.1	32917.4	<40300
Nickel	5	7	9.1	27.4	26.7	38.5	55.0 (2)	<48.5
Lead	1	7	80.6	80.6	12.7	29.9	34.7	<10.2
Antimony	1	7	14.4	14.4	8.7	2.8	10.7	<17
Selenium	0	7						< 1
Thallium	0	7						< 1
Vanadium	3	7	6.4	127	22.0	46.4	56.0	< 6
Zinc	1	7	1210	1210	204.1	443.8	530.1	<53

NOTES:

(1) t(0.95,6) = 1.943

(2) UCL exceeds maximum detected concentration.

(3) Source = MW-3

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TABLE 19 **Data Evaluation Summary of Dissolved Inorganic Metals in Groundwater**

Compound	Number of Detects	Number of Samples	Minimum Detected (ug/L)	Maximum Detected (ug/L)	Mean (ug/L)	Standard Deviation (ug/L)	95% UCL (1) (ug/L)	Upgradient (2) (ug/L)
Silver	1	7	75.5	75.5	12.5	27.8	32.9	< 4
Aluminum	0	7						<38
Arsenic	0	7						< 2
Barium	6	7	62.8	887	289.8	302.1	511.6	<137
Beryllium	0	7						< 1
Cadmium	0	7						< 2
Calcium	6	7	47300	121000	73764.3	25911.9	92793.6	71800
Chromium	1	7	6	6	3.4	1.1	4.3	< 6
Cobalt	0	7						< 7
Copper	0	7						< 4
Iron	0	7						<41.7
Mercury	1	7	0.78	0.78	0.2	0.3	0.4	< 0.10
Potassium	5	7	2670	4380	2724.3	1289.1	3671.0	1540
Magnesium	6	7	20800	28900	21885.7	7399.0	27319.4	<31700
Manganese	5	7	28.1	2270	559.7	817.2	1159.9	<21.5
Sodium	6	7	19900	39900	25485.7	6568.2	30309.3	<35300
Nickel	0	7						<25
Lead	0	7						< 1
Antimony	0	7						<18.2
Selenium	1	7	1.2	1.2	0.6	0.3	0.8	<1.6
Thallium	0	7						< 1
Vanadium	0	7						< 6
Zinc	1	7	75.8	75.8	21.3	24.2	39.1	<32.1

NOTES:

(1) t(0.95,6)= 1.943

(2) Source = MW-3

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TABLE 20 **Depth Discrete Groundwater Analytical Results from RW-1**

Sample Interval (depth: feet)	Volatile Organic Compounds (ug/L) 1,1,1-TCA	1,1,2-TCA	TCE	PCE	DCE	1,1-DCA	1,2-DCA	CB	BENZENE	TOLUENE	ETLBENZ	o-XYLENE	m-XYLENE	p-XYLENE
103-115	330	< 5	480	6	36	6	< 5	< 5	< 5	31	< 5	< 5	< 5	< 5
126-138A	250	< 5	460	6	34	7	< 5	< 5	< 5	46	< 5	< 5	< 5	< 5
126-138B	340	0.9	480	7.4	29	11	1.9	1.2	1.2	46	1.2	1.6	**3.1	
149-161	330	< 5	600	11	42	12	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
173-192	170	< 3	170	< 3	20	< 3	< 3	< 3	4	< 3	< 3	< 3	< 3	< 3
TRIP BLANK	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

NOTES:

Volatile Analysis by EPA Method 502.2. Compounds which were nondetected for all samples are not listed in this Table.

