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PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
Harrisburg, Pennsylvania

FINAL

FOCUSED FEASIBILITY STUDY

HAVERTOWN PCP SITE

HAVERFORD TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA
(DER Agreement No. ME-86110)

August 1989

R.E. WRIGHT ASSOCIATES, INC.
3240 Schoolhouse Road
Middletown, PA 17057
REWAI Project No. 86021

LAWLER, MATUSKY & SKELLY ENGINEERS
One Blue Hill Plaza
Pearl River, NY 10965
LMS Project No. 404-013

AR300868

LMSE-89/0411&404/013

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CHAPTER 1

INTRODUCTION

This focused feasibility study (FFS) for the Havertown PCP (pentachlorophenol) site located in Havertown, Haverford Township, Delaware County, Pennsylvania, was prepared by Lawler, Matusky & Skelly Engineers (LMS) for R.E. Wright Associates, Inc. (REWAI), prime contractor to the Commonwealth of Pennsylvania Department of Environmental Resources (PADER). Greeley-Polhemus Group, Inc. (GPG) conducted the risk assessment portions of the FFS.

1.1 PURPOSE AND FORMAT

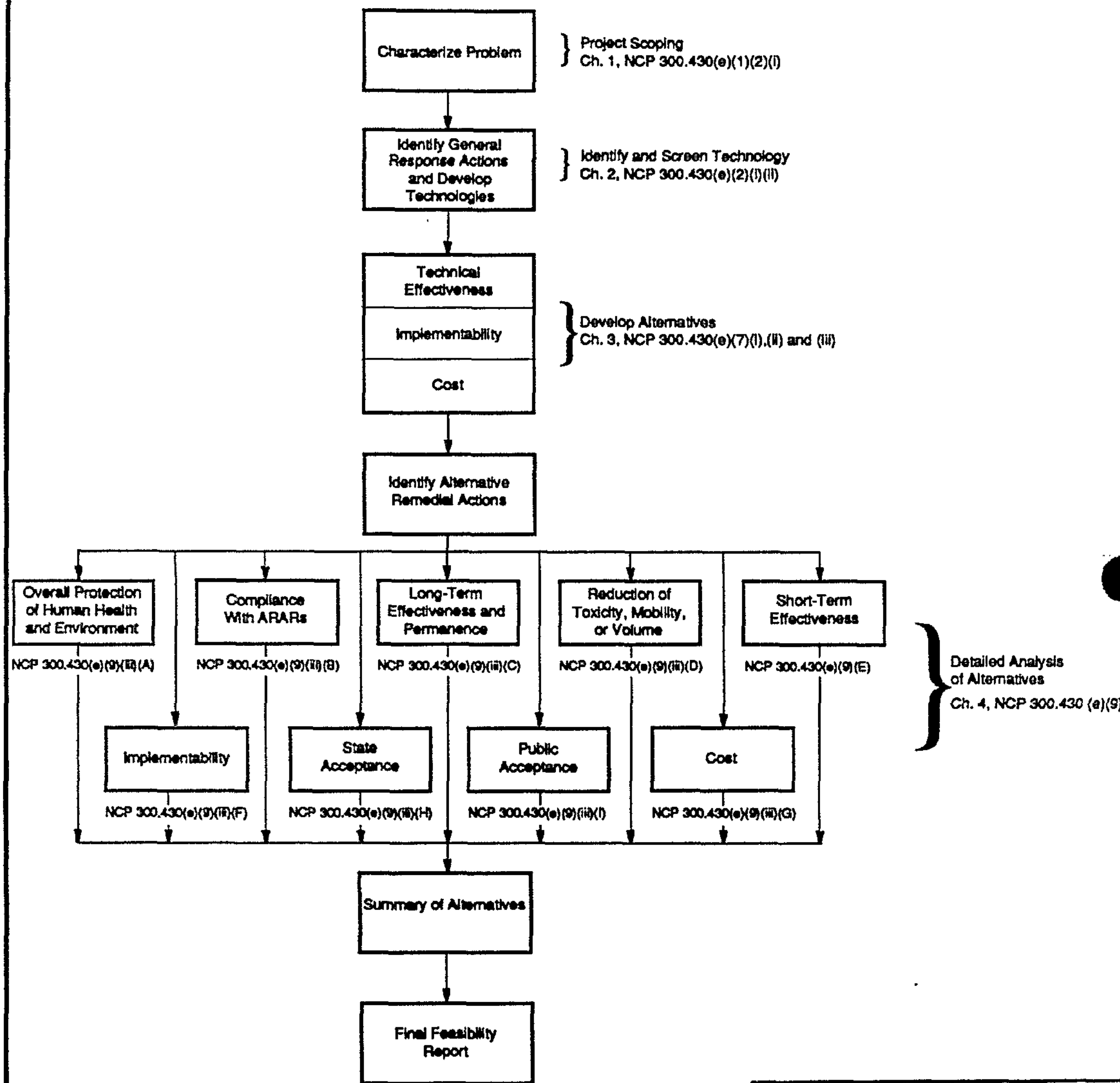
The purpose of this FFS is to evaluate remedial alternatives for specific matrices and areas of concern at the Havertown PCP site. The three areas to be addressed are:

- Remedial alternatives for contaminated soils at the National Wood Preservers, Inc. (NWP) facility
- Remedial alternatives for treatment of water and air at the catch basin (underflow dam) where site runoff enters Naylors Run
- Remedial alternatives for disposal of staged waste accumulated as a result of the remedial investigation and the oil collector at the catch basin

The format of the FFS generally follows the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988) and the revised National Contingency Plan (NCP) (Federal Register 1988). The focused nature and scope of the feasibility study was requested by the U.S. Environmental Protection Agency (EPA) and PADER on 29 April 1989. The evaluation contained in this FFS is based largely on information presented in the Final Remedial Investigation Report prepared by REWAI (1988) as well as more recent site data. The applicable or relevant and appropriate requirements (ARARs) are based on GPG's estimate of appropriate requirements needed to limit risk to a 10^{-6} incremental cancer risk. The report is organized according to EPA's RI and FS guidance document under CERCLA (EPA 1988) and the NCP (Federal Register 1988), as shown in Figure 1-1. Chapter

FIGURE 1-1

FEASIBILITY STUDY PROCESS



HAVERTOWN PCP SITE
HAVERTOWN, PA

FIGURE 1-1
FEASIBILITY STUDY PROCESS

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Pearl River, New York

AR300876

Adapted from: Guidance on feasibility studies under CERCLA (EPA/540/G-85/003 June 1985)
Note: NCP sections identified refer to those cited in the Federal Register, December 21, 1988.

1 summarizes the site investigations, nature and extent of contamination, contaminant fate and transport, and baseline risk assessment. Chapter 2 discusses the remedial objectives and screens technologies that might be applicable to the remedial program. Chapter 3 describes and screens alternatives according to effectiveness, implementability, and cost. Chapter 4 provides detailed analyses of those alternatives that passed the screening stage of evaluation. The analysis is based on the following criteria: short-term effectiveness; compliance with ARARs; overall protection of human health and the environment; reduction of toxicity, mobility, or volumes; long-term effectiveness and permanence; implementability; cost; state acceptance; and public acceptance.

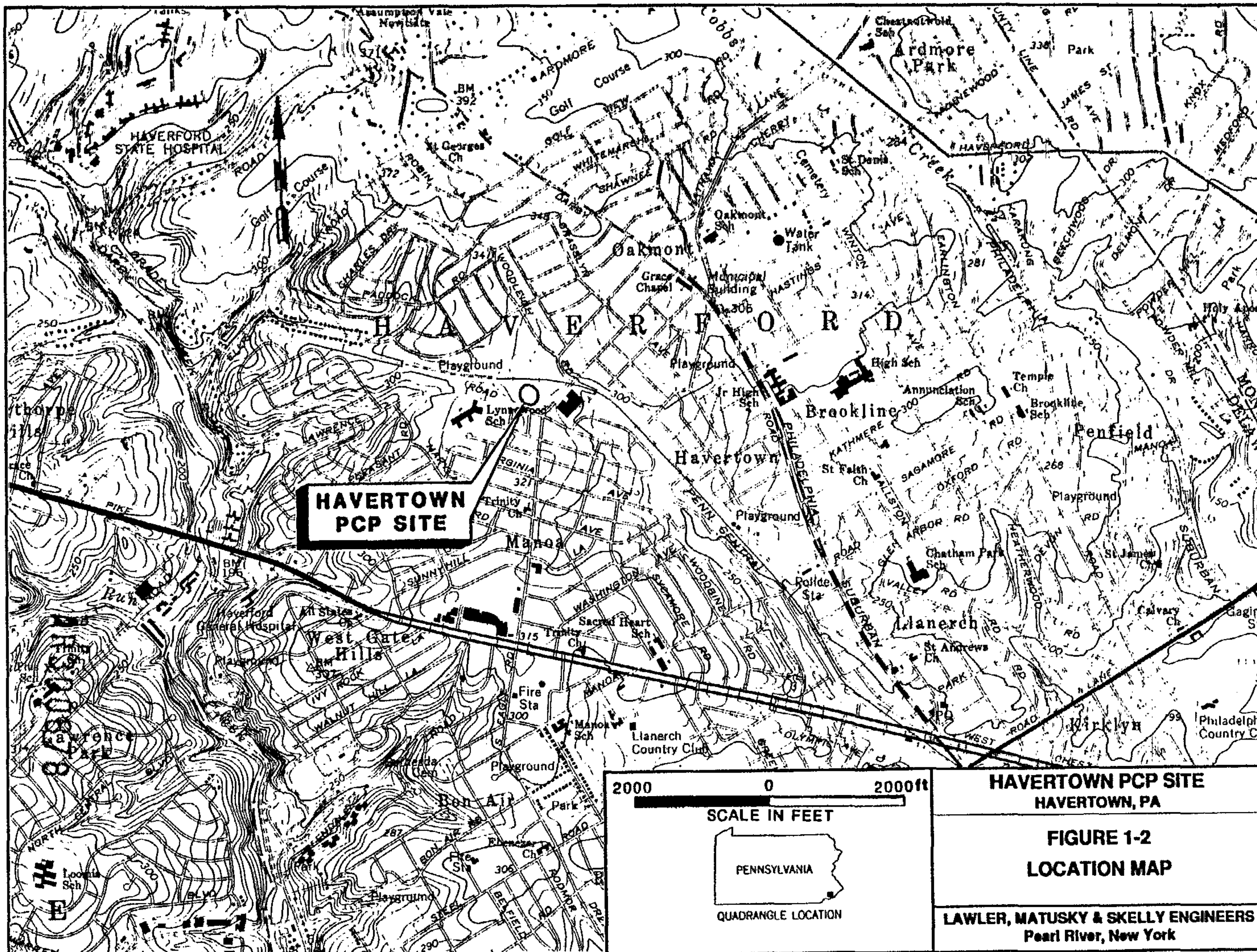
1.2 BACKGROUND INFORMATION

1.2.1 Site Description

The Havertown PCP site as described in the Final Remedial Investigation Report by REWAI (1988) is located in Havertown, Haverford Township, Delaware County, in southeastern Pennsylvania. The site (Figure 1-2) is located approximately 10 miles west of Philadelphia and is surrounded by a mixture of commercial establishments, industrial companies, parks, schools, and private homes.

The investigated area consists of a wood-treatment facility operated by NWP; the Philadelphia Chewing Gum Company (PCG) manufacturing plant adjacent to the wood-treatment facility; Naylors Run, a creek that drains the area; and neighboring residential and commercial properties (Figure 1-3).

The entire Havertown PCP site consists of approximately 12 to 15 acres roughly delineated by Lawrence Road and Rittenhouse Circle to the south, the former Penn Central Railroad tracks to the north, and the fence between NWP and Continental Motors to the west. There is no distinct boundary to the east. NWP, the source of the contamination, is the focus of the investigation. Structures on the property include a sheet metal building with aboveground chemical storage tanks situated on a 2-acre property just north of the intersection of Eagle and Lawrence roads and the large PCG bubble gum production building.



HAVERTOWN PCP SITE
HAVERTOWN, PA

FIGURE 1-2
LOCATION MAP

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Pearl River, New York

BASE MAP: LANSDOWNE, PA, 7 1/2 MINUTE USGS TOPOGRAPHIC QUADRANGLE (1967, photorevised 1973)

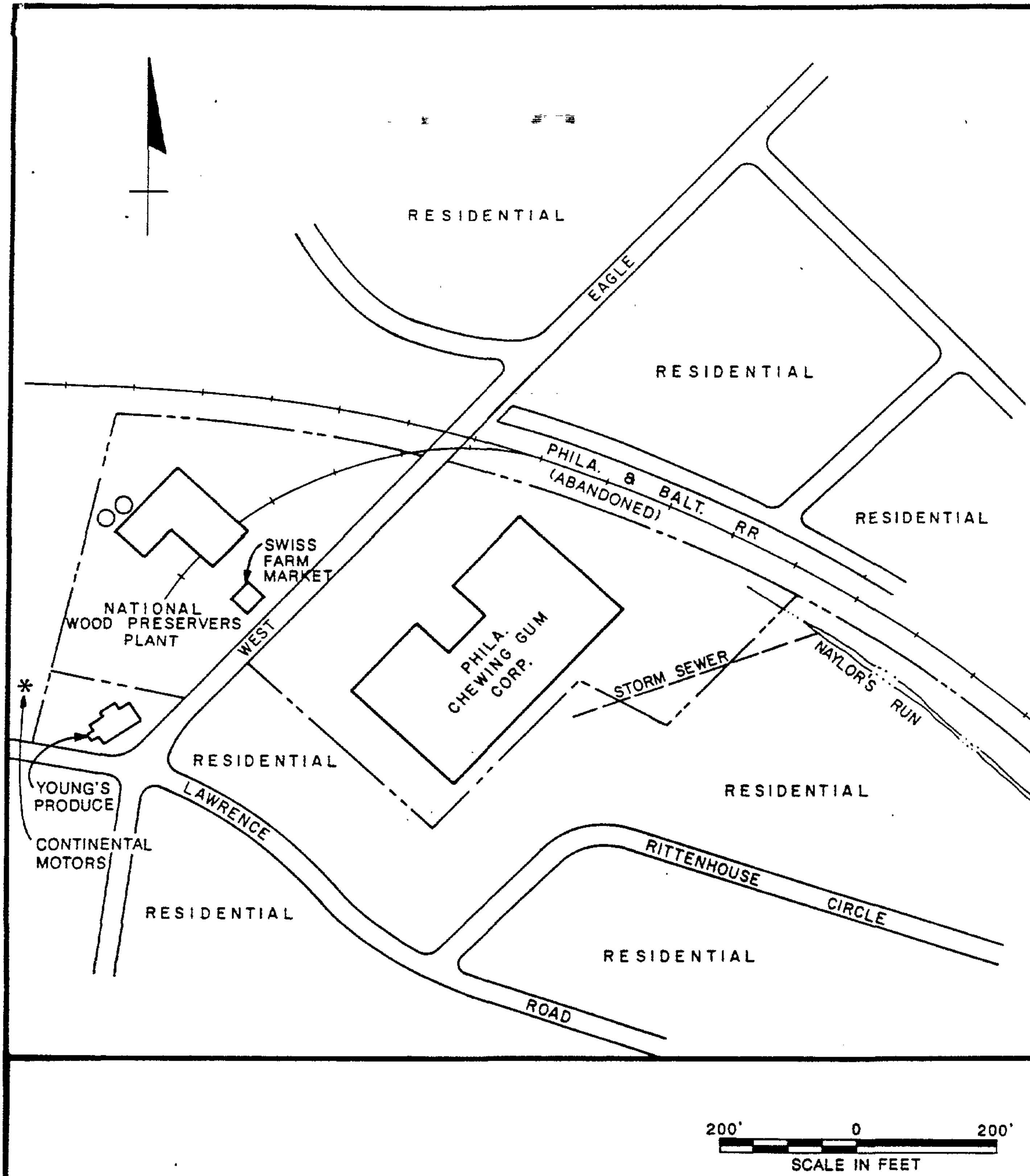

FIGURE 1-3

HAVERTOWN PCP SITE
HAVERTOWN, PA

STUDY AREA MAP

drawn CCS	approved JNW	drawing no.
checked JST	date 4-22-88	86021-013-AA

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earth resources consultants
middletown pennsylvania

