N62269.AR.000289
NAWC WARMINSTER
5090.3a

Engineering Evaluation/ Cost Analysis

for

Site 4 (North Runway Landfill)

Naval Air Warfare Center

Warminster, Pennsylvania

Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0159

July 1995

Halliburton NUS
CORPORATION

R-51-5-5-13

ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
FOR
SITE 4
NAVAL AIR WARFARE CENTER
WARMINSTER, PENNSYLVANIA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Northern Division
Environmental Branch, Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19087-1710

Submitted by:
Halliburton NUS Corporation
993 Old Eagle School Road, Suite 415
Wayne, Pennsylvania 19087-1710

CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0159

JULY 1995

SUBMITTED BY:

Neil Teamerson

NEIL TEAMERSON
PROJECT MANAGER
HALLIBURTON NUS CORPORATION
WAYNE, PENNSYLVANIA

APPROVED BY:

John Trepanowski

JOHN TREPANOWSKI, P.E.
PROGRAM MANAGER
HALLIBURTON NUS CORPORATION
WAYNE, PENNSYLVANIA

TABLE OF CONTENTS

SECTION		PAGE
EXECUTIVE SUMMARY		ES-1
1.0	FACILITY AND SITE CHARACTERIZATION	1-1
1.1	INTRODUCTION	1-1
1.1.1	Facility Description	1-1
1.1.2	Location and Physical Setting	1-3
1.1.3	Facility History	1-4
1.1.4	Current Facility Status	1-6
1.2	SITE 4, NORTH RUNWAY LANDFILL	1-8
1.2.1	Site Description and History	1-8
1.2.2	Previous Investigations and Response Actions	1-10
1.3	PHYSICAL CHARACTERISTICS	1-11
1.3.1	Meteorology	1-12
1.3.2	Site 4 Surface Water Hydrology and Topography	1-12
1.3.3	Site 4 Soils	1-13
1.3.4	Site 4 Geology and Hydrogeology	1-13
1.3.5	Groundwater Use Near Site 4	1-16
1.3.8	Site 4 Ecology	1-16
1.4	ADDITIONAL SITE 4 INVESTIGATION	1-17
1.4.1	Site 4 Geophysical Survey	1-18
1.4.2	Site 4 Soil Gas Survey	1-20
1.4.3	Test Pit Excavations	1-20
1.4.4	Surface Soil Sampling and Analysis	1-23
1.4.5	Surface Water and Sediment Sampling and Analysis	1-26
1.4.6	Groundwater Sampling and Analysis	1-28
1.5	NATURE AND EXTENT OF CONTAMINATION AT SITE 4	1-28
1.5.1	Geophysical Results	1-29
1.5.2	Soil Gas Sampling Results	1-30
1.5.3	Content of Site 4 Trenches	1-31
1.5.4	Subsurface Soil Sampling Results	1-32
1.5.5	Surface Soil/Sampling Results	1-37
1.5.6	Surface Water and Sediment Sampling Results	1-37
1.5.7	Groundwater Sampling Results	1-42
1.6	RISK ASSESSMENT	1-44
1.6.1	Potential Migration Routes	1-44
1.6.2	Potential Exposure Pathways	1-46
1.6.3	Human Health Risk Characterization	1-46
1.6.4	Ecological Risk Characterization	1-51
1.7	CONDITIONS THAT SUPPORT INITIATION OF A REMOVAL ACTION	1-55
2.0	IDENTIFICATION OF REMOVAL ACTION OBJECTIVES	2-1
2.1	INTRODUCTION	2-1
2.2	REMOVAL ACTION OBJECTIVES	2-1
2.3	COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS	2-2
2.3.1	Chemical-Specific ARARs and TBCs	2-4
2.3.2	Location-Specific ARARs and TBCs	2-6
2.3.3	Action-Specific ARARs and TBCs	2-7
2.4	REMOVAL ACTION GOALS	2-10
2.5	DETERMINATION OF REMOVAL ACTION SCOPE	2-13

TABLE OF CONTENTS (continued)

SECTION		PAGE
2.6	DETERMINATION OF REMOVAL ACTION SCHEDULE	2-13
3.0	**IDENTIFICATION AND SCREENING OF TECHNOLOGIES AND ALTERNATIVES**	**3-1**
3.1	INTRODUCTION	3-1
3.2	GENERAL RESPONSE ACTIONS	3-1
3.3	EVALUATION CRITERIA	3-1
3.4	IDENTIFICATION AND SCREENING OF TECHNOLOGY PROCESS OPTIONS	3-2
3.4.1	Institutional Controls	3-2
3.4.2	Removal through Bulk Excavation	3-4
3.4.3	Containment through Capping	3-5
3.4.4	Treatment	3-8
3.4.5	Disposal	3-17
3.5	SITE 4 REMOVAL ACTION ALTERNATIVES	3-19
3.5.1	Alternative 1: Institutional Controls	3-20
3.5.2	Alternative 2: Bulk Excavation, Off-Site Landfilling	3-21
3.5.3	Alternative 3: Single Synthetic Cap	3-23
4.0	**COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES**	**4-1**
4.1	INTRODUCTION	4-1
4.2	COMPARISON OF SITE 4 ALTERNATIVES	4-1
4.2.1	Effectiveness	4-1
4.2.2	Implementability	4-2
4.2.3	Cost	4-2
5.0	**RECOMMENDED ACTION**	**5-1**
6.0	**COMMUNITY RELATIONS**	**6-1**
6.1	INTRODUCTION	6-1
6.2	POINT-OF-CONTACT	6-1
6.3	PUBLIC INFORMATION REPOSITORIES	6-1
6.4	ADMINISTRATIVE RECORD	6-2
6.5	PUBLIC COMMENT PERIOD	6-2
6.6	PUBLIC NOTICES	6-2
6.7	PUBLIC MEETING	6-3
6.8	RESPONSIVENESS SUMMARY	6-3
6.9	PUBLIC BRIEFINGS	6-3
6.10	FACT SHEETS	6-3
6.11	MAILING LIST	6-4
REFERENCES		**R-1**

APPENDICES

A	SITE 4 TEST PIT LOGS	A-1
B	SITE 4 GEOPHYSICAL SURVEY RESULTS	B-1
C	SITE 4 SAMPLING RESULTS	C-1
D	COST ESTIMATES	D-1
E	SITE 4 VOLUME CALCULATIONS	E-1
F	DRAFT ACTION MEMORANDUM	F-1
G	RISK ASSESSMENT FOR SURFACE WATER/SEDIMENTS	G-1
H	ANALYTICAL DATABASE	H-1

TABLES

NUMBER		PAGE
1-1	Summary of Waste Management and Site Operations	1-5
1-2	Summary of Subsurface Soil Results	1-35
1-3	Summary of Surface Soil Results	1-39
1-4	Summary of Surface Water Results	1-41
1-5	Summary of Sediment Results	1-43
1-6	Summary of Groundwater Results	1-45
1-7	Estimated EEQs for Surface Water Chemicals of Concern	1-54
1-8	Estimated EEQs for Sediment Chemicals of Concern	1-56
2-1	Removal Action Goals	2-14

FIGURES

NUMBER		PAGE
1-1	Site Location Map	1-2
1-2	Site 4 Features	1-9
1-3	Site 4 Bedrock/Saprolite Surface Topography	1-15
1-4	Site 4 Geophysical Survey Results and Profile Lines	1-19
1-5	Site 4 Soil Gas Sample Locations	1-21
1-6	Site 4 Test Pit Locations	1-22
1-7	Typical Trench Sketch	1-24
1-8	Site 4 Surface Soil Sample Locations	1-25
1-9	Surface Water/Sediment Sample Locations	1-27
1-10	Site 4 Subsurface Soil Sample Locations	1-33
1-11	Background Surface Soil Sample Locations	1-38
2-1	Site 4 Contents of Trenches	2-15

EXECUTIVE SUMMARY

In response to Contract Task Order No. 159 under Contract N62472-90-D-1298, Halliburton NUS Corporation (HNUS) has prepared this engineering evaluation/cost analysis (EE/CA) for Site 4 (North Runway Landfill) at the Naval Air Warfare Center (NAWC) (formerly the Naval Air Development Center), Warminster, Pennsylvania. The purpose of the EE/CA is to meet the requirements of CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980), as amended by SARA (Superfund Amendments and Reauthorization Act of 1986). An EE/CA is required under the National Oil and Hazardous Substances Pollution Contingency Plan [Section 300.415(b)(4)(i)] for all non-time-critical removal actions. The EE/CA identifies the objectives of the removal action, analyzes the various alternatives that may be used to satisfy these objectives, and recommends the most appropriate response option to mitigate potential exposures to any contaminants and potential migration of any contaminants into the environment.

In addition to meeting the objectives of the EE/CA, this report is intended to meet the requirements for the Site 4 Remedial Investigation (RI), as outlined under CERCLA, as amended by SARA. As such, this report presents the nature and extent of contamination associated with all hazardous substance releases at Site 4 that are not regulated and are not being investigated under the authority of other federal laws (e.g., Clean Air Act, Resource Conservation and Recovery Act). The risks associated with the site are also evaluated and included in this report to meet RI requirements.

BACKGROUND

NAWC Warminster was originally the location of Brewster Aeronautical Corporation, a manufacturer of military aircraft. Since the 1940s, the main mission at the base has been research, development, testing, and evaluation for Naval aircraft systems. The base also conducts studies in anti-submarine warfare systems and software development. NAWC Warminster is scheduled for realignment under the Base Realignment and Closure (BRAC) Program managed by the Department of Defense (DOD). This realignment, which is due to the downsizing of the entire DOD budget, is tentatively set for 1996; however, this timetable is still being developed. As such, the future use of the NAWC Warminster property had not been finalized at the time of this report. The realignment will result in relocation of NAWC Warminster activities to Naval Air Station (NAS) Patuxent River, Maryland.

To date, at least eight known locations on current NAWC Warminster property have been identified as sites used for the disposal of wastes containing hazardous substances. None of the sites is currently used for waste disposal. Any hazardous substance releases from eight sites identified to date and from other unidentified sites at NAWC Warminster potentially affect the Stockton Formation aquifer, which provides

water for more than 100,000 people within the vicinity of the facility. Local surface water bodies are used for recreational and industrial purposes.

Site 4 is a grassy area covering 7 acres just north of the main runway along Kirk and Newtown Roads and south of the base Patrol Road. The Site is located at approximately the mid-point of the runway in the northeastern portion of the base. An unnamed tributary of Little Neshaminy Creek is located north of this area, and residential areas and two local parks are also in this direction.

Site 4 is the largest known waste disposal location at NAWC Warminster; it is less than 100 feet from the edge of the facility boundary. Site 4 reportedly was operated from 1966 to 1970. Several trenches at the site reportedly were used to dispose of non-industrial solid wastes, paints, waste oils, waste metals, construction debris, solvents, general refuse, office trash, and sewage sludges from the industrial wastewater treatment plant. Some drainage from this area intersects the unnamed tributary of Little Neshaminy Creek, off site to the north of Kirk and Newtown Roads, near Munro Park. Several off-base residences are present within 200 feet of Site 4.

NATURE AND EXTENT OF SITE 4 CONTAMINATION

In April 1995, site characterization data was gathered to determine the locations, nature, and extent of contamination at Site 4. These data were used in conjunction with data already gathered from previous investigations and studies. A field investigation was performed as part of Phase III remedial investigation (RI) activities at NAWC Warminster to better characterize the site and to provide information with which to generate volume estimates for landfill materials contained within Site 4. The field investigation consisted of the following activities:

- Geophysical survey to establish trench locations or potential subsurface waste disposal locations.

- Soil gas survey to identify the presence of any elevated levels of volatile organic compounds (VOCs) within those locations established by the geophysical survey.

- Test pits to further identify subsurface wastes within those locations established by the geophysical and soil gas survey.

- Surface soil and subsurface soil and waste sampling and analyses to characterize surface and subsurface conditions within Site 4.

- Surface water and sediment sampling and analysis to characterize the nature and extent of contamination for these media near Site 4.

- Limited groundwater sampling and analysis to ensure that drinking water users were not adversely affected by any Site 4 contamination.

Based on field investigations, there are 8 trenches at Site 4 and each trench is about 12 feet wide, 8 feet deep, and between 150 to 490 feet in length. During previous investigations, all confirmation and subsurface soil sample borings at Site 4 placed within the trenches encountered waste material, and borings placed between trenches encountered only fill. Outside the trenched area, one boring encountered fill, and all others encountered only native soil. The subsurface fill within the trenches averaged 4 to 5 feet in thickness.

The material encountered during the April 1995 test pit excavations generally consisted of a top layer of fill characterized as reddish-brown silty clay underlain by a bluish-gray micaceous silt and/or a layer of refuse or construction/demolition debris, reddish-brown clayey silt, and reddish-brown weathered siltstone. Some test pits encountered maroon siltstone or gray sandstone bedrock.

Refuse, consisting of paper, plastic products, soda and beer cans, glass bottles, styrofoam, cardboard, and photographic film was found in nearly all test pits and trenches at Site 4. Construction/demolition debris, consisting of wood, metal, concrete, brick, cables, wire, and steel was also encountered in two trenches. Natural (undisturbed) conditions consisting of topsoil, orange-brown silty clay, maroon silt, and maroon weathered siltstone were found in two background test pits. One background test pit encountered clean fill consisting of reddish-brown silty clay, bluish-gray micaceous silt, dark reddish-brown silty fine-grained sand, and maroon rocky weathered siltstone.

The bluish-gray micaceous silt was also encountered generally between 2 and 4 feet below the ground surface, in about one-half of the test pits. In general, this silt was not found in the western portions of most trenches; however, the material was encountered in the eastern end of one trench. The bluish-gray silt appears to pinch out near the base Patrol Road.

A majority of the wastes contained in the Site 4 trenches consist of construction debris, demolition materials, and general refuse. These wastes typically are not considered to be hazardous by themselves. However, investigations of soils, sediments, groundwater, and surface water suggest that wastes buried in the trenches may be the source of hazardous substances that have been released to the environment or could be potentially released. The major chemicals of concern for surface soils are Aroclor 1248, trichloroethene (TCE), pentachlorophenol (PCP), and several polycyclic aromatic hydrocarbons (PAHs) such as benz(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene. In addition, several metals (beryllium

and manganese) were detected above background concentrations and soil screening criteria for surface soils.

For subsurface soils, the chemicals of concern include PCP, benz(a)anthracene, enzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, dieldrin, endosulfan sulfate, Aroclor 1248, and Aroclor 1254. In addition, several metals (barium, beryllium, cadmium, manganese, and nickel) were detected above background concentrations and soil screening criteria for soils. No clear pattern of inorganic contamination in the surface and subsurface soils was observed.

Two phthalates (diethyl- and di-n-octyl-) were detected in surface water samples collected downstream of Site 4. One VOC, carbon disulfide, was also found downstream at a low level. Metals exceeding background and surface water screening criteria included copper, lead, and mercury. Manganese was also found in one sample at a concentration higher than the background range.

The sediment samples collected near Site 4 had positive detects for several PAHs in background and downstream samples; however, the downstream and background concentrations were similar. Off-base migration of PAHs may be the source of these chemicals. PAHs are commonly associated with erosion of asphalt roadways and residential roofing materials (i.e., shingles). None of the downstream metal concentrations in sediment were three times higher than background levels, except for zinc. 4,4'-DDT and Aroclor 1254 were each detected in one downstream sediment sample. 4,4'-DDT could be associated with use of insecticides or fertilizers.

The volume of contaminated soils and buried wastes at Site 4 is estimated at 7,900 cubic yards or 12,800 tons. The approximate area of contamination is 35,600 square feet. Based on site characterization information, it does not appear that buried materials and hazardous substances associated with these materials have significantly migrated from the eight trench locations identified at Site 4. This conclusion is supported by the lack of significant groundwater contamination in the vicinity of the Site, along with the lack of subsurface contamination between the trenches.

RISK CHARACTERIZATION

Potential risks resulting from exposure pathways associated with Site 4 were generally characterized on a qualitative basis. The qualitative estimates are based on risk-based screening concentrations or other screening criteria as outlined in current EPA and other appropriate guidance. The risks determined using these criteria are a unitless expression of an individual's likelihood of developing cancer or other adverse (non-cancer) effects as a result of exposure to hazardous substance concentrations. An incremental cancer risk of 1×10^{-6} indicates that the exposed receptor has a one in one million chance of developing cancer

under the defined exposure scenario. EPA as generally defined risks in the range of 10^{-4} to 10^{-6} as being acceptable for most sites.

For other adverse (non-cancer) effects, risk are expressed as the ratio of the estimated chronic daily intake and Reference Doses (RfDs), which are based on the non-carcinogenic health effects imparted by a chemical. If this ratio exceeds unity (1.0), there are potential health effects associated with exposure to that particular chemical. This ratio is known as a Hazard Quotient (HQ); the sum of all individual HQs is known as the Hazard Index (HI).

The future land use of the Site 4 area is anticipated to be recreational according to the draft re-use plan prepared for NAWC Warminster. The available risk-based screening criteria do not provide specific chemical concentrations for this type of land use. As a conservative approach, a residential land use scenario was assumed for Site 4 because this scenario tends to overestimate future exposures that may occur. In actuality, the potential exposures associated with hazardous substances present at Site 4 will be less than residential exposures.

Aroclor 1248 was detected in two surface soil samples at levels ranging between 0.064 and 0.140 mg/kg. The maximum value exceeds a carcinogenic risk of 10^{-6} under the residential (0.083 mg/kg) land use scenario. This PCB was not detected in background surface soil samples and is presumably related to Site 4 wastes. TCE was detected at low levels in six of nine surface soil samples. These results suggest that the trenches may contain a source of TCE that potentially could be released in the future. The maximum TCE concentration did not exceed a carcinogenic risk of 10^{-6} under the residential land use scenario.

Among inorganics, manganese and beryllium exceeded both background and soil screening criteria. The maximum values of manganese and beryllium exceed an HQ of 1.0 under the residential land use scenario. However, the highest background levels for these analytes also exceed the risk-based screening concentrations for residential soil.

Aroclor 1248 was detected in 50 percent of subsurface soil samples at Site 4. The maximum value exceeds a carcinogenic risk of 10^{-6} under residential and non-residential (0.74 mg/kg) land uses. This PCB was not detected in background subsurface soil samples and is presumably related to Site 4 wastes. Aroclor 1254 was detected once at 0.51 mg/kg; this value also exceeds a carcinogenic risk of 10^{-6}. Among the inorganic compounds, barium, beryllium, and manganese, exceeded both background and risk-based screening criteria for residential soils. HQs of 1.0 were exceeded for these metals.

For the surface water pathway, (Ambient Water Quality Criteria (AWQCs) were used to assess the potential for toxic effects in aquatic organisms and to identify the potential for human health risks. Several metals, including copper, lead, and mercury, exceeded surface water screening criteria.

These metals were not detected in background surface water samples. Copper and lead were found in all background surface and subsurface soil samples, therefore, it is possible that these concentrations in surface water may be related to naturally occurring conditions. None of these materials exceeded the respective drinking water standards.

It is possible that children may play in the stream north of Site 4 and thereby come in contact with contaminated surface water. Exposure could occur via either incidental ingestion or dermal adsorption. It is assumed that exposure would only occur during wading. To determine the estimated noncancer risk for children exposed to nearby surface water, risk assessment was performed for the metals of concern. The surface water HIs for incidental ingestion and dermal contact for children were 0.03 and 0.4, respectively. Thus, these risks were not found to be significant.

For sediments, effects range-low (ER-L) values were used to assess the potential for toxic effects in aquatic organisms and to identify the potential for human health risk. Only arsenic and zinc exceeded sediment screening criteria. These two metals were detected in all background sediment samples. Arsenic and zinc were found in all background surface and subsurface soil samples; therefore it is possible that these concentrations in sediment may be related to naturally occurring conditions.

The PCB Aroclor 1254 was detected in one downstream sediment sample at 74.5 ug/kg. The ER-L for PCBs is 22.7 ug/kg. DDT was also found at 5.6 ug/kg; the ER-L for total DDT is 1.58 ug/kg. DDT may be associated with the use of insecticides or fertilizers.

To determine the estimated cancer and noncancer risks for children exposed to nearby sediments, a formal risk assessment was performed for the metals of concern and Aroclor 1254. The incremental cancer risks for exposure to contaminated sediments for children were 1.0×10^{-6} for incidental ingestion and 2×10^{-7} for dermal contact. These risks are equal to the lower limit of the EPA risk range goal. HIs for these exposures were 0.1 and 0.005, respectively.

The human health risk characterization suggests that PCB and other hazardous substance concentrations in soils at Site 4 have the potential to cause carcinogenic risk in excess of 1×10^{-6} or cause other adverse effects. This risk characterization indicates that a response is necessary to address contaminated soils and wastes associated with the site.

The characterization of ecological effects was estimated using environmental effect quotients (EEQs) for chemicals of concern in both surface water and sediments. The EEQ was calculated by dividing the maximum chemical of concern by the selected toxicity benchmark value. The use of the maximum measured value is a conservative approach that estimates maximum likely exposure. Ratios greater than or equal to 1.0 indicate whether the chemical might pose a potential ecological threat. The EEQ values

do not represent risk probability values in themselves but are representative of the relative probability of risk.

An EEQ greater than one was calculated for copper, lead, and mercury based on surface water concentrations. These EEQs indicate that these metals have the potential to cause adverse effects on aquatic and aquatic-dependent biota near Site 4. However, despite the level of concern suggested by these values, the populations and biological communities near the Site 4 area do not appear to exhibit significant adverse effects. In addition, copper, lead, and mercury were not detected in filtered surface water samples collected during the Phase II RI near Site 4. Filtered samples usually better represent actual chemical concentrations in surface water.

An EEQ was calculated for 20 chemicals of concern based on sediment sample concentrations. These chemicals included several PAHs, DDT, Aroclor 1248, and seven metals. None of the chemicals had a calculated EEQ greater than 10.0, which would imply moderately high potential risk. About a half of the values are less than an EEQ of 2.0. As noted previously, the PAHs, DDT, and metals may be unrelated to Site 4.

The ecological risk characterization indicated that several EEQs exceed unity for surface water and sediment chemicals of concern. Therefore, potential but probably minor ecological risks may be occurring due to the presence of mercury, lead, phenanthrene, anthracene, DDT, and Aroclor 1248 in surface water or sediments. Additional ecological characterization studies may be warranted to assess receptors, exposures, and risk more quantitatively. However, no indications of severe ecological stress were observed in this area, based on the biological survey and the wetlands assessment.

PROPOSED REMOVAL ACTION

The proposed removal action will meet the following objectives:

- Prevent exposures (or potential exposures) to contaminated soils and wastes presenting unacceptable risks.
- Protect groundwater quality by reducing infiltration of water into and through contaminated soils and wastes of concern.
- Prevent the release of hazardous substances at Site 4 to nearby surface water, sensitive ecosystems, and other media.

The action proposed for Site 4 is to excavate contaminated soils and buried wastes without treatment at an off-site municipal waste landfill. Landfilling is a cost-effective alternative for addressing the buried soils and wastes at Site 4. Municipal waste landfills are engineered landfills which provide controls for protecting human health and the environment.

The contaminated soils and buried wastes are present in eight trenches at Site 4. Available information suggests that these materials are confined within the trenches themselves. The proposed action would excavate surface soils on top of the trenches, subsurface soils, and any buried wastes present within the trenches. If necessary, any contaminated soils or buried wastes that cannot be disposed in a municipal landfill will be disposed in a hazardous waste landfill. Alternately, some contaminated soils and buried wastes may be disposed in a Class I residual waste landfill in accordance with State residual waste management regulations; however, construction/demolition debris cannot be disposed in this type of landfill.

At this time, it is estimated that the entire project will be completed within 12 months and under the $2 million ceiling for removal actions, barring any unforeseen circumstances or disposal restrictions. The proposed removal action is consistent with accepted removal practices and is expected to abate the threats that meet the NCP removal criteria. The proposed removal action is not anticipated to impede any other response actions.

AUTHORITY

The conditions at Site 4 warrant a removal action. Field investigation results indicate unacceptable levels of hazardous substances in surface soils, subsurface soils, and buried materials at Site 4. Although the current industrial land use at Site 4 restricts access by the general public, workers near the site could have some exposure. In addition, the site may be used for recreation purposes once this parcel of property is turned over to the community by the Navy.

Section 300.415 of the NCP identifies the factors that must be considered when determining the appropriateness of a removal action. Paragraphs (b) (2) (i), (ii), and (viii) of Section 300.415 directly apply as follows to Site 4 conditions:

(b) (2) (i) "Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants."

Potential human and environmental exposure pathways identified under current or future land use scenarios for Site 4 include dermal, incidental ingestion, and fugitive dust inhalation exposure to soil contaminants. In addition, contaminants leaching from buried trench materials to groundwater is a potential exposure pathway because of infiltrating precipitation, and erosion of contaminated surface soils with overland runoff

transport to nearby surface water (i.e., an unnamed tributary of Little Neshaminy Creek) is also possible. Groundwater may also migrate into adjacent surface water via both overburden and shallow bedrock aquifers or from the shallow bedrock aquifer beneath the Site into deeper bedrock aquifers.

(b) (2) (ii) "Actual or potential contamination of drinking water supplies or sensitive ecosystems."

Although analytical data from nearby monitoring and residential wells do not indicate contamination of drinking water above Removal Action Levels which is solely attributable to Site 4, it is possible that contaminants leaching from buried trench materials may result in potential groundwater contamination. However, contaminated groundwater at Site 4 is being addressed by the OU-3 remedy and is not the focus of the Site 4 EE/CA or this proposed removal action. Potential contamination of sensitive ecosystems is also possible if a response action is not taken.

(b) (2) (vii) "The availability of other appropriate federal or state response mechanisms to respond to the release."

The availability of response mechanisms can be met through the Navy's IR Program.

(b) (2) (viii) "Other situations or factors that may pose threats to public health or welfare or the environment."

The presence of buried materials and contaminated soils at Site 4 will hinder future land use for this area, including recreational land use, once this property is turned over to the community by the Navy.

ALTERNATIVES CONSIDERED

Three criteria were used to screen potential technologies for the removal action: effectiveness, implementability, and cost. Effectiveness is a measure of the alternatives ability to protect public health and the environment and comply with applicable or relevant and appropriate requirements (ARARs). Implementability is a measure of both the technical and administrative feasibility of successfully executing the alternative. Cost is a measure of both direct and indirect capital costs as well as any recurring operational and maintenance (O&M) costs.

The proposed action was selected from three of the most appropriate removal action alternatives, including institutional controls (i.e., deed restrictions and groundwater monitoring) and a single synthetic cap. No effective in-situ technologies were identified and on-site treatment was not considered to be cost effective. Excavation and off-site landfilling was identified as the most effective alternative. Institutional controls would not meet the removal action objectives and ARARs. The estimated cost of the single synthetic cap

was comparable to the cost of excavation and off-site landfilling; however, the cap would not allow unrestricted land use of the Site 4 area. In addition, the cap would not protect groundwater for current and future use by reducing contaminated soils and associated waste concentrations .

CONCLUSION

Excavation and off-site disposal at a municipal waste landfill is recommended as the most cost effective alternative by which all the removal action goals can be achieved.

1.0 FACILITY AND SITE CHARACTERIZATION

1.1 INTRODUCTION

In response to Contract Task Order No. 159 under Contract N62472-90-D-1298, Halliburton NUS Corporation (HNUS) is submitting this engineering evaluation/cost analysis (EE/CA) for Site 4 (North Runway Landfill) at the Naval Air Warfare Center (NAWC) (formerly the Naval Air Development Center), Warminster, Pennsylvania. This work is part of the Navy's Installation Restoration (IR) Program, which is designed to identify contamination of Navy and Marine Corps facilities resulting from past operations and to institute corrective measures as appropriate.

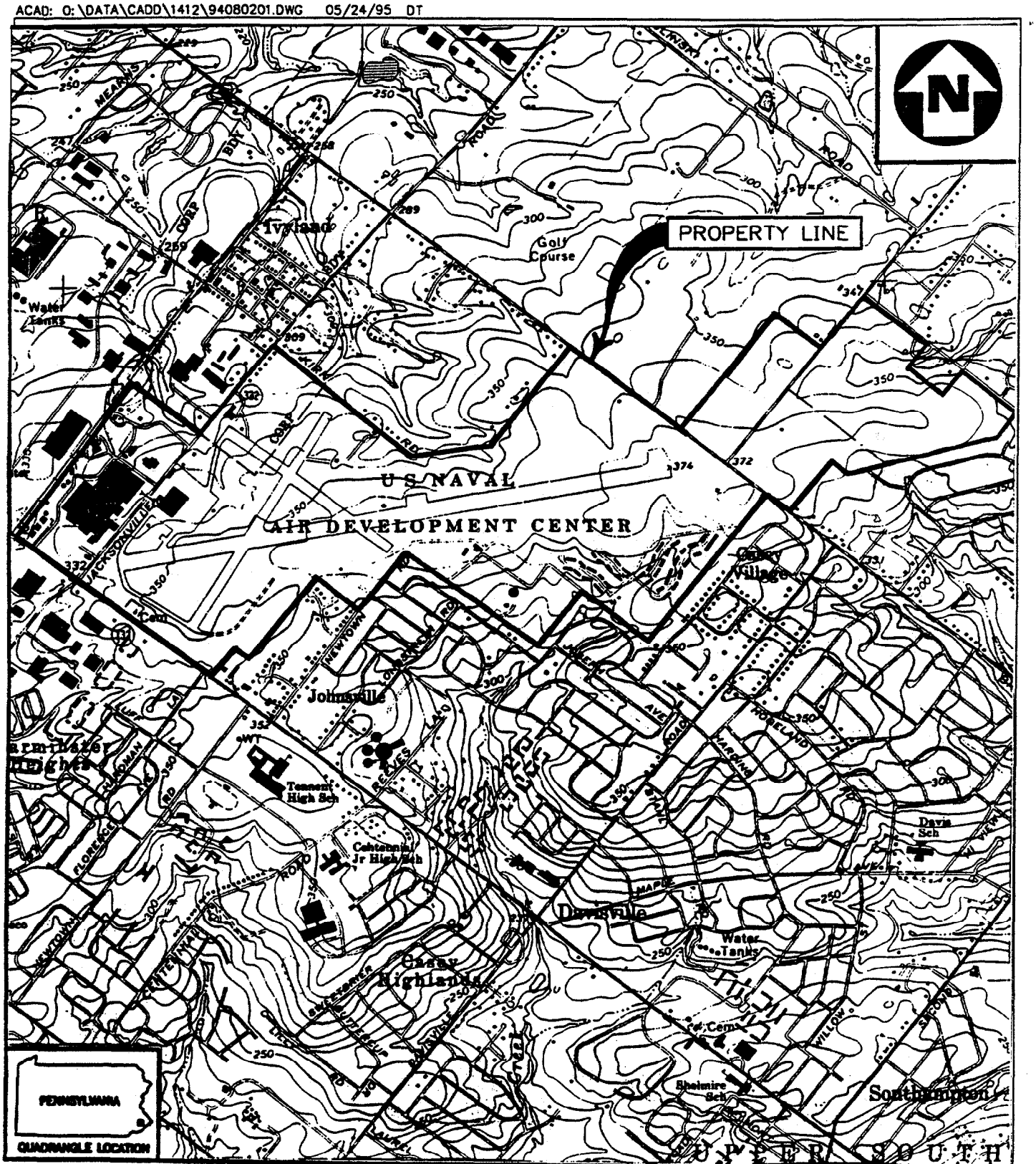
In addition to meeting the objectives of the Navy's IR Program, the purpose of the EE/CA is to meet the requirements of CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980), as amended by SARA (Superfund Amendments and Reauthorization Act of 1986). An EE/CA is required under the National Oil and Hazardous Substances Pollution Contingency Plan [Section 300.415(b)(4)(i)] for all non-time-critical removal actions. The EE/CA will identify the objectives of the removal action and will analyze the various alternatives that may be used to satisfy these objectives. The goal of the EE/CA is to identify the most appropriate response option to mitigate potential exposures to any contaminants and potential migration of any contaminants into the environment.

In addition to meeting the objectives of the EE/CA, this report is intended to meet the requirements for the Site 4 Remedial Investigation (RI), as outlined under CERCLA, as amended by SARA. As such, this report presents the nature and extent of contamination associated with all hazardous substance releases at Site 4 that are not regulated and are not being investigated under the authority of other federal laws (e.g., Clean Air Act, Resource Conservation and Recovery Act). The risks associated with the site are also evaluated and included in this report to meet RI requirements.

1.1.1 Facility Description

NAWC Warminster is located approximately 28 miles northeast of Philadelphia, mostly in Warminster Township, Bucks County, Pennsylvania. The facility can be found on the United States Geological Survey (U.S.G.S.) Hatboro 7.5-minute topographic quadrangle map, a portion of which is reproduced as Figure 1-1. The total area of NAWC Warminster is approximately 840 acres. The facility lies in a populated suburban area surrounded by private homes, various commercial/industrial activities, and a golf course. On-base areas include various buildings and other complexes connected by paved roads, the runway and ramp area, mowed fields, and a small wooded area.

ACAD: O:\DATA\CADD\1412\94080201.DWG 05/24/95 DT



SOURCE: U.S.G.S. 7.5 MINUTE HATBORO QUADRANGLE 1966, PHOTOREVISED 1983.

SITE LOCATION MAP
NAWC WARMINSTER, PA

0 2000 4000
SCALE IN FEET

FIGURE 1-1

Halliburton NUS CORPORATION

The main runway is generally located along the topographically highest area at the facility. Many of the primary facility buildings are located west of the airstrip, along Jacksonville Road. A housing development for military enlisted personnel is within the southeastern portion of NAWC Warminster. The on-base wastewater treatment plant is in the northwestern corner of the facility. NAWC Warminster currently has approximately 2,000 employees, and 1,000 people reside at the enlisted personnel's housing area year round. The residents living at the facility are the nearest population center. The closest off-base home is about 200 feet from the base property line. Residential development is located along the length of the southern property line and, to a lesser extent, along the northern property line. Industrial development is found along the western and northwestern perimeters of the base. The facility is located on a ridge, generally oriented east-west, with elevations ranging from 297 feet at the northwestern property boundary to 377 feet at the eastern boundary. Slopes are gentle and average three to five percent. The northern portion of the facility (about 65 percent) drains into small, unnamed tributaries of Little Neshaminy Creek. The remaining portion drains into unnamed tributaries of Pennypack Creek. Local surface water bodies are used for recreational and industrial purposes. Any hazardous substance releases from the eight sites identified to date and from other unidentified sites at NAWC Warminster potentially affect the Stockton Formation aquifer, which provides water for more than 100,000 people within the vicinity of the facility.

To date, at least eight sites on current NAWC Warminster property have been identified as sites used for the disposal of wastes containing hazardous substances. For investigative purposes, Sites 1, 2 and 3 have been grouped into Area A; Sites 5, 6, and 7 have been grouped into Area B; Sites 4 and 8 comprise Area C; and Area D consists of potential sources and hazardous substance releases west of the main building complex at the base. The current status of Areas A, B, C, and D and other operable units identified at NAWC Warminster is discussed in Section 1.1.4.

1.1.2 Location and Physical Setting

This section describes NAWC Warminster and provides a brief synopsis of the facility's background and history. The areas of concern identified to date at the base are eight sites covering more than 12 acres. All sites are located within the base property and include

- Three waste burn and disposal pits (Sites 1, 3, and 6)
- Two sludge disposal pit areas (Sites 2 and 7)
- Two landfills (Sites 4 and 5)
- One fire training area (Site 8)

Historically, wastes at the facility were generated during aircraft maintenance and repair, pest control, firefighting training, machine and plating shop operations, spray painting, and various materials research and testing activities in laboratories. These wastes included paints, solvents, sludges from industrial wastewater treatment, waste oils, construction and demolition debris, office trash, general refuse, and other forms of solid wastes. Table 1-1 summarizes the disposal history and types of waste deposited at these sites. None of the sites are currently used for waste disposal.

NAWC Warminster is listed on the National Priorities List (NPL). The NPL includes those sites that appear to pose the most serious risks to public health or the environment. Three remedial investigations (Phase I, Phase II, and a focused RI for groundwater) were conducted at the base between October 1989 and June 1995. A fourth RI (Phase III) is currently underway. Phase I was performed between October 1989 and January 1991 by SMC Martin, and Phase II was performed between May 1992 and September 1992 by HNUS. The focused RI was conducted by HNUS between January and July 1994 to address remaining data gaps that were not completely addressed during the Phase II RI. During this investigation, HNUS addressed groundwater contamination associated with Site 4 that was not completely evaluated during the earlier studies. A Restoration Advisory Board (RAB), which consists of representatives of the Navy, the United States Environmental Protection Agency (EPA), the Pennsylvania Department of Environmental Resources (PADER), the Bucks County Health Department, the Northampton Township Municipal Authority, the Warminster Township Municipal Authority, and Upper Southampton Township, assisted in the planning of this work.

1.1.3 Facility History

The facility was originally the location of Brewster Aeronautical Corporation, a manufacturer of military aircraft. In 1944, the Navy assumed full control of the Brewster plant. The Naval Air Modification Unit was installed at the base to add design modifications to military aircraft produced at other locations. After World War II, activities at the base were altered; in 1949, the facility was designated the Naval Air Development Center (NADC), and its main mission, research, development, testing, and evaluation for Naval aircraft systems, was established. NAWC Warminster also conducts studies in anti-submarine warfare systems and software development. The facility name was changed from NADC to NAWC, Aircraft Division, on January 1, 1992. NAWC Warminster is scheduled for realignment under the Base Realignment and Closure (BRAC) Program managed by the Department of Defense (DOD). This realignment, which is due to the downsizing of the entire DOD budget, is tentatively set for 1996; however, this timetable is still being developed, and the future use of the NAWC Warminster property had not been finalized at the time of this report. The realignment will result in relocation of NAWC Warminster activities to Naval Air Station (NAS) Patuxent River, Maryland.

TABLE 1-1
SUMMARY OF WASTE MANAGEMENT AND SITE OPERATIONS
NAWC WARMINSTER, PENNSYLVANIA

SITE	DATES OF OPERATION	TYPES OF WASTES	METHOD OF OPERATION	POTENTIAL HAZARDS	COMMENTS
1	1940 to 1955	Paints, oils, asphalt, roofing material, solvents, scrap metal, unspecified chemicals, firing range wastes, and demolition wastes (cinders, glass, ceramic, wood, brick, and metal)	Burn pit within an eroded ravine; unknown number of disposal trenches	Solvents, driers, pigments, PAHs, creosote, phenols, asbestos, binders, lead	Exact boundaries and disposal methods are not clear; near 8 former surface impoundments
2	1965 to 1970	Industrial wastewater sludges	2 disposal trenches	Heavy metals	Exact boundaries are not clear
3	1955 to 1965	Unspecified sanitary trash (wood, metal, brick, and glass), solvents, paints, roofing materials, and unspecified chemicals	Burn pit	Solvents, driers, pigments, asbestos, binders	Metal screen enclosure was placed over site before burning began
4	1966 to 1970	Non-industrial solid wastes, paints, waste oils, waste metals, construction debris (wood, metal, and glass), solvents, sewage treatment sludge, and general refuse	8 disposal trenches	Solvents, driers, pigments, lead, PAHs, biological wastes, heavy metals	Site may have been active in 1973
5	1955 to 1970	Demolition wastes (wood, glass, and metals), paints, solvents, scrap metal, and 30 drums of asphalt	6 to 8 disposal trenches	Solvents, driers, pigments, creosote, phenols, PAHs	Portions of the site now base housing unit
6	1960 to 1980	Paints, solvents, demolition wastes, construction debris (concrete, brick, glass, wire and electrical parts), scrap metal, waste oils, other flammable wastes, asphalt, and grease trap wastes	Unknown number of disposal pits/trenches	Various solvents, driers, pigments, lead, PAHs	Waste materials are present on the surface
7	1950 to 1955	Industrial wastewater sludge	2 disposal trenches	Heavy metals	Exact location has not been determined
8	1961 to 1988	Aviation fuel, lubricants, coolants	Firefighting training area; unknown number of pits	PAHs, PCBs	3 to 4 bermed pits

Data compiled from the following sources:

(1) Hydrogeologic Investigation of the NADC Waste Disposal Sites, Warminster, Pennsylvania. JRB Associates, Waste Management Division, McLean, Virginia. December 21, 1981.

(2) Notification of Hazardous Waste Sites; Letter from NADC, Warminster, Pennsylvania to U.S. EPA Region III, Philadelphia, Pennsylvania; June 9, 1981.

(3) Navy Shore Activity Disposal Site Fact Form; NADC, Warminster, Pennsylvania; December 4, 1980 (based on interviews with former base foreman - Mr. Richard Law (1950 to 1980)).

(4) Stages I and II - Rough Draft Remedial Investigation Report for NADC, Warminster, Pennsylvania; SMC Environmental Services Group, Valley Forge, Pennsylvania; April 18, 1991.

(5) Aerial Photographic Site Analysis Report for Naval Air Warfare Center, Warminster, Pennsylvania; Environmental Photo Interpretation Center, Warrenton, Virginia; May 1994.

EPA officially recognized the NAWC Warminster sites as possibly needing investigation in September 1979. In November 1979, EPA completed a preliminary assessment (PA) of the facility. In 1980, the Department of the Navy began its environmental investigative work at NAWC Warminster. The first study, known as the Clay/Law Report, inventoried disposal activities at each of the eight sites. Since 1980, a variety of environmental consultants under Navy contracts have studied these sites.

In 1985, EPA completed a preliminary assessment/site inspection (PA/SI) of the base. In 1986, NAWC Warminster was proposed for inclusion on the NPL based on a Hazard Ranking System (HRS) score greater than 28.50. EPA used the HRS to assess the relative threat from releases of hazardous substances from the eight NAWC Warminster sites to surrounding groundwater and surface water. The facility score was based on the likelihood that a hazardous substance would be released from the sites, the toxicity and amount of hazardous substances at the sites, and the people and sensitive environments potentially affected by contamination at the sites.

On October 4, 1989, NAWC Warminster was placed on the final NPL. That same year, EPA submitted a draft Federal Facilities Agreement to the Navy for formalizing and scheduling remedial activities. The contents of this agreement were negotiated in 1990. In 1991, HNUS was tasked to complete remaining RI/FS activities at the facility.

1.1.4 Current Facility Status

To date, the NAWC Warminster sites are being addressed by the Navy in four long-term remedial phases. The study for the first phase began at the end of 1989 and was completed in April 1991. Phase I involved mapping volatile organic compounds (VOCs) in soil gas and detecting magnetic and conductive anomalies through electromagnetic surveys. Approximate site boundaries were identified and confirmation of site contamination was made through soil borings, installation of monitoring wells, and groundwater sampling and analysis. In addition, test pits were excavated, local wells were inventoried, and a fracture-trace analysis was conducted.

Phase II began at the end of 1991 and was completed in April 1993. This phase helped determine the nature and extent of groundwater contamination, evaluate groundwater flow and add to the hydrogeologic database, and ascertain possible remedial alternatives. Phase II involved installing additional overburden and shallow bedrock monitoring wells, sampling and analyzing groundwater, and evaluating aquifer characteristics through water-level monitoring and a pumping test. Four off-base wells were also sampled.

Both phases explored the nature and extent of groundwater contaminants and helped to pinpoint the most effective strategies for hazardous substance cleanup. At the end of Phases I and II, the Navy and EPA selected a remedy for Operable Unit 1 (OU-1), which is contaminated shallow groundwater attributable to Areas A and B at the base. This was the first clean-up plan selected for NAWC Warminster. The Navy initiated construction of the OU-1 remedy in January 1995, and work is expected to be completed in the near future.

After Phase II was completed, the Navy initiated other environmental investigations to more fully determine the nature and extent of groundwater contamination attributable to NAWC Warminster. In April 1993, the Navy, in coordination with EPA, initiated a well testing program in the vicinity of the base to assess the impact of contaminated groundwater possibly attributable to NAWC Warminster. Between April and August 1993, the Navy sampled more than 250 off-base residential, commercial, and municipal wells. The test results indicated that the levels of some VOCs found in residential wells exceeded federal drinking water standards [i.e., Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act]. To address these levels, the Navy conducted a CERCLA removal action, installing a water treatment system in each residence where either EPA Removal Action Levels or MCLs have been exceeded.

The Navy and EPA determined that this off-base groundwater contamination constituted a threat to human health. Therefore, the Navy and EPA conducted additional CERCLA removal action work by connecting residences affected by groundwater contamination in the vicinity of Casey Village and Kirk Road to a public water-supply system between June and December 1994. Contaminated groundwater associated with residential wells located on Kirk Road north of Area C and residential wells in the vicinity of the Casey Village area southeast of Area B comprises OU-2.

Focused RI activities for other groundwater contamination at the base began in October 1993 for Area B, January 1994 for Area C, and February 1994 for Areas A and D. The RI field work for Area C groundwater (including impacts from Site 4) was completed in May 1994. The Navy prepared RI and FS reports addressing the results of this investigation and evaluating remedial alternatives for shallow groundwater contamination in the vicinity of Area C. Both reports were completed in August 1994. In March 1995, the Navy and EPA selected a remedy for OU-3, which is contaminated groundwater attributable to Area C. The Navy combined this remedy with the remedy for OU-1. Construction of the OU-3 remedial action is currently in progress.

The Navy is currently conducting additional environmental studies at the base and is planning to investigate other media associated with NAWC Warminster under the RI/FS process, including groundwater in deep bedrock aquifers, wastes, soils, sediment, and surface water. The Phase III RI/FS began in January 1995 and will identify the full nature and extent of contamination, both on and off base, for the rest of the facility (including Site 4).

The Phase III work is continuing. Additional remedial actions will be proposed and selected as soon as adequate information exists to support the selection of a remedy for a particular medium or group of media. Any such medium (or group of media) will be designated as an operable unit by the Navy and EPA. At this time, only OU-1, OU-2, and OU-3 have been designated by the Navy and EPA.

As part of the nation-wide BRAC legislation, NAWC Warminster has pledged to give top priority to early re-use of the base's land and buildings. Property available for reuse at the base includes 730 acres, approximately 1.5 million square feet of office and laboratory space, and about 200 buildings. The Federal Land Reuse Authority - Bucks County (FLRA-BC) is responsible for recommending strategies for reuse of the base to best utilize the resources of NAWC Warminster and its people to the greatest benefit of surrounding communities.

In addition to the work being performed under the IR Program, the Navy has undertaken environmental baseline survey (EBS) work to help identify and prioritize parcels of land at NAWC Warminster that can be transferred to the FLRA-BC. The EE/CA for Site 4 will also help to support the transfer of property to the community by identifying the most appropriate response option to mitigate potential exposure to Site 4 contaminants.

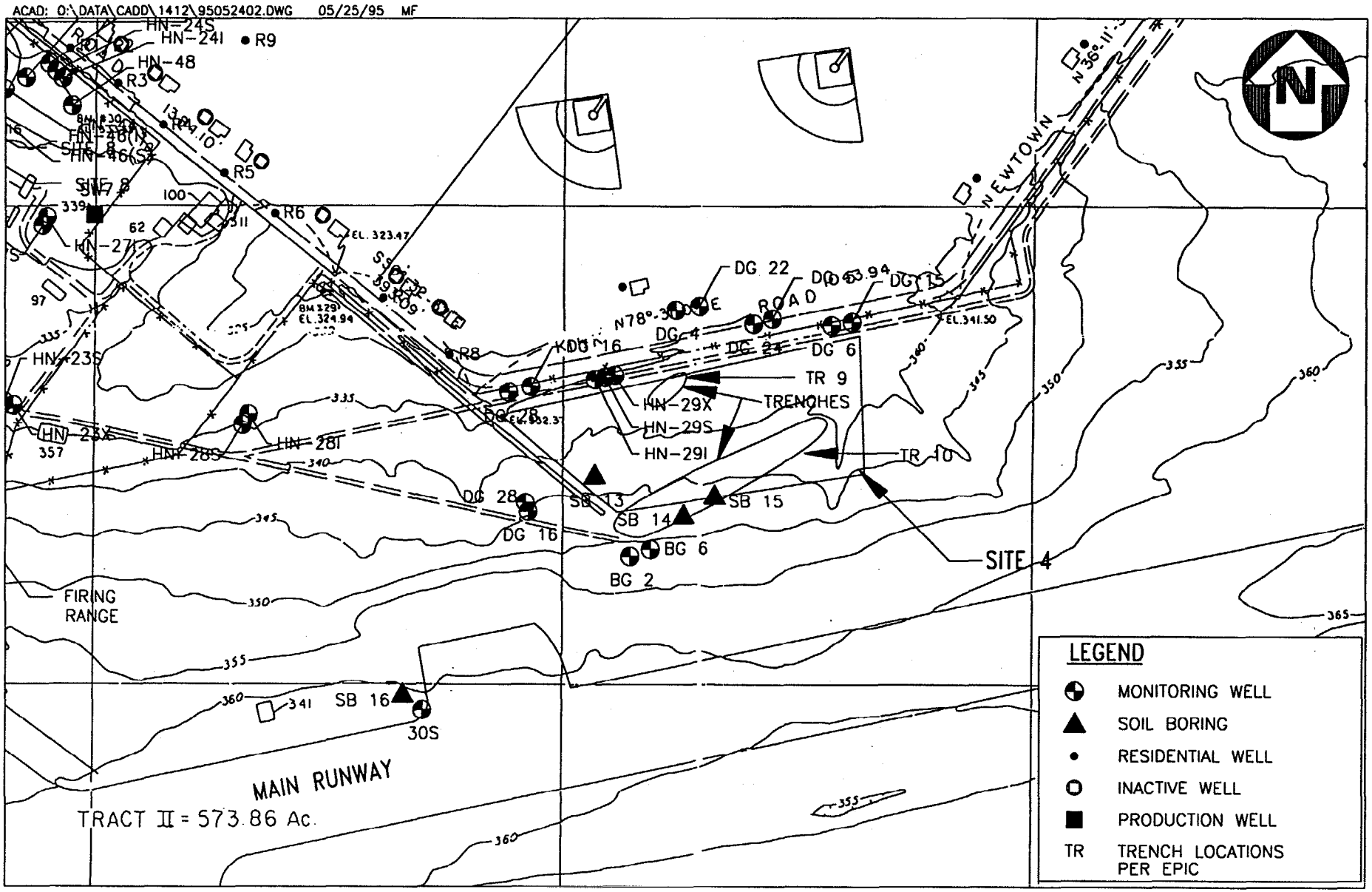
1.2 SITE 4, NORTH RUNWAY LANDFILL

This section presents the history and description of Site 4. The site is adjacent to Kirk and Newtown Roads in the northeastern portion of the base. An unnamed tributary of Little Neshaminy Creek is located north of this area, and residential areas and two local parks are also in this direction.

1.2.1 Site Description and History

Site 4 is a grassy area covering 7 acres just north of the main runway along Kirk Road and south of Patrol Road. The site is located at approximately the mid-point of the runway. The location of Site 4 is shown in Figure 1-2.

The site is the largest of the NAWC Warminster waste disposal locations; it is less than 100 feet from the edge of the facility boundary. This site reportedly was operated from 1966 to 1970. Several trenches on the site reportedly were used to dispose of non-industrial solid waste, paints, waste oils, waste metals, construction debris, solvents, and sewage sludge from the sewage treatment plant. It is not known if wastes were segregated prior to disposal or whether wastes were placed randomly into each trench. Some drainage from this area intersects the unnamed tributary of Little Neshaminy Creek, off site to the north of Kirk Road, near Munro Park. Several off-base residences are present within 200 feet of Site 4.



SITE 4 FEATURES
NAWC WARMINSTER, PA

FIGURE 1-2

Halliburton NUS CORPORATION

In 1994, EPA performed an analysis of historical aerial photographs for NAWC Warminster (EPIC, 1994). This study verified the presence of two trenches at Site 4 (TR9 and TR10) (Figure 1-2). The photo-interpretation study also indicated that Site 4 may have been active as late as 1973.

1.2.2 Previous Investigations and Response Actions

Prior to the Phase III RI field work for Site 4 (see Section 1.4), a series of investigations and actions were conducted by the Navy to address this site. During closure of Site 4 in 1970, 2 feet of fill was reportedly placed over the entire site and the area was reseeded. Reportedly, complaints by nearby residents concerning blowing trash and odors contributed to site closure. In July 1982, four monitoring wells were installed in the vicinity of Site 4, along with several observation wells that were used for water-table measurements. These wells have been sampled several times since 1982.

In October 1988, SMC Martin noted that the topography within Site 4 appeared to be hummocky, presumably due to differential settling within the landfill. Color variations in the grass cover were noted to create a banded or striped pattern. These color variations were approximately the same size as the landfill trenches.

The objectives of the Phase I and Phase II RI for Area C were to

- Characterize the nature and extent of potential overburden and shallow bedrock groundwater contamination at this area.
- Better understand the physical parameters affecting contaminant fate and transport.
- Assess risks to human health and the environment.

The nature and extent of contamination at Site 4, as determined by previous investigations, are presented in the Phase III RI work plan (HNUS, 1995a), the RI Report for Operable Unit 3 (OU-3) (HNUS, 1994a), and the Draft Phase II RI Report for NAWC Warminster (HNUS, 1992). This information has been summarized as appropriate in Section 1.5 of this report.

An electromagnetic (EM) conductivity survey and soil gas survey were performed at Site 4 during Phase I. The EM survey consisted of sample points located on a grid pattern that consisted of nine profile lines running perpendicular to Patrol Road and three lines parallel to this road. Soil gas readings were also taken on a grid pattern from 99 locations along and between the seven trenches at this site. Soil confirmation borings were drilled at 13 locations to further delineate site boundaries.

Five shallow bedrock and one overburden monitoring wells were installed during Phase I; no wells were installed during Phase II. A total of five well couplets are present at this site. All wells were sampled during both phases of the RI. In addition, information on local hydrogeology was collected and evaluated.

Two rounds of sediment and surface water samples were obtained near Site 4 during Phases I and II. Samples were taken from two locations (upstream and downstream) in a tributary adjacent to the site. Subsurface soil samples were obtained from four locations during Phase II. Three locations corresponded to areas where high soil gas readings were found during Phase I. The remaining location was chosen to evaluate background soil levels.

Hydrogeologic investigations at Site 4 included estimates of yields from new monitoring wells; calculations of horizontal groundwater flow velocities and vertical hydraulic gradients; construction of groundwater elevation maps; and estimates of flow rates for the surface water near this site. An ecological survey was also completed near Site 4 during Phase I.

Groundwater samples were analyzed for Target Compound List (TCL) volatile organics, Target Analyte List (TAL) metals (both total and dissolved), and cyanide. Selected samples were also analyzed for TCL semivolatiles and pesticides/polychlorinated biphenyls (PCBs). Analysis of surface water and sediment samples included full TCL and TAL analyses (both total and dissolved). Soil samples were analyzed for full TCL and TAL analyses, along with total petroleum hydrocarbons (TPHs). A variety of engineering parameters were analyzed for selected samples among the various media.

The objective of the focused RI for Area C was to determine groundwater impacts from Sites 4 and 8, particularly the location and concentration of potential groundwater contamination by VOCs and metals. Data collected during the RI were used to develop and evaluate groundwater remedial alternatives to address this contamination.

During the focused RI, field work consisted of installing one shallow and one intermediate monitoring well downgradient of Site 4. The new wells and existing monitoring wells were sampled and analyzed for TCL volatile organics and TAL metals (both total and dissolved). Well water samples for new wells were analyzed for TCL semivolatiles and pesticides/PCB compounds. Comprehensive water-level measurements were also taken.

1.3 PHYSICAL CHARACTERISTICS

Several environmental studies concerned with the NAWC Warminster Sites have been completed since 1980. A number of these studies have provided information on local surface features, soils, meteorology, surface water hydrology, demography and land use, and hydrogeology.

A summary of the physical characteristics of Site 4 has been prepared on the basis of published information and reports of previous site studies (including the Phase I and II RI and the focused RI for Area C groundwater). Additional information regarding the characteristics of Site 4 is provided in the RI report for OU-3 (HNUS, 1994a).

1.3.1 Meteorology

The climate of the area is humid continental and is modified by the Atlantic Ocean. Temperatures average 76°F (24.4°C) in July and 32°F (0°C) in January. The average daily temperature for the NAWC location is 53.3°F (11.8°C). Precipitation averages 42.5 inches per year (106.25 cm per year), and snowfall averages 22 inches per year (55 cm per year). The distribution of precipitation is fairly even throughout the year. The relative humidity for the site averages 70 percent. The mean wind speed for this area is 9.6 mph, with a prevailing direction to the west-southwest (NAWC Warminster Emergency Response Plan, August 13, 1990).

1.3.2 Site 4 Surface Water Hydrology and Topography

NAWC Warminster is situated on an upland area divided between two local drainage basins, the Little Neshaminy Creek Basin on the north and the Southampton Creek basin on the south. The northern 65 percent of the facility (including Site 4) drains toward the north through several swales and storm sewers into small unnamed tributaries of Little Neshaminy Creek. The southern 35 percent of the facility drains toward the south to the headwaters of Southampton Creek, a tributary of Pennypack Creek. Both local drainage basins lie within the regional drainage basin of the Delaware River. Various studies conducted on the site have revealed that no areas within NAWC Warminster are included in the 100-year or 500-year floodplain.

The location of NAWC Warminster represents a relative topographic high based on the U.S.G.S. quadrangle for the vicinity (Hatboro, Pennsylvania quadrangle, 1966). The crest of a local hilltop trends from west to east within the facility and is roughly coincident with the location of the main runway. Surface topography within the facility slopes away from the main runway to the north, west, and south, precluding surface water flow onto the facility from surrounding properties. Slopes range from nearly level to eight percent and average from three to five percent. Surface elevations range from a high of approximately 380 feet mean sea level (MSL) near the eastern end of the main runway to a low of approximately 300 feet where a small stream exits the northwestern part of the facility.

An unnamed tributary of Little Neshaminy Creek is located north of Site 4 (Figure 1-2). This stream originates at the base of the storm water drain east of Site 4 and runs east to west through Munro Park before turning north, away from NAWC Warminster. During base flow conditions, this stream appears

heavily silted and has an estimated maximum flow rate of 7 to 10 gallons per minute (gpm). The uppermost part of this stream is small and intermittent and, during dry periods, water in the stream tends to be limited to pool areas. The stream channel is well developed despite the low or intermittent flow rates. Channel width is 3 to 5 feet, and channel depth is 1 to 2 feet. Sediments in the stream are primarily sands and cobbles in run areas and sands and silts in pools.

1.3.3 Site 4 Soils

According to the Soil Survey of Bucks and Philadelphia Counties, Pennsylvania (United States Department of Agriculture, Soil Conservation Service, 1975), two soil series have been mapped in the vicinity of Site 4: the Chalfont silt loam and the Duncannon silt loam. The soils observed near Site 4 range from 2 to 15 feet in thickness. Soils types include orange-red, brown, and maroon-red mixtures of silt, clay, and sand, with the fine-grained soils dominant. A bluish-gray micaceous silt is also present in Site 4 area.

The Duncannon soils have moderate permeability and are deep, well drained, and nearly level to gently sloping. These soils consist primarily of brown, yellowish-brown, dark brown, and dark reddish-brown silt loam and shaly silt loam. These soils have moderate permeability ranging from 4.4×10^{-4} to 1.4×10^{-3} cm/sec. The depth to bedrock and the seasonal high water table are each typically greater than 4 feet below the surface.

The Chalfont soils have slow permeability and are deep, somewhat poorly drained, and nearly level to gently sloping. They occur in concave positions on low-relief uplands and formed in the silty wind-blown mantle overlying loamy material weathered from red and brown shale and sandstone. The soils consist primarily of brown, dark yellowish-brown, and grayish-brown silt loam, silty clay loam, and shaly silt loam that may be compact, firm, and brittle within the subsoil. The depth to bedrock is typically from 4 to 8 feet below the surface, and a high water table is within 6 to 18 inches of the surface in wet seasons.

1.3.4 Site 4 Geology and Hydrogeology

NAWC Warminster is located in the Piedmont Physiographic Province, Triassic Lowlands Section, of southeastern Pennsylvania. The province is extensive and gently undulating and generally slopes to the southeast. The land forms have been modified by erosion to form moderate slopes and gently rounded hills with a dendritic drainage pattern.

The bedrock underlying NAWC Warminster belongs to the late Triassic age Stockton Formation. The Stockton Formation underlying Site 4 consists of alternating lithologic units of predominately gray and brown, fine-grained arkosic sandstone and red-brown siltstone/mudstone. Individual beds or defined

sequences of rock units of predominantly one lithologic type range from a few feet to approximately 50 feet in thickness across the area. Major lithologic units can be traced over significant portions of this general area, although the thinner beds within a unit are often difficult to correlate and may pinch out over distances of several hundred feet.

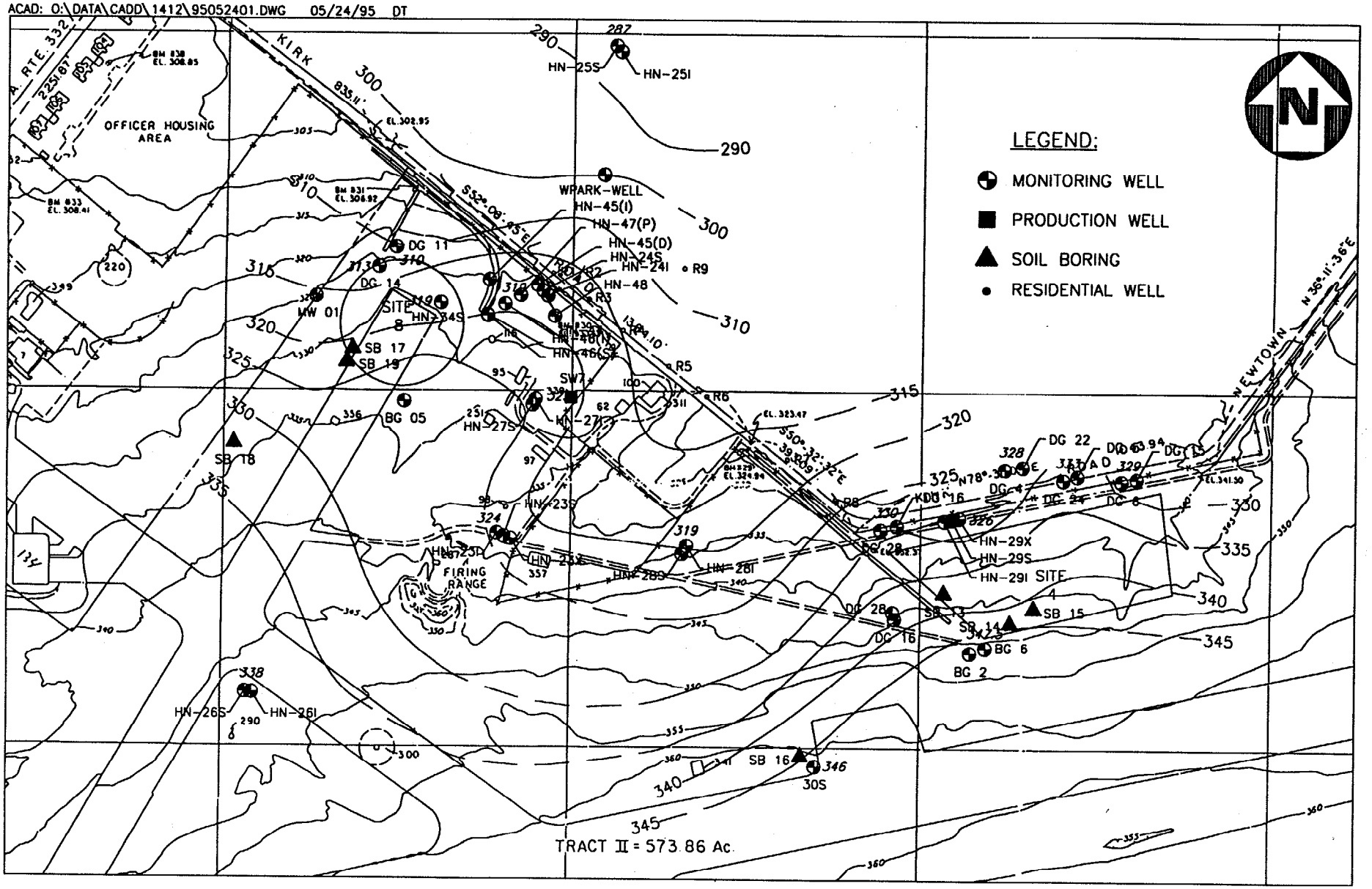
Based on RI results, the surface of bedrock underlying Site 4 is highly weathered for a depth of about 5 to 15 feet in general. Residual soils exist within the top few feet of the ground surface. The soils gradually grade into weathered rock, then competent bedrock. The transition points are hard to precisely define with any certainty. Figure 1-3 shows the topography of the bedrock surface, based on interpretations of drilling log information. This surface has an overall northward slope across Site 4. A minor trough in the bedrock surface is located between Sites 4 and 8. This trough corresponds to a subdued topographic low that extends off base to the north and to a tributary of Little Neshaminy Creek that drains this area.

Groundwater near Site 4 occurs primarily within the bedrock of the Stockton Formation. Groundwater occurrence and movement through this formation are primarily due to secondary porosity (fractures) that exists within the rock mass. These fractures include bedding-plane partings and fractures that extend through individual rock units. There is some minor porosity, especially in the sandstone units, that contributes to groundwater occurrence and movement. In general, the sandstone units yield more water than the siltstone and shale units, although significant water-yielding fractures are encountered in all rock types.

Shallow groundwater flow direction is related to topography, surface drainage, and bedrock structure in this area. The groundwater flow direction in shallow bedrock (to a depth of about 100 feet) across Site 4 is slightly west of due north, with an average gradient of 0.03. The flow direction and gradient closely correspond to the slope of the ground surface, which also trends slightly west of due north. Also, the groundwater flow direction is subparallel to the bedrock dip directions and is in the direction of overall surface water drainage toward Little Neshaminy Creek. This is expected based on the ground surface and bedrock surface slopes and the presence of the small creek north of Site 4. This creek may act as a local shallow groundwater discharge point. The depth to which this creek influences groundwater flow is unknown, but the creek's function as a discharge point for groundwater is expected to be minor given the small size of the creek and its intermittent nature.

Deeper groundwater flow directions (greater than 120 feet) trend generally to the north-northeast, and flow directions within the overburden are generally to the north following topography. Deeper groundwater flow may, however, follow the creek valley and be indirectly influenced by the stream. There is a marked upward vertical gradient between the deeper and more shallow portions of the bedrock aquifer. Hydraulic head differentials of over 15 feet were measured at several well cluster locations in this area where shallow and deeper wells were installed. Some deep wells are flowing artesian wells, with hydraulic heads over 10 feet

ACAD: O:\DATA\CADD\1412\95052401.DWG 05/24/95 DT



SITE 4
BEDROCK/SAPROLITE
SURFACE TOPOGRAPHY
NAWC WARMINSTER, PA

FIGURE 1-3

Halliburton NUS CORPORATION

above the top of the well casing. These confined conditions may be created by the presence of thick, predominantly fine-grained, interbedded mudstone-sandstone units.

Additional information regarding the Site 4 geology and hydrogeology is presented in the RI Report for OU-3 (HNUS, 1994a).

1.3.5 Groundwater Use Near Site 4

Residents near Site 4 rely entirely on groundwater sources for their water supply. The majority of the residents are served by municipal water authorities. Approximately 15 domestic wells are located within 1,000 feet of Site 4, and one municipal well (Well No. 13) for the Warminster Municipal Authority is within 1,500 feet of the area to the north.

Well No. 13 is a 10-inch-diameter well and is 601 feet deep. It is cased to a depth of 80 feet below the ground surface and pumps at an average rate of 85 gpm. The average daily withdrawal rate is 68,000 gallons. The intermittent, unnamed tributary of Little Neshaminy Creek is located between Site 4 and Well No. 13. This creek is not expected to act as a buffer between Site 4 and this well, given the stream's small size and the well's depth and pumping rate.

Most of the domestic wells immediately north of Site 4 were decommissioned when public water connections were made along Kirk Road and Newtown Road as part of the OU-2 removal action in 1994. There are approximately 35 domestic wells and one municipal well within 3,200 feet of Site 4 at this time. The nearest well currently providing domestic well water is about 600 feet to the east of Site 4, and one domestic well capable of serving the Base Commander's residence is 850 feet to the west.

1.3.6 Site 4 Ecology

A relatively large wooded area borders the stream to the north and northwest of Site 4. The wooded area extends along the stream from Kirk Road downstream toward Werner Park. This area offers a secluded and physically diverse habitat, as observed during the Phase I RI biological characterization (SMC Martin, 1991). Snails, earthworms, and amphipods are common in sediments and leaf packs from downstream portions of this study area as are small numbers of mayfly larvae. In addition, various songbirds, rabbits, raccoons, and white-tailed deer are found below the study area.

A wetlands assessment of the area north of Area C (HNUS, 1994b) classifies a wetland along the unnamed tributary of Little Neshaminy Creek as primarily palustrine, forested, broad-leaved, deciduous, temporary (PF01A). This wetland is characterized by green ash, silver maple, box elder, black cherry, and spicebush as the canopy and sub-canopy. Blackberry, Japanese honeysuckle, jewelweed, poison ivy, and skunk

cabbage are the dominant herbaceous species. A small scrub-shrub wetland, located immediately southwest of the Munro residence, is also associated with this area. Riparian vegetation in the upstream portion of this creek includes a canopy of mature maples and sycamores (Plantanus occidentalis), with a moderate understory of young trees and arrowwood shrubs. Downstream portions are characterized by fewer mature trees, a more open stream corridor, and greater bankside shrub and herbaceous growth.

The upland forest associated with stream provides excellent habitat for a large variety of wildlife. Fourteen species of birds were identified, including cardinals, robins, wood thrushes, starlings, blue jays, and downy woodpeckers. Amphipods, midges, and mayfly larvae were observed in the leaf packs in the stream. There also was evidence that rabbits, raccoons, and white-tailed deer are common to the area.

The wetlands assessment concluded that the stream and wetlands appear to be fairly healthy. No evidence of pollution, fish kills, or stressed vegetation was observed. Urban trash and litter (tires, boards, bottles, cans, paper, plastic) were common.

1.4 ADDITIONAL SITE 4 INVESTIGATION

To support the EE/CA, site characterization data were gathered to determine the locations, nature, and extent of contamination at Site 4. These data were collected between January and April 1995 as part of Phase III RI activities and have been used in conjunction with data already gathered from previous investigations and studies, including the results of the EPA aerial photograph analysis report (EPIC, 1994) and the environmental baseline survey (EA, 1995). A field investigation was performed to better characterize the site, to provide information with which to generate volume estimates for landfill materials contained within Site 4, and to perform waste characterization activities to support the evaluation of removal action alternatives. A field sampling plan for the Site 4 EE/CA was prepared that describes the scope of this work.

The EE/CA field investigation consisted of the following activities:

- Geophysical survey to establish trench locations or potential subsurface waste disposal locations.
- Soil gas survey to identify the presence of any elevated levels of VOCs within those locations established by the geophysical surveys.
- Test pits to further identify subsurface wastes within those locations established by the geophysical and soil gas surveys.

- Surface soil and subsurface soil and waste sampling and analyses to characterize surface and subsurface conditions within Site 4.

- Surface water and sediment sampling and analyses to characterize the nature and extent of contamination for these media near Site 4.

- Limited groundwater sampling and analysis to ensure that drinking water users were not adversely affected by any Site 4 contamination.

1.4.1 Site 4 Geophysical Survey

An EM conductivity survey was conducted at Site 4. The survey work was generally conducted in accordance with the field sampling plan for the Site 4 EE/CA (HNUS, 1995b). EPIC provided grid coordinates to help locate Site 4 aerial photography features (EPIC, 1995). HNUS added one additional north-south profile line at the eastern end of Site 4 and two additional east-west profile lines to improve the coverage of all potential anomalies. The surveyed area is shown in Figure 1-4. The surveyed area did not extend across Patrol Road, which borders the northern edge of the site, due to the presence of an unknown subsurface utility. However, it is unlikely buried wastes were deposited north of the road, given the shallow depth to bedrock.

A Geonics EM-31 conductivity meter and automatic data logger were used to measure and record the earth's response to an induced EM signal. Both in-phase and quadrature phase data were collected at each data point. The EM survey was successful in delineating potential waste locations.

The results of the Site 4 geophysical survey are presented in Section 1.5.1 and Appendix B. The data generated from the EM survey were evaluated to identify ground conductivity anomalies resulting from potential areas of buried waste. Graphs of ground conductivity (quadrature phase) and in-phase data were plotted for each profile line recorded. Anomaly values and shapes were evaluated to determine the probable cause of each anomaly (e.g., subsurface utility, buried metal, and natural geologic changes). Anomaly types and locations were correlated with observed surface features and cultural sources of interference across Site 4 to complete the data interpretation. Contour maps of the data were not generated because the profile line spacing was generally 5 to 10 times the station spacing, preventing the available contouring programs from making the proper correlations along trenches.

ACAD: O:\DATA\CADD\1412\95052601.DWG 05/26/95 MF

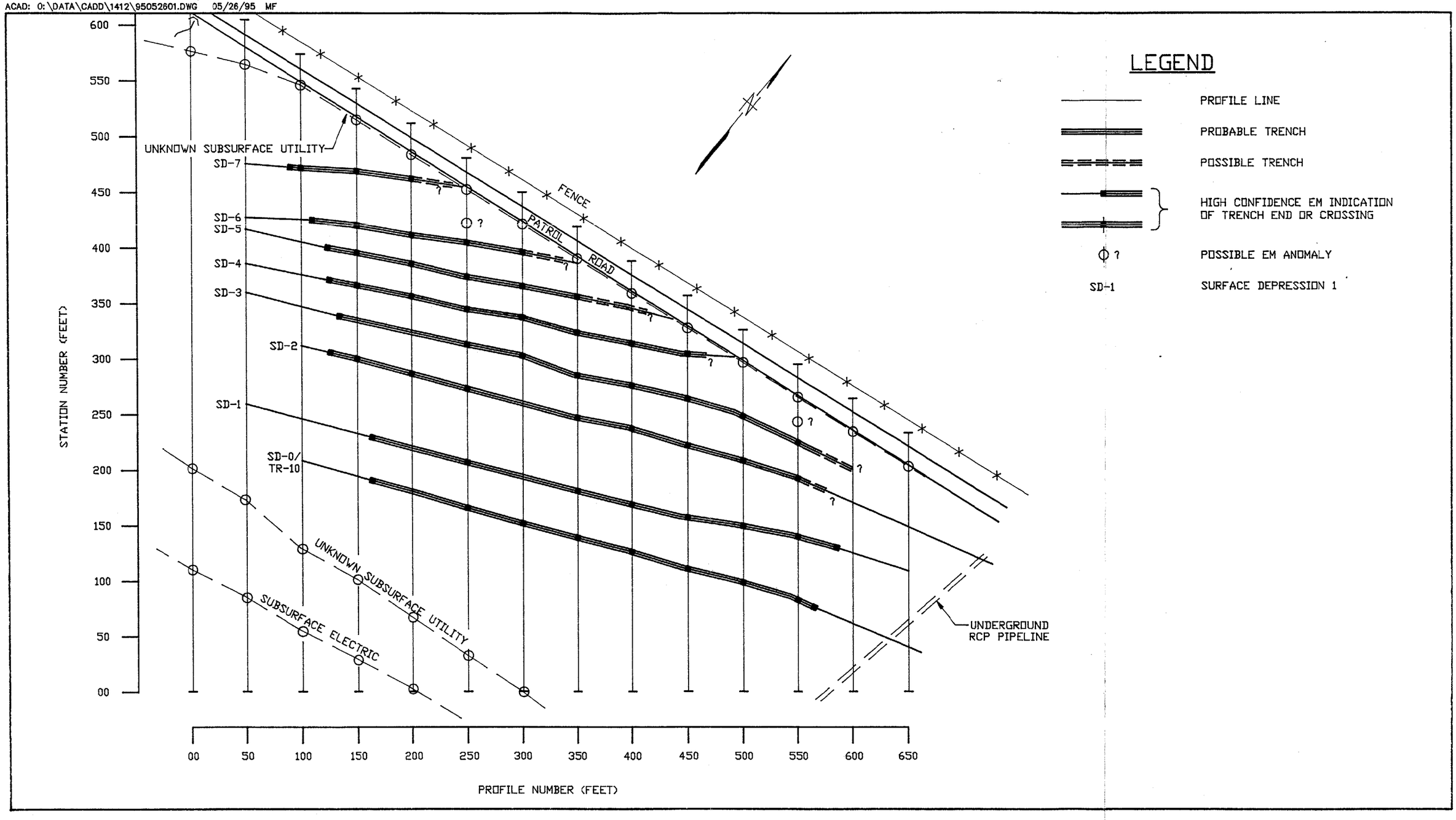


FIGURE 1 – 4

SITE 4
GEOPHYSICAL SURVEY RESULTS AND PROFILE LINES
NAWC WARMINSTER, PA

Halliburton NUS CORPORATION

00081 B0R

1.4.2 Site 4 Soil Gas Survey

A soil gas survey was performed in the vicinity of Site 4 to identify potential areas of elevated VOC concentrations. Results of the soil gas survey were used to identify test pit and subsurface soil sampling locations. The geophysical survey results were used to select soil gas survey locations, and these locations were adjusted as necessary to avoid buried subsurface objects. The soil gas survey was run along the long axis of each suspected trench or buried waste disposal location (Figure 1-5).

One soil gas sample was collected at each of the 26 survey locations. The samples were taken from a depth of 4 to 6 feet below the ground surface, which was the approximate mid-point of materials deposited in the trenches. After each soil gas sample was collected, the hollow probe and adapter assembly was removed with a mechanical jack and thoroughly decontaminated. The Tedlar bags were purged with three volumes of purified gas between use or disposed, in the case of any highly contaminated samples. The sample was then transferred to an on-base trailer for analysis. A temperature-programmable gas chromatograph (GC) was used for sample analysis, along with a detachable portable computer. The GC was equipped with an electron capture detector (ECD).