NA - Not Applicable

** = Result includes a total of m-Xylene and p-Xylene.

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TABLE 21

Summary of Potenti... xposure Pathways
Current Use

Population	Exposure Point	Potential Route of Exposure	Quantified in Risk Assessment	Reason for Exclusion
Onsite Worker	Surface Soil	• dermal contact with surface soil • incidental ingestion of surface soil • inhalation of fugitive dust	Yes Yes No	 site mainly paved/grass covered
	Groundwater	• ingestion of drinking water	No	not used as drinking water source
	Surface Water (Drainage Ditch)	• dermal contact with surface water • incidental ingestion of surface water	No No	drainage ditch is intermittently filled with water; child more sensitive receptor
	Sediment (Drainage Ditch)	• dermal contact with sediment • incidental ingestion of sediment	No No	drainage ditch is intermittently filled with water; child more sensitive receptor
	Soil Gas	• inhalation of volatiles in indoor air	Yes	
Off-site Worker	Surface Soil	• dermal contact with surface soil • incidental ingestion of surface soil; • inhalation of fugitive dust	No No No	onsite worker more sensitive receptor onsite worker more sensitive receptor site mainly paved/grass covered
	Groundwater	• ingestion of drinking water	No	not used as drinking water source in area
	Surface Water (Drainage Ditch)	• dermal contact with surface water • incidental ingestion of surface water	No No	drainage ditch is intermittently filled with water; child more sensitive receptor
	Sediment (Drainage Ditch)	• dermal contact with sediment • incidental ingestion of sediment	No No	drainage ditch is intermittently filled with water; child more sensitive receptor
	Soil Gas	• inhalation of volatiles in indoor air	No	onsite worker more sensitive receptor
Area Resident (Adult & Child)	Surface Soil	• dermal contact with surface soil while playing or trespassing onsite • incidental ingestion of surface soil while playing or trespassing onsite • inhalation of fugitive dust	Yes Yes No	child only-more sensitive receptor child only-more sensitive receptor site mainly paved/grass covered
	Groundwater	• ingestion of drinking water • dermal contact while showering or bathing • inhalation of volatiles while showering or bathing	Yes Yes Yes	
	Surface Water (Drainage Ditch)	• dermal contact with surface water while playing or trespassing onsite • incidental ingestion of surface water while playing or trespassing onsite	Yes Yes	child only-more sensitive receptor
	Sediment (Drainage Ditch)	• dermal contact with sediment while playing or trespassing onsite • incidental ingestion of sediment while playing or trespassing onsite	Yes Yes	child only-more sensitive receptor
	Soil Gas	• inhalation of volatiles in indoor air	No	no residences adjacent to property; onsite worker more sensitive population

TABLE 22

Summary of Potential Exposure Pathways
Future Use

Population	Exposure Point	Potential Route of Exposure	Quantified in Risk Assessment	Reason for Exclusion
Construction Worker	Surface Soil	• dermal contact with soil • incidental ingestion of soil • inhalation of fugitive dust	Yes Yes Yes	
	Groundwater	• ingestion of drinking water • dermal contact with groundwater • incidental ingestion of groundwater	No No No	not used as drinking water source groundwater is deep (> 50 feet) groundwater is deep (> 50 feet)
	Surface Water (Drainage Ditch)	• dermal contact with surface water • incidental ingestion of surface water	No No	drainage ditch is intermittently filled with water; soil exposure more frequent and likely
	Sediment (Drainage Ditch)	• dermal contact with sediment • incidental ingestion of sediment	No No	drainage ditch is intermittently filled with water; soil exposure more frequent and likely
	Soil Gas	• inhalation of volatiles in indoor air	No	onsite worker exposed to indoor air (current use) more sensitive receptor
Area Resident (Adult & Child)	Surface Soil	• dermal contact with surface soil • incidental ingestion of surface soil • inhalation of fugitive dust	Yes Yes No	 construction worker more sensitive receptor
	Groundwater	• ingestion of drinking water • dermal contact while showering or bathing • inhalation of volatiles while showering or bathing	Yes Yes Yes	
	Surface Water	• dermal contact with surface water while playing onsite • incidental ingestion of surface water while playing onsite	No No	drainage ditch is intermittently filled with water; soil exposure more frequent and likely
	Sediment	• dermal contact with sediment while playing onsite • incidental ingestion of sediment while playing onsite	No No	drainage ditch is intermittently filled with water; soil exposure more frequent and likely
	Soil Gas	• inhalation of volatiles in indoor air	Yes	