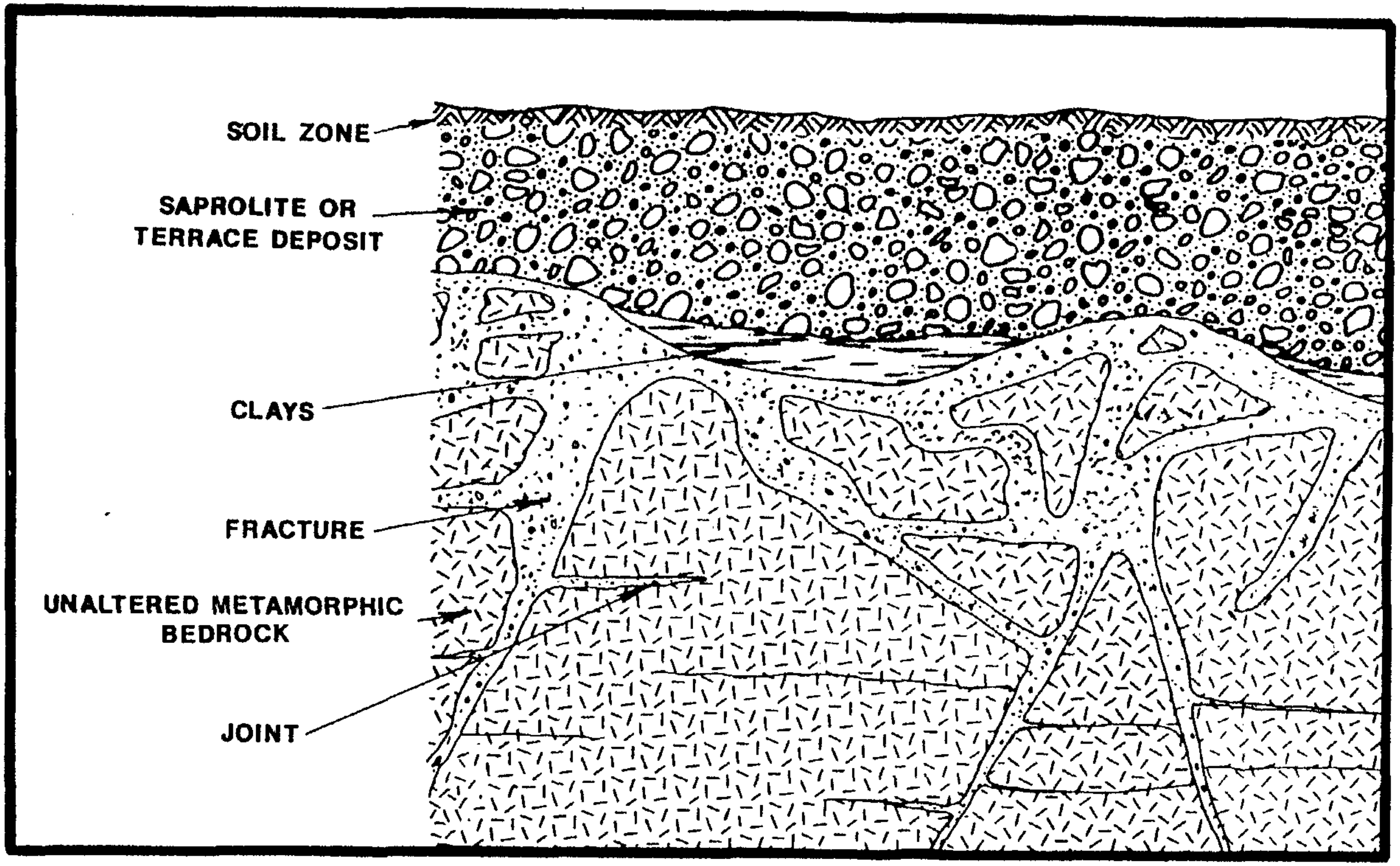
AR300879

The Havertown PCP site is located in the Piedmont Upland section of the Piedmont Physiographic Province. Bedrock in the site vicinity consists of metamorphic rocks of the Wissahickon Formation. Rocks in the vicinity generally consist of a finely plicated, medium-grained matrix of biotite, muscovite, and quartz, with varying amounts of feldspar, chlorite, and garnet. Unweathered rocks from the Wissahickon Formation are dense and have a low primary porosity; however, extensive jointing in the formation provides numerous openings for the storage and transportation of groundwater. Figure 1-4 shows a generalized cross-section of geologic conditions in the site vicinity.

Most soils in the study area are classified as one of the made land types: Mc (Made Land - silt/clay) and Me (Made Land - schist/gneiss). Glenville silt loam (GnB2) borders the NWP site on the north and east, generally following the Naylors Run drainage. Figure 1-5 shows the soil types as mapped by the U.S. Department of Agriculture (USDA).

The site is in an area that is relatively flat compared to the surrounding countryside. Much of the area's original topography has been altered by cut and fill activities on both the NWP plant site and the PCG property. Elevations range from approximately 320 ft mean sea level (MSL) near Continental Motors to nearly 280 ft (MSL) along Rittenhouse Circle. The NWP property is flat, with only 1 ft of relief; however, a drainage ditch borders the abandoned Penn Central Railroad bed north of the property. The PCG property is also quite flat except for a 12-15 ft fill embankment at the back.

The entire Havertown PCP site is drained by Naylors Run, a creek that flows in a southeasterly direction from the site. For the most part, surface runoff across the NWP site enters artificial drainage channels before discharging into Naylors Run. On the NWP property a significant amount of water accumulates in the area of the pedestrian gate near Continental Motors and in the vicinity of NWP's main gate near Eagle Road. Under storm event conditions, the large amount of sheet flow that occurs on NWP property in the area of the main gate empties into the drainage ditch bordering the north edge of the property. Naylors Run flows through natural channels, concrete-lined channels, and a variety of pipes before entering Cobbs Creek near East Lansdowne, approximately 4 miles southeast of the site. Cobbs Creek joins Darby



(Source-After Driscoll,F.G. Groundwater and Wells,Johnson Division,1986 p.44.)

NO SCALE

FIGURE 1-4

HAVERTOWN PCP SITE HAVERTOWN, PA		
GENERALIZED CROSS-SECTION OF SITE GEOLOGIC CONDITIONS		
drawn CCS	approved JNW	drawing no. 86021-015-AA
checked JST	date 4-22-88	

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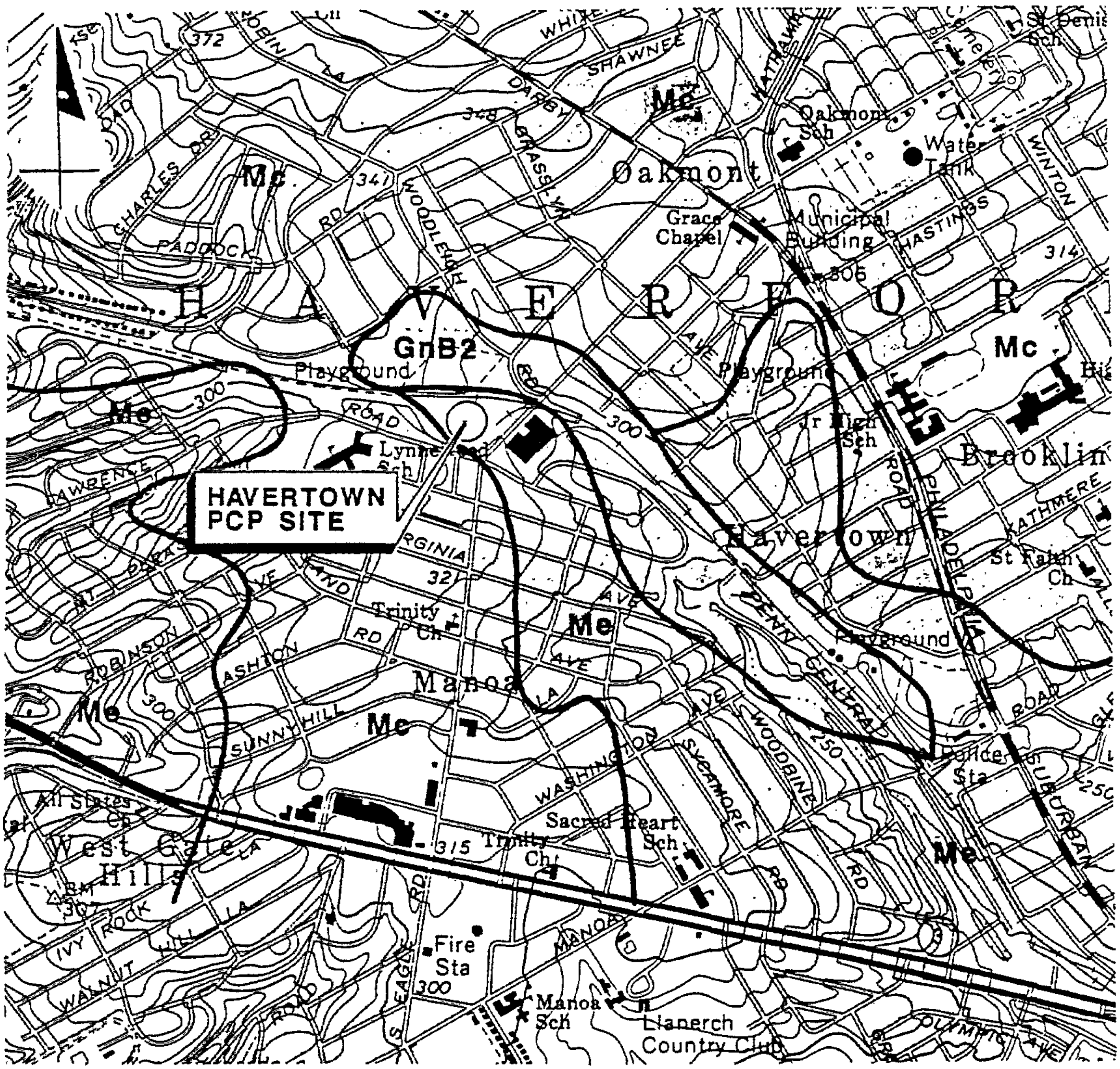

BASE MAP: FROM LANSDOWNE, PA 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE

1290' 0 1290'

SCALE IN FEET

LEGEND

Mc	MADE LAND (SILT/CLAY)
Me	MADE LAND (SCHIST/GNEISS)
GnB2	GLENVILLE SILT LOAM

AR300882

(BASED ON USDA, 1963 SOIL SURVEY OF CHESTER AND DELAWARE COUNTIES)

FIGURE 1-5

HAVERTOWN PCP SITE
HAVERTOWN, PA

SOIL MAP

drawn	approved	drawing no
CCS	JNW	86021-017-AA
checked JST	date 4-25-88	

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middletown, pa. westminster, md

Creek, which flows through the Tinicum Wildlife Preserve before entering the Delaware River.

Groundwater in the vicinity of the Havertown PCP site occurs in the unconsolidated soils, the weathered schistosic saprolite zone, and the unweathered biotite gneiss bedrock. The depth to groundwater beneath the site ranges from approximately 23 ft below ground surface in the vicinity of Young's Produce Store to approximately 0.5 ft below ground surface in the Rittenhouse Circle area. Groundwater in the vicinity of the site flows in an easterly direction, with some unknown portion discharging to Naylors Run. There are no known production wells in the vicinity of the site, and a public water supply system supplies water to the area's consumers (REWAI 1988).

1.2.2 Site History

The NWP site was first developed as a railroad storage yard and later became a lumberyard. In 1947 the wood-preserving facility was constructed and operated by Mr. Samuel T. Jacoby. In 1963 the existing facility was purchased by the Goldstein family.

The facility has not changed significantly since its construction and today consists of a single metal-sheeted building, which contains the wood-treatment equipment, and several chemical storage tanks located immediately northwest of the building. The production facility is surrounded by a dirt-covered storage yard in which untreated and treated wood are stored. The entire NWP facility is enclosed by a chain-link fence. In 1963-1964 the Goldsteins made some basic chemical containment and chemical recycling modifications to the facility at the request of PADER (REWAI 1988).

Two wood-treating processes have been used at this facility: the "empty cell pressure treatment process" and the "non-pressure treatment dip treatment." The facility has three pressure treatment cylinders, two inside the building and one outside. Pressure-treated wood was air dried on drip tracks and stored on-site. Wood that was dipped into treatment solutions was similarly dried and handled.

According to REWAI (1988), at least six wood-treatment chemical solutions have been used at the NWP facility since its construction. From 1947 to 1977-1978 three chemicals were used: PCP in P-9 Type A oil (diesel fuel), PCP in P-9 Type C oil (mineral oils), and fluoro-chrome arsenate phenol (FCAP) in a water solution. PCP in oil (both types) was used in both the pressure treatment and the dip treatment processes. FCAP was used only in the pressure treatment process.

Chlorinated copper arsenate (CCA) in a 0.4 or 0.6% water solution, first used at the facility in the mid-1970s, eventually replaced PCP and FCAP during 1977-1978. Other chemicals used on-site since the 1970s include chromated zinc chloride (CZC, a fire retardant) and tributyl tin oxide (TBTO, an antifouling compound). All three water-soluble chemicals were used in the pressure treatment process.

1.2.3 Source of Contamination

The primary contaminants of concern that occurred as a result of wood-treatment operations at NWP are PCP, chlorinated dioxins and dibenzofurans, fuel oil and mineral spirits components, heavy metals, certain volatile organic compounds, and phenols. A complete list of the detected contaminants is presented in Chapter 3 of REWAI (1988). All these materials are primary constituents or impurities of the various wood-treatment solutions used at NWP since operation began in 1947. The actual chemicals of concern used for the risk assessment and feasibility study are identified in Section 1.3.

Most of the PCP contaminant discharges reportedly occurred before 1963. Leaks and spills in the wood-treatment equipment, plumbing, and storage facilities were one source of contaminants to the environment. Because of poor maintenance and the lack of concrete containment basins at the site, any leak or spill would generally enter the soils and, subsequently, the groundwater and surface water.

Another potential source of contaminants to the environment occurred as a result of the storage of treated wood on the property. While the treated wood, saturated with the PCP/oil solution, was stored on-site to dry, the solution dripped or was washed onto the ground by rain. This material-handling technique is not a problem with the newer wood-treatment water solutions that leave the wood essentially dry after treatment but

AR300884

may have been a problem when the PCP/oil mix (which normally left the treated wood wet for some time) was used.

The use of an injection or disposal well to collect the spent wood-treating solutions containing PCP and oil was allegedly the major source of contamination to the environment from 1947 to 1963 at NWP. The well was located in the vicinity of what is now Young's Produce Market. It is estimated that up to one million gallons of spent solution may have been disposed of by this method. This uncontrolled disposal method resulted in significant contamination of the groundwater surrounding the site.

In 1963 some plant-processing and other modifications were completed that reduced the release of contaminants to the environment. These modifications included the construction of concrete sumps at the ends of the two large pressure treatment cylinders in the main building and the treatment cylinder located outside for the recycling of any unused solution. Modifications were also made to pumps and piping equipment and to storage tanks and the pressure cylinders to eliminate leak sources to the soil or air.

Four media have been documented as being affected by contaminants originating from the Havertown PCP site. Taken in chronological order of contamination, they are soils on-site, groundwater on-site and downgradient of the site, surface water in storm sewers and off-site in Naylors Run, and air on-site and in the vicinity of the catch basin on Naylors Run.

Because of the wood-treatment practices described above, soils at the NWP site have accumulated contaminants over the many years of the plant's operation. Groundwater samples collected from monitoring wells in the vicinity of the site had PCP concentrations of up to 31,000 ppm (NUS 1983). An estimated volume of 6000 gal of free-phase floating product was also found to be approximately 2-in. thick over the groundwater. The area contaminated by measurable free oil on the groundwater surface was estimated to encompass approximately 4.5 acres. Just east of PCG, where the storm sewer discharges into Naylors Run, oil containing PCP is evident on the water's surface within a catch basin installed by EPA. PCP has been detected in the water, sediments, and biota downstream of the storm sewer discharge point at the catch basin and in the air in the vicinity of Naylors Run, where strong petroleum odors persist. The air is also affected by dry, contaminated soil that is blown off the site (REWAI 1988).

