RECORD OF DECISION
FOR THE
TRANSFORMER STORAGE AREA
AT
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

Prepared for

Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Prepared by

CH2M HILL
Reston, Virginia

Contract
N62470-90-D-7660

December 1991

CONTENTS

CONTENTS (Continued)

WDCR577/018.51

Section 1
INTRODUCTION

CH2M HILL was contracted by the Naval Facilities Engineering Command, Atlantic Division (LANTDIV) to prepare this Record of Decision (ROD) for the Transformer Storage Area (TSA) located at the Norfolk Naval Base, Norfolk, Virginia. This ROD presents the final selected remedial action for the TSA developed in accordance with the U.S. Environmental Protection Agency's (EPA) "Guidance for Conducting Remedial Investigation/Feasibility Studies under CERCLA" (October 1988 Interim Final).

The ROD is organized into five sections. Section 1 includes the introduction and site background. Section 2 summarizes the Remedial Investigation performed by CH2M HILL. The remedial alternative objectives are presented in Section 3. The Feasibility Study is summarized in Section 4 and the preferred alternative is described in Section 5.

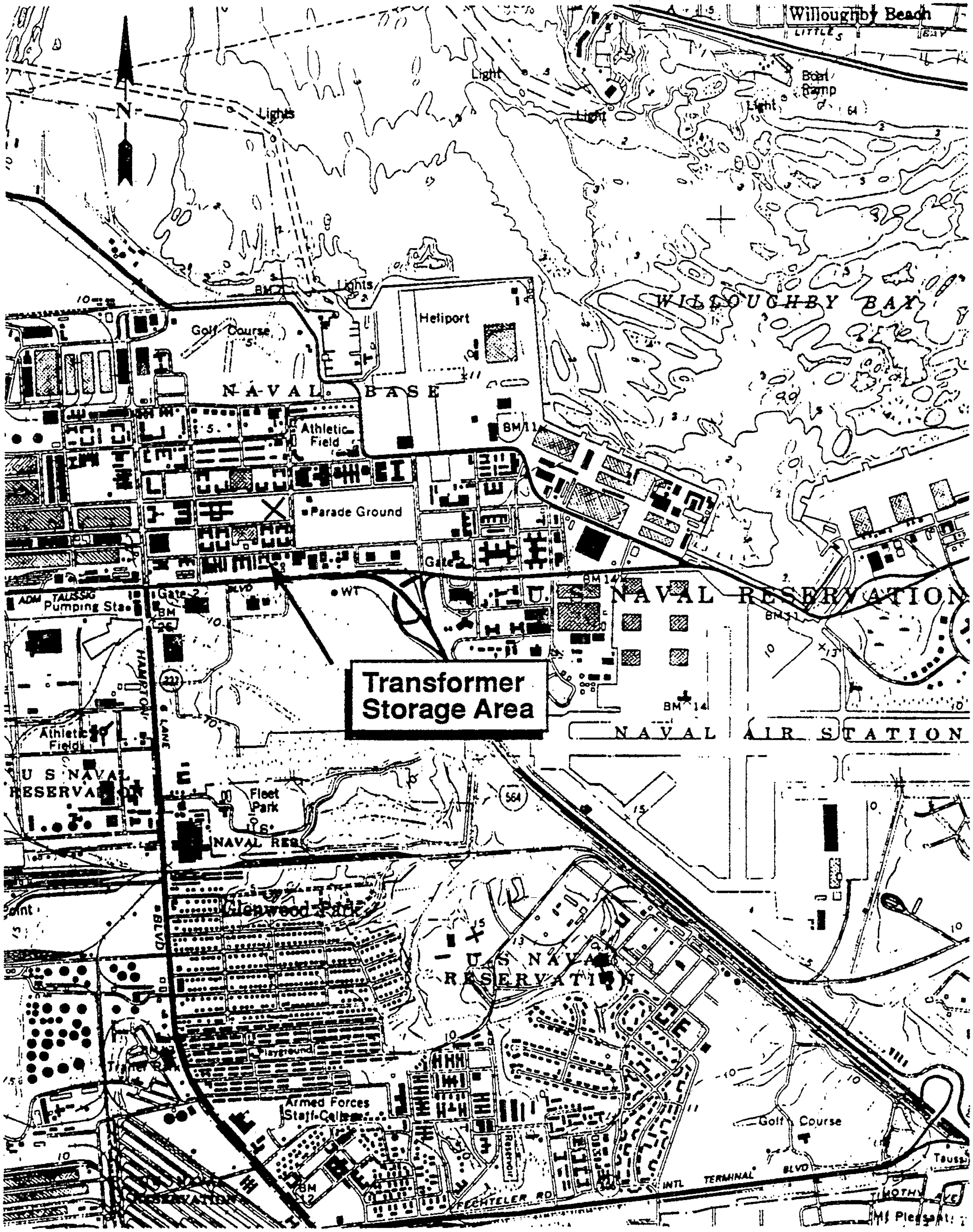
SITE BACKGROUND

Figure 1-1 shows the location of the TSA at the Norfolk Naval Base (NNB). The TSA was reportedly used to store out-of-service and new transformers from the 1940s until 1978. The out-of-service transformers were reportedly drained onto the open ground at the TSA. Much of the area is currently covered with gravel and some of the surface soils appear to be stained. The transformers stored during this period were vintage 1940s and 1950s and, therefore, it is expected that they contained PCBs.

The TSA is located south of Piersey Street, adjacent to tank P-78, and includes building 73 (Figure 1-2). Previous investigations performed under the Installation Restoration Program (IRP) include the Initial Assessment Study (IAS) and a Remedial Investigation-Interim Report (interim RI). The Navy completed the first phase of the IRP and summarized the results in an IAS report dated February, 1983. The IAS is similar to a Preliminary Assessment conducted by EPA under the Superfund Program. The IAS concluded that sufficient evidence existed supporting the possible presence of PCBs at the TSA which may pose a threat to public health or the environment. Consequently, a confirmation study, or interim RI, was completed in March 1988 by Malcolm Pirnie, Inc., under contract to the Navy.

The interim RI summarized fieldwork and analytical results, and recommended a remedial action for the TSA. The interim RI fieldwork involved two separate soil sampling events. The first sampling event occurred in November 1983 and included the drilling of 27 hand-augered soil borings to a depth of 5 feet. A total of 60 grab soil samples were collected from these borings. A second soil sampling event was conducted in August 1984 to further determine the extent of PCB contamination. This involved the