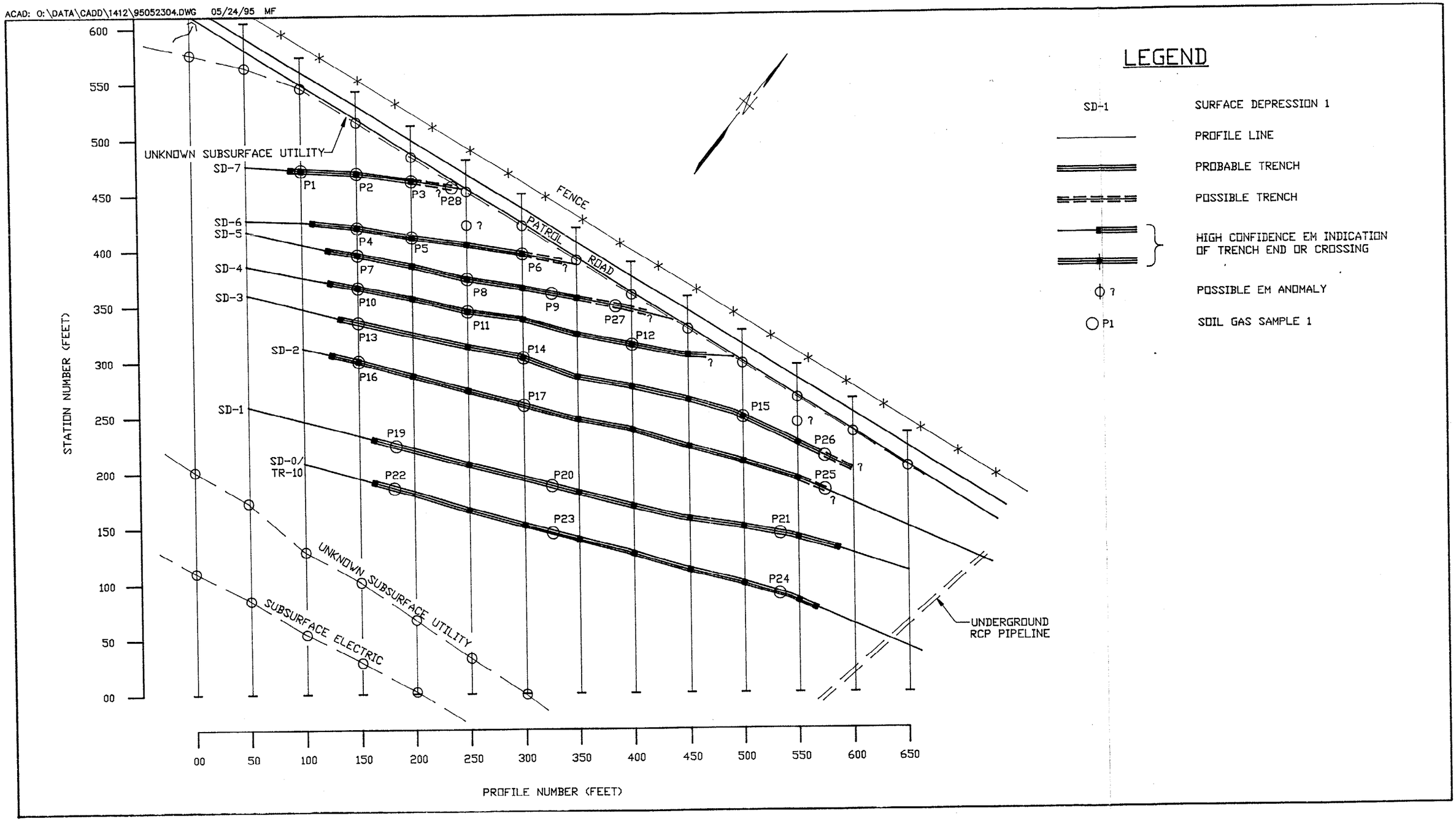
The results of the soil gas survey are presented in Section 1.5.2. These results provide qualitative data regarding the presence of VOCs.

1.4.3 Test Pit Excavations

The results of the geophysical and soil gas surveys were used to select test pit locations. Locations were adjusted to avoid the potential to puncture subsurface objects and the associated potential to release or previously immobile hazardous substances to groundwater.

A total of 31 test pits were excavated in April 1995 to identify subsurface wastes within those locations established by the geophysical and soil gas surveys and to delineate the nature and extent of fill materials at Site 4 (Figure 1-6). A backhoe was used to excavate an area ranging from 14 to 23 feet long (typically 16 feet long), 4 to 8 feet deep, and 4 feet wide. Based on visual observations, along with the survey results, three test pit locations were selected within each trench, one near each presumed end and one in the middle, for a total of 24 test pits. Also, seven test pits were excavated outside the apparent limits of the trenches to confirm the absence of wastes in areas with no noticeable surface depressions. Four of the seven test pits were excavated outside but within 20 feet of the presumed ends of the trenches; the remaining three test pits were excavated in random areas within Site 4 that were not near any surface depressions, in order to evaluate the potential for hidden trenches and for use as background.

ACAD: O:\DATA\CADD\1412\95052304.DWG 05/24/95 MF



SITE 4
SOIL GAS SAMPLE LOCATIONS
NAWC WARMINSTER, PA

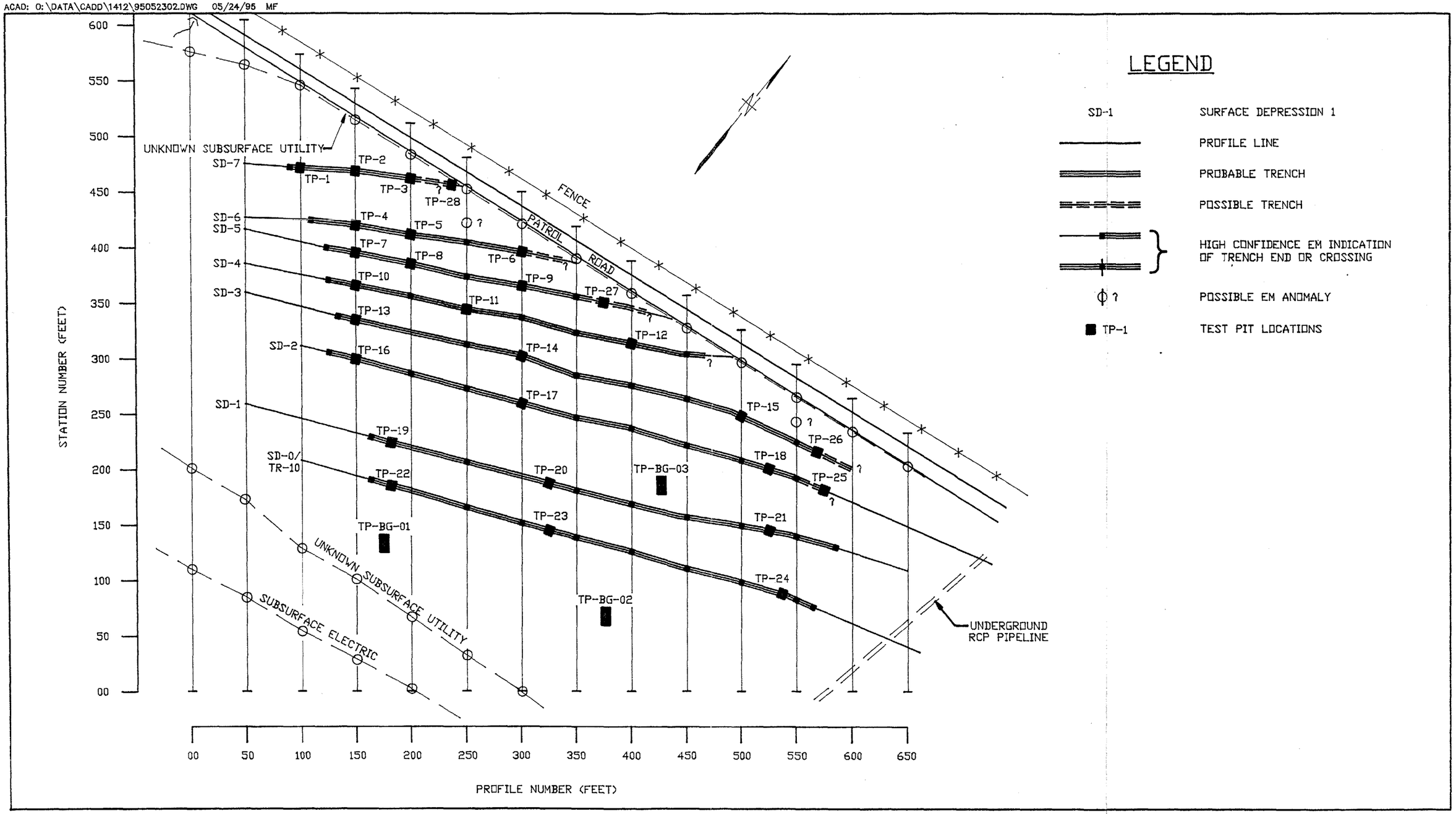
0 80 160
SCALE IN FEET
1"=80'-0"

FIGURE 1 – 5

Halliburton NUS CORPORATION

00051BB02

ACAD: O:\DATA\CADD\1412\95052302.DWG 05/24/95 MF



SITE 4
TEST PIT LOCATIONS
NAWC WARMINSTER, PA

0 80 160
SCALE IN FEET
1"=80'-0"

FIGURE 1 – 6

Halliburton NUS CORPORATION

The test pits excavated within the disposal trenches were extended across each trench to natural soils/clean fill on either side of the trench and were extended vertically to the bottom of the trench (or bedrock or maximum reach of the backhoe, whichever was encountered first). Each test pit was photographed and logged to provide a description of the wastes and a cross-section of the trench. Test pit logs are in Appendix A. Photographs of each test pit were also taken. Figure 1-7 shows a sketch of a typical test pit excavation.

The waste materials encountered were screened with a PID. If potentially contaminated wastes were encountered, based on PID readings and/or visual observations, representative samples of the wastes were obtained for laboratory analysis. Samples were obtained from the backhoe bucket, using dedicated stainless-steel trowels.

In addition, one soil sample was collected from the side wall of any test pit that showed the presence of potentially contaminated wastes. These soil samples were representative of subsurface soils that might be contaminated as the result of waste migration (e.g., leaching, infiltration) within or adjacent to the disposal trenches. Upon completion, each pit was backfilled with the same materials that were excavated.

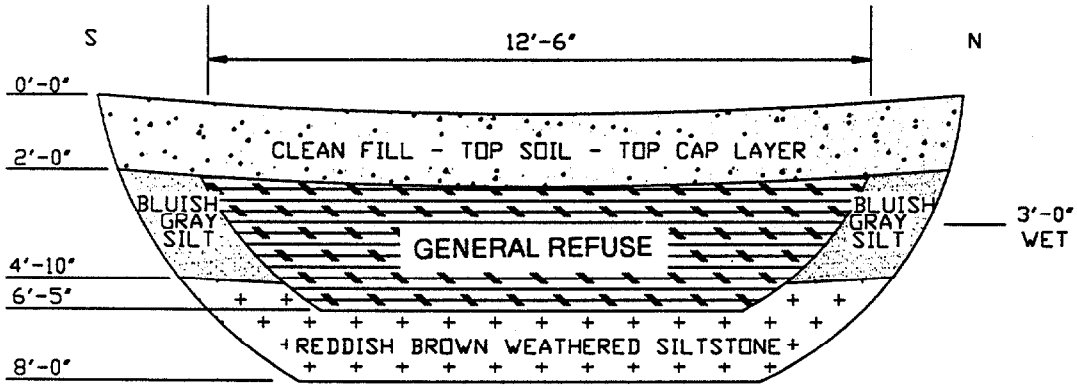
A total of 13 subsurface soil samples were obtained for analysis from the backhoe bucket (i.e., center line of the test pit), and 14 samples were collected from the sidewalls of the sampled test pits. Analytes included TCL volatiles and semivolatiles, TAL metals, pesticides/PCBs, and cyanide. Of the 27 samples collected, 18 samples were taken from the trenches (SB-1 through SB16, SB-23, and SB-24), three samples were duplicates of samples from the trenches (SB-30 [duplicate of SB-6], SB-31 [duplicate of SB-5], and SB-32 [duplicate of SB-24]), and six background samples were collected from test pits between the trenches (SB-17 through SB-22). No samples underwent toxicity characteristic leaching procedure (TCLP) waste characterization because significant wastes were not observed and most wastes appeared to be general refuse. The contents of the Site 4 trenches are more fully discussed in Section 1.5.3.

The subsurface soil analytical results are discussed in Section 1.5.4 and were used to characterize the buried wastes and associated soils and to establish clean-up goals or acceptable contaminant concentrations specific to this medium. All analytical results for subsurface soils are provided in Appendix C.

1.4.4 Surface Soil Sampling and Analysis

In April 1995, 20 surface soil samples were collected from 18 sample locations in the vicinity of Site 4 (Figure 1-8). Sample depths ranged between 18 and 30 inches below the ground surface. Surface soils consisted of silty clay with varying amounts of construction/demolition debris and general refuse. All

ACAD: O:\DATA\CADD\1412\95052403.DWG 05/26/95 MF



SITE 4
TYPICAL TRENCH SKETCH
NAWC, WARMINSTER, PA.

FIGURE 1 - 7

Halliburton NUS CORPORATION

ACAD: O:\DATA\CADD\1412\95052303.DWG 05/26/95 MF

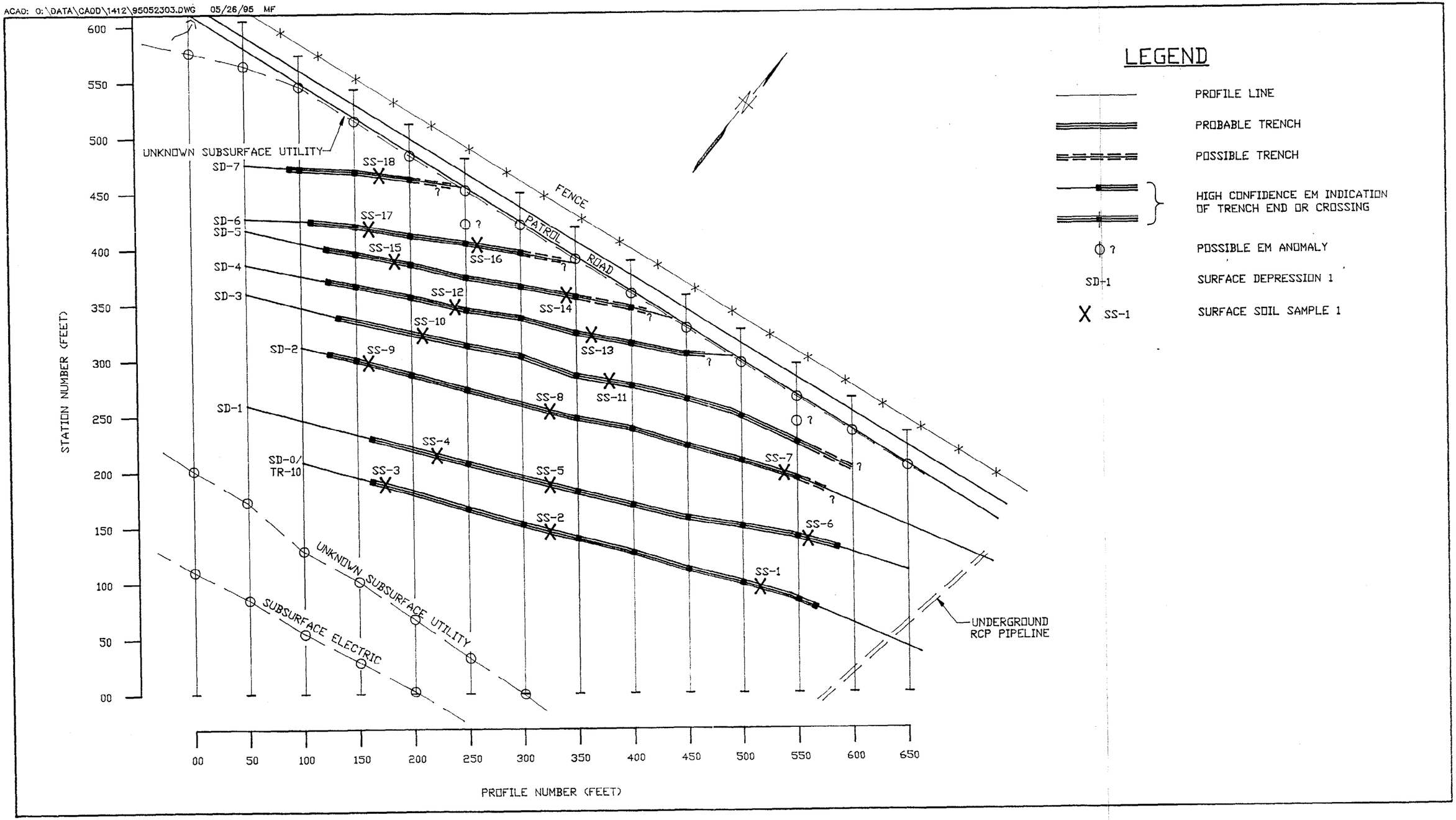


FIGURE 1 – 8

SITE 4
SURFACE SOIL SAMPLE LOCATIONS
NAWC WARMINSTER, PA

0 80 160
SCALE IN FEET
1"=80'-0"

Halliburton NUS CORPORATION

00081B032

samples were analyzed for TAL metals and cyanide, and 13 samples were tested for TCL semivolatile organics. In addition, 10 samples were tested for TCL volatile organics and seven were analyzed for TCL pesticides and PCBs. Of the 20 samples collected, 10 are considered site samples (SS-01 through SS-18) and two are considered duplicate samples (SS-20 [duplicate of SS-10] and SS-21 [duplicate of SS-05]). TCL volatile organic analysis was not performed for shallow soil samples (e.g., those collected from less than or equal to the 2.0-foot depth interval) since any VOCs present during the period that Site 4 was active were expected to have volatilized from surface soils. However, the deeper surficial soil samples (e.g., those collected from depths greater than 2.0 feet) were analyzed for this parameter. Based on observations made during the EM and soil gas surveys, as well as noticeable depressions and stained areas within the Site 4 disposal trenches, the actual number of samples collected and some of the planned surface soil sample locations were modified from the field sampling plan. Background sample locations near Site 4 were eliminated so that more trench samples could be collected. Instead, background surface soil samples were taken from each end of the main runway.

The surface soil analytical results are presented in Section 1.5.5 and were used to assess the risks posed by surficial soils and to establish clean-up goals or acceptable contaminant concentrations specific to this medium. All analytical results (for surface soils) are provided in Appendix C.

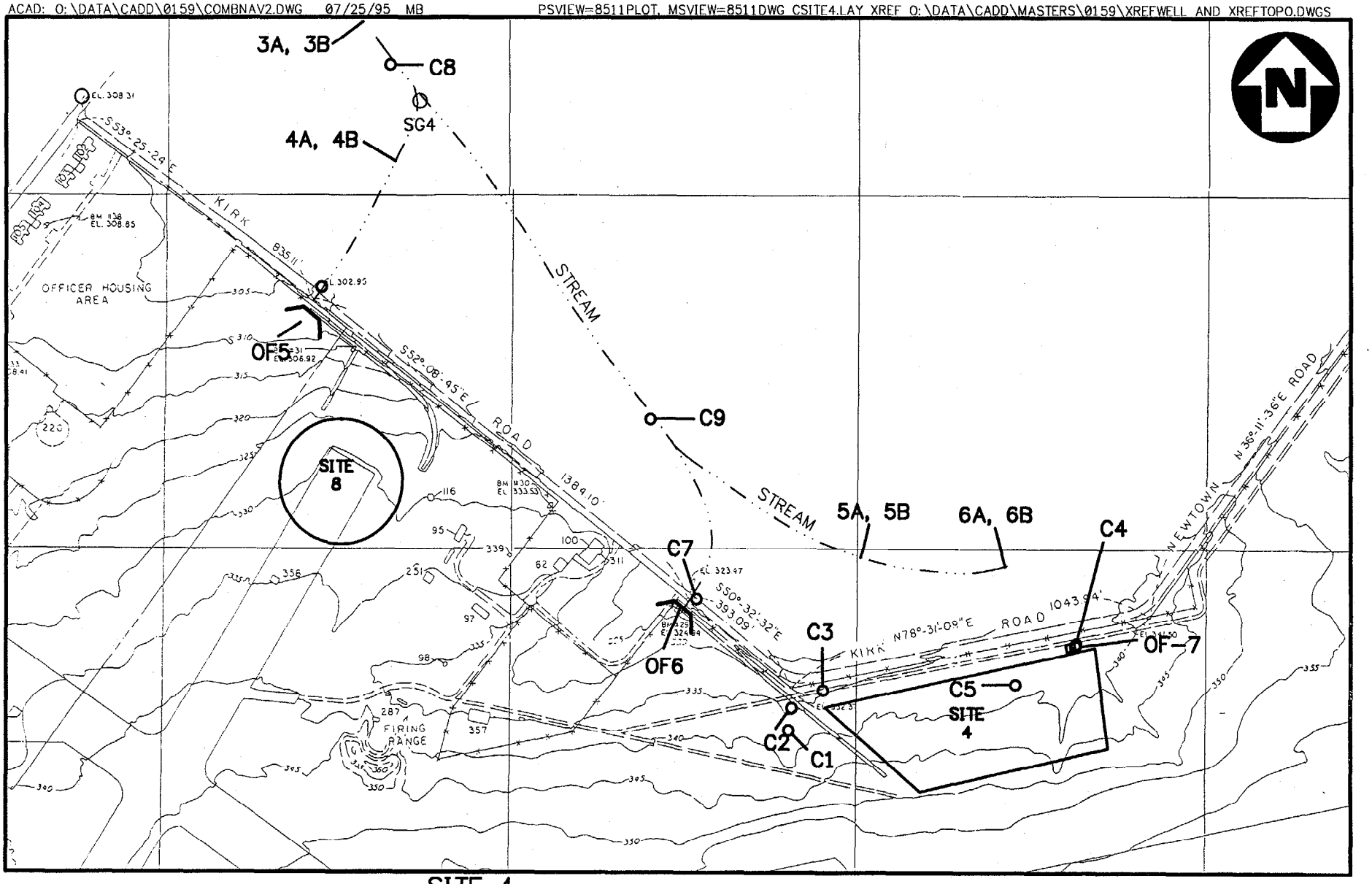
1.4.5 Surface Water and Sediment Sampling and Analysis

In December 1990 and June 1992, seven surface water sampling locations were selected near Site 4. The sample locations are 3B, 4A, 4B, 5A, 5B, 6A, and 6B (Figure 1-9). Those sample numbers designated with an A were collected in December 1990 during the Phase I RI and those with a B were collected in June 1992 during the Phase II RI. Sample 5A had a duplicate sample collected with it. Eight samples were analyzed for TAL metals, VOCs, SVOCs, and pesticides/PCBs. During Phase II, both filtered and unfiltered samples were analyzed for TAL metals. In January 1995, seven surface water sampling locations were selected near Site 4 (Figure 1-9). The samples locations are C-1, C-2, C-4, C-5, C-7, C-8, C-9 (C-10 is a duplicate of C-7). Eight samples were analyzed for TAL metals and VOCs (includes one duplicate), three samples were analyzed for SVOCs (includes one duplicate), and two samples were analyzed for pesticides/PCBs (includes one duplicate).

These results are discussed in Section 1.5.7 All analytical results for surface water/sediment are provided in Appendix C.

In December 1990 and June 1992, eight sediment sampling locations were selected near Site 4. The sample locations are 3A, 3B, 4A, 4B, 5A, 5B, 6A, and 6B (Figure 1-9). Those sample numbers designated with an A were collected in December 1990 and those with a B were collected in June 1992. Sample 5A

ACAD: O:\DATA\CADD\0159\COMBNAV2.DWG 07/25/95 MB PSVIEW=8511PLOT, MSVIEW=8511DWG CSITE4.LAY XREF O:\DATA\CADD\MASTERS\0159\XREFWELL AND XREFTOPO.DWGS



SITE 4

SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

NAWC WARMINSTER

0 400 800

SCALE IN FEET

FIGURE 1-9

Halliburton NUS CORPORATION

had a duplicate sample collected with it. Nine samples were analyzed for TAL metals, VOCs, SVOCs, and pesticides/PCBs. In January 1995, eight surface water sampling locations were selected near Site 4. The samples numbers are C-1 through C-5 and C-7/C-10 through C-9 (C-10 is a duplicate of C-7). Ten samples were analyzed for TAL metals and VOCs (includes one duplicate), and four samples were analyzed for SVOCs and pesticides/PCBs (includes one duplicate).

1.4.6 Groundwater Sampling and Analysis

In December 1994 and April 1995, several monitoring wells in the vicinity of Site 4 were sampled as part of the Navy's groundwater monitoring plan (HNUS, 1995c and HNUS, 1995d). These wells included DG-6, DG-15, HN-29X, and HN-29I, which are shown in Figure 1-2. All samples were analyzed for TCL volatiles, while the sample from HN-29X was also analyzed for TAL metals. The results are discussed in Section 1.5.7.

1.5 NATURE AND EXTENT OF CONTAMINATION AT SITE 4

Site 4 is less than 100 feet from the edge of the facility boundary. Some drainage from this area intersects the unnamed tributary of Little Neshaminy Creek, off site to the north of Kirk Road, near Munro Park. Several off-base residences are present within 200 feet of Site 4.

The trenches at Site 4 have subsided sufficiently such that linear depressions in surface topography mark their locations. Waste material such as wood, plastic, paper, metal, brick, and glass fragments, along with assorted general trash material, was discovered in site soils during the confirmation borings and soil sampling. All borings placed in the trenches encountered a minimum of 1 to 2 feet of clean fill that may represent a cap placed over the trenches. Borings between areas of linear subsidence did not encounter waste.

An east-west-trending fracture trace was located 500 feet north of Site 4. Soil thickness generally became thinner toward the upslope portion of the site and was between 4 and 10 feet. Bedrock geology generally consisted of siltstones interbedded with arkosic quartzitic sandstones. The bedrock layers were calculated to strike toward the northeast, with a dip of 8 to 12 degrees toward the northwest.

The sections below include summaries of the results of the Phase III RI for Site 4 available at the time this report was prepared. Surface water and sediment results also include Phase I and II RI data. Appendix H contains the complete analytical database.

1.5.1 Geophysical Results

The EM survey of Site 4 indicated an approximate 550-foot by 270-foot area that apparently contained eight northeast-to-southwest trenches (Figure 1-4). The EM anomalies closely corresponded to topographic depressions, exposed construction debris, or changes in vegetative cover observed in the field. The trenches were identified by noting these features over each former trench location. Varying amounts of buried metal were suspected to be scattered throughout the trenches. Appendix B provides additional geophysical survey information.

Field observations indicated the presence of eight buried trenches. The most common indications were surface depressions occurring in linear patterns along the suspected trench areas. Consequently, the locations of the suspected trenches are as indicated by EM axial profile lines SD-0 through SD-7.

Construction debris (e.g., reinforced concrete and roofing material) was exposed at several locations along SD-0 (aerial photo feature TR10 from the EPIC analysis). Subtle variations in vegetative cover also corresponded with the suspected trench locations. Ponded water with an oily sheen was observed at some surface depression locations.

EM anomalies (quadrature, inphase, or both) were observed more than 80 percent of the time where north-south profile lines crossed a suspected trench location based on field observations. There was strong correlation between EM anomalies and surface depressions.

The western ends of all suspected Site 4 trenches were clearly indicated by east-west profile lines. The eastern ends of suspected Site 4 trenches were clearly indicated on only two east-west profile lines, SD-0 and SD-1. For the remaining profile lines, subsurface utilities interfered with the delineation of the eastern end of the suspected trench locations. Suspected trench locations typically had lower terrain conductivity values than surrounding materials; the in-phase readings were lower or higher than the surrounding materials.

The trench fill materials were heterogeneous and highly variable; these findings are supported most clearly along the axial profile lines. Significant accumulations of metallic objects were indicated at several locations, most notably along SD-0 and SD-1.

A subsurface electric line was detected in the southern corner of the Site 4 survey area. This electric line is depicted on NAWC Warminster utility maps, and one surface indication was observed to pinpoint the line's location. This line did not interfere with the delineation of potential Site 4 trench locations.

A suspected subsurface utility line occurred in the southern corner of the Site 4 survey area, approximately parallel and 60 to 80 feet north of the subsurface electric line. This suspected line is not shown on NAWC Warminster utility maps. The EM signature and feature orientation were consistent with a buried utility line source. The suspected line did not interfere with the delineation of potential Site 4 trench locations.

A reinforced concrete pipeline runs north-south across the eastern corner of the Site 4 survey area a few feet below the ground surface. This line is shown on NAWC Warminster utility maps. The line's location was evident from field observations.

A suspected subsurface utility line runs along the southern edge of the Patrol Road across the entire survey area. This line is not shown on NAWC Warminster utility maps. The EM signature and feature orientation were consistent with a buried utility line source. This feature strongly interfered with the delineation of the eastern end of several of the suspected Site 4 trench locations

The base perimeter fence runs parallel to and 20 to 25 feet north of Patrol Road across the entire survey area. This interference precluded establishment of background conditions north of Patrol Road and the suspected subsurface utility along the southern edge of the road.

A steel storm water drainage culvert beneath Patrol Road acted as a source of interference along the northernmost portion of north-south profile line 00. The eastern ends of suspected trenches along SD-2 through SD-7 were obscured by interference from a buried utility along Patrol Road (or other unknown sources of interference).

The results of the EM survey could not be used to determine if suspected trenches extend beneath Patrol Road. No major anomalies were identified that are not related to suspected or known utilities or to suspected trench locations. There was a strong geologic terrain conductivity gradient from lower to higher values, south to north, in the western portion of Site 4.

1.5.2 Soil Gas Sampling Results

During the Phase I RI, VOCs were detected from 1 to 15 ppm in eight soil gas readings taken from the trench areas. Only one reading taken outside the trench areas yielded positive detections for VOCs. Acetone was detected from the GC soil gas readings. The soil gas survey performed during the EE/CA field investigation revealed positive VOC detections for xylene (between 1.8J to 3.0J ug/l), toluene (1.8J ug/l), and 1,2-dichloroethane (3,800 ug/l) at four locations. The highest soil gas reading was from the eastern end of SD-4 (Figure 1-5). Soil gas results are included in Appendix C.

1.5.3 Content of Site 4 Trenches

During previous investigations, all confirmation and subsurface soil sample borings placed within the trenches encountered waste material, and borings placed between trenches encountered only fill. Outside the trenched area, one boring encountered clean fill, and all others encountered only native soil. The subsurface fill within the trenches averaged 4 to 5 feet in thickness.

The material encountered during the April 1995 test pit excavations generally consisted of a top layer of clean fill characterized as reddish-brown silty clay underlain by a bluish-gray micaceous silt and/or a layer of refuse or construction/demolition debris, reddish-brown clayey silt, and reddish-brown weathered siltstone. Some test pits encountered maroon siltstone or gray sandstone bedrock.

Refuse, consisting of paper, plastic products, soda and beer cans, glass bottles, styrofoam, cardboard, and photographic film, was found in the following test pits and surface depressions:

- TP-01 through TP-03 and TP-28 [Surface Depression (SD) 7]
- TP-04 through TP-06 (SD-6)
- TP-07 through TP-TP-09 (SD-5)
- TP-10 through TP-12 (SD-4)
- TP-13 through TP-15 and TP-26 (SD-3)
- TP-16, TP-18, and TP-25 (SD-2) [Note: No refuse was detected in TP-17 (SD 2)]
- TP-19 and TP-21 (SD-1)

Construction/demolition debris, consisting of wood, metal, concrete, brick, cables, wire, and steel, was also encountered in TP-19 through TP-21 (SD 1) and TP-22 through TP-24 (SD-0). Natural (undisturbed) conditions consisting of topsoil, orange-brown silty clay, maroon silt, and maroon weathered siltstone were found in two background test pits (TP-BG-01 and TP-BG-02). Background test pit TP-BG-03, located between surface depressions 1 and 2, encountered clean fill consisting of reddish-brown silty clay, bluish-gray micaceous silt, dark reddish-brown silty fine-grained sand, and maroon rocky weathered siltstone.

The bluish-gray micaceous silt was also encountered generally between 2 and 4 feet below the ground surface, in the following test pits:

- TP-01 through TP-03 and TP-28 (SD-7)
- TP-05 and TP-06 (SD-6)
- TP-08, TP-09, and TP-27 (SD-5)
- TP-11 and TP-12 (SD-4)
- TP-14, TP-15, and TP-26 (SD-3)

- TP-17, TP-18, and TP-25 (SD-2).
- TP-BG-03 (between SD 2 and SD-1)
- TP-21 (SD-0)

In general, this silt was not found in the western portions of SD-2 through SD-6; however, the material was encountered in the eastern end of SD-1. It was not found in SD-0 or TP-BG-01 and TP-BG-02. Also, the material was not encountered at the north ends of the test pits located along SD 7, indicating that the bluish-gray silt pinched out near Patrol Road.

Positive PID readings were only obtained from TP-07, TP-11, and TP-13. These readings ranged from 5 to 15 µg/l. The highest reading was from TP-11 in wood and ashes from excavated soil cuttings. TP-21 contained four large truck tires and one 55-gallon drum of trash. Two small bottles of liquids containing metal cleaning fluid and film hardener were also discovered from TP-7 and TP-13, respectively. Paper products (e.g., receipts, newspapers, and record books) found in TP-03, TP-05, TP-09, and TP-12 were dated from 1966 to 1968. Four test pits (TP-15, 20, 21, and 27) were more difficult to excavate than others due to concrete and metal chunks, truck tires, and one drum of trash.

A slight, oily sheen was found in 11 test pits. In most cases, it is believed that this sheen is the result of decomposing organic material such as twigs, branches, and tree stumps. Soil samples were collected from beneath the sheen layer.

1.5.4 Subsurface Soil Sampling Results

During the EE/CA field investigation, subsurface soil samples were collected in areas considered background (not associated with Site 4 activities) and in test pit locations. The samples were either from a bucket (to show chemicals in the test pit) or from a sidewall (to show migration of chemicals from the pit). Sample locations are shown in Figure 1-10.

Pesticides and PCBs were found in several subsurface soil samples. Methoxychlor and Aroclor 1248 were detected in several samples with ranges of 55.3 to 6,300 ug/kg (highest hit in TP-23) and 46 to 3,500 ug/kg (highest hit in TP-2), respectively. Aroclor 1254 and endosulfan sulfate were each detected once at a concentration of 510J ug/kg in TP-12 (Sample SB-6) and 680D ug/kg in TP-23 (Sample SB-15), respectively. 4,4'-DDD was detected twice at concentrations of 4.3 and 4.9 ug/kg in TP-26 (Sample SB-23) and TP-7 (Sample SB-1), respectively. Alpha-chlordane was detected three times at concentrations of 12.5J, 18J, and 33J ug/kg in TP-12 (Samples SB-5 and SB-6) and TP-2 (Sample SB-8), respectively. No pesticides or PCBs were detected in the background subsurface soil samples.

THIS PAGE INTENTIONALLY LEFT BLANK.

ACAD: O:\DATA\CADD\1412\95052302.DWG 07/26/95 MB PLOT LIMITS 18.LAY

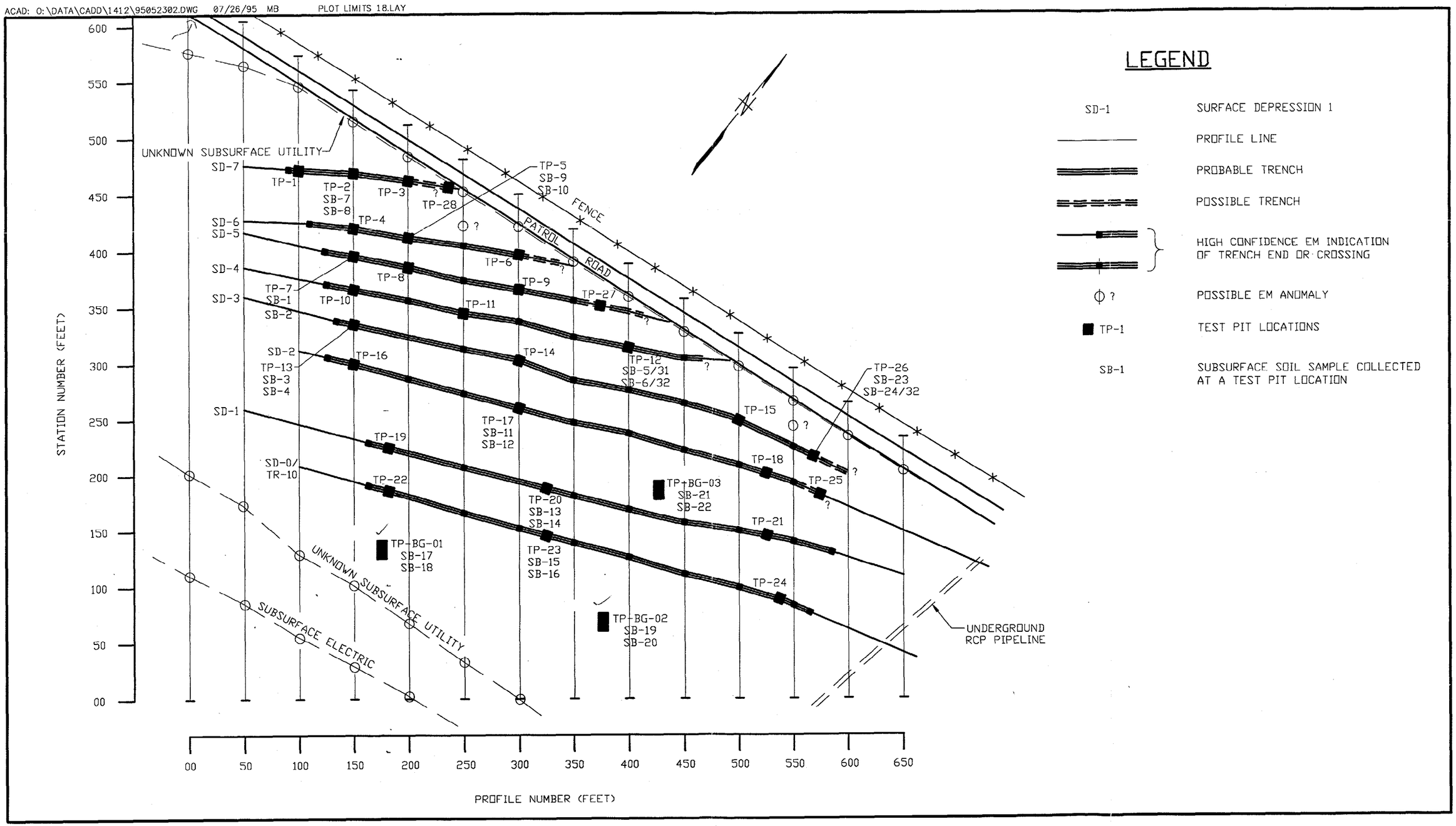


FIGURE 1-10

SITE 4
SUBSURFACE SOIL LOCATIONS
NAWC WARMINSTER, PA

0 80 160
SCALE IN FEET
1"=80'-0"

Halliburton NUS CORPORATION

00081B042

A few VOCs were detected in subsurface soils. Carbon disulfide and chlorobenzene were detected once at concentrations of 6J ug/kg in TP-2 (Sample SB-8) and 230 ug/kg in TP-5 (Sample SB-9), respectively. Acetone, 2-butanone, toluene, ethylbenzene, and xylenes were detected in several subsurface soil samples. The highest concentration (120 ug/kg) was for acetone in TP-12 (Sample SB-5); the test pit sample from TP-5 (Sample SB-9) showed the highest concentrations for toluene, ethylbenzene, and xylenes. Toluene was detected in two background samples at concentrations of 2 ug/kg at BG-1 (Sample SB-17) and BG-3 (Sample SB-21).

Several semivolatile organic compounds (SVOCs) were detected in the subsurface samples. The most frequently detected polynuclear aromatic hydrocarbons (PAHs) included pyrene, phenanthrene, benzo(b)fluoranthene, fluoranthene, benz(a)anthracene, and benzo(a)pyrene. Generally, the highest concentrations of PAHs were from TP-23 and TP-26 samples. Samples from these two test pits, along with samples from TP-2, showed the greatest number of positive PAH detections. The single highest PAH concentrations were for pyrene (2,700 ug/kg), fluoranthene (2,400 ug/kg), phenanthrene (1,700 ug/kg), and benzo(b)fluoranthene (1,500 ug/kg). Acenaphthene and fluorene were the only PAHs detected in background samples. They were both detected in BG-01 (Sample SB-17) at concentrations of 60 ug/kg (acenaphthene) and 120 ug/kg (fluorene).

Other SVOCs were detected infrequently among the test pit samples, except for bis(2-ethylhexyl) phthalate. This compound was detected 11 times at a range of 60 to 5,400 ug/kg; the highest concentration was from a TP-2 subsurface soil sample (Sample SB-8).

Metals, including arsenic, barium, beryllium, chromium, copper, lead, manganese, nickel, vanadium, and zinc, were detected frequently in subsurface soil sample results. Of these, concentrations of barium, copper, lead, manganese, and zinc in site samples sometimes exceeded background subsurface soil samples. Cadmium and mercury were each detected once in subsurface site samples; they were not detected in the background samples.

Table 1-2 summarizes the subsurface soil results for Site 4 and presents a comparison to applicable chemical-specific soil and groundwater protection criteria. Those chemicals exceeding background and subsurface soil screening criteria include pentachlorophenol, benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, dieldrin, endosulfan sulfate, Aroclor 1248, Aroclor 1254, barium, beryllium, cadmium, manganese, and nickel. These criteria and their relevance to the Site 4 removal action clean-up goals are discussed further in Section 2.2.

TABLE 1-2
SUBSURFACE SOIL RESULTS SUMMARY FOR SITE 4 - DATA COLLECTED FROM TEST PITS
A COMPARISON TO VARIOUS SCREENING CRITERIA
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Frequency of Detection in Background Samples	Range of Detection in Background Samples (mg/kg)	Frequency of Detection in Site Samples	Range of Detection in Site Samples (mg/kg)	Migration to (1) Groundwater With 10 DAF (mg/kg)	PADEP (2) Screening Criteria (mg/kg)	Risk Based (3) Screening Residential Soil (mg/kg)	Risk Based (4) Concentration Residential Soil (mg/kg)	Exceeds Background Level	Exceeds Screening Criteria
Volatiles*										
METHYLENE CHLORIDE	0 / 6	Not Detected	2 / 18	0.002 - 0.0025	0.01	0.2	230	85	Yes	No
ACETONE	0 / 6	Not Detected	11 / 18	0.009 - 0.12	8	8000/400	780	7800	Yes	No
CARBON DISULFIDE	0 / 6	Not Detected	1 / 18	0.006	14	7000/0.8	780	7800	Yes	No
2-BUTANONE	0 / 6	Not Detected	4 / 18	0.016 - 0.032	NA	0.05	390	47000	Yes	No
TOLUENE	2 / 6	0.002	7 / 18	0.002 - 0.014	5	7000/100	1600	16000	Yes	No
CHLOROBENZENE	0 / 6	Not Detected	1 / 18	0.23	0.6	1000/10	160	1600	Yes	No
ETHYLBENZENE	0 / 6	Not Detected	8 / 18	0.002 - 0.04	5	7000/70	780	7800	Yes	No
XYLENE (TOTAL)	0 / 6	Not Detected	8 / 18	0.002 - 0.049	74	1000000/5	16000	160000	Yes	No
Semivolatiles*										
1,4-DICHLOROBENZENE	0 / 6	Not Detected	1 / 18	0.11	1	7	71	27	Yes	No
4-METHYLPHENOL	0 / 6	Not Detected	1 / 18	0.13	NA	0.4	39	390	Yes	No
NAPHTHALENE	0 / 6	Not Detected	3 / 18	0.047 - 0.15	30	600/8	310	3100	Yes	No
2-METHYLNAPHTHALENE	0 / 6	Not Detected	4 / 18	0.14 - 0.29	NA	1000/20	NA	NA	Yes	No
DIMETHYLPHTHALATE	0 / 6	Not Detected	1 / 18	0.054	1200	780000/30000	78000	780000	Yes	No
ACENAPHTHENE	1 / 6	0.06	1 / 18	0.06	200	4000/30	470	4700	No	No
FLUORENE	1 / 6	0.12	5 / 18	0.045 - 0.12	160	6000/100	310	3100	No	No
PENTACHLOROPHENOL	0 / 6	Not Detected	1 / 18	0.061	0.01	40/200	14	5.3	Yes	Yes
PHENANTHRENE	0 / 6	Not Detected	8 / 18	0.043 - 1.7	NA	200/80	230	NA	Yes	No
ANTHRACENE	0 / 6	Not Detected	4 / 18	0.056 - 0.3	4300	20000/1000	2300	23000	Yes	No
DI-N-BUTYLPHTHALATE	0 / 6	Not Detected	2 / 18	0.067 - 0.117	120	300	780	7800	Yes	No
FLUORANTHENE	0 / 6	Not Detected	8 / 18	0.086 - 2.4	980	3000/400	310	3100	Yes	No
CARBAZOLE	0 / 6	Not Detected	2 / 18	0.042 - 0.055	0.2	NA	85	32	Yes	No
PYRENE	0 / 6	Not Detected	10 / 18	0.052 - 2.7	1400	2000/300	230	2300	Yes	No
BENZ(A)ANTHRACENE	0 / 6	Not Detected	8 / 18	0.045 - 1.1	0.7	6/500	1.6	0.88	Yes	Yes
CHRYSENE	0 / 6	Not Detected	7 / 18	0.06 - 0.94	1	600/300	NA	88	Yes	No
BIS(2-ETHYLHEXYL)PHTHALATE	0 / 6	Not Detected	11 / 18	0.06 - 5.4	11	300/400	120	46	Yes	No
DI-N-OCTYLPHTHALATE	0 / 6	Not Detected	1 / 18	0.77	NA	1500/500	160	1600	Yes	No
BENZO(B)FLUORANTHENE	0 / 6	Not Detected	8 / 18	0.055 - 1.5	4	6/500	1.9	0.88	Yes	Yes
BENZO(K)FLUORANTHENE	0 / 6	Not Detected	6 / 18	0.059 - 0.45	4	60/500	4.4	8.8	Yes	No
BENZO(A)PYRENE	0 / 6	Not Detected	8 / 18	0.045 - 1.005	4	0.6/500	0.23	0.088	Yes	Yes
INDENO(1,2,3-CD)PYRENE	0 / 6	Not Detected	6 / 18	0.056 - 0.39	35	6/500	0.84	0.88	Yes	No
DIBENZ(A,H)ANTHRACENE	0 / 6	Not Detected	2 / 18	0.1 - 0.1015	11	0.6/500	0.21	0.088	Yes	Yes
BENZO(G,H,I)PERYLENE	0 / 6	Not Detected	6 / 18	0.06 - 0.47	NA	NA/50	11	NA	Yes	NA

NA = Not Available
DAF = Dilution and Attenuation Factor
The results of this table are based on combinations of duplicate sample values.
* = The only chemicals shown on this table are those that were detected in site samples.
References
1. EPA, 1994. Soil Screening Guidance.
2. PADEP, 1995. Technical Guidance Manual - Land Recycling Program. First number is for ingestion; second number is for soil to groundwater pathway. Some values are from PADEP, 1993. Cleanup Standards for Contaminated Soils.
3. EPA, 1993. Selected Exposure Routes and COCs by Risk-Based Screening Levels.
4. EPA, 1995. Risk-Based Concentration Table (January - June 1995).

SUBSUM2.XLS 7/31/95 10:59 AM

TABLE 1-2 (Continued)
SUBSURFACE SOIL RESULTS SUMMARY FOR SITE 4 - DATA COLLECTED FROM TEST PITS
A COMPARISON TO VARIOUS SCREENING CRITERIA
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Frequency of Detection in Background Samples	Range of Detection in Background Samples (mg/kg)	Frequency of Detection in Site Samples	Range of Detection in Site Samples (mg/kg)	Migration to (1) Groundwater With 10 DAF (mg/kg)	PADEP (2) Screening Criteria (mg/kg)	Risk Based (3) Screening Residential Soil (mg/kg)	Risk Based (4) Concentration Residential Soil (mg/kg)	Exceeds Background Level	Exceeds Screening Criteria
Pesticides/PCBs*										
DIELDRIN	0 / 6	Not Detected	2 / 18	0.0054 - 0.022	0.001	0.3/90	0.11	0.04	Yes	Yes
4,4'-DDD	0 / 6	Not Detected	2 / 18	0.0043 - 0.0049	0.7	20/500	3.9	2.7	Yes	No
ENDOSULFAN SULFATE	0 / 6	Not Detected	1 / 18	0.68	4	NA	0.39	470	Yes	Yes
METHOXYCHLOR	0 / 6	Not Detected	3 / 18	0.0055 - 6.3	62	300/200	39	390	Yes	No
ALPHA-CHLORDANE	0 / 6	Not Detected	3 / 18	0.0125 - 0.033	2	500	0.47	0.49	Yes	No
AROCLOR-1248	0 / 6	Not Detected	9 / 18	0.046 - 3.5	NA	NA	0.22	0.083	Yes	Yes
AROCLOR-1254	0 / 6	Not Detected	1 / 18	0.51025	NA	NA	0.22	0.083	Yes	Yes
Inorganics*										
ARSENIC	6 / 6	3.2 - 6.1	18 / 18	1.9 - 5.2	15	20	0.97	0.37	No	Yes
BARIUM	5 / 5	42 - 67.7	18 / 18	31.6 - 660	32	5000	550	5500	Yes	Yes
BERYLLIUM	3 / 3	0.94 - 1.1	11 / 18	0.54 - 1.8	180	1	0.4	0.15	Yes	Yes
CADMIUM	0 / 6	Not Detected	1 / 18	4.2	6	20	3.9	39	Yes	Yes
CHROMIUM	6 / 6	13.2 - 25	18 / 18	11.3 - 23.3	19	1000	7800	78000	No	Yes
COPPER	6 / 6	8.5 - 16.6	18 / 18	7.6 - 61.5	NA	700	290	2900	Yes	No
LEAD	6 / 6	5.3 - 13.2	18 / 18	5.1 - 85.7	NA	200	NA	NA	Yes	No
MANGANESE	6 / 6	116 - 487	18 / 18	81.4 - 676	NA	400	780	390	Yes	Yes
MERCURY	0 / 6	Not Detected	1 / 18	1.3	3	20	2.3	23	Yes	No
NICKEL	5 / 5	8.7 - 12.1	18 / 18	7.6 - 21.1	21	200	160	1600	Yes	Yes
VANADIUM	6 / 6	22.6 - 37.9	18 / 18	16.9 - 35.8	NA	NA	55	550	No	No
ZINC	6 / 6	15.1 - 30.1	18 / 18	16.3 - 336	42000	1000	2300	23000	Yes	No

NA = Not Available
DAF = Dilution and Attenuation Factor
The results of this table are based on combinations of duplicate sample values.
* = The only chemicals shown on this table are those that were detected in site samples.
References
1. EPA, 1994. Soil Screening Guidance.
2. PADEP, 1995. Technical Guidance Manual - Land Recycling Program. First number is for ingestion; second number is for soil to groundwater pathway. Some values are from PADEP, 1993. Cleanup Standards for Contaminated Soils.
3. EPA, 1993. Selected Exposure Routes and COCs by Risk-Based Screening Levels.
4. EPA, 1995. Risk-Based Concentration Table (January - June 1995).

1.5.5 Surface Soil Sampling Results

During the EE/CA field investigation, surface soil samples were collected throughout the Site 4 area, and background surface soil samples were taken from both ends of the main runway at the base. Sample locations are shown in Figure 1-8 for the Site 4 area and in Figure 1-11 for the background locations.

Two pesticides and one PCB compound were detected in the Site 4 surface soil samples. The pesticides, 4,4'-DDT and 4,4'-DDE, were detected at concentrations of 22 and 6 ug/kg, respectively, in sample SS-04-09. The PCB, Aroclor 1248, was detected at concentrations of 64 and 139.5 ug/kg at samples SS-04-09 and SS-04-10/21, respectively. No pesticides or PCBs were detected in the background surface soil samples. Several VOCs were also detected but only TCE, acetone, and xylene were detected in more than one sample. TCE was detected in six out of nine samples at a range of 7 to 25 ug/kg. Positive TCE detections were from the near surface of SD-3 through SD-7. Acetone was found in five out of nine (range 18 to 65 ug/kg) samples; toluene was found in two out of nine (range 5 to 10 ug/kg) samples. SVOCs detected in surface soil samples collected at Site 4 include PAHs and bis(2-ethylhexyl) phthalate. PAHs were detected in less than one-half of the surface soil samples and were detected in the range of 42 to 1,100 ug/kg. Bis(2-ethylhexyl) phthalate was detected in six out of 18 samples (range 52 to 500 ug/kg).

Metal concentrations, including arsenic, barium, beryllium, chromium, and manganese, exceeded soil screening criteria. However, beryllium and manganese were the only metals to exceed both background and soil screening criteria for residential soils. The results for all other metals exhibited no apparent trend and the data are considered fairly evenly distributed.

Table 1-3 summarizes the surface soil results for Site 4 and presents a comparison to applicable chemical-specific soil and groundwater protection criteria as well as background levels. Those chemicals exceeding background and soil screening criteria include acetone, TCE, pentachlorophenol, benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, Aroclor 1248, beryllium, and manganese. These criteria and their relevance to soil clean-up goals are discussed in Section 2.2.

1.5.6 Surface Water and Sediment Sampling Results

Samples were collected for surface water and sediment in the vicinity of Site 4 during three sampling rounds. Sampling locations are shown on Figure 1-9 and, for the purposes of this discussion, are designated as "background" and "downstream." The background surface water/sediment sampling locations were 3A, 3B, 4A, and 4B during the Phase I and II RIs and C-8 during the Phase III RI. The downstream surface water/sediment sampling locations were 5A, 5B, 6A, and 6B in Phases I and II and

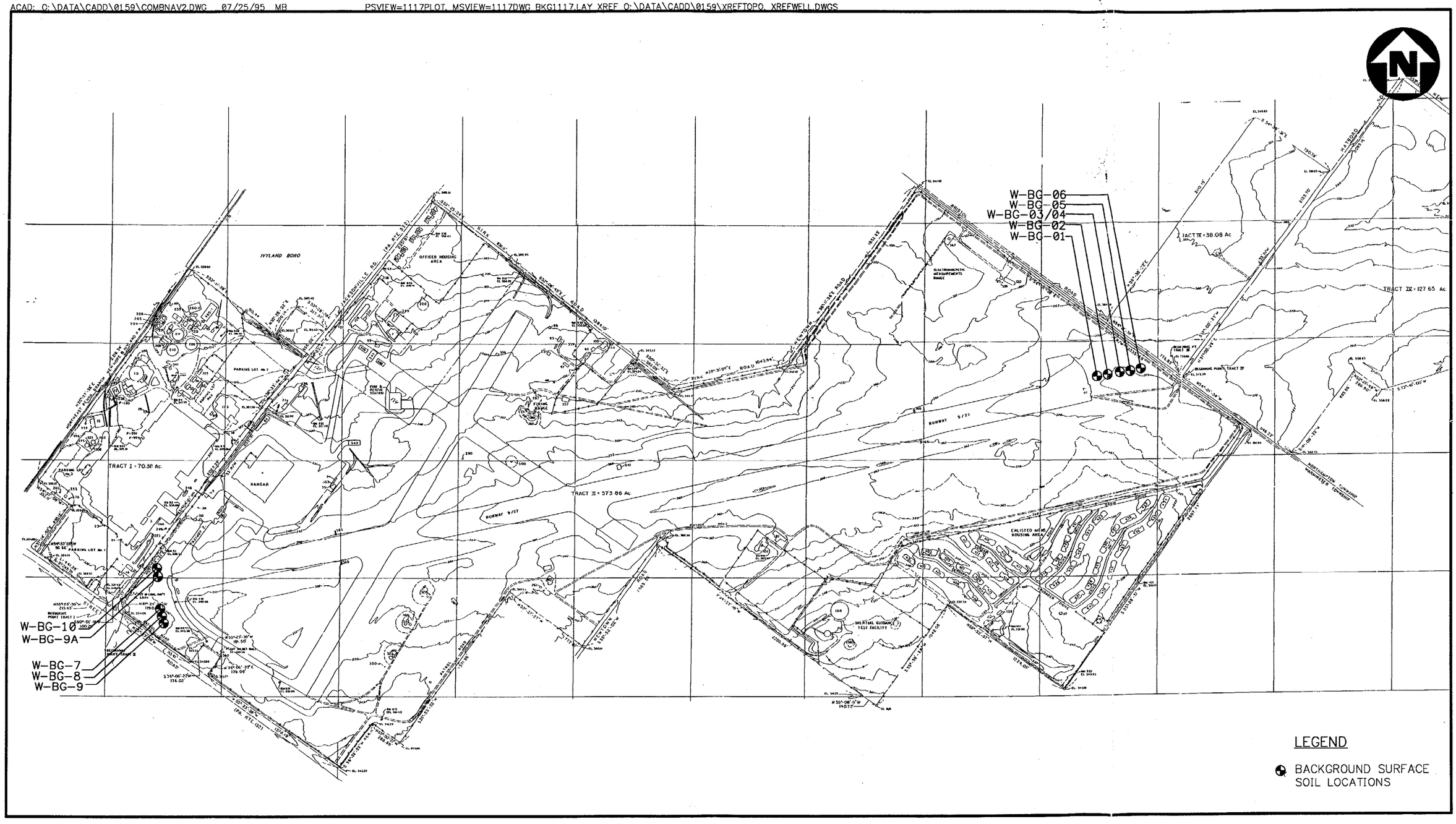


FIGURE 1-1 1

BACKGROUND
SURFACE SOIL SAMPLE LOCATIONS
NAWC WARMINSTER

0 800 1600
SCALE IN FEET

Halliburton NUS CORPORATION

00081B052

TABLE 1-3
SURFACE SOIL RESULTS SUMMARY FOR SITE 4
A COMPARISON TO VARIOUS SCREENING CRITERIA
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Frequency of Detection Background	Range of Positive Detection Background (mg/kg)	Frequency of Detection Site	Range of Positive Detection Site (mg/kg)	Migration to (1) Groundwater With 10 DAF (mg/kg)	PADEP (2) Screening Criteria (mg/kg)	Risk Based (3) Screening Criteria (mg/kg)	Risk Based (4) Concentration Res. Soil (mg/kg)	Site Exceeds Background Concentration	Exceeds Screening Criteria
Pesticides/PCBs*										
4,4'-DDE	0/10	Not Detected	1/6	0.006	0.5	10/500	5	1.9	Yes	No
4,4'-DDD	0/10	Not Detected	1/6	0.022	0.7	10/500	7.1	2.7	Yes	No
AROCLOR-1248	0/10	Not Detected	2/6	0.064 - 0.1395	NA	5/NA	0.22	0.083	Yes	Yes
Volatiles*										
ACETONE	--	Not Analyzed	5/9	0.018 - 0.065	8	8000/400	780	7800	Yes	No
2-BUTANONE	--	Not Analyzed	1/9	0.009	NA	0.05	390	47000	Yes	No
TRICHLOROETHENE	--	Not Analyzed	6/9	0.007 - 0.025	0.02	400/2	47	58	Yes	Yes
TOLUENE	--	Not Analyzed	1/9	0.001	5	10000/100	1600	16000	Yes	No
CHLOROBENZENE	--	Not Analyzed	1/9	0.004	0.6	1000/10	160	1600	Yes	No
ETHYLBENZENE	--	Not Analyzed	1/9	0.004	5	7000/70	780	7800	Yes	No
STYRENE	--	Not Analyzed	1/9	0.001	2	1000/10	57	16000	Yes	No
XYLENE (TOTAL)	--	Not Analyzed	2/9	0.005 - 0.01	74	10000/5	16000	160000	Yes	No
Semivolatiles*										
FLUORENE	--	Not Analyzed	1/18	0.059	160	3000/100	310	3100	Yes	No
PENTACHLOROPHENOL	--	Not Analyzed	1/18	0.042	0.01	40/200	14	5.3	Yes	Yes
PHENANTHRENE	--	Not Analyzed	6/18	0.042 - 0.61	NA	200/80	230	NA	Yes	No
ANTHRACENE	--	Not Analyzed	2/18	0.055 - 0.12	4300	20000/1000	2300	23000	Yes	No
FLUORANTHENE	--	Not Analyzed	7/18	0.060 - 1.2	980	3000/400	310	3100	Yes	No
CARBAZOLE	--	Not Analyzed	1/18	0.12	0.2	NA	85	32	Yes	No
PYRENE	--	Not Analyzed	7/18	0.051 - 0.98	1400	6000/300	230	2300	Yes	No
BENZ(A)ANTHRACENE	--	Not Analyzed	6/18	0.079 - 0.87	0.7	6/500	1.6	0.88	Yes	Yes
CHRYSENE	--	Not Analyzed	6/18	0.062 - 0.71	1	600/300	NA	88	Yes	No
BIS(2-ETHYLHEXYL)PHTHALATE	--	Not Analyzed	6/18	0.052 - 0.5	11	300/400	120	46	Yes	No
BENZO(B)FLUORANTHENE	--	Not Analyzed	7/18	0.058 - 1.1	4	6/500	1.9	0.88	Yes	Yes
BENZO(K)FLUORANTHENE	--	Not Analyzed	6/18	0.042 - 0.34	4	60/500	4.4	8.8	Yes	No
BENZO(A)PYRENE	--	Not Analyzed	7/18	0.046 - 0.7	4	0.6/500	0.23	0.088	Yes	Yes
INDENO(1,2,3-CD)PYRENE	--	Not Analyzed	5/18	0.074 - 0.24	35	6/500	0.84	0.88	Yes	No
DIBENZ(A,H)ANTHRACENE	--	Not Analyzed	1/18	0.088	11	0.6/500	0.21	0.088	Yes	No
BENZO(G,H,I)PERYLENE	--	Not Analyzed	5/18	0.088 - 0.26	NA	NA/50	11	NA	Yes	No
Inorganics*										
ARSENIC	10/10	3.7 - 7.2	18/18	2.05 - 5.1	15	20	0.97	0.37	No	Yes
BARIUM	7/7	37.3 - 113	18/18	24.75 - 116	32	5000	550	5500	Yes	Yes
BERYLLIUM	2/2	0.84 -1.1	18/18	0.515 - 1.3	180	1	0.4	0.15	Yes	Yes
CADMIUM	0/10	Not Detected	1/18	0.46	6	20	3.9	39	Yes	No
CHROMIUM	10/10	12 - 27	18/18	14.6 - 23.1	19	1000	7800	78000	No	Yes
COPPER	10/10	7.9 - 22.7	18/18	6.5 - 51	NA	700	290	2900	Yes	No
LEAD	10/10	6.7 - 19	18/18	5.3 - 30.2	NA	200	NA	NA	No	NA
MANGANESE	10/10	132 - 573	18/18	140 - 1090	NA	400	780	390	Yes	Yes
NICKEL	10/10	8.1 - 15	18/18	7.8 - 15.6	21	200	160	1600	Yes	No
VANADIUM	10/10	18.1 - 42.8	18/18	22 - 35.3	NA	NA	55	550	No	No
ZINC	10/10	19.8 - 50.2	18/18	15.3 - 64.6	42000	1000	2300	23000	Yes	No

NA = Not Available
DAF = Dilution and Attenuation Factor
The results of this table are based on combinations of duplicate sample values.
* = The only chemicals shown on this table are those that were detected in site samples.
References
1. EPA, 1994. Soil Screening Guidance.
2. PADEP, 1995. Technical Guidance Manual - Land Recycling Program. First number is for ingestion; second number is for soil to groundwater pathway. Some values are from PADEP, 1993. Cleanup Standards for Contaminated Soils.
3. EPA, 1993. Selected Exposure Routes and COCs by Risk-Based Screening Levels.
4. EPA, 1995. Risk-Based Concentration Table (January - June 1995).

SURFSUM.XLS 8/1/95 4:49 PM

C-1, C-2, C-3, C-4, C-5, C-6, C-7/C-10, and C-9 during Phase III. Sampling locations C-1 and C-2 were 2collected from an apparent groundwater seep, which may have contained water migrating through Site 4. Sampling locations C-3, C-4, and C-5 were taken from the downslope edge of this site, and not the off-base portion of the stream north of Site 4.

No true upstream samples were collected in the vicinity of Site 4 due to the hydrology of the area (i.e., the unnamed tributary of Little Neshaminy Creek has its headwaters across from Site 4). Therefore, background sampling locations for surface water and sediment were identified further downstream from the immediate vicinity of Site 4. Based on available analytical data, the background locations do not appear to be influenced by other potential sites at NAWC Warminster or off-base sources of contamination, except for PAHs, which may have been used at Site 8 during fire-fighting training exercises.

Two phthalates (diethyl- and di-n-octyl-) were detected in surface water samples collected downstream of Site 4. They were only detected once in sample 6A, except diethyl phthalate, which was also detected in C-7/C-10. No semivolatiles were detected in any background samples of any sampling round. One VOC, carbon disulfide, was detected in one downstream surface water sample. No VOCs were detected in any background samples of any sampling round. No pesticides or PCBs were detected in any downstream or background surface water samples collected in any sampling round.

Table 1-4 summarizes surface water results and presents a comparison to applicable chemical-specific Ambient Water Quality Criteria (AWQCs). Those analytes exceeding background and surface water screening criteria include copper, lead, and mercury. These criteria are discussed in Section 2.2. Manganese was found in one sample (C-5) at a concentration (364 ug/l) higher than the background range.

Several metals were detected in sediment samples in all three rounds. None of the downstream metal concentrations were three times higher than background levels, except for zinc.

The sediment samples collected for Site 4 had positive detects for several SVOCs in background and downstream sediment samples. Of those PAHs detected in background and downstream samples, the downstream and background concentrations were similar. The PAHs in the downstream sediment samples ranged from 55J to 2,000 ug/kg. The PAHs in the background sediment samples ranged from 49J to 1,400 ug/kg. One phthalate, bis(2-ethylhexyl)-, was detected in downstream sediment samples ranging from 74J to 130J ug/kg. Off-base migration of PAHs may be the source of these chemicals in sediment samples near Site 4. PAHs are commonly associated with erosion of asphalt roadways and residential roofing materials (i.e., shingles).

TABLE 1-4
SURFACE WATER RESULTS SUMMARY FOR SITE 4
A COMPARISON TO AMBIENT WATER QUALITY CRITERIA FOR SURFACE WATER
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Frequency of Detection in Background Samples	Range of Positive Detection in Background Samples (ug/L)	Frequency of Detection in Downstream Samples	Range of Positive Detection in Downstream Samples (ug/L)	Surface Water (1) AWQC (ug/L)	Downstream Concentration Exceeds Background Sample and AWQC Criteria
**Inorganics* ** **						
BARIUM	2 / 3	60 - 93	5 / 7	39 - 88	NA	No
CADMIUM	1 / 4	4	1 / 9	2	1.15	No
CHROMIUM (III)	0 / 3	Not Detected	1 / 9	5.8K	210	No
COPPER	0 / 3	Not Detected	1 / 4	15.5L	12.48	Yes
LEAD	0 / 2	Not Detected	5 / 7	1.1K - 22.7	3.424	Yes
MANGANESE	2 / 3	83 - 159	9 / 10	25 - 364	NA	Yes
MERCURY	0 / 4	Not Detected	1 / 10	0.27L	0.012	Yes
NICKEL	0 / 3	Not Detected	2 / 10	7.2L - 7.6L	166.4	No
ZINC	0 / 1	Not Detected	4 / 5	25.1L - 49.6	114.4	No
Volatiles**						
CARBON DISULFIDE	0 / 4	Not Detected	1 / 10	2.5J	NA	Yes
Semivolatiles**						
DIETHYLPHTHALATE	0 / 3	Not Detected	2 / 7	0.3J - 2J	3	No
DI-N-OCTYLPHTHALATE	0 / 3	Not Detected	1 / 7	0.2J	3	No

NA = Not Available

Reference

1. EPA, 1994. Ambient Water Quality Criteria (AWQC) for Water.

* = The essential nutients and minerals were not included in this table including aluminum, calcium, iron, magnesium, potassium, and sodium.

** = The only chemicals shown on this table are those that were detected in site samples.

4,4'-DDT and Aroclor 1254 were each detected in one downstream sediment sample. 4,4'-DDT was detected in C-9 at a concentration of 5.6 ug/kg. Aroclor 1254 was detected in C-7/C-10 at a concentration of 74.5 ug/kg. No pesticides or PCBs were detected in background sediment samples. 4,4'-DDT could be associated with use of insecticides or fertilizers.

Table 1-5 summarizes the chemicals detected in sediment samples upstream and downstream of Site 4 and presents a comparison of the downstream sample concentrations to available sediment criteria. Those chemicals exceeding background and sediment screening criteria include eight semivolatile organics, 4,4'DDT, Aroclor 1254, and several metals. Section 2.2 describes these criteria as they relate to cleanup goals for the site.

1.5.7 Groundwater Sampling Results

Groundwater immediately adjacent to and upgradient of Site 4 does not contain significant quantities of organic chemicals (HNUS, 1993 and 1994a). On the downgradient (north) side of the site, low concentrations of acetone and toluene were detected. Acetone was detected at concentrations of 52 ug/l and 17 ug/l in wells DG-16 and DG-6, respectively. Figure 1-2 shows the locations of groundwater monitoring wells near Site 4. Acetone was also present at concentrations ranging from 10 to 15 ug/l in the cluster of wells at HN-29. The positive acetone result in the immediate well at this cluster was not confirmed in the associated field duplicate sample, which was nondetect for this and all other organic compounds. Toluene was present at DG-22 and DG-24 at concentrations of 1 and 2 ug/l, respectively. No other positive results were reported for organic chemicals in the wells around Site 4 prior to 1995.

In 1994, wells HN-28S and HN-28I, located about 600 feet west of Site 4, contained several organic compounds at low concentrations. HN-28S contained detectable amounts of acetone (8 ug/l), di-n-butyl phthalate (1 ug/l), and the pesticide endosulfan II (0.37 ug/l). This pesticide has not been historically detected at Site 4 and it is normally not found in groundwater because of a high affinity for binding to organic carbon contained in soil. Well Cluster HN-28 is not located downgradient of any known source area, so the low levels of organics are unexpected. Additional Phase III RI work will attempt to address this contamination.

Several metals were detected in unfiltered and filtered groundwater samples collected from Site 4 monitoring wells; however, with the exception of a single detection of thallium, the representative concentrations appear to be within background ranges.

The cluster of wells at HN-29 and other downgradient wells (DG-6 and DG-15) near the site were sampled in December 1994 and April 1995 as part of the Navy's groundwater monitoring plan (NAWC Warminster, 1995). Low levels of VOCs, including carbon tetrachloride (3.25J ug/l), cis-1,2-dichloroethene (0.75J ug/l),

TABLE 1-5
SEDIMENT RESULTS SUMMARY FOR SITE 4
A COMPARISON TO EFFECTS RANGE - LOW FOR SEDIMENT
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Frequency of Detection in Background Samples	Range of Positive Detection in Background Samples (ug/kg)	Frequency of Detection in Downstream Samples	Range of Positive Detection in Downstream Samples (ug/kg)	Sediment (1) ER-L Criteria (ug/kg)	Downstream Concentration Exceed Background Samples and ER-L Criteria
Pesticides/PCBs*						
4,4'-DDT	0 / 2	Not Detected	1 / 5	5.6	1.58	Yes
AROCLOR 1254	0 / 4	Not Detected	1 / 7	74.5	22.7	Yes
Volatiles						
ACETONE	0 / 4	Not Detected	1 / 6	46J	NA	NA
2-BUTANONE	0 / 3	Not Detected	1 / 10	30J	NA	NA
TOLUENE	0 / 5	Not Detected	1 / 10	10J	NA	NA
Semivolatiles*						
ACENAPHTHENE	1 / 4	120J	1 / 7	77J	16	No
FLUORENE	1 / 4	140J	2 / 7	110J - 120J	19	No
PHENANTHRENE	3 / 4	340J - 1200	4 / 7	335J - 1100	240	Yes
ANTHRACENE	3 / 4	72J - 290J	3 / 7	55J - 320J	85.9	Yes
FLUORANTHENE	4 / 4	380J - 1200	4 / 7	620J - 1700	600	Yes
CARBAZOLE	1 / 2	49J	1 / 5	81J	NA	NA
PYRENE	4 / 4	330J - 1400	4 / 7	660J - 2000	685	Yes
BENZ(A)ANTHRACENE	4 / 4	210J - 720	4 / 7	270J - 880	261	Yes
CHRYSENE	4 / 4	190J - 740	4 / 7	290J - 670J	384	Yes
BIS(2-ETHYLHEXYL)PHTHALATE	1 / 2	93J	3 / 5	74J - 130J	NA	NA
BENZO(B)FLUORANTHENE	3 / 4	230J - 820	3 / 7	310J - 910	NA	NA
BENZO(K)FLUORANTHENE	3 / 4	200J - 370J	3 / 7	225J - 310J	NA	NA
BENZO(A)PYRENE	3 / 4	260J - 650	3 / 7	310J - 660	430	Yes
INDENO(1,2,3-CD)PYRENE	2 / 4	190J - 410	2 / 7	200J - 420	NA	NA
DIBENZ(A,H)ANTHRACENE	2 / 4	53J - 140J	2 / 7	80J - 86J	63.4	Yes
BENZO(G,H,I)PERYLENE	2 / 4	150J - 320J	2 / 7	245J - 480	NA	NA
Inorganics*		(mg/kg)		(mg/kg)	(mg/kg)	
ARSENIC	3 / 3	2.3 - 3.4	9 / 9	1.2 - 8.5	8.2	Yes
BARIUM	3 / 5	31.4 - 74.6	9 / 11	38.2 - 92.9	NA	Yes
BERYLLIUM	3 / 3	0.52 - 0.65	9 / 9	0.49 - 1.2	NA	Yes
CHROMIUM	5 / 5	7.7J - 20.5J	9 / 9	4.1 - 23.4J	81	No
COPPER	3 / 3	5.4J - 34.6J	7 / 7	5.5L - 29.7J	34	No
LEAD	4 / 5	9.8J - 30	11 / 11	8.6 - 42.2J	46.7	No
MANGANESE	5 / 5	144J - 848J	11 / 11	29.6 - 528	NA	No
NICKEL	3 / 3	4.4J - 10	9 / 10	7.3L - 17J	20.9	No
SELENIUM	0 / 5	Not Detected	1 / 11	0.82J	NA	Yes
SILVER	0 / 5	Not Detected	1 / 11	2.14J	NA	Yes
VANADIUM	5 / 5	11.8L - 34.2K	10 / 10	5.9K - 43.4	NA	Yes
ZINC	5 / 5	32.9 - 61.4J	11 / 11	13.8J - 310	150	Yes

NA = Not Available

Reference

1. Long and Morgan, 1991. Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program.

* = The only chemicals shown on this table are those that were detected in site samples.

SDSUM.XLS 7/26/95 1:32 PM

and TCE (1.25J ug/l) were detected in HN-29I (HNUS, 1995d). Toluene was found at 1 ug/l in DG-15 and 2-hexanone was detected at 68J ug/l in DG-6 during the December 1994 sampling (HNUS, 1995c). Toluene (3 ug/l) was also found in HN-29S during December 1994. These VOCs were not detected in any other Site 4 wells.

Table 1-6 summarizes the groundwater results for Site 4.

1.6 RISK ASSESSMENT

1.6.1 Potential Migration Routes

The potential contaminant transport pathways for Site 4 contaminants include

- Contaminants leaching from source areas to groundwater because of infiltrating precipitation.
- Erosion of contaminated soils with overland runoff transport to nearby surface water bodies (unnamed tributaries).

One possible route of contaminant migration is the generation of contaminant dusts from the subsurface soil (sediments are covered by water). This would be potentially important for metals and would depend upon the subsurface material being exposed in some way.

Another possible migration route in this area is from groundwater into the adjacent surface water. Groundwater movement to the stream may be via both overburden and shallow bedrock aquifers. Some of the same compounds found in monitoring wells, such as phthalates, are detected in downstream surface water; other organics are not detected.

The second possible route of groundwater migration is from the shallow bedrock aquifer beneath the sites into the deeper bedrock aquifers downdip and north of the sites, including those that are across the unnamed tributary. Migration may then occur along geologic structures such as permeable bedding planes, subsurface fractures, and joints. It is likely that the stream acts as a groundwater divide for the overburden aquifer; however, this has not been documented for the shallow bedrock aquifer.

TABLE 1-6
GROUNDWATER RESULTS SUMMARY FOR SITE 4
A COMPARISON TO BACKGROUND AND MCL
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Frequency of Detection in Background Samples	Range of Positive Detection in Background Samples (ug/L) (2)	Frequency of Detection in Downgradient Samples	Range of Positive Detection in Downgradient Samples (ug/L) (3)	Downgradient Concentration Exceeds Background	MCL (1) (ug/L)	Downgradient Concentration Exceeds MCL
Volatiles							
ACETONE	0 / 4	Not Detected	4 / 4	10 L - 52 L	Yes	NA	NA
CIS-1,2-DICHLOROETHENE	0 / 4	Not Detected	1 / 11	0.75 J	Yes	70	No
CARBON TETRACHLORIDE	0 / 4	Not Detected	1 / 11	3.25 J	Yes	5	No
TRICHLOROETHENE	0 / 4	Not Detected	1 / 11	1.25 J	Yes	5	No
4-METHYL-2-PENTANONE	0 / 4	Not Detected	1 / 11	4.75 J	Yes	NA	NA
TOLUENE	1 / 4	Not Detected	2 / 11	1 - 3	Yes	1000	No
2-HEXANONE	0 / 4	Not Detected	2 / 11	8.25J - 68J	Yes	NA	NA
Inorganics							
ARSENIC	1 / 4	5.9	7 / 11	3 K - 6.6 K	Yes	50	No
BARIUM	4 / 4	40.8 - 223	11 / 11	76.3 J - 593 J	Yes	2000	No
BERYLLIUM	1 / 4	1.5	1 / 11	1.1	No	4	No
CADMIUM	1 / 4	3.8	3 / 11	3.2 K - 3.3 K	No	5	No
CHROMIUM	0 / 3	Not Detected	2 / 11	8 K - 15.5	Yes	100	No
COPPER	3 / 4	7.8 - 10.4	6 / 11	7 - 79.2	Yes	1300	No
LEAD	2 / 4	1.7 - 11.9	3 / 11	3.2 - 3.5	No	15	No
MANGANESE	3 / 3	89.9 - 451	11 / 11	20.2 - 1840	Yes	NA	NA
MERCURY	1 / 4	0.17	2 / 11	0.13 - 0.15	No	2	No
THALLIUM	0 / 4	Not Detected	2 / 11	5.1 - 7.2	Yes	2	Yes
VANADIUM	1 / 3	3.1	1 / 9	21.7	Yes	NA	NA
ZINC	2 / 2	14.1 - 16.2	2 / 3	47.8 - 71.3	Yes	NA	NA

NA = Not Applicable
J = Estimated Value
K = Positive Result is Considered Biased High
L = Positive Result is Considered Biased Low
MCL = Maximum Contaminant Level
Reference
1. EPA, 1995. Drinking Water Regulations and Health Advisories. Office of Water, May, 1995.
Adapted from RI Report for OU-3 (HNUS, 1994a) A, also includes December 1994 (NHUS, 1995c), April 1995 (HNUS, 1995d) Phase III Results.
2. Background Wells = BG-2, BG-6, HN-26S, and HN-26I.
3. Downgradient Wells = DG-4, DG-5, DG-6, DG-15, DG-16, DG-22, DG-24, DG-28, HN-29S, HN-29I, and HN-29X. The maximum detection is reported for each analyte among all groundwater sampling events.

The primary migration route for stream contaminants in the surface water and sediment is via downstream flow. Contaminants may, to some degree, migrate from sediment to surface water and vice versa. However, chemicals such as metals, PCBs, and phthalates tend to bind strongly to sediment and migrateslowly, where as the more highly soluble substances such as TCE and toluene would tend to stay in the surface water and migrate more rapidly.