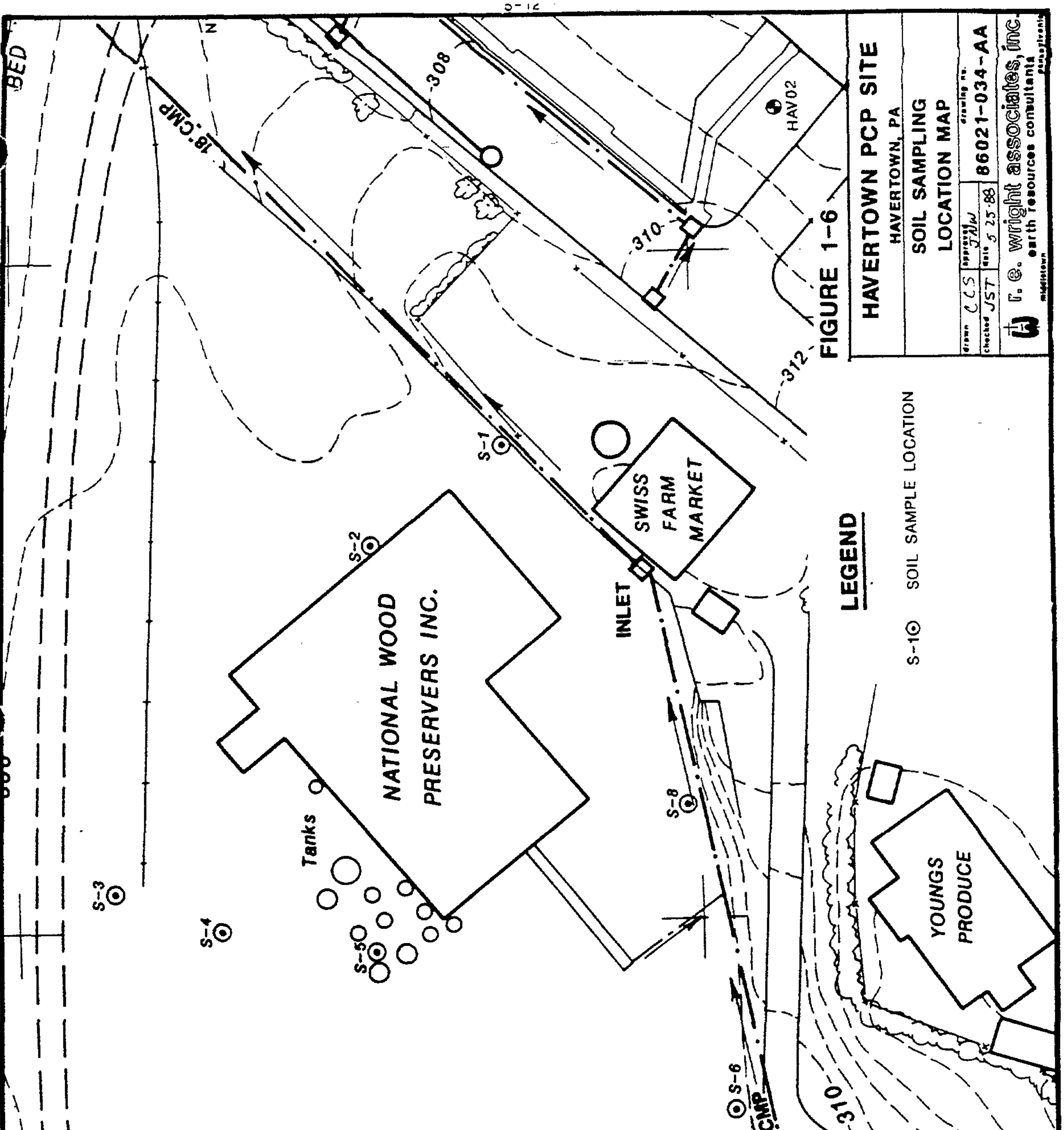
1.2.4 Extent of Contamination

Contaminant levels found in the three areas of concern addressed in this FFS (soils on-site, contaminated waste in tanks and drums, and water and air at the Naylors Run catch basin) are summarized below. The data presented are primarily from REWAI (1988).

1.2.4.1 Soils on the NWP Site. Soil samples were collected at eight locations (S-1 through S-8) on the NWP site (Figure 1-6) during July 1987 to determine the presence, extent, and degree of soil contamination. An attempt was made to collect samples from four depths: surface, 1 ft, 2 ft, and 3 ft. Based on the results of a field OVA scan of the samples, 16 samples were chosen to be analyzed for polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs), the complete Hazardous Substance List (HSL), and oil and grease.

Chemical results from the soil investigation indicate that elevated levels of arsenic, chromium, copper, lead, and zinc are present in the first 0 to 3 ft of soil, and may be the result of present NWP operations. Arsenic had reported concentrations ranging from 1.4 to 6850 ug/kg; total chromium was found between 56 and 22,300 ug/kg. Copper was detected at levels between 43 and 9790 ug/kg, nickel between 7.8 and 55 ug/kg, and lead between 12 and 108 ug/kg. Zinc was present at levels from 183 to 13,000 ug/kg. The highest levels of arsenic, chromium, copper, and zinc were found at location S-5.

Volatile organic aromatic (VOA) chemical analysis performed on the soil samples revealed elevated levels of total xylenes (5.1 to 2800 ug/kg), ethyl benzene (3.8 to 490 ug/kg), and toluene (6.1 to 390 ug/kg). Total xylenes was the most frequently detected VOA. Lesser amounts, listed in decreasing order, of benzene, 4-methyl-2-pentanone, chloromethane, tetrachloroethene, bromomethane, and trichloroethene were also found.


HAVERTOWN PCP SITE
HAVERTOWN, PA
SOIL SAMPLING
LOCATION MAP
FIGURE 1-6
86021-034-AA
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earth resources consultants
LEGEND
S-1 SOIL SAMPLE LOCATION
NATIONAL WOOD
PRESERVERS INC.
SWISS
FARM
MARKET
YOUNGS
PRODUCE
INLET
Tanks
18" CMP
HAV02
S-1
S-2
S-3
S-4
S-5
S-6
S-7
S-8
308
310
312
N

Results of the soil analyses indicate substantial contamination by base neutral and acid extractable (BNA) compounds. BNA compounds detected most frequently and in the highest concentrations were (in decreasing order) PCP, 2-methylnaphthalene, naphthalene, phenanthrene, and fluorene. Soil sample location S-5 had the greatest total concentration of BNA compounds with 6,195,100 ug/kg. The concentration of PCP at this location was 4,500,000 ug/kg. Soil sample location S-4 also had a significant total concentration of BNA compounds, with 713,800 ug/kg detected at the 3-ft depth interval in and around the chemical storage tank area. The analysis also indicated that BNA concentrations increased with depth. PCP concentrations constituted the largest portion of the total BNA concentrations in all of the sample locations except S-1, S-6, and S-7.

Pesticide and PCB analysis indicated that in four of the soil samples only beta-BHC and chlordane were detected. Beta-BHC was detected at 1300 ug/kg in one S-3 sample. Chlordane concentrations at S-8 were up to 1300 ug/kg. PCB (Arochlor 1260) was found in only one soil sample, S-2 (1 ft), at a concentration of 1600 ug/kg.

Cyanide and oil and grease analysis revealed no cyanide above detection limits in the soil. Oil and grease levels, however, were elevated throughout the site, especially in the storage tank area where 56% oil and grease was detected in soil sample S-5. Other samples ranged from 0.23 to 5%.

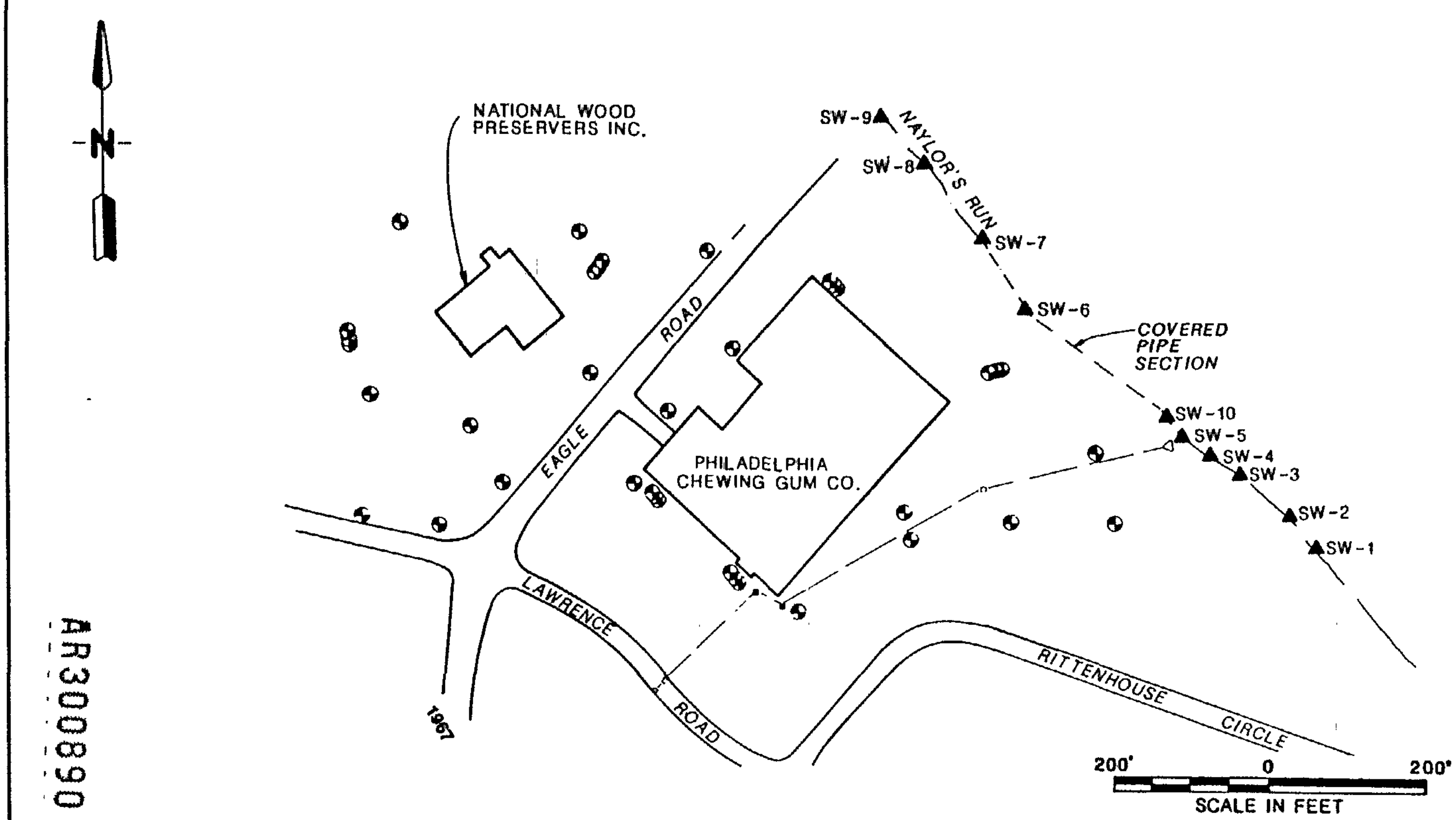
Soil samples were also analyzed for PCDDs and PCDFs. The octa-isomers of dioxin and dibenzofuran made up the majority of the total PCDDs and PCDFs isomer concentration. Sampling location S-5 had the highest concentrations of dioxin isomers at 39,318 ppt, with 30,579 ppt octa-dioxin, and the highest level of PCDFs, with 15,621 ppt.

In summary, soil sampling at the NWP plant site revealed significant concentrations of fuel oil and PCP widely distributed across the site. Other BNAs, metals, dioxins, and dibenzofurans were also identified. Soils in the tank area (S-5) had the highest detected levels of metals, BNAs (including PCPs), oil and grease, dioxins, and dibenzofurans.

1.2.4.2 Contaminated Surface Water, Sediment, and Floating Oil at Naylors Run. Ten surface water and nine sediment locations in Naylors Run were sampled during July 1987 prior to installation of the catch basin (underflow dam). SW-1 to SW-5 (surface water samples) and SED-1 to SED-5 (sediment samples) were collected below the storm sewer outfall. SW-6 to SW-10 and SED-6 to SED-9 were taken above the storm sewer outfall. Sample SED-10 was collected in a drainage ditch northeast of NWP property. Figures 1-7 and 1-8 show the 1987 surface water and sediment sampling locations in Naylors Run.

The chemicals detected in surface water samples SW-1 to SW-5 included PCP, naphthalene, benzene, toluene, xylene, and phenanthrene. Concentrations of these chemicals were not detected in surface water samples, where the floating oil believed to be associated with the NWP facility was not present. PCP was found above detection limits in surface water samples collected below the stormwater discharge pipe, SW-1 through SW-5, with the greatest concentration detected at the stormwater outfall (SW-5) at a level of 660 ug/l. The concentrations of pesticides and PCBs were below detection levels in all surface water samples. The toxicity equivalent factors (TEF) for total tetra- through octa-chlorinated dibenzodioxins and dibenzofurans in all surface water samples were less than 1 ppt (0.033 to 0.164 ppt). Contamination in the samples collected above the storm sewer outlet (surface water samples SW-6 to SW-10) consisted mainly of various heavy metals. The presence of arsenic, zinc, and copper may be associated with NWP because these metals are used in the wood-treatment process at the site.

Analytical results show that the sediments generally have higher levels of contaminants than the surface water. Several BNAs were found at elevated levels in all sediment samples. Total BNAs ranged from 221,000 to 6500 ug/kg in Naylors Run. PCP levels in samples collected below the outfall decreased from 2300 ug/kg at SED-4 to 120 ug/kg at SED-1 downstream. Although not found above detection limits upstream of the outfall, elevated analytical detection limits may have masked the presence of PCP. The highest level of PCP in sediment was 8700 ug/kg at SED-10. Total concentrations of metals were higher in the sediments than in surface water samples. Chromium, a wood preservative, was found at 40 ug/kg. No PCBs, dioxins, or dibenzofurans were found above detection limits. In September 1988 EPA's Technical Assistance Team