WDC30868.DO.01

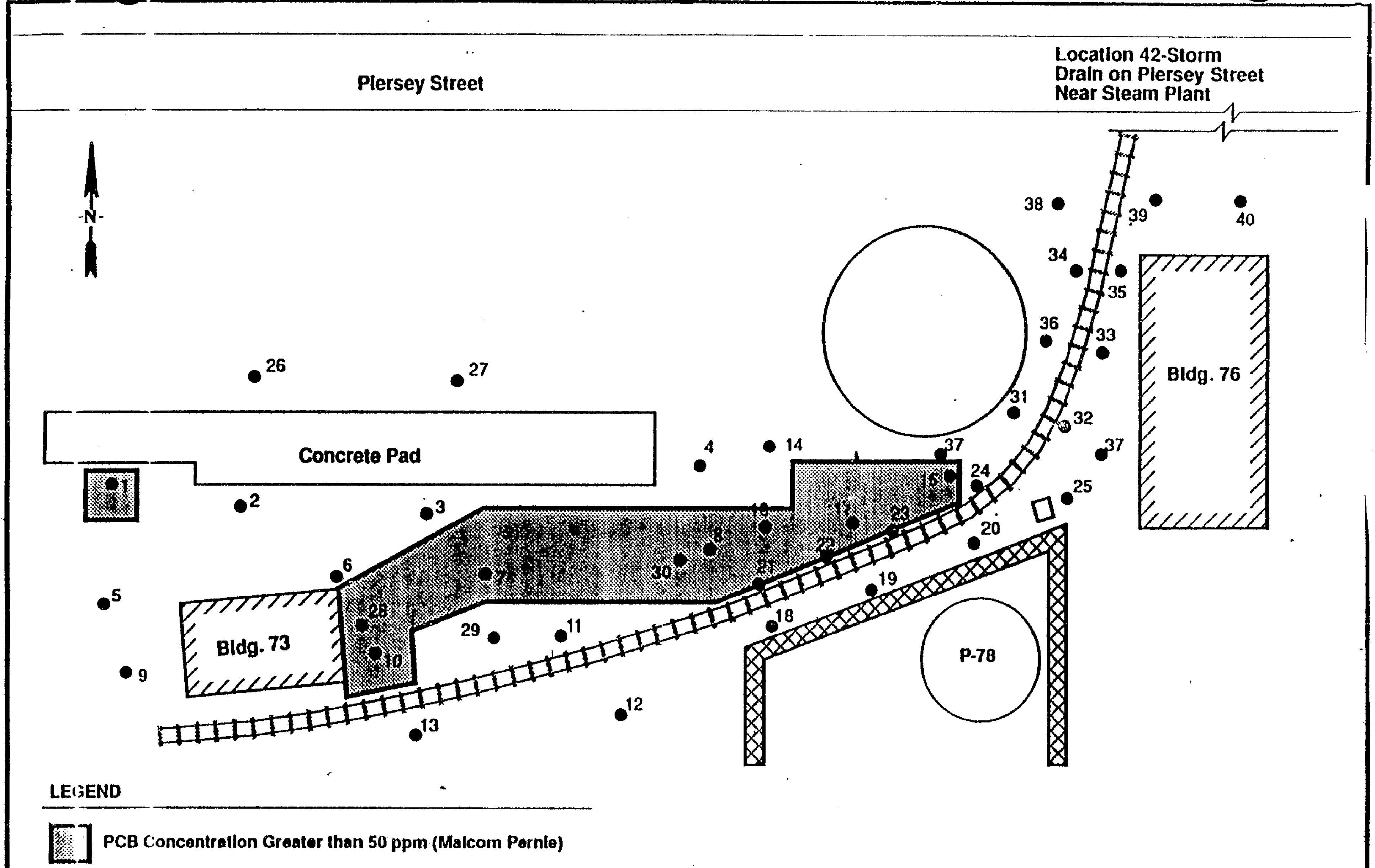


Source: U.S. Geological Survey Norfolk North Quadrangle Revised, 1986

Scale: 1" = 2000'

Figure 1-1
SITE LOCATION MAP
TRANSFORMER STORAGE AREA
Norfolk Naval Base

CH2M HILL



Approximate Scale 1" = 40'

Source: Remedial Investigation-Interim Report, Malcolm Pirnie, March 1988.

Figure 1-2
SITE SCHEMATIC
TRANSFORMER STORAGE AREA
Norfolk Naval Base

CH2M HILL

NBN-00423-06.04-12/01/91

drilling of an additional 18 hand-augered soil borings to a depth of 5 feet. A total of 65 additional grab soil samples were collected from these borings. All soil samples collected in both sampling events were analyzed for PCBs. Figure 1-2 shows the location of 42 soil borings and Table 1-1 presents the analytical results. It is important to note that although the interim RI indicated that a total of 45 borings were drilled, only 42 locations were shown in the interim RI with corresponding analytical results.

Review of the analytical results presented in Table 1-1 indicates elevated levels of PCBs in soils at the TSA. Surface soils (zero to 1 foot) exhibited the highest average PCB concentrations with the most frequent occurrence of PCBs. All other soil samples collected between 1 and 5 feet below grade contained PCB concentrations below 10 mg/kg with the exception of soil borings 7, 10, 15, 19, 21, 22, and 29.

Data generated from the fieldwork conducted in February 1983 and August 1984 were used in the interim RI to define areas of soil contamination. The interim RI used these data to delineate areas with 50 mg/kg or greater of PCBs. Figure 1-2 shows these areas. Currently, these areas are enclosed within a chain-link fence.

WDCR577/019.51

Table 1-1
INTERIM RI SOIL ANALYTICAL RESULTS
CONCENTRATIONS OF AROCLOR 1260 (mg/kg)
TRANSFORMER STORAGE AREA

Sample Location	Sample Depth (Feet)				
	0-1	1-2	2-3	3-4	4-5
04S-01	59	--	2	--	<1 NT
04S-02	9/23	--	--	--	--
04S-03	20	4	--	--	--
04S-04	4	--	1	--	1
04S-05	2	3	--	--	--
04S-06	40	--	6	--	<1 NT
04S-07	93	--	16	--	<1 NT
04S-08	160	--	<1 NT	--	< 1 NT
04S-09	2	--	<1 NT	--	1
04S-10	440	--	66	--	2
04S-11	2	--	2	--	<1 NT
04S-12	6	--	<1 NT	--	<1 NT
04S-13	11	--	<1 NT	--	<1 NT
04S-14	23	--	1	--	<1 NT
04S-15	52	12	--	--	--
04S-16	16	--	1	--	<1 NT
04S-17	57	--	1	--	<1 NT
04S-18	<1 NT	--	<1 NT	--	<1 NT
04S-19	45	42	--	--	--
04S-20	17	--	--	--	--
04S-21	88/45	85	<1 T	7200	7800
04S-22	890/29	300	<1 NT	<1 T	<1 NT
04S-23	770/160	1	1	<1 NT	<1 NT
04S-24	35	--	--	--	--

Table 1-1
INTERIM RI SOIL ANALYTICAL RESULTS
CONCENTRATIONS OF AROCLOR 1260 (mg/kg)
TRANSFORMER STORAGE AREA

Sample Location	Sample Depth (Feet)				
	0-1	1-2	2-3	3-4	4-5
04S-25	--	2	--	--	--
04S-26	1	--	--	--	--
04S-27	2	--	--	--	--
04S-28	240	<1 T	<1 T	<1 T	<1 NT
04S-29	7	15	<1 NT	1	<1 NT
04S-30	200	6	1	1	<1 NT
04S-31	2	1	<1 NT	<1 NT	<1 NT
04S-32	1	<1 T	<1 T	--	--
04S-33	2	1	<1 NT	<1 NT	<1 NT
04S-34	<1 T	<1 NT	<1 NT	<1 NT	<1 NT
04S-35	<1 T	<1 T	<1 NT	<1 NT	<1 NT
04S-36	1	1	--	--	--
04S-37	34	5	--	--	--
04S-38	<1 T	<1 T	--	--	--
04S-39	<1 T	<1 T	--	--	--
04S-40	<1 T	<1 T	--	--	--
04S-41	<1 NT	--	--	--	--
04S-42	<1 NT	--	--	--	--

Notation: NT = No Trace
T = Trace
-- = No Sample Taken
9/23 = Two Samples Taken

Source: *Remedial Investigations - Interim Report*, Malcolm Pirnie, Inc., March 1988.