1.6.2 Potential Exposure Pathways

Potential human and environmental exposure pathways identified under current or future land use scenarios for Site 4 include the following:

- Dermal, incidental ingestion, and fugitive dust inhalation exposure to soil contaminants
- Dermal and incidental ingestion exposure to surface water and sediment
- Exposure of aquatic organisms to surface water and sediment
- Ingestion, dermal exposure, and inhalation exposure to chemicals in groundwater

1.6.3 Human Health Risk Characterization

1.6.3.1 Methodology and Previous Results

A majority of the wastes contained in the test pits excavated within Site 4 consist of construction debris, demolition materials, and general refuse. These wastes typically are not considered to be hazardous by themselves. However, investigations of soils, sediments, groundwater, and surface water suggest that wastes buried in the trenches may be the source of hazardous substances that have been released to the environment or could be potentially released. The major chemicals of concern for soils are Aroclor 1248, PCP, TCE, and several PAHs [benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene]. In addition, several metals (barium, beryllium, copper, cadmium, chromium and manganese) were detected above background concentrations for both surface and subsurface soils.

Potential human health risks resulting from exposure pathways associated with Site 4 are generally characterized on a qualitative basis in this section. The qualitative estimates are based on risk-based screening concentrations or other screening criteria as outlined in current EPA and other appropriate guidance. The risks determined using these criteria are a unitless expression of an individual's likelihood of developing cancer or other adverse (non-cancer) effects as a result of exposure to hazardous substance concentrations. An incremental cancer risk of 1×10^{-6} indicates that the exposed receptor has a one in one million chance of developing cancer under the defined exposure scenario. Such a risk may be interpreted as representing one additional case of cancer (above background) in an exposed population of one million people. EPA has generally defined risks in the range of 10^{-4} to 10^{-6} as being acceptable for

most sites. Residual risks on the order of 10^{-6} are the primary goal but may be modified by regulatory requirements or chemical-specific clean-up goals.

For other adverse (non-cancer) effects, risks are expressed as the ratio of the estimated chronic daily intake and Reference Doses (RfDs), which are based on the non-carcinogenic health effects imparted by a chemical. If this ratio exceeds unity (1.0), there are potential health effects associated with exposure to that particular chemical. This ratio is known as a Hazard Quotient (HQ); the sum of all individual HQs is known as the Hazard Index (HI).

The future land use of the Site 4 area is anticipated to be recreational according to the draft re-use plan prepared for the FLRA-BC (ERA, 1995). The available risk-based screening criteria do not provide specific chemical concentrations for this type of land use. As a conservative approach, a residential land use scenario was assumed for Site 4 because this scenario tends to overestimate future exposures that may occur. In actuality, the potential exposures associated with hazardous substances present at Site 4 will be less than these residential exposures under a scenario involving recreational land use.

Conclusions regarding the characterization of human health risks for each medium affected by Site 4 (except groundwater) are presented below. An ecological risk characterization is provided separately in Section 1.6.4.

Based on previous work (HNUS, 1992), significant risks identified for subsurface soil at Site 4 were potential leaching of PCBs to groundwater. Since detailed modelling was not performed, the estimated cancer risks (between 1×10^{-6} and 1×10^{-4}) for future groundwater users may likely be overestimated due to limitations in the method used to estimate leaching. However, it was recommended that additional soil sampling be conducted in the vicinity of Site 4 to better characterize this risk.

1.6.3.2 Surface Soils

Aroclor 1248 was detected in two surface soil samples at levels ranging between 0.064 and 0.140 mg/kg. The maximum value of 0.140 mg/kg exceeds a carcinogenic risk of 10^{-6} under the residential (0.083 mg/kg) land use scenario. This PCB was not detected in background surface soil samples and is presumably related to Site 4 wastes.

TCE was detected at low levels in six of nine surface soil samples at levels ranging from 7 to 25 ug/kg. These results suggest that the trenches may contain a source of TCE that potentially could be released in the future. The maximum TCE concentration (0.025 mg/kg) did not exceed a carcinogenic risk of 10^{-6} under the residential (58 mg/kg) land use scenario. Thus, TCE is not impacting the environment to an unacceptable degree at this time, and more than 20 years have passed since Site 4 was used as a waste

disposal location. However, this concentration slightly exceeds the EPA soil screening level (0.02 mg/kg) for migration of contaminated soils to groundwater. During Phase III RI groundwater sampling, TCE (1.25J ug/l) was found in one of the monitoring wells sampled downgradient of Site 4.

Among inorganics, manganese and beryllium exceeded both background and soil screening criteria. The maximum value (1,090 mg/kg) of manganese exceeds an HQ of 1.0 under the residential (390 mg/kg) land use scenario. However, the highest background level (573 mg/kg) for manganese also exceeds the risk-based screening concentration for residential soil. Beryllium (1.3 mg/kg) exceeded a risk of 10^{-6} under residential (0.15 mg/kg) land use. The entire range of background concentrations for beryllium is greater than this risk level. Barium was also greater than the highest background and EPA soil screening levels for migration of contaminated soils to groundwater.

Other chemicals exceeding background and surface soil screening criteria include acetone, pentachlorophenol (PCP), and the PAHs benz(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene. PCP was found in only one surface soil sample at Site 4 and does not appear to pose a widespread contamination problem. PAH concentrations may be related to runoff from the road adjacent to Site 4. Acetone exceeds the state standard for groundwater protection only.

1.6.3.3 Subsurface Soils

Aroclor 1248 was detected in 50 percent of subsurface soil samples at levels ranging between 0.51 and 3.5 mg/kg. The maximum value of 3.5 mg/kg exceeds a carcinogenic risk of 10^{-6} under residential (0.083 mg/kg) and non-residential (0.74 mg/kg) land uses. This PCB was not detected in background subsurface soil samples and is presumably related to Site 4 wastes. Aroclor 1254 was detected once at 0.51 mg/kg; this value also exceeds a carcinogenic risk of 10^{-6} under the residential (0.083 mg/kg) land use scenario.

Among the inorganic compounds, barium, beryllium, cadmium, manganese, and nickel exceeded both background and risk-based screening criteria for residential soils. HQs of 1.0 were exceeded for these metals. Cadmium was detected in only one subsurface soil sample and does not appear to pose a widespread contamination problem. As with the surface soil results, the highest background subsurface soil concentration for manganese exceeded the risk-based screening concentration for residential soil.

Other chemicals exceeding background and soil screening criteria include acetone, PCP, the PAHs benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene, and dieldrin. PCP was found in one subsurface soil sample at Site 4, and dieldrin was detected in two samples; neither appears to pose a widespread contamination problem. PAH concentrations may be related to runoff from the road adjacent to Site 4. Acetone exceeds the state standard for groundwater protection only.

1.6.3.4 Surface Water

Ambient Water Quality Criteria (AWQCs) were used to assess the potential for toxic effects in aquatic organisms and to identify the potential for human health risks. Several metals exceeded surface water screening criteria:

- Copper (maximum of 15.5L ug/l) compared to its AWQC value (12.48 ug/l)
- Lead (22.7 ug/l) compared to 3.4 ug/l
- Mercury (0.27L ug/l) compared to 0.012 ug/l

These metals were not detected in background surface water samples. Copper and lead were found in all background surface and subsurface soil samples at levels ranging from 7.9 to 22.7 mg/kg for copper and from 5.3 to 19 mg/kg for lead. Therefore, it is possible that the copper and lead concentrations in surface water may be related to naturally occurring conditions. Mercury was not found in any background soil samples. None of these metals exceeded the respective MCL drinking water standards.

Two phthalates (diethyl phthalate and di-n-octyl phthalate) were found in downstream surface water samples but not in background samples. Phthalates are related to plastic components and are often found in urban surface water bodies. The phthalate concentrations were not greater than respective AWQCs.

It is possible that children may play in the stream north of Site 4 and thereby come in contact with contaminated surface water. Exposure could occur via either incidental ingestion or dermal adsorption. It is assumed that exposure will only occur during wading. Adult and adolescent exposures to surface water are not considered because the characteristics of the stream (i.e., limited fishing and shallow depth) are not favorable for these receptors. To determine the estimated cancer and noncancer risks for children exposed to nearby surface water, a formal risk assessment was performed for the metals of concern.

The risk assessment assumed a standard set of default values and other exposure factors. The surface water HIs for incidental ingestion and dermal contact for children were 0.03 and 0.4, respectively. Cancer risks were not calculated because slope factors were not available. Appendix G provides the supporting documentation.

1.6.3.5 Sediments

The sediment risk-based screening evaluation was based primarily on the biological effects data of Long and Morgan (1991), who derived toxicant concentrations in sediments that are associated with observed adverse biological effects. Long and Morgan sorted the concentrations of a specific toxicant in sediments that are associated with observed adverse biological effects in ascending order and derived the 10th and 50th percentile concentrations, described as the effects range-low (ER-L) and effects range-median (ER-M),

respectively, for each chemical evaluated. ER-L values represent concentrations of a chemical in sediment (dry weight) that are equivalent to the lower 10th percentile of the screened available data. Although the apparent effects data base is founded predominantly on marine life, freshwater organisms are not expected to exhibit markedly different responses. Therefore, the entire data base was used for screening purposes.

For this assessment, the ER-L value was selected as the toxicity criterion for selecting sediment chemicals of concern. ER-L values were used to assess the potential for toxic effects in aquatic organisms and to identify the potential for human health risks. Note that ER-L values have not been derived for a number of chemicals detected in Site 4 sediment samples.

Several metals were found in sediment samples during all three phases of RI sampling. Those that exceeded sediment screening criteria (ER-Ls) included

- Arsenic (maximum of 8.5 mg/kg) compared to its ER-L value (8.2 mg/kg)
- Zinc (310 mg/kg) compared to 150 mg/kg

These two metals were detected in all background sediment samples. Arsenic and zinc were found in all background surface and subsurface soil samples at levels ranging from 3.2 to 7.2 mg/kg for arsenic and from 15.1 to 50.2 mg/kg for zinc. Therefore, it is possible that these concentrations in sediment may be related to naturally occurring conditions.

Other metals, including barium, beryllium, selenium, silver, and vanadium, were found in one or more downstream samples at concentrations greater than background levels. None of these metals in downstream samples were two times greater than background. Selenium and silver were detected in only one sample and at low concentrations.

PAH concentrations in downstream sediment samples were similar to background concentrations. Note that the background sediment samples were collected downstream from the Site 8 area. These concentrations may be related to overland runoff from roads surfaced with coal tar and asphalt or to Site 8 (Fire-Fighting Training Area). Historical information indicates that waste fuels, lubricants, and coolants were burned at Site 8, and these wastes may have contained PAHs. Surface soil samples from Site 8 have shown the presence of these PAHs in at least one sample.

The PCB Aroclor 1254 was detected in one downstream sediment sample at 74.5 ug/kg. The ER-L for PCBs is 22.7 ug/kg. DDT was also found at 5.6 ug/kg; the ER-L for total DDT is 1.58 ug/kg. DDT may be associated with the use of insecticides or fertilizers.

It is possible that children may play in the stream north of Site 4 and thereby come in contact with contaminated sediments. To determine the estimated cancer and noncancer risks for children exposed to nearby sediments, a formal risk assessment was performed for the metals of concern and Aroclor 1254.

The risk assessment assumed a standard set of default values and other exposure factors. The incremental cancer risks for exposure to contaminated sediments for children were 1.0×10^{-6} for incidental ingestion and 2×10^{-7} for dermal contact. These risks are equal to the lower limit of the EPA risk range goal. HIs for these exposures were 0.1 and 0.005, respectively. Appendix G provides the supporting documentation.

1.6.3.6 Summary

The human health risk characterization suggests that PCB and other hazardous substance concentrations in soils at Site 4 have the potential to cause carcinogenic risks in excess of 1×10^{-6} or cause other adverse effects. This risk characterization indicates that a response is necessary to address contaminated soils and wastes associated with the site.

1.6.4 Ecological Risk Characterization

1.6.4.1 Methodology and Previous Results

The Site 4 area and Kirk Road stormwater runoff represent the only known sources of potential contamination to the unnamed headwater stream of Little Neshaminy Creek. Stormwater runoff from Munro Park is considered to be negligible. Organisms that are directly exposed near Site 4 include benthic invertebrates and amphibians that are presumed to inhabit the area. Songbirds and small mammals that were observed near the stream are indirectly exposed, as are white-tailed deer.

The wetlands assessment north of Site 4 classified a wetland along the unnamed stream as palustrine, broad-leaved, deciduous, temporary. A small scrub-shrub wetland, located immediately southwest of the Munro residence, was also associated with this area. Riparian vegetation in the upstream portion of this creek included a canopy of mature maples and sycamores with an understory of young trees and arrowwood shrubs. Downstream portions were characterized by fewer mature trees, a more open stream corridor, and greater bankside shrub and herbaceous growth. The wetlands assessment concluded that the stream and wetlands appear to be fairly healthy. No evidence of pollution, fish kills, or stressed vegetation was observed. Urban trash and litter (tires, boards, bottles, cans, paper, plastic) were common.

For most chemicals of concern and under most conditions, the present exposure posed to aquatic and terrestrial organisms will be the most hazardous, with hazards decreasing over time. The ecological risk

characterization focused on present conditions; future land uses and exposure scenarios were not considered.

The characterization of ecological effects was estimated using environmental effect quotients (EEQs) for chemicals of concern in both surface water and sediments. Chemicals of concern were selected based on comparisons to toxic or potentially hazardous concentrations or the potential of a contaminant to bioaccumulate. However, because no biological samples were analyzed for chemical composition, contaminated biota could not be considered to be a direct medium of concern. The potential impacts associated with the ingestion of contaminated biota are therefore addressed qualitatively.

For purposes of this report, the EEQ was calculated by dividing the maximum chemical of concern by the selected toxicity benchmark value. The use of the maximum measured value is a conservative approach that estimates maximum likely exposure. In contrast, the use of average concentrations allows a more realistic estimate of exposure for potentially exposed organisms. EEQs are based primarily on measured concentrations in various media or estimates as determined by simple algebraic models, such as partitioning coefficients. Ratios greater than or equal to 1.0 indicate whether the chemical might pose a potential ecological threat. The EEQ values do not represent risk probability values in themselves but are representative of the relative probability of risk.

Based on previous work (HNUS, 1992), the results of the ecological risk assessment indicated that only cadmium was present at elevated concentrations based on samples 5A and 5B; this metal accounted for the entire risk associated with surface water. No chemicals of concern were detected in sediment samples collected at this location. No chemicals of concern were found in surface water or sediment based on samples 6A and 6B.

The surface water quotient value calculated for Site 4 based on samples 5A and 5B indicated that cadmium has the potential to cause adverse effects on aquatic and aquatic-dependent biota in and around this headwater stream. However, despite the level of concern suggested by this value, the populations and biological communities in and around the Site 4 area did not appear to exhibit significant adverse effects.

1.6.4.2 Surface Water

In most instances, the selected benchmark toxicity values for surface water screening purposes were the chronic ambient water quality criteria (CAWQCs). This value was selected as a conservative and appropriate screening criterion. The calculation of CAWQCs that are hardness dependent was based on a surface water hardness value of 68 mg $CaCO_3$/L, which is the mean calculated hardness value for the Site 4 area (HNUS, 1992).

When CAWQCs were not available, surrogate toxicity values were derived. Lowest observable effects concentration (LOEC)/10 is an estimate of the preferred no observed effects concentration (NOEC). Both the NOEC and the CAWQC are generally regarded as concentrations of chemicals that are unlikely to adversely affect most aquatic species (e.g., non-sensitive species).

Several chemicals under consideration as surface water chemicals of concern are usually considered to be nontoxic. In general, toxicity data are unavailable for these chemicals (barium, calcium, magnesium, manganese, potassium, and sodium) because of their relatively low toxicity. Although very high concentrations of some of these chemicals can result in adverse effects to aquatic life (e.g., by upsetting acid-base balance), they were eliminated from further consideration because of their relatively nontoxic nature.

Both filtered and unfiltered samples were used for selecting surface water chemicals of concern. The use of unfiltered (or total) samples is an appropriate and conservative approach at this stage. However, filtered samples, if available, are preferred for estimating bioavailable, or potentially hazardous, exposure concentrations for surface water chemicals of concern. Filtered samples express concentrations of chemicals dissolved in water, and samples filtered at ambient pH probably best represent potentially hazardous aqueous exposure concentrations. Chemicals bound to particulate matter, which are measured in unfiltered samples, are not generally considered to be bioavailable. Such chemicals should eventually settle out of the water column and become associated with the sediments.

Surface water EEQs were calculated for those chemicals shown in Table 1-7. Lack of appropriate criteria for two chemicals prohibited additional calculations. An EEQ greater than one was calculated for copper, lead, and mercury. These EEQs indicate that these metals have the potential to cause adverse effects on aquatic and aquatic-dependent biota near Site 4. However, despite the level of concern suggested by these values, the populations and biological communities near the Site 4 area do not appear to exhibit significant adverse effects (HNUS, 1994b). In addition, copper, lead, and mercury were not detected in filtered surface water samples collected during the Phase II RI near Site 4. As previously mentioned, filtered samples better represent actual chemical concentrations in surface water.

1.6.4.3 Sediment

The selection of sediment chemicals of concern was based on criteria generally similar to those used for surface water and relied primarily on comparisons to contaminant toxicity. Surrogate sediment toxicity values were derived for a number of potential contaminants. In several instances, potential chemicals of concern were determined by comparisons to background soil concentrations rather than to toxicity benchmark values. In addition, sediment criteria established by various government agencies were used to screen a number of these contaminants.

TABLE 1-7
ESTIMATED EEQs FOR SURFACE WATER CHEMICALS OF CONCERN
SITE 4, NAWC WARMINSTER

ANALYTE	AWQC (ug/l)(1)	EEQ(2)(3)	COMMENTS (4)
Copper	12.48	1.2	<1
Lead	3.42	6.7	<1
Manganese	NA	NA	
Mercury	0.012	22.5	<1
Carbon Disulfide	NA	NA	

NA = Not Available

(1) EPA, 1994. Ambient Water Quality Criteria (AWQC) for Water. Some AWQCs were corrected for hardness.

(2) The maximum surface water concentration for each analyte among all downstream Site 4 surface water samples was selected for the EEQ calculation. The use of maximum metal concentrations among all samples probably overestimates ecological exposures along the entire downstream portion of the unnamed tributary.

(3) The use of unfiltered (or total) metal concentrations, as opposed to filtered metal results, probably overestimates potential ecological exposures.

(4) EEQs based on filtered metal concentrations are provided where appropriate.

The sediment toxicity evaluation was based primarily on the ER-L values initially developed by Long and Morgan. However, ER-L values have not been derived for a number of chemicals detected in Site 4 sediment samples. For such chemicals, surrogate ER-L values were derived, including

(1) CAWQC (or surrogate) divided by 0.0005, which is the median value of the ratio of CAWQC/ER-L computed for all chemicals for which ER-L values and CAWQC are available.

(2) ER-L values for closely related chemicals that are expected to exhibit similar toxicities.

Chemicals measured in sediments at concentrations above ER-L (or surrogate) values were considered to be sediment chemicals of concern. As noted above, sediment quality criteria established by various government agencies, rather than ER-L or ER-L surrogate values, were used to screen a number of potential sediment contaminants. In several instances, toxicity criteria could not be established; these potential chemicals of concern were instead compared to average soil concentrations.

Sediment EEQs were calculated for those chemicals shown in Table 1-8. None of the chemicals has a calculated EEQ greater than 10.0, which would imply moderately high potential risk. About half of the values are less than an EEQ of 2.0. As noted previously, the PAHs, DDT, and metals may be unrelated to Site 4.

1.6.4.4 Summary

The ecological risk characterization indicates that several EEQs exceed unity for surface water and sediment chemicals of concern. Therefore, potential but probably minor ecological risks may be occurring due to the presence of mercury, lead, phenanthrene, anthracene, DDT, and Aroclor 1248 in surface water or sediments. Additional ecological characterization studies may be warranted to assess receptors, exposures, and risks more quantitatively. However, no indications of severe ecological stress were observed in this area, based on the biological survey and the wetlands assessment.

1.7 CONDITIONS THAT SUPPORT INITIATION OF A REMOVAL ACTION

The conditions at Site 4 warrant a removal action. Results from field investigations indicate unacceptable levels of hazardous substances in the subsurface soils at Site 4. Although the current industrial land use at this site restricts access by the general public, workers at the site could have some potential exposure. In addition, the site may be used for recreational purposes if this property is turned over to the community by the Navy.

TABLE 1-8
ESTIMATED EEQs FOR SEDIMENT CHEMICALS OF CONCERN
SITE 4, NAWC WARMINSTER

CHEMICAL	ER-L (ug/kg)	EEQ	COMMENTS
DDT	1.58	3.5	
Aroclor 1248	22.7	3.2	
Acetone	1,000,000	<1	Verschueren, 1993
Toluene	3,500,000	<1	Surrogate ER-L value
2-Butanone	NA	NA	
Phenanthene	225	4.9	
Anthracene	85.3	3.8	
Fluoranthene	600	2.8	
Pyrene	350	2.9	
Benz(a)anthracene	665	3.0	
Chrysene	400	1.7	
Benzo(a)pyrene	400	1.7	
Dibenz(a,h)anthracene	60	1.4	
Arsenic	33,000	<1	
Barium	300,000	<1	Schacklette and Boerngen, 1984
Beryllium	<1000	1.2	Schacklette and Boerngen, 1984
Selenium	6,000	<1	Surrogate ER-L value
Silver	1,000	2.1	
Vanadium	NA	NA	
Zinc	120,000	2.6	

NA = Not Available

(1) Long and Morgan, 1991. Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. Supplemented by Environmental Management, 1995. Volume 1, No. 1, pages 81 - 97.

(2) The maximum sediment concentration for each analyte among all downstream Site 4 sediment samples was selected for the EEQ calculation. The use of maximum metal concentrations among all samples probably overestimates ecological exposures along the entire downstream portion of the unnamed tributary.

Section 300.415 of the NCP identifies eight factors that must be considered when determining the appropriateness of a removal action. The following factors are considered in determining the appropriateness of a removal action pursuant to this section:

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems.

(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

(vi) Threat of fire or explosion.

(vii) The availability of other appropriate federal or state response mechanisms to respond to the release.

(viii) Other situations or factors that may pose threats to public health or welfare or the environment.

Conditions at Site 4 coincide with factors (i), (ii), and (viii). The availability of response mechanisms [factor (vii)] can be met through the Navy's IR Program. With respect to factor (viii), future land use plans for Site 4 may involve shallow excavation work to build recreational facilities in this area. This work may pose threats to on-site workers involved in construction as well as future users of this area.

2.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

2.1 INTRODUCTION

This section describes the objectives of the Site 4 removal action. The removal action objectives are derived from the specific media under consideration, the contaminants of concern, risk characterization, and applicable or relevant and appropriate requirements (ARARs). Potential removal action technologies are evaluated for their ability to meet the removal action objectives in Section 3.0.

This section presents the removal action objectives (Section 2.2), identifies ARARs that set specific action levels or that restrict or limit site activities (Section 2.3), establishes the risk-based goals for the removal action (Section 2.4), provides an estimate of the scope of the removal action (Section 2.5), and presents the general schedule for this removal action (Section 2.6).

2.2 REMOVAL ACTION OBJECTIVES

The clean-up goals or acceptable contaminant concentrations are specific to the media of interest, the contaminants of concern, and the exposure pathways. The purpose of the Site 4 removal action is to decrease the risk to human health and the environment and comply with ARARs. Action levels for the removal action are derived from the most protective of the risk-based or ARAR-based concentrations.

This removal action is concerned with contaminated surface soils, subsurface soils, and buried materials at Site 4, North Runway Landfill. Groundwater is being addressed as part of OU-3. The intent of the removal action is to eliminate the potential for human exposure to the contaminants and potential migration of the contaminants into the environment.

All confirmation and subsurface soil sample borings or test pits placed within the trenches encountered waste material. Outside the trenched area, the borings and test pits encountered only clean fill or native soil. The surficial clean fill over the trenches averages 0 to 2 feet in thickness. The waste material encountered in the test pits consists of wood, metal, and glass fragments, along with general trash and refuse (i.e., food packaging).

Based on the site characterization information described in Section 1.0, it does not appear that buried materials have significantly migrated from the eight trench locations identified at Site 4. This conclusion is supported by the lack of groundwater contamination in the vicinity of the site, along with the lack of subsurface soil contamination in TP-BG-03 between SD-1 and SD-2. In addition, analysis of samples from the sidewalls of trenches did not detect higher contaminant concentrations than were found in the test pit contents.

Given this information and the risk characterization results, the following removal action objectives have been formulated for Site 4:

- Prevent exposures (or potential exposures) (i.e., incidental ingestion, dermal contact, and inhalation) to contaminated soils and wastes presenting unacceptable risks.

- Protect groundwater quality by reducing infiltration of water into and through contaminated soils and wastes.

- Prevent the release of hazardous substances at Site 4 to nearby surface water, sensitive ecosystems, and other media.

2.3 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Actions at any hazardous waste site, including federal facilities, must comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986, Sections 120 and 121. These sections mandate that the development and selection of removal action alternatives comply with requirements or standards under state or federal environmental laws that are applicable or relevant and appropriate requirements (ARARs) for the substances or circumstances at the site. More stringent state laws take precedence over less stringent federal laws in cases where standards are promulgated by both. Primary consideration is given to the degree of public health or environmental protection afforded by each remedy and remedies that attain or exceed ARARs.

The definition of ARARs is as follows:

- Any standard, requirement, criterion, or limitation under federal environmental law.

- Any promulgated standard, requirement, criterion, or limitation under a state environmental or facility-siting law that is more stringent than the associated federal standard, requirement, criterion, or limitation.

One of the primary concerns during the development of removal action alternatives for hazardous waste sites under CERCLA or "Superfund" is the degree of human health and environmental protection afforded by a given remedy. Section 121 of CERCLA requires that primary consideration be given to removal alternatives that attain or exceed ARARs. The purpose of this requirement is to make CERCLA response actions consistent with other pertinent federal and state environmental requirements.

Definitions of the two types of ARARs, as well as other "to be considered" (TBC) criteria, are given below:

- Applicable Requirements are those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that directly and fully address a hazardous substance, pollutant, contaminant, removal action, location, or other circumstance at a CERCLA site.

- Relevant and Appropriate Requirements are those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable", address problems or situations sufficiently similar (relevant) to those encountered at the CERCLA site that their use is well suited (appropriate) to the particular site.

- "To Be Considered" (TBC) Criteria are non-promulgated, non-enforceable guidelines or criteria that may be useful for developing removal action or necessary for determining what is protective to human health and/or the environment. Examples of TBC criteria include EPA Drinking Water Health Advisories, Carcinogenic Potency Factors, and Reference Doses.

ARARS fall into three categories, based on the manner in which they are applied. The characterization of these categories is not perfect, as many requirements are combinations of the three types of ARARs. These categories are as follows:

- Chemical-Specific: Health-/risk-based numerical values or methodologies that establish concentration or discharge limits for particular contaminants. Chemical-specific standards have been established under a number of statutes, including the Resource Conservation and Recovery Act (RCRA), the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), and the Clean Air Act (CAA). However, standards have been established for only a limited number of chemicals. In the absence of chemical-specific ARARs, it is often necessary to consider non-promulgated chemical-specific advisories or guidance documents to identify clean-up remedies that are protective of human health and the environment. Chemical-specific ARARs govern the extent of site cleanup.

- Location Specific: Restrictions on the concentration of hazardous substances or the conduct of activities in specific locations. These may restrict or preclude certain removal actions or may apply only to certain portions of the site. Examples of location-specific ARARs include RCRA location

requirements and floodplain management requirements. Location-specific ARARs pertain to special site features.

- Action Specific: Technology- or activity-based controls or restrictions on activities related to management of hazardous substances. Action-specific ARARs pertain to implementing a given remedy.

2.3.1 Chemical-Specific ARARs and TBCs

This section presents a summary of federal and state contaminant-specific ARARs and TBC criteria. All ARARs and TBC criteria provide some medium-specific guidance on "acceptable" or "permissible" concentrations of contaminants.

Reference Dose (RfD), as defined in the EPA Integrated Risk Information System (IRIS), is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs are developed for chronic and/or subchronic human exposure to hazardous chemicals and are based on the assumption that thresholds exist for certain toxic effects. The RfD is usually expressed as an acceptable dose (mg) per unit body weight (kg) per unit time (day). The RfD is derived by dividing the no-observed-adverse effect level (NOAEL) or the lowest-observed-adverse effect level (LOAEL) by an uncertainty factor (UF) times a modifying factor (MF). The use of uncertainty factors and modifying factors is discussed in the EPA Office of Research and Development (ORD) Health Effects Assessment Summary Tables, Fourth Quarter FY1989 [October 1989-ORD(RD-689)] (EPA, 1989a). RfDs are TBCs for NAWC Warminster.

Cancer Slope Factors (CSFs) are used for estimating the lifetime probability (assumed 70-year lifespan) of human receptors contracting cancer as a result of exposure to known or suspected carcinogens. These factors are generally reported in units of kg-day/mg and are derived through an assumed low dosage linear relationship and an extrapolation from high to low-dose responses determined from human or animal studies. Cancer risk and CSFs are most commonly estimated through the use of a linearized multistage mathematical extrapolation model applied to animal bioassay results. The value used in reporting the slope factor is the upper 95 percent confidence limit. CSFs are TBCs for NAWC Warminster.

EPA Polychlorinated Biphenyls Spill Policy (40 CFR Part 761) applies to recent spills of materials exceeding 50 ppm PCBs within 24 hours of occurrence. Effective May 1987, the policy requires cleanup of PCB spills to different levels depending on spill location, the potential for exposure to residual PCBs remaining after cleanup, the concentration of PCBs initially spilled, and the nature and size of the population potentially at

risk of exposure. The policy addresses reporting, cleanup, performance standards, post-clean-up sampling, and recordkeeping. Generally, the clean-up performance standard is 25 ppm for restricted areas and 10 ppm (with a minimum 10-inch depth to be excavated) for non-restricted-access areas. For old spills, requirements are to be established at the discretion of EPA, usually through the regional offices. This is also true for special cases (i.e., spills directly into surface water, sewers, drinking water, grazing lands, and vegetable gardens).

EPA OSWER Directive No. 9355.4-01, "Guidance on Remedial Action For Superfund Sites with PCB Contamination" provides guidance on remedial/removal actions for Superfund sites with PCB contamination. For contaminated soils, the directive provides preliminary PCB remediation goals of 1 ppm for residential areas and 10 to 25 ppm for industrial areas. Treatment is recommended when PCBs exceed principal threat concentrations of 100 ppm for residential areas and 500 ppm for industrial areas; between these levels and the clean-up goals, the guidance suggests that various containment or exposure reduction strategies will be sufficient. The concentrations given are based on actual soil concentrations, unlike Toxic Substance Control Act (TSCA) regulations, which are based on the concentration of the original spill.

For contaminated groundwater, the guidance recommends remediation goals of 0.5 µg/L [the federal Maximum Contaminant Level (MCL)]. Generally, PCB soil clean-up levels should provide sufficient protection unless groundwater is shallow, oily compounds are present, or the unsaturated zone has a very low total organic carbon (TOC) level (i.e., PCBs adsorb to organic matter and reduce transport to groundwater).

PADEP Cleanup Standards for Contaminated Soil. The Pennsylvania Department of Environmental Protection (PADEP) has developed contaminated soil clean-up standards for most of the chemicals of concern identified in site subsurface soils (PADEP, 1995). These standards are adopted as TBCs. Note that these standards were recently developed and may be revised in the future.

For protection of human health from potential cancer and non-cancer effects, two types of interim statewide health standards for soils have been identified: (1) the incidental ingestion of soils in residential and non-residential land use settings; and (2) the soil to groundwater pathway. These ingestion standards provide the same level of human health protection based on different exposure scenarios and the use of deed notices for non-residential cleanups. They are based on the use of existing standards previously developed by the state (PADEP, 1993).

For soil to groundwater pathway, these interim standards are intended to represent soil concentrations at which leaching to groundwater would not cause adverse effects.

EPA OSWER Directive No. 9355.4-14FS, "Soil Screening Guidance" provides a framework for developing soil screening levels (SSLs) for specific contaminants and exposure pathways at a site under a residential land use scenario. The SSLs do not define unacceptable contaminant concentrations in soil; rather, they help identify whether further evaluation of the potential risks posed by the contaminant levels is appropriate. The SSL framework uses assumptions for ingestion of soil, inhalation of volatiles and fugitive dusts, and ingestion of contaminated groundwater caused by migration of contaminants through soil. The SSLs will be used as TBCs.

EPA Region III Technical Guidance EPA/903/R-93-001, "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening" provides guidance to help focus the risk assessment on dominant contaminants of concern and exposure routes by using risk-based screening concentrations. The screening concentrations will also be used as TBCs, not as site-specific soil clean-up levels.

2.3.2 Location-Specific ARARs and TBCs

Federal Protection of Wetlands Executive Order (E.O. 11990) requires federal agencies, in carrying out their responsibilities, to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. According to the published definition of national wetlands, Federal Register 40 CFR Appendix C, several small areas of palustrine forested wetlands are present along intermittent tributaries to Little Neshaminy Creek. This ARAR has been retained in the event that wetland areas may be affected.

The Endangered Species Act of 1978 (16 USC 1531) (40 CFR Part 502) provides for consideration of the impacts on endangered and threatened species and their critical habitats. This act requires federal agencies, in consultation with the Secretary of the Interior, to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat. A review of the available information indicates that no state or federally listed endangered or threatened species are known to permanently or seasonally reside in the vicinity of NAWC Warminster. For this reason, the Endangered Species Act of 1978 is not applicable or relevant and appropriate to actions taken at the site.

The Fish and Wildlife Coordination Act (16 USC 661) provides for consideration of the impacts on wetlands and protected habitats. The act requires that federal agencies, before issuing a permit or undertaking federal action for the modification of any body of water, consult with the appropriate state agency exercising jurisdiction over wildlife resources to conserve those resources. Consultation with the United States Fish and Wildlife Service is also required.

The Fish and Wildlife Improvement Act of 1978 (16 USC 742a) and The Fish and Wildlife Conservation Act of 1980 (16 USC 2901) provide for consideration of the impacts on wetlands and protected habitats.

The Dam Safety and Waterway Management Act (25 PA Code, Chapter 105, Section 451, Wetlands) applies to wetlands that may be affected by removal response actions. This ARAR has been retained in the event that wetland areas may be affected.

2.3.3 Action-Specific ARARs and TBCs

RCRA Subtitle C regulates the treatment, storage, and disposal of hazardous waste from its generation until its ultimate disposal. In general, RCRA Subtitle C requirements for the treatment, storage, or disposal of hazardous waste will be applicable if

- The waste is a listed or characteristic waste under RCRA.
- The waste was treated, stored, or disposed (as defined in 40 CFR 260.10) after the effective date of the RCRA requirements under consideration.
- The activity at the CERCLA site constitutes current treatment, storage, or disposal as defined by RCRA.

RCRA Subtitle C requirements may be relevant and appropriate when the waste is sufficiently similar to a hazardous waste and/or the on-site removal action constitutes treatment, storage, or disposal and the particular RCRA requirement is well suited to the circumstances of the contaminant release and site. RCRA Subtitle C requirements may also be relevant and appropriate when the removal action constitutes generation of a hazardous waste. On-site activities, mandated by a federally ordered Superfund cleanup, must comply with the substantive requirements of RCRA Subtitle C but not with the administrative requirements (i.e., permits) of RCRA. All RCRA Subtitle C requirements must be met if the cleanup is not under federal order and/or when the hazardous waste moves off site.
The following requirements included in the RCRA Subtitle C regulations may pertain to NAWC Warminster:

- Hazardous waste generator requirements (40 CFR Part 262).
- Transportation requirements (40 CFR Part 263).
- Standards for owners and operators of hazardous waste TSD facilities (40 CFR Part 264).

- Interim status standards for owners and operators of hazardous waste TSD facilities (40 CFR Part 265).

- Land Disposal Restrictions (40 CFR Part 268)

A generator that treats, stores, or disposes of hazardous waste on site must comply with RCRA Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262). These standards include manifest, pre-transport (i.e., packaging, labeling, placarding), recordkeeping, and reporting requirements. The standards are applicable to actions taken at NAWC Warminster that constitute generation of a hazardous waste (e.g., generation of groundwater treatment residues that may be hazardous).

Standards Applicable to Transporters of Hazardous Waste (40 CFR Part 263) are applicable to off-site transportation of hazardous waste from NAWC Warminster. These regulations include requirements for compliance with the manifest and recordkeeping systems and requirements for immediate action and cleanup of hazardous waste discharges (spills) during transportation. Transporters must also have a Pennsylvania transporter permit.

Standards for Owners and Operators of Hazardous Waste Treatment, Substance, or Disposal (TSD) Facilities (40 CFR Part 264) are applicable to removal actions taken at NAWC Warminster and to off-site facilities receiving hazardous waste from the site for treatment and/or disposal and have a RCRA Part B permit. On-site facilities must also have a RCRA Part B Permit if the site is not a federally ordered CERCLA cleanup. Standards for TSD facilities include requirements for preparedness and prevention, releases from solid waste management units (i.e., corrective action requirements), closure and post-closure care, use and management of containers, and design and operating standards for tank systems, surface impoundments, waste piles, landfills, and incinerators.

RCRA Land Disposal Restrictions (LDR) Requirements (40 CFR Part 268) restrict certain wastes from being placed or disposed on the land unless they meet specific Best Demonstrated Available Technology (BDAT) treatment standards (expressed as concentrations, total or in the TCLP extract, or as specified technologies).

Pennsylvania Special Water Pollution Regulations (PA Code, Title 25, Chapter 101) establish a procedure for mandatory notification of downstream users in the case of an accident in which a toxic substance enters surface waters. These regulations also specify bonding requirements for solid waste facilities that would ensure closure of a permitted site in a manner that would abate or prevent water pollution. The regulations may be applicable for removal actions that include on-site treatment of solid waste.

Pennsylvania Hazardous Waste Management Regulations (PA Code, Title 25, Article VII) essentially parallel RCRA Subtitle C hazardous waste management regulations. Similar to RCRA Subtitle C regulations, Pennsylvania regulations include requirements for the following:

- Generators of hazardous waste (Chapter 262).
- Transporters of hazardous waste (Chapter 263).
- New and existing hazardous waste management facilities applying for a permit (Chapter 264).
- Interim status hazardous waste management facilities applying for a permit (Chapter 265).

The above regulations may be relevant and appropriate to on-site removal actions and applicable to the transport of hazardous waste off the NAWC Warminster property.

Pennsylvania Residual Waste Management Regulations (PA Code, Article IX, Chapter 287) establish general requirements that apply to removal actions that involve the generation, management, or handling of residual waste. Residual waste includes "any garbage, refuse, other discarded material, or other waste, including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, mining, or agricultural operations and any sludge from an industrial, mining, or agricultural water supply treatment facility, wastewater treatment facility, or air pollution control facility, provided that the waste is not hazardous." These regulations focus on the process by which a material is generated to determine whether it is a residual waste. Since some wastes deposited at Site 4 meet the definition of residual waste, these regulations may be pertinent to the Site 4 removal action.

Pennsylvania Erosion Control Regulations (PA Code 25, Chapter 102) regulate earthwork and construction that may result in the erosion of soils and sedimentation and pollution of surface wastes. Removal activities at Site 4 that may include soil excavation for remediation or construction are subject to these regulations. An erosion and sedimentation control plan must be prepared and implemented in these cases. Although a formal permit is not required, the plan must be submitted for approval before commencement of construction.

Toxic Substances Control Act (40 CFR Part 761) specifies treatment, storage, and disposal requirements for PCBs based on PCB concentration of the original material. Specifically, remediation for non-liquids (soil, rags, debris) exceeding 50 ppm is addressed in 40 CFR Section 761.6. Remediation for these non-liquids consists of incineration (in accordance with 761.70), chemical waste landfill (in accordance with 761.75), or an alternative treatment method attaining the same performance as incineration (typically 2 ppm measured in the treated residual). The regulations also outline requirements for manifesting waste shipments (40 CFR 761.208) and for notifying EPA (40 CFR 761.205).

Department of Transportation Regulations for Hazardous Materials Transport (49 CFR 107 and 171-179) regulate the transport of hazardous materials, including packaging, shipping equipment, and placarding. These rules are considered applicable to wastes shipped off site for laboratory analysis, treatment, or disposal.

RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR Part 257) are criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health and thereby constitute prohibited open dumps.

The Occupational Health and Safety Act (29 USC, Sections 651 through 678) regulates worker health and safety during implementation of removal actions.

EPA OSWER Directive 9834.11 establishes procedures for planning and implementing off-site response actions.

Pennsylvania Stormwater Management Act (Act No. 167) requires measures to control stormwater runoff during removal alternatives or development of land.

Pennsylvania Hazardous Substances Transportation Regulations (PA Code, Title 13 and Title 15) govern the transport of flammable liquids and solids, oxidizing materials, poisons, and corrosive liquids. These regulations may be applicable to certain wastes that are shipped off site for laboratory analysis, treatment, or disposal. These regulations are generally equivalent to federal regulations.

Pennsylvania Solid Waste Disposal Regulations (PA Code 25, Chapter 75) regulate the disposal of solid wastes including municipal and industrial materials. The regulations set operating and permitting standards for disposal areas and characterize waste materials to achieve proper disposal. Any removal actions resulting in the generation of waste material for on-site or off-site disposal are governed by these regulations.

2.4 REMOVAL ACTION GOALS

Removal action goals identify exposure levels that are protective of human health and the environment and are developed by considering the removal action objectives, ARARs, and the nature and extent of contamination at Site 4.

Analytical results for surface soils, subsurface soils, surface water, and sediment were compared to applicable chemical-specific soil criteria, groundwater protection criteria, or other pertinent screening criteria depending on the medium being evaluated. These criteria include

- State groundwater protection levels for contaminated soils (PADEP, 1995)
- State clean-up standards for contaminated soils (PADEP, 1995)
- EPA risk-based soil screening levels (EPA, 1994)
- EPA migration to the groundwater pathway levels for soils (EPA, 1994)
- EPA risk-based concentrations for soils (EPA, 1993; EPA, 1995)
- EPA ambient water quality criteria (EPA, 1994)
- Effects Range-Low (ER-L) sediment criteria (Long and Morgan, 1991)

For both surface and subsurface soils, a human exposure scenario was assumed to be consistent with future land use for this area. This land use is anticipated to be recreational according to the re-use plan prepared by FLRA-BC. As a conservative approach, however, a residential land use scenario was applied to Site 4. The potential future exposures at Site 4 will be less than the residential land use scenario might imply.

Under the residential land use scenario, the risk associated with exposure to contaminated soil is assumed to be due to incidental ingestion and dermal contact and is calculated for adult employees, adult residents, and child residents. Volatilization is not considered a significant release mechanism and inhalation is not considered a primary exposure pathway. Incidental ingestion and dermal contact with soil by on-site workers are considered as the primary exposure routes.

For noncarcinogens, acceptable exposure levels are represented by concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime. For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upperbound lifetime cancer risk to an individual of between 1×10^{-4} to 1×10^{-6}. The 1×10^{-6} risk level is considered the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at the site or multiple pathways of exposure.

For surface soils, between 0 to 3 feet below the ground surface, Aroclor 1248, TCE, pentachlorophenol, benz(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene are the organic compounds that exceeded one or more of the soil criteria. Arsenic, barium, beryllium, chromium, and magnesium are the inorganic compounds that exceeded the soil criteria.

The major chemicals of concern for subsurface soils include acetone, pentachlorophenol, benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, dieldrin, endosulfan sulfate, and Aroclor 1248. These organic compounds exceeded the soil criteria. Inorganic compounds that exceeded the soil criteria have not yet been identified.

During Phase I and II RIs, representative concentrations of aluminum, barium, cadmium, cobalt, iron, lead, nickel, vanadium, and zinc in subsurface soils exceeded the representative concentrations of these metals in background subsurface soils. No clear pattern of inorganic contamination in the subsurface soil was observed. Ketones, including acetone, PCBs, and alkylbenzenes were detected in a subsurface soil sample obtained from the western part of Site 4. PCE and low-level PCBs were detected in a subsurface soil sample taken from the south-central part of Site 4.

The chemicals of concern for surface water near Site 4 include cadmium and lead. Concentrations of these metals in upstream samples are elevated slightly above their respective AWQC values. The two SVOCs collected in surface water are below their respective AWQC values.

For sediments near Site 4, 4,4'-DDD, 4,4'-DDT, phenanthrene, and fluoranthene are above upstream concentrations and the ER-L criteria. Cadmium, lead, and zinc also exceeded the ER-L concentration and exceed upstream sample concentrations. Pesticides and PAHs may have come from off-site sources and may not be attributable to Site 4. Furthermore, for those pesticides, PAHs, and inorganic concentrations that exceeded ER-L sediment criteria in the downstream sample, the upstream sample has a higher concentration of the specific chemical.

During the Phase II RI, toxicity characteristic leaching procedure (TCLP) and water leachate tests were conducted on selected samples. Both tests help determine the amount of leachable metals in solid material. Under the Resource Conservation and Recovery Act (RCRA), TCLP is used to determine whether waste can be characterized as "toxic" (and therefore "hazardous") by comparison with regulatory limits.

One TCLP sample was obtained for Site 4, plus a background sample. Only leachable barium was found for the Site 4 sample; this result exceeded the background barium level but fell well below the RCRA level. No organic compounds were positively detected in the TCLP sample.

One water leachate sample was obtained for Site 4, plus background. Leachable aluminum, iron, manganese, potassium, sodium, and zinc were detected in the sample from Site 4; all exceeded water leachate concentrations from the background sample. No organic compounds were positively detected in the water leachate samples.

2.5 DETERMINATION OF REMOVAL ACTION SCOPE

Table 2-1 provides the proposed removal action goals for contaminated soils and buried materials at Site 4. These interim goals may be modified during the removal design work, based on more definitive guidance from the state or EPA. Specific goals for surface water and sediments have not been identified since the removal action objective for these media is only to prevent potential contamination of nearby surface water and sensitive ecosystems.

Figure 2-1 shows the approximate area of contaminated soils and wastes based on the field screening. For the purpose of this evaluation, it is assumed that soils up to 6 feet exceed the removal action level. The following calculations estimate the volume of contaminated soils and wastes. More complete information is provided in Appendix E. The actual volume may be different if post-removal action verification sampling indicates that the action levels are not being achieved.

- Approximate area of contaminated soil = 35,600 square feet
- Average depth of soil to be excavated = 6 feet
- Volume of contaminated soil = 213,600 cubic feet
  = 7,900 cubic yards
- Assumed soil density = 120 pounds/cubic foot
- Weight of contaminated soil = 25,632,000 pounds
  = 12,800 tons

These values are slightly overestimated to account for actual field conditions.

2.6 DETERMINATION OF REMOVAL ACTION SCHEDULE

The removal action at Site 4 is considered to be a non-time-critical removal action (NTCRA). The NTCRA could commence within 3 months of the publication of the EE/CA. It is recommended that the removal action be conducted during the fall when precipitation is expected to be at the lowest annual levels. The duration of the removal action at Site 4 is estimated to be approximately 3 months.

TABLE 2-1
PROPOSED REMOVAL ACTION GOALS FOR SITE 4
NAWC WARMINSTER, PENNSYLVANIA

Analyte	Media of Concern	TBC (1)	Range of Detected Concentrations in On-Site Media (ppm)	Range of Detected Concentrations in Background (ppm)	Proposed Removal Action Goal (ppm) (2)
Inorganics					
BARIUM	Surface Soil	1	24.75 - 116	37.3 - 113	113
BARIUM	Subsurface Soil	1	31.6 660	42 - 67.7	113
BERYLLIUM	Surface Soil	3	0.515 - 1.3	0.84 - 1.1	1.1
CADMIUM	Subsurface Soil	2	4.2	Not Detected	3.9
MANGANESE	Subsurface Soil	3	81.4 - 676	116 - 487	573
MANGANESE	Surface Soil	3	140 - 1090	132 - 573	573
NICKEL	Subsurface Soil	1	7.6 - 21.1	8.7 - 12.1	12.1
Volatiles					
TRICHLOROETHENE	Surface Soil	1	0.007 - 0.025	Not Analyzed	0.02
Semivolatiles					
PENTACHLOROPHENOL	Surface Soil	1	0.042	Not Detected	0.01
PENTACHLOROPHENOL	Subsurface Soil	1	0.061	Not Detected	0.01
BENZ(A)ANTHRACENE	Surface Soil	1	0.079 - 0.87	Not Detected	0.7
BENZ(A)ANTHRACENE	Subsurface Soil	1	0.045 - 1.1	Not Detected	0.7
BENZO(B)FLUORANTHENE	Surface Soil	3	0.058 - 1.1	Not Detected	0.88
BENZO(B)FLUORANTHENE	Subsurface Soil	3	0.055 - 1.5	Not Detected	0.88
BENZO(A)PYRENE	Surface Soil	3	0.046 - 0.7	Not Detected	0.088
BENZO(A)PYRENE	Subsurface Soil	3	0.045 - 1.005	Not Detected	0.088
DIBENZ(A,H)ANTHRACENE	Subsurface Soil	3	0.1 - 0.1015	Not Detected	0.088
Pesticides/PCBs					
DIELDRIN	Subsurface Soil	1	0.0054 - 0.022	Not Detected	0.001
ENDOSULFAN SULFATE	Subsurface Soil	2	0.68	Not Detected	0.39
AROCLOR-1248	Surface Soil	3	0.064 - 0.1395	Not Detected	0.083
AROCLOR-1248	Subsurface Soil	3	0.046 - 3.5	Not Detected	0.083
AROCLOR-1254	Subsurface Soil	3	0.51	Not Detected	0.083

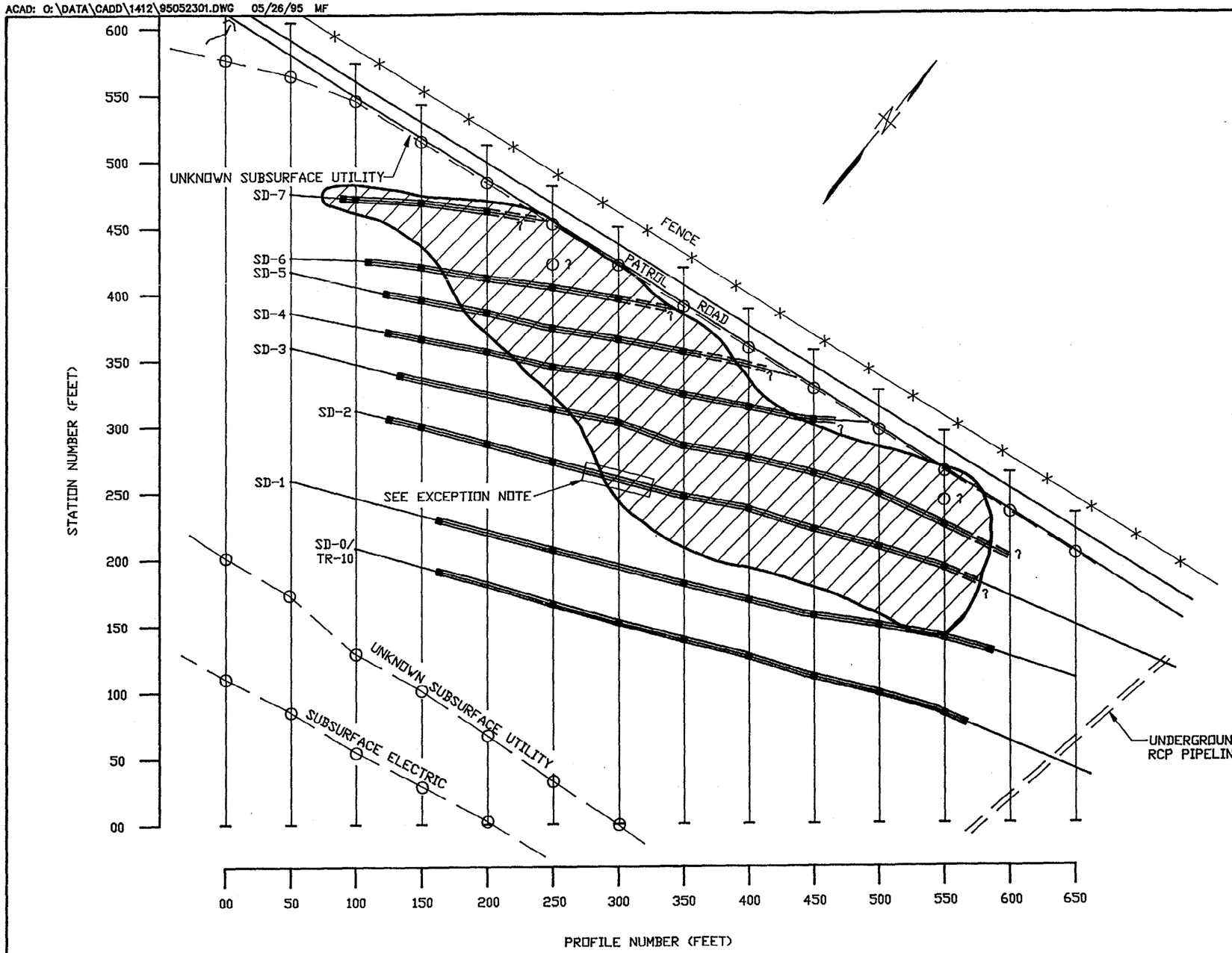
Note: AWQC and ER-L are not specific removal action goals for Site 4. Rather the goals established for surface and subsurface soils will be protective of surface water and sediment if future migration of chemicals in soils to surface water/sediments occurs.

(1) References:

1. EPA, 1994. Soil Screening Guidance.
2. EPA, 1993. *Selected Exposure Routes and COCs by Risk-Based Screening Levels.*
3. EPA, 1995. Risk-Based Concentration Table (January - June 1995).

(2) These are interim goals that may be modified during the removal design work based on more definitive guidance.

ACAD: O:\DATA\CADD\1412\95052301.DWG 05/26/95 MF



LEGEND

SD-1	SURFACE DEPRESSION 1
	PROFILE LINE
	PROBABLE TRENCH
	POSSIBLE TRENCH
	HIGH CONFIDENCE EM INDICATION OF TRENCH END OR CROSSING
ϕ ?	POSSIBLE EM ANOMALY
	BLUISH GREY MICACEOUS SILT

TRENCH CONTENTS

TRENCH	CONTENTS
SD-7	GENERAL REFUSE
SD-6	GENERAL REFUSE
SD-5	GENERAL REFUSE
SD-4	GENERAL REFUSE
SD-3	GENERAL REFUSE
SD-2	GENERAL REFUSE (SEE EXCEPTION)
SD-1	GENERAL REFUSE & CONTRUCTION DEMOLITION DEBRIS
SD-0/TR-10	CONSTRUCTION DEMOLITION DEBRIS

EXCEPTION

TRENCH SD-2 CONTAINS AN AREA WITH NEITHER REFUSE NOR CONTRUCTION DEMOLITION DEBRIS.
SEE NOTED EXCEPTION AREA ON PLAN.

FIGURE 2 – 1

SITE 4
CONTENTS OF TRENCHES
NAWC WARMINSTER, PA

0 80 160
SCALE IN FEET
1"=80'-0"

Halliburton NUS CORPORATION

00081 70052

3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES AND ALTERNATIVES

3.1 INTRODUCTION

This section documents the process and rationale for developing removal action alternatives for contaminated soils and wastes associated with Site 4. General response actions are identified in Section 3.2 that form the framework for identifying and screening specific removal response technologies. Criteria used to evaluate specific technologies are presented in Section 3.3. Process options for each technology are described and evaluated in Section 3.4. Process options that fail to pass the evaluation criteria are eliminated from further consideration. Those process options that remain are used to develop detailed removal action alternatives. Each removal action alternative is fully described and evaluated in Section 3.5.

3.2 GENERAL RESPONSE ACTIONS

General response actions represent combinations of technologies that, together, are expected to satisfy the removal action objectives. Subsequent sections present each technology (e.g., treatment) and the process options (e.g., soil washing, incineration, low temperature thermal desorption) associated with each technology. The process options within each technology are screened for effectiveness, technical implementability, and cost. Process options that remain after the initial screening are incorporated into specific removal action alternatives for each site.

Based on the nature and extent of contamination (Section 1.0) and the removal action objectives (Section 2.0), the following general response actions were identified for Site 4:

- Institutional controls
- Removal
- Containment
- Treatment
- Disposal

3.3 EVALUATION CRITERIA

Section 300.415 of the NCP requires removal actions to "contribute to the efficient performance of any anticipated long-term remedial action" to the maximum extent practicable. EPA's Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA (EPA, 1993) provides three broad criteria for the evaluation of the short- and long-term aspects of alternatives. These criteria are defined below.

- Effectiveness - This criterion focuses on the potential effectiveness of process options in protecting public health and the environment and in meeting the objectives of the removal action. This criterion addresses potential impacts to human health and the environment during construction and implementation, compliance with ARARs, and how proven and reliable the process is with respect to the contaminants and conditions at the site.

- Implementability - This criterion encompasses the technical and institutional feasibility of implementing a process. Three factors are considered: technical feasibility, availability, and administrative feasibility. Technical feasibility includes consideration of construction and operational issues, demonstrated performance, and adaptability to site conditions. Availability involves the evaluation of whether sufficient equipment, personnel, services, and disposal capacity exists to implement the technology. Administrative feasibility considerations include the ability to obtain any necessary permits or easements or adherence to applicable non-environmental laws and concerns of other regulatory agencies. Generally, only process options that are considered technically feasible are presented. Therefore, the evaluation focuses on the institutional aspects of implementability, such as the ability to obtain permits, availability of treatment, storage, and disposal services, and availability of necessary equipment and resources.

- Cost - This criterion includes direct and indirect capital costs and any recurring costs associated with operations and maintenance of the technology. Cost plays a limited role in technology screening. The cost analysis is based on engineering judgment, and each process is evaluated as to whether costs are high, low, or medium relative to the other options in the same technology type. Cost is more fully evaluated during the evaluation of removal action alternatives (Section 3.4).

3.4 IDENTIFICATION AND SCREENING OF TECHNOLOGY PROCESS OPTIONS

In this section, the five general response actions presented in Section 3.1 are broken down into their component technologies. Potential process options are identified and evaluated for each technology component, as follows:

3.4.1 Institutional Controls

3.4.1.1 Deed Restrictions

Deed restrictions are an institutional control that is legally recorded on the property deeds. These restrictions can include limitations on future land use activities, on placement of wells, or on certain types of construction.

Another type of deed restriction is a deed notice. This notice would require written documentation of the presence or potential presence of materials of concern prior to any property transaction.

Effectiveness. Deed restrictions could be applied to areas with contaminated soils, since only administrative action would be required. No additional risks to human health and the environment would directly result from the imposition of deed restrictions. Deed restrictions could ensure that future uses of Site 4 would be restricted. Deed restrictions would not address the removal action objective to prevent potential contaminant migration.

Implementability. Deed restrictions could be implemented by the Navy. This option would not eliminate the potential for contaminant migration. The likelihood of acceptance of a deed restriction by regulatory agencies or the public (including FLRA-BC) is low. The Navy has requested comments from the public, local municipalities, and other interested parties on the feasibility of this option.

Cost. Because no action would be taken at the site, no capital costs are involved. Minor indirect costs would be required to record the deed restriction. Minor operation & maintenance (O&M) costs would be required to monitor the effectiveness of the restriction.

Conclusion. Although this is not feasible as a stand-alone removal action alternative for Site 4, this option may be used in conjunction with other technologies to restrict future use of the site. If future uses of the site include residential development, deed restrictions in the form of limitations on future well development and/or construction might be required. A deed restriction would also be necessary in a case of non-residential land use due to the presence of contaminated soils and wastes of concern at Site 4.

3.4.1.2 Monitoring and Analysis

Monitoring results can be used to determine whether contaminated soils and wastes at Site 4 are migrating to groundwater. This is currently being conducted as part of the OU-3 remedy. The extent of groundwater contamination at the site was determined during previous investigations, including the focused RI for Area C, with wells installed to monitor contaminant concentrations in groundwater. Thirteen monitoring wells have been installed in the vicinity of Site 4. Installation of any additional monitoring wells would be evaluated during the design of the Site 4 removal action, and would be installed as part of the OU-3 remedy.

Effectiveness. Monitoring is an effective means to determine changes in groundwater contaminant concentrations and the effectiveness of the removal action. However, groundwater monitoring would not

reduce the toxicity, mobility, or volume of contaminants at Site 4. Also, monitoring would not provide any additional protection of the environment. Monitoring would allow establishment of a trend in contaminant levels to evaluate whether contaminant levels are increasing, decreasing, or stable.
Many monitoring wells already exist at and downgradient of the site, and the principal costs associated with this technology would be annual sampling and analyses costs. Annual monitoring costs would depend on the number of wells to be monitored, analytical parameters, and the sampling frequency.

Implementability. Groundwater monitoring could be easily implemented because monitoring wells already exist and additional wells could be readily installed.

Cost. Costs are dependent upon the number of wells and monitoring frequency.

Conclusion. Although this may not feasible as a stand-alone removal action alternative for Site 4, this option will be retained for further evaluation to track groundwater contaminant levels and to evaluate the need for other removal action alternatives.

3.4.2 Removal through Bulk Excavation

Bulk excavation involves the large-scale removal of soils and wastes. Traditional excavation equipment such as backhoes, bulldozers, and scoop loaders is typically used. In this scenario, buried trench material would be excavated, loaded onto trucks, and hauled off site to an approved treatment or disposal facility or could be treated and/or relocated on site.

Effectiveness. Removal of the contaminated soils and buried wastes would be effective in handling the volume of contaminated material at Site 4. Prior to excavation, best management practices would be required to minimize stormwater runon/runoff at the excavation and soil erosion. Backfilling would require the use of clean fill from another area and/or the use of decontaminated soils to restore the site to its original state. Excavation of contaminated soils would require the control of fugitive dust and any air emissions during construction to protect site workers and off-base receptors. Inadequate collection and treatment of fugitive emissions could result in adverse health and safety concerns for workers. This technology, combined with subsequent treatment and/or disposal, would be a permanent solution to attainment of removal action objectives. The quantities of material involved (i.e., 12,800 tons) and the types of soils and wastes at the site can be readily excavated.

Implementability. The estimated extent of contaminated soils and wastes at Site 4 is easily excavated due to the lack of buildings and other structures in the vicinity of the site. Existing subsurface utilities along

Patrol Road would be marked in the field prior to construction. Excavation contractors for this type of work are readily available.

Cost. The cost of excavation is generally low. The need to excavate around buried utilities may increase costs slightly.

Conclusion. Removal of contaminated soils and wastes via excavation is retained for further evaluation in conjunction with other process options.

3.4.3 Containment through Capping

Capping involves the installation of a low-permeability barrier over contaminated soils and wastes within the eight trenches at Site 4 to restrict access and/or reduce infiltration of precipitation into these materials. Low-permeability barriers should be considered where contamination threatens other media such as surface water. Consolidation and/or regrading of isolated quantities of contaminated soils prior to capping may be required. Frequently used materials include low-permeability clays such as bentonite; cement; asphalt; and synthetic membranes such as low-density polyethylene (VLDPE), polyvinyl chloride, and Hypalon. These materials can be covered with soil to protect them against weathering and erosion. The thickness of these caps can exceed 4 feet. Two basic system designs can be employed: single-layered or multi-layered caps.

The effectiveness of a well-designed and constructed multi-layer cap is not significantly better in this situation than a single-layer cap. Additionally, a multi-layer cap may prove to be technically impractical due to the thickness of the cap, proximity to Kirk Road, and undesirable changes to surface grading and stormwater flow. However, single-layered asphalt and concrete caps have not been considered because of potentially poor performance.

A single synthetic cap could be considered at Site 4 since migration to groundwater does not appear to be a concern. Since the concern is direct contact with surface soils and buried materials, a cap consisting of natural soils and HDPE would be appropriate under a residential land-use scenario. Two layers of natural soils would be used: a 6-inch layer of top soil and an 18-inch layer of clean fill. Filter fabric material would be placed between the natural soils and the synthetic membrane. An underlying geotextile layer would be placed between this membrane and buried materials. After the single synthetic cap was emplaced, the surface of the site would be revegetated.

Multi-layered caps are designed using a three-layered system (a vegetative layer underlain by a drainage layer over a low-permeability layer). The caps divert infiltrating liquids from the upper vegetative layer through the drainage layer and away from underlying contaminated materials.

The low-permeability layer may be constructed from natural soils, admixed soils, a synthetic liner, or a combination of synthetic and soil materials. A synthetic liner overlying low-permeability natural soil or soil admix could be expected to prevent liquid penetration for at least 20 years, and the soil layer would continue to provide protection if the synthetic liner does not perform properly. Standard design practices specify soil liner permeabilities less than or equal to 10^{-7} centimeters/seconds (cm/sec).

Flexible synthetic membranes, such as polyvinyl chloride and synthetic rubbers, are generally more expensive than natural soil layers and often require special field installation methods and sealing techniques. Special adhesives and sealants are used to ensure liner integrity. The chemical resistance of a synthetic liner can be critical if organic and/or corrosive vapors would be released. The thickness and flexibility of a synthetic liner are factors in material selection.

The drainage layer is placed directly above the low-permeability layer. Current designs generally specify a drainage layer material with permeability greater than or equal to 10^{-3} cm/sec to reduce the possibility that infiltrating rainwater will reach the low-permeability layer. The drainage layer thickness would be determined based on the volume of precipitation that may enter the drainage layer and the amount of settling that may occur.

The vegetative layer is placed above the drainage layer, with a filter fabric layer placed between the layers. In general, topsoil is used to establish the vegetative layer. This layer usually exceeds 2 feet in thickness, depending on the frost depth, the root penetration depth, and the anticipated soil-loss rate.

Generally, a vegetative cover is required to stabilize the surface of a site that has been graded and capped. Revegetation decreases erosion and contributes to stable surface development.

Surface controls such as grading or diversion structures may be used in conjunction with capping and vegetation to reshape the land surface or to minimize erosion and infiltration. Grading would minimize ponding and infiltration through marshy areas at the site, reduce runoff velocities and soil erosion, and roughen and loosen soils in preparation for vegetation. The topography and existing slope of Site 4 are generally conducive to minimal slope grading. Grading to a slope of about 2 percent would facilitate drainage and minimize erosion, particularly in the vicinity of the trench depressions. Diversion structures such as dikes, berms, and sediment fences could be used as temporary measures to also reduce erosion and infiltration.

Effectiveness. Single synthetic and multi-layered caps have traditionally been considered to be effective, reliable containment barriers. Their effectiveness would be determined by the cap's long-term ability to divert water away from underlying contaminants and reduce infiltration. Both types of caps would effectively

prevent contact with contaminated media and would control vertical contaminant migration from the leaching of wastes and soil-bound contaminants to groundwater. Data collected for Site 4 suggest that the majority of the contaminant mass has not reached the water table in this area (or has already migrated to water) and therefore reduction of infiltration may be particularly beneficial. However, both types of caps would not be as effective in controlling lateral groundwater migration without the benefit of additional landfill containment (e.g., interceptor trenches, cut-off walls).

Capping combined with surface controls would effectively reduce risk to human health by providing a barrier between contaminated soils and potential receptors, thus significantly limiting fugitive dust emissions and dermal contact with contaminated soils and buried wastes. Capping does not address existing contamination, offering no long-term reduction in the volume or toxicity of the contamination. During removal activities, fugitive dust emissions would have to be controlled to minimize effects on human health and the environment.

Deed restrictions may be required to control future land uses at this site and to prevent excavation and resultant damage to the cap.

Implementability. The small areal extent of contaminated materials estimated at Site 4 makes capping technically feasible. Capping has been employed at a variety of CERCLA sites as a remedial alternative component and may be installed at Site 4 with minimal difficulty and in a relatively short period of time, even where capping material must be imported. A variety of proven construction methods and materials is available, including soils, clay soils, man-made membranes/fabrics, asphalt, and combinations of the above. Some earthwork may be required in and around the eight trenches to achieve proper slopes for surface water runoff control. Construction methods involved in capping are relatively common and can be conducted by many contractors.

The multi-layered cap is more difficult to construct due to the many layers. Seaming is also an important consideration when installing the synthetic membranes.

Surface water runoff from the cap would be subject to PADER requirements. Other administrative requirements include the need for erosion and sediment control plans and stormwater management plans prior to construction. Deed restrictions may be required in conjunction with capping in order to limit the future usage of the capped area.

Cost. The capital costs for a single synthetic cap are expected to be low. O&M costs are moderate to high for this type of cap because more frequent inspection and maintenance would be required. The capital

costs for a multi-layered cap are expected to be moderate. O&M costs are moderate for a multi-layered cap.

Conclusion. Although capping is effective in controlling direct exposure to the contaminants, it will not address long-term reduction of toxicity and volume. Capping at Site 4 may interfere with future structures and activities that are planned by FLRA-BC at Site 4 or may interfere with timely transfer of the property from the Navy to the community.

Regardless of these potential limitations, both single synthetic and multi-layered caps are effective and implementable options at Site 4. The single cap could be as effective as the multi-layered cap. As such, this type of cap is retained for further consideration because it offers a reliable option for addressing contaminated materials at Site 4, particularly if long-term monitoring is performed in the vicinity of Site 4.

3.4.4 Treatment

Most wastes contained within the Site 4 trenches do not lend themselves to traditional treatment by any means. However, in the event that some buried wastes require treatment, the following options have been considered. The types of wastes to be treated would depend on ARARs and the chemical concentrations detected in excavated soils. Some treatment options are specific to organic contaminants, while others may be applicable for only inorganic chemicals. For example, soil-concentrations exceeding TCLP regulatory requirements could not be disposed in a municipal landfill. However, this situation has not been encountered in any of the previous investigations conducted at Site 4.

3.4.4.1 Biodegradation

In-situ biodegradation (e.g., bioremediation, biorestoration, or bioreclamation) describes a range of process options that rely on microbial transformation of organic contaminants to effect cleanup. Biodegradation of organics in soil systems is a natural process by which indigenous microorganisms obtain energy and/or carbon. However, natural biodegradation rates may be limited by site conditions. In some cases, it is possible to engineer physical, chemical, and biological conditions that promote biodegradation in the contaminated media, thereby stimulating or accelerating biodegradation of target contaminants.

Biodegradation can take place under aerobic (oxygen-rich) or anaerobic (oxygen-deficient) conditions. Depending on the type of biodegradation that is desired, engineered controls or systems can be implemented to enhance the conditions. Types of controls or systems include adding oxygen, organic, and inorganic nutrients needed or microbial metabolism and adding microorganisms.

Capping is often used to establish anaerobic conditions. Aerobic conditions typically involve aeration of the soil by mechanical means or by using vacuum extraction wells to draw air through the subsurface. Moisture, nutrients, and microorganisms are added using common irrigation equipment such as spray irrigators or sprinklers.

Effectiveness. Biodegradation has been used to remediate organic contaminants such as PAHs and phenols. For other chemicals of concern, it is not possible to determine whether biodegradation would be able to achieve the remedial action goals. A treatability study would be required to determine the level and products of degradation possible with these chemicals.

Implementability. Biodegradation systems are readily constructed; however, the systems can be sensitive to moisture, oxygen, and nutrient levels, pH, and temperature. Maintaining these variables within required tolerances in an in-situ system can be difficult. Consolidation of the contaminated soils on the site could provide greater control over these variables.

Numerous vendors are capable of providing biodegradation equipment and services. The length of time to achieve the removal goals could affect regulatory acceptance of this approach. Permits would be required for the off-site discharge of any irrigation process waters.

Cost. Direct capital costs associated with biodegradation are generally low. Indirect costs include the need for treatability studies and are low to moderate. O&M costs are low to moderate depending on the length of treatment required.

Conclusion. Based on the uncertainty in the effectiveness of bioremediation and the lack of data supporting the technical feasibility of this process option, biodegradation is eliminated from further consideration.

3.4.4.2 Soil Washing

Soil washing is an in-situ process that uses a closed-loop recirculation system of injection and extraction wells to remove contaminants from the saturated and unsaturated soils. Under soil washing, water, with or without other additives, is sprayed onto or injected into the soils. Additives are used to increase the mobility of the contaminants. For organics removal, surfactants or alkalis are commonly used. For inorganic removal, acids, alkalis, oxidizers, reducing agents, and/or complexing agents are commonly used. Collection of the washing fluids is an important step. At the collection point, treatment systems such as air stripping, carbon adsorption, or filtration are then utilized to separate the contaminants from the extracted water. The treated water is recirculated through the system by re-injection into the contaminated area.

Effectiveness. Soil washing would not be effective in treating the various types of organic contaminants to removal action objective levels. Several factors limit its effectiveness. Primary concerns are the ability to contact all the soils, the ability to mobilize the contaminants, the ability to capture the mobilized contaminants, the ability to separate the contaminants from the washing solution (or washing fluid), and the ability to monitor compliance. This process could actually result in the spread of contaminants at Site 4 since these contaminants have generally not migrated to the groundwater. Additionally, the spent washing solution would likely contain significant concentrations of contaminants in highly mobile forms and thereby potentially result in significant risk to human health and the environment, if it is not completely captured.

Implementability. Since treatment is conducted at the site, potential constraints such as the need to comply with RCRA facility requirements and extensive monitoring of that facility could be significant issues. Also, because contamination is extensive, this process would be difficult to control. In addition, the disposal or regeneration of activated carbon, and other residuals generated from treatment processes, which are used to separate contaminants from the extracted water, may require an off-site RCRA facility. The availability of equipment and resources to conduct this work is somewhat limited.

Cost. The capital and O&M costs are moderate.

Conclusion. Due to several effectiveness and implementability concerns, including potential risk to human health and the environment, soil washing is eliminated from further consideration as a process option.

3.4.4.3 Physical Extraction

Solvent extraction is an external process in which excavated soils and wastes are fed into a contractor or washing unit. Typical contractors include countercurrent extraction equipment, a pug mill, or a truck-mounted cement mixer. After contact, solvent with contaminants is removed from soil and waste by methods such as centrifugation or filtration. Contaminants are then removed from the solvent via the appropriate treatment systems.

Contaminants adsorbed on soil or sediment can be desorbed by solvent extraction processes through the application of hydraulic forces and physicochemical reactions. The passage of a liquid through the excavated soil can scrub and/or dissolve the soluble contaminants and entrain these dissolved contaminants in the liquid. The liquid may be composed of water, water with surfactants, carbon dioxide, triethylamine and other organic solvents, water/chelating agents, and acids or bases, depending on the contaminants that need to be removed. Water-based extraction, used for metals removal, is often referred to as soil washing. Non-water-based extraction, which may be applicable to organic contaminant removal, is referred to as solvent extraction.

Effectiveness. With proper controls, minimal risks to human health and the environment would be expected to result from this process. Extraction should be relatively effective in achieving the removal action goals. A successful extraction scheme would effectively reduce the concentration of contaminants in the soil to less than the risk-based concentrations. Concentrated residual streams will require further treatment prior to disposal.

Implementability. This technology first requires excavation of targeted soils. Excavation is readily implementable at Site 4. Treatment would occur on site so compliance with the substantive requirements for a RCRA facility and monitoring of that facility are required per 40 CFR 264. Off-site treatment of the residual soils and extracted contaminants would require transportation and treatment permits. The equipment and resources necessary to extract Site 4 soils and wastes are available, and several vendors are capable of performing this work.

Cost. The relative capital and O&M costs for solvent extraction are moderate.

Conclusion. Solvent extraction is eliminated from further consideration. The relative costs and length of time necessary to treat contaminated materials at Site 4 through extraction do not make the mobilization of a solvent extraction system practicable.

3.4.4.4 Incineration

Incineration is a thermal oxidation process that converts organic solids, liquids, and gases to inorganic substances at high temperatures in the presence of oxygen. The technology uses controlled flame combustion in an enclosed reactor to decompose organics. Carbon and hydrogen waste components are converted to carbon dioxide (CO_2) and water, respectively. Chlorine, if present, is mostly converted to hydrochloric acid (HCl). Other combustion products are also formed in smaller quantities and may include carbon monoxide, nitrogen oxides, and free chlorine and fluorine. Metals are not treated in incineration and may, in some situations, become more toxic due to a concentration effect. Incineration produces a solid stream from the incombustible portion of the original material, which is removed as bottom and fly ash, detoxified soil, and possibly other solid treatment residuals. If a wet scrubber air pollution control system is used, a liquid waste stream could also be generated. Depending on the original waste stream, process residuals/effluent may require further treatment and/or disposal. The rotary kiln incinerator is the most common and versatile type of incinerator that is capable of burning a broad range of gases, liquids, solids, and slurries. Other types of incinerators include the plasma arc pyrolysis, low-temperature, and infrared incinerators. Only the rotary kiln incinerator is discussed in this report. Rotary kiln incinerators can be used to remove volatile and some semivolatile organic compounds and moisture from a wide variety of granular, chunky, and semi-solid materials. Rotary kiln incineration of waste materials does not, however, remove

metals. The basic type of rotary kiln is a long inclined heated cylinder that is slowly rotated. Contaminated materials are fed into the kiln at the upper end and follow a spiral path down through the chamber as the kiln rotates. The tumbling facilitates solid-gas contact to promote thermal destruction of the vapors. Rotary kilns are often equipped with afterburners to improve combustion efficiency and flue gas scrubbers to control air emissions. Rotary kilns are widely used in industry as a commercially proven technology for the thermal destruction of wastes but have high capital and O&M costs.

Effectiveness. Incineration is a highly proven technology and currently the best demonstrated available technology (BDAT) for Aroclor 1248, pesticides, and compounds such as VOCs. Incineration is capable of handling the volume of wastes and organic-contaminated soils at Site 4. It is a common and relatively reliable means of treating organic wastes in general and is the preferred technology for removal of PCBs from soils. Incineration should allow for the treated soils to be disposed as nonhazardous material either on site or off site and should also be capable of achieving the remediation goals as identified in the removal action objectives for organics. Air emissions from the incinerator must be monitored closely in order to protect human health and the environment.

Rotary kiln incineration is a proven reliable process for the destruction of organic compounds, such as TCE. However, the soil may require several passes through the incinerator to reach concentration levels acceptable to regulatory agencies. The rotary kiln incinerator would also require an air emission control system for compliance with regulatory standards.

Implementability. On-site and off-site incineration are both implementable. The equipment and resources necessary are available and several vendors are capable of performing this work. If incineration is conducted on site, compliance with state air pollution control regulations would be required. TSCA regulations require a trial burn for on-site activities to demonstrate destruction and removal efficiency. Emissions of carbon monoxide, hydrogen chloride, nitric and sulfuric oxides, and particulates would be controlled and monitored in compliance with air pollution regulations. If incineration is conducted off site, compliance with applicable transportation regulations is required.

Rotary kiln incineration is commercially available for off-site treatment of wastes and soils contaminated with chlorinated hydrocarbons, such as those found at the site. However, there are only a few facilities in the United States that are equipped and permitted to treat soil contaminated with chlorinated hydrocarbons. Interstate transportation would be required to implement this option.