LEGEND

- ⊕ EXISTING WELL LOCATIONS
- — — STORM SEWER
- ▲SW-9 SURFACE WATER SAMPLING POINT

Adapted From: R. E. Wright Associates, Inc. (1988) Figure 6-1

FIGURE 1-7

HAVERTOWN PCP SITE
HAVERTOWN, PA

SURFACE WATER SAMPLING LOCATIONS

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Pearl River, New York

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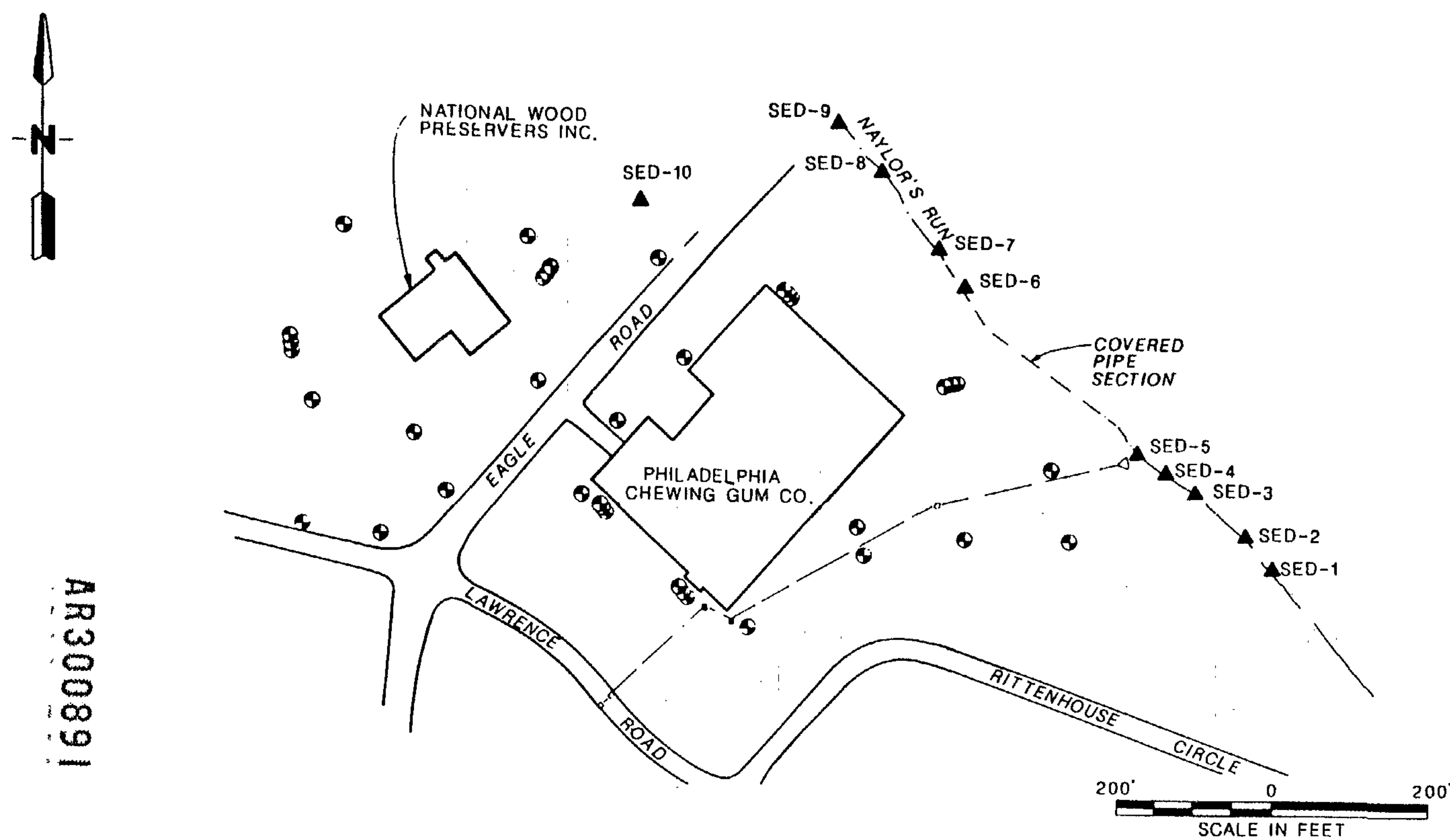

LEGEND

EXISTING WELL LOCATIONS

STORM SEWER

SED-9 SEDIMENT SAMPLING POINT

Adapted From: R. E. Wright Associates, Inc. (1988) Figure 6-4

FIGURE 1-8

HAVERTOWN PCP SITE
HAVERTOWN, PA

SEDIMENT SAMPLING LOCATIONS

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

AR300891

collected additional sediment and floating oil samples from the area of the stormwater outfall (catch basin). Oil in the catch basin had 2951 ppm (2,951,000 ug/kg) PCP, from 1 to 29,100 ug/kg PCDDs (no 2,3,7,8-TCDD), and 1 ug/kg PCDFs. Sediment samples (primarily composites) collected downstream of the outfall had PCP levels of ND to 3100 ug/kg and aromatic levels of 180 to 6100 ug/kg.

1.2.4.3 <u>Contaminated Waste in Tanks and Drums on NWP Site</u>. There are five holding tanks of contaminated water and over 100 drums of waste materials in a storage area northeast of the NWP building. The two 2500-gal tanks and three 500-gal tanks on-site contain contaminated water. The oil and grease concentrations in the water are less than 5 mg/l. PCP concentration is high, about 11,000 ug/l. Toluene (up to 12 ug/l) and trichloroethene (2 ug/l) were also found in the tank water.

There are two groups of drums on-site. One group of ninety-seven 55-gal drums contains miscellaneous waste from drilling and sampling activities at the Havertown PCP site. The waste materials include soil cuttings from monitoring wells; contaminated gloves, clothing, plastic, and paper; construction debris; and grout. It is conservatively assumed that these wastes have the same contaminant levels as the contaminated soil on-site.

Another group of drums contains contaminated oil, water, and waste materials from the catch basin on Naylors Run. The oil absorbed by the absorbent materials had 2951 ppm PCP, 1.2 to 8.5 ppm phenols, 0.001 ppm PCDFs, and 0.001 to 29.1 ppm PCDDs. No 2,3,7,8-TCDD was found. The PCDDs and PCDFs equate to a toxic equivalent of 23.254 ppb 2,3,7,8-TCDD.

1.2.5 <u>Contaminant Fate and Transport</u>

Contaminant transport in the vicinity of the Havertown PCP site varies with the contaminant and the media affected. Rates of movement through the various media and across their interfaces vary with the physiochemical nature of the contaminants, such as volatility, solubility, specific gravity, and octanol/water partition coefficient. Contaminated dust from the site is transported by wind. PCP oils in or floating on the groundwater are moved by gravity and/or hydraulic groundwater flows in a generally easterly direction. Contaminants are thought to enter Naylors Run by interception of groundwater flow by the stream, by collection of surface runoff and groundwater flow by a storm sewer that discharges to the stream, and by collection of surface runoff by the stream. Once in surface waters such as Naylors Run, contaminants are moved downstream by the streamflow. Vapors of volatile organic constituents released near Naylors Run are dispersed by air movements.

The area potentially affected by contaminants released from the Havertown PCP site is almost entirely urban. The primary contamination source (NWP) is located in the midst of several commercial establishments and surrounded by an urban mix of private homes, schools, stores, parks, and industrial facilities. Consequently, humans potentially make up the most important receptor group. Anticipated routes of exposure to the surrounding population may include inhalation and ingestion of dust and soils containing contaminants, inhalation of oil vapors from the area of the catch basin, and ingestion of or dermal contact with Naylors Run water and sediments. Ingestion of contaminated groundwaters is not considered a likely exposure pathway since there are no downgradient wells into the aquifer. Additional environmental receptors may include vegetation, aquatic biota, wildlife and domestic animals, and agricultural or garden products. Reports of detrimental effects on aquatic life have already been documented for Naylors Run.

1.3 Baseline Risk Assessment

The Havertown PCP site risk assessment was prepared by GPG. Appropriate portions of their summary (Chapter 9.0) form the basis of the discussion presented in this section. The complete risk assessment is a separate document entitled Havertown PCP Site Risk Assessment.

An evaluation of the contaminants present in each medium of the Havertown PCP site (on-site soils and air, groundwater, Naylors Run surface water, sediments in Naylors Run, and sediments in an on-site drainage ditch) was conducted, and the chemicals were rank ordered in accordance with their toxicity-concentration (TC) values. These values were summed for all media to obtain an indicator score (IS), and the chemicals were rank ordered in accordance with their IS values. Carcinogens were rank ordered separately from noncarcinogens. Six indicator chemicals were selected: arsenic, benzene, benzo(a)anthracene, benzo(a)pyrene, chromium VI, and 2,3,7,8-TCDD equivalents.

The arsenic and chromium probably come from the chromated copper arsenate used in the wood-preserving operations. The benzene, benzo(a)anthracene, and benzo(a)pyrene probably come from the diesel fuel used as a vehicle for the PCP previously used in wood preserving. The dioxins and furans making up the 2,3,7,8-TCDD equivalents probably are contaminants in the PCP.

In addition to these indicator chemicals, all other chemicals detected on-site and in the area that could potentially cause human health effects were evaluated. These included PCP, several metals (antimony, beryllium, copper, lead, mercury, nickel, silver, and zinc), several VOCs (chloroform, chloroethylene, dichloromethane, dichloroethylene, tetrachloroethylene, and trichloroethylene), a phthalate, and three pesticides (chlordane, beta BHC, and dieldrin) that may have been used on site.

Potential pathways were identified for these chemicals to reach persons on and off the site. These pathways include:

- Air - Inhalation of VOCs and entrained particulates containing the contaminants from the on-site soils
- Surface Water - Ingestion of water from Naylors Run and the liquids in the catch basin (underflow dam); inhalation of VOCs emanating from the underflow dam
- Soil - Ingestion of on-site soils
- Sediments - Ingestion of sediments from Naylors Run and from the on-site drainage ditch
- Groundwater - No pathways for exposure to the contaminated groundwater were identified except for the liquids in the underflow dam

The amounts of chemicals released via each medium and the resulting concentrations of those chemicals at the points of potential human exposure were determined either through direct measurements made by REWAI or by calculation.

Although chromium IV was used as an indicator chemical, its actual levels in the various media (soil, water, and air) were not measured. Only total chromium, which includes chromium III and chromium IV and other less table oxidation states, was measured during the remedial investigation. The chromium was released to the Havertown PCP site primarily as chromium IV, but over time an unknown portion has been chemically changed t the +3 oxidation state through complex environmental chemical processes. Since the actual amounts of chromium IV remaining are unknown and this oxidation state is the most biologically toxic form of chromium (Eisler 1986), the levels of total chromium measured were assumed to be all chromium IV for the purpose of estimating human health risks. This resulted in risk estimates for chromium that are considered to be higher than actual, i.e., conservative.

The numbers of persons potentially exposed to each chemical via each pathway and each medium were estimated, and the likely intakes and exposures of these persons at various locations or distances from the site were estimated for each chemical.

The human health risk in terms of the maximum potential increased risk of contracting cancer from inhalation or ingestion was calculated for each potentially carcinogenic chemical. The results, expressed in terms of risk per million people exposed, are as follows:

1. Inhalation of entrained particulates containing chromium VI, arsenic, and other metals from on-site soils and of VOCs emanating from the site by persons off site:

	DISTANCE FROM THE SITE				
	500 ft	1000 ft	1320 ft	2000 ft	2640 ft
Cancer risk (per million)	5.8	2.9	2.2	1.45	1.1

2. Inhalation of benzene and other VOCs at the nearest residences (two within 75 m or 250 ft) to the underflow dam: 5.5 (per million)

3. Ingestion of on-site soils: 8 (per million)

4. Ingestion of sediments from Naylors Run: 7 (per million)

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5. Ingestion of sediments from the on-site drainage ditch: 1 (per million)

6. Ingestion of liquids from the underflow dam: 2 (per million)

7. The total risk from all sources for a person living within 500 ft of the site and within 250 ft of the underflow dam and ingesting the on-site soils and sediments, the sediments under Naylors Run, and the liquids in the underflow dam would be (5.8 + 5.5 + 8 + 7 + 1 + 2) 29 per million. It should be recognized that it is extremely unlikely that any person would be exposed to all of these risks. In addition, the individual risks are very likely to be conservative (overestimated) since they are based on the maximum concentrations measured in each medium.

It should also be noted that the acceptable daily intake (ADI) for any chemical related to the site and having a noncarcenogenic effect was not exceeded for any identified exposure.

Four types of remedial actions would potentially remove the health risks or decrease the risks to acceptable levels:

1. Treatment, removal, and/or capping of the on-site surface soils

2. Containment and/or treatment of liquids and vapors in the underflow dam

3. Removal and/or treatment of the sediments in Naylors Run

4. Pumping and/or treatment of the groundwater

These actions should be designed to meet certain target concentrations that would effectively decrease the remaining health risks to acceptable levels. These target concentrations were determined through the development of performance goals by multiplying the measured or estimated concentrations of each chemical in each medium by a factor that resulted in total carcinogenic risks of less than one in a million.

The performance goals for each remedial action are listed below:

- On-site soil - Prevent access to the contaminants in the surface soils, particularly the benzo(a)pyrene (and other polyaromatic hydrocarbons [PAHs]), arsenic (and other metals), and the pesticides.

- Sediments in Naylors Run - Decrease the concentration of PAHs by a factor of 1/20 (0.05), or remove the sediments.

- Sediments in the drainage ditch (SED-10) - Same as for the on-site surface soils.

- Surface seeps into the underflow dam - Decrease the concentration of benzene and other VOCs by a factor of 1/6 (0.17).

- Air - Decrease the permeability of the soils to benzene and other VOCs from 44 to 5% or less and prevent entrainment by the wind of soils contaminated with metals and other chemicals.

The site would present acceptable risks to human health if the following generic remedial actions were taken:

1. The site itself is capped or the on-site surface soils are removed (including the sediments in and around the drainage ditch).

2. The underflow dam is modified to contain the vapors or to treat or remove the liquids as they enter the dam, or the groundwater flowing into the underflow dam is captured and treated or removed and treated before it reaches the dam.

3. The sediments under Naylors Run are treated or removed to decrease the concentration of PAHs.

It should be noted that considerable uncertainty arises from the methods used in this risk assessment to derive the toxicity constants, health effects that form the basis for the ARARs, and the other health-related data given in EPA guidance documents. Furthermore, the measurements of the concentrations of the contaminants in each medium represent an approximation of the actual values with which any person comes in contact. In addition, the models used to calculate the concentrations of the contaminants in the absence of direct measurements are highly uncertain because of the many assumptions required to make the models usable (GPG 1989).

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CHAPTER 2

IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.1 REMEDIAL ACTION OBJECTIVES

The remedial action objectives for each area of interest (contaminated soils, the catch basin at Naylors Run, and contaminated waste) are presented in this section. The applicable or relevant and appropriate requirements (ARARs) and descriptions of the contaminants of interest as defined in the risk assessment are listed in Tables 2-1 and 2-2, respectively. Pentachlorophenol (PCP) is also listed because of the high concentrations found throughout the site.

2.1.1 Contaminated Soils

The contaminants of interest found in the NWP soils are benzene, arsenic, chromium VI, PCP, 2,3,7,8-TCDD equivalents, benzo(a)anthracene, and benzo(a) pyrene. The ARARs for these contaminants are presented in Table 2-1. A full description of potential pathways and targets is provided in the baseline risk assessment (Section 1.3).

The remediation objective for the contaminated soils (including the swale) on-site is to limit wind entrainment of and access to the contaminants and to decrease the permeability of the soils to VOCs from 44 to 5% or less.

2.1.2 Catch Basin at Naylors Run

The contaminants of interest in surface water at the catch basin and downstream are closely associated with the PCP oil found floating on the water surface. These contaminants include benzene, arsenic, PCP, and 2,3,7,8-TCDD equivalents. The FFS remediation objectives at the catch basin are to:

1. Reduce PCP oil discharge to Naylors Run to less than 5 mg/l. Since the highest PCP level found in the floating oil was 2951 mg/l, the highest PCP level expected in the water if the objective is reached would be approximately 17 ug/l PCP.