Section 2
SUMMARY OF REMEDIAL INVESTIGATION

On February 6 and 7, 1991, CH2M HILL collected soil samples and installed three groundwater monitoring wells (MW-1, MW-2, and MW-3) at the TSA. Groundwater monitoring wells MW-4 and MW-5 were installed on June 3, 1991. Groundwater samples were collected from the wells by CH2M HILL on March 22, June 11, and June 18, 1991. All groundwater and soil samples were analyzed for PCBs using EPA Method 8080 and EPA Method 608.

SOIL INVESTIGATION

A total of 37 soil samples were collected at the TSA. Twenty-eight surface soil samples were collected between the 0- to 1-foot depth interval. Sample numbers 13-18, 22, 30, and 32 were collected at greater depths. Samples 14, 15, 17, and 18 were the only soil samples collected that were saturated with groundwater. The soil sample locations and analytical results are shown graphically in Figure 2-1.

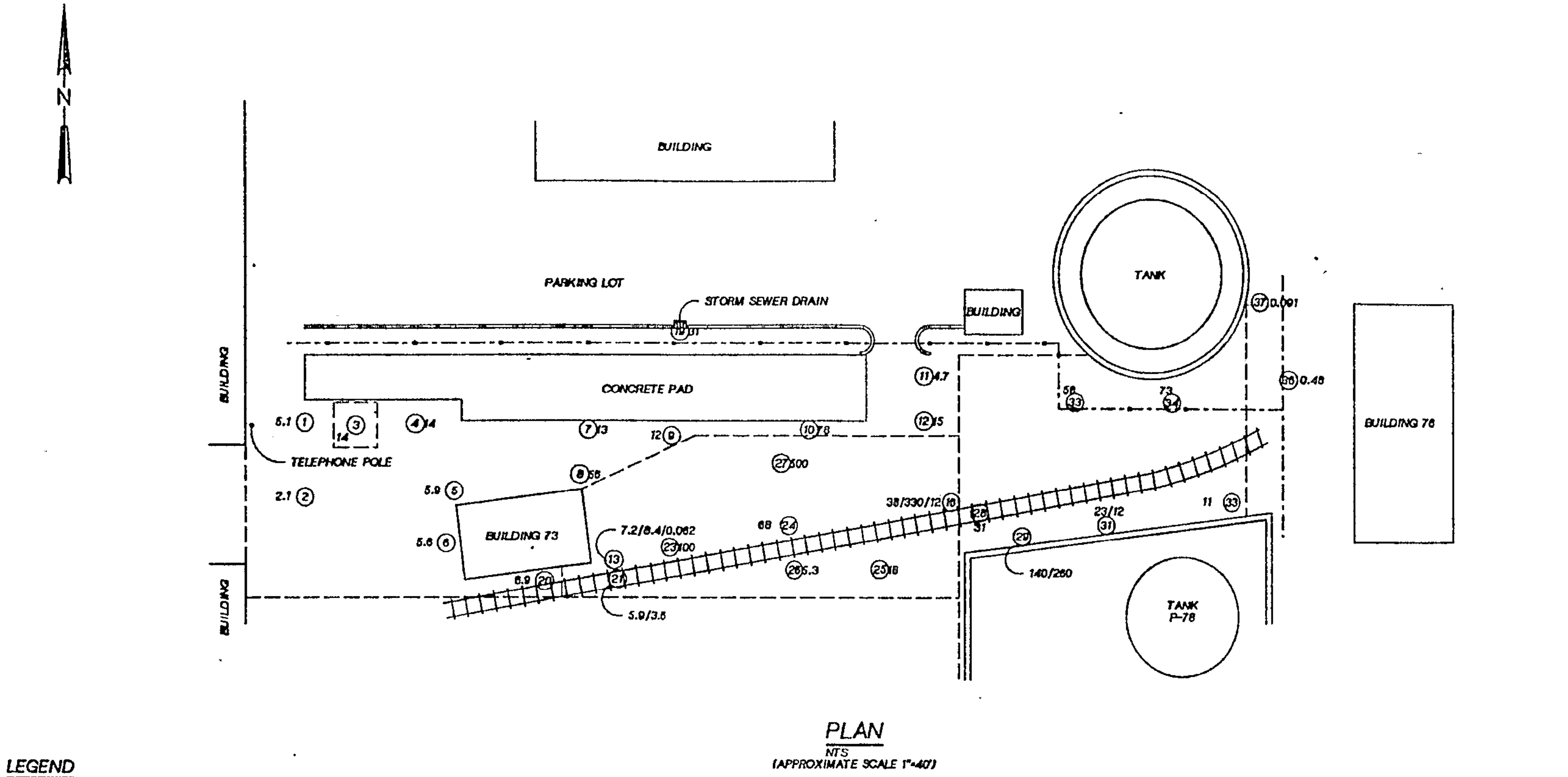
Aroclor 1260 was the only PCB Aroclor that was detected in any of the soil samples. It appears that detectable levels of this PCB are present across the entire site. Of the 37 soil samples collected, 21 contained PCB concentrations greater than 10 mg/kg, 10 had concentrations greater than 50 mg/kg, and 5 exceeded concentrations of 100 mg/kg. Of the seven soil samples collected at depths greater than 1 foot below grade, four of these samples contained PCB concentrations greater than 10 mg/kg. Sample 17 collected from the 3- to 5-foot depth interval during the installation of MW-2 contained 330 mg/kg of PCBs. Sample 30 collected from the 1- to 2-foot depth interval contained PCB concentrations of 260 mg/kg. Overall, the analytical results from the RI agree with those collected during the interim RI.

The approximate areal extent and depth of contamination equal to or greater than 10 mg/kg of PCBs is approximately 14,600 square feet, or 0.335 acres, giving a total volume of approximately 1,200 cubic yards of PCB-contaminated soil.

GROUNDWATER INVESTIGATION

The groundwater investigation was comprised of two phases. Phase I involved the installation and groundwater sampling of monitoring wells MW-1, MW-2, and MW-3. As a result of PCBs detected in groundwater samples collected from MW-1 and MW-2 during Phase I, Phase II of the groundwater investigation was performed. Phase II included the installation of MW-4 and MW-5 and sampling of all five wells.

NBN-00423-06.04-12/01/91



LEGEND

- CHAIN-LINK FENCE
- PIPE BRIDGE
- CONCRETE POSTS
- (1) 5.1— SAMPLE NUMBER 1 WITH 5.1 ppm PCB
- (13) 7.2/8.4/0.062— SAMPLE NUMBER 13 WITH 7.2 ppm PCB
  SAMPLE NUMBER 14 WITH 8.4 ppm PCB
  SAMPLE NUMBER 16 WITH 0.062 ppm PCB

NOTE 1 SAMPLE NUMBERS 14 AND 15 ARE AT THE SAME LOCATION AS 13.
SAMPLE NUMBERS 17 AND 18 ARE AT THE SAME LOCATION AS 16.
SAMPLE NUMBER 22 IS AT THE SAME LOCATION AS 21.
SAMPLE NUMBER 30 IS AT THE SAME LOCATION AS 29.
SAMPLE NUMBER 32 IS AT THE SAME LOCATION AS 31.

FIGURE 2-1
RI SOIL SAMPLE LOCATIONS AND ANALYTICAL RESULTS
TRANSFORMER STORAGE AREA
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

CH2M HILL

Well installation during Phase I occurred on February 6 and 7, 1991. Each well was installed to a depth of 7 feet. During well installation, groundwater was encountered at an approximate depth of 3 feet below grade in each of the wells. A stiff, black clay was encountered at roughly 7 feet below grade during the installation of MW-1 and MW-2.