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TABLE 23

Risk Characterization Summary
Assumed Future Residential Development and Groundwater Use

Potential Receptor	Exposure Pathway	Upper-Bound Estimated Cancer Risk	Estimated Hazard Index
Onsite Construction Worker	• dermal contact with subsurface soil	8.7×10^{-8}	0.005
	• incidental ingestion of subsurface soil	1.7×10^{-7}	0.010
	• inhalation of fugitive dust	8.4×10^{-10}	0.002
	TOTAL	**2.6×10^{-7}**	**0.02**
Onsite Resident (Adult)	• dermal contact with surface soil	2.3×10^{-7}	0.001
	• incidental ingestion of surface soil	1.7×10^{-7}	0.001
	• ingestion of drinking water	2.0×10^{-4}	0.15
	• dermal contact while showering or bathing	3.0×10^{-6}	0.002
	• inhalation of volatiles while showering or bathing	1.5×10^{-5}	0.002
	• inhalation of volatiles in indoor air	5.8×10^{-6}	0.0003
	TOTAL	**2.2×10^{-4}**	**0.15**
Onsite Resident (Child)	• dermal contact with surface soil	1.0×10^{-6}	0.03
	• incidental ingestion of surface soil	1.4×10^{-6}	0.030
	• ingestion of drinking water	2.5×10^{-4}	1.22
	• dermal contact while showering or bathing	2.5×10^{-6}	0.003
	• inhalation of volatiles while showering or bathing	1.8×10^{-5}	0.005
	• inhalation of volatiles in indoor air	4.8×10^{-6}	0.0004
	TOTAL	**2.8×10^{-4}**	**1.25**

TABLE 24

Risk Characterization Summary - Current Use

Potential Receptor	Exposure Pathway	Upper-Bound Estimated Cancer Risk	Estimated Hazard Index
Onsite Workers	• dermal contact with surface soil	6.2×10^{-7}	0.005
	• incidental ingestion of surface soil	2.3×10^{-7}	0.001
	• inhalation of volatiles in indoor air	9.5×10^{-7}	0.00005
	TOTAL	**1.8×10^{-6}**	**0.006**
Trespassing Area Resident (Adult)	• ingestion of drinking water	8.4×10^{-7}*	0.0007
	• dermal contact while showering or bathing	1.3×10^{-8}	0.00001
	• inhalation of volatiles while showering or bathing	1.1×10^{-7}	0.00003
	TOTAL	**9.6×10^{-7}**	**0.0007**
Trespassing Area Resident (Child)	• dermal contact with surface soil	1.9×10^{-7}	0.003
	• incidental ingestion of surface soil	1.1×10^{-7}	0.001
	• ingestion of drinking water	1.1×10^{-6}*	0.004
	• dermal contact while showering or bathing	1.0×10^{-8}	0.00001
	• inhalation of volatiles while showering or bathing	1.3×10^{-7}	0.00006
	• dermal contact with surface water	9.8×10^{-8}	0.0001
	• incidental ingestion of surface water	3.3×10^{-8}	0.00004
	• dermal contact with sediment	7.4×10^{-6}	0.01
	• incidental ingestion of sediment above)	1.6×10^{-6}	0.002
	TOTAL	**1.1×10^{-5}**	**0.02**

NOTES:
* = Risk was calculated based on a transport model assuming only site groundwater reaches the UMR and that the water was untreated prior to use. Currently, groundwater withdrawn from the UMR is treated to meet MCLs before use.