TABLE 2-1 (PAGE 1 OF 2)
SUMMARY OF THE ARARs FOR THE HAVERTOWN PCP SITE INDICATOR CHEMICALS

	FEDERAL DRINKING WATER REGULATION (ug/l)		PROPOSED (ug/l)		PRELIMINARY PROTECTIVE CONCENTRATION LIMIT	AMBIENT WATER QUALITY CRITERIA FOR THE PROTECTION OF HUMAN HEALTH (DRINKING WATER) (ug/l)	
	MCL	MCLG	MCL	MCLG	(ug/l)	FOR TOXICITY PROTECTION	FOR CARCINOGENICITY (a) PROTECTION
ARSENIC	50	-	30	0	0.020	0.025	2.2x10^-3
CHROMIUM (VI)	-	-	-	-	175.0	-	-
BENZENE	5	0	-	-	1.21	.67	.66
BENZO(a)ANTHRACENE	-	-	-	-	-	3.1x10^-3	-
BENZO(a)PYRENE	-	-	-	-	0.003	-	-
PENTACHLOROPHENOL	-	-	200	200	1050	1010	NA
2,3,7,8-TCDD	-	-	-	-	2.24x10^-7	2.88x10^-6	1.3x10^-8

Source: Havertown PCP Site Risk Assessment (GPG 1989); USEPA letter to REWAI (July 1989)
(a) - Concentrations for cancer risk of 1 x 10^-6 over a lifetime

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TABLE 2-1 (PAGE 2 OF 2)
SUMMARY OF THE ARARs FOR THE HAVERTOWN PCP SITE INDICATOR CHEMICALS

	EPA DRINKING WATER HEALTH ADVISORIES (ug/l)					AIR STANDARDS	
	ADULT		CHILD				
	LONGTERM	LIFETIME	1-DAY	10-DAY	LONGTERM	ACGIH (b) (ng/m^3)	PENNSYLVANIA ANNUAL ATG (c) (ug/m^3)
ARSENIC	-	-	-	-	-	24	0.024
CHROMIUM (VI)	-	-	-	-	-	120	0.0083
BENZENE	NA	NA	200	200	NA	31200	12.5
BENZO(a)ANTHRACENE	-	-	-	-	-	-	-
BENZO(a)PYRENE	-	-	-	-	-	-	.0007 (d)
PENTACHLOROPHENOL	1000	1000	1000	300	300	500	12
2,3,7,8-TCDD	4.0x10^-5	-	1.0x10^-3	1.0x10^-4	1.0x10^-5	-	3.03x10^-6

Source: Havertown PCP Site Risk Assessment (GPG 1989); USEPA letter to REWAI (July 1989)
(b) - American Conference of Governmental Industrial Hygienists
(c) - Air Toxic substances interim operating guidance under the Pennsylvania Air Pollution Control Act.
(d) - combustion product

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TABLE 2-2
PHYSICAL AND CHEMICAL PROPERTIES OF THE HAVERTOWN PCP SITE INDICATOR CHEMICALS

	CAS NUMBER	DENSITY AT (XX DEG C)	MELTING POINT (DEGREES C)	BOILING POINT (DEGREES C) (AT 760 mm Hg)	VAPOR PRESSURE (mm Hg) (AT 25 DEG. C)	AQ. SOLUBILITY (GM/LITER) (AT 25 DEG. C)	LOG OCTANOL/WATER PARTITION COEFFICIENT	HENRY's LAW CONSTANT (ATM-M^3/MOL)
ARSENIC	7440-38-2	5.727 at 20 C	817	(SUBLIMES)	-	INSOLUBLE	?	?
CHROMIUM (VI)	7440-47-3	7.200 at 20 C	1857	2672	-	INSOLUBLE	?	?
BENZENE	71-43-2	0.8787 at 20 C	-	80.1	95.9	1.79	2.28	0.0055
BENZO(a)ANTHRACENE	56-55-3	?	-	438	2.20x10^-8	5.70x10^-6	5.61	1.16x10^-6
BENZO(a)PYRENE	50-32-8	?	-	495	5.6x10^-9	1.2x10^-6	6.06	1.55x10^-6
PENTACHLOROPHENOL	87-86-5	1.978 at 22 C	-	310 at 759mm	1.1x10^-4	.0140	5	2.75x10^-6
2,3,7,8-TCDD	1746-01-6	?	-	?	1.70x10^-6	2.00x10^-7	6.72	3.60x10^-3

Source: Havertown PCP Site Risk Assessment, GPG 1989

2. Reduce the concentration of benzene and other VOCs by 17%.

In 1987, before installation of the catch basin, sediment samples were collected from nine locations in Naylors Run. The samples were found to be contaminated with arsenic, chromium VI, benzo(a)anthracene, benzo(a)pyrene, PCP, and dioxins. Based on these data and the limited analyses of samples collected in 1988, the sediments are judged to present a potential health exposure. Remediation alternatives for the sediments will not be addressed in the FFS, however, but will be assessed following additional sampling and evaluation of exposures.

2.1.3 Contaminated Waste Materials

Waste materials include soil, water, and contaminated debris from the site investigation in addition to PCP oil and adsorbent materials from the oil/water separator at Naylors Run. The contaminants of interest therefore are those associated with all three media and include all seven chemicals: arsenic, chromium VI, benzene, benzo(a)anthracene, benzo(a)pyrene, PCP, and 2,3,7,8-TCDD equivalents.

The remediation objective for the contaminated waste is to dispose of all materials in a safe and approved method.

2.2 GENERAL RESPONSE ACTIONS

Eight general technical response categories that may be applicable to the site have been formulated from EPA (1988) feasibility study guidance. These categories, which may address more than one potential exposure pathway, are summarized below:

- Minimal or no action may be taken. Minimal action may include any combination of access restrictions and monitoring programs to continue to assess site conditions. Access restrictions - security fencing, locking gates, or warning signs - can be effective in limiting direct physical contact with waste. Intensive monitoring programs may be required since the source of contamination is not removed.

- Containment acts primarily to minimize interaction of the waste with its environment and subsequently reduce or eliminate its migration. For the Havertown PCP site capping and covering actions should reduce further migration of contaminants into the groundwater and soil. At

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Naylors Run an effective oil-water separator could be set up at the catch basin to prevent contaminated oil from flowing to Naylors Run.

- Pumping may be used to control liquid contaminant sources and pathways and as a collection method. At the Havertown PCP site pumping could be used to control groundwater and remove contaminated groundwater for treatment; however, this FFS does not address contaminated groundwater.

- Collection systems may be used to control gas and dust when contaminated soil and drums are excavated. An air collection system can be used in conjunction with an oil/water separator to control volatilization and dispersion of volatile organics.

- Diversion mechanisms are generally associated with the control of surface water away from a contaminated area. Diversion mechanisms can include grading, paving, revegetation, dikes, and berms. On the NWP site diversion of surface flow may be combined with capping to keep water away from the contaminated soils.

- Removal actions generally involve the physical relocation of soils, liquid wastes, or drums. Removal is an alternative for on-site soils and drums of waste.

- Treatment mechanisms remove or reduce the mobility or toxicity of contaminants by chemical, physical, or biological means. Treatment of the soil, waste in the drums and tanks, surface water, and air are site alternatives. Soil may be treated in situ or after removal (excavation). The treatment facilities for batch processing may be located on the Havertown site.

- Disposal (off-site) may include off-site incineration or landfill. At the Havertown site disposal may be applicable to the treated soil and waste in the drums.

2.3 IDENTIFICATION AND SCREENING OF TECHNOLOGY OPTIONS

Table 2-3 summarizes the technologies potentially available for the various areas of interest and media found at the Havertown PCP site. Technologies are evaluated according to applicability to the site and limitations of the technology.

TABLE 2-3 (Page 1 of 6)

POTENTIAL REMEDIAL TECHNOLOGIES

AREA	ACTION	APPLICABILITY	LIMITATIONS OF TECHNOLOGY
I. CONTAMINATED SOILS			
	A. Excavation With Off-Site Disposal		
	1. Excavation		
	a. Grading	Maybe	Prevents forming surface depressions.
	b. Backfill	Maybe	Prevents surface water from infiltration on the contaminated soil.
	c. Revegetation or paving	Maybe	May revegetate or pave excavated areas.
	d. Retaining walls	Maybe	May be needed if excavating soil near building or property lines.
	2. Landfill Disposal	Maybe	May be limited by land ban.
	3. Incineration	Maybe	Must comply with 40 CFR 264.343.
	B. Excavation With On-Site Containment		
	1. Sorbents	No	Conceptual; high concentrations would not be reduced sufficiently; monitoring required.

TABLE 2-3 (Page 2 of 6)

POTENTIAL REMEDIAL TECHNOLOGIES

AREA	ACTION	APPLICABILITY	LIMITATIONS OF TECHNOLOGY
I. CONTAMINATED SOILS (Cont.)	2. Stabilization	No	Can stabilize dioxin, PCP, metal-contaminated soil, but this is interim measure; monitoring required.
	3. Encapsulation	Maybe	Restricts future use of site; monitoring required.
	C. Excavation With On-Site Treatment		
	1. Biodegradation	No	May use biodegradation of PCP, VOC, but not applicable now.
	2. Soil aeration	No	Not effective for metals, PCP, dioxin.
	3. Solvent extraction	No	Not applicable.
	4. Chemical dechlorination	Maybe	May remove dioxin, PCP, but these do not present increased risk.
	5. UV-ozonation	No	Not applicable.
	6. Oxidation	No	Not effective.
	7. UV-photolysis	No	Not effective.
	8. Incineration	No	Must comply with 40 CFR 264.343.
	9. Acid extraction	Maybe	May remove metals.

TABLE 2-3 (Page 3 of 6)

POTENTIAL REMEDIAL TECHNOLOGIES

AREA	ACTION	APPLICABILITY	LIMITATIONS OF TECHNOLOGY
I. CONTAMINATED SOILS (Cont.)			
	D. In Situ Containment of Soil		
	1. Capping	Maybe	Long-term groundwater monitoring required.
	a. Multi-media (gravel, clay, sand, soil)	No	Cannot withstand continued site usage (truck traffic).
	b. Asphalt	Maybe	Site usage may necessitate frequent maintenance of cap; weathering, cracking possible.
	c. Concrete	Maybe	Cracking possible.
	E. In Situ Treatment		
	1. Vitrification	No	Vitrification of PCP, VOC, metal, dioxin-contaminated soil, but very expensive.
	2. Chemical dechlorination	No	Not effective.
	3. Bioreclamation	No	Not effective.
	4. Solvent flushing	No	Concern over injection of solvent into soil.

TABLE 2-3 (Page 4 of 6)

POTENTIAL REMEDIAL TECHNOLOGIES

AREA	ACTION	APPLICABILITY	LIMITATIONS OF TECHNOLOGY
I. CONTAMINATED SOILS (Cont.)	5. Vacuum well	No	May remove VOC from soil, but cannot remove PCP, dioxin, metal.
II. CATCH BASIN			
	A. Surface Water and Oil Control		
	1. Cover	No	Not available.
	2. Gas collection	Maybe	Collection of VOCs.
	3. Upstream sedimentation basin	No	Not applicable.
	4. Physical treatment (separation)	Maybe	PCP oil separation from water.
	B. Surface Water and Air Treatment		
	1. Biological treatment	No	Not applicable.
	2. Neutralization	No	Not applicable.
	3. Precipitation	No	Not applicable.
	4. Oxidation	No	Not applicable.
	5. Hydrolysis	No	Not applicable.
	6. Reduction	No	Not applicable.
	7. Chemical dechlorination	Maybe	For dioxin, PCP, TCE.

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TABLE 2-3 (Page 5 of 6)

POTENTIAL REMEDIAL TECHNOLOGIES

AREA	ACTION	APPLICABILITY	LIMITATIONS OF TECHNOLOGY
II. CATCH BASIN (Cont.)	8. UV and ozonation	No	Not applicable.
	9. Activated carbon water treatment	No	Not appropriate.
	10. Air/steam stripping	No	Not applicable.
	11. Activated carbon air treatment	Maybe	For VOCs.
III. STAGED WASTE MATERIALS			
	A. Soils, Debris, and Oils		
	1. Landfill	Maybe	May be limited by land ban.
	2. Incineration	Maybe	Few permitted facilities for dioxin.
	3. Chemical dechlorination	Maybe	Not effective for metals or contaminated debris.
	B. Aqueous Wastes (Handled Individually or Composited)		
	1. Liquid incineration	No	Few permitted facilities.
	2. Landfill	Maybe	May require stabilization or be prohibited.

TABLE 2-3 (Page 6 of 6)

POTENTIAL REMEDIAL TECHNOLOGIES

AREA	ACTION	APPLICABILITY	LIMITATIONS OF TECHNOLOGY
III. STAGED WASTE MATERIALS (Cont.)	3. Chemical dechlorination	Maybe	Not effective for metals.
	4. Carbon adsorption	Maybe	Effective for PCP, dioxins, VOCs, not metals.

CHAPTER 3

DEVELOPMENT OF ALTERNATIVES

The alternatives discussed below were developed by combining feasible and applicable technologies based on their potential application within specified remediation scenarios, as described in Table 2-3 of Chapter 2. The alternatives are developed separately for each area of concern (contaminated soil on the NWP site, liquids at the catch basin in Naylors Run, and contaminated waste from tanks and drums).

The alternatives are evaluated using the criteria of effectiveness, implementability, and cost prior to the detailed analysis of alternatives in Chapter 4. The evaluation typically focuses on effectiveness factors; implementability primarily evaluates the institutional aspects of the combined technologies; the cost evaluation is only a relative assessment of the capital and O&M costs. Summaries of the alternatives for the three areas of interest are presented in Tables 3-1 through 3-3.

3.1 CONTAMINATED SOIL ON NWP SITE

3.1.1 No Action (Alternative 1)

3.1.1.1 Description. The no-action alternative does not include any activities that control, limit, or eliminate the contamination, but can include environmental monitoring and access control. The measures considered for the NWP site are installation and maintenance of a security fence, gates, and warning signs and the initiation of long-term (30-year) groundwater and soil monitoring.

3.1.1.2 Evaluation. The no-action alternative does not achieve remedial action objectives because of the continued entrainment of contaminated dust and infiltration of contaminants to groundwater, some of which enters Naylors Run where it represents a risk to humans. This alternative is therefore not acceptable to the public or PADER. Since there is no remedial action, capital and O&M costs are low but monitoring costs are high.

TABLE 3-1

REMEDIAL ALTERNATIVES FOR CONTAMINATED SOIL ON NWP SITE

ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST
1. No action with monitoring	Does not achieve remedial action objective. Access restrictions do not reduce contamination. Monitoring is useful for documenting conditions. Does not reduce risk by itself.	Not applicable.	No capital or O&M costs. High monitoring costs.
2. Cap soil with 8-in. reinforced concrete and monitor	Cap is effective, less susceptible to cracking and weathering. Can withstand truck traffic. Does not remove source of contamination.	Easily implemented. Vapor and dust control required. Restriction on future land use.	Moderate capital and low O&M costs. High monitoring costs.
3. Cap soil with 5-in. asphalt and monitor	Cap is effective, susceptible to cracking and weathering. Cannot withstand truck traffic. Does not remove source of contamination.	Easily implementable. Vapor and dust control required. Restriction on future land use.	Low capital and O&M costs. High monitoring costs.
4. Excavate and landfill	Landfilling is effective and reliable. Excavation is conventional technology. Off-site transport required. Clean backfill required.	Use of permitted transport and disposal facilities required. Vapor and dust control required.	High capital, low O&M costs. Low monitoring costs.

TABLE 3-2

REMEDIAL ALTERNATIVES FOR WATER, OIL, AND VOLATILE ORGANICS AT NAYLORS RUN CATCH BASIN

ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST
1. No action, with monitoring	Does not achieve remedial action objectives.	Not applicable.	No capital* or O&M cost. Moderate monitoring cost.
2. Present system for liquid effluent control and no action for air control	Reduces contaminated oil discharge to Naylors Run, but contaminated VOC emission continues. Does not achieve remedial action objectives.	Easily implemented.	No capital cost;* low O&M cost; moderate monitoring cost.
3. Optimum oil/water separator	Effective and reliable oil/water separator is a conventional technology.	Readily implemented; permit required for discharge.	Low capital;* moderate O&M and monitoring costs.

*Capital costs include one-time intensive sampling of Naylors Run sediment, water, and biota.

TABLE 3-3

REMEDIAL ALTERNATIVES FOR CONTAMINATED WASTE FROM TANKS AND DRUMS

ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST
1. Landfill of soil and debris; carbon adsorption of aqueous waste	Landfill is effective and reliable disposal; off-site transport required. Carbon adsorption is conventional technology.	Use of permitted transport and disposal facilities required. Vapor and dust control required. Treated water can be discharged to Naylors Run with permit. Must be completed prior to 1990 land ban.	Moderate capital, no O&M costs.
2. Landfill of soil and debris; off-site treatment of aqueous waste	Landfill of debris is only effective alternative; off-site disposal required. Off-site treatment demonstrated as effective.	Use of permitted transport and disposal facilities required. Vapor and dust control required. Must be completed prior to 1990 land ban.	Moderate capital, no O&M costs.

3.1.2 Cap Soil With Reinforced Concrete and Monitor Groundwater (Alternative 2)

3.1.2.1 Description. Approximately 2 acres of contaminated soil will be capped. The swale on the north side of the NWP site may be filled prior to capping. The cap will consist of a 6-in. gravel base topped with 8 in. of reinforced concrete. Surface water run-on and runoff controls for the cap will include a concrete perimeter drainage ditch to limit run-on and collect runoff, a collection basin and stormwater drainage pipes that connect to the existing stormwater drainage system, and a sloped cap surface to prevent ponding of water. Capping will stop just outside of the building and will include a raised edge to guide water away from the building.

Prior to capping, existing monitoring wells to be used will have flush caps installed, and any additional monitoring wells required will be installed. Wells that will not be used for monitoring will be appropriately, abandoned, thereby reducing the possibility of conveying contamination to lower aquifers.