As with the soil samples, Aroclor 1260 was the only PCB Aroclor detected in the groundwater samples. Figure 2-2 gives the well locations and analytical results of groundwater samples. Samples obtained from MW-1 and MW-2 contained PCB concentrations of 1.2 (1.6 duplicate) and 5.6 μg/L. Analysis of the groundwater sample collected from MW-3 indicated PCB concentrations of less than 0.2 μg/L. Hence, PCBs were only detected in the onsite wells. Water level measurements recorded on March 22, 1991, indicate local groundwater movement is in a northeastern direction.

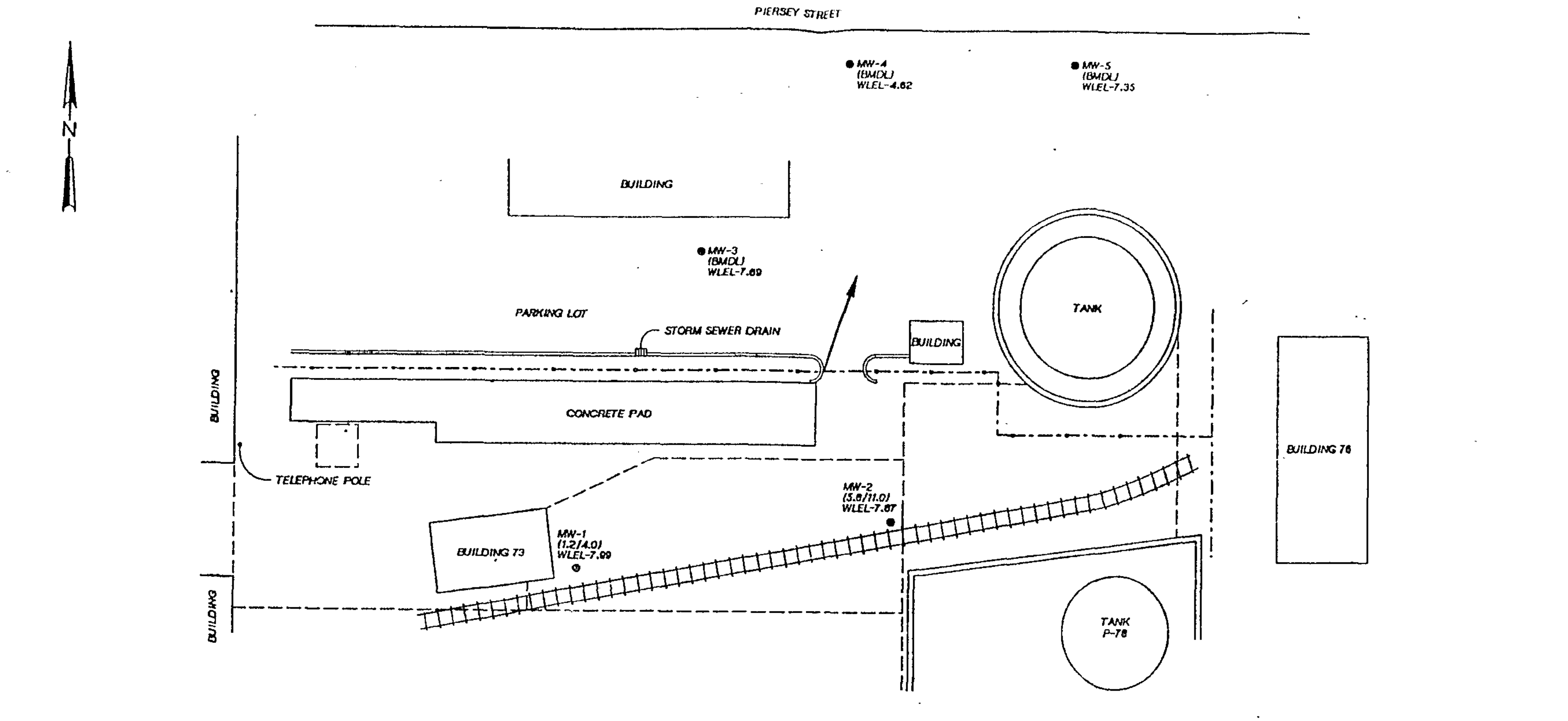
The objective of Phase II of the groundwater investigation was to determine if PCB groundwater contamination detected onsite had migrated into offsite groundwater. Therefore, MW-4 and MW-5 were installed hydraulically downgradient of the site and all five wells of the TSA were sampled and samples were analyzed for PCBs. MW-4 and MW-5 were installed to depths of 8.5 and 8 feet below grade, respectively. During well installation, groundwater was encountered at a depth of 4 feet in MW-4 and 2 feet in MW-5. A stiff, black clay was encountered at roughly 8 feet below grade in both of the wells. Water level measurements taken on June 23, 1991, are presented graphically in Figure 2-2. The water level measurements indicate local groundwater movement is in a northeastern direction.

Figure 2-2 gives the analytical results of groundwater samples collected during Phase II. Samples collected from MW-1 and MW-2 show an increase in PCB concentration detected compared to samples collected from these wells during Phase I. Analytical results of samples collected from wells MW-3, MW-4, and MW-5 situated hydraulically downgradient from the site indicate PCB concentrations of less than 0.2 μg/L for each sample. This indicates that PCB contamination detected in onsite groundwater has not migrated to offsite groundwater at these well locations.

BASELINE RISK ASSESSMENT

The only contaminant detected in soil and groundwater samples collected at the site is PCB, Aroclor 1260. According to EPA classification, PCBs are probable human B2-carcinogens. Exposure to PCBs occurring in soil and groundwater at the TSA may involve human health risks to the public.

PCBs are stable, immobile, hydrophobic compounds. As with all PCBs, physical properties of Aroclor 1260 indicate that it is unlikely that exposure through inhalation of vapors or extensive migration of Aroclor 1260 (via groundwater) will occur. PCBs adsorb very readily to soils and prefer the solid phase. Consequently, exposures are more likely to occur through inhalation of particulates, ingestion or dermal absorption.



PLAN
NTS
(APPROXIMATE SCALE 1"=40')

LEGEND

- CHAIN-LINK FENCE
- PIPE BRIDGE
- CONCRETE POSTS
- MONITORING WELL LOCATION
- (1.2/4.0) — PCB CONCENTRATION OF 1.2 MICROGRAM/L COLLECTED ON 3/22/1991 AND 4.0 MICROGRAM/L COLLECTED ON 6/11/1991.
- (BMDL) — PCB CONCENTRATION BELOW METHOD DETECTION LIMIT OF 0.2 MICROGRAM/L.
- WLEL — WATER LEVEL ELEVATION MEASURED ON 6/25/1991. (MEAN LOW WATER)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

FIGURE 2-2
PCB CONCENTRATIONS AND WATER LEVEL MEASUREMENTS IN MONITORING WELLS
TRANSFORMER STORAGE AREA
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

CH2M HILL

Table 2-1 presents risks associated with the ingestion and dermal absorption of PCBs in soils and the ingestion of PCBs in drinking water. Risks associated with inhalation of particulates were not calculated since ingestion of soil is considered to represent the worst case scenario. The risks given for soil ingestion and dermal absorption from soil were calculated using standard default exposure factors recommended by EPA (EPA, 1991). The risks given for drinking water were taken directly from the EPA's "Integrated Risk Information System" (IRIS), 1990.