TABLE 25

COST SUMMARY OF ALTERNATIVES
KESSLER NPL SITE

COMPONENT	TOTAL CAPITAL COSTS	O & M COSTS: YEARS 1-3	O & M COSTS: YEARS 4-15	O & M COSTS: YEARS 4-6	O & M COSTS: YEARS 7-12	O & M COSTS: CLOSURE COSTS	PRESENT WORTH O & M COSTS ***	TOTAL COSTS ****
Alternative 1: No Further Action	$0.00	$0.00	$0.00	NA	NA	* $100,000.00	$92,600.00	$92.600.00
Alternative 2: Institutional Controls	$0.00	$121,200.00	$417,600.00	NA	NA	** $180,000.00	$364,800.00	$364,800.00
Alternative 3: Air Stripping with Discharge to Surface Water (with vapor phase carbon)	$125,000.00	$250,800.00	NA	$228,000.00	$211,800.00	** $225,000.00	$556,500.00	$681,500.00
Alternative 4: Granular Activated Carbon with Discharge to Surface Water	$75,000.00	$247,200.00	NA	$224,400.00	$211,800.00	** $215,000.00	$547,300.0C	$622,300.00
Alternative 5: Off-site Disposal to POTW	$40,000.00	$340,800.00	NA	$318,000.00	$211,800.00	** $210,000.00	$689,700.00	$729,700.00

NOTES:

Present worth analysis assumes ROD to be issued in 1994 and an 8% interest rate.

- * Closure costs to be incurred one year from issuance of ROD
- ** Closure cost to be incurred at project completion
- *** Includes closure costs
- **** Total Cost in 1994 dollars.

RESPONSIVENESS SUMMARY
STANLEY KESSLER SUPERFUND SITE
UPPER MERION TOWNSHIP

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 not infrequently, potentially responsible parties ("PRPs").

PART II. This section provides a comprehensive response to all significant comment, explains how the Record of Decision incorporates or addresses the issues raised and is comprised primarily of the specific legal and technical questions submitted in writing during the public comment period.

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.

PART I. SUMMARY OF THE MAJOR COMMENTS AND QUESTIONS RECEIVED DURING THE PUBLIC MEETING AND EPA'S RESPONSES

Comment: A Township Supervisor asked if the Site posed any risk factor to the potential residential development of a tract of land near the O'Hara Site which extends from Henderson Road almost down to Route 202.

EPA Response: Potential human health risks from this Site primarily are due to exposure to contaminated ground water. Since any new residential development currently is required by local authorities to have public water, this Site does not pose a risk to the residential development of that area.

Comment: A Township Supervisor referred to remedial action or pumping that has already been conducted by Kessler and wanted to know if they (Kessler) determined whether it was effective.

EPA Response: Based on data and calculations presented in the RI Report, the pumping conducted thus far has been able to reduce the contaminant concentration in the plume by approximately 97 - 98%. Thus, pumping of contamination has been shown to be effective. However, the estimated 2% of the contaminant concentration in the ground water plume is two orders of magnitude greater than the maximum contaminant level for TCE.

Comment: A Township Supervisor asked what level of contaminants would be in the treated ground water that will be discharged to the intermittent stream.

EPA Response: Any discharge to the stream of treated ground water must according to this ROD, comply with the substantive requirements of Section 402 of the Clean Water Act, and the

National Pollutant Discharge Elimination System ("NPDES"). The discharge limits for the treated ground water will be set by the Commonwealth of Pennsylvania Department of Environmental Resources ("PADER").

Comment: A Township Supervisor asked who would be responsible for monitoring the treatment system and ensuring that it is properly maintained and operated.

EPA Response: If Kessler conducts the remedial action under the terms of a Federal Consent Decree, then it would be responsible for the O&M, and EPA would oversee its work. If EPA conducts the remedial action, then either EPA or Pennsylvania would be responsible for the O&M.

PART II. SUMMARY OF WRITTEN COMMENTS RECEIVED AND EPA'S RESPONSES

Copies of all written comments received are contained in the Administrative Record for the Site. These comments were received by mail during the public comment period. The written comments and EPA's responses are summarized below.

PRP Comments: On August 19, 1994 the Law Offices of Beveridge & Diamond, P.C. submitted comments on behalf of Stanley Kessler & Co. ("Kessler"). These comments and EPA's responses are summarized below.