Costs. The relative capital costs are high for incineration. Costs will vary based on the distance between the site and the permitted disposal facility. The nearest facility is in Illinois. Since the contamination is removed from the site permanently, there are no O&M costs.

Conclusion. Off-site incineration is an effective and implementable option for destroying unacceptable chemical concentrations present in contaminated materials. Thus, off-site incineration is retained for further consideration. It is not practical to install an on-site incineration system at the base since the facility is scheduled to be turned over to the community and there is an insufficient volume of contaminated materials to justify mobilization costs.

3.4.4.5 Low-Temperature Thermal Desorption

Low-temperature thermal desorption (LTTD) is a waste treatment process that thermally separates or desorbs organic contaminants from soils or solids, with subsequent treatment of the organic vapor stream prior to release to the atmosphere. LTTD removes and concentrates volatile and some semivolatile organics from a solid matrix by increasing vapor pressure and volatility. This process differs from incineration, which destroys organic contaminants in the soil or solids. As in the case of incineration, this technology does not remove metals. Typically, contaminated materials are processed through a direct-fired pug mill or rotary dryer drum system operating at relatively low temperatures (400°F to 700°F) to facilitate desorption of the organic contaminants into the airstream. The processing equipment includes transfer surfaces that are heated by circulating hot oil. The contaminated material is first screened and then heated for a period of 7 to 10 minutes under negative pressure to volatilize the organic compounds from the soil particles. An induced air flow conveys the desorbed organics through a secondary treatment system, such as a carbon adsorption unit, combustion afterburner, or a condenser unit. The gases produced are then passed through a cyclone separator, after-burner, quench tower, baghouse, and packed-bed air scrubber or carbon adsorber before being released to the atmosphere through a stack.

LTTD is principally used to treat material with light to moderate concentrations of volatile petroleum hydrocarbons and to a lesser extent chlorinated solvents such as TCE, PCE, and 1,1,1-TCA. The smallest commercially available thermal desorber units with emission controls for chlorinated organics have a approximate capacity of 7.5 tons per hour. Large-scale thermal desorption units with approximate capacities of 100 to 150 tons per day are also currently available. LTTD is well-demonstrated; however, heavy metals in soils are not removed by this technology.

Effectiveness. Prior to being fed to the thermal desorption unit, the excavated material may be screened and/or shredded to remove objects larger than approximately 2 inches from the feed. The need for pretreatment would be evaluated during the removal design phase. Large particles may cause implementation problems in the thermal desorption unit such as obstruction of flow. If any large particles are screened from the feed, they may be stockpiled and either pulverized to produce a homogeneous feed to the unit or disposed. Moisture in the feed material would produce water with a low organic content and, if required, this residual water could be processed further.

Thermal desorption would be an effective process to remove organic compounds, including TCE, from soils. Organics removed from the feed by thermal desorption are condensed in a residual sludge that would be treated to destroy the organics and disposed at an authorized facility. Metals and other inorganics are not amenable to thermal desorption, and significant levels of these compounds may be found in the treated material. An air emission control system would ensure that releases from the thermal desorption system are in compliance with particulate and gas emission standards.

LTTD should be capable of accommodating the small volume of contaminated soils and wastes at Site 4 that would potentially require this type of treatment. The effectiveness of LTTD is dependent primarily on the boiling point of the contaminant.

Low-temperature thermal desorption for the removal of TCE from site soil is not the most efficient application for this technology, because of the emissions control requirements for chlorinated compounds. The vaporized chlorinated hydrocarbons extracted from the soil would be converted to hydrogen chloride vapor in the after-burner of the thermal desorber and then condensed to hydrochloric acid in the wet scrubber to ensure that vapor releases comply with regulatory standards.

Implementability. There are few, if any, known off-site facilities that would be able to accept these soils; thus, consideration of LTTD is effectively limited to on-site processes. The equipment and resources necessary to treat the soils on site are available, with several vendors capable of performing this work. Implementation of LTTD at Site 4 is impractical due to the small volume of contaminated materials involved. Treatability studies would be required to determine the necessary operating temperatures and holding times. Air emission controls would be required, and monitoring would most likely be required to ensure that emissions meet applicable federal and state air quality standards. A trial burn would not be required to implement the thermal desorption process because the waste is not incinerated. However, pilot studies are required as part of the pre-design investigation.

Although LTTD has only been demonstrated in pilot scale tests to date, EPA tests have indicated that LTTD is an effective method to reduce organic concentrations typical of many CERCLA sites. It appears that all commercially available low-temperature thermal desorbers are mobile units that are transported to sites using front-end loaders and several semi-trailers. Power, gas, and water connections would also be required at the site. The mobile units are designed to treat quantities in excess of 5,000 tons, with a throughput range of 30 to 60 tons per hour and a system space requirement of 16,000 square feet. It is assumed that the mass of contaminated material at the site requiring such treatment is considerably less than this weight. The application of LTTD would not be readily implementable because the scale of remediation required is too small for the equipment available.

Cost. Thermal desorption is less costly than incineration because no trial burn is required, the air pollution control system is generally more than 10 times smaller than for an incinerator, and the thermal desorption process requires the addition of less supplemental heat. The relative capital and O&M costs for low-temperature thermal stripping are moderate.

For remediation by LTTD units, costs would include those for system mobilization, unit rental, power, gas, and water at the site and system demobilization. Since the estimated mass of wastes and contaminated soils at the site requiring such treatment is small, this technology may not be cost effective.

Conclusion. Thermal desorption is an innovative thermal treatment process. Furthermore, soils and wastes from the site could be treated by thermal desorption, and treated solids exiting the unit would contain only trace levels of organics. Low-temperature thermal desorption is one of EPA's presumptive remedies for VOC soil contamination at NPL sites. The condensed organics in the residual sludge and wastewater condensate could be effectively treated and disposed; however, these by-products would be considered hazardous wastes by the derived-from rule. However, LTTD is not considered a reasonable alternative for Site 4 due to the small volume of soils that would likely require treatment and is eliminated from further consideration.

3.4.4.6 Stabilization

Stabilization chemically immobilizes hazardous constituents by combining specially formulated reagents with the waste so that the hazardous contaminants are chemically maintained in their most immobile, or least toxic, form. The goal of stabilization is to reduce the solubility or chemical reactivity of a waste by altering the chemical state of the waste through the addition of a specific reagent mix.

Stabilization can be implemented either in-situ or ex-situ, by mixing soils with specific types of binders which chemically react with and immobilize hazardous constituents in a solid matrix. The binders fall into two categories, inorganic and organic, and are also identified by their chemical mechanism. Stabilization reagent options include oxidation/reduction agents, complexing agents, or various chemical adsorbents, such as ion exchange resins, activated carbon, and organophilic clays. The most commonly used commercial binders are inorganics such as cement kiln dust, fly ash, and other materials that chemically react with water. These binders are typically used in combination with more specific binders (e.g., silicates, resins) for stabilization.

Most commercial stabilization processes employ a certain amount of solidification to improve the physical characteristics of the waste material. Stabilization processes may use siliceous and aluminosilicate

materials together with lime, cement, gypsum, and other suitable setting agents. The solid formed by this process can vary from a moist, clay-like material to a hard, dry solid, similar in appearance to concrete.

Stabilization may produce particulate and organic air emissions during excavation, mixing, and transport of the waste. The choice of mixing equipment influences the extent to which organic air emissions can be collected and controlled. Tests would be conducted to select the binder formula that would minimize the volatilization of organics. It is expected that the levels of organics that may be released during stabilization would be low and would comply with air emission and health and safety standards. Emissions captured during excavation, mixing, and transport may be treated by conventional air pollution control equipment, such as condensers or absorbers, if necessary to comply with health and safety standards.

Debris and large particles (greater than 2 inches) in the material to be stabilized may adversely affect physical properties of the stabilized product. The presence of oversized objects may result in incomplete mixing and the product may contain areas of unblended material. It is not possible to avoid these potential impacts from oversized particles when stabilization is performed in-situ; however, the mixing efficiency of ex-situ stabilization processes could be enhanced by screening oversized objects from the materials to be treated. If any large particles are screened from the feed, they may be stockpiled and either pulverized to produce a homogeneous feed to the mixer or disposed of.

Effectiveness. Stabilization processes, both in-situ and ex-situ, effectively immobilize metals and other inorganic contaminants similar to those detected at Site 4. The process effectiveness would depend on the contaminant composition of the material and the types of stabilization additives utilized.

Reagent tests would be required to determine the most effective additive mixture to chemically stabilize contaminants in the soils at the site. Soluble silicates such as sodium and potassium silicate are generally more effective stabilizing agents than fly ash and blast furnace slag. Common problems with lime-fly ash and cement-fly ash materials relate to inhibition of cememtitious reactions. Silicates used with lime, cement, or other setting agents may effectively stabilize the metals detected at the site. Proprietary additives may be employed to increase the process effectiveness. Some leaching of contaminants from the stabilized product may occur.

Implementability. Stabilization processes have been widely used and are commercially available. The volume of waste may be increased due to the amount of reagent added. Implementation problems may result at the site if large volumes of contaminated materials require stabilization.

Cost. The relative capital and O&M costs for stabilization are moderate.

Conclusion. Stabilization may be an effective process for immobilizing specific contaminants or classes of contaminants found at Site 4, particularly any heavy metals detected in contaminated soils and buried trench wastes. In the event that heavy metal concentrations require treatment prior to disposal, off-site stabilization will be retained for further consideration. It is not practical to implement in-situ stabilization at the base since the facility is scheduled to be turned over to the community. In addition, there is an insufficient volume of contaminated materials to justify mobilization costs associated with the in-situ process. Off-site stabilization would eliminate long-term leaching problems at the site.

3.4.5 Disposal

3.4.5.1 Landfills

Depending on waste characteristics for Site 4 materials, the contaminated soils and wastes may ultimately be disposed at an off-site landfill. Two general types of off-site landfills are considered:

- Municipal waste landfill
- RCRA-regulated hazardous waste landfill

The main differences between these landfills are the administrative requirements and the degree of leachate control provided. These landfills are described below. Note that a residual waste landfill, as defined by PA Code, Article IX, Chapter 287, would not meet all ARARs because some types of buried wastes at Site 4 are not subject to residual waste regulations, including construction/demolition wastes.

RCRA-Regulated Hazardous Waste Landfill

Hazardous waste landfills are regulated by the landfill and post-closure requirements of RCRA (40 CFR 264, Subparts G and N), the Toxic Substances Control Act, and state and local laws. Among the requirements are foundations, double liner systems, leak detection systems, leachate collection and treatment systems, capping, post-closure inspections and maintenance of the landfill (30-year period), and post-closure groundwater monitoring (30-year period). The liner system, consisting of two layers of synthetic membranes, clay, or other acceptable material that meets permeability and strength requirements, inhibits the migration of leachate from the waste into the groundwater and surrounding soil. The cap system, similar in construction to the liner system, minimizes precipitation percolation, promotes surface water runoff, and controls volatilization of the waste. Volatilization is usually controlled by placing a gas interception system over and/or throughout the waste material to collect the gas and treat it, if necessary. The leachate collection system consists of permeable layers of sand and/or gravel or drainage nets above

the liner layers. The collected leachate may be stored in a tank and periodically treated, by either an on-site treatment system or an off-site, permitted facility.

Municipal Waste Landfill

A municipal waste landfill normally accepts solid waste and general refuse resulting from the construction or demolition of buildings and other structures, including, but not limited to, wood, plaster, metals, asphaltic substances, bricks, block, and unsegregated concrete. These wastes may be generated during remediation of the soil/sediments, if building or roadway demolition is required. Design and operating practices are typically similar to hazardous waste landfills; however, the permitting requirements are not nearly as stringent. These landfills may be used for wastes that are not classified as hazardous but may still significantly contaminate groundwater. Among the design and operating requirements are foundations, liner systems, leak detection systems, leachate collection and treatment systems, capping, post-closure inspection and maintenance of the landfill, and post-closure groundwater monitoring.

Effectiveness. The results of the Site 4 investigations indicate that the levels of soil and waste contamination at Site 4 could be placed directly into a municipal waste landfill. Landfilling alone does not provide a permanent solution for the reduction of volume or contaminant toxicity. The level of organics in the soils is not expected to be high enough to cause liner degradation or mobility concerns. In the event some excavated soils require disposal in a secure hazardous waste landfill, the volume of material is expected to be small.

Implementability. Off-site landfilling is implementable, but on-site landfills are not, given future land use considerations. Off-site landfills would have to be in compliance with an appropriate permit to accept the contaminated materials from Site 4. Off-site facilities are available to receive these materials and accept the volume anticipated from the site. Equipment and resources needed to transport the soils off site are readily available.

Cost. The relative capital costs for landfilling are low to moderate. Off-site disposal in hazardous waste landfills is more expensive than disposal in municipal landfills.

Conclusion. Off-site landfilling in municipal and hazardous waste landfills is effective and implementable for contaminated materials since they are permanently removed from the site. As a result, landfilling is retained for further consideration. Some contaminated materials may be disposed in a Class I residual waste landfill, particularly general refuse and industrial wastewater treatment sludge, if necessary. However, disposal costs are similar for both municipal and residual waste landfills.

3.4.5.2 Consolidation

Consolidation is an option in which untreated soils and wastes are relocated in the same area of contamination from which they were excavated.

Effectiveness. Consolidation of the soils and wastes would be considered if the risks associated with these materials are addressed by other actions (e.g., capping). The consolidation would occur within the same area of contamination and would likely take place in or near the original excavation location. Consolidation in combination with capping is effective when the placement of the waste reduces the potential for material migration or release. Consolidation and capping is an effective technique to reduce an exposure pathway for human contact and migration. This technique does not reduce volume or toxicity of the contaminant.

Implementability. No permits are required for consolidation, and items such as availability of RCRA facilities are not applicable. The consolidation would be conducted using readily available construction equipment.

Consolidation and capping may be constrained by existing natural and man-made features of Site 4. The size of Site 4 favors stockpiling any materials that may be characterized as RCRA hazardous waste. However, consolidation and capping would hinder unrestricted land use in the vicinity of the site.

Cost. The relative capital costs for consolidation are minimal compared to landfilling.

Conclusion. Consolidation by itself is not feasible as a stand-alone removal action alternative. This approach does not provide for long-term reduction of volume or toxicity of the contamination and might not be implementable due to existing site constraints regarding future land use. However, consolidation in combination with containment through capping offers a reliable option. Since the single synthetic cap has been retained (Section 3.4.3) for further consideration, consolidation by itself is eliminated.

3.5 SITE 4 REMOVAL ACTION ALTERNATIVES

Removal action alternatives are derived from those technology/process options that are considered viable based on the initial screening above. The following removal action alternatives are further evaluated below:

- Institutional controls (Alternative 1)
- Bulk excavation, off-site landfilling (Alternative 2)
- Single synthetic cap (Alternative 3)

3.5.1 Alternative 1: Institutional Controls

This alternative would involve deed restrictions on access to and uses of contaminated areas at Site 4, including excavation work. Restrictions on land development would be likely to reduce contact with any contaminated materials on a temporary or long-term basis. Groundwater monitoring would continue to be conducted as part of the OU-3 remedy to evaluate long-term groundwater quality and to ensure that plume concentrations would not threaten drinking water wells near the site. In addition, monitoring would help determine if contaminant concentrations at Site 4 are impacting groundwater quality.

Neighborhood communities would be kept up to date about activities at Site 4 through public meetings, press releases, and fact sheets. The groundwater monitoring program would use selected wells from the monitoring network in the vicinity of the site.

Effectiveness. Institutional controls can be effective in reducing exposure to contaminants of concern, but the volume and toxicity of the contaminants would not be reduced and the migration of contaminants to other media would not be impeded. Institutional controls are also dependent on the ability of the overseeing agency to ensure compliance with the formulated deed restrictions. Institutional controls would not meet ARARs for contaminated soils and buried materials.

Groundwater monitoring would be used to determine the trends in the nature and extent of contamination near the site but would not reduce the concentrations in groundwater. Monitoring would not provide any additional protection of the environment. Monitoring would allow establishment of a trend in contaminant levels to evaluate whether contaminant levels are increasing, decreasing, or stable.

Many monitoring wells already exist on and downgradient of the site, and the principal costs would be sampling and analyses costs. Monitoring costs would depend on the number of wells to be monitored, the sampling frequency, and the analytical parameters.

Implementability. Designation of a regulatory agency for oversight would be required. Legal involvement would be needed for deed preparation and coordination with the court.

Groundwater monitoring could be easily implemented because monitoring wells already exist and additional wells could be readily installed.

Deed restrictions may interfere with future recreational activities or land uses that are planned by FLRA-BC at Site 4 or may interfere with timely transfer of the property from the Navy to the community.

Cost. The estimated present-worth cost to implement this alternative is $282,000 (Appendix D). For cost purposes, a total of six monitoring wells near Site 4 would be sampled on a semi-annual basis for 15 years. Well water samples would be analyzed for full TCL organics and TAL metals (both total and dissolved). Appropriate quality assurance/quality control (QA/QC) samples would also be collected and analyzed.

3.5.2 Alternative 2: Bulk Excavation, Off-Site Landfilling

This alternative involves the bulk excavation of contaminated soils and wastes at Site 4. Alternative 2 would apply to all buried materials containing contaminant concentrations greater than the removal action goals. The soils and wastes would be loaded into licensed/permitted trucks and transported to a municipal waste landfill. The area excavated would be backfilled with clean soil, contoured to the pre-construction grade, and revegetated.

For this alternative, the cover soil in the vicinity of the buried trenches would be delineated for excavation. Excavation activities would be carried out following the procedures and monitoring requirements of a site-specific health and safety plan. Once the surrounding top soil layer has been excavated, the buried soils and wastes would be removed from the ground in accordance with the monitoring and handling guidelines of the site safety plan. The cover material from each trench would be stockpiled at an unlined staging area or to one side of the trench and reused as cover or fill material. This material would be subject to confirmation sampling at a frequency in accordance with the removal action work plan. Cover material that does not meet the removal action clean-up goals would be disposed at a municipal waste landfill.

The buried soils and wastes within each trench would be characterized through sampling. They would then be sorted based on field observations, field instrument readings, and analytical results. The contents of the trench would be analyzed for appropriate parameters (e.g., TCL organics, TAL metals, TCLP) as necessary. Soils adjacent to each trench that appear to be stained or that contain unacceptable contaminant concentrations would also be excavated, characterized, and disposed, if necessary. Excavated wastes would be conveyed to a designated staging area (or areas) and stockpiled on polyethylene liner(s). The liner itself would be covered by at least 1 foot of clean fill. A reinforced plastic sheet would be placed over the excavated wastes as a cover for staged materials. Adequate vapor suppressant foam or water spray and polyethylene sheeting would be used to control VOCs and dust to the level established by the local air quality management agency.

Once the excavated wastes are removed from a trench, the trench would be backfilled using the clean cover soil from the top of each trench as available. Confirmation sampling would be conducted to assure removal action goals are met. The frequency of this sampling, as well as the parameters to be tested for, would be developed during the removal design work. Additional clean fill would be obtained from other construction activities at the base (e.g., OU-1 and OU-3 remedial actions) or from off-base sources.

Based on the sampling results, the excavated wastes would be sent to the established truck loading area. A truck decontamination pad would be required for this operation. The excavated wastes would be transported off site and disposed at an appropriate off-site municipal waste landfill, in compliance with the CERCLA Off-Site Policy and other state regulations. Under this removal action alternative, the excavated wastes would generally not be treated.

In the event some wastes could not be disposed in a municipal waste landfill due to waste characteristics, these wastes would be sent to a hazardous waste landfill or treated using appropriate technology prior to disposal. For organic contaminants, incineration would be the most likely option for treatment; for inorganics, stabilization would be the preferred option.

Alternative 2 assumes that contaminated soils and wastes at Site 4 are not identified as a RCRA hazardous waste through TCLP testing to determine toxicity. If any materials contain spent halogenated solvents at concentrations of 10 percent or more by volume, they are classified as a listed hazardous waste under EPA Hazardous Waste Categories F001 or F002. It is assumed that these materials would be transported off site and then disposed at Chemical Waste Management's hazardous waste landfill located in Model City, New York, approximately 300 miles from the site. Given the high cost of incineration, it is more cost effective to transport RCRA hazardous waste to an appropriate permitted facility than to treat this waste.

Alternative 2 further assumes that non-hazardous contaminated soils and wastes will be transported off site and disposed of at a nearby municipal waste landfill. Several municipal waste landfills are located within 100 miles of the site, one of these being Tullytown Resource Recovery Landfill, Tullytown, Pennsylvania, approximately 25 miles from the site. Some non-hazardous materials could be transported to a residual waste landfill.

Effectiveness. This alternative would effectively eliminate the risks presented by the contamination at Site 4. Sampling of the soils remaining after excavation would provide clear validation that site clean-up goals have been met. Disposal of contaminated soils and wastes in a landfill operating in compliance with all applicable permits affords sufficient protection to public health and the environment. This alternative does not result in the reduction of volume or toxicity of the contaminated soils or wastes.

Implementability. This alternative is highly implementable. Bulk excavation and transportation employ commonly available equipment, and there are permitted landfills with capacity to accept the volumes of contaminated soils and wastes anticipated at Site 4. Respiratory protection might be required to protect workers from airborne contaminants during excavation.

The topography and location of the site would not indicate the need for major site preparation. Standard erosion and sediment control measures would be required. Residual waste from equipment decontamination would be collected and sent off site for treatment and disposal.

There are no significant administrative issues associated with implementing this alternative.

Cost. The estimated cost to implement this alternative for 12,800 tons of contaminated materials is $1,218,832 (Appendix D). This cost assumes that all contaminated material will be sent to a municipal waste landfill or an appropriate residual waste landfill. In addition, it is assumed that the existing topsoil overlying each trench will also be disposed of, although additional sampling and analysis may refute this assumption.

3.5.3 Alternative 3: Single Synthetic Cap

This alternative involves the installation of a single synthetic barrier cap over contaminated soils and wastes within the eight trenches at Site 4 to restrict access and reduce infiltration of precipitation into these materials. A single synthetic cap would be installed as opposed to a multi-layered cap since their effectiveness is similar. The cap would use a 40-millimeter synthetic liner and natural soils to construct a barrier over the Site 4 trenches and the surrounding area of the trenches. The soil layers would consist of 2 feet of top soil and clean fill. The synthetic liner would be sandwiched by a top and bottom layer of geotextile material. The cap would cover the entire Site 4 area, which is approximately 4 acres.

Groundwater monitoring will continue to be conducted to evaluate long-term groundwater quality and to ensure that any buried soils and wastes would not threaten additional drinking water wells near the site. The groundwater monitoring program would use selected wells from the existing monitoring network in the vicinity of the site.

Surface grading would be used in conjunction with capping and vegetation to reshape the land surface, minimize erosion and infiltration through marshy areas at the site, reduce runoff velocities, and roughen and loosen soils in preparation for vegetation. The topography and existing slope of Site 4 favor minimal slope grading. Grading to a slope of about 2 percent would be needed. Other measures (e.g., bales of hay, sediment control fences) would be carried out as needed to reduce erosion and infiltration.

Effectiveness. Capping combined with surface controls and monitoring would effectively reduce risk to human health by providing a barrier between waste and contaminated soils and potential receptors, thus significantly limiting fugitive dust emissions and dermal contact with contaminated soils. Capping would not address existing contamination and would not reduce the volume or toxicity of the contamination. During capping and grading operations, fugitive dust emissions would have to be controlled to minimize effects on human health and the environment. The cap would be effective in limiting the vertical infiltration

of water into the site. The thickness of the soil layers would also help to prevent punctures and tears. In conjunction with long-term groundwater monitoring, capping offers a reliable option for addressing contaminated materials at Site 4.

Site capping and grading would require procurement of a subcontractor(s). Groundwater monitoring would be part of OU-3, readily implementable, and would be performed in accordance with a site-specific health and safety plan to limit on-site worker exposure to any potential contaminants at the site. Designation of a regulatory agency for oversight would also be required.

Groundwater monitoring would not reduce the volume and toxicity of the contaminants and the possible migration of contaminants to other media would not be impeded. The effectiveness of this institutional control would be dependent on the ability of the overseeing agency to ensure compliance. Monitoring would not meet ARARs for contaminated soils and buried materials.

Implementability. This type of cap is easier to construct than a multi-layered cap. Seaming is an important consideration when installing synthetic membranes. The topography at Site 4 makes capping technically feasible. A variety of proven construction methods and materials is available, including native soils and synthetic membranes. Some earthwork would be required to achieve proper slopes for surface water runoff control. Construction methods involved in capping can be conducted by many contractors.

Capping at Site 4 may interfere with future structures and activities that are planned by FLRA-BC at Site 4 or may interfere with timely transfer of the property from the Navy to the community. Surface water runoff from the cap would be subject to PADER requirements. Other administrative requirements include the need for erosion and sediment control plans prior to construction. Deed restrictions may be required in conjunction with capping in order to limit the future usage of the capped area. A single synthetic cap is readily implementable.

Cost. The present-worth cost for a single synthetic cap is estimated to be $1,424,000. The capital cost for groundwater monitoring is estimated to be $0 because new monitoring wells would not be installed. Annual costs ($26,000) for groundwater monitoring would be dependent upon the number and frequency of sampling events; it is assumed that six wells would be sampled on a semi-annual basis for 15 years and that well water samples would be analyzed for full TCL organics and TAL metals. The estimated capital cost for constructing a cap over approximately 4 acres would be $1,118,827. The present-worth O&M costs for maintenance of the cap would be $307,000 over a 15-year period. A detailed breakdown of costs is presented in Appendix D.

4.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

4.1 INTRODUCTION

This section describes the relative merits of the removal action alternatives for Site 4. The relative performance of each alternative is presented in relation to the three evaluation criteria: effectiveness, implementability, and cost. The purpose of this comparison is to highlight the differences in the alternatives in order to support the selection of a preferred alternative.

4.2 COMPARISON OF SITE 4 ALTERNATIVES

Three alternatives are under consideration for the removal of an estimated 12,800 tons of contaminated soils and wastes at Site 4:

- Alternative 1: Institutional controls
- Alternative 2: Bulk excavation, off-site landfilling
- Alternative 3: Single synthetic cap

4.2.1 Effectiveness

Institutional controls can be effective in reducing the potential exposure of humans to the contaminants, but the volume and toxicity of the contaminants would not be reduced and the possible migration of contaminants to groundwater and surface water would not be impeded. The effectiveness of these controls would be dependent on the ability of the overseeing agency to ensure compliance. Institutional controls would not meet ARARs or TBCs for contaminated media, including those pertaining to the existing Site 4 landfill (e.g., PA Code, Article IX, Chapter 287).

Landfilling does not achieve any reduction of waste volume or toxicity; landfilling merely provides controls to prevent public and environmental exposure to the contaminants. Each alternative has varying effectiveness in meeting the clean-up goals necessary to protect public health and the environment. Adequate controls and methods are available to limit public and worker exposure during excavation, transportation, and handling of the wastes. Alternative 2 would be able to meet the requirements of all ARARs, but the other alternatives would not.

Capping combined with surface controls and monitoring would effectively reduce risks to human health and the environment by providing a barrier between contaminated materials and potential receptors, thus significantly limiting fugitive dust emissions and dermal contact with contaminated soils. Capping would not address existing contamination and would not reduce the volume or toxicity of the contamination.

4.2.2 Implementability

Each alternative is technically feasible. Availability of contractors and equipment for excavation and transportation is sufficient for the volumes anticipated. There are also sufficient municipal waste landfills with capacity to accept the waste. Verification that these facilities are operating in compliance with their permits is required prior to shipment of wastes. Landfills that are not in compliance with their permits cannot be considered.

The small areal extent of contaminated materials estimated at Site 4 makes capping technically feasible. Construction methods involved in capping can be conducted by many contractors. However, capping at Site 4 may interfere with future land re-use planning and with timely transfer of the property from the Navy to the community. Deed restrictions (e.g., no digging at Site 4) may be required in order to limit the future usage of the area.

4.2.3 Cost

Cost estimates for the three alternatives are as follows:

- Institutional controls $282,000
- Bulk excavation, off-site landfilling $1,218,832
- Single synthetic cap $1,424,000

The primary cost of Alternatives 2 and 3 is in direct capital costs. There are no O&M costs associated with the landfill alternative.

The capital cost for a single synthetic cap is high. The capital cost for groundwater monitoring is estimated to be $0 because new monitoring wells would not be installed. Costs for groundwater monitoring would be dependent upon the number and frequency of sampling events. The total annual cost for groundwater monitoring under Alternatives 1 and 3 is estimated to be $26,000.

5.0 RECOMMENDED ACTION

Excavation and off-site landfilling without treatment at a municipal waste landfill are recommended by the Navy. Landfilling is a cost-effective alternative for addressing the buried soils and wastes at Site 4. Municipal waste landfills are engineered landfills that provide controls for protecting human health and the environment.

Appendix F provides a draft action memorandum for the recommended removal action.

6.0 COMMUNITY RELATIONS

6.1 INTRODUCTION

Public participation is an important part of the IR Program at NAWC Warminster. This section describes the community involvement activities that NAWC Warminster will conduct to inform residents about removal action activities and provide opportunities for residents to take part in the decision-making process.

IRP activities conform to the same federal and state laws, regulations, and guidelines developed for the federal Superfund program. The Superfund Amendments and Reauthorization Act of 1986 (SARA) requires that IR Programs implemented at federal facilities meet Superfund requirements.

The activities described in the following sections were developed to meet information needs expressed by residents during interviews conducted for the Community Relations Plan and to fulfill community involvement requirements of the NCP and SARA. A revised Community Relations Plan (HNUS, 1994c) for NAWC Warminster environmental restoration activities was prepared in March 1994 and is available for review from the two public information repositories (see Section 6.3).

6.2 POINT-OF-CONTACT

The Base Commander has designated David Polish as the primary contact person for general inquiries at NAWC Warminster concerning environmental restoration activities. Mr. Polish will be identified in news releases, public notices, and material placed in the Administrative Record. All requests for information will be referred to him. He can be reached at (215) 441-3067.

6.3 PUBLIC INFORMATION REPOSITORIES

Two information repositories are maintained near the base:

- NAWC Warminster Environmental Programs Office
  Jacksonville Road (Building 3)
  Warminster, Pennsylvania 18974
  (215) 441-7118
  Hours: Monday - Friday, 9 a.m - 4 p.m.

- Bucks County Library
  150 South Pine Street
  Doylestown, Pennsylvania 18901
  (215) 348-9081
  Hours: Monday - Thursday, 9 a.m - 9 p.m.
  Friday, 9 a.m. - 6 p.m.
  Saturday, 9 a.m. - 5 p.m.

The information repositories contain general IR information, final technical reports, and community relations materials pertaining to environmental activities at NAWC Warminster. They are updated as necessary with the most current information about site activities. Both repositories contain the same file documents.

6.4 ADMINISTRATIVE RECORD

The Administrative Record is a file of documents, letters, and other correspondence that form the basis of official decisions made during the IRP. This file is available for public review at both information repositories. Citizens can review the Administrative Record documents at the Bucks County Library or at the base. Any citizen wishing to view the Administrative Record at the base should contact Frank Kurdziel, Environmental Programs Office, Monday through Friday at (215) 441-7118.

6.5 PUBLIC COMMENT PERIOD

A 30-day public comment period will be conducted upon completion of the EE/CA for Site 4 to enable citizens to review and comment on the proposed plan of action. The document will be available at the information repositories. Comments may be written and mailed to

Mr. David Polish
NAWC Warminster (Code 041)
Jacksonville Road
Warminster, Pennsylvania 18974-5000

6.6 PUBLIC NOTICES

At the completion of the EE/CA, a public notice and a display advertisement in local newspapers will announce the proposed removal action alternative, dates of the public comment period, addresses of the information repositories where copies can be reviewed, and the address where comments can be submitted. A telephone number and address of the public affairs point-of-contact also will be provided.

6.7 PUBLIC MEETING

Public comments will be received by the NAWC Warminster Public Affairs Office and reviewed by the Navy environmental officials. During the public comment period for the EE/CA, a meeting with the general public may be held to inform citizens of project status and to solicit questions, comments, and suggestions. The Public Affairs Office will determine if such a meeting is needed based on the number of comments and the level of community interest. The public meeting will be held at a convenient location, such as a local school or township office, where the proposed Site 4 removal action plan will be discussed. A court reporter will make a verbatim transcript of the public meeting proceedings. The transcript will be made available for public review. If a public meeting will be held, it will be advertised in the Intelligencer, Bucks County Courier Times, and Philadelphia Inquirer.

6.8 RESPONSIVENESS SUMMARY

NAWC Warminster will prepare a summary of the written and oral comments made during the comment period and public meeting and of the responses to those comments. This Responsiveness Summary will be issued by the Navy as an attachment to the Action Memorandum. The Action Memorandum will document the need for a removal action, identify the selected removal action alternative, and explain the rationale for the removal.

The Responsiveness Summary will discuss how the public's comments, suggestions, and questions were considered by the Navy in selecting the removal action alternative. If public input results in significant changes to the proposed plan of action, a second public comment period may be conducted.

6.9 PUBLIC BRIEFINGS

The Navy may, as needed, conduct public briefings to discuss environmental activities at the base and proposed response action plans. Public briefings will provide community leaders and other interested citizens with an opportunity to meet in an informal atmosphere to obtain up-to-date information about response action activities at the base. In addition, other briefings may be held in nearby communities for meetings with homeowners' associations, Chambers of Commerce, environmental organizations, and other community organizations.

6.10 FACT SHEETS

As necessary, fact sheets will be prepared before the public comment period and when the removal action design plan is completed. The fact sheets will provide a brief summary of progress and activities of the

IR Program. Fact sheets will be filed in the Administrative Record documents and distributed to residents and other interested parties on the NAWC Warminster mailing list.

6.11 MAILING LIST

NAWC Warminster keeps a mailing list of names and addresses of individuals interested in receiving information about IR Program activities at the base. The list has been compiled with input from the Base Public Affairs office; federal, state, and local regulators, and local elected and appointed officials. In accordance with the Federal Privacy Act, addresses of private citizens will be maintained at NAWC Warminster and will be kept confidential.

REFERENCES

1. EA Engineering, Science, and Technology, Incorporated, 1995. Base-Wide Environmental Baseline Survey for NAWC Warminster, Aircraft Division, Warminster, Pennsylvania. Berkely Heights, New Jersey.

2. Economics Research Associates, et al., 1995. Reuse Plan Technical Report for NAWC Warminster, Bucks County, Pennsylvania. Chicago, Illinois.

3. Environmental Photographic Interpretation Center, 1994. Aerial Photographic Site Analysis, NAWC Warminster, Pennsylvania. Warrenton, Virginia.

4. Environmental Photographic Interpretation Center, 1995. Aerial Photographic Support, NAWC Warminster, Pennsylvania. Warrenton, Virginia.

5. Halliburton NUS Corporation, 1992. Draft Phase II Remedial Investigation Report for NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

6. Halliburton NUS Corporation, 1993. Phase II Remedial Investigation Report for Operable Unit 1, NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

7. Halliburton NUS Corporation, 1994a. Remedial Investigation Report for Operable Unit 3, NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

8. Halliburton NUS Corporation, 1994b. Draft Wetlands Assessment for NAWC Warminster, Pennsylvania. Pittsburgh, Pennsylvania.

9. Halliburton NUS Corporation, 1994c. Revised Community Relations Plan for NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

10. Halliburton NUS Corporation, 1995a. Phase III Remedial Investigation Work Plan for NAWC Warminster, Pennsylvania, Quality Assurance Project Plan. Wayne, Pennsylvania.

11. Halliburton NUS Corporation, 1995b. Revised Field Sampling Plan for Site 4 Engineering Evaluation/Cost Analysis (EE/CA) for NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

12. Halliburton NUS Corporation, 1995c. Draft Summary Report for First Round of Perimeter Monitoring for NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

13. Halliburton NUS Corporation, 1995d. Draft Summary Report for Second Round of Perimeter Monitoring for NAWC Warminster, Pennsylvania. Wayne, Pennsylvania.

14. JRB Associates, 1981. Hydrogeologic Investigation of the Naval Air Development Center Waste Disposal Sites, Warminster, Pennsylvania; Task 1 - Records Search, Preliminary Site Investigation, and Recommendations for Task 2. McLean, Virginia.

15. Pennsylvania Department of Environmental Resources, 1993. Cleanup Standards for Contaminated Soils. Harrisburg, Pennsylvania.

16. Pennsylvania Department of Environmental Protection, 1995. Technical Manual - Land Recycling Program. Harrisburg, Pennsylvania.

17. SMC Environmental Services Group, 1991. Stages I and II - Rough Draft Remedial Investigation Report for NADC Warminster, Pennsylvania. Valley Forge, Pennsylvania.

18. U.S. Environmental Protection Agency, 1990. Superfund Removal Procedures: Action Memorandum Guidance. EPA/540/P-90/004. Washington, D.C.

19. U.S. Environmental Protection Agency, Region III, 1993a. Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening. EPA/903/R-93-001. Philadelphia, Pennsylvania.

20. U.S. Environmental Protection Agency, 1993b. Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA. EPA/540/R-93/057. Washington, D.C.

21. U.S. Environmental Protection Agency, 1994. Soil Screening Guidance. EPA/540/R-94/101. Washington, DC.

22. U.S. Environmental Protection Agency, Region III, 1995. Risk-Based Concentration Table, January - June 1995. Philadelphia, Pennsylvania.

APPENDIX A

SITE 4
TEST PIT LOGS

TABLE A-1
SITE 4 TEST PIT/SUBSURFACE SOIL SAMPLING SUMMARY
NAWC WARMINSTER

TEST PIT NUMBER	SAMPLE NUMBER	SIDEWALL OR BUCKET/DEPTH	ANALYSIS
4-TP-07	W-SB-04-01	Bucket/3.5'	TCL VOC, TCL SVOC, TAL metals, cyanide, TCL pesticides, and PCBs
4-TP-07	W-SB-04-02	Sidewall/3.5'	"
4-TP-13	W-SB-04-03	Bucket/3.0'	"
4-TP-13	W-SB-04-04	Sidewall/5.0'	"
4-TP-12	W-SB-04-05	Bucket/3.0'	"
4-TP-12	W-SB-04-06	Sidewall/3.0'	"
4-TP-12	W-SB-04-30	Sidewall/3.0'	Blind duplicate of W-SB-04-06
4-TP-12	W-SB-04-31	Bucket/3.0'	Blind duplicate of W-SB-04-05
4-TP-02	W-SB-04-07	Bucket/3.0'	TCL VOC, TCL SVOC, TAL metals, cyanide, TCL pesticides, and PCBs
4-TP-02	W-SB-04-08	Sidewall/3.5' to 4.0'	"
4-TP-05	W-SB-04-09	Bucket/4.0'	"
4-TP-05	W-SB-04-10	Sidewall/4.5'	"
4-TP-17	W-SB-04-11	Bucket/3.5'	"
4-TP-17	W-SB-04-12	Sidewall/3.5'	"
4-TP-20	W-SB-04-13	Bucket/3.5' to 4.0'	MS/MSD
4-TP-20	W-SB-04-14	Sidewall/3.5'	TCL VOC, TCL SVOC, TAL metals, cyanide, TCL pesticides, and PCBs
4-TP-23	W-SB-04-15	Bucket/2.5' to 30'	"
4-TP-23	W-SB-04-16	Sidewall/2.5' to 3.0'	"

TABLE A-1 (continued)
SITE 4 TEST PIT/SUBSURFACE SOIL SAMPLING SUMMARY
NAWC WARMINSTER
PAGE 2 OF 2

TEST PIT NUMBER	SAMPLE NUMBER	SIDEWALL OR BUCKET/DEPTH	ANALYSIS
4-TP-BG-01	W-SB-04-17	Bucket/3.0'	TCL VOC, TCL SVOC, TAL metals, cyanide, TCL pesticides, and PCBs
4-TP-BG-01	W-SB-04-18	Sidewall/3.0'	"
4-TP-BG-02	W-SB-04-19	Bucket/2.5 to 3.0'	"
4-TP-BG-02	W-SB-04-20	Sidewall/2.5' to 3.0'	"
4-TP-BG-03	W-SB-04-21	Bucket/3.5'	"
4-TP-BG-03	W-SB-04-22	Sidewall/3.5' to 4.0'	"
4-TP-26	W-SB-04-23	Bucket/3.5' to 4.0'	"
4-TP-26	W-SB-04-24	Sidewall/3.5' to 4.0'	"
4-TP-26	W-SB-04-32	Sidewall/3.5' to 40'	Blind duplicate of W-SB-04-24

APPENDIX B

SITE 4
GEOPHYSICAL SURVEY RESULTS

Halliburton NUS
CORPORATION

993 Old Eagle School Road, Suite 415
Wayne, PA 19087-1710

(610) 971-0900
FAX: (610) 971-9715

HNPH/51-3-5-34

March 13, 1995

Project Number 1412

Mr. Lonnie Monaco
Naval Facilities Engineering Command (NAVFACENGCOM)
Northern Division
Environmental Contracts Branch, Mail Stop No. 82
10 Industrial Highway
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order (CTO) No. 159

Subject: Preliminary Geophysical Survey Results for Site 4
Phase III Remedial Investigation/Feasibility Study (RI/FS)
Naval Air Warfare Center (NAWC) Warminster, Pennsylvania

Dear Mr. Monaco:

This letter updates the status of Halliburton NUS Corporation (HNUS) efforts with regard to geophysical survey work for Site 4 at NAWC Warminster. The scope of the geophysical survey for Site 4 was intended to help focus subsequent soil gas survey and test pit excavation work in this area. HNUS has performed a technical evaluation of the Site 4 geophysical survey results to meet this objective. The enclosures highlight our significant geophysical survey findings. A more detailed evaluation will be provided in the draft Site 4 engineering evaluation/cost analysis (EE/CA) report scheduled for submittal later this year.

The survey for Site 4 was laid out and performed as specified in the field sampling plan for the Site 4 EE/CA dated January 18, 1995. The survey also included additional/expanded profile lines as requested by the United States Environmental Protection Agency (EPA) in a facsimile received by the Navy on February 28, 1995. HNUS added one additional north-south profile line at the eastern end of Site 4 and two additional east-west profile lines to improve the coverage of all potential anomalies.

Preliminary geophysical survey results for Site 4 are contained in Enclosure 1. A map showing the layout and results of the EM survey, and plots of the individual profile lines with labeled anomalies are contained in Enclosure 2.

Copies of this letter and the enclosures are being provided to NAWC Warminster and EPA officials. Please contact Jeff Orient or me if you have any questions or comments.

Sincerely,

Neil Teamerson

Neil Teamerson
Assistant Project Manager

ANT/vb

Attachment

c: Raymond Mannella (NAVFACENGCOM)
Thomas Ames (NAWC Warminster)
Darius Ostrauskas (EPA Region III)
Jeffrey Orient (Halliburton NUS)
Michael Turco (Halliburton NUS)

PRELIMINARY GEOPHYSICAL SURVEY RESULTS FOR SITE 4

Sources of Cultural Interference

- A subsurface electric line was detected in the southern corner of the Site 4 survey area. This electric line is depicted on NAWC Warminster utility maps, and one surface indication was observed to pinpoint the line's location. This line does not interfere with the delineation of potential Site 4 trench locations.

- A suspected subsurface utility line occurs in the southern corner of the Site 4 survey area approximately parallel and 60 to 80 feet north of the subsurface electric line. This suspected line is not shown on NAWC Warminster utility maps. The EM signature and feature orientation are consistent with a buried utility line source. The suspected line does not interfere with the delineation of potential Site 4 trench locations.

- A reinforced concrete pipeline runs north-south across the eastern corner of the Site 4 survey area a few feet below the ground surface. This line is shown on NAWC Warminster utility maps. The line's location is evident from field observations.

- A suspected subsurface utility line runs along the southern edge of the Patrol Road across the entire survey area. This line is not shown on NAWC Warminster utility maps. The EM signature and feature orientation are consistent with a buried utility line source. This feature strongly interferes with the delineation of the eastern end of several of the suspected Site 4 trench locations.

- The base perimeter fence runs parallel to and 20 to 25 feet north of the Patrol Road across the entire survey area. Interference from the fence precludes establishing background conditions north of the Patrol Road.

- A steel stormwater drainage culvert beneath the Patrol Road acts as a source of interference along the northernmost portion of north-south profile line 00.

Results and Findings

- Field observations indicate the presence of 8 buried trenches. The most common indications are surface depressions occurring in linear patterns along the suspected trench areas. The locations of the suspected trenches are as marked by EM axial profile lines SD-0 through SD-7 (SD = surface depression).

- Construction debris (e.g., reinforced concrete and roofing material) are exposed at several locations along SD-0 (aerial photo feature TR10 from the EPIC analysis).

- Subtle variations in vegetative cover also correspond with the suspected trench locations.

- Ponded water with an oily sheen was observed at one surface depression location along SD-1.

- EM anomalies (quadrature, inphase, or both) are observed more than 80 percent of the time where north-south profile lines cross a suspected trench location based on field observations (map, Enclosure 2).

- The western ends of all suspected Site 4 trenches are clearly indicated by southeast-northwest profile lines.

PRELIMINARY GEOPHYSICAL SURVEY RESULTS FOR SITE 4

Results and Findings (continued)

- The eastern ends of suspected Site 4 trenches are clearly indicated on only two southeast-northwest profile lines, SD-0 and SD-1.
- Suspected trench locations typically have lower terrain conductivity values than surrounding materials; the in-phase readings may be lower or higher than the surrounding materials.
- The trench fill materials are heterogeneous and highly variable; these findings are supported most clearly along the axial profile lines.
- Significant accumulations of metallic objects were indicated at several locations, most notably along SD-0 and SD-1.
- The eastern ends of suspected trenches along SD-2 through SD-7 are obscured by interference from a buried utility along Patrol Road (or other unknown sources of interference).
- The results of the EM survey could not be used to determine if suspected trenches extend beneath Patrol Road.
- No major anomalies were identified that are not related to suspected or known utilities or to suspected trench locations.
- There is a strong backgroud geologic terrain conductivity gradient from lower to higher values, south to north, in the western portion of Site 4.

Recommendations

(1) HNUS should contact NAWC Warminster representatives to determine the nature of suspected utilities not shown on available maps, but noted during the Site 4 geophysical survey.

(2) The Navy should consider additional north-south profiles based on 25-foot spacing in the northern portion of the Site 4 survey area, profile numbers 225 to 625, to help delineate the eastern ends of suspected trenches in this area (SD-2 through SD-7).

(3) No further EM survey work other than Recommendation 2 is required in the vicinity of Site 4.

(4) The soil gas survey area should cover the probable trench areas identified by the EM survey.

ENCLOSURE 2

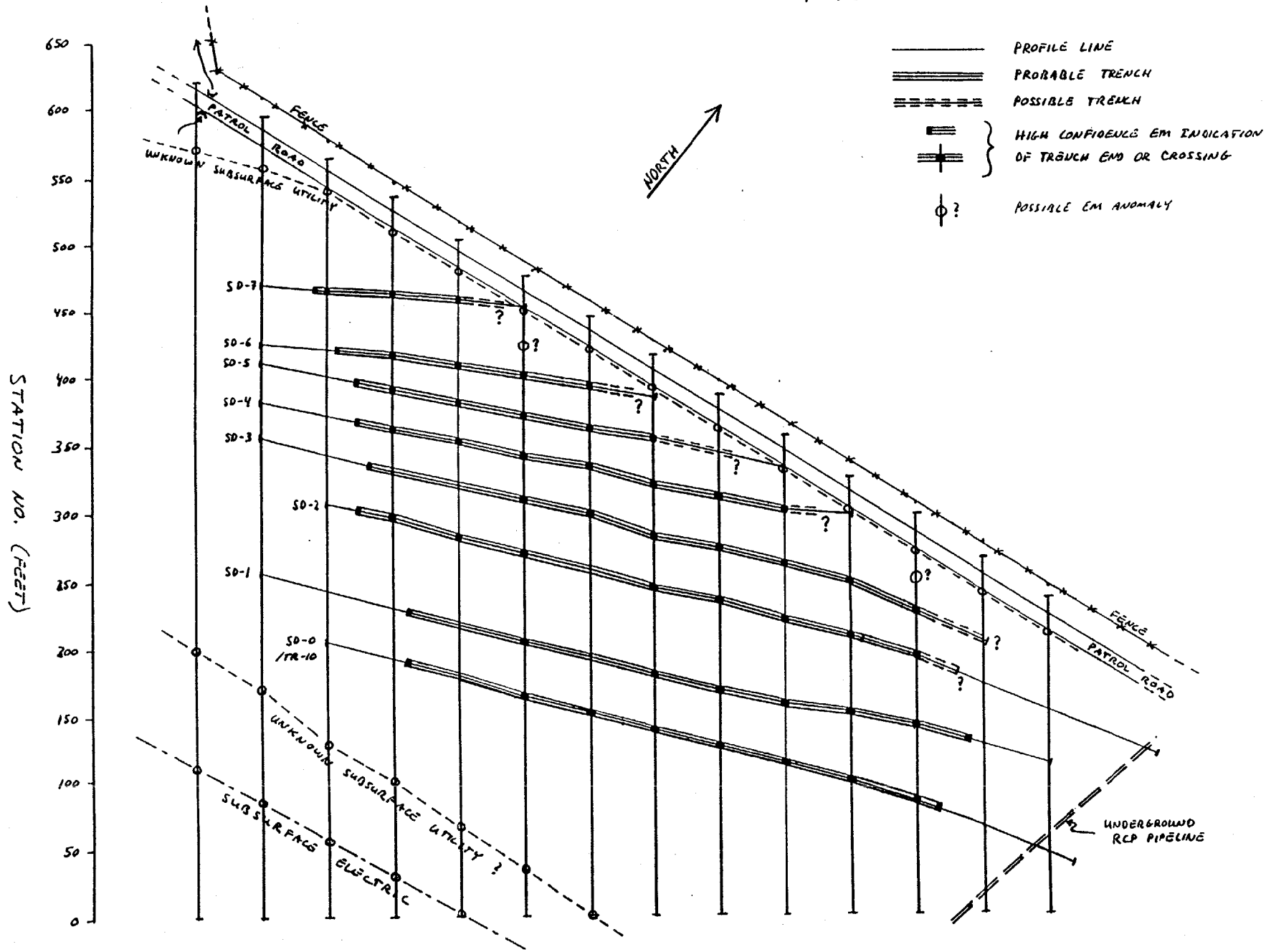
PRELIMINARY GEOPHYSICAL SURVEY RESULTS FOR SITE 4

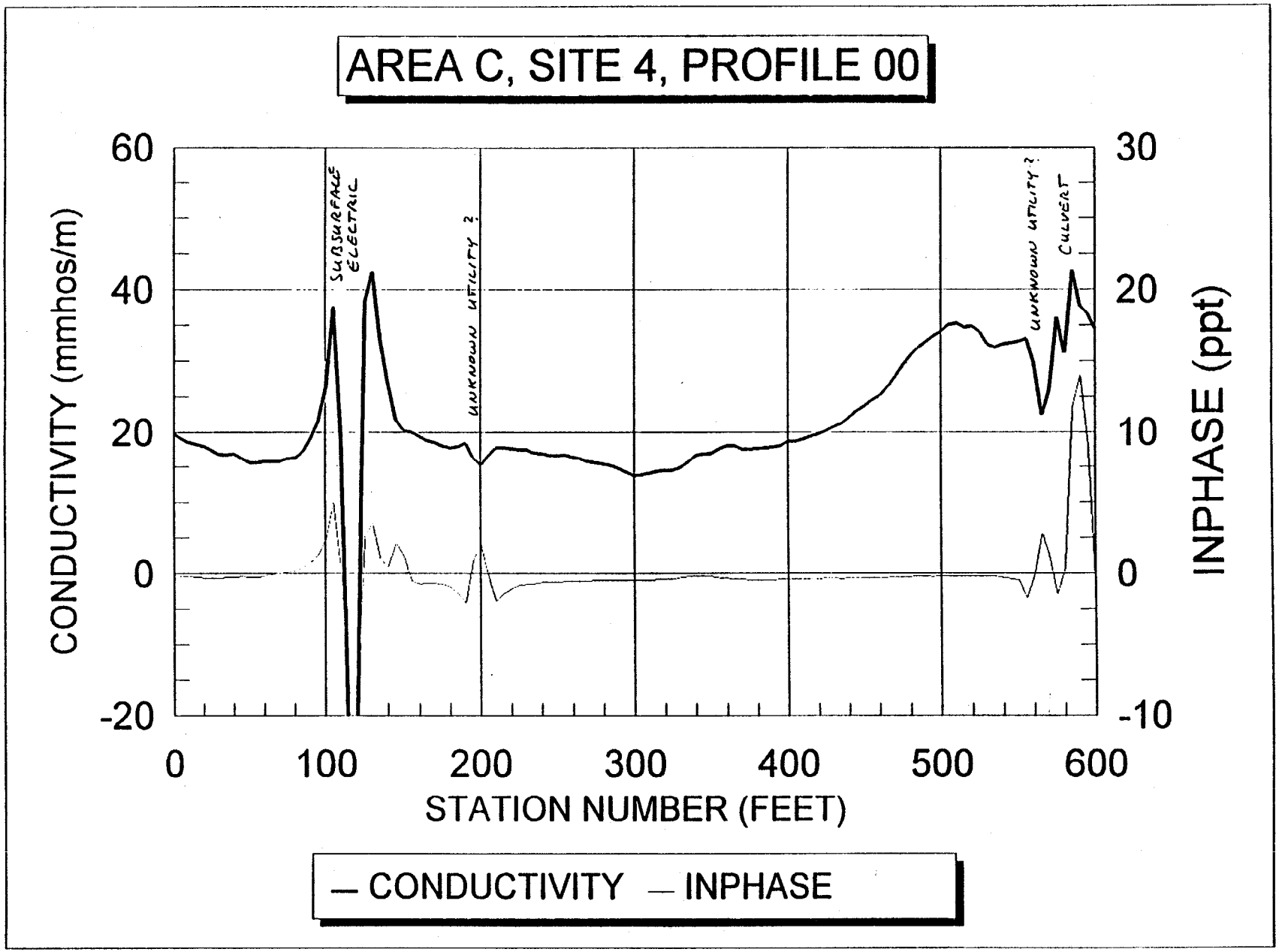
MAP AND PROFILE LINE PLOTS

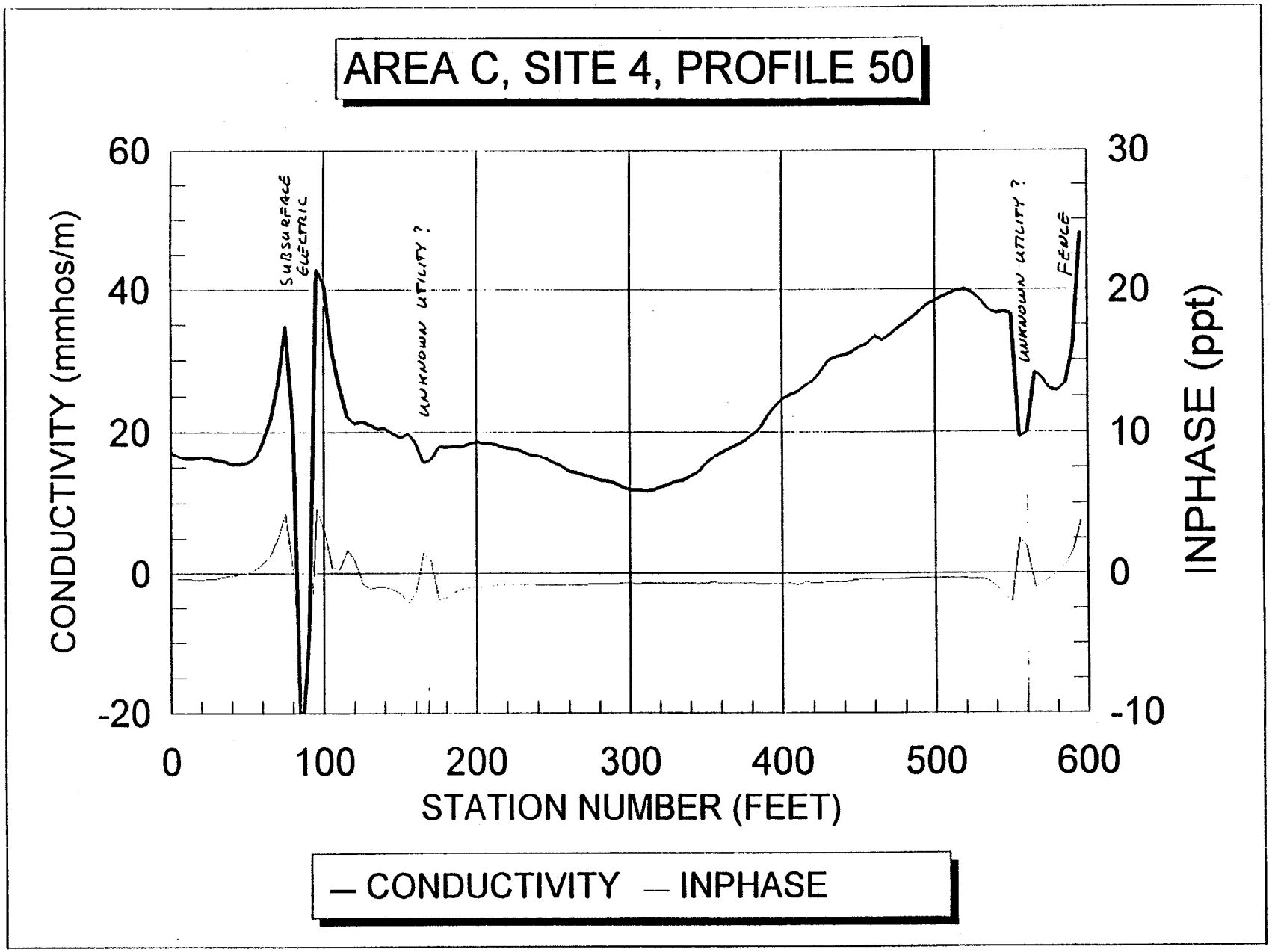
CORPORATION AND SUBSIDIARIES

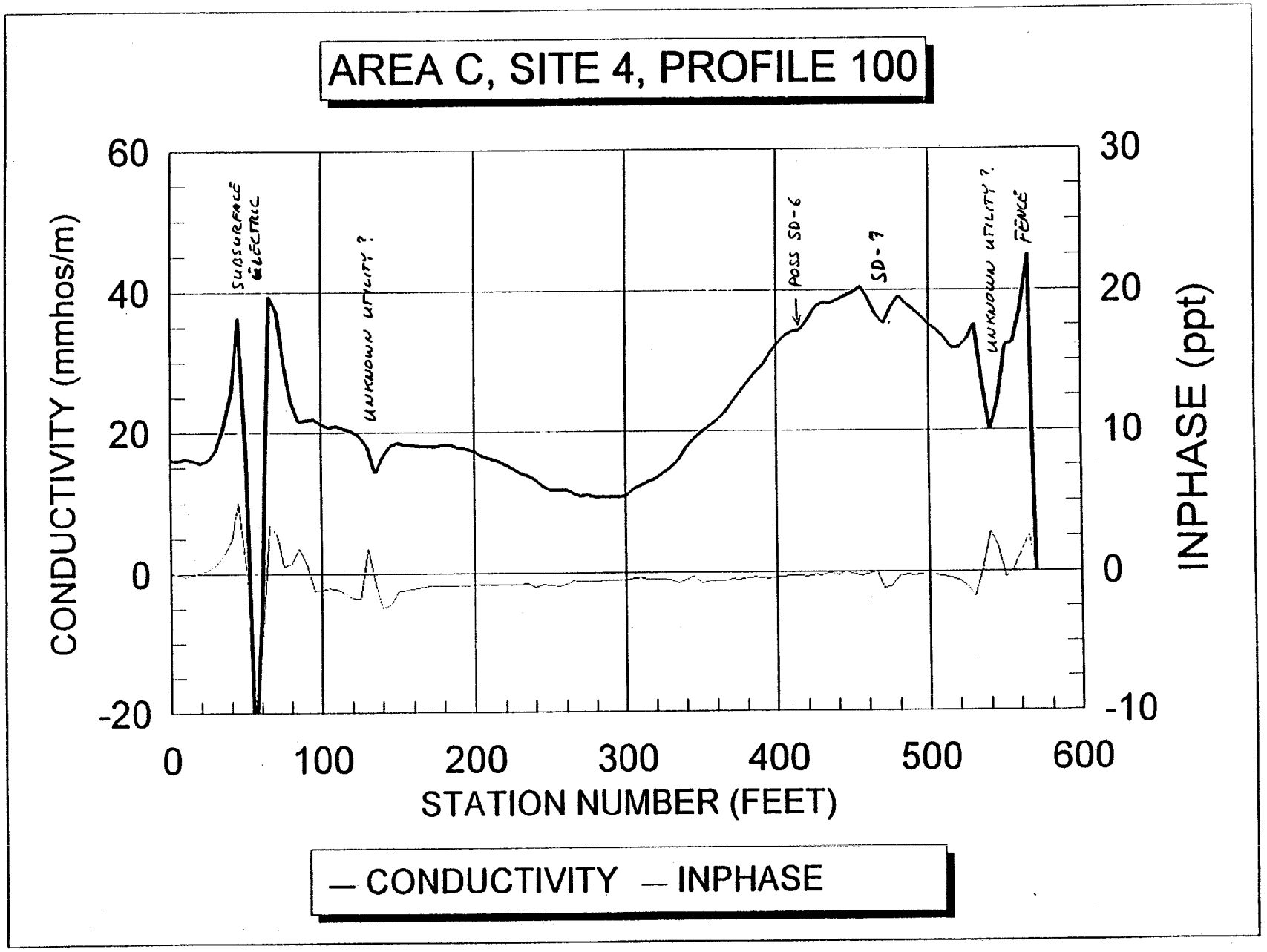
STANDARD CALCULATION SHEET

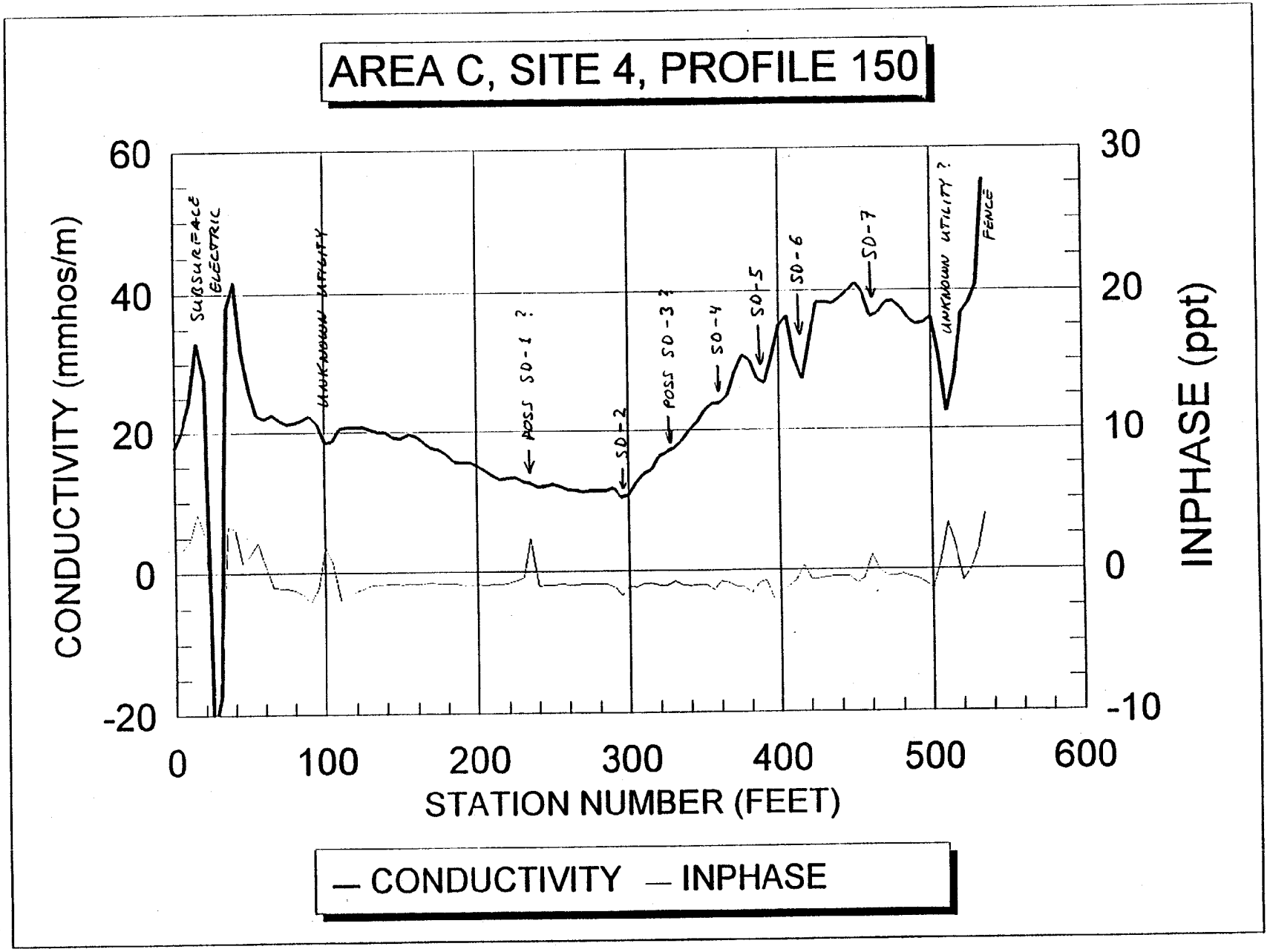
NAUC PHASE III RI, EM-SURVEY	FILE NO.: CTO-159	BY: R. GOOD	PAGE 1 OF 1
CT:		CHECKED BY: Tea	DATE: 3/5/95

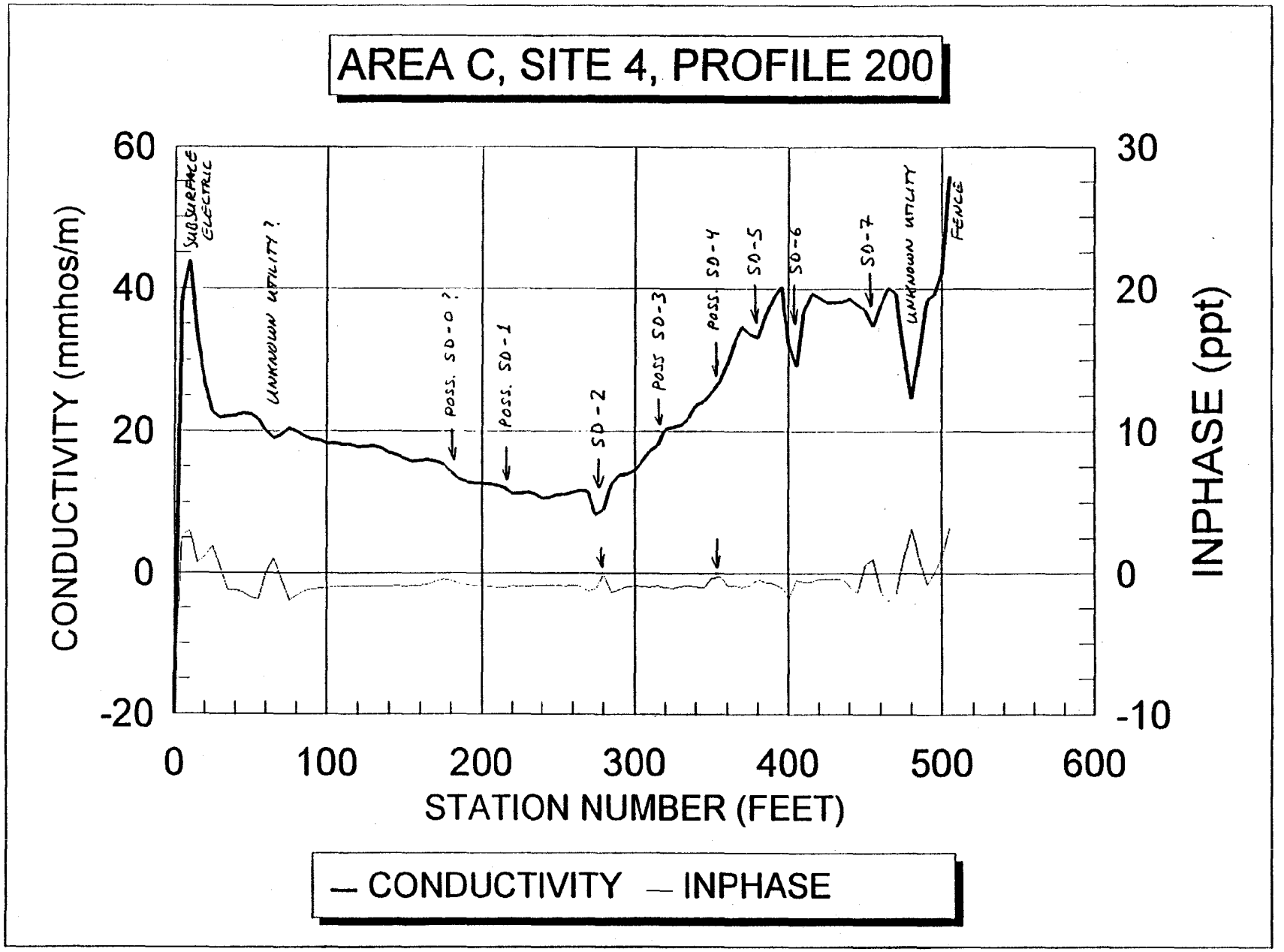


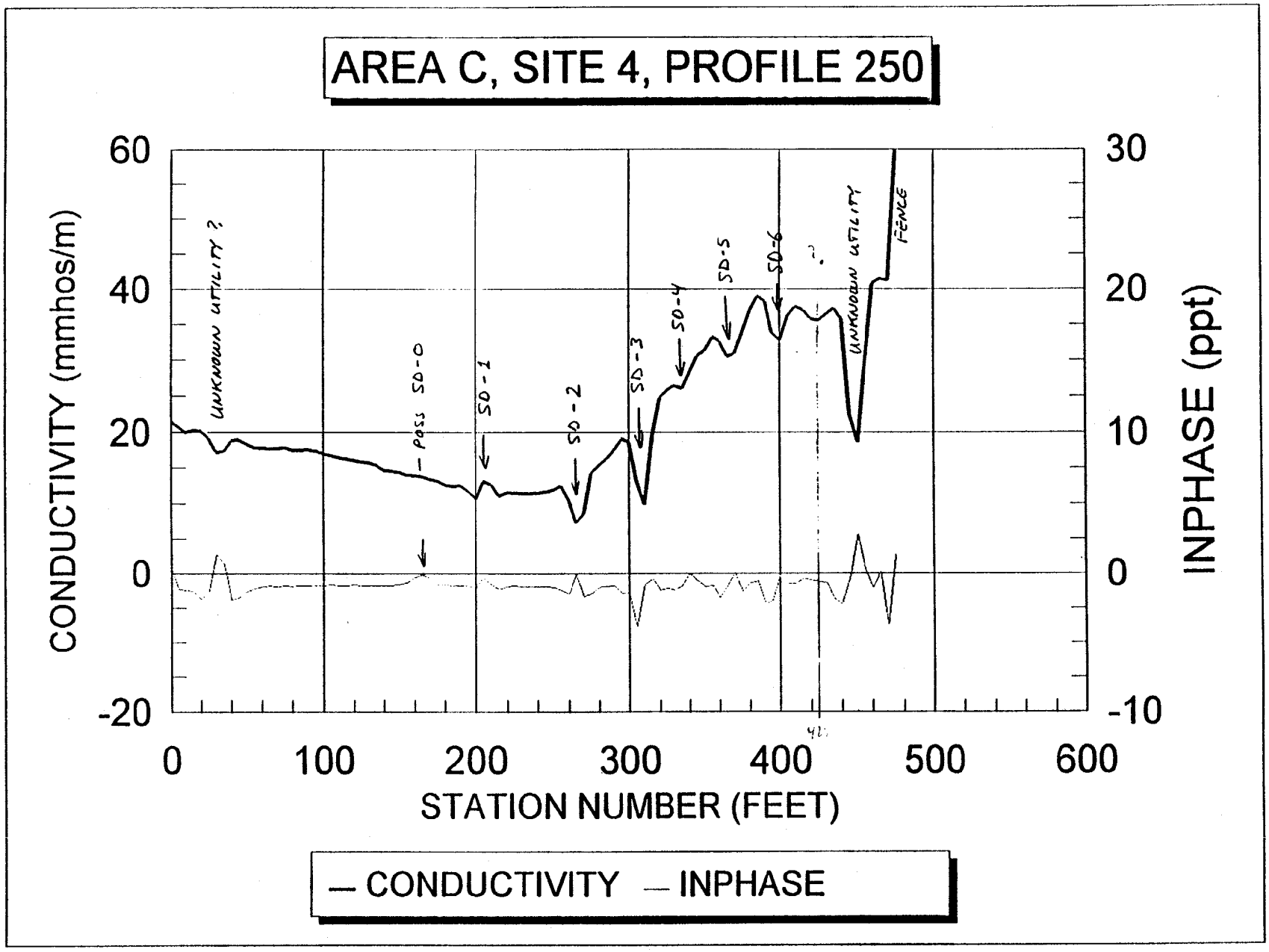

AREA C, SITE 4, PROFILE 00
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SUBSURFACE ELECTRIC
UNKNOWN UTILITY ?
UNKNOWN UTILITY ?
CULVERT
— CONDUCTIVITY — INPHASE

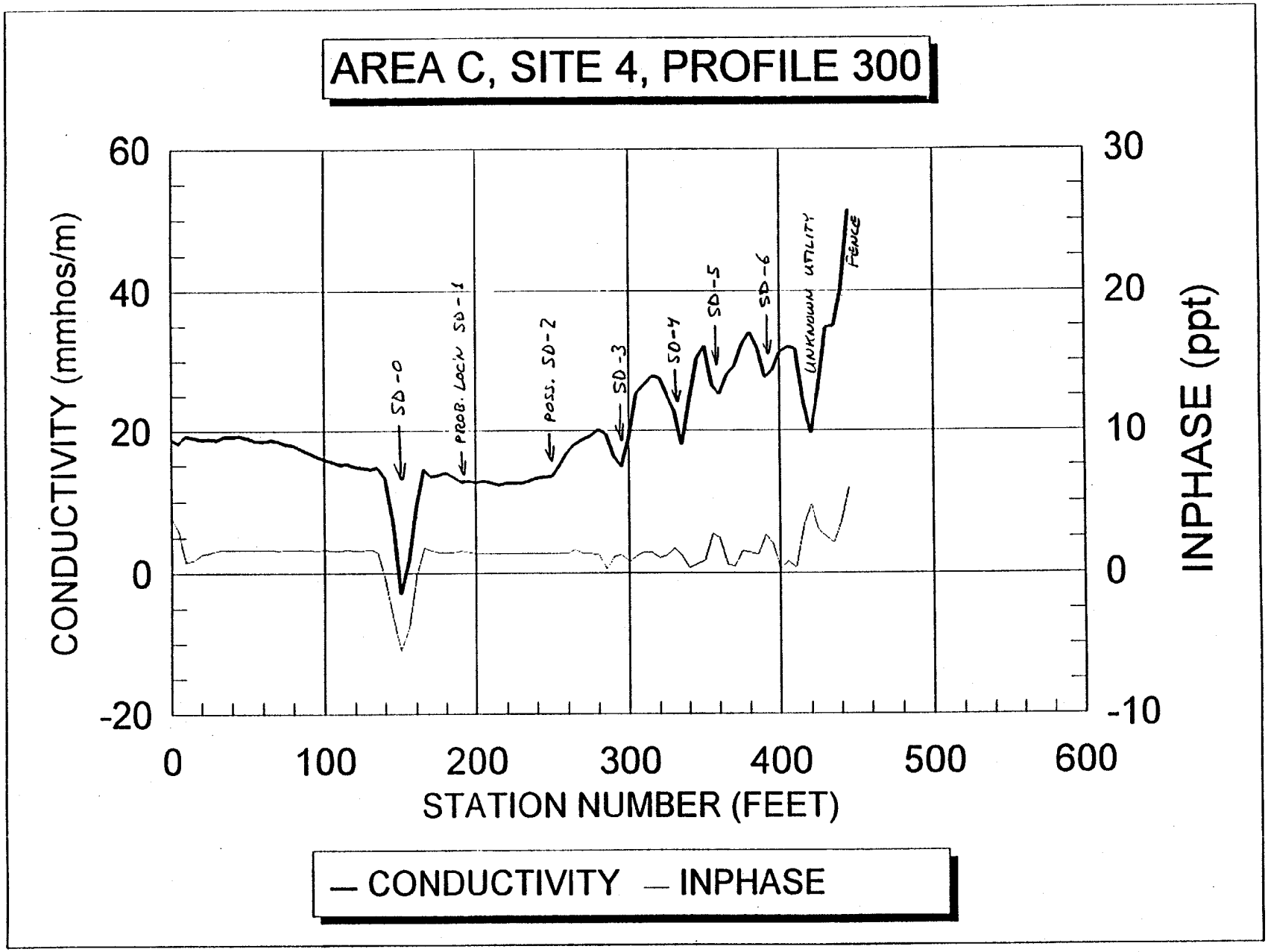

AREA C, SITE 4, PROFILE 50
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SUBSURFACE ELECTRIC
UNKNOWN UTILITY ?
UNKNOWN UTILITY ?
FENCE
— CONDUCTIVITY — INPHASE