PCB concentrations detected in onsite soil and groundwater exceed the risk levels presented in Table 2-1. Consequently, the site-specific remedial action objectives for PCB-contaminated soil and groundwater at the TSA are to:

- Control or prevent future or continued PCB contamination of groundwater from PCB-contaminated soils
- Control or prevent future exposure of the public and the environment to PCB-contaminated soils and groundwater

WDCR577/021.51

Table 2-1
RISK LEVELS FOR PCBs IN SOIL AND DRINKING WATER

Risk Level	PCB Concentration
Drinking Water:*	
10^{-6} (1 in 1,000,000)	5 x 10^{-3} μg/L
10^{-5} (1 in 100,000)	5 x 10^{-2} μg/L
10^{-4} (1 in 10,000)	0.5 μg/L
Soil Ingestion (50 mg/day):+	
10^{-6} (1 in 1,000,000)	0.743 mg/L
10^{-5} (1 in 100,000)	7.43 mg/L
10^{-4} (1 in 10,000)	74.3 mg/L
Dermal Absorption from Soil:+	
10^{-6} (1 in 1,000,000)	0.03 mg/L
10^{-5} (1 in 100,000)	0.30 mg/L
10^{-4} (1 in 10,000)	3.03 mg/L

*Source - EPA, IRIS, January 1990
+Calculated risk level using exposure scenario detailed in RI/FS.

WDCR577/021.51

Section 3
REMEDIAL ALTERNATIVE OBJECTIVES

The primary objectives of the remedial action selected is to provide a level of remediation that is protective of human health and the environment and that satisfies applicable or relevant and appropriate requirements (ARARs). In addition, the remedial action objectives are formulated to address not only short-term or immediate health risks but also long-term risks. Therefore, further removal, containment, or treatment of the site should not be required after the remedial action is complete. The most important component of the remedial action is the definition of the target cleanup level. The target cleanup level will not only dictate the extent of contamination that must be addressed, but will influence the selection of alternatives that may be employed at the site.

The site-specific remedial action objectives for PCB-contaminated soil and groundwater at the TSA are to:

- Control or prevent future or continued PCB contamination of groundwater from PCB-contaminated soils

- Control or prevent future exposure of the public and the environment to PCB-contaminated soils and groundwater

The determination of a cleanup level for PCBs in soils at the TSA is relatively straightforward and regulatory based. PCBs are regulated under the Toxic Substances Control Act (TSCA). Regulations relating to the cleanup of PCB spills are contained in 40 CFR Part 761 Subpart G. However, as discussed in Part 761.120, the PCB spill cleanup policy does not apply to spills that occurred prior to May 4, 1987. Spills that occurred before this effective date are to be remediated to levels established at the discretion of the Regional EPA and the affected state. However, the state of Virginia does not have its own regulations for PCB cleanup and simply references EPA or Federal regulations.

The Hazardous Site Control Division (HSCD) of the EPA Office of Emergency and Remedial Response (OERR) published "A Guide on Remedial Actions at Superfund Sites with PCB Contamination" August 1990. The guidance recommends soil action levels for industrial areas should be established within the range of 10 to 25 mg/kg. The appropriate concentration within the range depends on site-specific factors that effect exposure assumptions. In other words, sites where exposures are limited or where soil is already covered by a barrier (asphalt, concrete), then PCB action levels near the high end of the 10 to 25 mg/kg range may be protective of human health and the environment.

Regarding PCB contamination of groundwater, EPA guidance suggests that if the contaminated groundwater is or may be used for drinking water, then remedial actions that return the groundwater to drinkable levels should be considered. Therefore, maximum contaminant level goals (MCLGs) or maximum contaminant levels (MCLs) should be attained in groundwater where relevant and appropriate. The proposed MCL and MCLG for PCBs in drinking water are 0.5 and 0 μg/L, respectively. Given that PCBs are relatively immobile, their occurrence in groundwater likely results from the presence of solvents or the movement of colloidal particles. The fact that the Aroclor 1260 PCB concentration detected in MW-2 (11.0 μg/L) is more than four times the congeners average solubility (2.7 μg/L) indicates that some of the PCBs detected may have been originally adsorbed to colloidal particles. Consequently, the effectiveness of extracting PCB contaminated groundwater may be limited.

EPA guidance suggests that "In some cases, an ARAR waiver for the groundwater may be supported based on the technical impracticability of reducing PCB concentrations to health-based levels. Access restrictions to prevent the use of contaminated groundwater and containment measures to prevent contamination of clean groundwater should be considered in these cases."

ARARs associated with remedial actions, or "action-specific ARARs," are listed in Table 3-1. Disposal or treatment of PCB contaminated soils are the two likely general remedial actions at the TSA.

WDCR542/055.51

Table 3-1 ACTION-SPECIFIC ARARs				
Action	**Requirement**	**Prerequisite**	**Citation**	**Comments**
Disposal	Non-liquid hazardous waste with total halogenated organic carbon (HOCs) greater than 1,000 ppm cannot be disposed in RCRA landfill.	Must be a RCRA hazardous waste.	40 CFR 268.32	Soils at TSA are not RCRA hazardous wastes. Soil concentrations detected in RI are all below 1,000 ppm.
Treatment	Provides treatability variance; PCB concentrations in soil must be reduced to 1 to 10 ppm for initial concentrations up to 100 ppm; above 100 ppm, treatment should achieve 90 to 99% reduction of PCBs.	Must be CERCLA soil and debris.	40 CFR 268.44	Soils at TSA contain concentrations greater than 100 ppm. Treatment technology must achieve 90 to 99% reduction.

Section 4
SUMMARY OF FEASIBILITY STUDY

The remedial technologies and process options retained after screening and evaluation in the Feasibility Study were combined to form three remedial alternatives that address the remedial action objectives. EPA evaluation criteria were used for this evaluation.

EVALUATION CRITERIA

The remedial alternatives were evaluated using a detailed analysis involving nine criteria as specified by EPA. These nine criteria include the following:

- **Overall protection of human health and the environment**—This is a check to assess whether an alternative meets the requirements that it be protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

- **Compliance with ARARs**—This criterion gauges the degree of compliance of each alternative with applicable or relevant and appropriate federal and state requirements, as defined in CERCLA Section 121.

- **Long-term effectiveness and permanence**—This criterion gauges results of a remedial action in terms of how much risk remains at the site after response objectives have been met. The focus of this evaluation is on the effectiveness of the controls in managing risks posed by treatment residuals or untreated wastes.

- **Reduction of toxicity, mobility, and volume**—This criterion reflects statutory preference for remedies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substance. This preference is satisfied when treatment reduces the principal threats at the site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

- **Short-term effectiveness**—This criterion gauges the impact an alternative will have during construction and implementation, up until the time remedial response objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action and until protection is achieved.

- **Implementability**—This criterion gauges technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. It also evaluates the compatibility of the alternative with potential future actions to be implemented at the site that address other areas or sources of contamination.

- **Cost**—This criterion gauges the capital costs, annual operation and maintenance (O&M) costs, and total present worth of each alternative. The cost estimates are considered order-of-magnitude level and are expected to be accurate within +50 to -30 percent for the identified scope of the remedial action.

- **State acceptance**—This criterion takes into consideration the position and key concerns of the state regarding the preferred alternative and other alternatives and the state's comments on ARARs or the proposed use of waivers.

- **Community acceptance**—This criterion gauges support, opposition, and reservations of interested persons in the community to components of the remedial alternatives.

DETAILED EVALUATION OF ALTERNATIVES

Each of the three alternatives is described and evaluated according to the seven criteria established under SARA.

ALTERNATIVE 1—NO ACTION

Under this alternative, no removal or treatment of PCB-contaminated soil or groundwater will be performed. The PCB-contaminated soils will remain in place and the dissolution of PCBs into groundwater will continue unmitigated.