Comment: Kessler comments that EPA stated at a public meeting for the proposed plan that the health risk is acceptable. Kessler also comments that the FS concludes there are no human health or environmental risks posed by the Site.

EPA Response: There are unacceptable health risks posed by this Site, as described in detail in the Record of Decision particularly the risk assessment section. Under the current-use scenarios: an on-site worker and the child trespasser, the risks are within the acceptable range. However, under a future use scenario, which assumes domestic use of Site ground water, site-related risks to residents exceed the upper boundary of 1×10^{-4} for carcinogenic risks, thus supporting the need for remedial action. Therefore, the FS does conclude that the Site poses an unacceptable risk to human health. In addition, the affected ground water is a current source of drinking water because, as discussed below, Site ground water flows to the Upper Merion Reservoir which has been contaminated above acceptable drinking water standards. Therefore, the environment also has been adversely affected due to releases from the Site.

Comment: Kessler states that the Site is not a drinking water source and relies on this statement to support its contention that Alternative 2, Natural attenuation, should be preferred over Alternatives 3, 4, or 5.

EPA Response: The ground water under the Site is not currently used as a drinking water source because it is too contaminated. In its pristine condition, it would be an excellent source of drinking water. The aquifer beneath the Kessler Site is classified as a Class IIA Aquifer, a current source of drinking water in accordance with EPA document "Guidelines for Ground Water Classification". The Upper Merion Reservoir ("UMR") which is located approximately 3500 feet north of the Kessler Site, receives ground water from this aquifer. The water at the UMR is currently contaminated with many of the same contaminants which have been released at the Kessler Site. The operator of the UMR uses air strippers to remove contaminants from the water. The ground water beneath the Site flows toward the UMR.

Comment: Kessler contends that because of the nature, land use (present and future) and risks at the Site that its preferred remedy of "natural attenuation" should be selected by EPA.

EPA Response: Although the Kessler Site is located in an area where the land surface is zoned for industrial use, this does not in any way preclude the use of the Site's ground water as drinking water, now or in the future. As discussed above, the aquifer beneath the Site is classified as a Class IIA Aquifer, a current source of drinking water. Federal and State requirements which are ARARs for actions to be taken at the Kessler Site require the removal of the contaminants from the ground water as described in detail in the ROD.

Comment: Kessler states that Alternative 2, Natural Attenuation should be the preferred Alternative since the Site is located in an area where the ground water has been contaminated by other sources and that VOCs may be migrating from other properties to the Site.

EPA Response: Chemical despoilation of the aquifer by several sources is an illogical reason for the public to abandon this natural resource as a contaminated ground water dump. EPA and PADER are investigating and responding to the various possible sources of chemical contamination in the area which will ultimately result in the ground water being restored to its beneficial use. The location of the Site in an area zoned industrial, and the fact that other sources in the region may be contributing to the contaminant levels in the large regional area is not a sound basis for leaving the contaminants in the ground water at the Kessler Site. Kessler's own data proves that the ground water beneath this Site is still contaminated at levels that are two orders of magnitude greater than the Maximum Contaminant Levels ("MCLs") which are enforceable, health-based drinking water standards established under the Safe Drinking

Water Act.

Comment: Kessler cites a "prepublication" release of a National Research Council ("NRC") report, "Alternatives for Ground Water Cleanup", which it says casts serious doubts on the efficacy of pump and treat systems to achieve cleanup goals and to control the migration of ground water contaminants. It makes this comment in support of its preference for Alternative 2, Natural Attenuation, to address the contaminated ground water plume.

EPA Response: Nevertheless, good faith efforts are appropriate to restore this natural resource. Kessler's own pump and treat efforts in the past have been successful in removing significant contamination from the groundwater, as described above. Similar continued efforts are appropriate to recapature and remove the contamination.