Following capping, a long-term groundwater monitoring program will be initiated. The program will use existing wells and those new wells deemed necessary to monitor the cap's effectiveness.

3.1.2.2 Evaluation. The reinforced cap alternative can achieve several remedial objectives, including:

- Direct remediation of the air contaminant pathway by controlling the release of contaminated dust and volatile organics into the air
- Remediation of the surface water contaminant pathway by preventing direct contact of rainfall with the contaminated soil, thereby minimizing leachate production
- Remediation of the groundwater contaminant pathway by minimizing rainfall infiltration on site, thereby minimizing the production of leachate that can contaminate the groundwater

There are no technical reasons why this alternative cannot be implemented; the cap installation involves only standard engineering practices. The reinforced concrete cap is more durable than an asphalt or multimedia (sand, gravel, and clay) cap. It will be strong enough to withstand heavy truck traffic over a protracted period of time with minimal maintenance and will resist weathering and cracking better than asphalt. However, because of its inherent strength, it would be difficult to remove if eventual soil excavation were contemplated. Future land use will be limited since the cap cannot be disturbed and still satisfy its remediation objectives.

Capping with reinforced concrete involves moderate capital and low O&M costs. Monitoring costs will be high since the contaminant source has not been removed.

3.1.3 Cap Soil With Asphalt and Monitor Groundwater (Alternative 3)

3.1.3.1 Description. The asphalt cap is similar to the concrete cap in installation, features, and operation. The cap will consist of a 6-in. gravel base and 4 to 6 in. of asphalt instead of concrete. It will not be designed or built to withstand heavy truck traffic. As in the concrete cap alternative, a long-term monitoring program will be initiated after cap installation.

3.1.3.2 Evaluation. The asphalt cap, like the concrete cap, can achieve several remedial objectives. However, it is more susceptible to weathering and cracking and will require more annual maintenance than the concrete cap to preserve its integrity. The asphalt cap could be removed more easily if soil excavation is eventually done on site.

Capital and O&M costs for asphalt capping will be relatively low; groundwater monitoring costs will be high.

3.1.4 Excavate and Landfill Soil (Alternative 4)

3.1.4.1 Description. There are approximately 2 acres of contaminated soil on the NWP site, including the swale on the north side. Assuming excavation to the water table, which is 13 to 15 ft below grade, 45,200 yd^3 of contaminated soil will be excavated. Prior to excavation, the NWP building and other facilities will be removed. Costs for demolition are not included since they are minor compared to the costs of soil excavation and disposal and cannot be estimated without details on the building and associated facilities. Grade stakes will be driven in the area to establish horizontal and vertical control for the excavation and final backfilling and grading of the area. A track-type backhoe fitted with a straightedge bucket will be used for excavation. Preventive measures will be taken to minimize the amount of dust generated and to provide erosion control. The depth of the excavation will not exceed the groundwater level. Visual and olfactory observations and field organic vapor monitoring instrumentation will be used to determine the vertical and horizontal extent of the excavation. Where excavation stops above the groundwater elevation, soil samples will be taken to verify that remediation to the cleanup level has occurred. Otherwise, excavation will continue to groundwater.

The excavated materials will be transported in accordance with all applicable local, state, and Federal requirements. A waste manifest will be prepared for each shipment of waste and all applicable manifests will be filed with the appropriate government agencies. The contaminated material will be disposed of at a disposal facility that is operating in full compliance with all laws and statutes governing these types of facilities. The facility will be designated before hauling begins. Clean soil will be backfilled, compacted by conventional earthworking equipment, then graded.

3.1.4.2 Evaluation. Landfill disposal of contaminated soil is technically effective and reliable. EPA has specified that wastes of pentachlorophenol or of intermediates used to produce its derivatives (F021) are EPA-hazardous wastes and were banned from landfilling on 8 November 1988. If F021 dioxin-containing waste includes contaminated soil and debris resulting from a response action taken under Section 104 or 106 of CERCLA or a corrective action taken under Subtitle C of RCRA, the land ban will be effective on 8 November 1990 (51 FR 40641 as amended in 52 FR 21017 and 53 FR 31216). If landfill facilities are found that will dispose of the PCP-contaminated soil, the alternative can be implemented by obtaining necessary permits. High capital costs associated with this alternative are primarily to transport the contaminated soil. O&M and monitoring costs will be low.

3.2 LIQUID EFFLUENT AT NAYLORS RUN CATCH BASIN

3.2.1 No Action (Alternative 1)

3.2.1.1 Description. The no-action alternative means no further mitigative action. The existing catch basin will continue to function as an underdrain, and the fencing will serve to restrict access. The catch basin absorbents in Naylors Run will not be maintained, but an intensive sampling of Naylors Run will be conducted, followed by a monitoring program of reduced scope.

3.2.1.2 Evaluation. Under no action, contaminated oil will continue to discharge to the catch basin and Naylors Run; volatile organics will continue to evaporate from the catch basin. The alternative does not achieve the remedial action objectives of reducing PCP oil discharge to Naylors Run to less than 5 ppm and VOCs, e.g., benzene, and other air emissions by 1/6 (0.17).

The alternative is not acceptable because residential exposure through inhalation of volatiles and ingestion of liquids from the catch basin will continue. There will be no capital or O&M costs associated with the no-action alternative except for the intensive sampling program. Subsequent monitoring costs will be moderate.

3.2.2 Present System for Liquid Effluent Control and No Action for Air Control (Alternative 2)

3.2.2.1 Description. A filter fence with oil-absorbent pads was installed in Naylors Run in the vicinity of the storm sewer discharge to contain the PCP oil. The filter fence was ineffective during high stream flows and because of inadequate maintenance by the responsible party. Therefore, in 1988 EPA installed a catch basin with underflow drainpipes in Naylors Run to contain the floating PCP oil coming from the storm sewer. This alternative includes the regular inspection and maintenance of the underflow dam to prevent oversaturation of the absorbent material. However, nothing will be done to control VOC emissions from the water surface and PCP oil. An intensive sampling of Naylors Run followed by a monitoring program will be included.

3.2.2.2 Evaluation. The alternative will probably reduce contaminated oil discharge to Naylors Run, but the lack of a continuous oil recovery system will allow some oil to escape downstream, especially during periods of high flow. Volatile organics will continue to evaporate and disperse from the area. The alternative is not acceptable since it does not reduce cancer risks to less than 1×10^{-6}. Because the catch basin/underflow dam is already in place, there will be no capital costs except for the sampling program. O&M costs will be low and monitoring costs high.

3.2.3 Optimum Oil/Water Separator (Alternative 3)

3.2.3.1 Description. In this alternative an oil/water separator unit will be installed below grade near the storm sewer line upstream of its outfall to the catch basin. All flows up to a threshold level will be routed through the separator. Flows in excess of the threshold will be bypassed to Naylors Run through an underdrain siphon so that the upper portion of the water that contains higher levels of oil will still enter the separator. Air treatment for removal of VOCs is not thought to be needed since the oil/water separator is a closed vessel with only a small vent from which volatiles would be released. Assuming a maximum flow rate of 100-200 gpm, a Highland Tank & Mfg. Co. Model HTC-2000 or equivalent oil/water separator is feasible. For the purposes of this evaluation, the required separator is assumed to be 5 ft in diameter, 12 ft long, with 6-in. inlet/outlet pipes. The separator can separate oil and greasy solids from wastewater under a wide range of conditions, fluctuating flow rate and temperatures, varying solids contamination and oil/water mixture. The oily water enters the separator, heavy solids settle out, and concentrated oil sludge rises immediately to the surface in the sediment chamber. As the oily water passes through the parallel corrugated plate coalescer (an inclined arrangement of parallel corrugated plates set at a 22.5° angle and spaced 3 in. apart), buoyancy causes the oil to rise and coalesce into sheets on the underside of the plates, move up the surface, and form large globules that rise to the surface. Clean water flows in a downward path to the outlet where the treated water is discharged by gravity displacement from the lower regions of the separator. The separated oil accumulates in the upper regions of the separator. An oil-level sensor will sound an alarm if oil levels become deep enough to be passed with the water. Waste oil is periodically withdrawn from the top of the separator by pumping from an access hatch.

The estimated oil removal rate from the storm sewer is 1.3 to 8 gpd. Frequency of oil and solids removal from the separator unit will depend on the recovery rate; however, with an oil-holding capacity of 220 gal, pumping of the oil would be needed only monthly at close to the maximum removal rate of 8 gpd of oil. At lower removal rates servicing could be extended to once every six months. Oil/grease concentration in the separator effluent will be less than 10 ppm. Because the effluent enters Naylors Run and is diluted by water coming from upstream, concentrations are expected to be less than 5 ppm downstream of the catch basin.

3.2.3.2 Evaluation. The oil/water separator employs conventional technology that is effective and reliable for separating oil from water. The equipment is available from commercial sources.

Because the separator is a closed unit that will remove most of the PCP oil from the water before it enters the catch basin, VOCs such as benzene volatilizing from the PCP oil will not be continuously released to the atmosphere from the catch basin. Instead, a limited amount of VOCs will be released from a small vent and when the oil/water separator is serviced. It is estimated that the unit will be serviced once a month until accumulation rates of oil and solids are determined. Ultimately, the service frequency will probably be closer to once every three months.

The separator, i.e., capital cost is low; O&M costs are moderate; and monitoring costs are moderate. The legal, administrative, and contingency costs include the possibility that private property may be needed to locate the oil/water separator. As in the other alternatives, the cost of an intensive one-time sampling program for Naylors Run is included in the capital costs.

3.3 CONTAMINATED WASTE FROM TANKS AND DRUMS

The staged waste material consists of drummed drilling water from the wells, soil cuttings and contaminated materials, contaminated sorbent pads, oil, and water from Naylors Run. Most of the water is in two large tanks (2500 gal each) and three small tanks (500 gal each). Soil cuttings and contaminated materials are in 55-gal drums.

For the purposes of the FFS, two hundred 55-gal drums of soil and oily materials and 6000 gal of contaminated water have been assumed to be on site.

3.3.1 Landfill of Soil and Debris; Carbon Adsorption of Aqueous Waste (Alternative 1)

3.3.1.1 Description. In this alternative the solid and semisolid wastes in drums will be landfilled and the wastewater in the tanks will be treated on site using a carbon adsorption column. Before the drums are shipped to a landfill they will be checked against existing inventory sheets and labeled. Those with unknown contents will be sampled, analyzed, and labeled. To reduce analytic costs, drum contents will be composited as much as possible. Drums will be overpacked as necessary to prevent leakage. All drums will be transported and disposed of in accordance with applicable local, state, and Federal regulations.

The wastewater will be pumped to a carbon adsorption column where the contact time is typically 30 min. Carbon adsorption is a conventional technology that can remove dissolved organics from aqueous wastes by relying on the high carbon-water partition coefficients (K_{oc}) typical of organic compounds. PCP concentration can be reduced from 10,000 ug/l to less than 1 ug/l, toluene from 120 to 0.3 ug/l, trichloroethylene from 21 to 0.3 ug/l. The effluent from carbon adsorption treatment could be discharged directly to Naylors Run with an NPDES permit. The residuals are spent carbon and regenerant.

3.3.1.2 Evaluation. This alternative appears to be technically effective and reliable if a landfill can be found that will accept the solid wastes (the land ban on PCP waste becomes effective in November 1990). The treatment limitations of carbon adsorption are organic contaminant levels of <10,000 ppm, suspended solids of <50 ppm, and dissolved inorganics and oil and grease of <10 ppm. Levels higher than these would require additional treatment. The carbon adsorption unit must be placed on site, connected to electrical power and plumbing, and be operated by experienced personnel. On-site test runs with effluent analysis may be required in support of an NPDES permit. Capital costs are expected to be moderate for this alternative. There will be no O&M costs since all wastes will be removed.

3.3.2 Landfill of Soil and Debris; Off-Site Treatment of Aqueous Waste (Alternative 2)

3.3.2.1 Description. As in Section 3.3.1.1 above, drums of solid and semisolid wastes will be landfilled after the drum contents have been characterized and labeled. The aqueous waste will be composited to the extent possible, sampled, and analyzed to characterize the waste stream to the off-site treatment facility. The waste will be bulk-transferred to the treatment facility and the tanks landfilled with the solid waste.

3.3.2.2 Evaluation. This alternative for disposal of contaminated waste is also technically effective and reliable. It seems to be more implementable than the on-site carbon adsorption unit since it will not require utility hookups or discharge permits. Also, removal of the aqueous waste for off-site treatment may be completed in a shorter time. The capital costs will be moderate; there will be no O&M costs.

CHAPTER 4

DETAILED ANALYSIS OF ALTERNATIVES

In this chapter the alternatives developed and preliminarily evaluated in Chapter 3 are evaluated in greater detail. The alternatives in each area of interest (contaminated soil on site, liquid effluent at the catch basin, and contaminated waste in tanks and drums) are evaluated according to the nine criteria described in EPA's interim final report Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (October 1988). The nine criteria are:

- Short-term effectiveness
- Compliance with ARARs (applicable or relevant and appropriate requirements)
- Overall protection of human health and the environment
- Reduction of toxicity, mobility, and volume through treatment
- Long-term effectiveness and permanence
- Implementability
- Cost
- State acceptance
- Community acceptance

Much of the evaluation is accomplished through the use of detailed tables. Tables 4-1 through 4-9 present summaries of capital and operation and maintenance (O&M) costs for each alternative. Because the NWP buildings will either not be demolished prior to capping of the onsite soils or demolition costs associated with the excavation will be minimal, these costs are not included in Alternatives 2-4 (Tables 4-2 through 4-4). A "present worth" estimate is made to discount all future O&M and monitoring costs to a common base year. Evaluations for each area of interest are presented in Tables 4-10 through 4-12, which list the nine criteria (including cost), the final remediation alternatives, and descriptive evaluations for all criterion/alternative combinations. Summary evaluation tables in the form of relative rankings for all alternatives within

TABLE 4-1

NO ACTION - CONTAMINATED SOIL ON NWP SITE

A.	CAPITAL COSTS		
	1. Fencing	$ 15,000	
	2. Resampling of on-site soils	65,000	
	3. Contingency (25% of No. 1)	3,800	
	Total Capital Costs		$ 83,800
B.	CONTINUING O&M COST		
	1. Monitoring	$ 65,000/yr	
	Present worth (8% for 30 years)		$731,800
C.	PRESENT WORTH		$815,600

AR300923

TABLE 4-2

CAP SOIL WITH REINFORCED CONCRETE - CONTAMINATED SOIL ON NWP SITE

A. CAPITAL COSTS		
1. Preparation of surface cap ($4/yd²)	$ 40,000	
2. 6-in. gravel subbase (hauling and spreading) ($24/yd³)	39,000	
3. 8-in. concrete (hauling, spreading, and grading) ($150/yd³)	322,700	
4. Berm and a paved perimeter drainage ditch, replacement of storm sewer ($50/ft)	75,000	
5. Repair and install groundwater monitoring wells	25,000	
6. Health and safety	25,000	
7. Engineering and design (15%)	79,000	
8. Legal and administrative (2%)	10,500	
9. Contingency (10%)	52,700	
Total Capital Costs		$668,900
B. CONTINUING O&M COST		
1. Cap maintenance and repair	$ 5,000/yr	
2. Monitoring	50,000/yr	
Total	$55,000/yr	
Present worth (8% for 30 years)		$619,200
C. PRESENT WORTH		$1,288,100

AR300924

TABLE 4-3

CAP SOIL WITH ASPHALT - CONTAMINATED SOIL ON NWP SITE

A. CAPITAL COSTS		
1. Preparation of surface cap ($4/yd^2)	$ 40,000	
2. 6-in. gravel subbase (hauling and spreading) ($24/yd^3)	39,000	
3. 4-6 in. asphalt (hauling, spreading, and grading) ($8/yd^2)	77,000	
4. Berm and a paved perimeter drainage ditch, replacement of storm sewer ($50/ft)	75,000	
5. Repair and install groundwater monitoring wells	15,000	
6. Health and safety	25,000	
7. Engineering and design (15%)	40,600	
8. Legal and administrative (2%)	5,400	
9. Contingency (10%)	27,100	
Total Capital Costs		$344,100
B. CONTINUING O&M COST		
1. Cap maintenance and repair	$ 15,000/yr	
2. Monitoring	50,000/yr	
Total	$ 65,000/yr	
Present worth (8% for 30 years)		$731,800
C. PRESENT WORTH		$1,075,900