This alternative includes the continuance of site security consisting of fencing and sign posting. Deed restrictions would be employed, preventing future use of the site. The no-action alternative would also include long-term monitoring involving the semi-annual sampling of the existing groundwater monitoring wells.

Under this alternative, contaminants would remain onsite and the site data would be reviewed every five years. If justified by the review, remedial actions could be taken in the future to remove the PCB-contaminated soil or groundwater.

Overall Protection of Human Health and the Environment

Because the no-action alternative includes no removal, treatment or disposal of PCB-contaminated soil or groundwater, it would not contribute to protection of human health and the environment beyond deterring entry to the site and thus minimizing direct contact with PCB-contaminated soil. There would not be any immediate reduction in the risk associated with the toxicity, mobility, or volume of PCB-contaminated soil or groundwater.

Compliance with ARARs

The no-action alternative would not comply with the EPA recommended cleanup levels of 10-25 mg/kg for PCB-contaminated soils at CERCLA sites. In addition, proposed MCLs of 0.5 mg/L would not be satisfied. All action-specific ARARs would be met since no-actions would occur.

Long-Term Effectiveness and Permanence

Under this alternative, PCB-contaminated soils would continue to be a potential source of further soil and groundwater contamination and remain a potential threat to human health and the environment. Consequently, this alternative would require long-term groundwater sampling and monitoring.

Reduction of Toxicity, Mobility, or Volume

With this alternative, no reduction of toxicity, mobility, or volume of PCB-contaminated soil or groundwater would occur.

Short-Term Effectiveness

This alternative would pose no additional risks to the community during implementation because no direct action would be taken.

Implementability

The technical implementability of this alternative is good. Technical actions would involve continued groundwater monitoring. If it was determined by a five-year review that additional work is required, the implementation of this alternative would not restrict or complicate future remedial actions.

Administrative actions, such as deed restrictions, would require some coordination among federal, state, and local authorities.

Cost

There are no capital costs associated with this alternative. Annual O&M costs for semiannual groundwater monitoring is estimated at $2,600 per year. This includes two sampling events each year and collection and analysis of one groundwater sample from MW-3, MW-4, and MW-5. In addition, a duplicate, matrix spike and a matrix spike duplicate will be collected and analyzed for a total of six samples. The total present worth of this alternative is $40,000 at a 5 percent discount rate over a 30-year period.

ALTERNATIVE 2—EXCAVATION AND DISPOSAL

This alternative involves the excavation and removal of PCB-contaminated soils containing greater than 10 mg/kg of PCBs. Onsite preliminary confirmatory sampling will be performed to determine if removal is complete and an offsite laboratory will be used to verify analytical results generated by the mobile laboratory. All excavated soils will be disposed of in a TSCA-permitted landfill.

It is anticipated that some PCB-contaminated soils requiring excavation occur below the water table and will be dewatered by placing a sump pump in the excavation. All groundwater generated from this action will be treated with either onsite carbon adsorption units or discharged to a RCRA-permitted wastewater facility.

Dust control, air monitoring, and stormwater management and erosion control measures will be implemented during removal. Water will be used to suppress dust protecting onsite workers as well as the public and the environment. Opacity meters will be used to determine the effectiveness of dust control. Diversion dikes, silt fences, and straw bales will be used as necessary during excavation and backfilling of soil to prevent offsite migration of PCB-contaminated soil via runoff.

Existing monitoring wells MW-3, MW-4, and MW-5 will be sampled semi-annually and analyzed for PCBs. This will be done in order to detect any future offsite groundwater PCB-contamination.

Overall Protection of Human Health and the Environment

This alternative would protect human health and the environment by excavating and removing the PCB-contaminated soils. Because the PCB-contaminated soils would be removed from the site, the risks of exposure from direct contact and soil ingestion or the risk of continued or future PCB-contamination of groundwater from PCB-contaminated soils would be eliminated. In addition, since groundwater would be removed from the deeper excavations located in areas that include MW-1 and MW-2, it is likely that the most contaminated groundwater will be removed and treated at the site. This will result in the reduction of toxicity, mobility, and volume of PCBs in groundwater at the TSA. However, no reduction in toxicity, mobility, or volume will occur regarding PCBs contained in soils since they will be disposed of at a TSCA-permitted landfill.

Although PCBs are very toxic, they are also very immobile compounds. TSCA landfills are specially designed to contain PCBs and have been proven effective in doing so.

Compliance with ARARs

Alternative 2 complies with all ARARs with the exception of the proposed MCL for PCBs of 0.5 μg/l. However, since the MCL is only proposed and the groundwater at the TSA is not used for drinking water, it is questionable whether the MCL should be an ARAR. In addition, the PCB contamination in groundwater at the TSA will be reduced after dewatering and treatment. Since MW-1 and MW-2 will be removed with this alternative the concentration of PCBs in onsite groundwater after implementation of Alternative 2 will be unknown. However, semiannual sampling of MW-3, MW-4 and MW-5 will detect any future offsite groundwater PCB contamination.

Long-Term Effectiveness

With this alternative little risk to human health and the environment would remain. All soils containing greater than 10 mg/kg of PCBs would be removed. Soils containing less than 10 mg/kg of PCBs would remain. This has been determined by EPA as a recommended cleanup level for industrial areas posing acceptable risks to human health and the environment. (EPA, August, 1990).

Onsite groundwater containing PCBs will be removed and treated during soil excavation. The removal of PCB-contaminated soil will prevent continued or further contamination of onsite groundwater. Since onsite groundwater is not used and no PCB contamination has been detected in offsite groundwater, PCB-contaminated onsite groundwater poses little risk to human health and the environment.

Reduction of Toxicity, Mobility, or Volume

This alternative will reduce the toxicity and volume of PCBs at the TSA in onsite groundwater. All onsite groundwater generated by dewatering during soil excavation will be treated. Any PCBs contained in remaining onsite groundwater will not be treated.

PCBs contained in soils will not be treated. Therefore no reduction in toxicity, mobility, or volume of PCBs contained in soils will occur. However, PCBs are a very immobile compound and excavated soils will be removed and contained in a permitted TSCA landfill.

Short-Term Effectiveness

Alternative 2 includes control, containment, and monitoring methods to protect the community, site workers, and the environment from exposure to PCBs released as a result of its implementation.

The greatest risk to the community and site workers would be exposure to dusts containing PCBs. Dusts will be suppressed using water and monitored with opacity meters. Excavation is not anticipated to require more than one month to complete. Therefore, these risks will be posed for a relatively short time period. Risks to site workers also include dermal absorption through direct contact with PCBs in soil or groundwater. To reduce exposure risks site workers will be outfitted in Level C or D protection as required.

The transport of PCB-contaminated soil or groundwater from the TSA to the TSCA-permitted landfill or RCRA-permitted wastewater facility, respectively, presents a potential pathway for public exposure if an accident were to occur.

Implementability

The technologies and process options included in this alternative have been used at many similar sites and are commercially available. A large number of vendors and contractors would be available to provide competitive bids. Offsite disposal at a TSCA-permitted landfill is commonly used, acceptable, and effective in containing PCB-contaminated soils. The main difficulty anticipated with Alternative 2 is the excavation of soils with underground and aboveground utilities obstructing or interfering with soil removal. However, this is not unusual.