Unfortunately, Kessler distorts the statements from the NRC study pertaining to the efficacy of pump and treat technology. The NRC Study does conclude that pump and treat systems, as commonly used at many ground water contamination sites, may not be able to completely restore a significant number of these sites regardless of the technology employed (conventional or innovative) due to site complexities. However, at sites, such as Kessler, where the remaining contamination in the ground water is in a dissolved aqueous plume, the NRC study concludes that pump and treat is capable of providing many benefits including: cleanup of the aqueous contaminant plumes, containment, and mass reduction. The RI states on page 4-9 "These data, in addition to the actual magnitude of VOC concentrations detected when compared to solubility limits indicate that non-aqueous phase liquids are not present, and that only dissolved phase VOCs have impacted the ground water at the Site."

Comment: Kessler states that Alternative 2, Natural Attenuation, would control contaminant migration through attenuation and degradation of the contaminants in the aquifer. Kessler further comments that Alternative 2 should be the preferred alternative because it questions the efficacy of pump and treat technology.

EPA Response: As discussed immediately above, Kessler's prior pump and treat has proved capable of controlling the migration of contaminated ground water at the Site. In this case, "Natural Attenuation" would mean that the chemical contamination would just continue to spread, thereby affecting other portions of the water system. The FS states that Alternative 2 would not preclude further movement of TCE in ground water. Furthermore, Kessler implies that pumping and treating will not achieve cleanup levels when by its own calculations in the FS, Kessler does predict that ground water pumping and treat will achieve remediation. This is consistent with EPA's conclusions, and EPA's selected remedy.

Comment: Kessler comments that the FS demonstrates that Alternative 2 is no less effective in complying with ARARs than any of other Alternatives.

EPA Response: The FS does not demonstrate that Alternative 2 is no less effective in complying with ARARS than any other Alternative. Ignored in this statement was the State's ARAR which requires active restoration of ground water. Moreover, the NCP and EPA's ground water policy require that usable groundwater be restored to its beneficial uses within a reasonable timeframe.

Comment: Kessler states that the estimated timeframe for cleanup of the aquifer under Alternative 2 would be within a period of 2 to 18 years (a median of ten years). The calculations in the FS, for active pumping estimate 7 years to achieve the same cleanup level. Based on this, Kessler contends that Alternative 2 should be the preferred alternative since the time period to achieve remediation may be even shorter or may be longer.

EPA Response: The main question is the issue of chemical contamination in the Site ground water: "natural attenuation" would not remove this contamination--it would just spread out. Additionally, EPA does not accept Kessler's conclusions on the ability of Alternative 2, Natural Attenuation, to achieve cleanup in 2 years. Data generated over a number of years by Kessler does not support a theory of rapid biodegradation of the contaminants in the ground water. EPA believes it is erroneous to state that Alternative 2, Natural Attenuation, would achieve cleanup levels sooner than a remedy which also includes actively pumping and removing the contaminants. Any possible biodegradation processes that might reduce contaminant concentrations in the ground water plume under Alternative 2 would, of course, also be occurring during the pumping of the plume. EPA does not accept the calculations presented by Kessler on the estimated efficacy of Alternative 2. Kessler's modeling of ground water pumping overpredicts required cleanup times and the equation used to evaluate the combined alternative of pumping and decay is not correct. Specifically, the two separate exponential equations cannot be added to or subtracted from one another to combine the effects of pumping and decay.

Comment: Kessler comments that Alternative 2 would achieve a level of contaminant reduction in toxicity, mobility and volume comparable to the levels that may be achieved by Alternative 3, 4, and 5.

EPA Response: As described in detail in the ROD, EPA has concluded that Alternative 2 is not comparable to Alternatives 3, 4 and 5 in its ability to reduce the toxicity, mobility, and volume of the contaminants in the Site ground water. Alternative

2 could not possibility reduce the toxicity in an equivalent timeframe. As stated in the FS, Alternative 2 does not reduce the mobility of the contaminants in the Site ground water. Moreover, the size of the contaminant plume would increase, because it would be constantly spreading out thereby increasing the volume of ground water that is contaminated. The natural resource would be further damaged by the migration of the plume.