AR300925

TABLE 4-4

EXCAVATION WITH LANDFILL DISPOSAL - CONTAMINATED SOIL ON NWP SITE

A. CAPITAL COSTS		
1. General site preparation	$ 15,000	
2. Excavation ($12/yd³)	542,000	
3. Off-site disposal (landfill) ($310/yd³)	14,000,000	
4. Backfill and cover with clean soil ($10/yd³), reinstall storm sewer	452,000	
5. Reinstall monitoring wells	15,000	
6. Health and safety	50,000	
7. Engineering and design (15%)	2,261,100	
8. Legal and administrative (2%)	301,500	
9. Contingency (10%)	1,507,400	
Total Capital Costs		$19,144,000
B. CONTINUING O&M COST		
1. Monitoring	$ 25,000/yr	
Present worth (8% for 30 yrs)		$ 281,400
C. PRESENT WORTH		$19,425,400

AR300926

TABLE 4-5

NO ACTION - LIQUID EFFLUENT CONTROL AT NAYLORS RUN CATCH BASIN

A.	CAPITAL COSTS		
	1. Initial monitoring of sediments, water, and biota		$ 50,000
B.	CONTINUING O&M COST		
	1. Monitoring of water and sediments	$ 20,000/yr	
	Present worth (8% for 30 years)		$225,200
C.	PRESENT WORTH		$275,200

AR300927

TABLE 4-6

PRESENT SYSTEM - LIQUID EFFLUENT CONTROL AT NAYLORS RUN CATCH BASIN

A. CAPITAL COSTS		
1. Initial monitoring of sediments, water, and biota		$ 50,000
B. CONTINUING O&M COST		
1. Inspection and maintenance of catch basin	$ 25,000/yr	
2. Monitoring of water and sediments	20,000/yr	
Total O&M	$ 45,000/yr	
Present worth (8% for 30 years)		$556,600
C. PRESENT WORTH		$556,600

AR300928

TABLE 4-7

OPTIMUM OIL/WATER SEPARATOR -
LIQUID EFFLUENT CONTROL AT NAYLORS RUN CATCH BASIN

A.	CAPITAL COSTS		
	1. Initial monitoring of sediments, water, and biota	$ 50,000	
	2. Oil/water separator, including installation	35,000	
	3. Health and safety	2,000	
	4. Predesign data acquisition	25,000	
	5. Engineering and design (25% of Nos. 2-4)	15,500	
	6. Legal and administrative (25% of Nos. 2-4)	15,500	
	7. Contingency (25% of Nos. 2-4)	15,500	
	Total Capital Costs		$158,500
B.	CONTINUING O&M COST		
	1. O&M of oil/water separator	$ 30,000/yr	
	2. Monitoring of water and sediments	15,000/yr	
	Total O&M	$ 45,000/yr	
	Present worth (8% for 30 years)		$506,600
C.	PRESENT WORTH		$665,100

AR300929

TABLE 4-8

LANDFILL OF SOIL AND OILY DEBRIS
AND ON-SITE CARBON ADSORPTION OF WATER -
CONTAMINATED WASTE FROM TANKS AND DRUMS

A. CAPITAL COSTS		
1. Sampling, analysis, and labeling of soil and oily debris (200 drums)	$ 30,000	
2. Off-site disposal (landfill) of soil and oily debris	35,000	
3. Carbon adsorption of aqueous waste (includes analysis of waste and effluent)	15,000	
4. Health and safety	10,000	
5. Engineering and design (25%)	22,500	
6. Legal and administrative (20%)	18,000	
7. Contingency (25%)	22,500	
Total capital costs		$153,000
B. CONTINUING O&M COST	0	
C. PRESENT WORTH		$153,000

AR300930

TABLE 4-9

LANDFILL OF SOIL AND OILY DEBRIS AND OFF-SITE TREATMENT OF WATER - CONTAMINATED WASTE FROM TANKS AND DRUMS

A. CAPITAL COSTS		
1. Sampling, analysis, and labeling of soil and oily debris (200 drums)	$ 30,000	
2. Off-site disposal (landfill) of soil and oily debris	35,000	
3. Sampling and analysis of aqueous waste	5,000	
4. Off-site hauling and treating of aqueous waste (6000 gal @ $4/gal)	24,000	
5. Health and safety	10,000	
6. Engineering and design (10%)	10,400	
7. Legal and administrative (20%)	20,800	
8. Contingency (25%)	26,000	
Total capital costs		$161,200
B. CONTINUING O&M COST	0	
C. PRESENT WORTH		$161,200

AR300931

TABLE 4-10 (Page 1 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Short-Term Effectiveness				
Community protection	Risk to community not increased by remedy implementation.	Temporary increase in dust production through cap installation. Contaminated soils remain undisturbed.	Temporary increase in dust production through cap installation. Contaminated soils remain undisturbed.	Temporary increase in dust production through excavation and soil transportation.
Worker protection	No significant risk to workers.	Protection required against dermal contact and inhalation of contaminated dust during cap construction.	Protection required against dermal contact and inhalation of contaminated dust during cap construction.	Protection required against dermal contact and inhalation of contaminated dust during excavation and transportation.
Environmental impact	No change from existing conditions.	Cap installation may temporarily impact air quality.	Cap installation may temporarily impact air quality.	Excavation may temporarily impact air quality.

TABLE 4-10 (Page 2 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Time until action is complete	Not applicable.	Cap installed in three months.	Cap installed in two months.	Excavation complete in one year (75 trucks/week, 12 yd^3/truck); backfill with clean fill, grading complete after an additional two months.
Compliance With ARARs				
Chemical-specific ARARs	May meet Pennsylvania air standards on site and past the site boundary.	Would meet Pennsylvania air standards at the site boundary.	Would meet Pennsylvania air standards at the site boundary.	Would meet Pennsylvania air standards at the site boundary.
Location-specific ARARs	Not relevant. There are no location-specific ARARs.	Not relevant. There are no location-specific ARARs.	Not relevant. There are no location-specific ARARs.	Not relevant. There are no location-specific ARARs.

300933

TABLE 4-10 (Page 3 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Action-specific ARARs	Not relevant.	Would not meet RCRA landfill closure requirement (40 CFR 264.228, 40 CFR 264.310).	Would not meet RCRA landfill closure requirement (40 CFR 264.228, 40 CFR 264.310).	Would meet RCRA clean closure and land disposal requirement (40 CFR 264.111, 40 CFR 268.31).
Other criteria and guidance	Would allow inhalation of contaminated air to exceed 1×10^{-6} risk.	Protects against inhalation of contaminated air to 1×10^{-6} risk.	Protects against inhalation of contaminated air to 1×10^{-6} risk.	Protects against inhalation of contaminated air to 1×10^{-6} risk.
Overall Protection				
Human health protection	No significant reduction in risk. Some reduction in access to risk through fence repair.	Cap reduces direct contact risk and soil ingestion risk to less than 1×10^{-6}.	Cap reduces direct contact risk and soil ingestion risk to less than 1×10^{-6}.	Excavation and off-site landfill reduce direct contact/soil ingestion risk to less than 1×10^{-6}.
Environmental protection	Contaminants remain on site and continue to leach into groundwater.	Contaminant movement is reduced by use of cap.	Contaminant movement is reduced by use of cap.	Contaminant source is removed by use of excavation and landfill.

AR300934

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Reduction of Toxicity, Mobility, or Volume Through Treatment				
Treatment process used	None.	None.	None.	None.
Amount destroyed or treated	None.	None.	None.	All contaminated soil removed.
Reduction of toxicity, mobility, or volume	None.	Air and groundwater mobility reduced by capping.	Air and groundwater mobility reduced by capping.	Toxicity, mobility, and volume of contaminated soil reduced on site.
Irreversible treatment	None.	None.	None.	None.
Type and quantity of residuals remaining after treatment	None.	None.	None.	None.
Statutory preference for treatment	Does not satisfy.	Does not satisfy.	Does not satisfy.	Does not satisfy.

TABLE 4-10 (Page 5 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Long-Term Effectiveness and Permanence				
Magnitude of residual risk	Source has not been removed. Existing risk will remain.	Risk eliminated as long as cap is maintained. Because source is only contained, inherent hazard of waste remains.	Risk eliminated as long as cap is maintained. Because source is only contained, inherent hazard of waste remains.	Source has been removed; risk will no longer exist.
Adequacy and reliability of controls	No controls over remaining contamination. No reliability.	The cap controls contaminated soil. The cap is effective and reliable with minimal maintenance. Cap will withstand truck traffic.	The cap controls contaminated soil. The cap is effective and reliable only if regularly maintained. Cap cannot withstand constant truck traffic.	Excavation and off-site landfill are adequate and reliable to control contaminated soil.
Need for 5-year review	Review would be required to ensure that minimum protection of human health and the environment is maintained.	Review would be required since contaminated soil remains on site.	Review would be required since contaminated soil remains on site.	Not applicable. Contaminated soil would not be on site.

TABLE 4-10 (Page 6 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Implementability				
Ability to construct and operate	No construction or operation.	Simple to construct. Would require about 2150 yd^3 of reinforced concrete and 1620 yd^3 of gravel.	Simple to construct. Would require about 1350 yd^3 of asphalt and 1620 yd^3 of gravel.	Simple to construct. Would require back-filling of about 45,200 yd^3 of soil.
Ease of doing more action if needed	If monitoring indicates more action is necessary, may need to go through the FS/ROD process again.	Simple to extend capping.	Simple to extend capping.	Can handle varying volumes.
Ability to monitor effectiveness	Monitoring would further document existing condition.	Inspection and monitoring would detect failure before significant exposure occurs.	Inspection and monitoring would detect failure before significant exposure occurs.	Not applicable.

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TABLE 4-10 (Page 7 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Ability to obtain approvals and co-ordinate with other agencies	No approval necessary.	No approval necessary.	No approval necessary.	Need a permit for hauling contaminated soil; need approval for landfill disposal.
Availability of service and capacities	No services or capacities required.	Only basic construction services needed.	Only basic construction services needed.	Limited landfill availability.
Availability of equipment, specialists, and materials	None required.	No special equipment, materials, or specialists required. Cap materials available within 20 miles.	No special equipment, materials, or specialists required. Cap materials available within 20 miles.	Need licensed drivers.
Availability of technology	None required.	Cap technology readily available.	Cap technology readily available.	Not applicable.
<u>Cost</u>				
Capital cost	$83,800	$668,900	$344,100	$19,144,000
Annual O&M cost (with monitoring)	$65,000	$55,000	$65,000	$281,400
Present worth cost	$815,600	$1,288,100	$1,075,900	$19,425,400

AR300358

TABLE 4-10 (Page 8 of 8)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Acceptability by State	Low	Moderate	Moderate	Moderate
Public Acceptance	Low	Moderate	Moderate	Moderate

TABLE 4-11 (Page 1 of 7)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Short-Term Effectiveness			
Community protection	Risk to community not increased by remedy implementation.	Risk to community not increased by remedy implementation.	Temporary disturbance of storm sewer discharge during installation of separator.
Worker protection	No significant risk to workers.	Protection required against VOCs inhalation and dermal contact during maintenance of filter fence.	Protection required against VOCs inhalation and dermal contact during servicing of oil/water separator.
Environmental impact	Continued impact from existing conditions.	Continued impact to air quality.	Temporary increase in turbidity during construction.
Time until action is complete	Not applicable.	Currently in place.	Two months.
Compliance With ARARs			
Chemical-specific ARARs	Does not meet Pennsylvania air standards past the site boundary. Does not meet drinking water MCLs at the site boundary.	Does not meet Pennsylvania air standards past the site boundary. Would meet NPDES requirements at the site boundary.	Would meet Pennsylvania air standards past the site boundary. Would meet NPDES requirements at the site boundary.

TABLE 4-11 (Page 2 of 7)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Location-specific ARARs	Not applicable.	Not applicable.	Oil/water separator in 100-yr flood zone.
Action-specific ARARs	Not applicable.	Would not meet NPDES requirements.	May meet NPDES requirements for oil and grease.
Other criteria and guidance	Would allow ingestion of surface water and inhalation of contaminated air exceeding 1 x 10^{-6} risk.	Would allow inhalation of contaminated air exceeding 1 x 10^{-6} risk. Would reduce ingestion of surface water exceeding 1 x 10^{-6} risk.	Protects against ingestion of surface water and inhalation of contaminated air exceeding 1 x 10^{-6} risk.
Overall Protection			
Human health protection			
Air inhalation	No reduction in risk.	No significant reduction in risk.	Can reduce air inhalation risk to less than 1 x 10^{-6}.
Surface water ingestion	No reduction in risk.	Does not reduce surface water ingestion risk to less than 1 x 10^{-6}.	Can reduce surface water ingestion to less than 1 x 10^{-6}.

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TABLE 4-11 (Page 3 of 7)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Environmental protection	Continued VOCs emission to air and contaminated oil discharge to Naylors Run.	Continued VOCs emission to air and reduced contaminated oil discharge to Naylors Run.	VOCs emission and contaminated oil discharge are mitigated by use of optimum oil/water separator.
Reduction of Toxicity, Mobility, or Volume Through Treatment			
Treatment process used	None.	Existing catch basin and filter fence.	Optimum oil/water separation.
Amount destroyed or treated	None.	Treat less than 1.3 gpd oil.	Treat 1.3-8 gpd oil. 90% VOCs in the vapor removed.
Reduction of toxicity, mobility, or volume	None.	Toxicity of surface water reduced in the vicinity of catch basin.	Toxicity of air and surface water reduced in the vicinity of catch basin.
Irreversible treatment	None.	Present oil recovery system is reversible.	Oil/water separation is reversible.

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TABLE 4-11 (Page 4 of 7)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Type and quantity of residual remaining after treatment	No residual remaining.	Residual oily absorbent materials; approximately four barrels per month.	Liquid oil residue; less than four barrels per month.
Statutory preference for treatment	Does not satisfy.	Satisfies.	Satisfies.
Long-Term Effectiveness and Permanence			
Magnitude of residual risk			
Air inhalation	Source has not been removed; existing risk will remain.	Source has not been removed; existing risk would remain.	Risk eliminated through air containment within separator.
Surface water ingestion	Source has not been removed; existing risk will remain.	Risk reduced through inspection and maintenance of filter fence.	Risk eliminated through optimum oil/water separator.

TABLE 4-11 (Page 5 of 7)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Adequacy and reliability of control	No controls over remaining contamination. No reliability.	Present system can reduce contaminated oil discharge, but is not reliable. No control of air contamination.	The alternative is adequate and reliable to control contaminated oil and air.
Need for 5-yr review	Review would be required to assess impact of continued discharge.	Review would be required to ensure that minimal protection of human health and the environment is maintained.	Review would be required to ensure that adequate protection of human health and the environment is maintained.
Implementability			
Ability to construct and operate	No construction or operation.	Simple to maintain filter fence.	Installation will require excavation of soil and rock near catch basin; operation is routine.
Ease of doing more action if needed	Not applicable.	If monitoring indicates more action is necessary, may need to go through the FS/ROD process again.	Can treat 200 gpm. If volumes exceed maximum separator capacity due to severe storms, they must bypass separator.
Ability to monitor effectiveness	Monitoring would better define extent of contamination.	Monitoring would determine effectiveness of treatment.	Monitoring would determine effectiveness of treatment.

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INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Ability to obtain approvals and coordinate with other agencies	No approval necessary.	No approval necessary.	Need stream disturbance and NPDES permits for construction and operation of separator.
Availability of services and capacities	No services or capacities required.	Need continued sorbent boom maintenance.	Oil/water separator maintenance services available from commercial sources. Oil to be hauled by licensed carrier to permitted disposal facility.
Availability of equipment, specialists, and materials	None required.	Present system is currently maintained; no special equipment, etc., required.	Oil/water separator service requires pump, barrels - readily available.
Availability of technologies	None required.	None required.	Oil/water separation technology well developed and available.