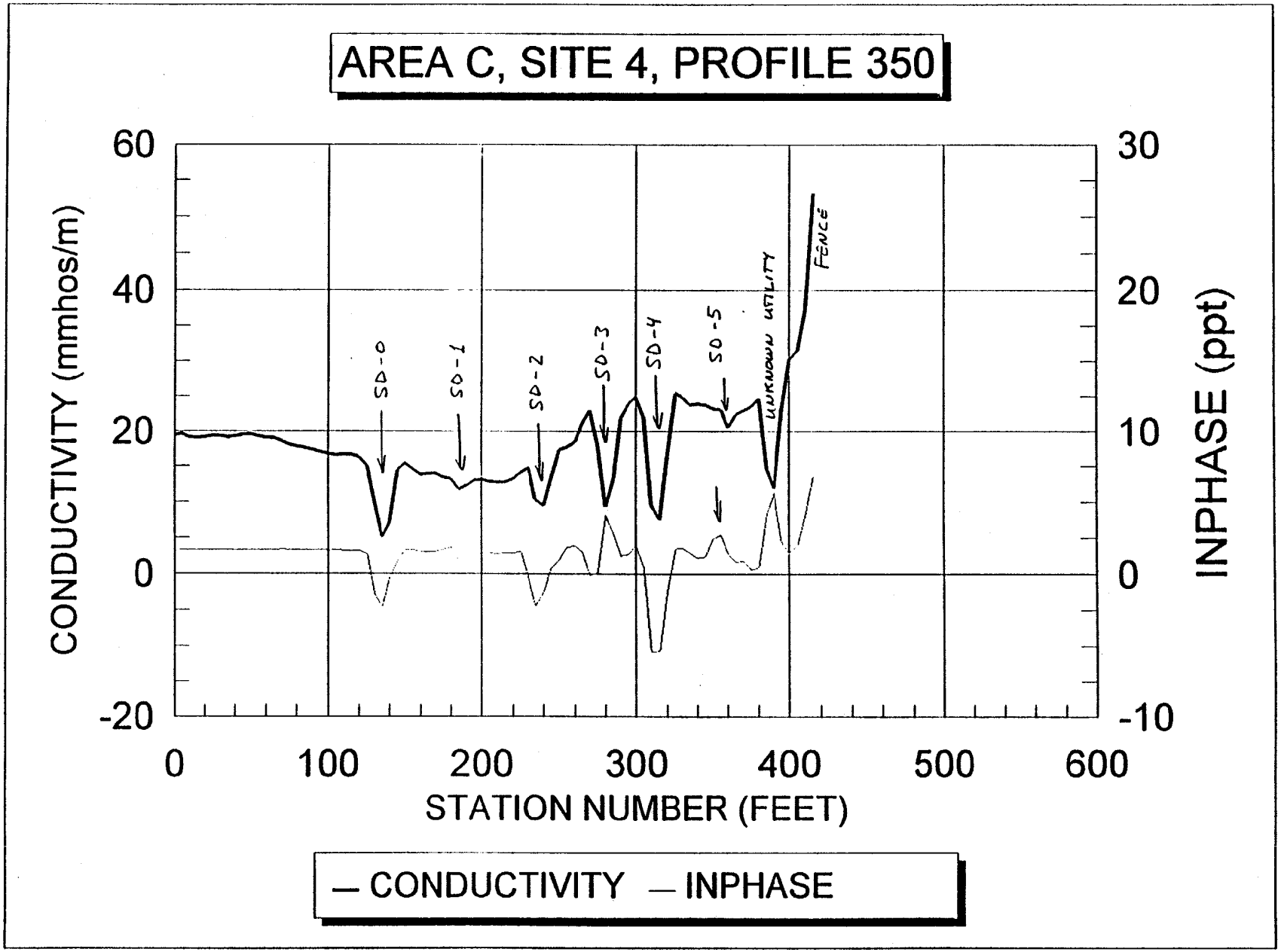

AREA C, SITE 4, PROFILE 100
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SUBSURFACE ELECTRIC
UNKNOWN UTILITY ?
POSS SD-6
SD-7
UNKNOWN UTILITY ?
FENCE
— CONDUCTIVITY — INPHASE

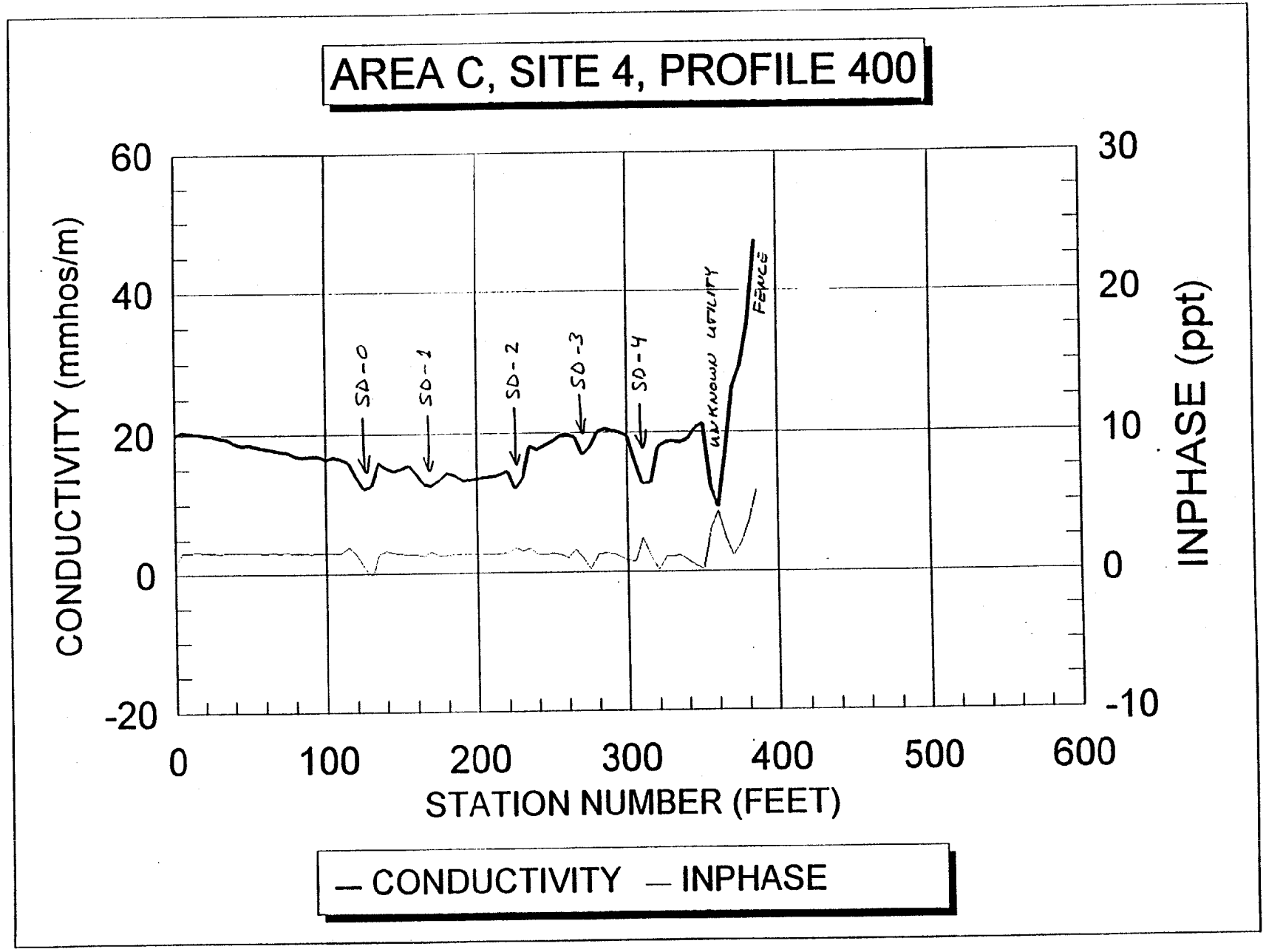

AREA C, SITE 4, PROFILE 150
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SUBSURFACE ELECTRIC
UNKNOWN UTILITY
POSS SD-1 ?
SD-2
POSS SD-3 ?
SD-4
SD-5
SD-6
SD-7
UNKNOWN UTILITY ?
FENCE
— CONDUCTIVITY — INPHASE

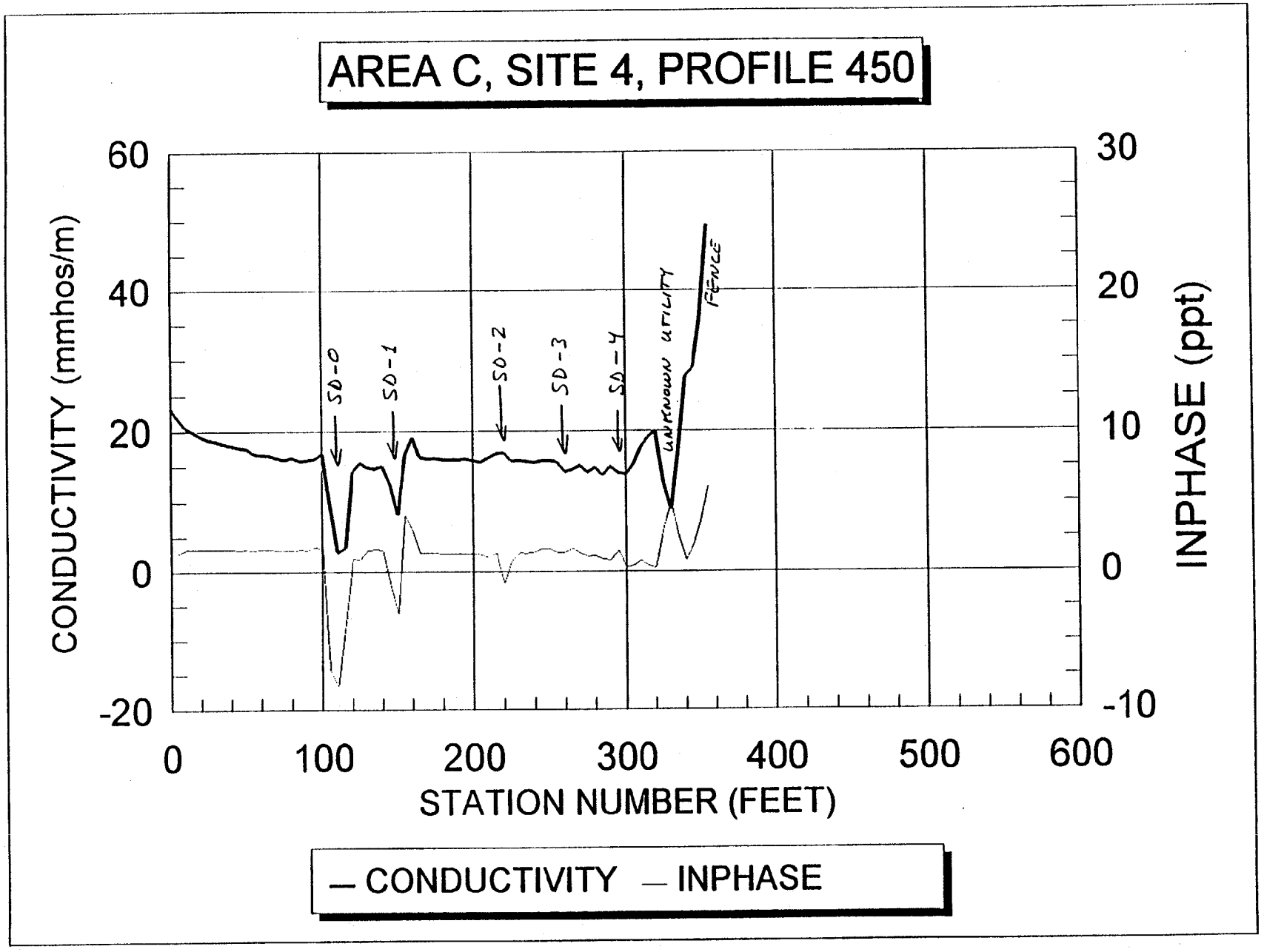

AREA C, SITE 4, PROFILE 200
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SUBSURFACE ELECTRIC
UNKNOWN UTILITY ?
POSS. SD-0 ?
POSS. SD-1
SD-2
POSS SD-3
POSS. SD-4
SD-5
SD-6
SD-7
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE


AREA C, SITE 4, PROFILE 250
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
UNKNOWN UTILITY ?
PASS SD-0
SD-1
SD-2
SD-3
SD-4
SD-5
SD-6
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

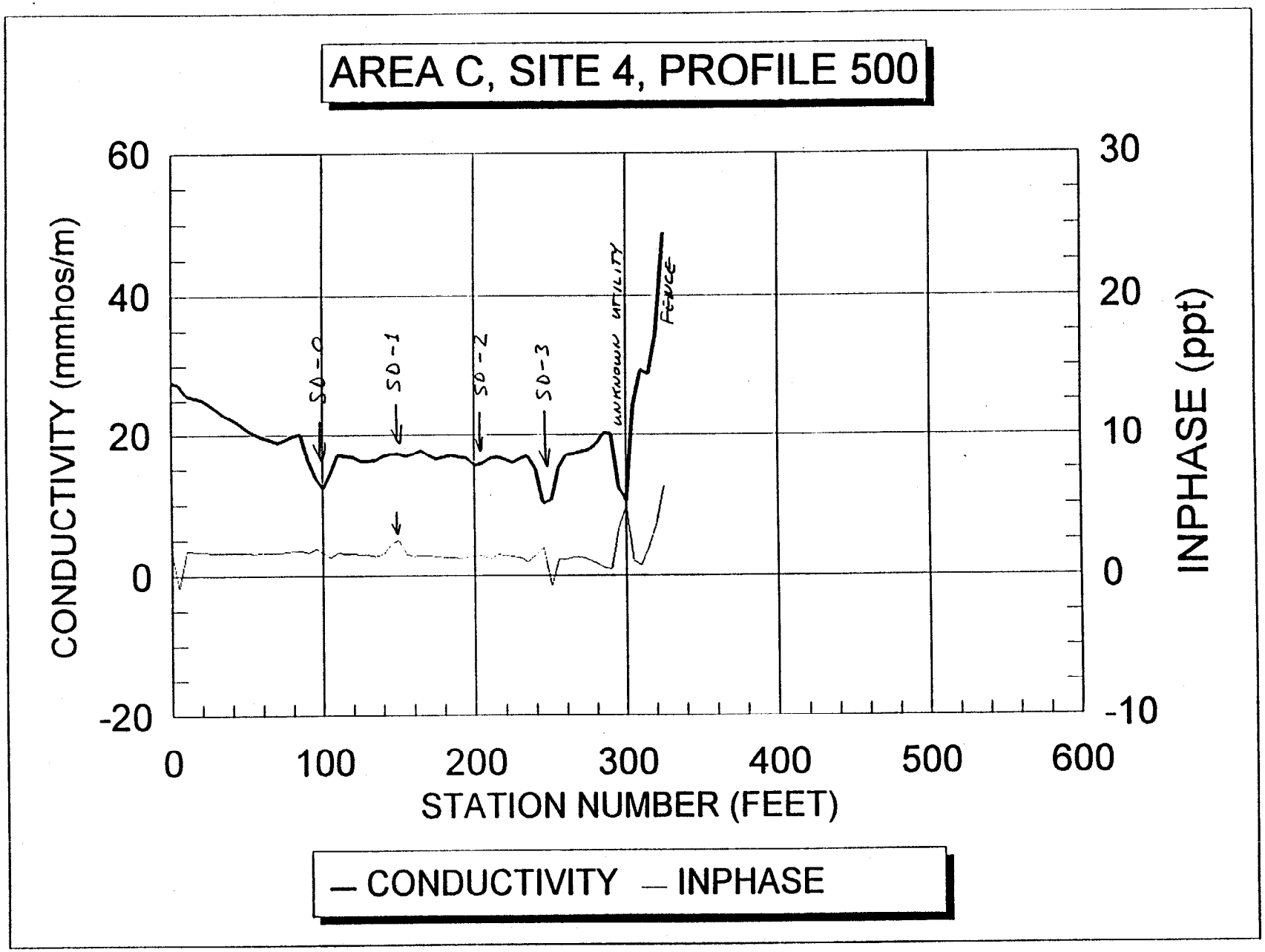

AREA C, SITE 4, PROFILE 300
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SD-0
PROB. LOC'N SD-1
POSS. SD-2
SD-3
SD-4
SD-5
SD-6
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

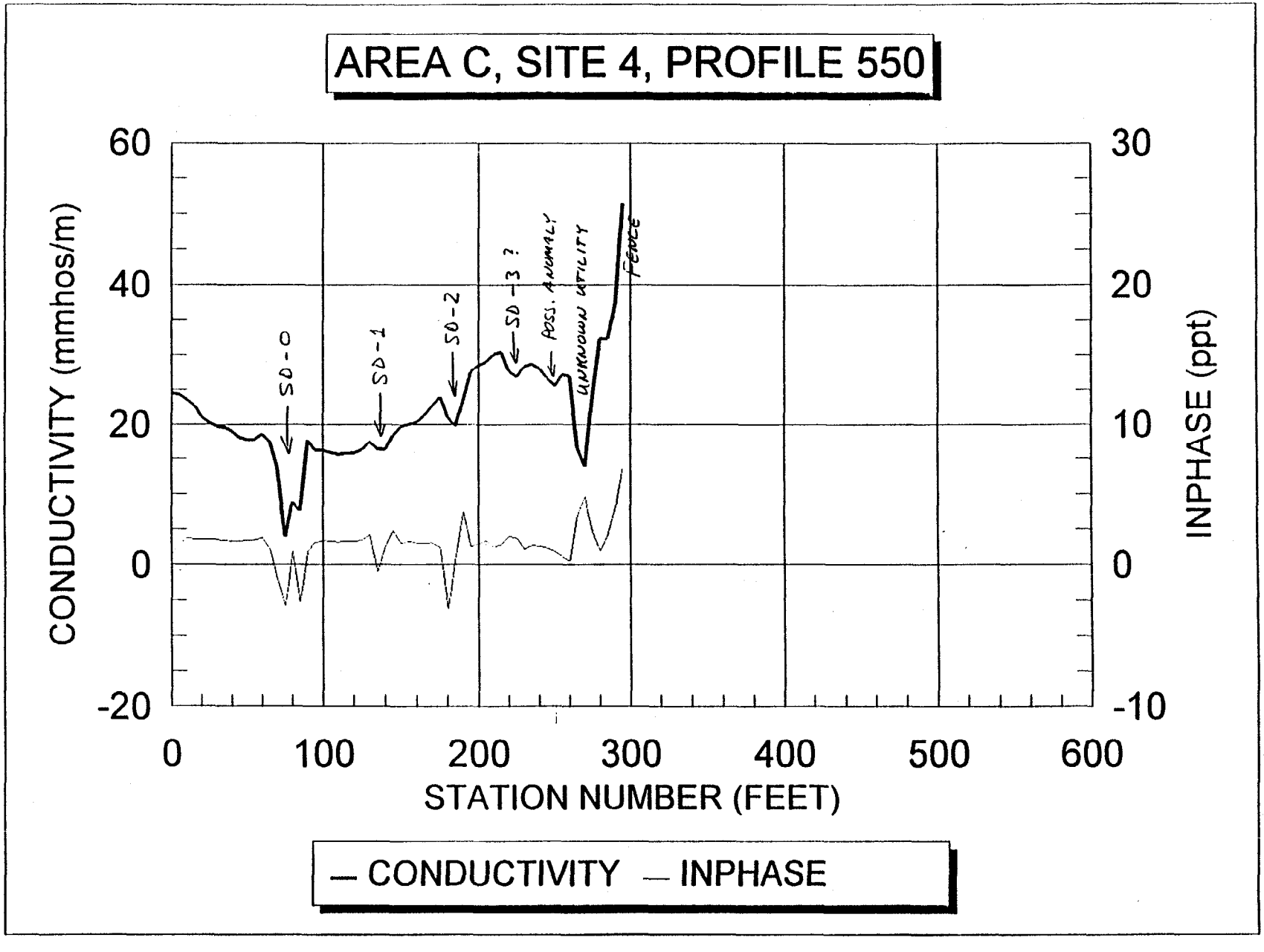

AREA C, SITE 4, PROFILE 350
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SD-0
SD-1
SD-2
SD-3
SD-4
SD-5
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

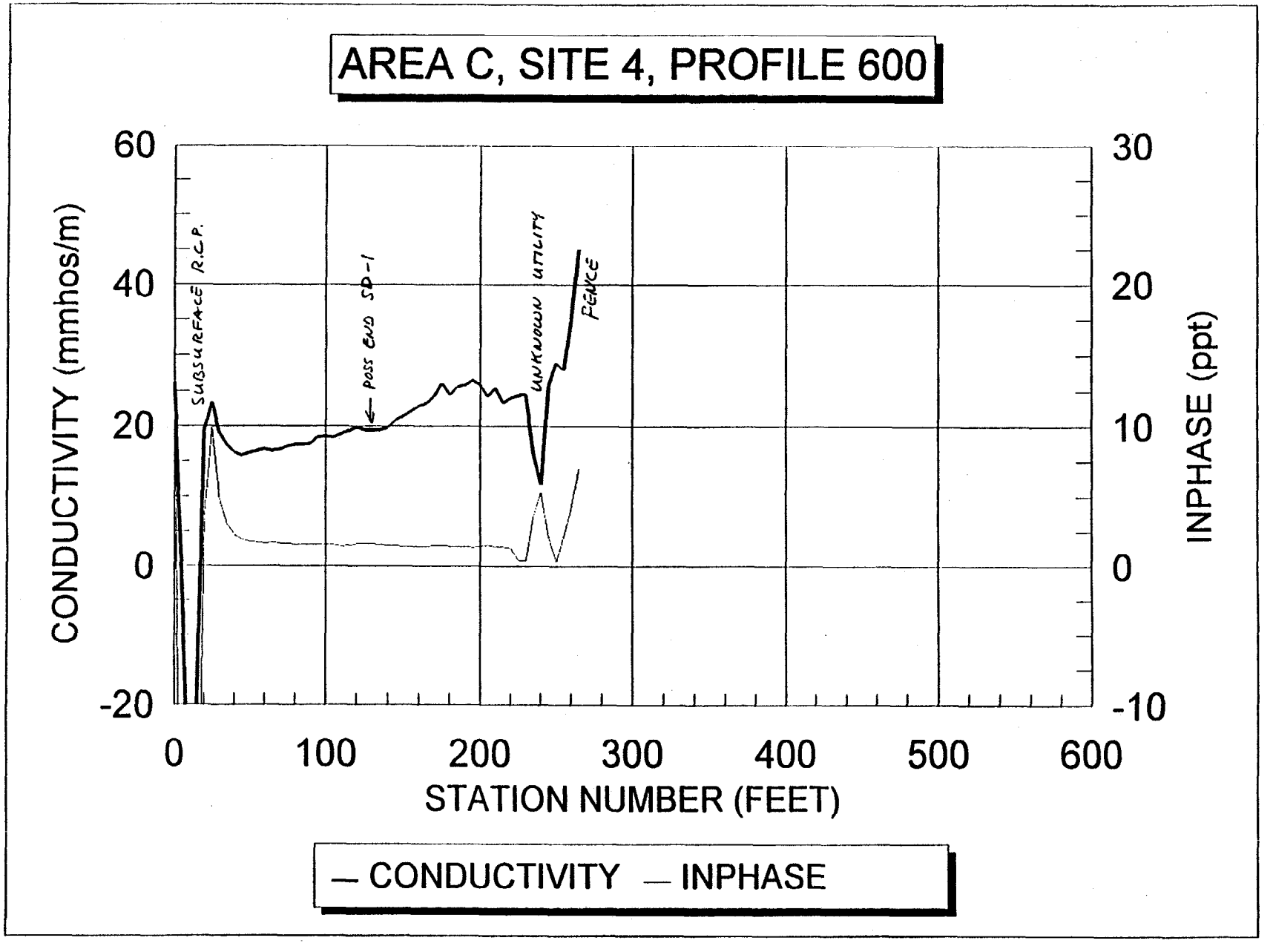

AREA C, SITE 4, PROFILE 400
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SD-0
SD-1
SD-2
SD-3
SD-4
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

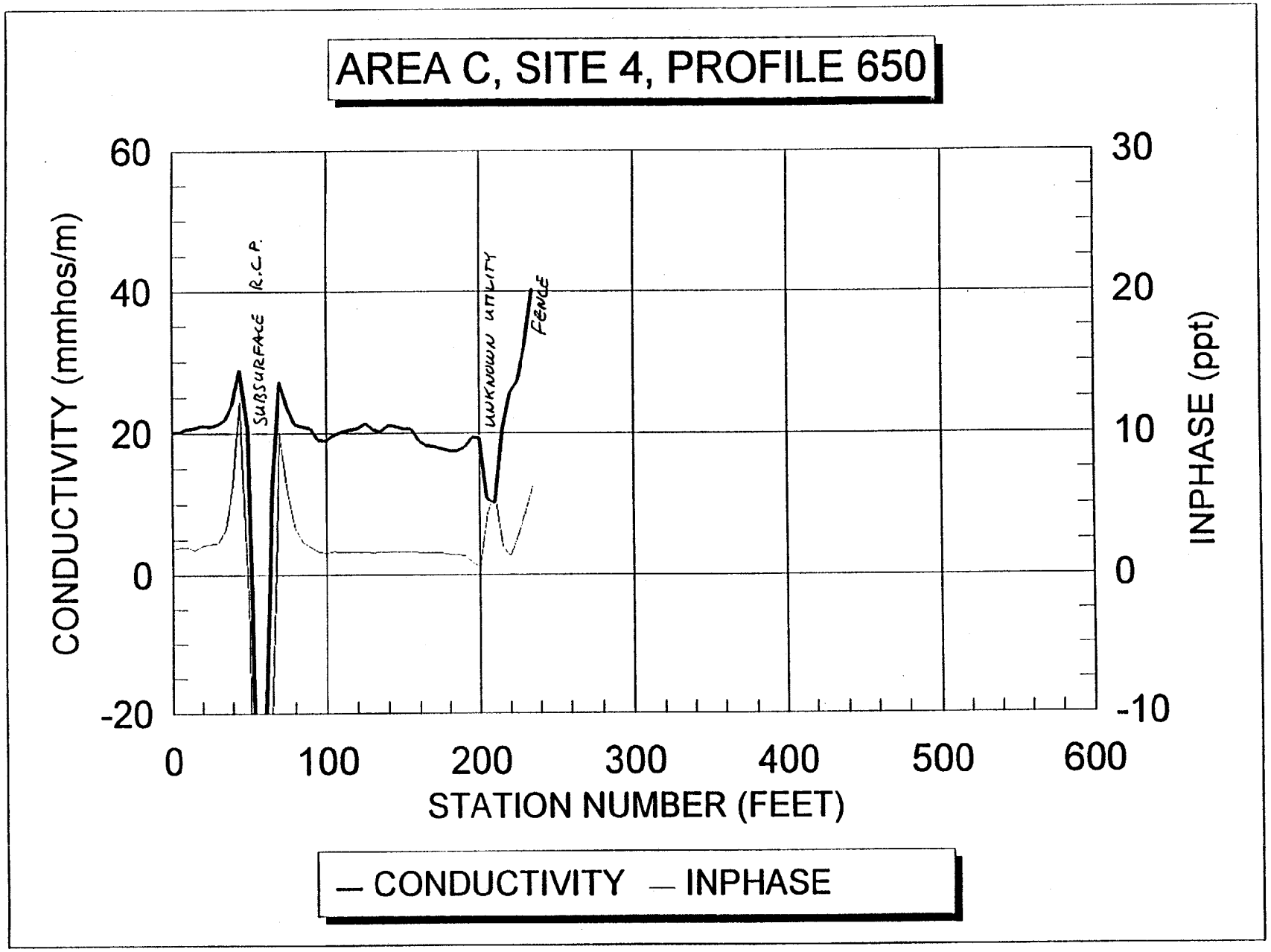

AREA C, SITE 4, PROFILE 450
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SD-0
SD-1
SD-2
SD-3
SD-4
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

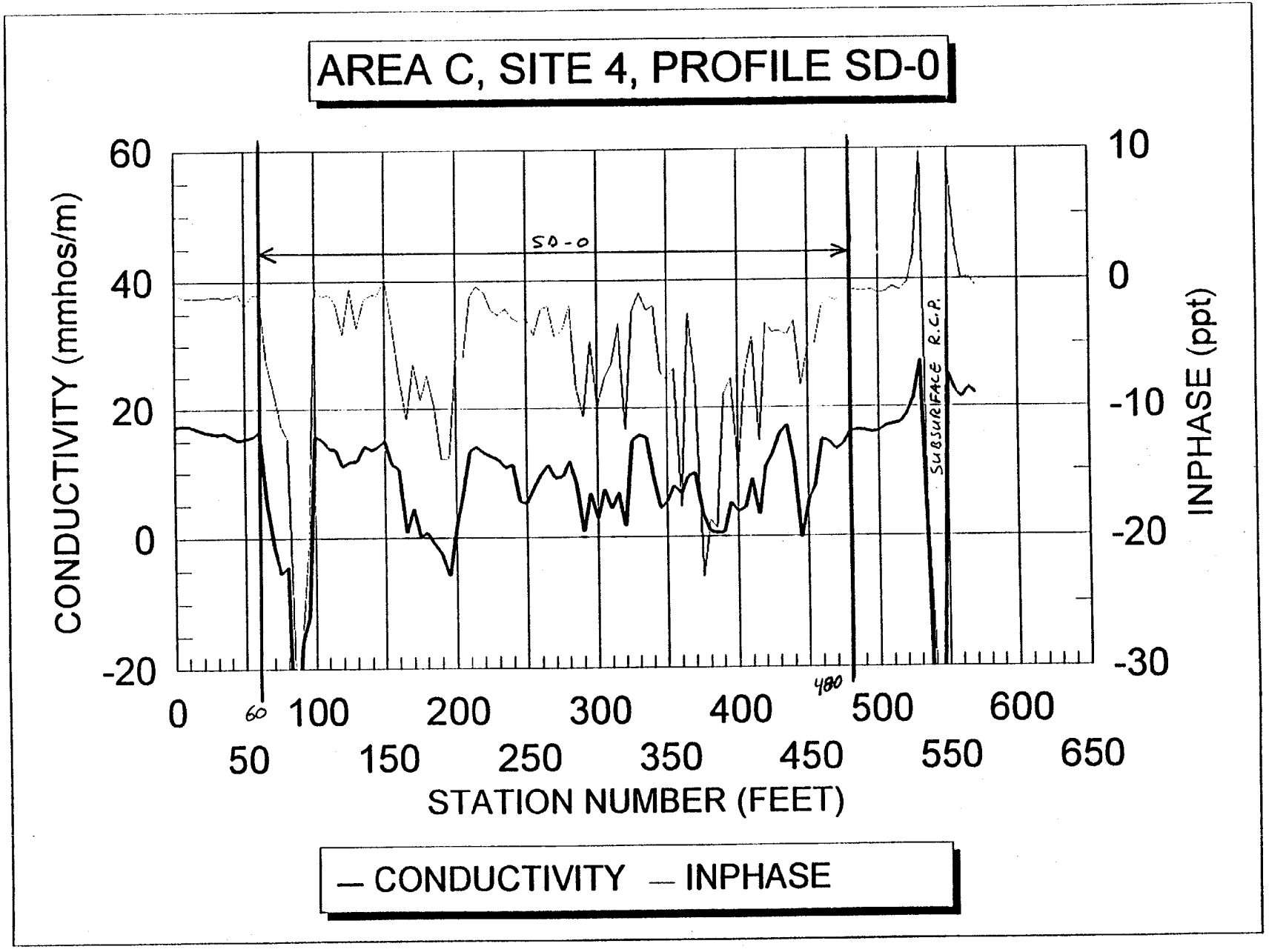
11

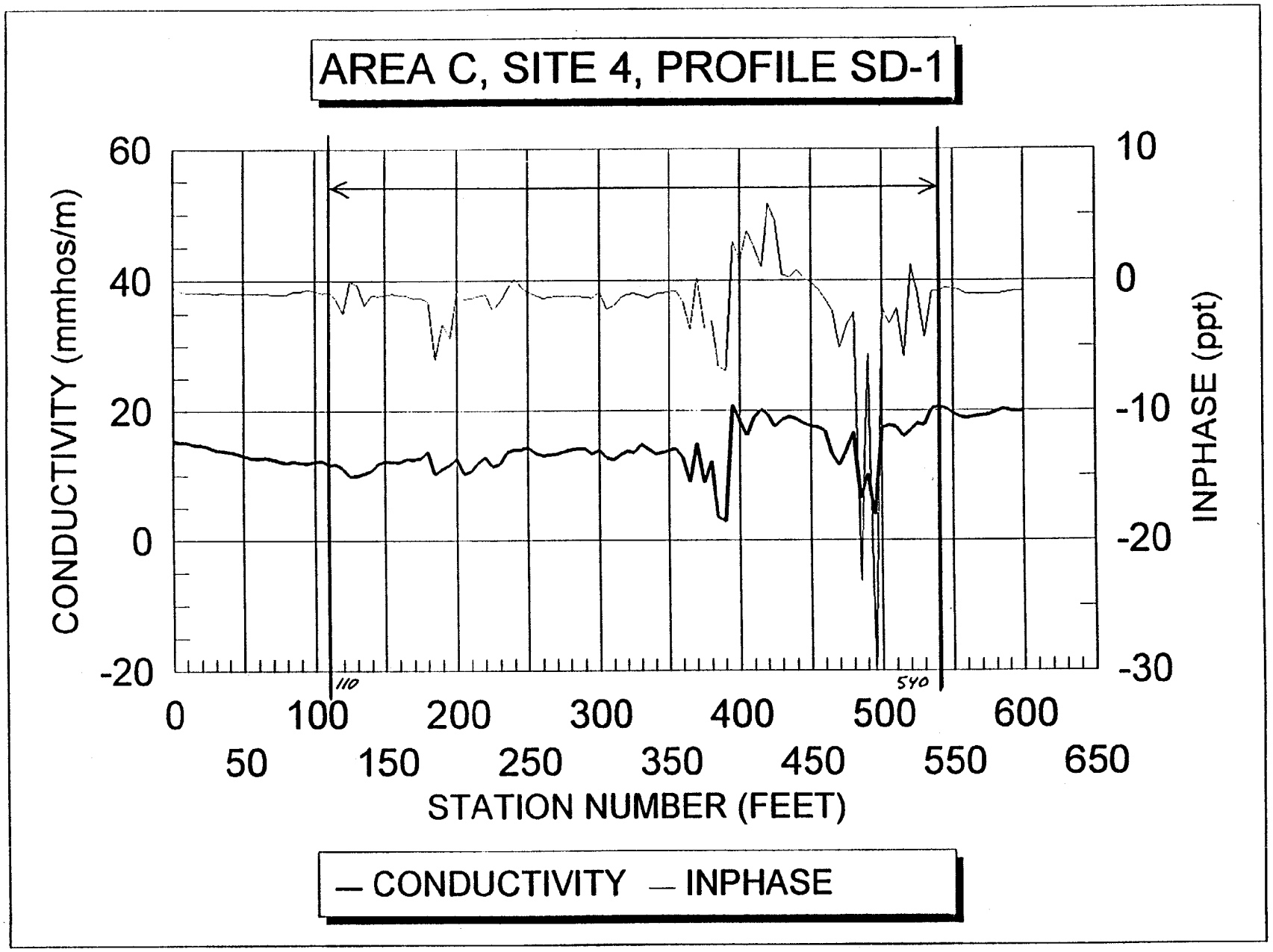

AREA C, SITE 4, PROFILE 500
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SD-0
SD-1
SD-2
SD-3
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

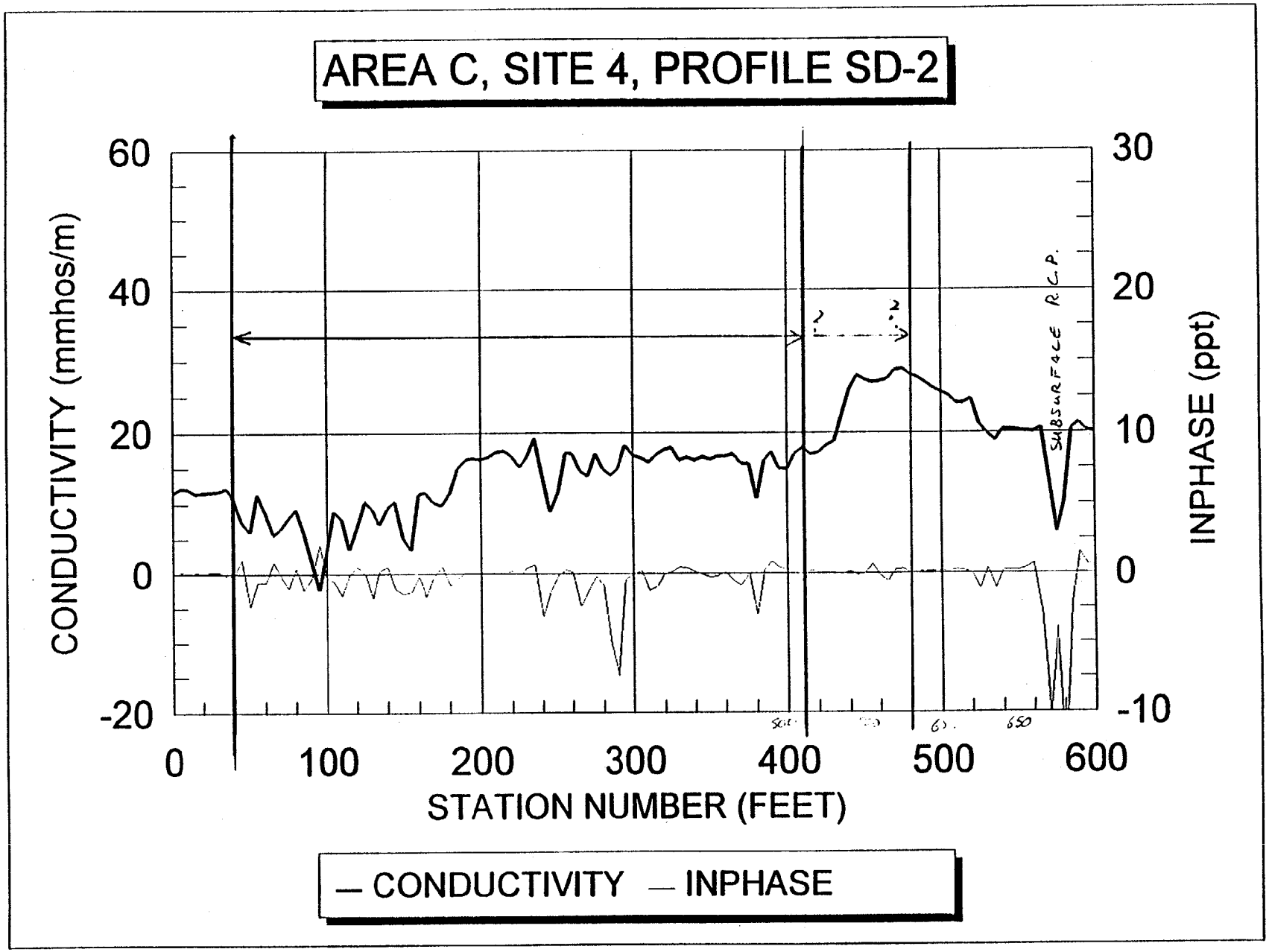

AREA C, SITE 4, PROFILE 550
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SD-0
SD-1
SD-2
SD-3 ?
POSS. ANOMALY
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

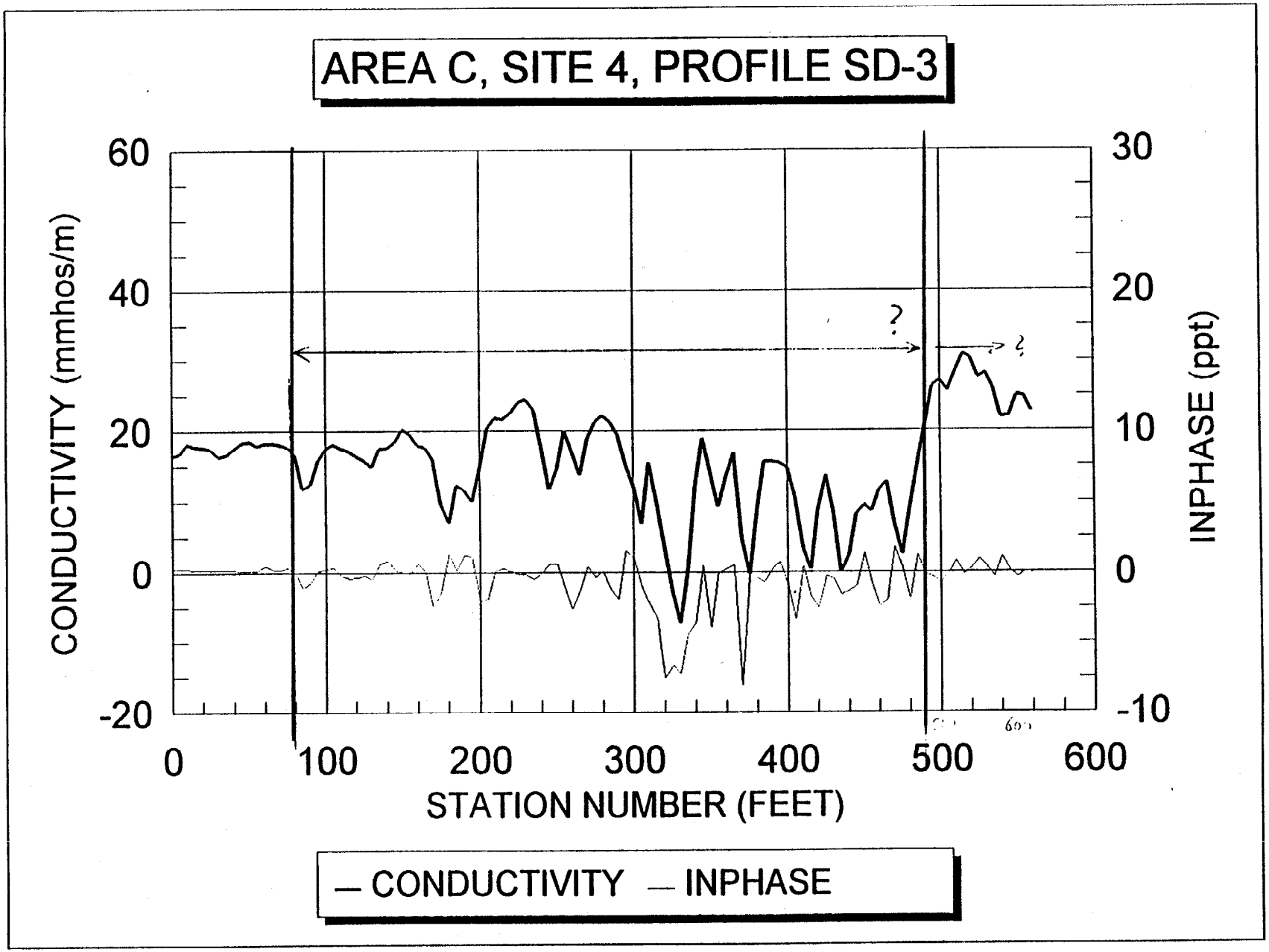

AREA C, SITE 4, PROFILE 600
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
SUBSURFACE R.C.P.
← POSS END SD-1
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

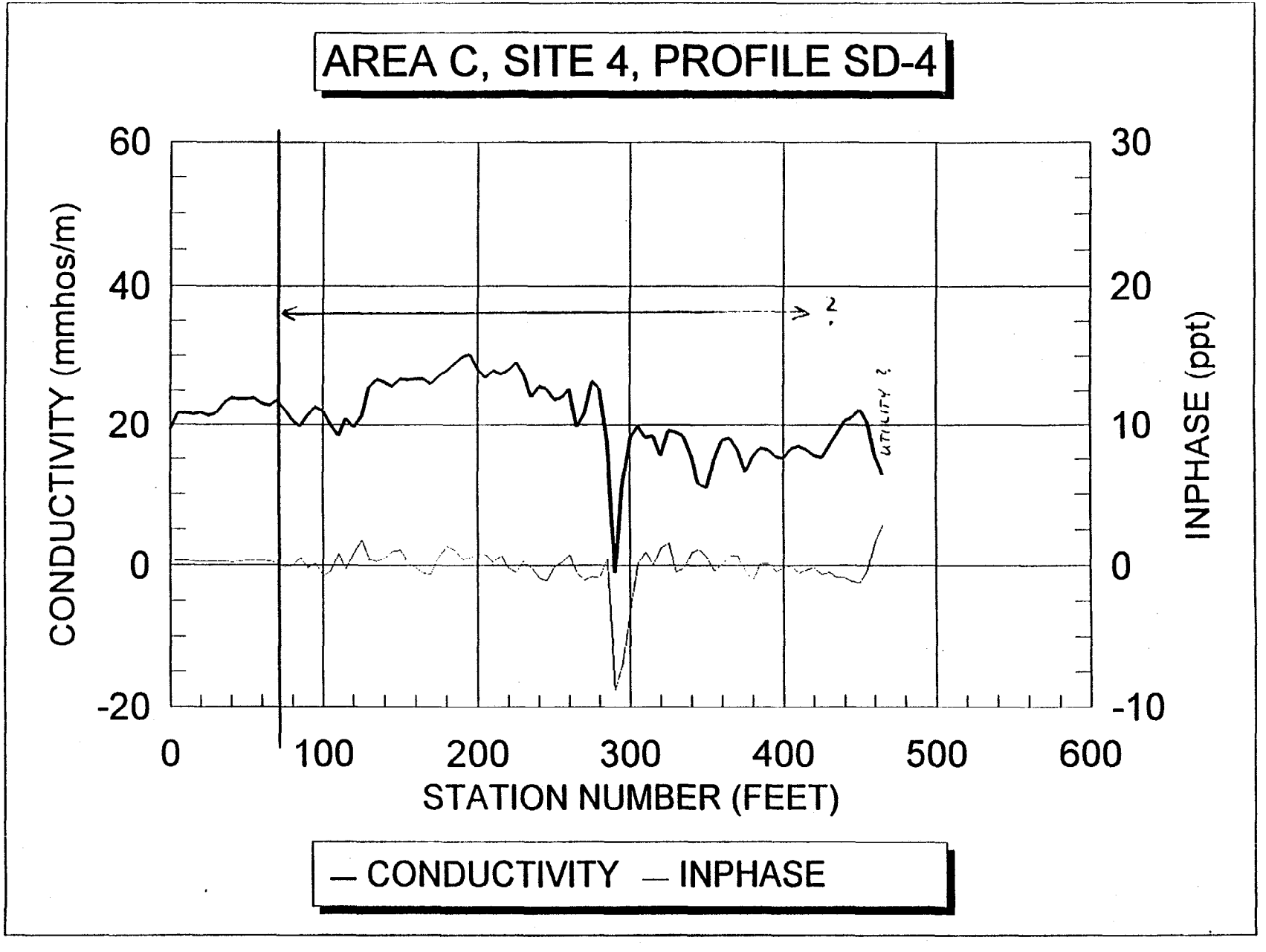

AREA C, SITE 4, PROFILE 650
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
R.C.P.
SUBSURFACE
UNKNOWN UTILITY
FENCE
— CONDUCTIVITY — INPHASE

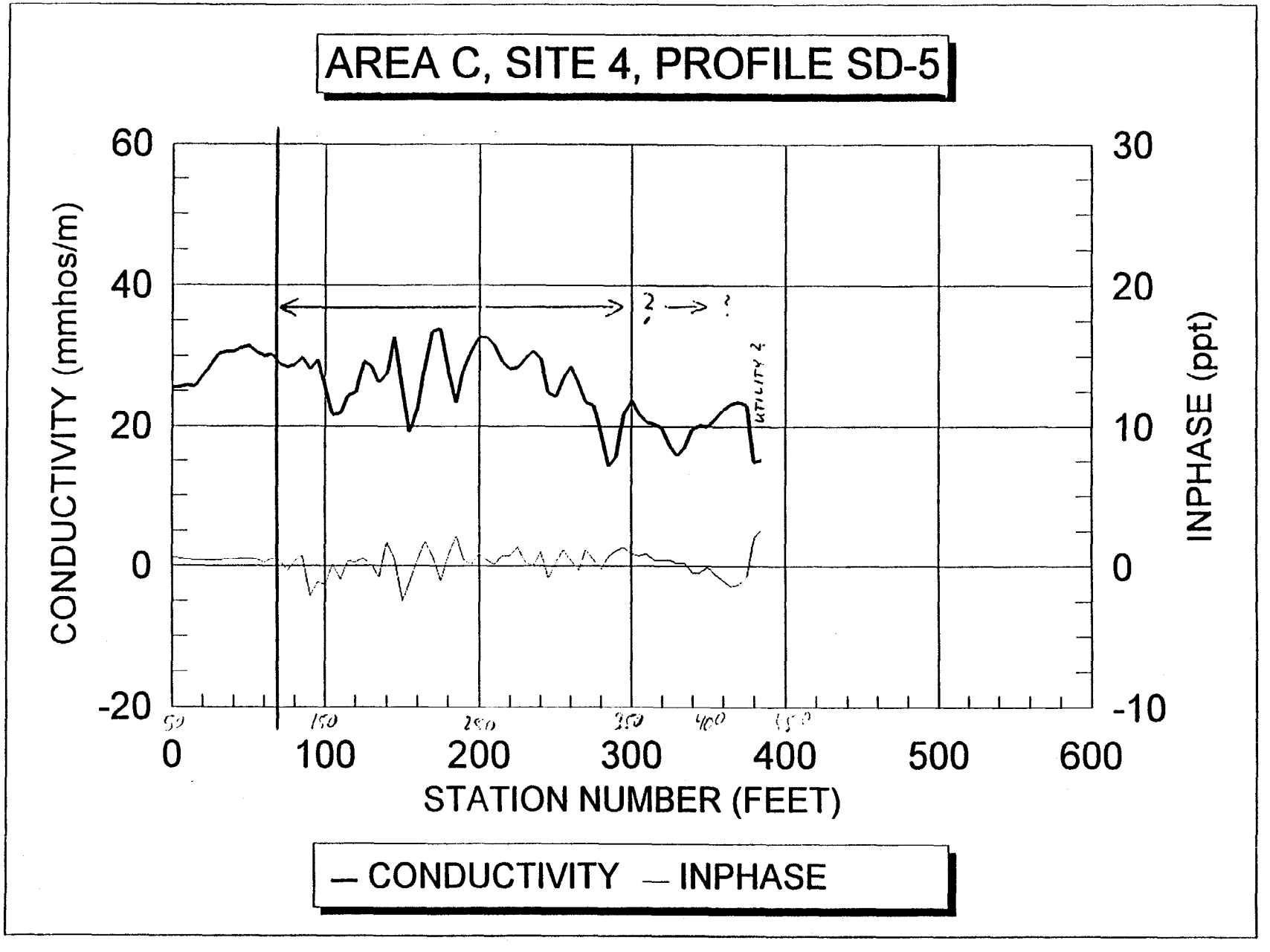

AREA C, SITE 4, PROFILE SD-0
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
SD-0
SUBSURFACE R.C.P.
60
480
— CONDUCTIVITY — INPHASE

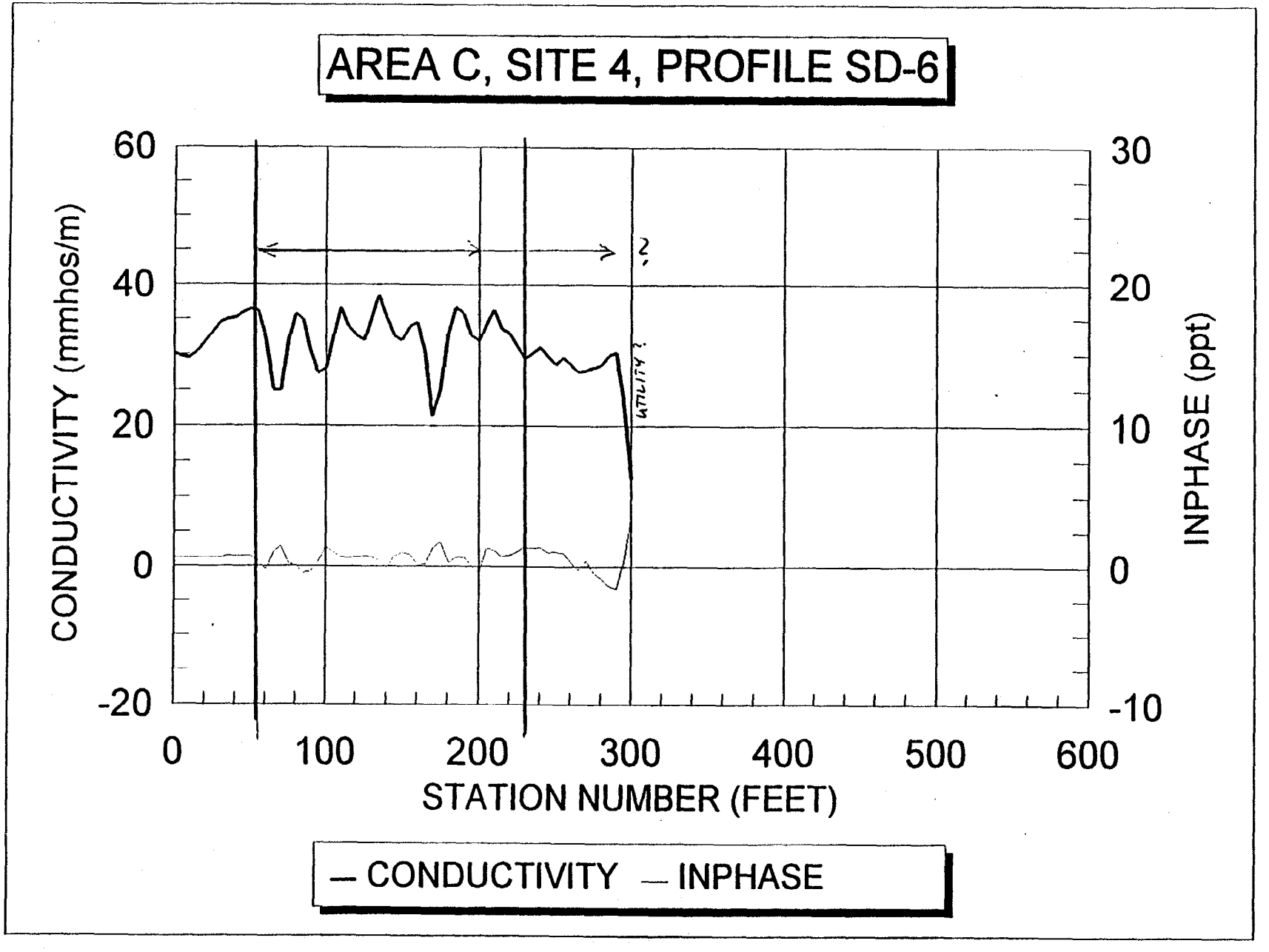

AREA C, SITE 4, PROFILE SD-1
CONDUCTIVITY (mmhos/m)
60
40
20
0
-20
INPHASE (ppt)
10
0
-10
-20
-30
110
540
0
100
200
300
400
500
600
50
150
250
350
450
550
650
STATION NUMBER (FEET)
— CONDUCTIVITY — INPHASE

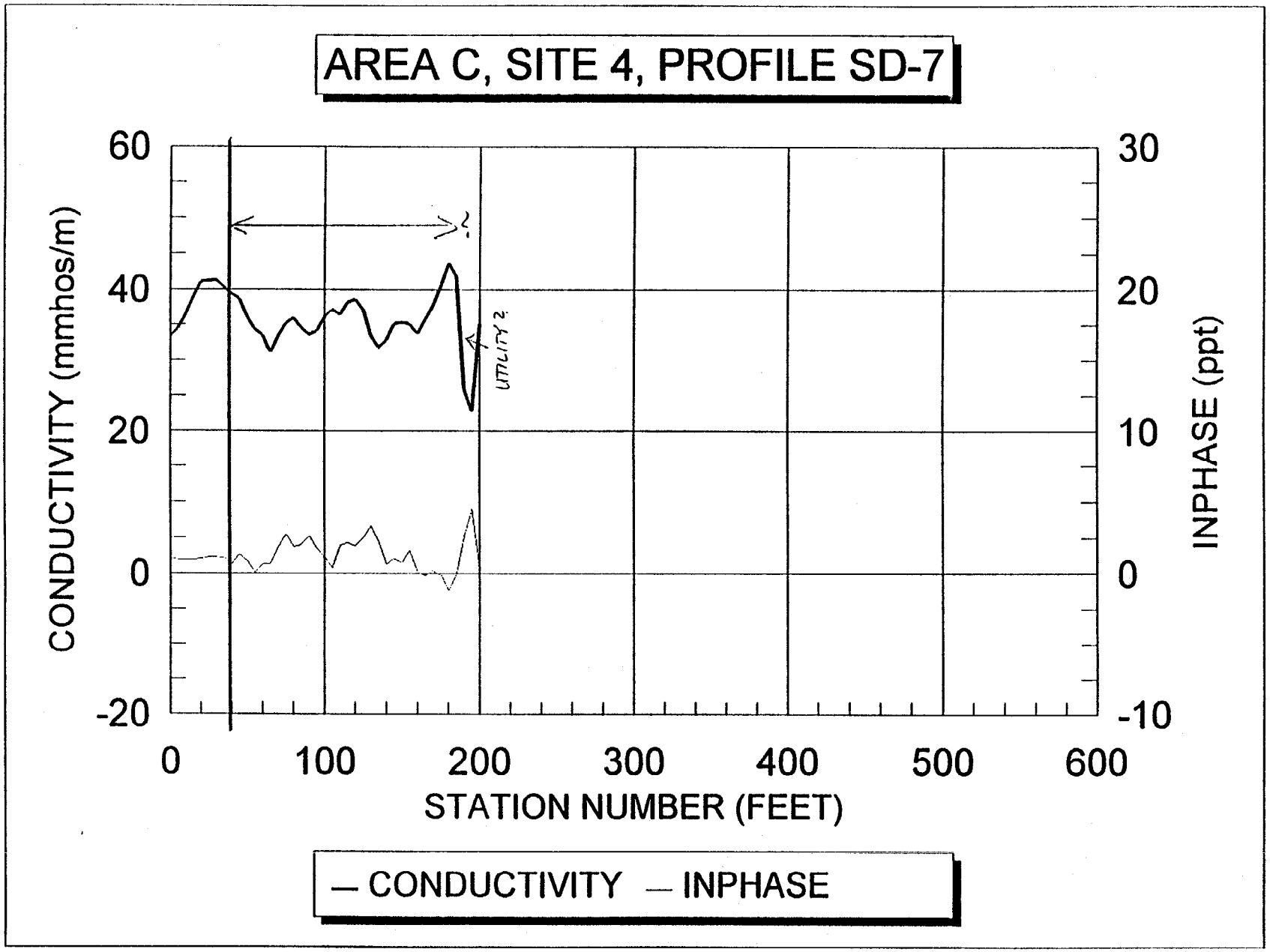

AREA C, SITE 4, PROFILE SD-2
CONDUCTIVITY (mmhos/m)
60
40
20
0
-20
INPHASE (ppt)
30
20
10
0
-10
0
100
200
300
400
500
600
STATION NUMBER (FEET)
SUBSURFACE R.C.P.
— CONDUCTIVITY — INPHASE


AREA C, SITE 4, PROFILE SD-3
CONDUCTIVITY (mmhos/m)
60
40
20
0
-20
INPHASE (ppt)
30
20
10
0
-10
0
100
200
300
400
500
600
STATION NUMBER (FEET)
?
?
— CONDUCTIVITY — INPHASE


AREA C, SITE 4, PROFILE SD-4
CONDUCTIVITY (mmhos/m)
60
40
20
0
-20
INPHASE (ppt)
30
20
10
0
-10
0
100
200
300
400
500
600
STATION NUMBER (FEET)
— CONDUCTIVITY — INPHASE


AREA C, SITE 4, PROFILE SD-5
CONDUCTIVITY (mmhos/m)
INPHASE (ppt)
STATION NUMBER (FEET)
60
40
20
0
-20
30
20
10
0
-10
0
100
200
300
400
500
600
? → ?
UTILITY ?
— CONDUCTIVITY — INPHASE


AREA C, SITE 4, PROFILE SD-6
CONDUCTIVITY (mmhos/m)
60
40
20
0
-20
INPHASE (ppt)
30
20
10
0
-10
0
100
200
300
400
500
600
STATION NUMBER (FEET)
UTILITY ?
— CONDUCTIVITY — INPHASE


AREA C, SITE 4, PROFILE SD-7
CONDUCTIVITY (mmhos/m)
60
40
20
0
-20
INPHASE (ppt)
30
20
10
0
-10
0
100
200
300
400
500
600
STATION NUMBER (FEET)
UTILITY 2
— CONDUCTIVITY — INPHASE

APPENDIX C

SITE 4
SAMPLING RESULTS

TABLE C-1
SITE 4 ANALYTICAL RESULTS FOR METALS IN SUBSURFACE SOILS (mg/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES																	
ANALYTE	SB1	SB2	SB3	SB4	SB5/31*	SB6/30*	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	SB16	SB23	SB24/32*
ALUMINUM	9960	11100	9770	7940	10990	7565	15300	7030	10100	8580	7770	8940	10600	9960	11400	13800	10200	11000
ANTIMONY	2.9 U	3 U	2.8 U	3.3 U	2.7 U	2.6 U	6.4 U	8.5 U	6.1 U	6.3 U	6.3 U	5.9 U	5.9 U	6.1 U	5.2 U	6.6 U	6.3 U	6 U
ARSENIC	3.2	2.8 L	3 L	2.5 L	3.8 L	2.1 L	3.5	5.2	3.1	2.8	4.4	4.3	1.9	2.6	3.3	3.3	3.9	4.85
BARIUM	113	99.1	72.7	60.9	72.2	63.3	52.9	77.7	660	75.7	101	106	31.6 B	48.1	48.6	56.3	71.3	64.15
BERYLLIUM	1.3	1.2	0.78	0.69	0.8	0.54	0.63 B	0.72 B	1.3	0.96	1.8	1.8	0.59 B	0.7 B	0.87	0.99 B	0.79 B	0.84 B
CADMIUM	0.71 B	1.4 B	0.38 B	1.1 B	0.44 U	0.24 U	0.58 U	0.78 U	0.77 B	0.57 U	0.57 U	0.54 U	0.53 U	0.56 U	0.47 U	0.6 U	4.2	0.55 U
CALCIUM	1090	1910	797	716	1287.5	644	433 B	851 B	1370	1250	1460	1470	1190	1830	2050	2440	1510	1145
CHROMIUM	17.6	20.5	17.1	15.6	19.65	17.25	22.7	21.4	16.5	12.6	23.3	21.3	15.8	11.3	13.8	15.4	19.1	19.8
COBALT	8.1	9.4	7.4	6.7	7.6	5.2	5.7 B	8.1 B	9.4	7.3 B	6.4 B	8.5 B	5 B	10.5	8.1	13.6	6.5 B	7.2 B
COPPER	7.6	10.4	15.5	11.5	16.2	8.8	8.4	21	21.8	44.9	11	13.4	54.5	61.5	26.8	35.8	13.2	8.9
IRON	13600	16300	16600	17000	20250	11075	18700	10700	19100	13700	20100	19100	13000	11600	15400	18800	16700	20750
LEAD	31.2	85.7	22	25.5	16.05	6.25	10.4	28.3	11.3	7.4	7.6	7.3	6.1	5.1	17.8	22.7	19.2	15.1
MAGNESIUM	2350	3700	2080	1610	2155	1940	2050	1970	2540	2680	2600	2810	2040	2370	1980	2280	2040	1935
MANGANESE	148	261	231	326	676	137.9	81.4	107	539	363	192	326	135	433	455	676	318	342
MERCURY	0.06 B	0.05 UL	0.06 UL	0.06 UL	0.05 UL	0.06 U	0.06 U	1.3	0.05 U	0.05 U	0.06 U	0.05 U	0.06 U	0.06 U	0.09 B	0.06 U	0.06 U	0.06 U
NICKEL	11.7	13	11	9.3	14.8	7.6 K	8.1	21.1	12.7	9.5	11.3	12.5	10.1	10.3	12.1	11.5	9	9.45
POTASSIUM	1170	1670	770	705	661.5	509	650 B	594 B	965	1160	530 B	727 B	287 B	219 B	655 B	851 B	451 B	592 B
SELENIUM	0.36 U	0.36 U	0.35 U	0.47 K	0.33 U	0.32 U	0.77 U	1 U	0.73 U	0.76 U	0.76 U	0.72 U	0.71 U	0.74 U	0.63 U	0.81 U	0.77 U	0.73 U
SILVER	0.36 UL	0.36 UL	0.35 UL	0.54 L	0.33 UL	0.32 U	0.77 U	2.6 B	0.73 U	0.76 U	0.76 U	0.72 U	0.71 U	0.74 U	0.63 U	0.81 U	0.77 U	0.73 U
SODIUM	75.1 B	93.7 B	79.8 B	88.2 B	85.7 B	61.6 B	62.9 B	77.5 B	119 B	125 B	96.4 B	89.9 B	81.1 B	87.3 B	68.4 B	82.9 B	95.6 B	104 B
THALLIUM	0.45 U	0.45 U	0.43 U	0.5 U	0.41 U	0.4 U	0.96 U	1.3 U	0.92 U	0.96 U	0.95 U	0.89 U	0.89 U	0.93 U	0.78 U	1 U	0.96 U	0.91 U
VANADIUM	20.1	20.9	25.3	19.9	27.95	23.1	35.8	16.9	24.3	20.1	33.8	30.2	30.9	18.8	29.1	33	30.9	31.7
ZINC	54.8	71	44.3	68.8	43.05	21.25	52.6	80.7	336	30.5	26.1	29.8	18.3	16.3	33.3	35.3	51.6	31.3
CYANIDE	1.4 U	1.3 U	1.4 U	1.6 U	1.2 U	1.2 U	1.1 U	1.6 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U

QUALIFIERS
U= NONDETECTED RESULT
UL = NONDETECTED RESULT IS CONSIDERED BIASED LOW
B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)
L = POSITIVE RESULT IS CONSIDERED BIASED LOW
K = POSITIVE RESULT IS CONSIDERED BIASED HIGH

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES

TABLE C-1 (CONTINUED)
SITE 4 ANALYTICAL RESULTS FOR METALS IN SUBSURFACE SOILS (mg/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND SAMPLES					
ANALYTE	SB17	SB18	SB19	SB20	SB21	SB22
ALUMINUM	13500	14500	12000	14300	8790	7370
ANTIMONY	5.9 U	6 U	5.9 U	5.9 U	5.6 U	5.9 U
ARSENIC	4.9	5.1	6.1	6	3.9	3.2
BARIUM	64.3	58.2	34.6 B	42	67.7	51
BERYLLIUM	1.1	1	0.67 B	0.75 B	0.94	0.67 B
CADMIUM	0.54 U	0.54 U	0.54 U	0.54 U	0.51 U	0.54 U
CALCIUM	788 B	684 B	240 B	315 B	828 B	745 B
CHROMIUM	17.1	19.5	23	23.5	25	13.2
COBALT	8.4 B	9.4	7.6 B	9.4	3.9 B	6.5 B
COPPER	8.5	9.2	12	10.7	12.7	16.6
IRON	19800	21900	23700	25800	17300	13300
LEAD	13.2	12.4	9	11.9	6.4	5.3
MAGNESIUM	1890	2070	2250	2380	2380	1750
MANGANESE	487	411	335	343	116	370
MERCURY	0.06 U	0.06 U	0.06 U	0.05 U	0.05 U	0.06 U
NICKEL	8.7	9.5	9.7	12.1	9	7.2 B
POTASSIUM	608 B	693 B	728 B	855 B	494 B	396 B
SELENIUM	0.72 U	0.72 U	0.72 U	0.72 U	0.68 U	0.72 U
SILVER	0.72 U	0.72 U	0.72 U	0.72 U	0.68 U	0.72 U
SODIUM	54.8 B	54.9 B	76.5 B	57.1 B	80.3 B	74.8 B
THALLIUM	0.9 U	0.9 U	0.9 U	0.9 U	0.85 U	0.9 U
VANADIUM	30.7	33.1	35.1	37.9	29.6	22.6
ZINC	30.1	29.7	24.8	30	23.7	15.1
CYANIDE	1.1 U	1.2 U	1.2 U	1.2 U	1.1 U	1.2 U

QUALIFIERS
U= NONDETECTED RESULT
B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)

TABLE C-2
SITE 4 ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS IN SUBSURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES																	
ANALYTE**	SB1	SB2	SB3	SB4	SB5/31*	SB6/30*	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	SB16	SB23	SB24/32*
1,4-DICHLOROBENZENE	430 U	410 U	460 U	110 J	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
4-METHYLPHENOL	430 U	410 U	460 U	480 U	410 U	400 U	420 U	130 J	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
NAPHTHALENE	430 U	410 U	47 J	480 U	57 J	400 U	420 U	150 J	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
2-METHYLNAPHTHALENE	190 J	290 J	140 J	480 U	410 U	400 U	420 U	170 J	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
DIMETHYLPHTHALATE	430 U	54 J	460 U	480 U	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
ACENAPHTHENE	430 U	410 U	460 U	480 U	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	390 U	60 J	400 U	410 U
FLUORENE	430 U	410 U	460 U	480 U	410 U	400 U	420 U	73 J	420 U	52 J	390 U	410 U	400 U	400 U	390 U	120 J	45 J	75.5 J
PENTACHLOROPHENOL	1100 U	1000 U	1100 U	1200 U	1000 U	980 U	1000 U	1600 U	1000 U	950 U	950 U	1000 U	970 U	960 U	940 U	940 U	61 J	1000 U
PHENANTHRENE	430 U	83 J	460 U	480 U	410 U	400 U	420 U	350 J	43 J	320 J	390 U	410 U	400 U	400 U	350 J	1700	340 J	730
ANTHRACENE	430 U	410 U	460 U	480 U	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	56 J	300 J	60 J	134 J
DI-N-BUTYLPHTHALATE	430 U	67 J	460 U	480 U	117 J	400 U	420 U	100 BJ	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
FLUORANTHENE	430 U	110 J	460 U	480 U	410 U	400 U	86 J	350 J	420 U	190 J	390 U	410 U	400 U	400 U	550	2400	470	1690
CARBAZOLE	430 U	410 U	460 U	480 U	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	42 J	55 J	400 U	410 U
PYRENE	430 U	210 J	62 J	480 U	52 J	400 U	87 J	490 J	420 U	180 J	390 U	410 U	400 U	400 U	530	2700	610	1650
BENZ(A)ANTHRACENE	430 U	76 J	460 U	480 U	410 U	400 U	45 J	160 J	420 U	61 J	390 U	410 U	400 U	400 U	260 J	1100	150 J	1000
CHRYSENE	430 U	63 J	460 U	480 U	410 U	400 U	420 U	250 J	420 U	60 J	390 U	410 U	400 U	400 U	260 J	940	310 J	840
BIS(2-ETHYLHEXYL)PHTHALATE	430 U	740	1300	1500	4500 J	288 J	60 J	5400 E	320 J	390 U	390 U	410 U	400 U	400 U	94 J	75 J	680	410 U
DI-N-OCTYLPHTHALATE	770	410 U	460 U	480 U	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	390 U	390 U	400 U	410 U
BENZO(B)FLUORANTHENE	430 U	99 J	460 U	480 U	410 U	400 U	55 J	250 J	420 U	64 J	390 U	410 U	400 U	400 U	390	1500	320 J	1430
BENZO(K)FLUORANTHENE	430 U	59 J	460 U	480 U	410 U	400 U	420 U	100 J	420 U	390 U	390 U	410 U	400 U	400 U	120 J	450	59 J	440 J
BENZO(A)PYRENE	430 U	72 J	460 U	480 U	410 U	400 U	45 J	200 J	420 U	48 J	390 U	410 U	400 U	400 U	240 J	940	200 J	1005 J
INDENO(1,2,3-CD)PYRENE	430 U	56 J	460 U	480 U	410 U	400 U	420 U	74 J	420 U	390 U	390 U	410 U	400 U	400 U	110 J	390	91 J	340 J
DIBENZ(A,H)ANTHRACENE	430 U	410 U	460 U	480 U	410 U	400 U	420 U	660 U	420 U	390 U	390 U	410 U	400 U	400 U	390 U	100 J	400 U	102 J
BENZO(G,H,I)PERYLENE	430 U	60 J	460 U	480 U	410 U	400 U	420 U	96 J	420 U	390 U	390 U	410 U	400 U	400 U	120 J	470	110 J	390 J

QUALIFIERS
U = NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS
E = ESTIMATED VALUE WHERE RESULT IS OVER THE CALIBRATION RANGE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-2 (CONTINUED)
SITE 4 ANALYTICAL RESULTS FOR SVOCS IN SUBSURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND SAMPLES					
ANALYTE**	SB17	SB18	SB19	SB20	SB21	SB22
1,4-DICHLOROBENZENE	400 U	420 U	390 U	400 U	390 U	390 U
4-METHYLPHENOL	400 U	420 U	390 U	400 U	390 U	390 U
NAPHTHALENE	400 U	420 U	390 U	400 U	390 U	390 U
2-METHYLNAPHTHALENE	400 U	420 U	390 U	400 U	390 U	390 U
DIMETHYLPHTHALATE	400 U	420 U	390 U	400 U	390 U	390 U
ACENAPHTHENE	60 J	400 U	390 U	400 U	390 U	390 U
FLUORENE	120 J	400 U	390 U	400 U	390 U	390 U
PENTACHLOROPHENOL	940 U	940 U	950 U	970 U	940 U	940 U
PHENANTHRENE	400 U	400 U	390 U	400 U	390 U	390 U
ANTHRACENE	400 U	400 U	390 U	400 U	390 U	390 U
DI-N-BUTYLPHTHALATE	400 U	400 U	390 U	400 U	390 U	390 U
FLUORANTHENE	400 U	400 U	390 U	400 U	390 U	390 U
CARBAZOLE	400 U	400 U	390 U	400 U	390 U	390 U
PYRENE	400 U	400 U	390 U	400 U	390 U	390 U
BENZ(A)ANTHRACENE	400 U	400 U	390 U	400 U	390 U	390 U
CHRYSENE	400 U	400 U	390 U	400 U	390 U	390 U
BIS(2-ETHYLHEXYL)PHTHALATE	400 U	400 U	390 U	400 U	390 U	390 U
DI-N-OCTYLPHTHALATE	400 U	400 U	390 U	400 U	390 U	390 U
BENZO(B)FLUORANTHENE	400 U	400 U	390 U	400 U	390 U	390 U
BENZO(K)FLUORANTHENE	400 U	400 U	390 U	400 U	390 U	390 U
BENZO(A)PYRENE	400 U	400 U	390 U	400 U	390 U	390 U
INDENO(1,2,3-CD)PYRENE	400 U	400 U	390 U	400 U	390 U	390 U
DIBENZ(A,H)ANTHRACENE	400 U	400 U	390 U	400 U	390 U	390 U
BENZO(G,H,I)PERYLENE	400 U	400 U	390 U	400 U	390 U	390 U

QUALIFIERS
U = NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS

* ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-3
SITE 4 - ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS IN SUBSURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES																	
ANALYTE**	SB1	SB2	SB3	SB4	SB5/31*	SB6/30*	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	SB16	SB23	SB24/32*
METHYLENE CHLORIDE	13 U	2 BJ	14 U	4200 U	2 J	2.5 J	15 U	7 BJ	11 BJ	4 BJ	4 BJ	3 BJ	3 BJ	4 BJ	4 BJ	4 BJ	13 U	3 BJ
ACETONE	15	25	64	4200 U	120	46 B	86 B	74	48 B	100	9 J	12 U	13	13 U	11 J	16	89	110 B
CARBON DISULFIDE	13 U	11 U	14 U	4200 U	12 U	12 U	15 U	6 J	12 U	12 U	12 U	12 U	13 U	13 U	13 U	12 U	13 U	12 U
2-BUTANONE	13 U	11 U	14 U	4200 U	25 J	16	15 U	32	12 U	12 U	12 U	12 U	13 U	13 U	13 U	12 U	13 U	17
TOLUENE	13 U	11 U	5 J	4200 U	2 J	12 U	15 U	16 U	14	12 U	12 U	2 J	13 U	13 U	2 J	12 U	3 J	3 J
CHLOROBENZENE	13 U	11 U	14 U	4200 U	12 U	12 U	15 U	16 U	230	12 U	12 U	12 U	13 U	13 U	13 U	12 U	13 U	12 U
ETHYLBENZENE	7 J	2 J	8 J	4200 U	3 J	12 U	3 J	26	40	12 U	12 U	12 U	13 U	13 U	13 U	12 U	13 U	3 J
XYLENE (TOTAL)	3 J	2 J	20	4200 U	5.5 J	12 U	15 U	27	49	12 U	12 U	12 U	13 U	13 U	13 U	12 U	6 J	5.5 J

QUALIFIERS
U= NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS
BJ = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)
BJ = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. ESTIMATED FALSE POSITIVES)

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-3 (CONTINUED)
SITE 4 - RESULTS FOR VOCS IN SUBSURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND SAMPLES					
ANALYTE**	SB17	SB18	SB19	SB20	SB21	SB22
METHYLENE CHLORIDE	4 BJ	12 U	12 U	2 BJ	3 BJ	3 BJ
ACETONE	12 U	12 U	12 U	4 BJ	12 U	7 BJ
CARBON DISULFIDE	12 U	12 U	12 U	12 U	12 U	12 U
2-BUTANONE	12 U	12 U	12 U	12 U	12 U	12 U
TOLUENE	2 J	12 U	12 U	12 U	2 J	12 U
CHLOROBENZENE	12 U	12 U	12 U	12 U	12 U	12 U
ETHYLBENZENE	12 U	12 U	12 U	12 U	12 U	12 U
XYLENE (TOTAL)	12 U	12 U	12 U	12 U	12 U	12 U

QUALIFIERS
U= NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS
BJ = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. ESTIMATED FALSE POSITIVES)

** ONLY COMPOUND WITH DETECTIONS ARE SHOWN

TABLE C-4
SITE 4 ANALYTICAL RESULTS FOR PESTICIDES AND PCBS IN SUBSURFACE SOILS (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES																	
ANALYTE**	SB1	SB2	SB3	SB4	SB5/31*	SB6/30*	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	SB16	SB23	SB24/32*
DIELDRIN	4.3 U	4.1 U	4.6 U	4.9 U	4.1 U	22 J	4.2 U	66 U	4.2 U	3.9 U	3.9 U	4.1 U	4 U	4 U	770 U	310 U	5.4 P	4.1 U
4,4'-DDD	4.9	4.1 U	4.6 U	4.9 U	4.1 U	4.1 U	4.2 U	66 U	4.2 U	3.9 U	3.9 U	4.1 U	4 U	4 U	770 U	310 U	4.3 P	4.1 U
ENDOSULFAN SULFATE	4.3 U	4.1 U	4.6 U	4.9 U	4.1 U	4.1 U	4.2 U	66 U	4.2 U	3.9 U	3.9 U	4.1 U	4 U	4 U	770 U	680 PD	4 U	4.1 U
METHOXYCHLOR	22 U	21 U	24 U	25 U	21 U	55.3 J	22 U	340 U	22 U	20 U	20 U	21 U	21 U	21 U	6300 D	2900 D	21 U	21 U
ALPHA-CHLORDANE	2.2 U	2.1 U	2.4 U	2.5 U	12.5 J	18 J	2.2 U	33 J	2.2 U	2 U	2 U	2.1 U	2.1 U	2.1 U	400 U	160 U	2.1 U	2.1 U
AROCLOR-1248	66 P	46 P	150	110 P	660 J	41 U	42 U	3500 P	130 P	56	39 U	41 U	40 U	40 U	7700 U	3100 U	180 P	41 U
AROCLOR-1254	43 U	41 U	46 U	49 U	41 U	510 J	42 U	660 U	42 U	39 U	39 U	41 U	40 U	40 U	7700 U	3100 U	40 U	41 U

QUALIFIERS
U = NONDETECTED RESULT
P = PERCENT DIFFERENCE IN RESULTS ON TWO GC COLUMNS EXHIBITED IMPRECISION
D = DILUTED
J = ESTIMATED POSITIVE VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-4 (CONTINUED)
SITE 4 RESULTS FOR PESTICIDES/PCBS IN SUBSURFACE SOILS (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND SAMPLES					
ANALYTE**	SB17	SB18	SB19	SB20	SB21	SB22
DIELDRIN	4 U	4.2 U	3.9 U	4 U	3.9 U	3.9 U
4,4'-DDD	4 U	4.2 U	3.9 U	4 U	3.9 U	3.9 U
ENDOSULFAN SULFATE	4 U	4.2 U	3.9 U	4 U	3.9 U	3.9 U
METHOXYCHLOR	21 U	22 U	20 U	21 U	20 U	20 U
ALPHA-CHLORDANE	2.1 U	2.2 U	2 U	2.1 U	2 U	2 U
AROCLOR-1248	40 U	42 U	39 U	40 U	39 U	39 U
AROCLOR-1254	40 U	42 U	39 U	40 U	39 U	39 U