Comment: With respect to the evaluation criterion,"Short-term effectiveness," Kessler comments that Alternative 2 is superior to Alternatives 3, 4 and 5 with respect to short-term impacts. As EPA acknowledges, Alternatives 3, 4, and 5 all have short-term impacts related to dermal hazards... physical hazards . . . and potential hazards to onsite personnel. Kessler also states that Alternative 2 has no adverse short-term impacts whatsoever.

EPA Response: It is unfortunate that chemical contamination exists in the Site ground water such that workers need to avoid exposure to it. The criterion,"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 remediation requirements are achieved. Of course, implementing a remedy that includes construction would pose short-term risks that would not exist if this activity were not conducted. The construction required under Alternatives 3, 4 or 5 would not pose unacceptable short-term risks to the community or workers during construction or implementation, particularly compared to any other construction project. In addition, it is erroneous to state that Alternative 2 has no adverse short-term impacts whatsoever. The potential dermal contact hazards due to exposure to contaminated ground water would exist during the sampling of the ground water monitoring wells proposed under Alternative 2. However, as stated in EPA's June 20, 1994 Proposed Plan on page 11 and as described in detail in the ROD, these potential dermal hazards can be easily controlled or minimized by the use of protective gear when exposure to contaminated ground water occurs.

Comment: Kessler comments that Alternative 2 is easily implementable and can be instituted immediately. It states that Alternatives 3, 4, and 5 all would be more difficult, and would require more time.

EPA's Response: EPA agrees that those alternatives which require actual construction are more "difficult" to implement than one that proposes no construction and just sampling of existing ground water monitoring wells. The preferred remedy, Alternative 4 Ground Water Extraction And Treatment With GAC, is a proven technology. The materials and services needed to implement this remedy are readily available, and the long-term benefits through reduction of contamination are superior to Alternative 2.

Comments: Kessler asserts that Alternative 2 can attain the same level of incremental risk reductions as the other alternatives at a much lower cost, and therefore is far more cost effective than Alternative 3, 4, or 5.

EPA's Response: As discussed above, Kessler's proposed alternative is not protective of the environment because it does not remove contaminants from the ground water in a Class IIA aquifer which is a current source of drinking water. Also as discussed above, EPA believes it is appropriate to recapture the contamination and restore the natural resource. Because Kessler's proposed remedy would not meet ARARs and is not protective of the environment, the threshold for analyzing the criterion of "cost effectiveness" has not been met. A remedial action is to be cost effective, provided that it first satisfies the criteria of overall protection of human health and the environment and meets ARARs.

Comment: Kessler comments that EPA unlawfully preselected a pump and treat alternative before completion of the RI/FS Report and refers to an informational meeting with the Township Supervisors where EPA was discussing the findings of the draft RI/FS reports.

EPA'S Response: EPA has attempted to keep the public fully informed throughout this process, and has been very frank and open concerning the matters it was considering. At the time of the identified informational meeting with the Township Supervisors, EPA had reviewed the draft RI/FS Reports. These reports documented that the Class IIA Aquifer, a current source of drinking water, was still contaminated at levels significantly higher than drinking water standards and that the risk to human health under a potential future use scenario were unacceptable. Because of these facts EPA believed at that point that some type of active removal of the contaminants from the ground water in the aquifer would be necessary. This statement did not represent a final determination on a remedy selection. However,instead of hiding this preliminary conclusion, EPA attempted to provide as full information on its deliberations as possible.

The following comments were submitted by the Upper Merion Township.

Comment: The Township recommended that protection of human health and the environment be achieved by adopting Alternative 3 or Alternative 4 and agrees with whichever EPA feels is best suited as the remediation method. The Township requested that periodic monitoring reports be submitted to the Township

Supervisors for review and comment and a copy of the Record of Decision.

EPA Response: EPA will provide the Township with periodic monitoring reports. A copy of the ROD will be provided to the Township Supervisors.