TABLE 4-11 (Page 7 of 7)

INDIVIDUAL EVALUATION OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Cost			
Capital cost	$ 50,000	$ 50,000	$158,500
Annual O&M cost (with monitoring)	$ 20,000	$ 45,000	$ 45,000
Present worth cost	$275,200	$556,600	$665,100
Acceptability by State	Low	Moderate	High
Public Acceptance	Low	Low	High

TABLE 4-12 (Page 1 of 6)

INDIVIDUAL EVALUTION OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTE	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTE
Short-Term Effectiveness		
Community protection	Temporary increase in dust production through loading and transportation of soil and debris.	Temporary increase in dust production through loading and transportation of soil and debris.
Worker protection	Protection required against dermal contact and inhalation of contaminated waste during loading, transportation, and treatment.	Protection required against dermal contact and inhalation of contaminated waste during loading, transportation, and treatment.
Environmental impact	Loading, transportation, and treatment may temporarily impact air quality.	Loading, transportation, and treatment may temporarily impact air quality.
Time until action is complete	Off-site landfill of soil and debris and carbon adsorption of aqueous waste may be completed in two months.	Off-site landfill of soil and debris and bulk transfer of liquids may be completed in two months.
Compliance With ARARs		
Chemical-specific ARARs	Would meet Pennsylvania air standards at the site boundary.	Would meet Pennsylvania air standards at the site boundary.

TABLE 4-12 (Page 2 of 6)

INDIVIDUAL EVALUTION OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTE	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTE
Location-specific ARARs	Not relevant. There are no location-specific ARARs.	Not relevant. There are no location-specific ARARs.
Action-specific ARARs	Would meet RCRA clean closure and land disposal requirements (40 CFR 264.111, 40 CFR 268.31).	Would meet RCRA clean closure and land disposal requirements (40 CFR 264.111, 40 CFR 268.31).
Other criteria and guidance	Protects against inhalation of contaminated air to less than 1×10^{-6} risk.	Protects against inhalation of contaminated air to less than 1×10^{-6} risk.
Overall Protection		
Human health protection	Eliminates potential for ingestion, inhalation.	Eliminates potential for ingestion, inhalation.
Environmental protection	Potential contaminant release to environment eliminated.	Potential contaminant release to environment eliminated.

TABLE 4-12 (Page 3 of 6)

INDIVIDUAL EVALUTION OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTE	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTE
Reduction of Toxicity, Mobility, or Volume Through Treatment		
Treatment process used	Carbon adsorption of water.	Off-site treatment (possibly carbon adsorption).
Amount destroyed or treated	99.9% PCP in the aqueous waste removed by carbon adsorption.	99.9% PCP in the aqueous waste removed by carbon adsorption.
Reduction of toxicity, mobility, or volume	Toxicity of contaminated water reduced.	Toxicity of contaminated water reduced.
Irreversible treatment	Carbon adsorption with regeneration of carbon is irreversible.	Carbon adsorption with regeneration of carbon is irreversible.
Type and quantity of residuals remaining after treatment	Metals and chlorinated compounds are residual in the waste. Carbon requires regeneration or disposal.	Metals and chlorinated compounds are residual in the waste. Carbon requires regeneration or disposal.
Statutory preference for treatment	Satisfies.	Satisfies.

TABLE 4-12 (Page 4 of 6)

INDIVIDUAL EVALUTION OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTE	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTE
Long-Term Effectiveness and Permanence		
Magnitude of residual risk	Risk eliminated through off-site landfill and carbon adsorption.	Risk eliminated through off-site landfill and treatment.
Adequacy and reliability of control	Actions are adequate and reliable to control contaminated waste.	Actions are adequate and reliable to control contaminated waste.
Need for 5-yr review	Not applicable.	Not applicable.
Implementability		
Ability to construct and operate	Carbon adsorption requires some operation.	No operation required.
Ease of doing more action if needed	Carbon adsorption can handle varying aqueous/waste volumes or concentrations of contaminants.	Off-site treatment facility will have flexibility to treat waste as required.
Ability to monitor effectiveness	Visual inspection adequate to ensure removal. Carbon adsorption effluent will be monitored.	Visual inspection adequate to ensure removal.

TABLE 4-12 (Page 5 of 6)

INDIVIDUAL EVALUTION OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTE	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTE
Ability to obtain approvals and coordinate with other agencies	Need a permit for hauling the waste and an approval for landfill disposal. May need NPDES discharge permit for carbon adsorption process.	Need a permit for hauling the waste and an approval for landfill disposal.
Availability of service and capacities	Need carbon adsorption services. Limited approved landfill site availability.	Limited approved landfill site availability. Treatment facility available nearby.
Availability of equipment, specialists, and materials	Needs operator to install and operate carbon adsorption. Need licensed drivers.	Need licensed drivers. Need bulk liquid handling trucks.
Availability of technology	Carbon adsorption is conventional technology.	Treatment facilities are available.

TABLE 4-12 (Page 6 of 6)

INDIVIDUAL EVALUTION OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTE	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTE
Cost		
Capital cost	$153,000	$161,200
Continue first year annual O&M cost	0	0
Present worth cost	$153,000	$161,200
Acceptability by State	Moderate	Moderate
Public Acceptance	Moderate	Moderate

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TABLE 4-13

<u>SUMMARY RANKING[a] OF FINAL ALTERNATIVES - CONTAMINATED SOIL ON NWP SITE</u>

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 CAP SOIL WITH CONCRETE	ALTERNATIVE 3 CAP SOIL WITH ASPHALT	ALTERNATIVE 4 EXCAVATION WITH LANDFILL DISPOSAL
Short-term effectiveness	3	1.5	1.5	4
Compliance with ARARs	4	2.5	2.5	1
Overall protection	4	2.5	2.5	1
Reduction of toxicity, mobility, and volume through treatment	4	2.5	2.5	1
Long-term effectiveness and permanence	4	2	3	1
Implementabilty	1	2.5	2.5	4
Cost	1	3	2	4
State acceptance	4	1	2	3
Public acceptance	4	1.5	1.5	3

[a]One (1) indicates highest ranking, four (4) the lowest. Where ties exist, rank is shown as sum of ranks as if no tie divided by n.

TABLE 4-14

SUMMARY RANKING[a] OF FINAL ALTERNATIVES - LIQUID EFFLUENT CONTROL AT CATCH BASIN

CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 PRESENT SYSTEM FOR LIQUID CONTROL	ALTERNATIVE 3 OPTIMUM OIL/WATER SEPARATOR
Short-term effectiveness	3	1.5	1.5
Compliance with ARARs	3	2	1
Overall protection	3	2	1
Reduction of toxicity, mobility, and volume through treatment	3	2	1
Long-term effectiveness and permanence	3	2	1
Implementability	1	2	3
Cost	1	2	3
State acceptance	3	2	1
Public acceptance	3	2	1

[a]One (1) indicates highest ranking, four (4) the lowest. Where ties exist, rank is shown as sum of ranks as if no tie divided by n.

TABLE 4-15

SUMMARY RANKING[a] OF FINAL ALTERNATIVES - CONTAMINATED WASTE FROM TANKS AND DRUMS

CRITERIA	ALTERNATIVE 1 LANDFILL OF SOIL AND OILY DEBRIS, CARBON ADSORPTION OF AQUEOUS WASTES	ALTERNATIVE 2 LANDFILL OF SOIL AND OILY DEBRIS, OFF-SITE TREATMENT OF AQUEOUS WASTES
Short-term effectiveness	2	1
Compliance with ARARs	1.5	1.5
Overall protection	1.5	1.5
Reduction of toxicity, mobility, and volume through treatment	1.5	1.5
Long-term effectiveness and permanence	1.5	1.5
Implementability	2	1
Cost	1	2
State acceptance	1.5	1.5
Public acceptance	2	1

[a]One (1) indicates highest ranking, four (4) the lowest. Where ties exist, rank is shown as sum of ranks as if no tie divided by n.

an area of interest are presented in Tables 4-13 through 4-15. Ranks were developed by qualitatively summing the topic evaluations under each criterion. The rationale for the evaluation rankings for each area of interest are presented below.

4.1 CONTAMINATED SOIL ON NWP SITE

The no-action alternative (Alternative 1) receives the lowest ratings for six of the nine criteria because the on-site contaminants are not removed, treated, contained, or immobilized. Controlling access through fencing and warning signs will reduce public exposure through direct ingestion, but NWP workers are still directly exposed and the public is still at risk through inhalation of contaminated particulates.

The rankings of the two capping alternatives (reinforced concrete and asphalt) were very similar for most of the criteria. Although shown as equivalent, capping with asphalt (Alternative 3) may have slightly better short-term effectiveness since it can be completed somewhat faster than concrete capping. The concrete cap ranks higher on long-term effectiveness and permanence since it is more resistant to cracking, weathering, and use by heavy trucks (assuming the present site usage as a wood treatment facility continues). The asphalt cap is slightly less expensive (present worth) because of its lower capital cost, but maintenance costs will be higher than for the concrete cap. Finally, the concrete cap will probably be more acceptable to the state because of its permanence and lower maintenance requirements.

Excavation and landfill (Alternative 4) appears to be the best alternative in terms of compliance with ARARs, overall protection, reduction of toxicity, and long-term effectiveness. However, because of the large volume of contaminated soil that must be removed and trucked to a landfill, it is rated fourth in terms of short-term effectiveness, implementability, and cost. The estimated cost for this alternative is over $19 million, 20 times more than either of the capping alternatives. Because the entire excavation and backfill process will create a potential hazardous dust problem for more than a year, there are increased short-term risks to the community, workers, and the environment.

4.2 LIQUID EFFLUENT AT NAYLORS RUN CATCH BASIN

Rankings of the three remediation alternatives for the storm drain effluent into the Naylors Run catch basin follow a consistent pattern. For six of the nine criteria, the highest-to-lowest rankings were: Alternative 3 (optimum oil/water separator), Alternative 2 (present system), and Alternative 1 (no action). For short-term effectiveness Alternatives 2 and 3 tied for first and the no-action alternative was third. The implementability criterion displayed a pattern opposite to that seen in the majority of criteria, but all alternatives are readily implementable. Capital costs for all three alternatives include the cost of a one-time sampling of the sediment, water, and biota in Naylors Run as recommended in Chapter 5. Alternatives 1 and 2 have no other capital costs, but do have estimated monitoring costs greater than Alternative 3 - optimum oil/water separator. The three present worth cost estimates are between $275,000 for No Action and $665,000 for the oil/water separator.

4.3 CONTAMINATED WASTE FROM TANKS AND DRUMS

Two remediation alternatives are evaluated for the contaminated waste:

- Alternative 1 - Landfill of soil and oily debris and on-site carbon adsorption of aqueous waste
- Alternative 2 - Landfill of soil and oily debris and off-site treatment of aqueous waste

The two alternatives are functionally similar in that both will landfill the solids and treat the liquid waste. Consequently, the rankings are similar. No difference is perceived for five of the criteria, and only limited differences are seen in the remaining four criteria.

Alternative 2 is ranked first for short-term effectiveness, implementability, and public acceptance. This is because the aqueous waste will be removed from the site for treatment instead of being treated on site. Waste cleanup will be completed sooner, and there will be no discharge to Naylors Run that would require effluent characterization and possibly a NPDES permit application. The Alternative 1 estimated costs are slightly less than those for Alternative 2. However, the cost estimate for on-site carbon adsorption includes more unknown factors and could eventually exceed the estimated costs for off-site treatment.

CHAPTER 5

RECOMMENDED ALTERNATIVES

Following are the recommended remediation alternatives for the three areas of interest addressed in the focused feasibility study. Other recommendations are made regarding additional analyses, the results of which would be used to confirm the adequacy of the recommended alternatives and to provide information on areas not addressed in the FFS.

5.1 CONTAMINATED SOIL ON NWP SITE

The recommended remediation alternative for contaminated soil on the NWP site is capping with reinforced concrete and monitoring the groundwater (Alternative 3). This recommendation is made based on two assumptions:

- The site will continue to be used for commercial/industrial purposes that will generate truck traffic.
- Excavation of site soils to remove contamination will not be undertaken in the foreseeable future.

If excavation of the contaminated soil in the near future were a definite possibility, the better alternative would be the asphalt cap since it would be much easier than reinforced concrete to remove and dispose of. The reinforced concrete cap would probably be the recommended alternative, however, even if truck traffic were not anticipated since the total costs for the two caps (concrete and asphalt) are similar, and the concrete cap is anticipated to have better long-term integrity.

While excavation of the soil will remove a primary source of the contamination, it is not recommended because of its very high cost and the tight excavation and landfill schedule imposed by the PCP land ban expected to take effect in November 1990. Over 45,000 yd^3 of contaminated soil would take approximately one year to excavate, necessitating start-up by November 1989.

5.2 LIQUID EFFLUENT AT NAYLORS RUN CATCH BASIN

The recommended alternative for remediation of the storm drain effluent to Naylors Run is the installation and operation of a state-of-the-art, i.e., optimum, oil/water separator (Alternative 3). Such separators, which are commercially available, are used in petroleum distribution and transportation facilities and in a variety of other industrial and military operations. Of the three alternatives, only the oil/water separator complies with ARARs and provides overall, long-term protection to humans.

Installation of a carbon adsorption air treatment unit is not considered necessary since the oil/water separator is a closed vessel with only a small vent from which VOCs could be released. Also, since the existing risk due to inhalation of organics from the catch basin at the two residences nearest to the basin is based on limited empirical data, it is recommended that the following additional investigations be conducted in the area of the catch basin to provide predesign data:

- Measurement of flow volumes from the stormwater pipe draining the NWP site area and in Naylors Run
- Air sampling for VOCs near the catch basin
- Water and oil sampling within the catch basin for PCP, VOCs, and other contaminants of concern

The results of the analyses will be essential in determining the proper size for the oil/water separator and its adequacy for air treatment.

5.3 CONTAMINATED WASTE FOR TANKS AND DRUMS

The recommended alternative for cleaning up the contaminated waste staged on site is Alternative 2 - landfill of soil and oily debris and off-site treatment of aqueous waste. While the two alternatives evaluated are similar, off-site treatment of the liquid waste is recommended for two reasons:

- It can be implemented more readily; a carbon adsorption unit does not have to be brought on site, effluent testing is not required, and a NPDES permit is not needed.

- Off-site treatment will not require discharging of effluent (albeit treated) to Naylors Run and therefore will be more acceptable to the community.

5.4 OTHER RECOMMENDATIONS

The FFS has concentrated on three areas of interest at the Havertown PCP site:

- On-site contaminated soils
- Oil/water effluent at Naylors Run
- Contaminated waste from tanks and drums

The risk assessment prepared by GPG (1989) and summarized in Section 1.3 included these areas in addition to the contaminated sediments in Naylors Run. The risk assessment for the sediments, which was based on limited data collected in 1987 before installation of the catch basin, indicates a potential health risk of 7×10^{-6} from ingestion of contaminated sediments. This risk is second only to the 8×10^{-6} cancer risk from ingestion of on-site soils.

It is recommended that sediments in Naylors Run upstream, adjacent to, and downstream of the catch basin be sampled and analyzed for PCP, metals, PAHs, and grain size to better determine the extent of contamination. Sufficient samples should be collected so that estimates of the longitudinal and vertical extent of contamination can be prepared. Further, it is recommended that the risk assessment for the sediments be revised using these more complete data. A feasibility study focusing on the sediments in Naylors Run should be conducted to select the best alternative for remediating the contaminated sediments in the creek.

It is recommended that further investigation into source removal of the free-phase floating product (oil containing the PCP) be conducted. This would involve additional investigation into the best techniques and locations to remove the oil containing the PCP before it gets to the storm sewer. The combination of a viable source removal technique with the oil/water separator proposed in this FFS would reduce the time required to clean up the oil. It is also recommended that further studies be undertaken to determine the sources of groundwater contaminants that cannot be attributed to the NWP facility.

As described in Chapter 1, it was assumed that the levels of total chromium on site were all chromium VI for the purposes of estimating risk. It is recommended that additional soil analyses be conducted to determine the actual levels of chromium VI across the entire NWP site. If additional testing determines that hexavalent chromium is a small percentage of the total chrome, then PADER may reevaluate its position on treatment alternatives for the site.

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