Cost

The total capital cost estimated for this alternative is $856,000. This estimate assumes that an onsite mobile lab will be used for 30 days and 50 confirmatory samples will be sent to an offsite laboratory. A total of 1,200 cubic yards of soil will be excavated. Each cubic yard was estimated to weigh 1.5 tons for a total of 1,800 tons of soil. The unit cost per ton for transportation and disposal (includes tax) were obtained from three TSCA-permitted landfills. These facilities include:

- Chemwaste Management, Model City, NY
- Chemwaste Management, Emelle, Alabama
- U.S. Ecology, Beatty, NV

The average unit cost for these three landfills was calculated to be $340/ton. This was the unit cost used in this cost estimate. A 20 percent contingency was added to the capital cost to account for uncertainties associated with the estimated quantity of soil requiring removal. Assuming that dewatering will only be necessary in excavations greater than 3-feet deep and the soil permeability is 10^{-4} cm/sec, an estimated 500 gallons of groundwater will be generated and require treatment. Annual O&M costs of $2,600 are included for groundwater monitoring as discussed with Alternative 1. A present worth cost of $896,000 is estimated for this alternative, assuming a 5 percent discount rate over a 30-year period. Appendix E includes costing tables summarizing this estimate.

ALTERNATIVE 3—EXCAVATION AND INCINERATION

This alternative is identical to Alternative 2 except that all soil removed will be treated at an offsite TSCA-permitted incinerator.

Overall Protection of Human Health and the Environment

Long-term protection of human health and the environment would be the same as for Alternative 2 since PCB-contaminated soil and groundwater would be removed from the TSA. However, treatment of PCB-contaminated soils by incineration will reduce toxicity and volume of PCBs.

Short-term risks to human health and the environment during removal activities would be identical to those discussed with Alternative 2.

Compliance with ARARs

Alternative 3 would comply with all ARARs with the exception of the proposed MCL for PCBs as discussed with Alternative 2.

Long-Term Effectiveness

Little risk to human health and the environment would remain as discussed with Alternative 2.

Reduction of Toxicity, Mobility, and Volume

Incineration of PCB-contaminated soil removed from the TSA would reduce the toxicity and volume of PCBs. In addition, groundwater collected during dewatering will be treated thus reducing the contaminants toxicity and volume in the groundwater aquifer.

Short-Term Effectiveness

The short-term effectiveness for Alternative 3 is identical to that discussed with Alternative 2.

Implementability

The technologies and process options included in this alternative have been used at many similar sites and are commercially available. Offsite incineration at a TSCA-permitted incinerator is commonly used, acceptable, and effective in treating PCB-contaminated soils. Underground and aboveground utilities may impose some difficulty with soil excavation as discussed with Alternative 2.

Cost

A total capital cost of $3,794.000 is estimated for this alternative. All assumptions regarding laboratories, groundwater treatment, soil quantities, contingencies, and groundwater monitoring are identical to those made with Alternative 2. The nearest TSCA-permitted incinerator is the Westinghouse-APTUS facility located in Coffeyville, Kansas. The unit cost including transportation, treatment, ash disposal, and tax is estimated at $1,700/ton. The estimated present worth cost for this alternative is $3,834,000 assuming a 5 percent discount rate over a 30-year period. Appendix E includes costing tables summarizing this cost estimate.

COMPARISON OF ALTERNATIVES

The three alternatives were compared on the basis of the seven evaluation criteria to identify the relative benefits of each alternative.

Overall Protection of Human Health and the Environment

Alternative 1 would provide no increased protection to human health and the environment. Both Alternatives 2 and 3 significantly increase the protection of human health and the environment by removing PCB-contaminated soils and onsite groundwater. Essentially the only difference between Alternative 2 and 3 is that Alternative 3 will treat the PCB-contaminated soil, thus reducing toxicity, mobility, and volume of the PCBs contained in excavated soils.

Compliance with ARARs

Alternative 1 does not comply with EPA recommended cleanup levels for PCB contaminated soils. Alternatives 2 and 3 comply with all ARARs but the proposed MCL for PCBs. However, since the MCL is proposed and onsite groundwater is not used for drinking, it is questionable whether the MCL is an ARAR.

Long-Term Effectiveness

Alternative 1 would provide little or no long-term protection from exposure risks. Alternatives 2 and 3 provide a high degree of long-term protection since all PCB-contaminated soils are removed along with some PCB-contaminated onsite groundwater.

Reduction in Toxicity, Mobility, or Volume

Alternative 1 includes no reduction in toxicity, mobility, or volume of PCBs at the TSA. Alternative 2 reduces the toxicity and volume of PCBs contained in onsite groundwater removed by dewatering performed during soil excavation. Alternative 3 reduces the toxicity and volume of PCBs contained in excavated soils and onsite groundwater generated by dewatering.

Short-Term Effectiveness

Alternative 1 presents no risks associated with its implementation since no actions are involved. Alternatives 2 and 3 involve identical risks during excavation.

Implementability

All three alternatives use well-developed technologies that would be readily available and should be effective in monitoring, removing and treating or containing PCB-contaminated soil and groundwater.

Cost

Table 4-1 presents a comparison of the capital, annual O&M, and present worth costs estimated for each of the three alternatives.

WDCR577/022.51

Table 4-1
COMPARISON OF ESTIMATED COSTS FOR ALTERNATIVES

Estimated Costs	Alternative 1 No-Action	Alternative 2 Excavation and Disposal	Alternative 3 Excavation and Incineration
Capital	$0	$856,000	$3,794,000
Annual O&M	$2,600	$2,600	$2,600
Present Worth (5% @ 30 yrs)	$40,000	$896,000	$3,834,000

WDCR577/023.51

Section 5
PREFERRED ALTERNATIVE

Alternative 2—Excavation and Disposal is the preferred alternative selected by Navy for remediation at the TSA. This remedial alternative will protect human health and the environment by excavating and removing all PCB-contaminated soil. Because the PCB-contaminated soils will be removed from the site, the risks of exposure from direct contact and soil ingestion or the risk of continued or future PCB-contamination of groundwater from PCB-contaminated soils is eliminated. Onsite groundwater containing PCBs will be removed from excavations and treated during soil excavation. The removal of PCB-contaminated soil will prevent continued or further contamination of onsite groundwater. Since onsite groundwater is not used and no PCB contamination has been detected in offsite groundwater, PCB-contaminated onsite groundwater poses little risk to human health and the environment.

This alternative favorably satisfies all EPA evaluation criteria as does Alternative 3—Excavation and Incineration—with the exception of reducing toxicity, mobility, or volume of PCBs in PCB-contaminated soils. PCBs contained in excavated soils will not be treated as with Alternative 3. Therefore, no reduction in toxicity, mobility, or volume of PCBs contained in soils will occur. However, PCBs are very immobile compounds and excavated soils will be contained in a TSCA-permitted landfill designed to contain PCB-contaminated material.

WDCR577/025.51

Section 6
RESPONSIVENESS SUMMARY

This section presents the public, state, and EPA comments along with the Navy's response to these comments.

Public Comments

The public notice informing the public of the Remedial Action Plan (RAP) for the TSA was posted on October 29, 1991. After the 30-day public comment period was over, the Navy had received comments from three individuals. All comments were transmitted by phone. The comments and the Navy's response are listed below:

Comment: Mr. John Karafa (phone # 548-1300) called wanting to bid on the construction of the remedial design at the TSA.

Response: The contract for the construction of the remedial design at the TSA has already been advertised, bid, and awarded through the Navy Energy and Environmental Support Activity (NEESA).

Comment: Mr. Newton Berliner (phone # 468-5931) called to express his preference for incineration over landfilling of any PCB-contaminated material removed from the TSA.

Response: Excavation and incineration was one of the alternatives considered and evaluated in the RI/FS. All alternatives were compared on the basis of EPA's nine evaluation criteria. These are defined in Section 4 and are listed below.