QUALIFIERS
U = NONDETECT

** ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-5
SITE 4 ANALYTICAL RESULTS FOR METALS IN SURFACE SOILS (mg/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES									
ANALYTE	SS-04-01	SS-04-02	SS-04-03	SS-04-04	SS-04-05/20*	SS-04-06	SS-04-07	SS-04-08	SS-04-09	SS-04-10/21*
ALUMINUM	11600	11400	11800	12100	9350	11000	9360	12000	13100	11850
ANTIMONY	4.5 U	4 U	4.1 U	4.5 U	4.3 U	5.4 U	4.7 U	5 U	4.2 U	4.5 U
ARSENIC	4.5	4	3.9	4.7	2.05	3.8	3.4	4.6	3.8	4.8
BARIUM	45.8	116	45.5	64.8	24.75	57.6	62.7	69.1	46.7	79.1
BERYLLIUM	0.78	0.83	0.77	0.79	0.515	0.76	0.67	0.98	0.64	1
CADMIUM	0.27 U	0.24 U	0.25 U	0.27 U	0.26 U	0.32 U	0.28 U	0.3 U	0.46	0.27 U
CALCIUM	1010	10200	1670	1170	1200	989	728	817	674	2055
CHROMIUM	20.8	17.7	15.7	17.3	16.05	14.6	18.9	21.9	22.7	18.9
COBALT	6.7	7	8.6	7.6	7.85	5.7	7.5	8.9	6.9	9.05
COPPER	10.7	18.9	12.8	11.4	48.15	17.8	10.4	12.3	51	8.7
IRON	21000	18100	18900	18300	15200	17300	18100	23300	25000	20800
LEAD	9.7	30.2	15.1	15.1	5.3	20.1	9.8	11.4	21.3	18
MAGNESIUM	2660	4450	2330	2040	1910	1770	2210	2580	2300	2795
MANGANESE	184	474	367	499	246.5	140	163	147	201	669.5
MERCURY	0.05 U	0.21	0.06 U	0.05 U	0.05 U	0.06 U	0.05 U	0.06 U	0.06 U	0.05 U
NICKEL	10.1	15	10.8	9.3	11.25	10.2	10.9	10.5	12	11.9
POTASSIUM	851	929	823	686	206 B	668	711	977	853	950.5
SELENIUM	0.36 U	0.32 U	0.33 U	0.36 U	0.34 U	0.43 U	0.38 U	0.4 U	0.34 U	0.36 U
SILVER	0.36 U	0.32 U	0.33 U	0.36 U	0.34 U	0.43 U	0.38 U	0.4 U	0.34 U	0.36 U
SODIUM	56.2 B	128 B	64.4 B	109 B	68.6 B	59.5 B	74.7 B	91.1 B	55.9 B	61.1 B
THALLIUM	0.45 U	0.4 U	0.41 U	0.45 U	0.43 U	0.54 U	0.47 U	0.5 U	0.42 U	0.45 U
VANADIUM	32.7	35.3	25.7	25.7	22.25	23.8	28.8	32.2	28.2	27.4
ZINC	34.6	64.6	33.8	31.3	15.3	50.1	27.3	28.5	60.5	53.2
CYANIDE	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U

QUALIFIERS
U= NONDETECTED RESULT
B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES

TABLE C-6
ANALYTICAL RESULTS FOR METALS IN BACKGROUND SURFACE SOILS (mg/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND SAMPLES									
	WBG-01	WBG-02	WBG-03/04*	WBG-05	WBG-06	WBG-07	WBG-08	WBG-09	WBG-9A	WBG-10
ALUMINUM	14900	14600	15900	13200	17600	17900	14000	16700	11200	13100
ANTIMONY	6.3 U	6.4 U	7.2 U	6.7 U	6.8 U	7.6 U	6.4 U	6.7 U	5.4 U	5.6 U
ARSENIC	5.6	6.1	4.75	5.2	7.2	6.9	4.2	3.7	6.3	6
BARIUM	61.8	39.8	38.1 B	37.2 B	48.1	113	76.2	34.1 B	37.3	77.4
BERYLLIUM	0.88 B	0.64 B	0.72 B	0.69 B	0.82 B	1.1 B	0.83 B	0.68 B	0.84	1.1
CADMIUM	0.57 U	0.58 U	0.65 U	0.6 U	0.62 U	0.69 U	0.59 U	0.61 U	0.49 UL	0.51 UL
CALCIUM	877 B	684 B	508 B	603 B	553 B	960 B	972 B	1020	1070	1100
CHROMIUM	20.9	21.4	21.35	18.1	27	22.6	15.8	20.2	12	14
COBALT	9 B	8.9 B	9.3 B	7.9 B	10.7	8.7 B	6.6 B	7.1 B	6.2	8.9
COPPER	9.2	11.5	11.65	12.1	11.5	10.9	10.1	7.9	9.3	22.7
CYANIDE	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U	1.1 U
IRON	22400	23600	23800	20900	28800	21900	15300	20000	15100	19100
LEAD	13.2	10	9.25	9.6	11.3	11.3	11.8	6.7	7.7	19
MAGNESIUM	2380	2490	2920	2500	3080	2670	1810	1910	2580	2480
MANGANESE	352	305	343.5	217	319	573	338	132	185	414
MERCURY	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 B	0.06 U	0.06 UL	0.06 UL
NICKEL	13.4	13.1	13.6	11.6	14.7	15	11.5	10.7	8.1	9.9
POTASSIUM	816 B	795 B	963 B	921 B	1240	839 B	516 B	681 B	766	1060
SELENIUM	0.76 U	0.77 U	0.87 U	0.81 U	0.82 U	0.93 U	0.78 U	0.81 U	0.65 U	0.68 U
SILVER	0.76 U	0.77 U	0.87 U	0.81 U	0.82 U	0.93 U	0.78 U	0.81 U	0.65 UL	0.68 UL
SODIUM	59.2 B	25.9 B	66.9 B	52.7 B	60.6 B	58.6 B	53.1 B	63.2 B	57.9 B	64.7 B
THALLIUM	0.95 U	0.96 U	1.1 U	1 U	1 U	1.2 U	0.98 U	1 U	0.81 U	0.86 U
VANADIUM	32.3	35.8	38.2	30.4	42.8	38	24.5	31.6	18.1	21.3
ZINC	31.5	31.9	32.3	28.8	35.3	50.2	25.6	19.8	20.2	33

QUALIFIERS
U= NONDETECTED RESULT
B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)
UL = NONDETECTED RESULT IS CONSIDERED BIASED LOW

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES

TABLE C-7
SITE 4 ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS IN SURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES								
ANALYTE**	**SS-04-01**	**SS-04-02**	**SS-04-03**	**SS-04-04**	**SS-04-05/20***	**SS-04-06**	**SS-04-07**	**SS-04-08**	**SS-04-09**
FLUORENE	420 U	380 U	59 J	400 U	390 U	420 U	410 U	390 U	410 U
PENTACHLOROPHENOL	1000 U	930 U	940 U	970 U	950 U	1000 U	42 J	950 U	980 U
PHENANTHRENE	420 U	320 J	610	80 J	390 U	420 U	410 U	390 U	410 U
ANTHRACENE	420 U	55 J	120 J	400 U	390 U	420 U	410 U	390 U	410 U
FLUORANTHENE	420 U	590	1200	190 J	390 U	60 J	410 U	390 U	410 U
CARBAZOLE	420 U	380 U	120 J	400 U	390 U	420 U	410 U	390 U	410 U
PYRENE	420 U	410	980	200 J	390 U	51 J	410 U	390 U	410 U
BENZ(A)ANTHRACENE	420 U	250 J	870	110 J	390 U	420 U	410 U	390 U	410 U
CHRYSENE	420 U	270 J	710	100 J	390 U	420 U	410 U	390 U	410 U
BIS(2-ETHYLHEXYL)PHTHALATE	54 J	380 U	52 J	400 U	390 U	110 J	410 U	390 U	82 J
DI-N-OCTYLPHTHALATE	420 U	380 U	390 U	400 U	390 U	420 U	410 U	390 U	410 U
BENZO(B)FLUORANTHENE	420 U	390	1100	210 J	390 U	58 J	410 U	390 U	410 U
BENZO(K)FLUORANTHENE	420 U	120 J	340 J	82 J	390 U	420 U	410 U	390 U	410 U
BENZO(A)PYRENE	420 U	260 J	700	170 J	390 U	46 J	410 U	390 U	410 U
INDENO(1,2,3-CD)PYRENE	420 U	150 J	240 J	140 J	390 U	420 U	410 U	390 U	410 U
DIBENZ(A,H)ANTHRACENE	420 U	380 U	88 J	400 U	390 U	420 U	410 U	390 U	410 U
BENZO(G,H,I)PERYLENE	420 U	170 J	260 J	170 J	390 U	420 U	410 U	390 U	410 U

QUALIFIERS
U = NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** = ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-7 (CONTINUED)
SITE 4 ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS IN SURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES								
ANALYTE**	SS-04-10/21*	SS-04-11	SS-04-12	SS-04-13	SS-04-14	SS-04-15	SS-04-16	SS-04-17	SS-04-18
FLUORENE	390 U	400 U	390 U	400 U	380 U	400 U	360 U	410 U	400 U
PENTACHLOROPHENOL	940 U	960 U	950 U	960 U	930 U	970 U	860 U	990 U	960 U
PHENANTHRENE	42 J	48 J	390 U	400 U	150 J	400 U	360 U	410 U	400 U
ANTHRACENE	390 U	400 U	390 U	400 U	380 U	400 U	360 U	410 U	400 U
FLUORANTHENE	63 J	130 J	390 U	400 U	240 J	400 U	360 U	410 U	400 U
CARBAZOLE	390 U	400 U	390 U	400 U	380 U	400 U	360 U	410 U	400 U
PYRENE	72.5 J	120 J	390 U	400 U	260 J	400 U	360 U	410 U	400 U
BENZ(A)ANTHRACENE	89 J	79 J	390 U	400 U	130 J	400 U	360 U	410 U	400 U
CHRYSENE	83 J	62 J	390 U	400 U	100 J	400 U	360 U	410 U	400 U
BIS(2-ETHYLHEXYL)PHTHALATE	390 U	480	390 U	400 U	500	400 U	360 U	410 U	400 U
DI-N-OCTYLPHTHALATE	390 U	400 U	390 U	400 U	380 U	400 U	360 U	410 U	400 U
BENZO(B)FLUORANTHENE	150 J	78 J	390 U	400 U	110 J	400 U	360 U	410 U	400 U
BENZO(K)FLUORANTHENE	46 J	42 J	390 U	400 U	47 J	400 U	360 U	410 U	400 U
BENZO(A)PYRENE	120 J	68 J	390 U	400 U	100 J	400 U	360 U	410 U	400 U
INDENO(1,2,3-CD)PYRENE	100 J	400 U	390 U	400 U	74 J	400 U	360 U	410 U	400 U
DIBENZ(A,H)ANTHRACENE	390 U	400 U	390 U	400 U	380 U	400 U	360 U	410 U	400 U
BENZO(G,H,I)PERYLENE	110 J	400 U	390 U	400 U	88 J	400 U	360 U	410 U	400 U

QUALIFIERS
U = NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** = ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-8
SITE 4 - ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS IN SURFACE SOIL (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES								
ANALYTE**	**SS-04-01**	**SS-04-06**	**SS-04-07**	**SS-04-10/21***	**SS-04-11**	**SS-04-13**	**SS-04-14**	**SS-04-16**	**SS-04-18**
ACETONE	12 U	13 U	16 U	18 J	12 U	36	65	61	42
2-BUTANONE	12 U	13 U	12 U	12 U	12 U	9 J	12 U	12 U	12 U
TRICHLOROETHENE	6 U	6 U	6 U	22.5	25	22	7	8	8
TOLUENE	6 U	6 U	6 U	6 U	6 U	6 U	6 U	1 J	6 U
CHLOROBENZENE	6 U	6 U	6 U	6 U	6 U	6 U	4 J	6 U	6 U
ETHYLBENZENE	6 U	6 U	6 U	6 U	6 U	6 U	4 J	6 U	6 U
STYRENE	6 U	6 U	6 U	6 U	6 U	6 U	6 U	1 J	6 U
XYLENE (TOTAL)	6 U	6 U	6 U	6 U	6 U	6 U	10	5 J	6 U

QUALIFIERS
U= NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** = ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-9
SITE 4 ANALYTICAL RESULTS FOR PESTICIDES AND PCBS IN SURFACE SOILS (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SITE RELATED SAMPLES					
ANALYTE**	SS-04-01	SS-04-07	SS-04-09	SS-04-10/21*	SS-04-13	SS-04-16
4,4'-DDE	4.2 U	4.1 U	6	3.9 U	4 U	3.9 U
4,4'-DDD	4.2 U	4.1 U	22	3.9 U	4 U	3.9 U
AROCLOR-1248	42 U	41 U	64	139.5	40 U	39 U

QUALIFIERS
U = NONDETECTED RESULT

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
** = ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN

TABLE C-9 (CONTINUED)
SITE 4 ANALYTICAL RESULTS FOR PESTICIDES AND PCBS IN SURFACE SOILS (ug/kg)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND SAMPLES									
ANALYTE	**WBG-01**	**WBG-02**	**WBG-03/04***	**WBG-05**	**WBG-06**	**WBG-07**	**WBG-08**	**WBG-09**	**WBG-9A**	**WBG-10**
4,4'-DDE	4 UJ	4 UJ	4.05 UJ	3.9 UJ	4.1 UJ	4.1 UJ	3.9 UJ	4 UJ	3.9 UR	4 U
4,4'-DDT	4 UJ	4 UJ	4.05 UJ	3.9 UJ	4.1 UJ	4.1 UJ	3.9 UJ	4 UJ	3.9 UR	4 U
AROCLOR-1248	40 UJ	40 UJ	40 UJ	39 UJ	41 UJ	41 UJ	39 UJ	40 UJ	39 UR	40 U

QUALIFIERS
U = NONDETECTED RESULT
UJ = NONDETECTED RESULT IS AN ESTIMATED VALUE
UR = NONDETECTED RESULT IS AN ESTIMATED VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES

TABLE C-10

AREA C ANALYTICAL RESULTS FOR TOTAL METALS IN SURFACE WATER (ug/l)

PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)

NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND				DOWNSTREAM									
ANALYTE	4B	3A	3B	C8-SW	6A	6B	C1-SW	C2-SW	5A	5B	C4-SW	C5-SW	C7/C10-SW*	C9-SW
ALUMINUM	165 B	1000 U	501 B	62.1 B	1000 U	196 B	458 B	500 B	1000 U	189 B	2360	2090	62.8 B	570 B
ANTIMONY	49 U	10 U	49 U	32 UL	10 U	49 U	32 UL	35.8 B	10 U	49 U	32 UL	32 UL	32 UL	32 UL
ARSENIC	3 UL	2 U	3 UL	2 U	2 U	3 UL	2 U	2 U	2 U	3 UL	2 U	2 U	2 U	2 U
BARIUM	93	500 U	60	60.6 B	500 U	43	65.2 B	80.7	500 U	39	62.9 B	81.1	64.4 B	88
BERYLLIUM	3 B	0.5 U	3 B	1 UL	0.5 U	3 B	1 UL	1 UL	1 B	3 B	1 UL	1 UL	1 UL	1 UL
CADMIUM	3 U	4	3 U	3 U	2 U	3 U	3 U	3 U	2	3 B	3 U	3 U	3 U	3 U
CALCIUM	42800	17000 B	15900	18300	26000 B	8590	10400	10800	21000 B	13300	20200	19300	19100	20100
CHROMIUM	5 U	3 B	5 U	5 U	3 B	5 U	5 U	5 U	3 B	5 U	5.8 K	5 U	5 U	5 U
COBALT	6 B	2 U	6 U	3 UL	2 U	6 U	3 UL	3 UL	2 U	6 U	3 UL	3.7 B	3 UL	3 UL
COPPER	5 B	25 U	4 U	2 UL	25 U	4 U	3.1 B	3.2 B	25 U	4 B	6.9 B	15.5 L	3.6 B	2.4 B
IRON	186	320 B	630	110 B	320 B	293	794	1300	270 B	239	2960	4900	165 B	983
LEAD	1 B	2 U	1.4 B	1 U	2 B	1.6 B	1.1 K	3.2 K	2 U	1.4 B	9.5	22.7	1 U	2.5 K
MAGNESIUM	13700	8000 B	6590	7240	14000 B	4150	4070	4220	9000 B	6150	11200	11500	6310	8410
MANGANESE	159	100 U	83	22.3 B	100 U	25	74.4	65.3	100	36	130	364	28.9 L	109
MERCURY	0.2 U	0.2 U	0.2 U	0.13 UL	0.2 U	0.2 U	0.13 UL	0.27 L	0.2 U	0.2 U	0.13 UL	0.14 UL	0.135 UJ	0.14 UL
NICKEL	18 B	10 U	17 U	7 UL	10 U	17 U	7 UL	7.2 L	10 U	17 U	7.6 L	7 UL	7 UL	7 UL
POTASSIUM	2150	2000 B	1700	1130	1300 B	1570	795	763	1200 B	1290	1220	3410	1330	1240
SELENIUM	5 U	2 U	5 U	2 UJ	2 U	5 U	2 UJ	2 UJ	2 U	5 U	2 UJ	2 UJ	2 UJ	2 UJ
SILVER	10 U	2 U	10 U	4 UL	2 U	10 U	4 UL	4 UL	2 U	10 U	4 UL	4 UL	4 UL	4 UL
SODIUM	42900	8400 B	9960	8980	9500 B	7050	7810	8090	13000 B	7320	7430	7520	10050	9490
THALLIUM	2 U	2 U	2 U	4.2 B	2 U	2 U	3 UL	6.4 B	2 U	2 U	3 UL	3 UL	3 UL	3 UL
VANADIUM	6 B	10 U	8 B	1 UL	10 U	9 B	1.4 B	3.4 B	10 U	5 U	4.3 B	10.1 B	1 UL	1 B
ZINC	23 B	20 U	24 B	3.8 B	20 B	5 B	17.2 B	11.6 B	20 U	9 B	42.8	49.6	25.1 L	27 L

QUALIFIERS:

U =NONDETECTED RESULT

B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)

J = ESTIMATED POSITIVE RESULTS

K = POSITIVE RESULT IS CONSIDERED BIASED HIGH

L = POSITIVE RESULT IS CONSIDERED BIASED LOW

UL = NONDETECTED RESULT IS CONSIDERED BIASED LOW

UJ = NONDETECTED RESULT IS AN ESTIMATED VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES

SAMPLES COLLECTED - PHASE 1 (3A, 6A, 5A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C2-SD, C7/C10-SD, C9-SD)

TABLE C-11
AREA C ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS IN SURFACE WATER (ug/l)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND				DOWNSTREAM									
ANALYTE	4B	3A	3B	C8-SW	6A	6B	C1-SW	C2-SW	5A	5B	C4-SW	C5-SW	C7/C10-SW*	C9-SW
CARBON DISULFIDE	10 U	5 U	10 U	10 U	5 U	10 U	10 U	10 U	5 U	10 U	10 U	10 U	2.5 J	10 U

QUALIFIERS:
U =NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
SAMPLES COLLECTED - PHASE 1 (3A, 5A, 6A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C2-SD, C7/C10-SD, C9-SD)

TABLE C-12
AREA C ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS IN SURFACE WATER (ug/l)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND			DOWNSTREAM						
ANALYTE	4B	3A	3B	6A	6B	C2-SW	5A	5B	C7/C10-SW*	C9-SW
DIETHYLPHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	0.3 J	10 U	2 J	10 U
DI-N-OCTYLPHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	0.2 J	10 U	10 UJ	10 UJ

QUALIFIERS
U = NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS
UJ = NONDETECTED RESULT IS AN ESTIMATED VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
SAMPLES COLLECTED - PHASE 1 (3A, 6A, 5A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C2-SD, C7/C10-SD, C9-SD)

TABLE C-13
AREA C ANALYTICAL RESULTS FOR PESTICIDES AND PCBS IN SURFACE WATER (ug/L)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND			DOWNSTREAM					
ANALYTE	4B	3A	3B	6A	6B	5A	5B	C7/C10-SW*	C9-SW

NO PESTICIDES OR PCBS WERE DETECTED IN SURFACE WATER SAMPLES IN THE VICINITY OF SITE 4

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
SAMPLES COLLECTED - PHASE 1 (3A, 6A, 5A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C7/C10-SW, C9-SW)

TABLE C-14
AREA C ANALYTICAL RESULTS FOR METALS IN SEDIMENT (mg/kg)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND					DOWNSTREAM										
ANALYTE	4A	4B	3A	3B	C8-SD	6A	6B	C1-SD	C2-SD	5A	5B	C3-SD	C4-SD	C5-SD	C7/C10-SD*	C9-SD
ALUMINUM	3700	5240 J	4000	3250 J	2920	2400	2240 J	10800	8950	2300	2670 J	15700	4280	10100	7750	5840
ANTIMONY	1 U	10.8 UJ	1 U	11.9 UJ	6.3 UL	1 U	12.7 UJ	11.1 UL	9 UL	1 U	12.3 UJ	7.5 UL	6.6 UL	6.4 UL	8.3 UL	8.5 B
ARSENIC	3.4	3.1 B	2.3	2.8 B	2.8	1.2	0.76 B	4.8	4.2	0.55	2.9 B	6.4	4.3 K	5.1	8.5 K	3.1
BARIUM	50 U	74.6	50 U	31.4	40.6 J	50 U	38.2	92.9	84.5	50 U	38.8	42.2	40.8	50.4	74.2 J	74 J
BERYLLIUM	0.65	1.3 B	0.52	0.97 B	0.62 L	0.93	1 B	1.2 L	1.1 L	0.49	1 B	0.58 L	1.1 L	0.71 L	0.88 L	0.78 L
CADMIUM	0.2	3.1 B	0.2 U	1.5 B	0.8 B	0.2 U	0.78 B	1 U	0.92 B	0.2 U	1 B	2.7 B	3.8 B	1.9 B	8.2 R	1.3 B
CALCIUM	9900 B	20300 J	2000 B	1290 J	1060 J	760 B	376 J	1030	646	800 B	592 J	735	4140	1010	2470 J	1220
CHROMIUM	14	20.5 J	8.2	11.7 J	7.7 J	6	5.5 B	13.6	15.1	4.1	7.3 B	23.4 J	9.9 J	15.9	18.3 J	12.7 J
COBALT	6	9.3 K	4.4	5.1 B	3.5 B	2.6	3.1 B	7.8 B	6.3 B	2.3	3.5 B	5.3 B	6.9 B	7.9 L	7.4 J	4.5 B
COPPER	15.4 B	34.6 J	8.6 B	7.5 J	5.4 J	6.4 B	3.1 B	8.5 L	5.5 L	5.2 B	2.8 B	11.6 L	29.4	12.2	29.7 J	8.7 J
IRON	16200	25400	5800	11200	9010	4400	5570	14300	11900	400	9610	25600	34600	17300	48250	11700
LEAD	30	20.4 K	0.2 U	24.6 J	9.8 J	8.6	13.9 K	27.9	15.9	8.8	10.7 K	12.1	28.2	14.9	42.2 J	16.1 J
MAGNESIUM	4600 B	12700 J	1400 B	1320 J	1040 J	550 B	670 J	1620	1440	400 B	747 J	2230	3370	2010	1920 J	1380 J
MANGANESE	500	848 J	220	144 J	219 J	96	29.6 J	242	96.8	200	125 J	126	528	372	389.5 J	168 J
MERCURY	0.07 U	0.1 UJ	0.07 U	0.11 UJ	0.05 UJ	0.07 U	0.11 UJ	0.1 UL	0.07 UL	0.07 U	0.1 UJ	0.05 UL	0.06 UL	0.06 UL	0.06 UJ	0.06 UJ
NICKEL	10	13.2 B	6	6.8 B	4.4 J	18	6.8 B	11.3 L	8.3 L	9	4.3 U	7.3 L	16.8	8.9 L	17 J	8.5 J
POTASSIUM	700 B	924	200 B	421	288	200 B	152	427	306	130 B	351	638	630	517	544	439
SELENIUM	0.2 U	1.2 UJ	0.2 U	1.2 UJ	0.4 UJ	0.2 U	1.2 UJ	0.69 UJ	0.56 UJ	0.2 U	1.1 UJ	0.82 J	0.41 UJ	0.4 UJ	0.52 UJ	0.48 UJ
SILVER	0.2 U	2.2 U	0.2 U	2.4 U	0.79 UJ	0.2 U	2.6 U	1.4 UL	1.1 UL	0.2 U	2.5 U	0.94 UL	0.83 UL	0.8 UL	2.14 J	0.97 UJ
SODIUM	50 B	732 J	50 U	340 J	67.2 B	50 U	197 J	129 B	84.1 B	50 U	288 J	88.9 B	72.9 B	70.1 B	328	164 B
THALLIUM	0.2 U	0.49 R	0.2 U	0.5 R	0.59 UL	0.2 U	0.46 R	1 UL	0.84 UL	0.2 U	0.46 R	0.71 UL	0.62 UL	0.6 UL	0.78 UL	0.73 UL
VANADIUM	18 K	34.2 K	13 K	13.6	11.8 L	9.2 K	7.8 B	23.8	20.7	5.9 K	11.8	43.4	14.7	28.1	25.5	18.5 L
ZINC	59	61.4 J	56	57.2 J	32.9	55	13.8 J	46.4	30.3	40	16.8 J	35	310	28.5	156.4	43.4

QUALIFIERS:
U =NONDETECTED RESULT
B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)
J = ESTIMATED POSITIVE RESULTS
K = POSITIVE RESULT IS CONSIDERED BIASED HIGH
L = POSITIVE RESULT IS CONSIDERED BIASED LOW
UL = NONDETECTED RESULT IS CONSIDERED BIASED LOW
UJ = NONDETECTED RESULT IS AN ESTIMATED VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
SAMPLES COLLECTED - PHASE 1 (6A, 5A, 4A, 3A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C2-SD, C7/C10-SD, C9-SD)

TABLE C-15
AREA C ANALYTICAL RESULTS FOR VOLATILE ORGANIC COMPOUNDS IN SEDIMENT (ug/kg)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND					DOWNSTREAM										
ANALYTE	4A	4B	3A	3B	C8-SD	6A	6B	C1-SD	C2-SD	5A	5B	C3-SD	C4-SD	C5-SD	C7/C10-SD*	C9-SD
ACETONE	50 UJ	14 UJ	66 B	13 UJ	16 UJ	340 B	46 J	130 B	110 B	150 B	13 UJ	9 B	14 UJ	9 B	17 UJ	15 UJ
2-BUTANONE	R	14 U	R	13 U	16 U	R	13 U	30 J	24 U	R	13 U	16 U	14 U	16 U	16 U	15 U
TOLUENE	25 U	14 U	25 U	13 U	16 U	13 B	13 U	10 J	24 U	7 B	13 U	16 U	14 U	16 U	16 U	15 U

QUALIFIERS:
U =NONDETECTED RESULT
B = ANALYTE QUALIFIED AS A RESULT OF BLANK CONTAMINATION (I.E. FALSE POSITIVES)
J = ESTIMATED POSITIVE RESULTS
UJ = NONDETECTED RESULT IS AN ESTIMATED VALUE
R = REJECTED VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
SAMPLES COLLECTED - PHASE 1 (6A, 5A, 4A, 3A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C2-SD, C7/C10-SD, C9-SD)

TABLE C-16
AREA C ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS IN SEDIMENT (ug/kg)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND				DOWNSTREAM						
ANALYTE	4A	4B	3A	3B	6A	6B	C2-SD	5A	5B	C7/C10-SD*	C9-SD
ACENAPHTHYLENE	60 J	360 U	5000 U	420 U	5000 U	440 U	480 U	5000 U	380 U	540 U	470 U
ACENAPHTHENE	5000 U	120 J	5000 U	420 U	5000 U	440 U	480 U	5000 U	380 U	540 U	77 J
DIBENZOFURAN	5000 U	72 J	5000 U	420 U	5000 U	440 U	480 U	5000 U	380 U	540 U	470 U
FLOURENE	5000 U	140 J	5000 U	420 U	5000 U	440 U	480 U	110 J	380 U	540 U	120 J
PHENANTHRENE	340 J	1200	5000 UJ	420 J	390 J	440 U	480 U	1100 J	380 U	335 J	1100
ANTHRACENE	72 J	290 J	5000 UJ	97 J	5000 U	440 U	480 U	230 J	380 U	55 J	320 J
FLOURANTHENE	670 J	1200	380 J	550	620 J	440 U	480 U	1300 J	380 U	625	1700
CARBAZOLE	NR	49 J	NR	420 U	NR	440 U	480 U	NR	380 U	540 U	81 J
PYRENE	540 J	1400	330 J	590	660 J	440 U	480 U	1100 J	380 U	1095 J	2000
BENZO(A)ANTHRACENE	280 J	720	210 J	280 J	270 J	440 U	480 U	420 J	380 U	350 J	880
CHRYSENE	340 J	740	190 J	340 J	290 J	440 U	480 U	440 J	380 U	360 J	670 J
BIS(2-ETHYLHEXYL)PHTHALATE	93 J	280 B	5000 U	200 B	5000 U	110 B	480 U	130 J	93 B	76.5 J	74 J
DI-N-OCTYLPHTHALATE	5000 U	94 J	5000 U	420 U	5000 U	440 U	480 U	5000 U	380 U	540 U	470 U
BENZO(B)FLUORANTHENE	230 J	820	5000 U	320 J	5000 U	440 U	480 U	310 J	380 U	425 J	910
BENZO(K)FLOURANTHENE	370 J	350 J	5000 U	200 J	5000 U	440 U	480 U	310 J	380 U	225 J	280 J
BENZO(A)PYRENE	270 J	650	5000 U	260 J	5000 U	440 U	480 U	310 J	380 U	320 J	660
INDENO(1,2,3-CD)PYRENE	5000 U	410	5000 U	190 J	5000 U	440 U	480 U	5000 U	380 U	200 J	420 J
DIBENZO(A,H)ANTHRACENE	5000 U	140 J	5000 U	53 J	5000 U	440 U	480 U	5000 U	380 U	80 J	86 J
BENZO(G,H,I)PERYLENE	5000 U	320 J	5000 U	150 J	5000 U	440 U	480 U	5000 U	380 U	245 J	480

QUALIFIERS
U = NONDETECTED RESULT
J = ESTIMATED POSITIVE RESULTS

TABLE C-17
AREA C ANALYTICAL RESULTS FOR PESTICIDES AND PCBS IN SEDIMENT (ug/kg)
PHASES 1 (12/90), 2 (6/92), AND 3 (1/95)
NAWC WARMINSTER, PENNSYLVANIA

	BACKGROUND				DOWNSTREAM						
ANALYTE	4A	4B	3A	3B	6A	6B	C2-SD	5A	5B	C7/C10-SD*	C9-SD
4,4'-DDT	R	3.7 U	R	4.2 U	R	4.4 U	4.8 UL	R	3.8 U	5.4 U	5.6
AROCLOR-1254	160 U	37 U	240 U	42 U	240 U	44 U	48 UL	240 UL	38 U	74.5	47 U

QUALIFIERS
U = NONDETECTED RESULT
R = REJECTED VALUE

* = DUPLICATE SAMPLE COLLECTED, THE RESULT SHOWN IS A COMBINATION OF THE TWO VALUES
SAMPLES COLLECTED - PHASE 1 (6A, 5A, 4A, 3A); PHASE 2 (6B, 5B, 4B, 3B); AND PHASE 3 (C2-SD, C7/C10-SD, C9-SD)

TABLE C-18
SITE 4 SOIL GAS SAMPLE RESULTS (ug/l)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SAMPLE ID	TP-1-02	TP-2-03	TP-3-02	TP-4-03	TP-5-02	TP-6-03	TP-7-03	TP-8-03	TP-9-02	TP-10-03	TP-11-02	TP-12-02
	Factor to Multiply PQL by	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.
PQL	COMPOUND	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
50	acetone	U	48 B	32 B	U	110 B	84 B	U	U	Q	Q	Q	Q
2.0	1,1-dichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
5.0	trans-1,2-dichloroethene	U	U	U	U	U	U	U	U	Q	Q	Q	Q
15	1,1-dichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
50	2-butanone	U	U	U	U	U	U	U	U	Q	Q	Q	Q
5.0	cis-1,2-dichloroethene	U	U	U	U	U	U	U	U	Q	Q	Q	Q
0.30	chloroform	U	U	U	U	U	U	U	U	U	U	U	U
0.30	1,1,1-trichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
0.030	carbon tetrachloride	U	U	U	U	U	U	U	U	U	U	U	U
3.0	benzene	U	U	U	U	U	U	U	U	Q	Q	Q	Q
15	1,2-dichloroethane	U	U	U	U	U	U	U	U	U	U	U	3800
0.30	trichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
3.0	toluene	U	U	U	U	U	U	1.1 J	U	Q	Q	Q	Q
0.30	tetrachloroethene	U	U	U	U	U	U	U	U	U	U	U	U
3.0	ethyl benzene	U	U	U	U	U	U	U	U	Q	Q	Q	Q
6.0	m-xylene/p-xylene	U	U	U	1.8 J	U	U	U	U	Q	Q	Q	Q
6.0	o-xylene/styrene	U	U	U	U	U	U	3.0 J	3.0 J	Q	Q	Q	Q
	Date Sampled	3/29/95	3/29/95	3/29/95	3/29/95	3/29/95	3/29/95	3/29/95	3/29/95	3/28/95	3/28/95	3/28/95	3/28/95
	Injected by	DK	DK	DK	DK	DK	DK	DK	DK	DK	DK	DK	DK
	Reviewed by	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS

COMMENTS: Q=not analyzed

11:41:40 AM NO PID

TABLE C-18
SITE 4 SOIL GAS SAMPLE RESULTS (ug/l)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SAMPLE ID	TP-13-02	TP-14-02	TP-16-04	TP-17-05	TP-19-06	TP-20	TP-21	TP-22	TP-23	TP-24	TP-25-06	TP-26-05
	Factor to Multiply PQL by	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.	Aq. Headsp.
PQL	COMPOUND	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
50	acetone	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
2.0	1,1-dichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
5.0	trans-1,2-dichloroethene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
15	1,1-dichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
50	2-butanone	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
5.0	cis-1,2-dichloroethene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
0.30	chloroform	U	U	U	U	U	U	U	U	U	U	U	U
0.30	1,1,1-trichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
0.030	carbon tetrachloride	U	U	U	U	U	U	U	U	U	U	U	U
3.0	benzene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
15	1,2-dichloroethane	U	U	U	U	U	U	U	U	U	U	U	U
0.30	trichloroethene	U	U	U	U	U	U	U	U	U	U	U	U
3.0	toluene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
0.30	tetrachloroethene	U	U	U	U	U	U	U	U	U	U	U	U
3.0	ethyl benzene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
6.0	m-xylene/p-xylene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
6.0	o-xylene/styrene	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
	Date Sampled	3/28/95	3/28/95	03/28/95	3/28/95	3/28/95	03/28/95	03/28/95	03/28/95	03/28/95	03/28/95	03/28/95	3/28/95
	Injected by	DK	DK	DK	DK	DK	DK	DK	DK	DK	DK	DK	DK
	Reviewed by	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS

COMMENTS: Q=not analyzed NO PID Q=not analyzed NO PID

11:41:40 AM

TABLE C-18
SITE 4 SOIL GAS SAMPLE RESULTS (ug/l)
PHASE 3 - 1995
NAWC WARMINSTER, PENNSYLVANIA

	SAMPLE ID	TP-27		TP-28-03	
	Factor to Multiply PQL by	1.0		1.0	
		Aq. Headsp.		Aq. Headsp.	
PQL	COMPOUND	ug/L		ug/L	
50	acetone		Q	270	B
2.0	1,1-dichloroethene		U		U
5.0	trans-1,2-dichloroethene		Q		U
15	1,1-dichloroethane		U		U
50	2-butanone		Q		U
5.0	cis-1,2-dichloroethene		Q		U
0.30	chloroform		U		U
0.30	1,1,1-trichloroethane		U		U
0.030	carbon tetrachloride		U		U
3.0	benzene		Q		U
15	1,2-dichloroethane		U		U
0.30	trichloroethene		U		U
3.0	toluene		Q		U
0.30	tetrachloroethene		U		U
3.0	ethyl benzene		Q		U
6.0	m-xylene/p-xylene		Q		U
6.0	o-xylene/styrene		Q		U
	Date Sampled	3/28/95		3/29/95	
	Injected by	DK		DK	
	Reviewed by	RS		RS	

COMMENTS:

11:41:40 AM

APPENDIX D

COST ESTIMATES

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
Institutional Controls
Alternate No. 1
(NAWCRA1)
5/30/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
1) Deed Restriction		LS	10000.00				10000				10000	
							10000	0	0	0	10000	
Burden @ 30% of Labor Cost									0		0	
Labor @ 10% of Labor Cost									0		0	
Material @ 10% of Material Cost								0			0	
SubContract @ 10% of Sub. Cost							1000				1000	
Total Direct Cost							11000	0	0	0	11000	
Indirects @ 75% of Total Direct Labor Cost									0		0	
Profit @ 10% of Total Direct Cost											1100	
TOTAL COST THIS PAGE											12100	

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
Institutional Controls
Alternate No. 1
(OMNAW1) 5/30/95

Annual Costs

ITEM	ITEM $ SEMI-ANNUAL SAMPLING	NOTES
1. Sampling	5000.00	6 groundwater samples, 40 manhours per sampling period, semi-annual plus travel, living & shipping costs.
2. Analysis	12000.00	6 groundwater samples, QA/QC samples per sampling period. (inc. blank & duplicate) TAL, Metals, TCL VOCS, TCL VOCS, TCL Pesticides
3. Reporting	9000.00	60 manhours per report including validation, plus other direct costs
TOTAL ANNUAL COST	26000.00	Monitoring will be performed semi-annually for 15 years

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
No Action With Monitoring
Alternate No. 1
(PWANW1) 5/30/95

282

PRESENT WORTH ANALYSIS

COST/YEAR COST OCCURS ($000'S)

COST COMPONENT	0	1	2	3	4	5	6	7	8	9	10	11
1. CAPITAL COST	12.1											
2. O & M COSTS		26										
3. ANNUAL COSTS	12.1	26	26	26	26	26	26	26	26	26	26	26
4. ANNUAL DISCOUNT RATE=5%	1	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614	0.585
PRESENT WORTH =	12	25	24	22	21	20	19	18	18	17	16	15

	12	13	14	15	16	17	18	19	20	21	22	23
O & M COSTS	26	26	26	26	0	0	0	0	0	0	0	0
ANNUAL DISCOUNT RATE=5%	0.557	0.53	0.505	0.481	0.458	0.436	0.416	0.396	0.377	0.359	0.342	0.326
PRESENT WORTH =	14	14	13	13	0	0	0	0	0	0	0	0

	24	25	26	27	28	29	30	TOTAL PRESENT WORTH (000'S)
O & M COSTS	0	0	0	0	0	0	0	
ANNUAL DISCOUNT RATE=5%	0.31	0.295	0.281	0.268	0.255	0.243	0.231	
PRESENT WORTH =	0	0	0	0	0	0	0	282

228.108
53.898
0

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
Excavation, Off-Site Disposal at Municipal Landfill
Alternate No.2
Sheet 1 of 2
(NAWCRA2)
5/30/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1)	3	MO	1000.00				3000				3000	
2) Storage Trailer (1)	3	MO	500.00				1500				1500	
3) Construction Survey		LS	6000.00				6000				6000	
4) Portable Communication Equipment	2	SET	1500.00				3000				3000	
5) Equipment Mobilization/Demobilization		LS	10000.00				10000				10000	
6) Site Utilities	3	MO	4000.00				12000				12000	
7) Security	3	MO	10000.00				30000				30000	
8) Decontamination Trailer	3	MO	1500.00				4500				4500	
DECONTAMINATION FACILITIES AND SERVICES												
1) Laundry Service	12	WKS	250.00				3000				3000	
2) Truck Decon Pad												
a) Concrete Pad - 6"	40	CY		70.00	125.00	5.00		2800	5000	200	8000	
b) Gravel Base - 6"	30	CY		7.50	3.33	8.00		225	100	240	565	
c) Curb	120	LF		3.07	1.99	0.05		368	239	6	613	
d) Collection Sump	1			1450.00	500.00	220.00		1450	500	220	2170	
e) Splash Guard	780	SF		1.25	1.00			975	780		1755	
3) Decontamination Services	3	MO	1200.00				3600				3600	
4) Decon Water	39000	GAL	0.20				7800				7800	
5) Clean Water Storage Tank	1			3000.00	300.00			3000	300		3300	3000 Gallon
6) Spent Water Storage Tank	1			5000.00	400.00			5000	400		5400	5000 Gallon
ACCESS ROAD												
1) Gravel Access Road	8890	SY		2.18	1.60	0.33		19380	14224	2934	36538	4000'
2) Geotextile Liner	8900	SY		1.50	0.10			13350	890		14240	
3) Drainage Culvert 12" CS	100	LF		18.50	3.96	0.67		1850	396	67	2313	5 @ 20'
EROSION/SEDIMENT CONTROL												
1) Silt Fence	2000	LF		0.37	0.33			740	660		1400	
2) Hay Bales	2000	LF		0.75	2.60	0.90		1500	5200	1800	8500	Place & Remove
STAGING AREAS												
1) Grading	2222	CY			1.39	1.40			3089	3111	6199	
2) Synthetic Liner	62700	SF	1.00				62700				62700	
3) Soil Layer - 12"	2100	CY			0.63	0.57			1323	1197	2520	
4) Soil Cover (10 mil Reinforced Plastic)	62700	SF	0.30				18810				18810	
TEST PITS												
1) Excavate Waste Soil	206	CY			1.27	1.49			262	307	569	33 Pits
EXCAVATION												
1) Excavate Clean Soil	2600	CY			1.41	1.65			3666	4290	7956	
a) Haul Soil To Staging Area	3000	CY			0.48	1.50			1440	4500	5940	
2) Excavate Solid Waste & Soil	4000	CY			1.27	1.49			5080	5960	11040	
a) Haul Solid Waste To Staging Area	4000	CY			0.48	1.50			1920	6000	7920	
3) Excavate Hazardous Waste	0	CY			1.69	1.98			0	0	0	
a) Haul Hazardous Waste To Staging Area	0	CY			0.48	1.50			0	0	0	
4) Confirmatory Samples	100		1000.00				100000				100000	
HAZARDOUS WASTE DISPOSAL												
1) Load Hazardous Waste	0	CY			0.50	0.64			0	0	0	
2) Hauling/Disposal Waste	0	TON	169.00				0				0	Model City, N.Y.

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
Excavation, Off-Site Disposal at Muncipal Landfill
Alternate No.2
Sheet 2 of 2
(NAWCRA2)
5/30/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
NONHAZARDOUS WASTE DISPOSAL												
1) Load Solid Waste	4000	CY			0.50	0.64			2000	2560	4560	
2) Hauling Waste	5000	TON	12.50				62500				62500	
3) Landfill Disposal	5000	TON	50.00				250000				250000	
RESTORATION												
1) Load Clean Soil	1000	CY			1.69	1.98			1690	1980	3670	
a) Haul Clean Soil To Trench Area	1000	CY			0.48	1.50			480	1500	1980	
b) Place, Spread & Compact	1000	CY			0.84	2.67			840	2670	3510	
2) Purchase Clean Soil	3000	CY		4.50	2.70	7.43			8100	22290	30390	
a) Place, Spread & Compact	3000	CY			0.84	2.67			2520	8010	10530	
3) Revegetation	435	MSF		24.60	8.40	6.68		10701	3654	2906	17261	
							578410	61340	64752	72747	777249	
Burden @ 30% of Labor Cost									19426		19426	
Labor @ 10% of Labor Cost									6475		6475	
Material @ 10% of Material Cost								6134			6134	
SubContract @ 10% of Sub. Cost							57841				57841	
Total Direct Cost							636251	67474	90653	72747	867124	
Indirects @ 75% of Total Direct Labor Cost									67989		67989	
Prime Contractor Fee @ 10% of Total Direct Cost Less Subcontract											23087	
											958201	
Health & Safety Monitoring @ 6%											57492	
Total Field Cost											1015693	
Contingency @ 20% of Total Field Cost											203139	
TOTAL COST THIS PAGE											1218832	

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
Single Synthetic Cap
Alternate No. 3
(NAWCRA3)
5/30/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1)	3	MO	1000.00				3000				3000	
2) Storage Trailer (1)	3	MO	500.00				1500				1500	
3) Construction Survey		LS	6000.00				6000				6000	
4) Portable Communication Equipment	2	SET	1500.00				3000				3000	
5) Equipment Mobilization/Demobilization		LS	10000.00				10000				10000	
6) Site Utilities	3	MO	4000.00				12000				12000	
7) Security	3	MO	10000.00				30000				30000	
8) Decontamination Trailer	3	MO	1500.00				4500				4500	
DECONTAMINATION FACILITIES AND SERVICES												
1) Laundry Service	12	WKS	250.00				3000				3000	
2) Truck Decon Pad												
a) Concrete Pad - 8"	40	CY		70.00	125.00	5.00		2800	5000	200	8000	
b) Gravel Base - 6"	30	CY		7.50	3.33	8.00		225	100	240	565	
c) Curb	120	LF		3.07	1.99	0.05		368	239	6	613	
d) Collection Sump	1			1450.00	500.00	220.00		1450	500	220	2170	
e) Splash Guard	780	SF		1.25	1.00			975	780		1755	
3) Decontamination Services	3	MO	1200.00				3600				3600	
4) Decon Water	39000	GAL	0.20				7800				7800	
5) Clean Water Storage Tank	1			3000.00	300.00			3000	300		3300	3000 Gallon
6) Spent Water Storage Tank	1			5000.00	400.00			5000	400		5400	5000 Gallon
SYNTHETIC LINER CAP												
1) Geotextile Layer	174240	SF	0.65				113256				113256	
2) Synthetic Liner - 40 mil HDPE	174240	SF	1.10				191664				191664	
3) Filter Fabric	19360	SY	1.70				32912				32912	
4) Soil Layer - 18"	9680	CY		4.50	2.70	7.43		43560	26136	71922	141618	
a) Place, Spread & Compact	9680	CY			0.84	2.67			8131	25846	33977	
5) Topsoil Layer - 6"	3227	CY		8.00	2.70	7.43		25816	8713	23977	58506	
a) Place, Spread & Compact	3227	CY			0.63	0.57			2033	1839	3872	
6) Revegetation	174.3	MSF		24.60	8.40	6.68		4288	1464	1164	6916	
							422232	87482	53796	125414	688924	
Burden @ 30% of Labor Cost									16139		16139	
Labor @ 10% of Labor Cost									5380		5380	
Material @ 10% of Material Cost								8748			8748	
SubContract @ 10% of Sub. Cost							42223				42223	
Total Direct Cost							464455	96230	75314	125414	761414	
Indirects @ 75% of Total Direct Labor Cost									56486		56486	
Prime Contractor Fee @ 10% of Total Direct Cost Less Subcontract											29696	
											847596	
Health & Safety Monitoring @ 10%											84760	
Total Field Cost											932355	
Contingency @ 20% of Total Field Cost											186471	
TOTAL COST THIS PAGE											1118827	

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Site 4
Single Synthetic Cap
Alternate No. 3
(OMNAW3) 5/30/95

Annual Costs

ITEM	ITEM $ SEMI-ANNUAL SAMPLING	NOTES
1. Sampling	5000.00	6 groundwater samples, 40 manhours per sampling period, semi-annual plus travel, living & shipping costs.
2. Analysis	12000.00	6 groundwater samples, QA/QC samples per sampling period. (inc. blank & duplicate) TAL, Metals, TCL VOCS, TCL VOCS, TCL Pesticides
3. Reporting	9000.00	60 manhours per report including validation, plus other direct costs
TOTAL ANNUAL COST	26000.00	Monitoring will be performed semi-annually for 15 years

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Area "C"
Single Layer Cap
Alternate No. 3
(OMNAW3a) 7/27/95

Annual Costs

ITEM	ITEM $ ANNUAL COST	ITEM $ COST PER 5 YEARS	NOTES
1. Cap Maintenance			
a. Mowing	300.00		Twice/Year
b. Inspection	1300.00		Twice/Year
c. Rodent Control	1300.00		Once/Year
d. Regrading/ Revegetation		2500.00	Once Every 5 Years
TOTAL ANNUAL COST	2900.00	2500.00	Post Remedial maintenance be performed for years 1 thru 15

NAVAL AIR WARFARE CENTER
Warminster, Pennsylvania
Area "C"
Single Layer Cap
Alternate No. 3
(PWANW3) 7/27/95
1424

PRESENT WORTH ANALYSIS

COST/YEAR COST OCCURS ($000'S)

COST COMPONENT	0	1	2	3	4	5	6	7	8	9	10	11
1. CAPITAL COST	1118.8											
2. O & M COSTS		28.9										
3. ANNUAL COSTS	1118.8	28.9	28.9	28.9	28.9	31.4	28.9	28.9	28.9	28.9	31.4	28.9
4. ANNUAL DISCOUNT RATE=5%	1	.952	.907	.864	.823	.784	.746	.711	.677	.645	.614	.585
PRESENT WORTH =	1119	28	26	25	24	25	22	21	20	19	19	17

	12	13	14	15	16	17	18	19	20	21	22	23
O & M COSTS	28.9	28.9	28.9	31.4	0	0	0	0	0	0	0	0
ANNUAL DISCOUNT RATE=5%	.557	.53	.505	.481	.458	.436	.416	.396	.377	.359	.342	.326
PRESENT WORTH =	16	15	15	15	0	0	0	0	0	0	0	0

	24	25	26	27	28	29	30	TOTAL PRESENT WORTH (000'S)
O & M COSTS	0	0	0	0	0	0	0	
ANNUAL DISCOUNT RATE=5%	.31	.295	.281	.268	.255	.243	.231	
PRESENT WORTH =	0	0	0	0	0	0	0	1424

APPENDIX E

SITE 4
VOLUME CALCULATIONS

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT U.S. NAVY	JOB NUMBER CTO-159
SUBJECT Site 4 - NAWC - Warminster Disposal Trenches	
BASED ON Field observations	DRAWING NUMBER
BY Paul M. Davis Paul M. Davis 5-24-95	CHECKED BY Tea
APPROVED BY	DATE 5-25-95

Surface Depression # 0

Length: 420 feet
Average width: 12 feet
Average thickness: 4 feet (includes 2 feet of top soil)

$420' \times 12' \times 4' = 20,160\ ft^3$ ✓

$20,160 \div 27 = 746.6\ yd^3$ ✓

Length: 420 feet
Average width: 12 feet
Average thickness: 2 feet (Does not include top soil layer)

$420' \times 12' \times 2' = 10080\ ft^3$ ✓

$10080 \div 27 = 373.3\ yd^3$ ✓

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: U.S. Navy	JOB NUMBER: CTC-154
SUBJECT: Site 4 - NAWC Warminster Disposal Trenches	
BASED ON: Field observations	DRAWING NUMBER:
BY: Paul Davis, Paul Davis 5-24-95 / CHECKED BY: Tea	APPROVED BY: / DATE: 5-25-95

Surface Depression #1

Length = 436 feet
Average width = 13.6 feet
Average thickness = 4.5 feet (includes 2-feet of top soil)

436' x 13.6' x 4.5' = 26,683.2 ft^3 ✓

26,683.2 ÷ 27 = 988.26 yd^3 ✓

Length = 436'
Average width = 13.6'
Average thickness = 2.5' (Does not include top soil)

436' x 13.6' x 2.5' = 14824 ft^3 ✓

14824 ÷ 27 = 549 yd^3 ✓

CLIENT U.S. NAVY	JOB NUMBER CTO - 159
SUBJECT Site 4 - NAWC Warminster Disposal Trenches	
BASED ON Field Observations	DRAWING NUMBER
BY Paul Davis 5-24-95 / CHECKED BY Tea	APPROVED BY / DATE 5-25-95

Surface Depression # 2

Length: ≈ 472 feet
Average width: 10.5 feet
Average Thickness: 3.75 feet (includes 2-feet of top soil)

472' x 10.5' x 3.75' = 18,585 ft³ ✓

18585 ÷ 27 = 688.3 yd³ ✓

Length: ≈ 472 feet
Average width: 10.5 feet
Average Thickness: 1.75 feet (Does NOT include Top Soil layer)

472' x 10.5' x 1.75' = 8673 ft³ ✓

8673 ÷ 27 = 321.22 yd³ ✓

CLIENT U.S. Navy	JOB NUMBER CTO - 159
SUBJECT Site 4 - NAWC - Warminster - Disposal Trenches	
BASED ON Field Observations	DRAWING NUMBER
BY Paul M. Davis 5-24-95 / CHECKED BY TRA	APPROVED BY / DATE 5-25-95

Surface Depression # 3

Length: ≈ 488 feet
Average width: 12.75 feet
Average Thickness: 5.25 feet (includes 2-feet of top soil)

488' x 12.75' x 5.25' = 32665.5 ft³ ✓

32,665.5 ÷ 27 = 1209.83 yd³ ✓

Length: ≈ 488 feet
Average width: 12.75 feet
Average Thickness: 3.25 feet (does not include Top Soil - 2.0')

488' x 12.75' x 3.25' = 20221.5 ft³ ✓

20221.5 ÷ 27 = 748.94 yd³ ✓

CLIENT U.S. NAVY	JOB NUMBER CTO-159
SUBJECT Site 4- NAWC Warminster Disposal Trenches	
BASED ON Field observations	DRAWING NUMBER
BY Paul Davis 5-24-95 / CHECKED BY Tea	APPROVED BY / DATE 5-25-95

Surface Depression # 4

Length = 356 feet
Average width = 13.33 feet
Average Thickness = 5.33 feet (includes 2-feet of Top So

356' x 13.33' x 5.33' = 25293.41 ft^3 ✓

25293.41 ÷ 27 = 936.80 yd^3 ✓

Length = 356 feet
Average width = 13.33 feet
Average Thickness = 3.33 feet (does NOT include 2-feet of top soil)

356' x 13.33' x 3.33' = 15802.45 ft^3 ✓

15802.45 ÷ 27 = 585.3 yd^3 ✓

CLIENT U.S. NAVY	JOB NUMBER CTO-159
SUBJECT Site 4- NAWC Warminster Disposal Trenches	
BASED ON Field observations	DRAWING NUMBER
BY Paul Davis 5-24-95	CHECKED BY TRA
APPROVED BY	DATE 5-25-95

Surface Depression # 5

Length = 290 feet
Average width = 12.75 feet
Average thickness = 5.38 feet (includes 2.0-feet of clean top soil)

290' x 12.75' x 5.38' = 19892.55 ft^3 ✓

19892.55 ÷ 27 = 736.76 yd^3 ✓

Length = 290 feet
Average width = 12.75 feet
Average thickness = 3.38 feet (Does not include 2-feet of top soil

290' x 12.75' x 3.38' = 12497.55 ft^3 ✓

12497.55 ÷ 27 = 462.87 yd^3 ✓

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: U.S. Navy	JOB NUMBER: CTO-159
SUBJECT: Site 4 - NAWC Warminster - Disposal Trenches	
BASED ON: Field Observations	DRAWING NUMBER:
BY: Paul M Davis 5-24-95 / CHECKED BY: Tea	APPROVED BY: / DATE: 5-25-95

Surface Depression # 6

Length: 232 feet
Average width: 11.6 feet
Average thickness: 5.5 feet (includes 2.0 feet of clean top soil)

232' x 11.6' x 5.5' = ~~17353.6~~ 14801.6 ft^3 pmD 5-12-95 Tea ✓

~~17353.6~~ 14801.6 pmD 5-12-95 ÷ 27 = ~~642.73~~ 548.21 pmD 5-12-95 yd^3 Tea ✓

Length: 232 feet
Average width: 11.6 feet
Average thickness: 3.5 feet (does not include 2.0 feet of top soil)

232' x 11.6' x 3.5' = 9419.2 ft^3 ✓

9419.2 ÷ 27 = 348.86 yd^3 ✓

CLIENT U.S. Navy	JOB NUMBER CTO-159
SUBJECT Site 4- NAWC - Warminster Disposal Trenches	
BASED ON Field Observations	DRAWING NUMBER
BY Paul Davis Paul M. Davis 5-24-95 / CHECKED BY Tek	APPROVED BY / DATE 5-25-95

Surface Depression #7

Length = 148 feet
Average width = 12.13 feet
Average Thickness = 4.88 feet (Includes 2.0 feet of top soil)

148' x 12.13' x 4.88' = 8760.77 ft^3

8760.77 ÷ 27 = 324.47 yd^3

Length = 148 feet
Average width = 12.13 feet
Average Thickness = 2.88 feet (Does not include 2-feet of top soil)

148' x 12.13' x 2.88' = 5170.29 ft^3

5170.29 ÷ 27 = 191.50 yd^3

CALCULATION WORKSHEET

Order No. 19116 (01-91)

CLIENT: U.S. Navy	JOB NUMBER: CTO - 159
SUBJECT: Site 4 - NAWC Warminster Disposal Trenches.	
BASED ON: Field Observations	DRAWING NUMBER:
BY: Paul M Davis, Paulson Davis 5-24-95 / CHECKED BY: TRG	APPROVED BY: / DATE: 5-25-95

S.D. = Surface Depression

	2.0 feet top soil included	2.0 feet top soil NOT included.
SD # 0	746.6 yd³ ✓	373.3 yd³ ✓
SD # 1	988.28 yd³ ✓	549.0 yd³ ✓
SD # 2	688.30 yd³ ✓	321.22 yd³ ✓
SD # 3	1209.83 yd³ ✓	748.94 yd³ ✓
SD # 4	936.80 yd³ ✓	585.30 yd³ ✓
SD # 5	736.76 yd³ ✓	462.87 yd³ ✓
SD # 6	548.21 yd³ ✓	348.86 yd³ ✓
SD # 7	324.47 yd³ ✓	191.50 yd³ ✓
Total	6179.23 yd³ ✓	3580.99 yd³ ✓

APPENDIX F

DRAFT ACTION MEMORANDUM

MEMORANDUM

DATE: TBD

SUBJECT: Request for a Removal Action at Site 4 (North Runway Landfill)
Naval Air Warfare Center (NAWC) National Priorities List (NPL) Site
Warminster, Bucks County, Pennsylvania

FROM: TBD

TO: TBD

THROUGH: TBD

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed removal action described herein for Site 4 at the Naval Air Warfare Center (NAWC) National Priorities List (NPL) Site, Warminster, Bucks County, Pennsylvania. An assessment performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, has identified a threat to human health and the environment due to the presence of hazardous substances in surface soils, subsurface soils, and buried materials around Site 4. These substances pose threats to nearby human populations, drinking water supplies, and future land use plans. As a result of these conditions, a removal action is needed at the Site pursuant to Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. Section 9604.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

Portions of the Site are located in the Township of Warminster and the Borough of Ivyland, Bucks County, Pennsylvania, in a heavily populated suburban area. The facility, which encompasses approximately 840 acres, is surrounded by private homes, several commercial and industrial enterprises, and a golf course. On-base areas include various buildings and other complexes connected by paved roads, the runway and ramp area, mowed fields, and a small wooded area. The longest runway, which is no longer active, is generally located along the topographically highest area at the facility. Many of the primary facility buildings are located west of the airstrip, along Jacksonville Road. A housing development for military enlisted personnel is within the southeastern portion of NAWC Warminster.

NAWC Warminster currently has approximately 2,000 employees, and 1,000 people reside at the enlisted personnel's housing area year round. The residents living at the facility are the nearest population center. The closest off-base home is about 200 feet from the base property line. Residential development is located along the length of the southern property line and, to a lesser extent, along the northern property line. Industrial development is found along the western and northwestern perimeters of the base.

B. Site Background

NAWC Warminster was originally the location of Brewster Aeronautical Corporation, a manufacturer of military aircraft. In 1944, the Navy assumed full control of the Brewster plant. The Naval Air Modification Unit was installed at the base to add design modifications to military aircraft produced at other locations. After World War II, activities at the base were altered; in 1949, the facility was designated the Naval Air Development Center (NADC), and its main mission, research, development, testing, and evaluation for Naval aircraft systems, was established. NAWC Warminster also conducts studies in anti-submarine warfare systems and software development. The facility name was changed from NADC to Naval Air Warfare Center, Aircraft Division, on January 1, 1992. NAWC Warminster is scheduled for realignment under the Base Realignment and Closure (BRAC) Program managed by the Department of Defense (DOD). This realignment, which is due to the downsizing of the entire DOD budget, is tentatively set for 1996; however, this timetable is still being developed, and the future use of the NAWC Warminster property had not been finalized at the time of this report. The realignment will result in relocation of NAWC Warminster activities to Naval Air Station (NAS) Patuxent River, Maryland.

Historically, wastes at the facility were generated during aircraft maintenance and repair, pest control, firefighting training, machine and plating shop operations, spray painting, and various materials research and testing activities in laboratories. These wastes included paints, solvents, sludges from industrial wastewater treatment, and waste oils.

To date, at least eight sites on current NAWC Warminster property have been identified as sites used for the disposal of wastes containing hazardous substances. None of the sites are currently used for waste disposal. Any hazardous substance releases from the eight sites identified to date and from other unidentified sites at NAWC Warminster potentially affect the Stockton Formation aquifer, which provides water for more than 100,000 people within the vicinity of the facility. Local surface water bodies are used for recreational and industrial purposes.

For investigative purposes, Sites 1, 2 and 3 have been grouped into Area A; Sites 5, 6 and 7 have been grouped into Area B; Sites 4 and 8 comprise Area C; and Area D consists of potential sources and hazardous substance releases west of the main building complex at the base.

C. Physical Location and Description

Site 4 is a grassy area covering 7 acres just north of the main runway along Kirk and Newtown Roads and south of the base Patrol Road. The Site is located at approximately the mid-point of the runway in the northeastern portion of the base. An unnamed tributary of Little Neshaminy Creek is located north of this area, and residential areas and two local parks are also in this direction.

The Site is the largest known waste disposal location at NAWC Warminster. It is less than 100 feet from the edge of the facility boundary. Several trenches at the Site, allegedly operated from 1966 to 1970, were used to dispose of non-industrial solid waste, paints, waste oils, waste metals, construction debris, solvents, general refuse, and sewage sludge from the sewage treatment plant. Some drainage from this area intersects the unnamed tributary of Little Neshaminy Creek, off site to the north of Kirk Road, near Munro Park. Several off-base residences are present within 200 feet of Site 4.

Based on field investigations, there are eight trenches at Site 4 and each trench is about 12 feet wide, 8 feet deep, and between 150 to 490 feet in length. Approximately 2 feet of cover soil overlies each trench. Approximately 7,900 cubic yards (or 12,800 tons) of buried materials are present within these trenches. It is not known if wastes were segregated prior to disposal or whether wastes were placed randomly into each trench, although it appears as if only two trenches received construction and demolition debris. The remaining six trenches apparently received only general refuse, consisting of paper, plastic products, glass bottles, styrofoam, and cardboard.

D. Quantities and Types of Hazardous Substances Present

During previous investigations, all confirmation and subsurface soil sample borings at Site 4 placed within the trenches encountered waste material, and borings placed between trenches encountered only fill. Outside the trenched area, one boring encountered clean fill, and all others encountered only native soil. The subsurface fill within the trenches averaged 4 to 5 feet in thickness.

The material encountered during the April 1995 test pit excavations generally consisted of a top layer of clean fill characterized as reddish-brown silty clay underlain by a bluish-gray micaceous silt and/or a layer of refuse or construction/demolition debris, reddish-brown clayey silt, and reddish-brown weathered siltstone. Some test pits encountered maroon siltstone or gray sandstone bedrock.

Refuse, consisting of paper, plastic products, soda and beer cans, glass bottles, styrofoam, cardboard, and photographic film, was found in nearly all test pits and trenches at Site 4. Construction/demolition debris, consisting of wood, metal, concrete, brick, cables, wire, and steel, was also encountered in two trenches.

Natural (undisturbed) conditions consisting of topsoil, orange-brown silty clay, maroon silt, and maroon weathered siltstone were found in two background test pits. One background test pit encountered clean fill consisting of reddish-brown silty clay, bluish-gray micaceous silt, dark reddish-brown silty fine-grained sand, and maroon rocky weathered siltstone.

The bluish-gray micaceous silt was also encountered generally between 2 and 4 feet below the ground surface in about one-half of the test pits. In general, this silt was not found in the western portions of most trenches; however, the material was encountered in the eastern end of one trench. The bluish-gray silt appears to pinch out near the base Patrol Road.

Positive organic vapor detector readings were only obtained from three test pits. These readings ranged from 5 to 15 µg/l. One test pit contained large truck tires and a single 55-gallon drum of trash. Small bottles of liquids containing metal cleaning fluid and film hardener were also discovered, as were paper products (e.g., receipts, newspapers, and record books) dated from 1966 to 1968. An oily sheen was found in 11 test pits. In most cases, it is believed that this sheen is the result of decomposing organic material such as twigs, branches, and tree stumps.

A majority of the wastes contained in the test pits excavated within Site 4 consist of construction debris, demolition materials, and general refuse. These wastes typically are not considered to be hazardous by themselves. However, investigations of soils, sediments, groundwater, and surface water suggest that wastes buried in the trenches may be the source of hazardous substances that have been released to the environment or could be potentially released. The major chemicals of concern for surface soils are Aroclor 1248, trichloroethene (TCE), pentachlorophenol (PCP), and several polycyclic aromatic hydrocarbons (PAHs) such as benz(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene. In addition, several metals (barium, beryllium, and manganese) were detected above background concentrations and soil screening criteria for surface soils.

For subsurface soils, the chemicals of concern include acetone, PCP, benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, dieldrin, endosulfan sulfate, Aroclor 1248, and Aroclor 1254. In addition, several metals (barium, beryllium, cadmium, manganese, and nickel) were detected above background concentrations and soil screening criteria for soils. No clear pattern of inorganic contamination in the surface and subsurface soils was observed.

The volume of contaminated soils and buried wastes at Site 4 is estimated to be 7,900 cubic yards or 12,800 tons. The approximate area of contamination is 35,600 square feet. Based on site characterization information, it does not appear that buried materials have significantly migrated from the eight trench locations identified at Site 4. This conclusion is supported by the lack of significant groundwater

contamination in the vicinity of the Site, along with the lack of subsurface contamination between the trenches.

E. NPL Status

EPA officially recognized the waste disposal locations at NAWC Warminster as possibly needing investigation in September 1979. On October 4, 1989, NAWC Warminster was placed on the final NPL. That same year, EPA submitted a draft Interagency Agreement to the Navy for formalizing and scheduling remedial activities. The contents of this agreement were negotiated in 1990.

To date, the NAWC Warminster sites are being addressed by the Navy in four long-term remedial phases. Four remedial investigations (RI) (Phase I, Phase II, focused RI for groundwater, and Phase III) have been conducted at the base since October 1989.

Phase I was performed between October 1989 and April 1991. The study for the first phase began at the end of 1989 and was completed in April 1991. Phase I involved mapping volatile organic compounds (VOCs) in soil gas and detecting magnetic and conductive anomalies through electromagnetic surveys. Approximate site boundaries were identified and confirmation of site contamination was made through soil borings, installation of monitoring wells, and groundwater sampling and analysis. In addition, test pits were excavated, local wells were inventoried, and a fracture-trace analysis was conducted.

Phase II was performed between May 1992 and April 1993. This phase helped determine the nature and extent of groundwater contamination, evaluate groundwater flow and add to the hydrogeologic database, and ascertain possible remedial alternatives. Phase II involved installing additional overburden and shallow bedrock monitoring wells, sampling and analyzing groundwater, and evaluating aquifer characteristics through water-level monitoring and a pumping test. Four off-base wells were also sampled. At the end of Phases I and II, the Navy and EPA selected a remedy for Operable Unit 1 (OU-1), which is contaminated shallow groundwater attributable to Areas A and B at the base. This was the first clean-up plan selected for NAWC Warminster. The Navy initiated construction of the OU-1 remedy in January 1995 and work is expected to be completed by September 1995.

Focused RI activities for other groundwater contamination at the base began in October 1993 for Area B, January 1994 for Area C, and February 1994 for Areas A and D. The RI field work for Area C groundwater (including impacts from Site 4) was completed in May 1994. During this investigation, the Navy addressed groundwater contamination associated with Site 4 that was not completely evaluated during the earlier studies. The Navy prepared RI and FS reports addressing the results of this investigation and evaluating remedial alternatives for shallow groundwater contamination in the vicinity of Area C. Both reports were

completed in August 1994. In March 1995, the Navy and EPA selected a remedy for OU-3, which is contaminated groundwater attributable to Area C. The Navy combined this remedy with the remedy for OU-1. Construction of the OU-3 remedial action is currently in progress.

The Phase III RI/FS began in January 1995 and will identify the full nature and extent of contamination, both on and off base, for the rest of the facility. The Navy is currently conducting additional environmental studies at the base and is planning to investigate other media associated with NAWC Warminster under the RI/FS process, including groundwater in deep bedrock aquifers, wastes, soils, sediment, and surface water. Additional remedial actions will be proposed and selected as soon as adequate information exists to support the selection of a remedy for a particular medium or group of media.

F. Other Actions to Date

During closure of Site 4 in 1970, 2 feet of fill was reportedly placed over the entire Site and the area was reseeded. Reportedly, complaints by nearby residents concerning blowing trash and odors contributed to this closure.

After the Phase II RI was completed, the Navy initiated other environmental investigations to more fully determine the nature and extent of groundwater contamination attributable to NAWC Warminster. In April 1993, the Navy, in coordination with EPA, initiated a well testing program in the vicinity of the base to assess the impact of contaminated groundwater possibly attributable to NAWC Warminster. Between April and August 1993, the Navy sampled more than 250 off-base residential, commercial, and municipal wells. The test results indicated that the levels of some VOCs found in residential wells exceeded federal drinking water standards [i.e., Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act]. To address these levels, the Navy conducted a CERCLA removal action, installing a water treatment system in each residence where either EPA Removal Action Levels or MCLs had been exceeded.

The Navy and EPA determined that this off-base groundwater contamination constituted an imminent threat to human health. Therefore, the Navy and EPA conducted additional CERCLA removal action work by connecting residences affected by groundwater contamination in the vicinity of Casey Village and Kirk Road to a public water-supply system between June and December 1994. As such, OU-2 consists of contaminated groundwater associated with residential wells located on Kirk Road north of Area C (including Site 4) and residential wells in the vicinity of the Casey Village area southeast of Area B.

In addition to the work being performed under CERCLA, the Navy has undertaken environmental baseline survey work to help identify and prioritize parcels of land at NAWC Warminster that can be transferred to the Federal Lands Reuse Authority - Bucks County (FLRA-BC). The proposed removal action for Site 4

will help to support the transfer of property to the community by identifying the most appropriate response option to mitigate potential exposure to Site 4 contaminants.

G. State and Local Authorities' Roles

The Pennsylvania Department of Environmental Protection (PADEP) has been apprised of site-related activities. EPA officials will continue to coordinate Site 4 activities with all appropriate state and local officials. A Restoration Advisory Board (RAB), which consists of representatives of the Navy, the United States Environmental Protection Agency (EPA), PADEP, the Bucks County Health Department, the Northampton Township Municipal Authority, the Warminster Township Municipal Authority, and Upper Southampton Township has assisted in the planning and review of these activities.

As part of the nationwide BRAC legislation, NAWC Warminster has pledged to give top priority to early re-use of the base's land and buildings. FLRA-BC is responsible for recommending strategies for reuse of the base to best utilize the resources of NAWC Warminster and its people to the greatest benefit of surrounding communities.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES

The conditions at Site 4 warrant a removal action. Field investigation results indicate unacceptable levels of hazardous substances in surface soils, subsurface soils, and buried materials at Site 4. Although the current industrial land use at the Site restricts access by the general public, workers at the Site could have some exposure. In addition, the Site may be used for recreational activities when this parcel of property is turned over to the community by the Navy.

Section 300.415 of the NCP identifies the factors that must be considered when determining the appropriateness of a removal action. Paragraphs (b) (2) (i), (ii), (iv), and (vii) of Section 300.415 directly apply as follows to Site 4 conditions:

A. Section 300.415 (b) (2) (i) "Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants."

Potential human and environmental exposure pathways identified under current or future land use scenarios for Site 4 include dermal, incidental ingestion, and fugitive dust inhalation exposure to soil contaminants.

In addition, leaching of contaminants from buried trench materials to groundwater is a potential exposure pathway because of infiltrating precipitation, and erosion of contaminated surface soils with overland runoff transport to nearby surface water (i.e., an unnamed tributary of Little Neshaminy Creek) is also possible. Groundwater may also migrate into adjacent surface water via both overburden and shallow bedrock aquifers or from the shallow bedrock aquifer beneath the Site into deeper bedrock aquifers.

B. Section 300.415 (b) (2) (ii) "Actual or potential contamination of drinking water supplies or sensitive ecosystems."

Although analytical data from nearby monitoring and residential wells do not indicate contamination of drinking water above Removal Action Levels that is solely attributable to Site 4, it is possible that contaminants leaching from buried trench materials may result in potential groundwater contamination in the future. Low levels (less than 3 ug/l) of several VOCs have been detected in downgradient Site 4 monitoring wells. However, contaminated groundwater at Site 4 is being addressed by the OU-3 remedy and is not the focus of this removal action. Potential contamination of sensitive ecosystems is also possible if a response action is not taken.

D. Section 300.415 (b) (2) (vii) "The availability of other appropriate federal or state response mechanisms to respond to the release."

The availability of response mechanisms can be met through the Navy's IR Program.

D. Section 300.415 (b) (2) (viii) "Other situations or factors that may pose threats to public health or welfare or the environment."

The presence of buried materials and contaminated soils at Site 4 will hinder future land use for this area, including recreational land use, when this property is turned over to the community by the Navy.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from Site 4, if not addressed by the response action selected in this Action Memorandum, may present an endangerment to public health, welfare, or the environment.

V. PROPOSED ACTION AND ESTIMATED COSTS

A. Actions

The action proposed for Site 4 is to excavate contaminated soils and buried wastes and dispose of these materials without treatment at a municipal waste landfill. Landfilling is a cost-effective alternative for addressing the buried soils and wastes at Site 4. Municipal waste landfills are engineered landfills that provide controls for protecting human health and the environment.

The contaminated soils and buried wastes are present in eight trenches at the Site. Available information suggests that these materials are confined within the trenches themselves. The proposed action would excavate surface soils on top of the trenches and subsurface soils and any buried wastes present within the trenches. If necessary, any soils or buried wastes that cannot be disposed in a municipal landfill will be disposed in a hazardous waste landfill.

The proposed action was selected from three of the most appropriate removal action alternatives, including institutional controls (i.e., deed restrictions and groundwater monitoring) and a single synthetic cap. These alternatives are described in the Site 4 Engineering Evaluation/Cost Analysis report, Section 3.5, dated July 1995.

At this time, it is estimated that the entire project will be completed within 12 months and under the $2 million ceiling for removal actions, barring any unforeseen circumstances or disposal restrictions.

B. Estimated Costs

The Navy estimates that $1,218,832 will be needed to carry out the recommended removal action at Site 4, excluding annual operation and maintenance (O&M) costs.

C. Contribution to Remedial Performance

The Record of Decision (ROD) for groundwater contamination in the vicinity of Area C (including Site 4) was signed in March 1995; pumping and treating the groundwater of concern is the selected remedy. This remedy is a long-term project and as such would not abate the threats posed to nearby residents, on-site workers, sensitive ecosystems, and future land use plans in a timely manner.

The proposed removal action will meet the following objectives:

- Prevent exposures (or potential exposures) to contaminated soils and wastes presenting unacceptable risks.

- Protect groundwater quality by reducing infiltration of water into and through contaminated soils and wastes of concern.

- Prevent the release of hazardous substances at Site 4 to nearby surface water, sensitive ecosystems, and other media.

The proposed removal action is consistent with accepted removal practices and is expected to abate the threats that meet the NCP removal criteria. The proposed removal action is not anticipated to impede future remedial or removal actions contemplated at Site 4.

D. Compliance with Applicable or Relevant and Appropriate Requirements

The proposed removal action will comply with all applicable or relevant and appropriate environmental and health requirements (ARARs) or "To be Considered" (TBC) criteria to the extent practicable considering the exigencies of the situation. The Navy has contacted PADEP and EPA to request ARARs for this removal action and has allowed the state and EPA the opportunity to comment on the ARARs pertinent to this removal action.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Possible exposure of nearby residents and on-site workers to contamination from hazardous substances in soils, wastes, and drinking water is expected to continue should action be delayed or no action be taken at Site 4. Potential risks to sensitive ecosystems near the Site are also possible. In addition, transfer of the Site 4 area to the FLRA-BC for reuse planning would be delayed or impeded.

VII. OUTSTANDING POLICY ISSUES

The Base Realignment and Closure (BRAC) Act of 1990 directed the closure or realignment of activities at NAWC Warminster. A proposed BRAC Implementation Plan was prepared by the Navy in 1994. The area of work for this project lies within the portion of the base planned for closing and eventual excessing. Operations at areas to be excessed are scheduled to cease in 1996.

There are no other outstanding policy issues pertaining to Site 4 at the NAWC Warminster NPL Site.

VIII. ENFORCEMENT

The Naval Facilities Engineering Command, Northern Division, is the lead agency for this project. The removal action will not be financed through Superfund. All funding will be provided by the Navy with BRAC funds. Based on this scenario, enforcement strategies do not apply to this removal action.

IX. RECOMMENDATION

Because conditions at Site 4 meet the NCP Section 300.415 criteria for a non-time-critical removal action, I recommend approval of this request for $1,218,832. Please indicate your approvals or disapprovals by signing below. I recommend your approvals to initiate response actions because of the nature of the threats described herein.

For U.S. Navy

Approved: _____ Date: _____

Disapproved: _____ Date: _____

APPENDIX G

RISK ASSESSMENT FOR SURFACE WATER/SEDIMENTS

G.1 RATIONALE FOR HUMAN HEALTH RISK CALCULATIONS

G.1.1 Ingestion and Dermal Contact with COCs in Sediment

Incidental ingestion of/and dermal contact with chemicals of concern (COCs) present in sediment by a potential receptor could occur through recreational activities (wading in streams) near Site 4. The ingestion of sediment pathway assumes that the route of exposure is by direct ingestion of a COC in sediment. The dermal contact with sediment pathway assumes that the route of exposure is by direct absorption of a COC in sediment through the skin. These pathways are considered complete and risk estimates can be generated for potential receptors.

G.1.2 Ingestion and Dermal Contact with COCs in Surface Water

Incidental ingestion of/and dermal contact with COCs present in surface water by a potential receptor could occur through recreational activities (wading in streams). The ingestion of surface water pathway assumes that the route of exposure by direct ingestion of a COC in surface water. The dermal contact with surface water pathway assumes that the route of exposure is by direct absorption of a COC in water through the skin. These pathways are considered complete and risk estimates can be generated for potential receptors.

G.2 EXPOSURE ASSUMPTIONS

Quantitative estimates of chemical intakes require that surface water and sediment exposure point concentrations be estimated. The maximum detection of metals and PCBs in surface water and sediment (Table G-1) will be used as the exposure point concentration. Pathway specific intakes also need to be estimated. Intake variables are selected so that the combination of all variables results in an estimate of the reasonable maximum exposure (RME) for that pathway (EPA, 1989a). RME is considered the upper limit of a reasonable exposure predicted to occur for an individual. In calculating the chronic daily intakes (CDIs) for children contacting surface waters and sediments during recreational activities., many assumptions pertaining to input parameters were made, in accordance with EPA guidance (EPA, 1989a; EPA, 1989b; EPA, 1991; EPA, 1992; EPA, 1993). These assumptions pertain to body weight, averaging time, exposure duration, exposure frequency, ingestion rates, absorption rates and various others. Each of these is discussed in detail below.

G.2.1 Exposure Assumptions Common to All Equations

The value selected for body weight (BW) of a small child is 15 kg (EPA, 1993). Averaging Time (AT) is equal to 70 years when calculating the CDI for carcinogenic exposure (EPA, 1989a). When calculating the CDI for noncarcinogenic exposure, AT is equal to exposure duration (ED), 6 years. Exposure frequency

TABLE G-1
RISK ASSUMPTIONS AND ESTIMATES FOR RECREATIONAL CHILDREN WADING IN STREAMS NEAR SITE 4
WARMINSTER NAWC

EXPOSURE ASSUMPTIONS:

SW ING	value	units	SW DER	value	units	SD ING	value	units	SD DER	value	units
CONC	max conc	mg/L	CONC	max conc	mg/L	CONC	max conc	mg/kg	CONC	max conc	mg/kg
IR	0.05	L/d	SA	3160	cm2	IR	100	mg/kg	CF	1.00E-06	kg/mg
EF	36	d	PC	see below		CF	1.00E-06	kg/mg	SA	3160	cm2
ED	6	yrs	ET	2.6	hr/d	FI	1		AF	1.45	mg/cm2
BW	15	kg	EF	36	d	EF	36	d	ABS (org)	0.1	
ATcar	25550	d	ED	6	yrs	ED	6	yrs	ABS (met)	0.001	
ATnon	2190	d	CF	1.00E-03	L/cm3	BW	15	kg	EF	36	d
			BW	15	kg	AT	25550	d	ED	6	yrs
			ATnon	25550	d	AT	2190	d	BW	15	kg
			ATcar	2190	d				AT	26550	d
									AT	2190	d

SEDIMENT CONCENTRATIONS, CDI ESTIMATIONS, AND HQ, HI, AND RISK ESTIMATES:

					SEDIMENT INGESTION				SEDIMENT DERMAL			
ANALYTE	ABS	SF	RfD	SD CONC	cdi-car	rsik	cdi-ncar	hq	cdi-car	rsik	cdi-ncar	hq
arsenic	1.00E-03	1.75E+00	3.00E-04	8.5	4.79E-07	8.3836E-07	5.59E-06	0.01863	2.20E-08	3.84E-08	2.56E-07	0.00085
barium	1.00E-03	NA	7.00E-02	92.9	NA	NA	6.11E-05	0.00087	NA	NA	2.80E-06	0.00004
beryllium	1.00E-03	4.30E+00	5.00E-03	1.2	6.76E-08	2.9082E-07	7.89E-07	0.00016	3.10E-09	1.33E-08	3.62E-08	0.00001
cadmium	1.00E-03	NA	5.00E-04	ND	NA	NA	NA	NA	NA	NA	NA	NA
chromium	1.00E-03	NA	5.00E-03	23.4	NA	NA	1.54E-05	0.00308	NA	NA	7.05E-07	0.00014
copper	1.00E-03	NA	3.71E-02	29.7	NA	NA	1.95E-05	0.00053	NA	NA	8.95E-07	0.00002
lead	1.00E-03	NA	NA	42.2	NA	NA	NA	NA	NA	NA	NA	NA
manganese	1.00E-03	NA	5.00E-03	528	NA	NA	3.47E-04	0.06944	NA	NA	1.59E-05	0.00318
mercury	1.00E-03	NA	3.00E-04	ND	NA	NA	NA	NA	NA	NA	NA	NA
nickel	1.00E-03	NA	2.00E-02	17	NA	NA	1.12E-05	0.00056	NA	NA	5.12E-07	0.00003
selenium	1.00E-03	NA	5.00E-03	0.82	NA	NA	5.39E-07	0.00011	NA	NA	2.47E-08	0.0000049
silver	1.00E-03	NA	5.00E-03	2.14	NA	NA	1.41E-06	0.00028	NA	NA	6.45E-08	0.00001
vanadium	1.00E-03	NA	7.00E-03	43.4	NA	NA	2.85E-05	0.00408	NA	NA	1.31E-06	0.00019
zinc	1.00E-03	NA	3.00E-01	310	NA	NA	2.04E-04	0.00068	NA	NA	9.34E-06	0.00003
Aroclor 1254	0.1	7.70E+00	NA	0.0745	4.20E-09	3.2331E-08	NA	NA	1.92E-08	1.48E-07	NA	NA
HQs:								0.09840				0.00451
Total Cancer Risks:						1E-06				2.00E-07		

SURFACE WATER CONCENTRATIONS, CDI ESTIMATIONS, AND HQ, HI, AND RISK ESTIMATES:

					SURFACE WATER INGESTION				SURFACE WATER DERMAL			
ANALYTE	PC	SF	RfD	SW CONC	cdi-car	risk	cdi-ncar	hq	cdi-car	risk	cdi-ncar	hq
arsenic	1.00E-03	1.75E+00	3.00E-04	ND	---	---	---	---	---	---	---	---
barium	1.00E-03	NA	7.00E-02	0.088	NA	NA	2.89E-05	0.00041	NA	NA	4.07E-04	0.00582
beryllium	1.00E-03	4.30E+00	5.00E-03	ND	---	---	---	---	---	---	---	---
cadmium	1.00E-03	NA	5.00E-04	0.002	NA	NA	6.58E-07	0.00132	NA	NA	9.26E-06	0.01852
chromium	2.00E-03	NA	5.00E-03	0.0058	NA	NA	1.91E-06	0.00038	NA	NA	2.69E-05	0.00537
copper	1.00E-03	NA	3.71E-02	0.0155	NA	NA	5.10E-06	0.00014	NA	NA	7.18E-05	0.00193
lead	4.00E-06	NA	NA	0.0227	NA	NA	NA	NA	NA	NA	NA	NA
manganese	1.00E-03	NA	5.00E-03	0.364	NA	NA	1.20E-04	0.02393	NA	NA	1.69E-03	0.33710
mercury	1.00E-03	NA	3.00E-04	0.00027	NA	NA	8.88E-08	0.00030	NA	NA	1.25E-06	0.00417
nickel	1.00E-04	NA	2.00E-02	0.0076	NA	NA	2.50E-06	0.00012	NA	NA	3.52E-05	0.00176
selenium	1.00E-03	NA	5.00E-03	ND	---	---	---	---	---	---	---	---
silver	6.00E-04	NA	5.00E-03	ND	---	---	---	---	---	---	---	---
vanadium	1.00E-03	NA	7.00E-03	ND	---	---	---	---	---	---	---	---
zinc	6.00E-04	NA	3.00E-01	0.0496	NA	NA	1.63E-05	0.00005	NA	NA	2.30E-04	0.00077
Aroclor 1254	0.71	7.70E+00	NA	ND	---	---	---	---	---	---	---	---
HQs:								0.02666				0.37545
Total Cancer Risks:						0				0		

RSK22.XLS 7/27/95 5:43 PM

ND = Not Detected
NA = Not Applicable

(EF) is equal to 36 days per year. This is based on a recreational child wading in a stream three days a week for 12 weeks (June, July, and August).

G.2.2 Exposure Assumptions - Ingestion of Sediment

The value selected for sediment ingestion rate (IR) for recreational children is 100 mg/day. This value is presumed suitable for contact intensive scenarios and is one-half the recommended 200 mg/day RME ingestion rate for a residential child incidentally ingesting surface soil (EPA, 1993). The 100 mg/day value is presumed to be a conservative for ingestion of sediment and represent an RME level. The sediment fraction ingested (FI) from the contaminated source is assumed to be 100 percent.

G.2.3 Exposure Assumptions - Dermal Contact with Sediment

The value selected for body surface area (SA) available for dermal contact with sediment is 3,160 cm^2 for recreational children (EPA, 1989a). This SA represents the 50th percentile skin surface area for the hands, arms, and legs of a child 3 to 4 years old. The value selected to represent the sediment adherence factor (AF) was 1.45 mg/cm^2. This value is considered to be a reasonable upper value (EPA, 1989a). Chemical specific absorption factors (ABS) selected for organics were 10% and for inorganics were 0.1 percent.

G.2.4 Exposure Assumptions - Ingestion of Surface Water

The value selected for the surface water IR for recreational children is 0.05 ml/day.

G.2.5 Exposure Assumptions - Dermal Contact with Surface Water

The value selected for body surface area (SA) available for dermal contact with surface soil is 3,160 cm^2 for recreational children (EPA, 1989a). This SA represents the 50th percentile skin surface area for the hands, arms, and legs of a child 3 - 4 years old. Chemical-specific permeability constants (PC) were selected for each specific chemical from EPA (1992) and are shown on Table G-1. Exposure time (ET) was selected at 2.6 hours per event which is the national average for swimming (EPA, 1989a). This is considered to be a conservative value for wading in a stream.

G.3 ESTIMATION OF CHEMICAL INTAKES

Chemical intakes by potentially exposed recreational children were estimated using the maximum detected value in surface water and sediment as the exposure point concentration. Chronic daily intakes, expressed as the amount of a chemical an individual may be exposed to per unit body weight per day ((mg/kg)/day), were estimated for each selected exposure pathway.

G.3.1 Ingestion of Chemicals in Sediment

For exposure to COCs by ingestion of sediment, it was assumed that the ingested sediments were not treated prior to intake and the route of exposure was by direct ingestion of chemicals in sediment. The following equation (EPA, 1989a) was used to estimate the dose for the incidental ingestion of sediment exposure pathway:

$$CDI\ (mg/kg\text{-}day) = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Value Definitions:

CDI	= Chronic Daily Intake ((mg/kg)/day)
CS	= Chemical Concentration in Sediment (mg/kg)
IR	= Ingestion Rate (mg/day)
CF	= Conversion Factor (10^{-6} kg/mg)
FI	= Fraction Ingested from Contaminated Source (unitless)
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
BW	= Body Weight (kg)
AT	= Averaging Time (days)

The following example calculation assumes that the exposure point concentration for arsenic is 8.5 mg/kg:

Noncarcinogenic Chronic Daily Intake:

$$CDI\ (mg/kg\text{-}day) = \left[\frac{8.5\,(mg/kg) * 100\,(mg/d) * 10^{-6} * 1 * 36\,(d/yr) * 6\,(yr)}{15\,(kg) * (365\,(d/yr) * 6\,(yr))}\right] = 5.59 * 10^{-6}$$

Carcinogenic Chronic Daily Intake:

$$CDI\ (mg/kg\text{-}day) = \left[\frac{8.5\,(mg/kg) * 100\,(mg/d) * 10^{-6} * 1 * 36\,(d/yr) * 6\,(yr)}{15\,(kg) * (365\,(d/yr) * 70\,(yr))}\right] = 4.79 * 10^{-7}$$

Table G-1 contains the CDIs for COCs estimated using the incidental ingestion of sediment exposure equation.

G.3.2 Dermal Contact with Chemicals in Sediment

For exposure to COCs by dermal contact with sediment, it was assumed that the sediments were not treated prior to contact and the route of exposure was by direct dermal contact with chemicals in sediment. The following equation (EPA, 1989a) was used to estimate the intake from dermal contact with COCs in sediment exposure pathway:

$$CDI\ (mg/kg\text{-}day) = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Value Definitions:

CDI	= Chronic Daily Intake ((mg/kg)/day)
CS	= Chemical Concentration in Sediment (mg/kg)
CF	= Conversion Factor (10^{-6} kg/mg)
SA	= Skin Surface Area Available for Contact (cm^2/event)
AF	= Soil to Skin Adherence Factor (mg/cm^2)
ABS	= Absorption Factor (unitless)
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
BW	= Body Weight (kg)
AT	= Averaging Time (days)

The following example calculation assumes that the exposure point concentration for arsenic is 8.5 mg/kg.

Noncarcinogenic Chronic Daily Intake:

$$CDI\ (mg/kg\text{-}day) = \left[\frac{8.5\,(mg/kg)*10^{-6}*3160\,(cm^2)*1.45\,(mg/cm^2*0.001*36\,(d/yr)*6\,(yr)}{15\,(kg)*(365\,(d/yr)*6\,(yr))}\right] = 2.56*10^{-7}$$

$$= 2.56 \times 10^{-7}$$

Carcinogenic Chronic Daily Intake:

$$CDI\ (mg/kg\text{-}day) = \left[\frac{8.5\,(mg/kg)*10^{-6}*3160\,(cm^2)*1.45\,(mg/cm^2*0.001*36\,(d/yr)*6\,(yr)}{15\,(kg)*(365\,(d/yr)*70\,(yr))}\right] = 2.2*10^{-8}$$

$$= 2.2 \times 10^{-8}$$

Table G-1 contains the CDIs for COCs estimated using the dermal contact with chemicals in sediment exposure equation.

G.3.3 Ingestion of Surface Water

To estimate the CDI of chemicals from ingestion of surface water, it was assumed that the surface water was not treated prior to intake and the route of exposure was by direct incidental ingestion of the chemicals in surface water. The CDI associated with the ingestion of surface water ingestion pathway was estimated using the following equation (EPA, 1989a):

$$CDI\ (mg/kg\text{-}day) = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$

Value Definitions:

CDI	= Chronic Daily Intake ((mg/kg)/day)
CW	= Chemical Concentration in Surface Water (mg/liter)
IR	= Ingestion Rate (liters/day)
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
BW	= Body Weight (kg)
AT	= Averaging Time (days)

The following example calculation assumes that the exposure point concentration for barium is 0.088 mg/L.

Noncarcinogenic Chronic Daily Intake:

$$CDI\ (mg/kg\text{-}day) = \left[\frac{0.088\,(mg/L)*0.05\,(L/d)*36\,(d/yr)*6\,(yr)}{15\,(kg)*(365\,(d/yr)*6\,(yr))}\right] = 2.9*10^{-5}$$

Note: Carcinogenic chronic daily intakes were not calculated for surface water ingestion because no carcinogens were detected in site surface water samples.

Table G-1 contains the CDIs for COCs estimated using the ingestion of chemicals in surface water exposure equation.

G.3.4 Dermal Contact with Surface Water

For exposure to COCs by dermal contact with surface water, it was assumed that the surface water was not treated prior to contact and the route of exposure was by direct dermal contact with chemicals in surface water. The following equation (EPA 1989a) to determine the CDI associated with dermal contact with chemicals in surface water:

$$CDI\ (mg/kg\text{-}day) = \frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Value Definitions:

CDI	= Chronic Daily Intake ((mg/kg)/day)
CW	= Chemical Concentration in Surface Water (mg/liter)
SA	= Skin Surface Area Available for Contact (cm^2/event)
PC	= Chemical Specific Dermal Permeability Constant(cm/hr)
ET	= Exposure Time (hours/day)
EF	= Exposure Frequency (days/year)
ED	= Exposure Duration (years)
CF	= Conversion Factor (1 liter/1000 centimeters)
BW	= Body Weight (kg)
AT	= Averaging Time (days)

The following example calculation assumes that the exposure point concentration for barium is 0.088 mg/L.

Noncarcinogenic Chronic Daily Intake:

$$CDI\ (mg/kg\text{-}day) = \left[\frac{0.088\,(mg/L)*3160\,(cm^2)*1*10^{-3}\,(cm/hr)*2.6\,(hr/d)*36\,(d/yr)*6\,(yr)*10^{-3}}{15\,(kg)*(365\,(d/yr)*6\,(yr))}\right] = 4.1*10^{-4}$$

$$= 4.1 \times 10^{-4}$$

Note: Carcinogenic chronic daily intakes were not calculated for surface water dermal contact because no carcinogens were detected in site surface water samples.

Table G-1 contains the CDIs for COCs estimated using the dermal contact with chemicals in surface water exposure equation.

G.4 ESTIMATION OF CARCINOGENIC AND NONCARCINOGENIC RISKS

G.4.1 Noncarcinogenic Health Effects

To evaluate noncarcinogenic health risks, CDIs estimated previously are compared to toxicity criteria to determine if the exposure is within a range which is unlikely to cause adverse health effects. The relevant toxicity criteria are EPA RfDs (EPA, 1995 and see Table G-1). The potential for noncarcinogenic health effects is evaluated by comparing a chemical-specific exposure level with a chemical-specific reference dose. The ratio of exposure to toxicity for a single chemical is called a hazard quotient (HQ) and is calculated as follows:

$$\text{Hazard quotient} = \frac{CDI}{RfD}$$

Where: CDI = Chronic Daily Intake ((mg/kg)/day)
RfD = Reference Dose ((mg/kg)/day)

The HQ assumes that there is a level of exposure below which it is unlikely for even a sensitive population to experience adverse health effects. If the CDI exceeds the RfD, a potential for non-cancer adverse health effects may exist.

The Hazard Index (HI) is equal to the sum of hazard quotients for the COCs per receptor group. When the HI exceeds one, there is a potential for adverse health effects. All noncarcinogenic HQs and HIs are shown on Table G-1.

Example Calculation:

Ingestion of Sediment, Arsenic CDI (estimated previously), RfD = 3E-04, Noncarcinogenic Effects (EPA, 1989a and 1995):

$HQ = 5.59*10^{-6}$ ((mg/kg)/day) / $3*10^{-4}$ ((mg/kg)/day) = 0.02

G.4.2 Cancer Risk Estimates

To evaluate cancer risks, CDIs estimated previously are multiplied by the cancer SFs (see Table G-1) identified to develop the upper-bound incremental cancer-risks (EPA, 1995). Incremental cancer risks in the range of $1x10^{-6}$ to $1x10^{-4}$ are generally characterized as acceptable by EPA. Total cancer risks are obtained by combining the cancer risks estimated in each exposure pathway. All carcinogenic risks are shown on Table G-1.

Example Calculation:

Ingestion of Sediment, Arsenic CDI (estimated previously), SF = 1.75E+00, Carcinogenic Effects (EPA, 1989a and 1995):

Risk = $4.79*10^{-7}$ ((mg/kg)/day) * $1.75*10^{0}$ $((mg/kg)/day)^{-1}$ = 9E-7

REFERENCES

United States Environmental Protection Agency, 1989a. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89/002.

United States Environmental Protection Agency, 1989b. Exposure Factors Handbook. Office of Health and Environmental Assessment. EPA/600/8-89/043.

United States Environmental Protection Agency, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Office of Solid Waste and Emergency Response. OSWER Directive 9285.6-03.

United States Environmental Protection Agency, 1992. Dermal Exposure Assessment: Principles and Applications. Office of Health and Environmental Assessment. EPA/600/8-91/011B.

United States Environmental Protection Agency, 1993. Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Preliminary Review Draft.

United States Environmental Protection Agency, 1995. Risk-Based Concentration (RBC) Tables - Region III. January - June 1995.

APPENDIX H

ANALYTICAL DATABASE

TCL VOLATILES

SURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-13		W-SS-04-01		W-SS-04-06		W-SS-04-07		W-SS-04-10	
LABORATORY ID:			950222-19		950222-01		950222-09		950222-10		950222-13	
TCL VOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	2	12	U	12	U	13	U	12	U	12	U
BROMOMETHANE	10	2	12	U	12	U	13	U	12	U	12	U
VINYL CHLORIDE	10	2	12	U	12	U	13	U	12	U	12	U
CHLOROETHANE	10	2	12	U	12	U	13	U	12	U	12	U
METHYLENE CHLORIDE	10	2	6	U	6	U	6	U	6	U	6	U
ACETONE	10	2	36	B	12	U	13	U	16	B	12	U
CARBON DISULFIDE	10	2	6	U	6	U	6	U	6	U	6	U
1,1-DICHLOROETHENE	10	2	6	U	6	U	6	U	6	U	6	U
1,1-DICHLOROETHANE	10	2	6	U	6	U	6	U	6	U	6	U
1,2-DICHLOROETHENE (TOTAL)	10	2	6	U	6	U	6	U	6	U	6	U
CHLOROFORM	10	2	6	U	6	U	6	U	6	U	6	U
1,2-DICHLOROETHANE	10	2	6	U	6	U	6	U	6	U	6	U
2-BUTANONE	10	2	9	J	12	U	13	U	12	U	12	U
1,1,1-TRICHLOROETHANE	10	2	6	U	6	U	6	U	6	U	6	U
CARBON TETRACHLORIDE	10	2	6	U	6	U	6	U	6	U	6	U
BROMODICHLOROMETHANE	10	2	6	U	6	U	6	U	6	U	6	U
1,2-DICHLOROPROPANE	10	2	6	U	6	U	6	U	6	U	6	U
CIS-1,3-DICHLOROPROPENE	10	2	6	U	6	U	6	U	6	U	6	U
TRICHLOROETHENE	10	2	22		6	U	6	U	6	U	23	
DIBROMOCHLOROMETHANE	10	2	6	U	6	U	6	U	6	U	6	U
1,1,2-TRICHLOROETHANE	10	2	6	U	6	U	6	U	6	U	6	U
BENZENE	10	2	6	U	6	U	6	U	6	U	6	U
TRANS-1,3-DICHLOROPROPENE	10	1	6	U	6	U	6	U	6	U	6	U
BROMOFORM	10	2	6	U	6	U	6	U	6	U	6	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U	13	U	12	U	12	U
2-HEXANONE	10	2	12	U	12	U	13	U	12	U	12	U
TETRACHLOROETHENE	10	2	6	U	6	U	6	U	6	U	6	U
1,1,2,2-TETRACHLOROETHANE	10	2	6	U	6	U	6	U	6	U	6	U
TOLUENE	10	2	6	U	6	U	6	U	6	U	6	U
CHLOROBENZENE	10	2	6	U	6	U	6	U	6	U	6	U
ETHYLBENZENE	10	2	6	U	6	U	6	U	6	U	6	U
STYRENE	10	2	6	U	6	U	6	U	6	U	6	U
TOTAL XYLENES	10	2	6	U	6	U	6	U	6	U	6	U
% SOLIDS:			83.0		81.0		77.0		81.0		82.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-21		W-SS-04-11		W-SS-04-14	
LABORATORY ID:			950222-14		950222-15		950222-20	
TCL VOLATILE SOILS (UG/KG)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2	12	U	12	U	12	U
BROMOMETHANE	10	2	12	U	12	U	12	U
VINYL CHLORIDE	10	2	12	U	12	U	12	U
CHLOROETHANE	10	2	12	U	12	U	12	U
METHYLENE CHLORIDE	10	2	6	U	6	U	6	U
ACETONE	10	2	30	B	12	U	65	B
CARBON DISULFIDE	10	2	6	U	6	U	6	U
1,1-DICHLOROETHENE	10	2	6	U	6	U	6	U
1,1-DICHLOROETHANE	10	2	6	U	6	U	6	U
1,2-DICHLOROETHENE (TOTAL)	10	2	6	U	6	U	6	U
CHLOROFORM	10	2	6	U	6	U	6	U
1,2-DICHLOROETHANE	10	2	6	U	6	U	6	U
2-BUTANONE	10	2	12	U	12	U	12	U
1,1,1-TRICHLOROETHANE	10	2	6	U	6	U	6	U
CARBON TETRACHLORIDE	10	2	6	U	6	U	6	U
BROMODICHLOROMETHANE	10	2	6	U	6	U	6	U
1,2-DICHLOROPROPANE	10	2	6	U	6	U	6	U
CIS-1,3-DICHLOROPROPENE	10	2	6	U	6	U	6	U
TRICHLOROETHENE	10	2	22		25		7	
DIBROMOCHLOROMETHANE	10	2	6	U	6	U	6	U
1,1,2-TRICHLOROETHANE	10	2	6	U	6	U	6	U
BENZENE	10	2	6	U	6	U	6	U
TRANS-1,3-DICHLOROPROPENE	10	1	6	U	6	U	6	U
BROMOFORM	10	2	6	U	6	U	6	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U	12	U
2-HEXANONE	10	2	12	U	12	U	12	U
TETRACHLOROETHENE	10	2	6	U	6	U	6	U
1,1,2,2-TETRACHLOROETHANE	10	2	6	U	6	U	6	U
TOLUENE	10	2	6	U	6	U	6	U
CHLOROBENZENE	10	2	6	U	6	U	4	J
ETHYLBENZENE	10	2	6	U	6	U	4	J
STYRENE	10	2	6	U	6	U	6	U
TOTAL XYLENES	10	2	6	U	6	U	10	
% SOLIDS:			80.0		82.0		85.0	
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-16		W-SS-04-18	
LABORATORY ID:			950222-22		950222-24	

TCL VOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL				
CHLOROMETHANE	10	2	12	U	12	U
BROMOMETHANE	10	2	12	U	12	U
VINYL CHLORIDE	10	2	12	U	12	U
CHLOROETHANE	10	2	12	U	12	U
METHYLENE CHLORIDE	10	2	6	U	6	U
ACETONE	10	2	61		42	
CARBON DISULFIDE	10	2	6	U	6	U
1,1-DICHLOROETHENE	10	2	6	U	6	U
1,1-DICHLOROETHANE	10	2	6	U	6	U
1,2-DICHLOROETHENE (TOTAL)	10	2	6	U	6	U
CHLOROFORM	10	2	6	U	6	U
1,2-DICHLOROETHANE	10	2	6	U	6	U
2-BUTANONE	10	2	12	U	12	U
1,1,1-TRICHLOROETHANE	10	2	6	U	6	U
CARBON TETRACHLORIDE	10	2	6	U	6	U
BROMODICHLOROMETHANE	10	2	6	U	6	U
1,2-DICHLOROPROPANE	10	2	6	U	6	U
CIS-1,3-DICHLOROPROPENE	10	2	6	U	6	U
TRICHLOROETHENE	10	2	8		8	
DIBROMOCHLOROMETHANE	10	2	6	U	6	U
1,1,2-TRICHLOROETHANE	10	2	6	U	6	U
BENZENE	10	2	6	U	6	U
TRANS-1,3-DICHLOROPROPENE	10	1	6	U	6	U
BROMOFORM	10	2	6	U	6	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U
2-HEXANONE	10	2	12	U	12	U
TETRACHLOROETHENE	10	2	6	U	6	U
1,1,2,2-TETRACHLOROETHANE	10	2	6	U	6	U
TOLUENE	10	2	1	J	6	U
CHLOROBENZENE	10	2	6	U	6	U
ETHYLBENZENE	10	2	6	U	6	U
STYRENE	10	2	1	J	6	U
TOTAL XYLENES	10	2	5	J	6	U
% SOLIDS:			84.0		84.0	
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0410		W-TB-04-11		W-TB-04-12	
LABORATORY ID:			950222-02		950222-03		950222-17	

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2	10	U	10	U	10	U
BROMOMETHANE	10	2	10	U	10	U	10	U
VINYL CHLORIDE	10	2	10	U	10	U	10	U
CHLOROETHANE	10	2	10	U	10	U	10	U
METHYLENE CHLORIDE	10	2	1	B	5	U	5	U
ACETONE	10	2	7	J	10	U	7	J
CARBON DISULFIDE	10	2	5	U	5	U	5	U
1,1-DICHLOROETHENE	10	2	5	U	5	U	5	U
1,1-DICHLOROETHANE	10	2	5	U	5	U	5	U
1,2-DICHLOROETHENE (TOTAL)	10	2	5	U	5	U	5	U
CHLOROFORM	10	2	5	U	5	U	5	U
1,2-DICHLOROETHANE	10	2	5	U	5	U	5	U
2-BUTANONE	10	2	6	J	10	U	10	U
1,1,1-TRICHLOROETHANE	10	2	5	U	5	U	5	U
CARBON TETRACHLORIDE	10	2	5	U	5	U	5	U
BROMODICHLOROMETHANE	10	2	5	U	5	U	5	U
1,2-DICHLOROPROPANE	10	2	5	U	5	U	5	U
CIS-1,3-DICHLOROPROPENE	10	2	5	U	5	U	5	U
TRICHLOROETHENE	10	2	5	U	5	U	5	U
DIBROMOCHLOROMETHANE	10	2	5	U	5	U	5	U
1,1,2-TRICHLOROETHANE	10	2	5	U	5	U	5	U
BENZENE	10	2	5	U	5	U	5	U
TRANS-1,3-DICHLOROPROPENE	10	1	5	U	5	U	5	U
BROMOFORM	10	2	5	U	5	U	5	U
4-METHYL-2-PENTANONE	10	2	10	U	10	U	10	U
2-HEXANONE	10	2	10	U	10	U	10	U
TETRACHLOROETHENE	10	2	5	U	5	U	5	U
1,1,2,2-TETRACHLOROETHANE	10	2	5	U	5	U	5	U
TOLUENE	10	2	5	U	5	U	5	U
CHLOROBENZENE	10	2	5	U	5	U	5	U
ETHYLBENZENE	10	2	5	U	5	U	5	U
STYRENE	10	2	5	U	5	U	5	U
TOTAL XYLENES	10	2	5	U	5	U	5	U
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0412
LABORATORY ID: 950222-30

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
CHLOROMETHANE	10	2	10	U
BROMOMETHANE	10	2	10	U
VINYL CHLORIDE	10	2	10	U
CHLOROETHANE	10	2	10	U
METHYLENE CHLORIDE	10	2	5	U
ACETONE	10	2	10	U
CARBON DISULFIDE	10	2	5	U
1,1-DICHLOROETHENE	10	2	5	U
1,1-DICHLOROETHANE	10	2	5	U
1,2-DICHLOROETHENE (TOTAL)	10	2	5	U
CHLOROFORM	10	2	5	U
1,2-DICHLOROETHANE	10	2	5	U
2-BUTANONE	10	2	6	J
1,1,1-TRICHLOROETHANE	10	2	5	U
CARBON TETRACHLORIDE	10	2	5	U
BROMODICHLOROMETHANE	10	2	5	U
1,2-DICHLOROPROPANE	10	2	5	U
CIS-1,3-DICHLOROPROPENE	10	2	5	U
TRICHLOROETHENE	10	2	5	U
DIBROMOCHLOROMETHANE	10	2	5	U
1,1,2-TRICHLOROETHANE	10	2	5	U
BENZENE	10	2	5	U
TRANS-1,3-DICHLOROPROPENE	10	1	5	U
BROMOFORM	10	2	5	U
4-METHYL-2-PENTANONE	10	2	10	U
2-HEXANONE	10	2	10	U
TETRACHLOROETHENE	10	2	5	U
1,1,2,2-TETRACHLOROETHANE	10	2	5	U
TOLUENE	10	2	1	J
CHLOROBENZENE	10	2	5	U
ETHYLBENZENE	10	2	5	U
STYRENE	10	2	5	U
TOTAL XYLENES	10	2	5	U
DILUTION FACTOR:			1.0	

SUBSURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-01		W-SB-04-02		W-SB-04-03		W-SB-04-04		W-SB-04-05	
LABORATORY ID:			950237-02		950237-03		950237-06		950237-07		950237-10	
TCL VOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
BROMOMETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
VINYL CHLORIDE	10	2	13	U	11	U	14	U	4200	U	12	U
CHLOROETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
METHYLENE CHLORIDE	10	2	13	U	2	B	14	U	4200	U	2	B
ACETONE	10	2	15	B	25	B	64	B	4200	U	120	B
CARBON DISULFIDE	10	2	13	U	11	U	14	U	4200	U	12	U
1,1-DICHLOROETHENE	10	2	13	U	11	U	14	U	4200	U	12	U
1,1-DICHLOROETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
1,2-DICHLOROETHENE (TOTAL)	10	2	13	U	11	U	14	U	4200	U	12	U
CHLOROFORM	10	2	13	U	11	U	14	U	4200	U	12	U
1,2-DICHLOROETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
2-BUTANONE	10	2	13	U	11	U	14	U	4200	U	44	
1,1,1-TRICHLOROETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
CARBON TETRACHLORIDE	10	2	13	U	11	U	14	U	4200	U	12	U
BROMODICHLOROMETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
1,2-DICHLOROPROPANE	10	2	13	U	11	U	14	U	4200	U	12	U
CIS-1,3-DICHLOROPROPENE	10	2	13	U	11	U	14	U	4200	U	12	U
TRICHLOROETHENE	10	2	13	U	11	U	14	U	4200	U	12	U
DIBROMOCHLOROMETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
1,1,2-TRICHLOROETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
BENZENE	10	2	13	U	11	U	14	U	4200	U	12	U
TRANS-1,3-DICHLOROPROPENE	10	1	13	U	11	U	14	U	4200	U	12	U
BROMOFORM	10	2	13	U	11	U	14	U	4200	U	12	U
4-METHYL-2-PENTANONE	10	2	13	U	11	U	14	U	4200	U	12	U
2-HEXANONE	10	2	13	U	11	U	14	U	4200	U	12	U
TETRACHLOROETHENE	10	2	13	U	11	U	14	U	4200	U	12	U
1,1,2,2-TETRACHLOROETHANE	10	2	13	U	11	U	14	U	4200	U	12	U
TOLUENE	10	2	13	U	11	U	5	J	4200	U	2	J
CHLOROBENZENE	10	2	13	U	11	U	14	U	4200	U	12	U
ETHYLBENZENE	10	2	7	J	2	J	8	J	4200	U	12	J
STYRENE	10	2	13	U	11	U	14	U	4200	U	12	U
TOTAL XYLENES	10	2	3	J	2	J	20		4200	U	8	J
% SOLIDS:			75.0		90.0		74.0		30.0		82.0	
DILUTION FACTOR:			1.0		1.0		1.0		125.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-06		W-SB-04-30		W-SB-04-31	
LABORATORY ID:			950237-11		950237-12		950237-13	
TCL VOLATILE SOILS (UG/KG)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2	12	U	12	U	12	U
BROMOMETHANE	10	2	12	U	12	U	12	U
VINYL CHLORIDE	10	2	12	U	12	U	12	U
CHLOROETHANE	10	2	12	U	12	U	12	U
METHYLENE CHLORIDE	10	2	2	B	3	B	2	B
ACETONE	10	2	46	B	46	B	64	B
CARBON DISULFIDE	10	2	12	U	12	U	12	U
1,1-DICHLOROETHENE	10	2	12	U	12	U	12	U
1,1-DICHLOROETHANE	10	2	12	U	12	U	12	U
1,2-DICHLOROETHENE (TOTAL)	10	2	12	U	12	U	12	U
CHLOROFORM	10	2	12	U	12	U	12	U
1,2-DICHLOROETHANE	10	2	12	U	12	U	12	U
2-BUTANONE	10	2	17	J	15	J	12	U
1,1,1-TRICHLOROETHANE	10	2	12	U	12	U	12	U
CARBON TETRACHLORIDE	10	2	12	U	12	U	12	U
BROMODICHLOROMETHANE	10	2	12	U	12	U	12	U
1,2-DICHLOROPROPANE	10	2	12	U	12	U	12	U
CIS-1,3-DICHLOROPROPENE	10	2	12	U	12	U	12	U
TRICHLOROETHENE	10	2	12	U	12	U	12	U
DIBROMOCHLOROMETHANE	10	2	12	U	12	U	12	U
1,1,2-TRICHLOROETHANE	10	2	12	U	12	U	12	U
BENZENE	10	2	12	U	12	U	12	U
TRANS-1,3-DICHLOROPROPENE	10	1	12	U	12	U	12	U
BROMOFORM	10	2	12	U	12	U	12	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U	12	U
2-HEXANONE	10	2	12	U	12	U	12	U
TETRACHLOROETHENE	10	2	12	U	12	U	12	U
1,1,2,2-TETRACHLOROETHANE	10	2	12	U	12	U	12	U
TOLUENE	10	2	12	U	12	U	12	U
CHLOROBENZENE	10	2	12	U	12	U	12	U
ETHYLBENZENE	10	2	12	U	12	U	3	J
STYRENE	10	2	12	U	12	U	12	U
TOTAL XYLENES	10	2	12	U	12	U	3	J
% SOLIDS:			80.0		81.0		80.0	
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-07		W-SB-04-08		W-SB-04-09		W-SB-04-10	
LABORATORY ID:			950255-02		950255-03		950255-04		950255-05	
TCL VOLATILE SOILS (UG/KG)										
ANALYTE	CRQL	MDL								
CHLOROMETHANE	10	2	15	U	16	U	3	B	12	U
BROMOMETHANE	10	2	15	U	16	U	12	U	12	U
VINYL CHLORIDE	10	2	15	U	16	U	12	U	12	U
CHLOROETHANE	10	2	15	U	16	U	12	U	12	U
METHYLENE CHLORIDE	10	2	15	U	7	B	11	B	4	B
ACETONE	10	2	86	B	74	B	48	B	100	B
CARBON DISULFIDE	10	2	15	U	6	J	12	U	12	U
1,1-DICHLOROETHENE	10	2	15	U	16	U	12	U	12	U
1,1-DICHLOROETHANE	10	2	15	U	16	U	12	U	12	U
1,2-DICHLOROETHENE (TOTAL)	10	2	15	U	16	U	12	U	12	U
CHLOROFORM	10	2	15	U	16	U	12	U	12	U
1,2-DICHLOROETHANE	10	2	15	U	16	U	12	U	12	U
2-BUTANONE	10	2	15	U	32	B	12	U	12	U
1,1,1-TRICHLOROETHANE	10	2	15	U	16	U	12	U	12	U
CARBON TETRACHLORIDE	10	2	15	U	16	U	12	U	12	U
BROMODICHLOROMETHANE	10	2	15	U	16	U	12	U	12	U
1,2-DICHLOROPROPANE	10	2	15	U	16	U	12	U	12	U
CIS-1,3-DICHLOROPROPENE	10	2	15	U	16	U	12	U	12	U
TRICHLOROETHENE	10	2	15	U	16	U	12	U	12	U
DIBROMOCHLOROMETHANE	10	2	15	U	16	U	12	U	12	U
1,1,2-TRICHLOROETHANE	10	2	15	U	16	U	12	U	12	U
BENZENE	10	2	15	U	16	U	12	U	12	U
TRANS-1,3-DICHLOROPROPENE	10	1	15	U	16	U	12	U	12	U
BROMOFORM	10	2	15	U	16	U	12	U	12	U
4-METHYL-2-PENTANONE	10	2	15	U	16	U	12	U	12	U
2-HEXANONE	10	2	15	U	16	U	12	U	12	U
TETRACHLOROETHENE	10	2	15	U	16	U	12	U	12	U
1,1,2,2-TETRACHLOROETHANE	10	2	15	U	16	U	12	U	12	U
TOLUENE	10	2	15	U	16	U	14		12	U
CHLOROBENZENE	10	2	15	U	16	U	230		12	U
ETHYLBENZENE	10	2	3	J	25		40		12	U
STYRENE	10	2	15	U	16	U	12	U	12	U
TOTAL XYLENES	10	2	15	U	27		49		12	U
% SOLIDS:			66.0		64.0		82.0		82.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-11		W-SB-04-12		W-SB-04-13		W-SB-04-14		W-SB-04-15	
LABORATORY ID:			950261-02		950261-03		950261-04		950261-05		950261-06	
TCL VOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	2	12	U	12	U	13	U	13	U	13	U
BROMOMETHANE	10	2	12	B	12	U	4	B	13	U	13	U
VINYL CHLORIDE	10	2	12	U	12	U	13	U	13	U	13	U
CHLOROETHANE	10	2	12	U	12	U	13	U	13	U	13	U
METHYLENE CHLORIDE	10	2	4	B	3	B	3	B	4	B	4	B
ACETONE	10	2	9	B	12	U	13	B	13	U	11	B
CARBON DISULFIDE	10	2	12	U	12	U	13	U	13	U	13	U
1,1-DICHLOROETHENE	10	2	12	U	12	U	13	U	13	U	13	U
1,1-DICHLOROETHANE	10	2	12	U	12	U	13	U	13	U	13	U
1,2-DICHLOROETHENE (TOTAL)	10	2	12	U	12	U	13	U	13	U	13	U
CHLOROFORM	10	2	12	U	12	U	13	U	13	U	13	U
1,2-DICHLOROETHANE	10	2	12	U	12	U	13	U	13	U	13	U
2-BUTANONE	10	2	12	U	12	U	13	U	13	U	13	U
1,1,1-TRICHLOROETHANE	10	2	12	U	12	U	13	U	13	U	13	U
CARBON TETRACHLORIDE	10	2	12	U	12	U	13	U	13	U	13	U
BROMODICHLOROMETHANE	10	2	12	U	12	U	13	U	13	U	13	U
1,2-DICHLOROPROPANE	10	2	12	U	12	U	13	U	13	U	13	U
CIS-1,3-DICHLOROPROPENE	10	2	12	U	12	U	13	U	13	U	13	U
TRICHLOROETHENE	10	2	12	U	12	U	13	U	13	U	13	U
DIBROMOCHLOROMETHANE	10	2	12	U	12	U	13	U	13	U	13	U
1,1,2-TRICHLOROETHANE	10	2	12	U	12	U	13	U	13	U	13	U
BENZENE	10	2	12	U	12	U	13	U	13	U	13	U
TRANS-1,3-DICHLOROPROPENE	10	1	12	U	12	U	13	U	13	U	13	U
BROMOFORM	10	2	12	U	12	U	13	U	13	U	13	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U	13	U	13	U	13	U
2-HEXANONE	10	2	12	U	12	U	13	U	13	U	13	U
TETRACHLOROETHENE	10	2	12	U	12	U	13	U	13	U	13	U
1,1,2,2-TETRACHLOROETHANE	10	2	12	U	12	U	13	U	13	U	13	U
TOLUENE	10	2	12	U	2	J	13	U	13	U	2	J
CHLOROBENZENE	10	2	12	U	12	U	13	U	13	U	13	U
ETHYLBENZENE	10	2	12	U	12	U	13	U	13	U	13	U
STYRENE	10	2	12	U	12	U	13	U	13	U	13	U
TOTAL XYLENES	10	2	12	U	12	U	13	U	13	U	13	U
% SOLIDS:			80.0		80.0		79.0		78.0		79.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-16		W-SB-04-17		W-SB-04-18	
LABORATORY ID:			950261-07		950261-08		950261-09	
TCL VOLATILE SOILS (UG/KG)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2	12	U	12	U	12	U
BROMOMETHANE	10	2	12	U	12	U	12	U
VINYL CHLORIDE	10	2	12	U	12	U	12	U
CHLOROETHANE	10	2	12	U	12	U	12	U
METHYLENE CHLORIDE	10	2	4	B	4	B	12	U
ACETONE	10	2	18	B	12	U	12	U
CARBON DISULFIDE	10	2	12	U	12	U	12	U
1,1-DICHLOROETHENE	10	2	12	U	12	U	12	U
1,1-DICHLOROETHANE	10	2	12	U	12	U	12	U
1,2-DICHLOROETHENE (TOTAL)	10	2	12	U	12	U	12	U
CHLOROFORM	10	2	12	U	12	U	12	U
1,2-DICHLOROETHANE	10	2	12	U	12	U	12	U
2-BUTANONE	10	2	12	U	12	U	12	U
1,1,1-TRICHLOROETHANE	10	2	12	U	12	U	12	U
CARBON TETRACHLORIDE	10	2	12	U	12	U	12	U
BROMODICHLOROMETHANE	10	2	12	U	12	U	12	U
1,2-DICHLOROPROPANE	10	2	12	U	12	U	12	U
CIS-1,3-DICHLOROPROPENE	10	2	12	U	12	U	12	U
TRICHLOROETHENE	10	2	12	U	12	U	12	U
DIBROMOCHLOROMETHANE	10	2	12	U	12	U	12	U
1,1,2-TRICHLOROETHANE	10	2	12	U	12	U	12	U
BENZENE	10	2	12	U	12	U	12	U
TRANS-1,3-DICHLOROPROPENE	10	1	12	U	12	U	12	U
BROMOFORM	10	2	12	U	12	U	12	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U	12	U
2-HEXANONE	10	2	12	U	12	U	12	U
TETRACHLOROETHENE	10	2	12	U	12	U	12	U
1,1,2,2-TETRACHLOROETHANE	10	2	12	U	12	U	12	U
TOLUENE	10	2	12	U	2	J	12	U
CHLOROBENZENE	10	2	12	U	12	U	12	U
ETHYLBENZENE	10	2	12	U	12	U	12	U
STYRENE	10	2	12	U	12	U	12	U
TOTAL XYLENES	10	2	12	U	12	U	12	U
% SOLIDS:			84.0		81.0		80.0	
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL VOLATILE SOILS (UG/KG)

CLIENT ID:			W-SB-04-19		W-SB-04-20		W-SB-04-21		W-SB-04-22		W-SB-04-23	
LABORATORY ID:			950266-02		950266-03		950266-04		950266-05		950266-06	
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	2	12	U	12	U	12	U	12	U	13	U
BROMOMETHANE	10	2	2	B	12	U	12	U	12	U	13	U
VINYL CHLORIDE	10	2	12	U	12	U	12	U	12	U	13	U
CHLOROETHANE	10	2	12	U	12	U	12	U	12	U	13	U
METHYLENE CHLORIDE	10	2	12	U	2	B	3	B	3	B	13	U
ACETONE	10	2	12	U	4	B	12	U	7	B	89	B
CARBON DISULFIDE	10	2	12	U	12	U	12	U	12	U	13	U
1,1-DICHLOROETHENE	10	2	12	U	12	U	12	U	12	U	13	U
1,1-DICHLOROETHANE	10	2	12	U	12	U	12	U	12	U	13	U
1,2-DICHLOROETHENE (TOTAL)	10	2	12	U	12	U	12	U	12	U	13	U
CHLOROFORM	10	2	12	U	12	U	12	U	12	U	13	U
1,2-DICHLOROETHANE	10	2	12	U	12	U	12	U	12	U	13	U
2-BUTANONE	10	2	12	U	12	U	12	U	12	U	13	U
1,1,1-TRICHLOROETHANE	10	2	12	U	12	U	12	U	12	U	13	U
CARBON TETRACHLORIDE	10	2	12	U	12	U	12	U	12	U	13	U
BROMODICHLOROMETHANE	10	2	12	U	12	U	12	U	12	U	13	U
1,2-DICHLOROPROPANE	10	2	12	U	12	U	12	U	12	U	13	U
CIS-1,3-DICHLOROPROPENE	10	2	12	U	12	U	12	U	12	U	13	U
TRICHLOROETHENE	10	2	12	U	12	U	12	U	12	U	13	U
DIBROMOCHLOROMETHANE	10	2	12	U	12	U	12	U	12	U	13	U
1,1,2-TRICHLOROETHANE	10	2	12	U	12	U	12	U	12	U	13	U
BENZENE	10	2	12	U	12	U	12	U	12	U	13	U
TRANS-1,3-DICHLOROPROPENE	10	1	12	U	12	U	12	U	12	U	13	U
BROMOFORM	10	2	12	U	12	U	12	U	12	U	13	U
4-METHYL-2-PENTANONE	10	2	12	U	12	U	12	U	12	U	13	U
2-HEXANONE	10	2	12	U	12	U	12	U	12	U	13	U
TETRACHLOROETHENE	10	2	12	U	12	U	12	U	12	U	13	U
1,1,2,2-TETRACHLOROETHANE	10	2	12	U	12	U	12	U	12	U	13	U
TOLUENE	10	2	12	U	12	U	2	J	12	U	3	J
CHLOROBENZENE	10	2	12	U	12	U	12	U	12	U	13	U
ETHYLBENZENE	10	2	12	U	12	U	12	U	12	U	13	U
STYRENE	10	2	12	U	12	U	12	U	12	U	13	U
TOTAL XYLENES	10	2	12	U	12	U	12	U	12	U	6	J
% SOLIDS:			83.0		81.0		83.0		83.0		78.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-24		W-SB-04-32	
LABORATORY ID:			950266-07		950266-08	

TCL VOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL				
CHLOROMETHANE	10	2	13	U	12	U
BROMOMETHANE	10	2	13	U	12	U
VINYL CHLORIDE	10	2	13	U	12	U
CHLOROETHANE	10	2	13	U	12	U
METHYLENE CHLORIDE	10	2	2	B	3	B
ACETONE	10	2	82	B	110	B
CARBON DISULFIDE	10	2	13	U	12	U
1,1-DICHLOROETHENE	10	2	13	U	12	U
1,1-DICHLOROETHANE	10	2	13	U	12	U
1,2-DICHLOROETHENE (TOTAL)	10	2	13	U	12	U
CHLOROFORM	10	2	13	U	12	U
1,2-DICHLOROETHANE	10	2	13	U	12	U
2-BUTANONE	10	2	15	B	19	B
1,1,1-TRICHLOROETHANE	10	2	13	U	12	U
CARBON TETRACHLORIDE	10	2	13	U	12	U
BROMODICHLOROMETHANE	10	2	13	U	12	U
1,2-DICHLOROPROPANE	10	2	13	U	12	U
CIS-1,3-DICHLOROPROPENE	10	2	13	U	12	U
TRICHLOROETHENE	10	2	13	U	12	U
DIBROMOCHLOROMETHANE	10	2	13	U	12	U
1,1,2-TRICHLOROETHANE	10	2	13	U	12	U
BENZENE	10	2	13	U	12	U
TRANS-1,3-DICHLOROPROPENE	10	1	13	U	12	U
BROMOFORM	10	2	13	U	12	U
4-METHYL-2-PENTANONE	10	2	13	U	12	U
2-HEXANONE	10	2	13	U	12	U
TETRACHLOROETHENE	10	2	13	U	12	U
1,1,2,2-TETRACHLOROETHANE	10	2	13	U	12	U
TOLUENE	10	2	4	J	2	J
CHLOROBENZENE	10	2	13	U	12	U
ETHYLBENZENE	10	2	4	J	2	J
STYRENE	10	2	13	U	12	U
TOTAL XYLENES	10	2	8	J	3	J
% SOLIDS:			79.0		80.0	
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-TB-0414		W-TB-0417		W-RB-0417		W-TB-0419		W-FB-0419	
LABORATORY ID:			950237-01		950237-05		950237-08		950237-09		950237-14	
TCL VOLATILE WATERS (UG/L)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
BROMOMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
VINYL CHLORIDE	10	2	10	U	10	U	10	U	10	U	10	U
CHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
METHYLENE CHLORIDE	10	2	10	U	10	U	10	U	10	U	10	U
ACETONE	10	2	10	U	10	U	14	J	10	U	10	U
CARBON DISULFIDE	10	2	10	U	10	U	10	U	10	U	10	U
1,1-DICHLOROETHENE	10	2	10	U	10	U	10	U	10	U	10	U
1,1-DICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U	10	U	10	U	10	U	10	U
CHLOROFORM	10	2	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
2-BUTANONE	10	2	10	U	10	U	10	U	10	U	10	U
1,1,1-TRICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
CARBON TETRACHLORIDE	10	2	10	U	10	U	10	U	10	U	10	U
BROMODICHLOROMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROPROPANE	10	2	10	U	10	U	10	U	10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U	10	U	10	U	10	U	10	U
TRICHLOROETHENE	10	2	10	U	10	U	10	U	10	U	10	U
DIBROMOCHLOROMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
BENZENE	10	2	10	U	10	U	10	U	10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	1	10	U	10	U	10	U	10	U	10	U
BROMOFORM	10	2	10	U	10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	2	10	U	10	U	10	U	10	U	10	U
2-HEXANONE	10	2	10	U	10	U	10	U	10	U	10	U
TETRACHLOROETHENE	10	2	10	U	10	U	10	U	10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
TOLUENE	10	2	10	U	10	U	10	U	10	U	10	U
CHLOROBENZENE	10	2	10	U	10	U	10	U	10	U	10	U
ETHYLBENZENE	10	2	10	U	10	U	10	U	10	U	10	U
STYRENE	10	2	10	U	10	U	10	U	10	U	10	U
TOTAL XYLENES	10	2	10	U	10	U	10	U	10	U	10	U
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-TB-0421
LABORATORY ID: 950255-01

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
CHLOROMETHANE	10	2	10	U
BROMOMETHANE	10	2	10	U
VINYL CHLORIDE	10	2	10	U
CHLOROETHANE	10	2	10	U
METHYLENE CHLORIDE	10	2	10	U
ACETONE	10	2	9	J
CARBON DISULFIDE	10	2	10	U
1,1-DICHLOROETHENE	10	2	10	U
1,1-DICHLOROETHANE	10	2	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U
CHLOROFORM	10	2	10	U
1,2-DICHLOROETHANE	10	2	10	U
2-BUTANONE	10	2	7	J
1,1,1-TRICHLOROETHANE	10	2	10	U
CARBON TETRACHLORIDE	10	2	10	U
BROMODICHLOROMETHANE	10	2	10	U
1,2-DICHLOROPROPANE	10	2	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U
TRICHLOROETHENE	10	2	10	U
DIBROMOCHLOROMETHANE	10	2	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U
BENZENE	10	2	10	U
TRANS-1,3-DICHLOROPROPENE	10	1	10	U
BROMOFORM	10	2	10	U
4-METHYL-2-PENTANONE	10	2	10	U
2-HEXANONE	10	2	10	U
TETRACHLOROETHENE	10	2	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U
TOLUENE	10	2	10	U
CHLOROBENZENE	10	2	10	U
ETHYLBENZENE	10	2	10	U
STYRENE	10	2	10	U
TOTAL XYLENES	10	2	10	U
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-TB-0425		W-RB-0425	
LABORATORY ID:			950266-01		950266-10	

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
CHLOROMETHANE	10	2	10	U	10	U
BROMOMETHANE	10	2	10	U	10	U
VINYL CHLORIDE	10	2	10	U	10	U
CHLOROETHANE	10	2	10	U	10	U
METHYLENE CHLORIDE	10	2	2	J	10	U
ACETONE	10	2	12	J	16	J
CARBON DISULFIDE	10	2	10	U	10	U
1,1-DICHLOROETHENE	10	2	10	U	10	U
1,1-DICHLOROETHANE	10	2	10	U	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U	10	U
CHLOROFORM	10	2	10	U	10	U
1,2-DICHLOROETHANE	10	2	10	U	10	U
2-BUTANONE	10	2	6	J	10	U
1,1,1-TRICHLOROETHANE	10	2	10	U	10	U
CARBON TETRACHLORIDE	10	2	10	U	10	U
BROMODICHLOROMETHANE	10	2	10	U	10	U
1,2-DICHLOROPROPANE	10	2	10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U	10	U
TRICHLOROETHENE	10	2	10	U	10	U
DIBROMOCHLOROMETHANE	10	2	10	U	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U	10	U
BENZENE	10	2	10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	1	10	U	10	U
BROMOFORM	10	2	10	U	10	U
4-METHYL-2-PENTANONE	10	2	10	U	10	U
2-HEXANONE	10	2	10	U	10	U
TETRACHLOROETHENE	10	2	10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U	10	U
TOLUENE	10	2	10	U	10	U
CHLOROBENZENE	10	2	10	U	10	U
ETHYLBENZENE	10	2	10	U	10	U
STYRENE	10	2	10	U	10	U
TOTAL XYLENES	10	2	10	U	10	U
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-TB-0424
LABORATORY ID: 950261-01

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
CHLOROMETHANE	10	2	10	U
BROMOMETHANE	10	2	10	U
VINYL CHLORIDE	10	2	10	U
CHLOROETHANE	10	2	10	U
METHYLENE CHLORIDE	10	2	2	J
ACETONE	10	2	14	J
CARBON DISULFIDE	10	2	10	U
1,1-DICHLOROETHENE	10	2	10	U
1,1-DICHLOROETHANE	10	2	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U
CHLOROFORM	10	2	10	U
1,2-DICHLOROETHANE	10	2	10	U
2-BUTANONE	10	2	6	J
1,1,1-TRICHLOROETHANE	10	2	10	U
CARBON TETRACHLORIDE	10	2	10	U
BROMODICHLOROMETHANE	10	2	10	U
1,2-DICHLOROPROPANE	10	2	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U
TRICHLOROETHENE	10	2	10	U
DIBROMOCHLOROMETHANE	10	2	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U
BENZENE	10	2	10	U
TRANS-1,3-DICHLOROPROPENE	10	1	10	U
BROMOFORM	10	2	10	U
4-METHYL-2-PENTANONE	10	2	10	U
2-HEXANONE	10	2	10	U
TETRACHLOROETHENE	10	2	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U
TOLUENE	10	2	10	U
CHLOROBENZENE	10	2	10	U
ETHYLBENZENE	10	2	10	U
STYRENE	10	2	10	U
TOTAL XYLENES	10	2	10	U
DILUTION FACTOR:			1.0	

SURFACE WATER
PHASE I

(SMC Martin, 1991)

(SMC Martin, 1991)

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

VOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		NADC - 3-S. WATER	5-S. WATER	6-S. WATER
LAB ID:		3A 8800	5A 8803	6A 8805
CHEMICAL	CRQL			
Chloromethane	10	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U
Methylene Chloride	5	6 B	5 B	5 B
Acetone	10	10 UJ(c)	7 B	10 UJ(c)
Carbon Disulfide	5	5 U	5 U	5 U
Trichlorofluoromethane	5	5 U	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U
1,2-Dichloroethene(total)	5	5 U	5 U	5 U
Chloroform	5	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U
2-Butanone	10	R(f)	R(f)	R(f)
1,1,1-Trichloroethane	5	5 U	5 U	5 U
CarbonTetrachloride	5	5 U	5 U	5 U
VinylAcetate	10	10 U	10 U	10 U
Bromodichloromethane	5	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	5 U
Benzene	5	5 U	5 U	5 U
Dibromochloromethane	5	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U
2-chloroethylVinyl ether	10	10 U	10 U	10 U
Bromoform	5	5 U	5 U	5 U
4-Methyl-2-Pentanone	10	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U
Tetrachloroethene	5	5 U	0.4 B	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U
Xylenes (total)	5	5 U	5 U	5 U
1,3-dichlorobenzene	5	5 U	5 U	5 U
1,2 & 1,4-dichlorobenzene	5	5 U	5 U	5 U

SURFACE WATER
PHASE II

(HNUS, 1992)

SITE: WARMINSTER NAVAL BASE

HNUS, 1992

Surface Water Volatile Organics Analysis (ug/ L)

Sample No.:	W-SW-01 (6B)	W-SW-02 (5B)	W-SW-03 (4B)	W-SW-04 (3B)
Lab Sample ID:	920328-08	920328-10	920328-12	920328-14
Chloromethane	10 UJ	10 UJ	10 UJ	10 UJ
Bromomethane	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U
Methylene Chloride	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U
Carbon Disulfide	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U
Benzene	10 U	10 U	10 U	10 U
Trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U
Toluene	10 U	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U
Total Xylenes	10 U	10 U	10 U	10 U

SURFACE WATER
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0103		W-SW-C1	
LABORATORY ID:			950005-08		950005-03	

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
CHLOROMETHANE	10	2	10	U	10	U
BROMOMETHANE	10	2	10	U	10	U
VINYL CHLORIDE	10	2	10	U	10	U
CHLOROETHANE	10	2	10	U	10	U
METHYLENE CHLORIDE	10	2	6	B	5	B
ACETONE	10	2	21	J	12	B
CARBON DISULFIDE	10	2	10	U	10	U
1,1-DICHLOROETHENE	10	2	10	U	10	U
1,1-DICHLOROETHANE	10	2	10	U	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U	10	U
CHLOROFORM	10	2	10	U	10	U
1,2-DICHLOROETHANE	10	2	10	U	10	U
2-BUTANONE	10	2	10	U	10	U
1,1,1-TRICHLOROETHANE	10	2	10	U	10	U
CARBON TETRACHLORIDE	10	2	10	U	10	U
BROMODICHLOROMETHANE	10	2	10	U	10	U
1,2-DICHLOROPROPANE	10	2	10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U	10	U
TRICHLOROETHENE	10	2	10	U	10	U
DIBROMOCHLOROMETHANE	10	2	10	U	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U	10	U
BENZENE	10	2	10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	2	10	U	10	U
BROMOFORM	10	2	10	U	10	U
4-METHYL-2-PENTANONE	10	2	10	U	10	U
2-HEXANONE	10	2	10	U	10	U
TETRACHLOROETHENE	10	2	10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U	10	U
TOLUENE	10	2	10	U	10	U
CHLOROBENZENE	10	2	10	U	10	U
ETHYLBENZENE	10	2	10	U	10	U
STYRENE	10	2	10	U	10	U
XYLENE (TOTAL)	10	2	10	U	10	U
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL VOLATILE WATERS (UG/L)

CLIENT ID:			W-SW-C2		W-SW-C4		W-SW-C5		Young W-SW-C7		W-SW-C8	
LABORATORY ID:			950005-01		950005-12		950005-06		950005-14		950005-13	
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
BROMOMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
VINYL CHLORIDE	10	2	10	U	10	U	10	U	10	U	10	U
CHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
METHYLENE CHLORIDE	10	2	6	B	4	B	6	B	4	B	4	B
ACETONE	10	2	11	B	10	B	18	B	16	B	9	B
CARBON DISULFIDE	10	2	10	U	10	U	10	U	2	J	10	U
1,1-DICHLOROETHENE	10	2	10	U	10	U	10	U	10	U	10	U
1,1-DICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U	10	U	10	U	10	U	10	U
CHLOROFORM	10	2	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
2-BUTANONE	10	2	10	U	10	U	10	U	10	U	10	U
1,1,1-TRICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
CARBON TETRACHLORIDE	10	2	10	U	10	U	10	U	10	U	10	U
BROMODICHLOROMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROPROPANE	10	2	10	U	10	U	10	U	10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U	10	U	10	U	10	U	10	U
TRICHLOROETHENE	10	2	10	U	10	U	10	U	10	U	10	U
DIBROMOCHLOROMETHANE	10	2	10	U	10	U	10	U	10	U	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
BENZENE	10	2	10	U	10	U	10	U	10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	2	10	U	10	U	10	U	10	U	10	U
BROMOFORM	10	2	10	U	10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	2	10	U	10	U	10	U	10	U	10	U
2-HEXANONE	10	2	10	U	10	UJ	10	U	10	UJ	10	UJ
TETRACHLOROETHENE	10	2	10	U	10	U	10	U	10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U	10	U	10	U	10	U	10	U
TOLUENE	10	2	10	U	10	U	10	U	10	U	10	U
CHLOROBENZENE	10	2	10	U	10	U	10	U	10	U	10	U
ETHYLBENZENE	10	2	10	U	10	U	10	U	10	U	10	U
STYRENE	10	2	10	U	10	U	10	U	10	U	10	U
XYLENE (TOTAL)	10	2	10	U	10	U	10	U	10	U	10	U
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SW-C9		W-TB-0103	
LABORATORY ID:			950005-15		950005-09	

TCL VOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
CHLOROMETHANE	10	2	10	U	10	U
BROMOMETHANE	10	2	10	U	10	U
VINYL CHLORIDE	10	2	10	U	10	U
CHLOROETHANE	10	2	10	U	10	U
METHYLENE CHLORIDE	10	2	5	B	5	B
ACETONE	10	2	15	B	10	UJ
CARBON DISULFIDE	10	2	10	U	10	U
1,1-DICHLOROETHENE	10	2	10	U	10	U
1,1-DICHLOROETHANE	10	2	10	U	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2	10	U	10	U
CHLOROFORM	10	2	10	U	10	U
1,2-DICHLOROETHANE	10	2	10	U	10	U
2-BUTANONE	10	2	10	U	10	U
1,1,1-TRICHLOROETHANE	10	2	10	U	10	U
CARBON TETRACHLORIDE	10	2	10	U	10	U
BROMODICHLOROMETHANE	10	2	10	U	10	U
1,2-DICHLOROPROPANE	10	2	10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	2	10	U	10	U
TRICHLOROETHENE	10	2	10	U	10	U
DIBROMOCHLOROMETHANE	10	2	10	U	10	U
1,1,2-TRICHLOROETHANE	10	2	10	U	10	U
BENZENE	10	2	10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	2	10	U	10	U
BROMOFORM	10	2	10	U	10	U
4-METHYL-2-PENTANONE	10	2	10	U	10	U
2-HEXANONE	10	2	10	UJ	10	U
TETRACHLOROETHENE	10	2	10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	2	10	U	10	U
TOLUENE	10	2	10	U	10	U
CHLOROBENZENE	10	2	10	U	10	U
ETHYLBENZENE	10	2	10	U	10	U
STYRENE	10	2	10	U	10	U
XYLENE (TOTAL)	10	2	10	U	10	U
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			Young Duplicate **		W-SW-C10		W-TB-0104	
LABORATORY ID:					950005-26		950005-29	
TCL VOLATILE WATERS (UG/L)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2			10	U	10	U
BROMOMETHANE	10	2			10	U	10	U
VINYL CHLORIDE	10	2			10	U	10	U
CHLOROETHANE	10	2			10	U	10	U
METHYLENE CHLORIDE	10	2			4	B	5	B
ACETONE	10	2			18	B	10	UJ
CARBON DISULFIDE	10	2			3	J	10	U
1,1-DICHLOROETHENE	10	2			10	U	10	U
1,1-DICHLOROETHANE	10	2			10	U	10	U
1,2-DICHLOROETHENE (TOTAL)	10	2			10	U	10	U
CHLOROFORM	10	2			10	U	10	U
1,2-DICHLOROETHANE	10	2			10	U	10	U
2-BUTANONE	10	2			10	U	10	U
1,1,1-TRICHLOROETHANE	10	2			10	U	10	U
CARBON TETRACHLORIDE	10	2			10	U	10	U
BROMODICHLOROMETHANE	10	2			10	U	10	U
1,2-DICHLOROPROPANE	10	2			10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	2			10	U	10	U
TRICHLOROETHENE	10	2			10	U	10	U
DIBROMOCHLOROMETHANE	10	2			10	U	10	U
1,1,2-TRICHLOROETHANE	10	2			10	U	10	U
BENZENE	10	2			10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	2			10	U	10	U
BROMOFORM	10	2			10	U	10	U
4-METHYL-2-PENTANONE	10	2			10	U	10	U
2-HEXANONE	10	2			10	UJ	10	UJ
TETRACHLOROETHENE	10	2			10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	2			10	U	10	U
TOLUENE	10	2			10	U	10	U
CHLOROBENZENE	10	2			10	U	10	U
ETHYLBENZENE	10	2			10	U	10	U
STYRENE	10	2			10	U	10	U
XYLENE (TOTAL)	10	2			10	U	10	U
DILUTION FACTOR:					1.0		1.0	

** W-SW-C10 is a duplicate of SW-C7.

SEDIMENT
PHASE I

(SMC Martin, 1991)

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

VOLATILE SEDIMENT ANALYSES (ug/Kg)

CLIENT ID:
LAB ID:

CHEMICAL	CRQL	3A 3-SEDIMENT 8801	4A 4-SEDIMENT 8802
Chloromethane	50	50 U	50 U
Bromomethane	50	50 U	50 U
Vinyl Chloride	50	50 U	50 U
Chloroethane	50	50 U	50 U
Methylene Chloride	25	13 B	23 B
Acetone	50	66 B	50 UJ(c)
Carbon Disulfide	25	25 U	25 U
Trichlorofluoromethane	25	25 U	25 U
1,1-Dichloroethene	25	25 U	25 U
1,1-Dichloroethane	25	25 U	25 U
1,2-Dichloroethene (total)	25	25 U	25 U
Chloroform	25	25 U	25 U
1,2-Dichloroethane	25	25 U	25 U
2-Butanone	50	R(f)	R(f)
1,1,1-Trichloroethane	25	25 U	25 U
CarbonTetrachloride	25	25 U	25 U
VinylAcetate	50	50 U	50 U
Bromodichloromethane	25	25 U	25 U
1,2-Dichloropropane	25	25 U	25 U
cis-1,3-Dichloropropene	25	25 U	25 U
Trichloroethene	25	25 U	25 U
Benzene	25	25 U	25 U
Dibromochloromethane	25	25 U	25 U
1,1,2-Trichloroethane	25	25 U	25 U
trans-1,3-Dichloropropene	25	25 U	25 U
2-chloroethylvinyl ether	50	50 U	50 U
Bromoform	25	25 U	25 U
4-Methyl-2-Pentanone	50	50 U	50 U
2-Hexanone	50	50 U	50 U
Tetrachloroethene	25	25 U	25 U
1,1,2,2-Tetrachloroethane	25	25 U	25 U
Toluene	25	25 U	25 U
Chlorobenzene	25	25 U	25 U
Ethylbenzene	25	25 U	25 U
Styrene	25	25 U	25 U
Xylenes (total)	25	25 U	25 U
1,3-dichlorobenzene	25	25 U	25 U
1,2 & 1,4-dichlorobenzene	25	25 U	25 U

Analysis Factor

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

VOLATILE SEDIMENT ANALYSES (ug/Kg)

CLIENT ID:		5A NADC - 5-SEDIMENT	6A 6-SEDIMENT
LAB ID:		8804	8806
CHEMICAL	CRQL		
Chloromethane	50	50 U	50 U
Bromomethane	50	50 U	50 U
Vinyl Chloride	50	50 U	50 U
Chloroethane	50	50 U	50 U
Methylene Chloride	25	12 B	15 B
Acetone	50	150 B	340 B
Carbon Disulfide	25	25 U	25 U
Trichlorofluoromethane	25	25 U	25 U
1,1-Dichloroethene	25	25 U	25 U
1,1-Dichloroethane	25	25 U	25 U
1,2-Dichloroethene (total)	25	25 U	25 U
Chloroform	25	25 U	25 U
1,2-Dichloroethane	25	25 U	25 U
2-Butanone	50	R(f)	R(f)
1,1,1-Trichloroethane	25	25 U	25 U
CarbonTetrachloride	25	25 U	25 U
VinylAcetate	50	50 U	50 U
Bromodichloromethane	25	25 U	25 U
1,2-Dichloropropane	25	25 U	25 U
cis-1,3-Dichloropropene	25	25 U	25 U
Trichloroethene	25	25 U	25 U
Benzene	25	25 U	25 U
Dibromochloromethane	25	25 U	25 U
1,1,2-Trichloroethane	25	25 U	25 U
trans-1,3-Dichloropropene	25	25 U	25 U
2-chloroethylVinyl ether	50	50 U	50 U
Bromoform	25	25 U	25 U
4-Methyl-2-Pentanone	50	50 U	50 U
2-Hexanone	50	50 U	50 U
Tetrachloroethene	25	25 U	25 U
1,1,2,2-Tetrachloroethane	25	25 U	25 U
Toluene	25	7 B	13 B
Chlorobenzene	25	25 U	25 U
Ethylbenzene	25	25 U	25 U
Styrene	25	25 U	25 U
Xylenes (total)	25	25 UJ(c)	25 UJ(c)
1,3-dichlorobenzene	25	25 U	25 U
1,2 & 1,4-dichlorobenzene	25	25 U	25 U

SMC March, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

VOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		NADC - FIELD R. BLANK	FIELD BLK-TAP	FIELD BLK-DI	TRIP BLANK	S2-20-RINSATE
LAB ID:		8807	8808	8811	8820	8847
CHEMICAL	CRQL					
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	5	6 B	5 B	8 B	16 B	5 B
Acetone	10	10 UJ(c)	10 UJ(c)	2 B	10 UJ(c)	10 UJ(c)
Carbon Disulfide	5	5 U	5 U	5 U	5 U	5 U
Trichlorofluoromethane	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene (total)	5	5 U	5 U	5 U	5 U	5 U
Chloroform	5	5 U	4 B	2 B	5 U	0.5 B
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
2-Butanone	10	R(f)	R(f)	R(f)	R(f)	R(f)
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
CarbonTetrachloride	5	5 U	5 U	5 U	5 U	5 U
VinylAcetate	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5	5 U	1 J	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U
Benzene	5	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
2-chloroethylVinyl ether	10	10 U	10 U	10 U	10 U	10 U
Bromoform	5	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5	5 U	5 U	5 U	5 U	5 U
1,3-dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U
1,2 & 1,4-dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

VOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		NADC - TRIP BLANK - 21	FIELD BLANK - 27	FIELD BLANK - 28	RINS. BLANK - 30	TRIP BLANK - 31
LAB ID:		8848	8854	8855	8901	8902
CHEMICAL	CRQL					
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	5	6 B	3 B	5 B	6 B	4 B
Acetone	10	4 B	2 B	10 UJ(c)	28 B	3 B
Carbon Disulfide	5	5 U	5 U	5 U	5 U	5 U
Trichlorofluoromethane	5	5 U	5 U	5 U	3 J	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene(total)	5	5 U	5 U	5 U	5 U	5 U
Chloroform	5	5 U	8 B	2 B	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
2-Butanone	10	R(f)	R(f)	R(f)	R(f)	R(f)
1,1,1-Trichloroethane	5	5 U	5 U	5 U	0.6 J	0.4 J
CarbonTetrachloride	5	5 U	5 U	5 U	5 U	5 U
VinylAcetate	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5	5 U	7	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U
Benzene	5	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5	5 U	6	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
2-chloroethylvinyl ether	10	10 U	10 U	10 U	10 U	10 U
Bromoform	5	5 U	1 J	5 U	5 U	5 U
4-Methyl-2-Pentanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5	5 U	2 J	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U	13	9
Chlorobenzene	5	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5	5 U	5 U	5 U	5 U	5 U
1,3-dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U
1,2 & 1,4-dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U

SEDIMENT
PHASE II

(HNUS, 1992)

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Sediment Volatile Organics Analysis (ug/kg)

Sample No.:	6B W-SD-01	5B W-SD-02	4B W-SD-03	3B W-SD-04
Lab Sample ID:	920328-03	920328-04	920328-05	920328-6
Chloromethane	13 U	13 U	14 U	13 U
Bromomethane	13 U	13 U	14 U	13 U
Vinyl Chloride	13 U	13 U	14 U	13 U
Chloroethane	13 U	13 U	14 U	13 U
Methylene Chloride	13 U	13 U	14 U	13 U
Acetone	46 J	13 UJ	14 UJ	13 UJ
Carbon Disulfide	13 U	13 U	14 U	13 U
1,1-Dichloroethene	13 U	13 U	14 U	13 U
1,1-Dichloroethane	13 U	13 U	14 U	13 U
1,2-Dichloroethene (total)	13 U	13 U	14 U	13 U
Chloroform	13 U	13 U	14 U	13 U
1,2-Dichloroethane	13 U	13 U	14 U	13 U
2-Butanone	13 U	13 U	14 U	13 U
1,1,1-Trichloroethane	13 U	13 U	14 U	13 U
Carbon Tetrachloride	13 U	13 U	14 U	13 U
Bromodichloromethane	13 U	13 U	14 U	13 U
1,2-Dichloropropane	13 U	13 U	14 U	13 U
cis-1,3-Dichloropropene	13 U	13 U	14 U	13 U
Trichloroethene	13 U	13 U	14 U	13 U
Dibromochloromethane	13 U	13 U	14 U	13 U
1,1,2-Trichloroethane	13 U	13 U	14 U	13 U
Benzene	13 U	13 U	14 U	13 U
Trans-1,3-Dichloropropene	13 U	13 U	14 U	13 U
Bromoform	13 U	13 U	14 U	13 U
4-Methyl-2-Pentanone	13 U	13 U	14 U	13 U
2-Hexanone	13 U	13 U	14 U	13 U
Tetrachloroethene	13 U	13 U	14 U	13 U
1,1,2,2-Tetrachloroethane	13 U	13 U	14 U	13 U
Toluene	13 U	13 U	14 U	13 U
Chlorobenzene	13 U	13 U	14 U	13 U
Ethylbenzene	13 U	13 U	14 U	13 U
Styrene	13 U	13 U	14 U	13 U
Total Xylenes	13 U	13 U	14 U	13 U

SEDIMENT
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SD-C1		W-SD-C2		W-SD-C3	
LABORATORY ID:			950005-04		950005-02		950005-05	
TCL VOLATILE SOILS (UG/KG)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2	16	U	24	U	16	U
BROMOMETHANE	10	2	16	U	24	U	16	U
VINYL CHLORIDE	10	2	16	U	24	U	16	U
CHLOROETHANE	10	2	16	U	24	U	16	U
METHYLENE CHLORIDE	10	2	5	B	6	B	4	B
ACETONE	10	2	130	B	110	B	9	B
CARBON DISULFIDE	10	2	16	U	24	U	16	U
1,1-DICHLOROETHENE	10	2	16	U	24	U	16	U
1,1-DICHLOROETHANE	10	2	16	U	24	U	16	U
1,2-DICHLOROETHENE (TOTAL)	10	2	16	U	24	U	16	U
CHLOROFORM	10	2	16	U	24	U	16	U
1,2-DICHLOROETHANE	10	2	16	U	24	U	16	U
2-BUTANONE	10	2	30	J	24	U	16	U
1,1,1-TRICHLOROETHANE	10	2	16	U	24	U	16	U
CARBON TETRACHLORIDE	10	2	16	U	24	U	16	U
BROMODICHLOROMETHANE	10	2	16	U	24	U	16	U
1,2-DICHLOROPROPANE	10	2	16	U	24	U	16	U
CIS-1,3-DICHLOROPROPENE	10	2	16	U	24	U	16	U
TRICHLOROETHENE	10	2	16	U	24	U	16	U
DIBROMOCHLOROMETHANE	10	2	16	U	24	U	16	U
1,1,2-TRICHLOROETHANE	10	2	16	U	24	U	16	U
BENZENE	10	2	16	U	24	U	16	U
TRANS-1,3-DICHLOROPROPENE	10	2	16	U	24	U	16	U
BROMOFORM	10	2	16	U	24	U	16	U
4-METHYL-2-PENTANONE	10	2	16	U	24	U	16	U
2-HEXANONE	10	2	16	U	24	U	16	U
TETRACHLOROETHENE	10	2	16	U	24	U	16	U
1,1,2,2-TETRACHLOROETHANE	10	2	16	U	24	U	16	U
TOLUENE	10	2	10	J	24	U	16	U
CHLOROBENZENE	10	2	16	U	24	U	16	U
ETHYLBENZENE	10	2	16	U	24	U	16	U
STYRENE	10	2	16	U	24	U	16	U
XYLENE (TOTAL)	10	2	16	U	24	U	16	U
% SOLIDS:			62.0		41.0		64.0	
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SD-C4		W-SD-C5	
LABORATORY ID:			950005-19		950005-07	