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Long-Term Effectiveness
- Reduction of Toxicity, Mobility, or Volume
- Short-Term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

With the exception of state and community acceptance, the two alternatives (excavation and disposal versus excavation and incineration) differ only with two of the evaluation criteria. These are cost and reduction in toxicity, mobility, and volume. Incineration will oxidize PCBs, thus reducing the toxicity, mobility, and volume of the PCBs. However, PCBs are immobile compounds and the anticipated total volume of PCB-contaminated soil is relatively low. TSCA permitted landfills are designed specifically to contain PCB-contaminated material. Therefore, although the toxicity will not be reduced, the immobile characteristic and relatively low volume of PCB-contaminated material indicates that incineration does not provide a significant benefit over disposal in a TSCA permitted landfill. In addition, the cost of incineration is estimated to be more than three times that for disposal. Hence, excavation and disposal is the more cost-effective alternative.

The state of Virginia concurs with the selection of the excavation and disposal alternative as well as the EPA. This responsiveness summary outlines public comments along with the Navy's response, thus, representing the evaluation of the community acceptance criterion.

Comment: Clifton L. Parker called to say he had a copy of a paper describing a project that employed an alternative means for disposing PCB-contaminated soil other than landfilling. He sent a copy to the Navy. The paper discussed a project which employed an in situ stabilization/solidification process.

Response: In situ stabilization/solidification processes were not considered as a viable alternative for remediating PCB-contaminated soil at the TSA. The primary reason for this is that the Navy's objective is to remediate the TSA to a level where it's future use is not limited. Although in situ stabilization/solidification processes have shown success with reducing the leaching or dissolution of PCBs into groundwater, the PCBs still remain onsite in soils at elevated levels. Consequently, strict land use restrictions would be necessary in order to prevent future risk to the public. In addition, considering that PCBs are relatively immobile compounds in soil without the addition of stabilizing agents, this alternative provides minimal improvement over the no-action alternative.

The primary exposure routes for the public are dermal absorption through direct contact, ingestion of soil and inhalation of dust. None of these exposure routes would be eliminated with in situ stabilization/solidification.

State Comments

The Department of Waste Management (DWM) was also given the opportunity to review the RAP. DWM comments and the Navy's response are listed below:

Comment: DWM feels that at least one monitoring well in the area of groundwater contamination should be included in the monitoring program.

Program: One groundwater monitoring well will be installed in the area of groundwater contamination, after the remedial action is completed. It will be included in the groundwater monitoring program.

Comment: Are there any wells within a radius of 1 mile that provide groundwater for other uses, for example, lawn watering?

Response: No.

Comment: Some of the site will need to be dewatered. The RAP should address the handling of the contaminated...

Response: All contaminated groundwater and surface water collected will be treated at an offsite TSCA permitted wastewater facility.

EPA Comments

EPA also provided general comments on the RAP as well as the RI/FS. The Navy's response to the general comments are listed below with the corresponding EPA comments. EPA's specific comments on the RI/FS will be addressed in the RI/FS.

Comment: Figure 2-1 in the Draft *Remedial Investigation and Feasibility Study* (RI/FS) indicates an elevated concentration of PCBs in sediments at sample location 19, which is a storm sewer drain. The RI/FS and the Draft *Remedial Action Plan* (RAP) do not address the possibility of a release to Willoughby Bay due to stormwater runoff from this drain. Observed releases of PCBs in sediment have been recorded northeast of the Transformer Storage Area (TSA) at outfalls that empty into Willoughby Bay (Virginia State Water Control Board, 1991). The RI/FS should include analytical results from stormwater runoff at the drain, and identify the contaminant migration pathways associated with this drain. Analytical results for sediments along these pathways may also need to be provided in the RI/FS. The Baseline Risk Assessment portion of the RI/FS should address this possible PCB migration pathway and possible ecological targets, as described in Section 3.4 of the 1990 EPA guidance on remedial actions for Superfund sites with PCB contamination (EPA/540/G-90/007.

Response: The Navy agrees that the potential for PCB contamination in the storm sewer drain does exist. In an effort to expedite the remediation of the TSA, which represents the primary source of possible PCB contamination in the storm sewer drain, the storm sewer drain and the entire stormwater sewer line will be investigated as a separate site. However, sediment samples will be collected from the storm sewer drain during the remedial action.

Comment: At a minimum, the groundwater should be monitored after the contaminated soil is excavated to evaluate any remaining PCB contamination in unfiltered groundwater samples (RCRA minimum technology requirement for close-out). Alternatives 2 and 3, therefore, should include the installation of additional onsite monitoring wells (MW), downgradient from the highest levels of contamination, as well as at the source (since the existing MW-1 and MW-2 will be destroyed during the soil excavation). These new wells could be used to assess the long-term effect of soil removal on PCB concentrations in groundwater. Monitoring wells MW-3, MW-4, and MW-5 are not sufficient for this purpose, because PCBs were not detected in the groundwater sampled from these wells.

Response: The Navy agrees with this comment and intends to install one groundwater monitoring well in the area of groundwater contamination. It will be installed after the remedial action is completed.

Comment: Alternatives 2 and 3 both use confirmatory sampling (soil sampling and testing during excavation) to ensure that all PCB contaminated soil having concentration above the 10 ppm action level is removed. However, a sampling and analysis plan was not provided. A sampling and analysis plant for this confirmatory sampling should be developed before any onsite excavation begins. This confirmatory sampling operation is critical, as the excavation limits shown in the excavation plan included with the RAP might be different from the extent of excavation that actually will be required if the confirmatory sampling shows more extensive PCB contamination.

Response: A sampling and analysis plan for the confirmatory sampling will be submitted by the contractor performing the remedial action.

Comment: The ARARs that are applicable to the site remedy need to be expanded upon, including any State regulations and Federal Land Ban restrictions.

Response: The Commonwealth of Virginia does not include any regulations specific to PCBs in their regulations. They simply reference Federal regulations.

The Federal Land Ban restrictions only apply to RCRA hazardous wastes. The PCB contaminated soils at the TSA are not classified as RCRA hazardous wastes.

WDCR577/070.51

Section 7
DECLARATIONS

The preferred alternative described in the previous section meets or exceeds the criteria of overall protection of human health and the environment, applicable or relevant and appropriate requirements (ARARs), effectiveness, implementability, and cost. The preferred alternative is consistent with the Navy Installation Restoration Program (NEESA 20.2-047B), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and subsequent amendments, and the National Contingency Plan (40 CFR Part 3000).

12/19/91
Date

B.E. Tobin, RADM, USN
Commander, Naval Base Norfolk
Norfolk, Virginia

12/20/91
Date

S.R. Holm, Jr., CAPT, CEC, USN
Commanding Officer
Navy Public Works Center, Norfolk

REFERENCES

EPA, March 1991, "Risk Assessment Guidance for Superfund; Volume I: Human Health Evaluation Manual; *Supplemental Guidance*; Standard Default Exposure Factors," Interim Final, Office of Emergency and Remedial Response.

EPA, December 1989, "Risk Assessment Guidance Volume I."

EPA, November 1990, Memorandum, "Dermal Absorption of 2,3,7,8-TCDD, PCBs, and PAHs Contained in Soil," Interim, Office of Research and Development.

EPA, August 1990, "A Guide on Remedial Actions at Superfund Sites with PCB Contamination," Office of Emergency and Remedial Response.

EPA, October 1988, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," Interim Final, Office of Emergency and Remedial Response.

EPA, December 1982, "Aquatic Fate Process Data for Organic Priority Pollutants," Office of Water Regulations and Standards.

IRIS, January 1990, "EPA Integrated Risk Information System."

WDCR577/024.51