TCL VOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL				
CHLOROMETHANE	10	2	14	U	16	U
BROMOMETHANE	10	2	14	U	16	U
VINYL CHLORIDE	10	2	14	U	16	U
CHLOROETHANE	10	2	14	UJ	16	UJ
METHYLENE CHLORIDE	10	2	4	B	4	B
ACETONE	10	2	14	UJ	9	B
CARBON DISULFIDE	10	2	14	U	16	U
1,1-DICHLOROETHENE	10	2	14	U	16	U
1,1-DICHLOROETHANE	10	2	14	U	16	U
1,2-DICHLOROETHENE (TOTAL)	10	2	14	U	16	U
CHLOROFORM	10	2	14	U	16	U
1,2-DICHLOROETHANE	10	2	14	U	16	U
2-BUTANONE	10	2	14	U	16	U
1,1,1-TRICHLOROETHANE	10	2	14	U	16	U
CARBON TETRACHLORIDE	10	2	14	U	16	U
BROMODICHLOROMETHANE	10	2	14	U	16	U
1,2-DICHLOROPROPANE	10	2	14	U	16	U
CIS-1,3-DICHLOROPROPENE	10	2	14	U	16	U
TRICHLOROETHENE	10	2	14	U	16	U
DIBROMOCHLOROMETHANE	10	2	14	U	16	U
1,1,2-TRICHLOROETHANE	10	2	14	U	16	U
BENZENE	10	2	14	U	16	U
TRANS-1,3-DICHLOROPROPENE	10	2	14	U	16	U
BROMOFORM	10	2	14	U	16	U
4-METHYL-2-PENTANONE	10	2	14	U	16	U
2-HEXANONE	10	2	14	U	16	U
TETRACHLOROETHENE	10	2	14	U	16	U
1,1,2,2-TETRACHLOROETHANE	10	2	14	U	16	U
TOLUENE	10	2	14	U	16	U
CHLOROBENZENE	10	2	14	U	16	U
ETHYLBENZENE	10	2	14	U	16	U
STYRENE	10	2	14	U	16	U
XYLENE (TOTAL)	10	2	14	U	16	U
% SOLIDS:			69.0		62.0	
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

			Young Duplicate		Young			
CLIENT ID:			W-SD-C10		W-SD-C7		W-SD-C8	
LABORATORY ID:			950005-27		950005-22		950005-21	
TCL VOLATILE SOILS (UG/KG)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	10	2	15	U	17	U	16	U
BROMOMETHANE	10	2	15	U	17	U	16	U
VINYL CHLORIDE	10	2	15	U	17	U	16	U
CHLOROETHANE	10	2	15	U	17	UJ	16	UJ
METHYLENE CHLORIDE	10	2	15	U	2	B	3	B
ACETONE	10	2	41	B	17	UJ	16	UJ
CARBON DISULFIDE	10	2	15	U	17	U	16	U
1,1-DICHLOROETHENE	10	2	15	U	17	U	16	U
1,1-DICHLOROETHANE	10	2	15	U	17	U	16	U
1,2-DICHLOROETHENE (TOTAL)	10	2	15	U	17	U	16	U
CHLOROFORM	10	2	15	U	17	U	16	U
1,2-DICHLOROETHANE	10	2	15	U	17	U	16	U
2-BUTANONE	10	2	15	U	17	U	16	U
1,1,1-TRICHLOROETHANE	10	2	15	U	17	U	16	U
CARBON TETRACHLORIDE	10	2	15	U	17	U	16	U
BROMODICHLOROMETHANE	10	2	15	U	17	U	16	U
1,2-DICHLOROPROPANE	10	2	15	U	17	U	16	U
CIS-1,3-DICHLOROPROPENE	10	2	15	U	17	U	16	U
TRICHLOROETHENE	10	2	15	U	17	U	16	U
DIBROMOCHLOROMETHANE	10	2	15	U	17	U	16	U
1,1,2-TRICHLOROETHANE	10	2	15	U	17	U	16	U
BENZENE	10	2	15	U	17	U	16	U
TRANS-1,3-DICHLOROPROPENE	10	2	15	U	17	U	16	U
BROMOFORM	10	2	15	U	17	U	16	U
4-METHYL-2-PENTANONE	10	2	15	U	17	U	16	U
2-HEXANONE	10	2	15	U	17	U	16	U
TETRACHLOROETHENE	10	2	15	U	17	U	16	U
1,1,2,2-TETRACHLOROETHANE	10	2	15	U	17	U	16	U
TOLUENE	10	2	15	U	17	U	16	U
CHLOROBENZENE	10	2	15	U	17	U	16	U
ETHYLBENZENE	10	2	15	U	17	U	16	U
STYRENE	10	2	15	U	17	U	16	U
XYLENE (TOTAL)	10	2	15	U	17	U	16	U
% SOLIDS			66.0		58.0		62.0	
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SD-C9
LABORATORY ID: 950005-23

TCL VOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
CHLOROMETHANE	10	2	15	U
BROMOMETHANE	10	2	15	U
VINYL CHLORIDE	10	2	15	U
CHLOROETHANE	10	2	15	UJ
METHYLENE CHLORIDE	10	2	3	B
ACETONE	10	2	15	UJ
CARBON DISULFIDE	10	2	15	U
1,1-DICHLOROETHENE	10	2	15	U
1,1-DICHLOROETHANE	10	2	15	U
1,2-DICHLOROETHENE (TOTAL)	10	2	15	U
CHLOROFORM	10	2	15	U
1,2-DICHLOROETHANE	10	2	15	U
2-BUTANONE	10	2	15	U
1,1,1-TRICHLOROETHANE	10	2	15	U
CARBON TETRACHLORIDE	10	2	15	U
BROMODICHLOROMETHANE	10	2	15	U
1,2-DICHLOROPROPANE	10	2	15	U
CIS-1,3-DICHLOROPROPENE	10	2	15	U
TRICHLOROETHENE	10	2	15	U
DIBROMOCHLOROMETHANE	10	2	15	U
1,1,2-TRICHLOROETHANE	10	2	15	U
BENZENE	10	2	15	U
TRANS-1,3-DICHLOROPROPENE	10	2	15	U
BROMOFORM	10	2	15	U
4-METHYL-2-PENTANONE	10	2	15	U
2-HEXANONE	10	2	15	U
TETRACHLOROETHENE	10	2	15	U
1,1,2,2-TETRACHLOROETHANE	10	2	15	U
TOLUENE	10	2	15	U
CHLOROBENZENE	10	2	15	U
ETHYLBENZENE	10	2	15	U
STYRENE	10	2	15	U
XYLENE (TOTAL)	10	2	15	U
% SOLIDS			65.0	
DILUTION FACTOR:			1.0	

GROUNDWATER

(HNUS, 1995c)
(HNUS, 1995d)

HNUS, 1995c

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-1220	W-TB-1220	W-MW-[redacted]29S	W-MW-H[redacted]9I	W-MW-HN[redacted]X
LABORATORY ID:			941106-06	941106-07	941106-08	941106-09	941106-10
TCL VOLATILE WATERS (UG/L)							
ANALYTE	CRQL	MDL					
CHLOROMETHANE	1	1	1 U	1 U	1 U	1 U	1 U
BROMOMETHANE	1	1	1 U	1 U	1 U	1 U	1 U
VINYL CHLORIDE	1	1	1 U	1 U	1 U	1 U	1 U
CHLOROETHANE	1	1	1 U	1 U	1 U	1 U	1 U
METHYLENE CHLORIDE	2	2	2 U	4 B	2 B	2 U	2 B
ACETONE	5	5	5 UR	5 UR	5 UR	5 UR	5 UR
CARBON DISULFIDE	1	1	1 U	1 U	1 U	2 B	1 U
1,1-DICHLOROETHENE	1	1	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHANE	1	1	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	1	1	1 U	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	1	1	1 U	1 U	1 U	1 U	1 U
CHLOROFORM	1	1	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	1	1	1 U	1 U	1 U	1 U	1 U
2-BUTANONE	5	5	5 UR	5 UR	5 UR	5 UR	5 UR
1,1,1-TRICHLOROETHANE	1	1	1 U	1 U	1 U	1 U	1 U
CARBON TETRACHLORIDE	1	1	1 U	1 U	1 U	1 U	1 U
BROMODICHLOROMETHANE	1	1	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROPROPANE	1	1	1 U	1 U	1 U	1 U	1 U
CIS-1,3-DICHLOROPROPENE	1	1	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	1	1	1 U	1 U	1 U	1 U	1 U
DIBROMOCHLOROMETHANE	1	1	1 U	1 U	1 U	1 U	1 U
1,1,2-TRICHLOROETHANE	1	1	1 U	1 U	1 U	1 U	1 U
BENZENE	1	1	1 U	1 U	1 U	1 U	1 U
TRANS-1,3-DICHLOROPROPENE	1	1	1 U	1 U	1 U	1 U	1 U
BROMOFORM	1	1	1 U	1 U	1 U	1 U	1 U
4-METHYL-2-PENTANONE	5	5	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	5	5	5 U	5 U	5 UJ	5 U	5 UJ
TETRACHLOROETHENE	1	1	1 U	1 U	1 U	1 U	1 U
1,1,2,2-TETRACHLOROETHANE	1	1	1 U	1 U	1 U	1 U	1 U
TOLUENE	1	1	1 U	1 U	3	1 U	1 U
CHLOROBENZENE	1	1	1 U	1 U	1 U	1 U	1 U
ETHYLBENZENE	1	1	1 U	1 U	1 U	1 U	1 U
STYRENE	1	1	1 U	1 U	1 U	1 U	1 U
XYLENE (TOTAL)	1	1	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMOETHANE	1	1	1 U	1 U	1 U	1 U	1 U
1,3-DICHLOROBENZENE	1	1	1 U	1 U	1 U	1 U	1 U
1,4-DICHLOROBENZENE	1	1	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROBENZENE	1	1	1 U	1 U	1 U	1 U	1 U
1,2-DIBROMO-3-CHLOROPROPANE	1	1	1 U	1 U	1 U	1 U	1 U
BROMOCHLOROMETHANE	1	1	1 U	1 U	1 U	1 U	1 U
DILUTION FACTOR:			1.0	1.0	1.0	1.0	1.0

* RESULT FROM DILUTION ANALYSIS

HNUS, 1995c

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-MW-DG15		W-TB-0110		W-MW-DG6		W-MW-HN28S		W-MW-HN28I	
LABORATORY ID:			941106-11		950009-13		950009-14		941106-20		941106-21	
TCL VOLATILE WATERS (UG/L)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	1	1	1	U	1	U	10	U	1	U	1	U
BROMOMETHANE	1	1	1	U	1	U	10	U	1	U	1	U
VINYL CHLORIDE	1	1	1	U	1	U	10	U	1	U	1	U
CHLOROETHANE	1	1	1	U	1	U	10	U	1	U	1	U
METHYLENE CHLORIDE	2	2	2	U	1	B	36	B	2	U	2	U
ACETONE	5	5	5	UR	5	UR	50	UR	5	UR	5	UR
CARBON DISULFIDE	1	1	1	U	1	U	10	U	1	U	1	U
1,1-DICHLOROETHENE	1	1	1	U	1	U	10	U	1	U	1	U
1,1-DICHLOROETHANE	1	1	1	U	1	U	10	U	1	U	1	U
CIS-1,2-DICHLOROETHENE	1	1	1	U	1	U	10	U	1	U	1	U
TRANS-1,2-DICHLOROETHENE	1	1	1	U	1	U	10	U	1	U	1	U
CHLOROFORM	1	1	1	U	1	U	10	U	1	U	1	U
1,2-DICHLOROETHANE	1	1	1	U	1	U	10	U	1	U	1	U
2-BUTANONE	5	5	5	UR	5	UR	50	UR	5	UR	5	UR
1,1,1-TRICHLOROETHANE	1	1	1	U	1	U	10	U	1	U	1	U
CARBON TETRACHLORIDE	1	1	1	U	1	U	10	U	1	U	1	U
BROMODICHLOROMETHANE	1	1	1	U	1	U	10	U	1	U	1	U
1,2-DICHLOROPROPANE	1	1	1	U	1	U	10	U	1	U	1	U
CIS-1,3-DICHLOROPROPENE	1	1	1	U	1	U	10	U	1	U	1	U
TRICHLOROETHENE	1	1	1	U	1	U	10	U	1	U	1	U
DIBROMOCHLOROMETHANE	1	1	1	U	1	U	10	U	1	U	1	U
1,1,2-TRICHLOROETHANE	1	1	1	U	1	U	10	U	1	U	1	U
BENZENE	1	1	1	U	1	U	10	U	1	U	1	U
TRANS-1,3-DICHLOROPROPENE	1	1	1	U	1	U	10	U	1	U	1	U
BROMOFORM	1	1	1	U	1	U	10	U	1	U	1	U
4-METHYL-2-PENTANONE	5	5	5	U	5	U	50	U	5	U	5	U
2-HEXANONE	5	5	5	U	5	UJ	68	J	5	U	5	U
TETRACHLOROETHENE	1	1	1	U	1	U	10	U	1	U	1	U
1,1,2,2-TETRACHLOROETHANE	1	1	1	U	1	U	10	U	1	U	1	U
TOLUENE	1	1	1		1	U	10	U	6		1	U
CHLOROBENZENE	1	1	1	U	1	U	10	U	1	U	1	U
ETHYLBENZENE	1	1	1	U	1	U	10	U	1	U	1	U
STYRENE	1	1	1	U	1	U	10	U	1	U	1	U
XYLENE (TOTAL)	1	1	1	U	1	U	10	U	1	U	1	U
1,2-DIBROMOETHANE	1	1	1	U	1	U	10	U	1	U	1	U
1,3-DICHLOROBENZENE	1	1	1	U	1	U	10	U	1	U	1	U
1,4-DICHLOROBENZENE	1	1	1	U	1	U	10	U	1	U	1	U
1,2-DICHLOROBENZENE	1	1	1	U	1	U	10	U	1	U	1	U
1,2-DIBROMO-3-CHLOROPROPANE	1	1	1	U	1	U	10	UR	1	U	1	U
BROMOCHLOROMETHANE	1	1	1	U	1	U	10	U	1	U	1	U
DILUTION FACTOR:			1.0		1.0		10.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

HNUS, 1995d

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-HN-29I		W-HN-29X		W-HN-29S	
LABORATORY ID:			950172-03		950172-04		950172-05	
TCL VOLATILE WATERS (UG/L)								
ANALYTE	CRQL	MDL						
CHLOROMETHANE	1	1	1	U	1	U	1	U
BROMOMETHANE	1	1	1	U	1	U	1	U
VINYL CHLORIDE	1	1	1	U	1	U	1	U
CHLOROETHANE	1	1	1	U	1	U	1	U
METHYLENE CHLORIDE	2	2	2	U	2	U	1	B
ACETONE	5	5	7	B	20	B	5	UR
CARBON DISULFIDE	1	1	1	U	1	U	1	U
1,1-DICHLOROETHENE	1	1	1	U	1	U	1	U
1,1-DICHLOROETHANE	1	1	1	U	1	U	1	U
CIS-1,2-DICHLOROETHENE	1	1	1	U	1	U	1	U
TRANS-1,2-DICHLOROETHENE	1	1	1	U	1	U	1	U
CHLOROFORM	1	1	1	U	1	U	1	U
1,2-DICHLOROETHANE	1	1	1	U	1	U	1	U
2-BUTANONE	5	5	5	UR	5	UR	5	UR
1,1,1-TRICHLOROETHANE	1	1	1	U	1	U	1	U
CARBON TETRACHLORIDE	1	1	1	U	1	U	1	U
BROMODICHLORMETHANE	1	1	1	U	1	U	1	U
1,2-DICHLOROPROPANE	1	1	1	U	1	U	1	U
CIS-1,3-DICHLOROPROPENE	1	1	1	U	1	U	1	U
TRICHLOROETHENE	1	1	1	U	1	U	1	U
DIBROMOCHLOROMETHANE	1	1	1	U	1	U	1	U
1,1,2-TRICHLOROETHANE	1	1	1	U	1	U	1	U
BENZENE	1	1	1	U	1	U	1	U
TRANS-1,3-DICHLOROPROPENE	1	1	1	U	1	U	1	U
BROMOFORM	1	1	1	U	1	U	1	U
4-METHYL-2-PENTANONE	5	5	7		5	U	5	U
2-HEXANONE	5	5	14		5	U	5	U
TETRACHLOROETHENE	1	1	1	U	1	U	1	U
1,1,2,2-TETRACHLOROETHANE	1	1	1	U	1	U	1	U
TOLUENE	1	1	1	U	1	U	1	U
CHLOROBENZENE	1	1	1	U	1	U	1	U
ETHYLBENZENE	1	1	1	U	1	U	1	U
STYRENE	1	1	1	U	1	U	1	U
XYLENE(TOTAL)	1	1	1	U	1	U	1	U
1,2-DIBROMOETHANE	1	1	1	U	1	U	1	U
1,3-DICHLOROBENZENE	1	1	1	U	1	U	1	U
1,4-DICHLOROBENZENE	1	1	1	U	1	U	1	U
1,2-DICHLOROBENZENE	1	1	1	U	1	U	1	U
1,2-DIBROMO-3-CHLOROPROPANE	1	1	1	U	1	U	1	U
BROMOCHLOROMETHANE	1	1	1	U	1	U	1	U
DILUTION FACTOR:			1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

HNUS, 1995d

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-DG-6		W-DG-15	
LABORATORY ID:			950172-06		950172-07	
TCL VOLATILE WATERS (UG/L)						
ANALYTE	CRQL	MDL				
CHLOROMETHANE	1	1	1	U	1	U
BROMOMETHANE	1	1	1	U	1	U
VINYL CHLORIDE	1	1	1	U	1	U
CHLOROETHANE	1	1	1	U	1	U
METHYLENE CHLORIDE	2	2	2	U	2	U
ACETONE	5	5	5	UR	11	B
CARBON DISULFIDE	1	1	1	U	1	U
1,1-DICHLOROETHENE	1	1	1	U	1	U
1,1-DICHLOROETHANE	1	1	1	U	1	U
CIS-1,2-DICHLOROETHENE	1	1	1	U	1	U
TRANS-1,2-DICHLOROETHENE	1	1	1	U	1	U
CHLOROFORM	1	1	1	U	1	U
1,2-DICHLOROETHANE	1	1	1	U	1	U
2-BUTANONE	5	5	5	UR	5	UR
1,1,1-TRICHLOROETHANE	1	1	1	U	1	U
CARBON TETRACHLORIDE	1	1	1	U	1	U
BROMODICHLORMETHANE	1	1	1	U	1	U
1,2-DICHLOROPROPANE	1	1	1	U	1	U
CIS-1,3-DICHLOROPROPENE	1	1	1	U	1	U
TRICHLOROETHENE	1	1	1	U	1	U
DIBROMOCHLOROMETHANE	1	1	1	U	1	U
1,1,2-TRICHLOROETHANE	1	1	1	U	1	U
BENZENE	1	1	1	U	1	U
TRANS-1,3-DICHLOROPROPENE	1	1	1	U	1	U
BROMOFORM	1	1	1	U	1	U
4-METHYL-2-PENTANONE	5	5	5	U	5	U
2-HEXANONE	5	5	5	U	5	U
TETRACHLOROETHENE	1	1	1	U	1	U
1,1,2,2-TETRACHLOROETHANE	1	1	1	U	1	U
TOLUENE	1	1	1	U	1	U
CHLOROBENZENE	1	1	1	U	1	U
ETHYLBENZENE	1	1	1	U	1	U
STYRENE	1	1	1	U	1	U
XYLENE(TOTAL)	1	1	1	U	1	U
1,2-DIBROMOETHANE	1	1	1	U	1	U
1,3-DICHLOROBENZENE	1	1	1	U	1	U
1,4-DICHLOROBENZENE	1	1	1	U	1	U
1,2-DICHLOROBENZENE	1	1	1	U	1	U
1,2-DIBROMO-3-CHLOROPROPANE	1	1	1	U	1	U
BROMOCHLOROMETHANE	1	1	1	U	1	U
DILUTION FACTOR:			1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

HNUS, 1995d

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:	W-HN-29X
LABORATORY ID:	950172-04

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	0.05	U
BETA-BHC	0.05	0.01	0.05	U
DELTA-BHC	0.05	0.01	0.05	U
GAMMA-BHC (LINDANE)	0.05	0.01	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U
ALDRIN	0.05	0.01	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U
DIELDRIN	0.1	0.02	0.10	U
4,4'-DDE	0.1	0.02	0.10	U
ENDRIN	0.1	0.02	0.10	U
ENDOSULFAN II	0.1	0.02	0.10	U
4,4'-DDD	0.1	0.02	0.10	U
ENDOSULFAN SULFATE	0.1	0.02	0.10	U
4,4'-DDT	0.1	0.02	0.10	U
METHOXYCHLOR	0.5	0.1	0.50	U
ENDRIN KETONE	0.1	0.02	0.10	U
ENDRIN ALDEHYDE	0.1	0.02	0.10	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U
TOXAPHENE	5	1.67	5.0	U
AROCLOR-1016	1	0.33	1.0	U
AROCLOR-1221	2	0.67	2.0	U
AROCLOR-1232	1	0.33	1.0	U
AROCLOR-1242	1	0.33	1.0	U
AROCLOR-1248	1	0.33	1.0	U
AROCLOR-1254	1	0.33	1.0	U
AROCLOR-1260	1	0.33	1.0	U
DILUTION FACTOR:			1.0	

TCL SEMIVOLATILES

SURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-01		W-SS-04-02		W-SS-04-03		W-SS-04-04		W-SS-04-05	
LABORATORY ID:			950222-01		950222-04		950222-05		950222-06		950222-07	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
BIS(2-CHLOROETHYL)ETHER	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2-CHLOROPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
1,3-DICHLOROBENZENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
1,4-DICHLOROBENZENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
1,2-DICHLOROBENZENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2-METHYLPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
4-METHYLPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
N-NITROSO-DI-N-PROPYLAMINE	10	10	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
HEXACHLOROETHANE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
NITROBENZENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
ISOPHORONE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2-NITROPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,4-DIMETHYLPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
BIS(2-CHLOROETHOXY)METHANE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,4-DICHLOROPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
1,2,4-TRICHLOROBENZENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
NAPHTHALENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
4-CHLOROANILINE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
HEXACHLOROBUTADIENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
4-CHLORO-3-METHYLPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2-METHYLNAPHTHALENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
HEXACHLOROCYCLOPENTADIENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,4,6-TRICHLOROPHENOL	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,4,5-TRICHLOROPHENOL	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
2-CHLORONAPHTHALENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2-NITROANILINE	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
DIMETHYL PHTHALATE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
ACENAPHTHYLENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,6-DINITROTOLUENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
3-NITROANILINE	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
ACENAPHTHENE	10	1	420	UJ	380	UJ	69	J	400	UJ	400	UJ

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-01		W-SS-04-02		W-SS-04-03		W-SS-04-04		W-SS-04-05	
LABORATORY ID:			950222-01		950222-04		950222-05		950222-06		950222-07	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
4-NITROPHENOL	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
DIBENZOFURAN	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
2,4-DINITROTOLUENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
DIETHYL PHTHALATE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
4-CHLOROPHENYL PHENYL ETHER	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
FLUORENE	10	1	420	UJ	380	UJ	59	J	400	UJ	400	UJ
4-NITROANILINE	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
4,6-DINITRO-2-METHYLPHENOL	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
N-NITROSODIPHENYLAMINE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
4-BROMOPHENOL PHENYL ETHER	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
HEXACHLOROBENZENE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
PENTACHLOROPHENOL	25	2.5	1000	UJ	930	UJ	940	UJ	970	UJ	970	UJ
PHENANTHRENE	10	1	420	UJ	320	J	610	J	80	J	400	UJ
ANTHRACENE	10	1	420	UJ	55	J	120	J	400	UJ	400	UJ
DI-N-BUTYL PHTHALATE	10	10	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
FLUORANTHENE	10	1	420	UJ	590	J	1200	J	190	J	400	UJ
CARBAZOLE	10	1	420	UJ	380	UJ	120	J	400	UJ	400	UJ
PYRENE	10	1	420	UJ	410	J	980	J	200	J	400	UJ
BUTYLBENZYL PHTHALATE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
3,3'-DICHLOROBENZIDINE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
BENZO(A)ANTHRACENE	10	10	420	UJ	250	J	870	J	110	J	400	UJ
CHRYSENE	10	1	420	UJ	270	J	710	J	100	J	400	UJ
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	54	J	380	UJ	52	J	400	UJ	400	UJ
DI-N-OCTYL PHTHALATE	10	1	420	UJ	380	UJ	390	UJ	400	UJ	400	UJ
BENZO(B)FLUORANTHENE	10	1	420	UJ	390	J	1100	J	210	J	400	UJ
BENZO(K)FLUORANTHENE	10	10	420	UJ	120	J	340	J	82	J	400	UJ
BENZO(A)PYRENE	10	10	420	UJ	260	J	700	J	170	J	400	UJ
INDENO(1,2,3-CD)PYRENE	10	10	420	UJ	150	J	240	J	140	J	400	UJ
DIBENZO(A,H)ANTHRACENE	10	10	420	UJ	380	U	88	J	400	UJ	400	UJ
BENZO(G,H,I)PERYLENE	10	10	420	UJ	170	J	260	J	170	J	400	UJ
% SOLIDS:			79.0		85.0		85.0		82.0		81.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-20		W-SS-04-06		W-SS-04-07		W-SS-04-08		W-SS-04-09	
LABORATORY ID:			950222-08		950222-09		950222-10		950222-11		950222-12	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BIS(2-CHLOROETHYL)ETHER	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2-CHLOROPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
1,3-DICHLOROBENZENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
1,4-DICHLOROBENZENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
1,2-DICHLOROBENZENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2-METHYLPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
4-METHYLPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
N-NITROSO-DI-N-PROPYLAMINE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
HEXACHLOROETHANE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
NITROBENZENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
ISOPHORONE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2-NITROPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,4-DIMETHYLPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BIS(2-CHLOROETHOXY)METHANE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,4-DICHLOROPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
1,2,4-TRICHLOROBENZENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
NAPHTHALENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
4-CHLOROANILINE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
HEXACHLOROBUTADIENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
4-CHLORO-3-METHYLPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2-METHYLNAPHTHALENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
HEXACHLOROCYCLOPENTADIENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,4,6-TRICHLOROPHENOL	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,4,5-TRICHLOROPHENOL	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
2-CHLORONAPHTHALENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2-NITROANILINE	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
DIMETHYL PHTHALATE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
ACENAPHTHYLENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,6-DINITROTOLUENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
3-NITROANILINE	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
ACENAPHTHENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-20		W-SS-04-06		W-SS-04-07		W-SS-04-08		W-SS-04-09	
LABORATORY ID:			950222-08		950222-09		950222-10		950222-11		950222-12	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
4-NITROPHENOL	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
DIBENZOFURAN	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
2,4-DINITROTOLUENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
DIETHYL PHTHALATE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
4-CHLOROPHENYL PHENYL ETHER	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
FLUORENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
4-NITROANILINE	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
4,6-DINITRO-2-METHYLPHENOL	25	2.5	950	UJ	1000	UJ	990	UJ	950	UJ	980	UJ
N-NITROSODIPHENYLAMINE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
4-BROMOPHENOL PHENYL ETHER	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
HEXACHLOROBENZENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
PENTACHLOROPHENOL	25	2.5	950	UJ	1000	UJ	42	J	950	UJ	980	UJ
PHENANTHRENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
ANTHRACENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
DI-N-BUTYL PHTHALATE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
FLUORANTHENE	10	1	390	UJ	60	J	410	UJ	390	UJ	410	UJ
CARBAZOLE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
PYRENE	10	1	390	UJ	51	J	410	UJ	390	UJ	410	UJ
BUTYLBENZYL PHTHALATE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
3,3'-DICHLOROBENZIDINE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BENZO(A)ANTHRACENE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
CHRYSENE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	390	UJ	110	J	410	UJ	390	UJ	82	J
DI-N-OCTYL PHTHALATE	10	1	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BENZO(B)FLUORANTHENE	10	1	390	UJ	58	J	410	UJ	390	UJ	410	UJ
BENZO(K)FLUORANTHENE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BENZO(A)PYRENE	10	10	390	UJ	46	J	410	UJ	390	UJ	410	UJ
INDENO(1,2,3-CD)PYRENE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
DIBENZO(A,H)ANTHRACENE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
BENZO(G,H,I)PERYLENE	10	10	390	UJ	420	UJ	410	UJ	390	UJ	410	UJ
% SOLIDS:			83.0		77.0		80.0		83.0		81.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-10		W-SS-04-21		W-SS-04-11		W-SS-04-12		W-SS-04-13	
LABORATORY ID:			950222-13		950222-14		950222-15		950222-18		950222-19	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
BIS(2-CHLOROETHYL)ETHER	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2-CHLOROPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
1,3-DICHLOROBENZENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
1,4-DICHLOROBENZENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
1,2-DICHLOROBENZENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2-METHYLPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
4-METHYLPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
N-NITROSO-DI-N-PROPYLAMINE	10	10	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
HEXACHLOROETHANE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
NITROBENZENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
ISOPHORONE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2-NITROPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,4-DIMETHYLPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
BIS(2-CHLOROETHOXY)METHANE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,4-DICHLOROPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
1,2,4-TRICHLOROBENZENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
NAPHTHALENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
4-CHLOROANILINE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
HEXACHLOROBUTADIENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
4-CHLORO-3-METHYLPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2-METHYLNAPHTHALENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
HEXACHLOROCYCLOPENTADIENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,4,6-TRICHLOROPHENOL	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,4,5-TRICHLOROPHENOL	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
2-CHLORONAPHTHALENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2-NITROANILINE	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
DIMETHYL PHTHALATE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
ACENAPHTHYLENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,6-DINITROTOLUENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
3-NITROANILINE	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
ACENAPHTHENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-10		W-SS-04-21		W-SS-04-11		W-SS-04-12		W-SS-04-13	
LABORATORY ID:			950222-13		950222-14		950222-15		950222-18		950222-19	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
4-NITROPHENOL	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
DIBENZOFURAN	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
2,4-DINITROTOLUENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
DIETHYL PHTHALATE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
4-CHLOROPHENYL PHENYL ETHER	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
FLUORENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
4-NITROANILINE	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
4,6-DINITRO-2-METHYLPHENOL	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
N-NITROSODIPHENYLAMINE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
4-BROMOPHENOL PHENYL ETHER	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
HEXACHLOROBENZENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
PENTACHLOROPHENOL	25	2.5	940	UJ	980	UJ	960	UJ	950	UJ	960	UJ
PHENANTHRENE	10	1	390	UJ	42	J	48	J	390	UJ	400	UJ
ANTHRACENE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
DI-N-BUTYL PHTHALATE	10	10	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
FLUORANTHENE	10	1	51	J	75	J	130	J	390	UJ	400	UJ
CARBAZOLE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
PYRENE	10	1	53	J	92	J	120	J	390	UJ	400	UJ
BUTYLBENZYL PHTHALATE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
3,3'-DICHLOROBENZIDINE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
BENZO(A)ANTHRACENE	10	10	390	UJ	89	J	79	J	390	UJ	400	UJ
CHRYSENE	10	1	390	UJ	83	J	62	J	390	UJ	400	UJ
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	390	UJ	400	UJ	480	J	390	UJ	400	UJ
DI-N-OCTYL PHTHALATE	10	1	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
BENZO(B)FLUORANTHENE	10	1	390	UJ	150	J	78	J	390	UJ	400	UJ
BENZO(K)FLUORANTHENE	10	10	390	UJ	46	J	42	J	390	UJ	400	UJ
BENZO(A)PYRENE	10	10	390	UJ	120	J	68	J	390	UJ	400	UJ
INDENO(1,2,3-CD)PYRENE	10	10	390	UJ	100	J	400	UJ	390	UJ	400	UJ
DIBENZO(A,H)ANTHRACENE	10	10	390	UJ	400	UJ	400	UJ	390	UJ	400	UJ
BENZO(G,H,I)PERYLENE	10	10	390	UJ	110	J	400	UJ	390	UJ	400	UJ
% SOLIDS:			84.0		82.0		83.0		84.0		83.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SS-04-14
LABORATORY ID: 950222-20

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
PHENOL	10	1	380	UJ
BIS(2-CHLOROETHYL)ETHER	10	1	380	UJ
2-CHLOROPHENOL	10	1	380	UJ
1,3-DICHLOROBENZENE	10	1	380	UJ
1,4-DICHLOROBENZENE	10	1	380	UJ
1,2-DICHLOROBENZENE	10	1	380	UJ
2-METHYLPHENOL	10	1	380	UJ
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	380	UJ
4-METHYLPHENOL	10	1	380	UJ
N-NITROSO-DI-N-PROPYLAMINE	10	10	380	UJ
HEXACHLOROETHANE	10	1	380	UJ
NITROBENZENE	10	1	380	UJ
ISOPHORONE	10	1	380	UJ
2-NITROPHENOL	10	1	380	UJ
2,4-DIMETHYLPHENOL	10	1	380	UJ
BIS(2-CHLOROETHOXY)METHANE	10	1	380	UJ
2,4-DICHLOROPHENOL	10	1	380	UJ
1,2,4-TRICHLOROBENZENE	10	1	380	UJ
NAPHTHALENE	10	1	380	UJ
4-CHLOROANILINE	10	1	380	UJ
HEXACHLOROBUTADIENE	10	1	380	UJ
4-CHLORO-3-METHYLPHENOL	10	1	380	UJ
2-METHYLNAPHTHALENE	10	1	380	UJ
HEXACHLOROCYCLOPENTADIENE	10	1	380	UJ
2,4,6-TRICHLOROPHENOL	10	1	380	UJ
2,4,5-TRICHLOROPHENOL	25	2.5	930	UJ
2-CHLORONAPHTHALENE	10	1	380	UJ
2-NITROANILINE	25	2.5	930	UJ
DIMETHYL PHTHALATE	10	1	380	UJ
ACENAPHTHYLENE	10	1	380	UJ
2,6-DINITROTOLUENE	10	1	380	UJ
3-NITROANILINE	25	2.5	930	UJ
ACENAPHTHENE	10	1	380	UJ

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SS-04-14
LABORATORY ID: 950222-20

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.5	930	UJ
4-NITROPHENOL	25	2.5	930	UJ
DIBENZOFURAN	10	1	380	UJ
2,4-DINITROTOLUENE	10	1	380	UJ
DIETHYL PHTHALATE	10	1	380	UJ
4-CHLOROPHENYL PHENYL ETHER	10	1	380	UJ
FLUORENE	10	1	380	UJ
4-NITROANILINE	25	2.5	930	UJ
4,6-DINITRO-2-METHYLPHENOL	25	2.5	930	UJ
N-NITROSODIPHENYLAMINE	10	1	380	UJ
4-BROMOPHENOL PHENYL ETHER	10	1	380	UJ
HEXACHLOROBENZENE	10	1	380	UJ
PENTACHLOROPHENOL	25	2.5	930	UJ
PHENANTHRENE	10	1	150	J
ANTHRACENE	10	1	380	UJ
DI-N-BUTYL PHTHALATE	10	10	380	UJ
FLUORANTHENE	10	1	240	J
CARBAZOLE	10	1	380	UJ
PYRENE	10	1	260	J
BUTYLBENZYL PHTHALATE	10	1	380	UJ
3,3'-DICHLOROBENZIDINE	10	1	380	UJ
BENZO(A)ANTHRACENE	10	10	130	J
CHRYSENE	10	1	100	J
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	500	J
DI-N-OCTYL PHTHALATE	10	1	380	UJ
BENZO(B)FLUORANTHENE	10	1	110	J
BENZO(K)FLUORANTHENE	10	10	47	J
BENZO(A)PYRENE	10	10	100	J
INDENO(1,2,3-CD)PYRENE	10	10	74	J
DIBENZO(A,H)ANTHRACENE	10	10	380	UJ
BENZO(G,H,I)PERYLENE	10	10	88	J
% SOLIDS:			85.0	
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			WSS0415		WSS0416		WSS0417		WSS0418	
LABORATORY ID:			950222-21		950222-22		950222-23		950222-24	
TCL SEMIVOLATILE SOILS (UG/KG)										
ANALYTE	CRQL	MDL								
PHENOL	10	1	400	U	360	U	410	U	400	U
BIS(2-CHLOROETHYL)ETHER	10	1	400	U	360	U	410	U	400	U
2-CHLOROPHENOL	10	1	400	U	360	U	410	U	400	U
1,3-DICHLOROBENZENE	10	1	400	U	360	U	410	U	400	U
1,4-DICHLOROBENZENE	10	1	400	U	360	U	410	U	400	U
1,2-DICHLOROBENZENE	10	1	400	U	360	U	410	U	400	U
2-METHYLPHENOL	10	1	400	U	360	U	410	U	400	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	400	U	360	U	410	U	400	U
4-METHYLPHENOL	10	1	400	U	360	U	410	U	400	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	400	U	360	U	410	U	400	U
HEXACHLOROETHANE	10	1	400	U	360	U	410	U	400	U
NITROBENZENE	10	1	400	U	360	U	410	U	400	U
ISOPHORONE	10	1	400	U	360	U	410	U	400	U
2-NITROPHENOL	10	1	400	U	360	U	410	U	400	U
2,4-DIMETHYLPHENOL	10	1	400	U	360	U	410	U	400	U
BIS(2-CHLOROETHOXY)METHANE	10	1	400	U	360	U	410	U	400	U
2,4-DICHLOROPHENOL	10	1	400	U	360	U	410	U	400	U
1,2,4-TRICHLOROBENZENE	10	1	400	U	360	U	410	U	400	U
NAPHTHALENE	10	1	400	U	360	U	410	U	400	U
4-CHLOROANILINE	10	1	400	U	360	U	410	U	400	U
HEXACHLOROBUTADIENE	10	1	400	U	360	U	410	U	400	U
4-CHLORO-3-METHYLPHENOL	10	1	400	U	360	U	410	U	400	U
2-METHYLNAPHTHALENE	10	1	400	U	360	U	410	U	400	U
HEXACHLOROCYCLOPENTADIENE	10	1	400	U	360	U	410	U	400	U
2,4,6-TRICHLOROPHENOL	10	1	400	U	360	U	410	U	400	U
2,4,5-TRICHLOROPHENOL	25	2.5	970	U	860	U	990	U	960	U
2-CHLORONAPHTHALENE	10	1	400	U	360	U	410	U	400	U
2-NITROANILINE	25	2.5	970	U	860	U	990	U	960	U
DIMETHYL PHTHALATE	10	1	400	U	360	U	410	U	400	U
ACENAPHTHYLENE	10	1	400	U	360	U	410	U	400	U
2,6-DINITROTOLUENE	10	1	400	U	360	U	410	U	400	U
3-NITROANILINE	25	2.5	970	U	860	U	990	U	960	U
ACENAPHTHENE	10	1	400	U	360	U	410	U	400	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			WSS0415		WSS0416		WSS0417		WSS0418	
LABORATORY ID:			950222-21		950222-22		950222-23		950222-24	
TCL SEMIVOLATILE SOILS (UG/KG)										
ANALYTE	CRQL	MDL								
2,4-DINITROPHENOL	25	2.5	970	U	860	U	990	U	960	U
4-NITROPHENOL	25	2.5	970	U	860	U	990	U	960	U
DIBENZOFURAN	10	1	400	U	360	U	410	U	400	U
2,4-DINITROTOLUENE	10	1	400	U	360	U	410	U	400	U
DIETHYL PHTHALATE	10	1	400	U	360	U	410	U	400	U
4-CHLOROPHENYL PHENYL ETHER	10	1	400	U	360	U	410	U	400	U
FLUORENE	10	1	400	U	360	U	410	U	400	U
4-NITROANILINE	25	2.5	970	U	860	U	990	U	960	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	970	U	860	U	990	U	960	U
N-NITROSODIPHENYLAMINE	10	1	400	U	360	U	410	U	400	U
4-BROMOPHENOL PHENYL ETHER	10	1	400	U	360	U	410	U	400	U
HEXACHLOROBENZENE	10	1	400	U	360	U	410	U	400	U
PENTACHLOROPHENOL	25	2.5	970	U	860	U	990	U	960	U
PHENANTHRENE	10	1	400	U	360	U	410	U	400	U
ANTHRACENE	10	1	400	U	360	U	410	U	400	U
DI-N-BUTYL PHTHALATE	10	10	400	U	360	U	410	U	400	U
FLUORANTHENE	10	1	400	U	360	U	410	U	400	U
CARBAZOLE	10	1	400	U	360	U	410	U	400	U
PYRENE	10	1	400	U	360	U	410	U	400	U
BUTYLBENZYL PHTHALATE	10	1	400	U	360	U	410	U	400	U
3,3'-DICHLOROBENZIDINE	10	1	400	U	360	U	410	U	400	U
BENZO(A)ANTHRACENE	10	10	400	U	360	U	410	U	400	U
CHRYSENE	10	1	400	U	360	U	410	U	400	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	400	U	360	U	410	U	400	U
DI-N-OCTYL PHTHALATE	10	1	400	U	360	U	410	U	400	U
BENZO(B)FLUORANTHENE	10	1	400	U	360	U	410	U	400	U
BENZO(K)FLUORANTHENE	10	10	400	U	360	U	410	U	400	U
BENZO(A)PYRENE	10	10	400	U	360	U	410	U	400	U
INDENO(1,2,3-CD)PYRENE	10	10	400	U	360	U	410	U	400	U
DIBENZO(A,H)ANTHRACENE	10	10	400	U	360	U	410	U	400	U
BENZO(G,H,I)PERYLENE	10	10	400	U	360	U	410	U	400	U
% SOLIDS:			81.0		84.0		81.0		83.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: WRB0412
LABORATORY ID: 950222-30

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
PHENOL	10	1	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U
2-CHLOROPHENOL	10	1	10	U
1,3-DICHLOROBENZENE	10	1	10	U
1,4-DICHLOROBENZENE	10	1	10	U
1,2-DICHLOROBENZENE	10	1	10	U
2-METHYLPHENOL	10	1	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	U
4-METHYLPHENOL	10	1	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	10	U
HEXACHLOROETHANE	10	1	10	U
NITROBENZENE	10	1	10	U
ISOPHORONE	10	1	10	U
2-NITROPHENOL	10	1	10	U
2,4-DIMETHYLPHENOL	10	1	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U
2,4-DICHLOROPHENOL	10	1	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U
NAPHTHALENE	10	1	10	U
4-CHLOROANILINE	10	1	10	U
HEXACHLOROBUTADIENE	10	1	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U
2-METHYLNAPHTHALENE	10	1	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U
2-CHLORONAPHTHALENE	10	1	10	U
2-NITROANILINE	25	2.5	25	U
DIMETHYL PHTHALATE	10	1	10	U
ACENAPHTHYLENE	10	1	10	U
2,6-DINITROTOLUENE	10	1	10	U
3-NITROANILINE	25	2.5	25	U
ACENAPHTHENE	10	1	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: WRB0412
LABORATORY ID: 950222-30

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.5	25	U
4-NITROPHENOL	25	2.5	25	U
DIBENZOFURAN	10	1	10	U
2,4-DINITROTOLUENE	10	1	10	U
DIETHYL PHTHALATE	10	1	10	U
4-CHLOROPHENYL PHENYL ETHER	10	1	10	U
FLUORENE	10	1	10	U
4-NITROANILINE	25	2.5	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U
4-BROMOPHENOL PHENYL ETHER	10	1	10	U
HEXACHLOROBENZENE	10	1	10	U
PENTACHLOROPHENOL	25	2.5	25	U
PHENANTHRENE	10	1	10	U
ANTHRACENE	10	1	10	U
DI-N-BUTYL PHTHALATE	10	10	10	U
FLUORANTHENE	10	1	10	U
CARBAZOLE	10	1	10	U
PYRENE	10	1	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	U
BENZO(A)ANTHRACENE	10	10	10	U
CHRYSENE	10	1	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	10	U
DI-N-OCTYL PHTHALATE	10	1	10	U
BENZO(B)FLUORANTHENE	10	1	10	U
BENZO(K)FLUORANTHENE	10	10	10	U
BENZO(A)PYRENE	10	10	10	U
INDENO(1,2,3-CD)PYRENE	10	10	10	U
DIBENZO(A,H)ANTHRACENE	10	10	10	U
BENZO(G,H,I)PERYLENE	10	10	10	U
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0410
LABORATORY ID: 950222-02

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
PHENOL	10	1	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U
2-CHLOROPHENOL	10	1	10	U
1,3-DICHLOROBENZENE	10	1	10	U
1,4-DICHLOROBENZENE	10	1	10	U
1,2-DICHLOROBENZENE	10	1	10	U
2-METHYLPHENOL	10	1	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	U
4-METHYLPHENOL	10	1	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	10	U
HEXACHLOROETHANE	10	1	10	U
NITROBENZENE	10	1	10	U
ISOPHORONE	10	1	10	U
2-NITROPHENOL	10	1	10	U
2,4-DIMETHYLPHENOL	10	1	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U
2,4-DICHLOROPHENOL	10	1	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U
NAPHTHALENE	10	1	10	U
4-CHLOROANILINE	10	1	10	U
HEXACHLOROBUTADIENE	10	1	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U
2-METHYLNAPHTHALENE	10	1	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U
2-CHLORONAPHTHALENE	10	1	10	U
2-NITROANILINE	25	2.5	25	U
DIMETHYL PHTHALATE	10	1	10	U
ACENAPHTHYLENE	10	1	10	U
2,6-DINITROTOLUENE	10	1	10	U
3-NITROANILINE	25	2.5	25	U
ACENAPHTHENE	10	1	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0410
LABORATORY ID: 950222-02

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.5	25	U
4-NITROPHENOL	25	2.5	25	U
DIBENZOFURAN	10	1	10	U
2,4-DINITROTOLUENE	10	1	10	U
DIETHYL PHTHALATE	10	1	10	U
4-CHLOROPHENYL PHENYL ETHER	10	1	10	U
FLUORENE	10	1	10	U
4-NITROANILINE	25	2.5	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U
4-BROMOPHENOL PHENYL ETHER	10	1	10	U
HEXACHLOROBENZENE	10	1	10	U
PENTACHLOROPHENOL	25	2.5	25	U
PHENANTHRENE	10	1	10	U
ANTHRACENE	10	1	10	U
DI-N-BUTYL PHTHALATE	10	10	10	U
FLUORANTHENE	10	1	10	U
CARBAZOLE	10	1	10	U
PYRENE	10	1	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	U
BENZO(A)ANTHRACENE	10	10	10	U
CHRYSENE	10	1	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	10	U
DI-N-OCTYL PHTHALATE	10	1	10	U
BENZO(B)FLUORANTHENE	10	1	10	U
BENZO(K)FLUORANTHENE	10	10	10	U
BENZO(A)PYRENE	10	10	10	U
INDENO(1,2,3-CD)PYRENE	10	10	10	U
DIBENZO(A,H)ANTHRACENE	10	10	10	U
BENZO(G,H,I)PERYLENE	10	10	10	U
DILUTION FACTOR:			1.0	

SUBSURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-01		W-SB-04-02		W-SB-04-03		W-SB-04-04		W-SB-04-05	
LABORATORY ID:			950237-02		950237-03		950237-06		950237-07		950237-10	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
BIS(2-CHLOROETHYL)ETHER	10	1	430	U	410	UJ	460	U	490	U	470	U
2-CHLOROPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
1,3-DICHLOROBENZENE	10	1	430	U	410	UJ	460	U	490	U	470	U
1,4-DICHLOROBENZENE	10	1	430	U	410	UJ	460	U	110	J	470	U
1,2-DICHLOROBENZENE	10	1	430	U	410	UJ	460	U	490	U	470	U
2-METHYLPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	430	U	410	UJ	460	U	490	U	470	U
4-METHYLPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	430	U	410	UJ	460	U	490	U	470	U
HEXACHLOROETHANE	10	1	430	U	410	UJ	460	U	490	U	470	U
NITROBENZENE	10	1	430	U	410	UJ	460	U	490	U	470	U
ISOPHORONE	10	1	430	U	410	UJ	460	U	490	U	470	U
2-NITROPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
2,4-DIMETHYLPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
BIS(2-CHLOROETHOXY)METHANE	10	1	430	U	410	UJ	460	U	490	U	470	U
2,4-DICHLOROPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
1,2,4-TRICHLOROBENZENE	10	1	430	U	410	UJ	460	U	490	U	470	U
NAPHTHALENE	10	1	430	U	410	UJ	47	J	490	U	57	J
4-CHLOROANILINE	10	1	430	U	410	UJ	460	U	490	U	470	U
HEXACHLOROBUTADIENE	10	1	430	U	410	UJ	460	U	490	U	470	U
4-CHLORO-3-METHYLPHENOL	10	1	430	U	410	UJ	460	U	490	U	470	U
2-METHYLNAPHTHALENE	10	1	190	J	290	J	140	J	490	U	470	U
HEXACHLOROCYCLOPENTADIENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
2,4,6-TRICHLOROPHENOL	10	1	430	U	410	UJ	460	UJ	490	U	470	U
2,4,5-TRICHLOROPHENOL	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
2-CHLORONAPHTHALENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
2-NITROANILINE	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
DIMETHYL PHTHALATE	10	1	430	U	54	J	460	UJ	490	U	470	U
ACENAPHTHYLENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
2,6-DINITROTOLUENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
3-NITROANILINE	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
ACENAPHTHENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL SEMIVOLATILE SOILS (UG/KG)

CLIENT ID:			W-SB-04-01		W-SB-04-02		W-SB-04-03		W-SB-04-04		W-SB-04-05	
LABORATORY ID:			950237-02		950237-03		950237-06		950237-07		950237-10	
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
4-NITROPHENOL	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
DIBENZOFURAN	10	1	430	U	410	UJ	460	UJ	490	U	470	U
2,4-DINITROTOLUENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
DIETHYL PHTHALATE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
4-CHLOROPHENYL PHENYL ETHER	10	1	430	U	410	UJ	460	UJ	490	U	470	U
FLUORENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
4-NITROANILINE	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
N-NITROSODIPHENYLAMINE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
4-BROMOPHENOL PHENYL ETHER	10	1	430	U	410	UJ	460	UJ	490	U	470	U
HEXACHLOROBENZENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
PENTACHLOROPHENOL	25	2.5	1100	U	1000	UJ	1100	UJ	1200	U	1100	U
PHENANTHRENE	10	1	430	U	83	J	460	UJ	490	U	470	U
ANTHRACENE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
DI-N-BUTYL PHTHALATE	10	10	430	U	67	J	460	UJ	490	U	190	J
FLUORANTHENE	10	1	430	U	110	J	460	UJ	490	U	470	U
CARBAZOLE	10	1	430	U	410	UJ	460	UJ	490	U	470	U
PYRENE	10	1	430	U	210	J	62	J	490	U	58	J
BUTYLBENZYL PHTHALATE	10	1	430	U	410	U	460	U	490	U	470	U
3,3'-DICHLOROBENZIDINE	10	1	430	U	410	U	460	U	490	U	470	U
BENZO(A)ANTHRACENE	10	10	430	U	76	J	460	U	490	U	470	U
CHRYSENE	10	1	430	U	63	J	460	U	490	U	470	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	770	B	740	B	1300		1500		2100	
DI-N-OCTYL PHTHALATE	10	1	430	U	410	U	460	UJ	490	U	470	UJ
BENZO(B)FLUORANTHENE	10	1	430	U	99	J	460	UJ	490	U	470	UJ
BENZO(K)FLUORANTHENE	10	10	430	U	59	J	460	UJ	490	U	470	UJ
BENZO(A)PYRENE	10	10	430	U	72	J	460	UJ	490	U	470	UJ
INDENO(1,2,3-CD)PYRENE	10	10	430	U	58	J	460	UJ	490	U	470	UJ
DIBENZO(A,H)ANTHRACENE	10	10	430	U	410	U	460	UJ	490	U	470	UJ
BENZO(G,H,I)PERYLENE	10	10	430	U	60	J	460	UJ	490	U	470	UJ
% SOLIDS:			76.0		79.0		72.0		67.0		69.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-06		W-SB-04-30		W-SB-04-31	
LABORATORY ID:			950237-11		950237-12		950237-13	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL						
PHENOL	10	1	410	U	400	U	410	U
BIS(2-CHLOROETHYL)ETHER	10	1	410	U	400	U	410	U
2-CHLOROPHENOL	10	1	410	U	400	U	410	U
1,3-DICHLOROBENZENE	10	1	410	U	400	U	410	U
1,4-DICHLOROBENZENE	10	1	410	U	400	U	410	U
1,2-DICHLOROBENZENE	10	1	410	U	400	U	410	U
2-METHYLPHENOL	10	1	410	U	400	U	410	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	410	U	400	U	410	U
4-METHYLPHENOL	10	1	410	U	400	U	410	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	410	U	400	U	410	U
HEXACHLOROETHANE	10	1	410	U	400	U	410	U
NITROBENZENE	10	1	410	U	400	U	410	U
ISOPHORONE	10	1	410	U	400	U	410	U
2-NITROPHENOL	10	1	410	U	400	U	410	U
2,4-DIMETHYLPHENOL	10	1	410	U	400	U	410	U
BIS(2-CHLOROETHOXY)METHANE	10	1	410	U	400	U	410	U
2,4-DICHLOROPHENOL	10	1	410	U	400	U	410	U
1,2,4-TRICHLOROBENZENE	10	1	410	U	400	U	410	U
NAPHTHALENE	10	1	410	U	400	U	57	J
4-CHLOROANILINE	10	1	410	U	400	U	410	U
HEXACHLOROBUTADIENE	10	1	410	U	400	U	410	U
4-CHLORO-3-METHYLPHENOL	10	1	410	U	400	U	410	U
2-METHYLNAPHTHALENE	10	1	410	U	400	U	410	U
HEXACHLOROCYCLOPENTADIENE	10	1	410	U	400	U	410	U
2,4,6-TRICHLOROPHENOL	10	1	410	U	400	U	410	U
2,4,5-TRICHLOROPHENOL	25	2.5	980	U	980	U	1000	U
2-CHLORONAPHTHALENE	10	1	410	U	400	U	410	U
2-NITROANILINE	25	2.5	980	U	980	U	1000	U
DIMETHYL PHTHALATE	10	1	410	U	400	U	410	U
ACENAPHTHYLENE	10	1	410	U	400	U	410	U
2,6-DINITROTOLUENE	10	1	410	U	400	U	410	U
3-NITROANILINE	25	2.5	980	U	980	U	1000	U
ACENAPHTHENE	10	1	410	U	400	U	410	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-06		W-SB-04-30		W-SB-04-31	
LABORATORY ID:			950237-11		950237-12		950237-13	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL						
2,4-DINITROPHENOL	25	2.5	980	U	980	U	1000	U
4-NITROPHENOL	25	2.5	980	U	980	U	1000	U
DIBENZOFURAN	10	1	410	U	400	U	410	U
2,4-DINITROTOLUENE	10	1	410	U	400	U	410	U
DIETHYL PHTHALATE	10	1	410	U	400	U	410	U
4-CHLOROPHENYL PHENYL ETHER	10	1	410	U	400	U	410	U
FLUORENE	10	1	410	U	400	U	410	U
4-NITROANILINE	25	2.5	980	U	980	U	1000	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	980	U	980	U	1000	U
N-NITROSODIPHENYLAMINE	10	1	410	U	400	U	410	U
4-BROMOPHENOL PHENYL ETHER	10	1	410	U	400	U	410	U
HEXACHLOROBENZENE	10	1	410	U	400	U	410	U
PENTACHLOROPHENOL	25	2.5	980	U	980	U	1000	U
PHENANTHRENE	10	1	410	U	400	U	410	U
ANTHRACENE	10	1	410	U	400	U	410	U
DI-N-BUTYL PHTHALATE	10	10	410	U	400	U	44	J
FLUORANTHENE	10	1	410	U	400	U	410	U
CARBAZOLE	10	1	410	U	400	U	410	U
PYRENE	10	1	410	U	400	U	46	J
BUTYLBENZYL PHTHALATE	10	1	410	U	400	U	410	U
3,3'-DICHLOROBENZIDINE	10	1	410	U	400	U	410	U
BENZO(A)ANTHRACENE	10	10	410	U	400	U	410	U
CHRYSENE	10	1	410	U	400	U	410	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	410	U	370	B	*5900	
DI-N-OCTYL PHTHALATE	10	1	410	U	400	U	410	U
BENZO(B)FLUORANTHENE	10	1	410	U	400	U	410	U
BENZO(K)FLUORANTHENE	10	10	410	U	400	U	410	U
BENZO(A)PYRENE	10	10	410	U	400	U	410	U
INDENO(1,2,3-CD)PYRENE	10	10	410	U	400	U	410	U
DIBENZO(A,H)ANTHRACENE	10	10	410	U	400	U	410	U
BENZO(G,H,I)PERYLENE	10	10	410	U	400	U	410	U
% SOLIDS:			80.0		81.0		80.0	
DILUTION FACTOR:			1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-07		W-SB-04-08		W-SB-04-09		W-SB-04-10	
LABORATORY ID:			950255-02		950255-03		950255-04		950255-05	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL								
PHENOL	10	1	420	U	660	U	420	U	390	U
BIS(2-CHLOROETHYL)ETHER	10	1	420	U	660	U	420	U	390	U
2-CHLOROPHENOL	10	1	420	U	660	U	420	U	390	U
1,3-DICHLOROBENZENE	10	1	420	U	660	U	420	U	390	U
1,4-DICHLOROBENZENE	10	1	420	U	660	U	420	U	390	U
1,2-DICHLOROBENZENE	10	1	420	U	660	U	420	U	390	U
2-METHYLPHENOL	10	1	420	U	660	U	420	U	390	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	420	U	660	U	420	U	390	U
4-METHYLPHENOL	10	1	420	U	130	J	420	U	390	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	420	U	660	U	420	U	390	U
HEXACHLOROETHANE	10	1	420	U	660	U	420	U	390	U
NITROBENZENE	10	1	420	U	660	U	420	U	390	U
ISOPHORONE	10	1	420	U	660	U	420	U	390	U
2-NITROPHENOL	10	1	420	U	660	U	420	U	390	U
2,4-DIMETHYLPHENOL	10	1	420	U	660	U	420	U	390	U
BIS(2-CHLOROETHOXY)METHANE	10	1	420	U	660	U	420	U	390	U
2,4-DICHLOROPHENOL	10	1	420	U	660	U	420	U	390	U
1,2,4-TRICHLOROBENZENE	10	1	420	U	660	U	420	U	390	U
NAPHTHALENE	10	1	420	U	150	J	420	U	390	U
4-CHLOROANILINE	10	1	420	U	660	U	420	U	390	U
HEXACHLOROBUTADIENE	10	1	420	U	660	U	420	U	390	U
4-CHLORO-3-METHYLPHENOL	10	1	420	U	660	U	420	U	390	U
2-METHYLNAPHTHALENE	10	1	420	U	170	J	420	U	390	U
HEXACHLOROCYCLOPENTADIENE	10	1	420	U	660	U	420	U	390	U
2,4,6-TRICHLOROPHENOL	10	1	420	U	660	U	420	U	390	U
2,4,5-TRICHLOROPHENOL	25	2.5	1000	U	1600	U	1000	U	950	U
2-CHLORONAPHTHALENE	10	1	420	U	660	U	420	U	390	U
2-NITROANILINE	25	2.5	1000	U	1600	U	1000	U	950	U
DIMETHYL PHTHALATE	10	1	420	U	660	U	420	U	390	U
ACENAPHTHYLENE	10	1	420	U	660	U	420	U	390	U
2,6-DINITROTOLUENE	10	1	420	U	660	U	420	U	390	U
3-NITROANILINE	25	2.5	1000	U	1600	U	1000	U	950	U
ACENAPHTHENE	10	1	420	U	660	U	420	U	390	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-07		W-SB-04-08		W-SB-04-09		W-SB-04-10	
LABORATORY ID:			950255-02		950255-03		950255-04		950255-05	
TCL SEMIVOLATILE SOILS (UG/KG)										
ANALYTE	CRQL	MDL								
2,4-DINITROPHENOL	25	2.5	1000	U	1600	U	1000	U	950	U
4-NITROPHENOL	25	2.5	1000	U	1600	U	1000	U	950	U
DIBENZOFURAN	10	1	420	U	660	U	420	U	390	U
2,4-DINITROTOLUENE	10	1	420	U	660	U	420	U	390	U
DIETHYL PHTHALATE	10	1	420	U	660	U	420	U	390	U
4-CHLOROPHENYL PHENYL ETHER	10	1	420	U	660	U	420	U	390	U
FLUORENE	10	1	420	U	73	J	420	U	52	J
4-NITROANILINE	25	2.5	1000	U	1600	U	1000	U	950	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	1000	U	1600	U	1000	U	950	U
N-NITROSODIPHENYLAMINE	10	1	420	U	660	U	420	U	390	U
4-BROMOPHENOL PHENYL ETHER	10	1	420	U	660	U	420	U	390	U
HEXACHLOROBENZENE	10	1	420	U	660	U	420	U	390	U
PENTACHLOROPHENOL	25	2.5	1000	U	1600	U	1000	U	950	U
PHENANTHRENE	10	1	420	U	350	J	43	J	320	J
ANTHRACENE	10	1	420	U	660	U	420	U	390	U
DI-N-BUTYL PHTHALATE	10	10	420	U	100	B	420	U	390	U
FLUORANTHENE	10	1	86	J	350	J	420	U	190	J
CARBAZOLE	10	1	420	U	660	U	420	U	390	U
PYRENE	10	1	87	J	490	J	420	U	180	J
BUTYLBENZYL PHTHALATE	10	1	420	U	660	U	420	U	390	U
3,3'-DICHLOROBENZIDINE	10	1	420	U	660	U	420	U	390	U
BENZO(A)ANTHRACENE	10	10	45	J	160	J	420	U	61	J
CHRYSENE	10	1	420	U	250	J	420	U	60	J
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	60	J	*9800		320	J	390	U
DI-N-OCTYL PHTHALATE	10	1	420	U	660	UJ	420	U	390	U
BENZO(B)FLUORANTHENE	10	1	55	J	250	J	420	U	64	J
BENZO(K)FLUORANTHENE	10	10	420	U	100	J	420	U	390	U
BENZO(A)PYRENE	10	10	45	J	200	J	420	U	48	J
INDENO(1,2,3-CD)PYRENE	10	10	420	U	74	J	420	U	390	U
DIBENZO(A,H)ANTHRACENE	10	10	420	U	660	UJ	420	U	390	U
BENZO(G,H,I)PERYLENE	10	10	420	U	96	J	420	U	390	U
% SOLIDS:			77.0		50.0		78.0		84.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-11		W-SB-04-12		W-SB-04-13		W-SB-04-14		W-SB-04-15	
LABORATORY ID:			950261-02		950261-03		950261-04		950261-05		950261-06	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	10	1	390	U	410	U	400	U	400	U	390	U
BIS(2-CHLOROETHYL)ETHER	10	1	390	U	410	U	400	U	400	U	390	U
2-CHLOROPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
1,3-DICHLOROBENZENE	10	1	390	U	410	U	400	U	400	U	390	U
1,4-DICHLOROBENZENE	10	1	390	U	410	U	400	U	400	U	390	U
1,2-DICHLOROBENZENE	10	1	390	U	410	U	400	U	400	U	390	U
2-METHYLPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	390	U	410	U	400	U	400	U	390	U
4-METHYLPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	390	U	410	U	400	U	400	U	390	U
HEXACHLOROETHANE	10	1	390	U	410	U	400	U	400	U	390	U
NITROBENZENE	10	1	390	U	410	U	400	U	400	U	390	U
ISOPHORONE	10	1	390	U	410	U	400	U	400	U	390	U
2-NITROPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
2,4-DIMETHYLPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
BIS(2-CHLOROETHOXY)METHANE	10	1	390	U	410	U	400	U	400	U	390	U
2,4-DICHLOROPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
1,2,4-TRICHLOROBENZENE	10	1	390	U	410	U	400	U	400	U	390	U
NAPHTHALENE	10	1	390	U	410	U	400	U	400	U	390	U
4-CHLOROANILINE	10	1	390	U	410	U	400	U	400	U	390	U
HEXACHLOROBUTADIENE	10	1	390	U	410	U	400	U	400	U	390	U
4-CHLORO-3-METHYLPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
2-METHYLNAPHTHALENE	10	1	390	U	410	U	400	U	400	U	390	U
HEXACHLOROCYCLOPENTADIENE	10	1	390	U	410	U	400	U	400	U	390	U
2,4,6-TRICHLOROPHENOL	10	1	390	U	410	U	400	U	400	U	390	U
2,4,5-TRICHLOROPHENOL	25	2.5	950	U	1000	U	970	U	980	U	940	U
2-CHLORONAPHTHALENE	10	1	390	U	410	U	400	U	400	U	390	U
2-NITROANILINE	25	2.5	950	U	1000	U	970	U	980	U	940	U
DIMETHYL PHTHALATE	10	1	390	U	410	U	400	U	400	U	390	U
ACENAPHTHYLENE	10	1	390	U	410	U	400	U	400	U	390	U
2,6-DINITROTOLUENE	10	1	390	U	410	U	400	U	400	U	390	U
3-NITROANILINE	25	2.5	950	U	1000	U	970	U	980	U	940	U
ACENAPHTHENE	10	1	390	U	410	U	400	U	400	U	390	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-11		W-SB-04-12		W-SB-04-13		W-SB-04-14		W-SB-04-15	
LABORATORY ID:			950261-02		950261-03		950261-04		950261-05		950261-06	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	25	2.5	950	U	1000	U	970	U	980	U	940	U
4-NITROPHENOL	25	2.5	950	U	1000	U	970	U	980	U	940	U
DIBENZOFURAN	10	1	390	U	410	U	400	U	400	U	390	U
2,4-DINITROTOLUENE	10	1	390	U	410	U	400	U	400	U	390	U
DIETHYL PHTHALATE	10	1	390	U	410	U	400	U	400	U	390	U
4-CHLOROPHENYL PHENYL ETHER	10	1	390	U	410	U	400	U	400	U	390	U
FLUORENE	10	1	390	U	410	U	400	U	400	U	390	U
4-NITROANILINE	25	2.5	950	U	1000	U	970	U	980	U	940	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	950	U	1000	U	970	U	980	U	940	U
N-NITROSODIPHENYLAMINE	10	1	390	U	410	U	400	U	400	U	390	U
4-BROMOPHENOL PHENYL ETHER	10	1	390	U	410	U	400	U	400	U	390	U
HEXACHLOROBENZENE	10	1	390	U	410	U	400	U	400	U	390	U
PENTACHLOROPHENOL	25	2.5	950	U	1000	U	970	U	980	U	940	U
PHENANTHRENE	10	1	390	U	410	U	400	U	400	U	350	J
ANTHRACENE	10	1	390	U	410	U	400	U	400	U	56	J
DI-N-BUTYL PHTHALATE	10	10	390	U	410	U	400	U	400	U	390	U
FLUORANTHENE	10	1	390	U	410	U	400	U	400	U	550	
CARBAZOLE	10	1	390	U	410	U	400	U	400	U	42	J
PYRENE	10	1	390	U	410	U	400	U	400	U	530	
BUTYLBENZYL PHTHALATE	10	1	390	U	410	U	400	U	400	U	390	U
3,3'-DICHLOROBENZIDINE	10	1	390	U	410	U	400	U	400	U	390	U
BENZO(A)ANTHRACENE	10	10	390	U	410	U	400	U	400	U	260	J
CHRYSENE	10	1	390	U	410	U	400	U	400	U	260	J
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	390	U	410	U	400	U	400	U	94	J
DI-N-OCTYL PHTHALATE	10	1	390	U	410	U	400	U	400	U	390	UJ
BENZO(B)FLUORANTHENE	10	1	390	U	410	U	400	U	400	U	390	J
BENZO(K)FLUORANTHENE	10	10	390	U	410	U	400	U	400	U	120	J
BENZO(A)PYRENE	10	10	390	U	410	U	400	U	400	U	240	J
INDENO(1,2,3-CD)PYRENE	10	10	390	U	410	U	400	U	400	U	110	J
DIBENZO(A,H)ANTHRACENE	10	10	390	U	410	U	400	U	400	U	390	UJ
BENZO(G,H,I)PERYLENE	10	10	390	U	410	U	400	U	400	U	120	J
% SOLIDS:			83.0		79.0		81.0		82.0		84.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-16		W-SB-04-17		W-SB-04-18	
LABORATORY ID:			950261-07		950261-08		950261-09	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL						
PHENOL	10	1	390	U	400	U	420	U
BIS(2-CHLOROETHYL)ETHER	10	1	390	U	400	U	420	U
2-CHLOROPHENOL	10	1	390	U	400	U	420	U
1,3-DICHLOROBENZENE	10	1	390	U	400	U	420	U
1,4-DICHLOROBENZENE	10	1	390	U	400	U	420	U
1,2-DICHLOROBENZENE	10	1	390	U	400	U	420	U
2-METHYLPHENOL	10	1	390	U	400	U	420	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	390	U	400	U	420	U
4-METHYLPHENOL	10	1	390	U	400	U	420	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	390	U	400	U	420	U
HEXACHLOROETHANE	10	1	390	U	400	U	420	U
NITROBENZENE	10	1	390	U	400	U	420	U
ISOPHORONE	10	1	390	U	400	U	420	U
2-NITROPHENOL	10	1	390	U	400	U	420	U
2,4-DIMETHYLPHENOL	10	1	390	U	400	U	420	U
BIS(2-CHLOROETHOXY)METHANE	10	1	390	U	400	U	420	U
2,4-DICHLOROPHENOL	10	1	390	U	400	U	420	U
1,2,4-TRICHLOROBENZENE	10	1	390	U	400	U	420	U
NAPHTHALENE	10	1	390	U	400	U	420	U
4-CHLOROANILINE	10	1	390	U	400	U	420	U
HEXACHLOROBUTADIENE	10	1	390	U	400	U	420	U
4-CHLORO-3-METHYLPHENOL	10	1	390	U	400	U	420	U
2-METHYLNAPHTHALENE	10	1	390	U	400	U	420	U
HEXACHLOROCYCLOPENTADIENE	10	1	390	U	400	U	420	U
2,4,6-TRICHLOROPHENOL	10	1	390	U	400	U	420	U
2,4,5-TRICHLOROPHENOL	25	2.5	940	U	970	U	1000	U
2-CHLORONAPHTHALENE	10	1	390	U	400	U	420	U
2-NITROANILINE	25	2.5	940	U	970	U	1000	U
DIMETHYL PHTHALATE	10	1	390	U	400	U	420	U
ACENAPHTHYLENE	10	1	390	U	400	U	420	U
2,6-DINITROTOLUENE	10	1	390	U	400	U	420	U
3-NITROANILINE	25	2.5	940	U	970	U	1000	U
ACENAPHTHENE	10	1	60	J	400	U	420	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-16		W-SB-04-17		W-SB-04-18	
LABORATORY ID:			950261-07		950261-08		950261-09	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL						
2,4-DINITROPHENOL	25	2.5	940	U	970	U	1000	U
4-NITROPHENOL	25	2.5	940	U	970	U	1000	U
DIBENZOFURAN	10	1	390	U	400	U	420	U
2,4-DINITROTOLUENE	10	1	390	U	400	U	420	U
DIETHYL PHTHALATE	10	1	390	U	400	U	420	U
4-CHLOROPHENYL PHENYL ETHER	10	1	390	U	400	U	420	U
FLUORENE	10	1	120	J	400	U	420	U
4-NITROANILINE	25	2.5	940	U	970	U	1000	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	940	U	970	U	1000	U
N-NITROSODIPHENYLAMINE	10	1	390	U	400	U	420	U
4-BROMOPHENOL PHENYL ETHER	10	1	390	U	400	U	420	U
HEXACHLOROBENZENE	10	1	390	U	400	U	420	U
PENTACHLOROPHENOL	25	2.5	940	U	970	U	1000	U
PHENANTHRENE	10	1	1700		400	U	420	U
ANTHRACENE	10	1	300	J	400	U	420	U
DI-N-BUTYL PHTHALATE	10	10	390	U	400	U	420	U
FLUORANTHENE	10	1	2400		400	U	420	U
CARBAZOLE	10	1	55	J	400	U	420	U
PYRENE	10	1	2700		400	U	420	U
BUTYLBENZYL PHTHALATE	10	1	390	U	400	U	420	U
3,3'-DICHLOROBENZIDINE	10	1	390	U	400	U	420	U
BENZO(A)ANTHRACENE	10	10	1100		400	U	420	U
CHRYSENE	10	1	940		400	U	420	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	75	J	400	U	420	U
DI-N-OCTYL PHTHALATE	10	1	390	UJ	400	U	420	U
BENZO(B)FLUORANTHENE	10	1	1500	J	400	U	420	U
BENZO(K)FLUORANTHENE	10	10	450	J	400	U	420	U
BENZO(A)PYRENE	10	10	940	J	400	U	420	U
INDENO(1,2,3-CD)PYRENE	10	10	390	J	400	U	420	U
DIBENZO(A,H)ANTHRACENE	10	10	100	J	400	U	420	U
BENZO(G,H,I)PERYLENE	10	10	470	J	400	U	420	U
% SOLIDS:			85.0		82.0		77.0	
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-19		W-SB-04-20		W-SB-04-21		W-SB-04-22		W-SB-04-23	
LABORATORY ID:			950266-02		950266-03		950266-04		950266-05		950266-06	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	10	1	390	U	400	U	390	U	390	U	400	U
BIS(2-CHLOROETHYL)ETHER	10	1	390	U	400	U	390	U	390	U	400	U
2-CHLOROPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
1,3-DICHLOROBENZENE	10	1	390	U	400	U	390	U	390	U	400	U
1,4-DICHLOROBENZENE	10	1	390	U	400	U	390	U	390	U	400	U
1,2-DICHLOROBENZENE	10	1	390	U	400	U	390	U	390	U	400	U
2-METHYLPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	390	U	400	U	390	U	390	U	400	U
4-METHYLPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	390	U	400	U	390	U	390	U	400	U
HEXACHLOROETHANE	10	1	390	U	400	U	390	U	390	U	400	U
NITROBENZENE	10	1	390	U	400	U	390	U	390	U	400	U
ISOPHORONE	10	1	390	U	400	U	390	U	390	U	400	U
2-NITROPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
2,4-DIMETHYLPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
BIS(2-CHLOROETHOXY)METHANE	10	1	390	U	400	U	390	U	390	U	400	U
2,4-DICHLOROPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
1,2,4-TRICHLOROBENZENE	10	1	390	U	400	U	390	U	390	U	400	U
NAPHTHALENE	10	1	390	U	400	U	390	U	390	U	400	U
4-CHLOROANILINE	10	1	390	U	400	U	390	U	390	U	400	U
HEXACHLOROBUTADIENE	10	1	390	U	400	U	390	U	390	U	400	U
4-CHLORO-3-METHYLPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
2-METHYLNAPHTHALENE	10	1	390	U	400	U	390	U	390	U	400	U
HEXACHLOROCYCLOPENTADIENE	10	1	390	U	400	U	390	U	390	U	400	U
2,4,6-TRICHLOROPHENOL	10	1	390	U	400	U	390	U	390	U	400	U
2,4,5-TRICHLOROPHENOL	25	2.5	950	U	970	U	940	U	940	U	970	U
2-CHLORONAPHTHALENE	10	1	390	U	400	U	390	U	390	U	400	U
2-NITROANILINE	25	2.5	950	U	970	U	940	U	940	U	970	U
DIMETHYL PHTHALATE	10	1	390	U	400	U	390	U	390	U	400	U
ACENAPHTHYLENE	10	1	390	U	400	U	390	U	390	U	400	U
2,6-DINITROTOLUENE	10	1	390	U	400	U	390	U	390	U	400	U
3-NITROANILINE	25	2.5	950	U	970	U	940	U	940	U	970	U
ACENAPHTHENE	10	1	390	U	400	U	390	U	390	U	400	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-19		W-SB-04-20		W-SB-04-21		W-SB-04-22		W-SB-04-23	
LABORATORY ID:			950266-02		950266-03		950266-04		950266-05		950266-06	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	25	2.5	950	U	970	U	940	U	940	U	970	U
4-NITROPHENOL	25	2.5	950	U	970	U	940	U	940	U	970	U
DIBENZOFURAN	10	1	390	U	400	U	390	U	390	U	400	U
2,4-DINITROTOLUENE	10	1	390	U	400	U	390	U	390	U	400	U
DIETHYL PHTHALATE	10	1	390	U	400	U	390	U	390	U	400	U
4-CHLOROPHENYL PHENYL ETHER	10	1	390	U	400	U	390	U	390	U	400	U
FLUORENE	10	1	390	U	400	U	390	U	390	U	45	J
4-NITROANILINE	25	2.5	950	U	970	U	940	U	940	U	970	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	950	U	970	U	940	U	940	U	970	U
N-NITROSODIPHENYLAMINE	10	1	390	U	400	U	390	U	390	U	400	U
4-BROMOPHENOL PHENYL ETHER	10	1	390	U	400	U	390	U	390	U	400	U
HEXACHLOROBENZENE	10	1	390	U	400	U	390	U	390	U	400	U
PENTACHLOROPHENOL	25	2.5	950	U	970	U	940	U	940	U	61	J
PHENANTHRENE	10	1	390	U	400	U	390	U	390	U	340	J
ANTHRACENE	10	1	390	U	400	U	390	U	390	U	60	J
DI-N-BUTYL PHTHALATE	10	10	390	U	400	U	390	U	390	U	400	U
FLUORANTHENE	10	1	390	U	400	U	390	U	390	U	470	
CARBAZOLE	10	1	390	U	400	U	390	U	390	U	400	U
PYRENE	10	1	390	U	400	U	390	U	390	U	610	
BUTYLBENZYL PHTHALATE	10	1	390	U	400	U	390	U	390	U	400	U
3,3'-DICHLOROBENZIDINE	10	1	390	U	400	U	390	U	390	U	400	U
BENZO(A)ANTHRACENE	10	10	390	U	400	U	390	U	390	U	150	J
CHRYSENE	10	1	390	U	400	U	390	U	390	U	310	J
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	390	U	400	U	390	U	390	U	680	
DI-N-OCTYL PHTHALATE	10	1	390	U	400	U	390	U	390	U	400	U
BENZO(B)FLUORANTHENE	10	1	390	U	400	U	390	U	390	U	320	J
BENZO(K)FLUORANTHENE	10	10	390	U	400	U	390	U	390	U	59	J
BENZO(A)PYRENE	10	10	390	U	400	U	390	U	390	U	200	J
INDENO(1,2,3-CD)PYRENE	10	10	390	U	400	U	390	U	390	U	91	J
DIBENZO(A,H)ANTHRACENE	10	10	390	U	400	U	390	U	390	U	400	U
BENZO(G,H,I)PERYLENE	10	10	390	U	400	U	390	U	390	U	110	J
% SOLIDS:			84.0		82.0		84.0		84.0		81.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-24		W-SB-04-32	
LABORATORY ID:			950266-07		950266-08	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL				
PHENOL	10	1	410	U	420	U
BIS(2-CHLOROETHYL)ETHER	10	1	410	U	420	U
2-CHLOROPHENOL	10	1	410	U	420	U
1,3-DICHLOROBENZENE	10	1	410	U	420	U
1,4-DICHLOROBENZENE	10	1	410	U	420	U
1,2-DICHLOROBENZENE	10	1	410	U	420	U
2-METHYLPHENOL	10	1	410	U	420	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	410	U	420	U
4-METHYLPHENOL	10	1	410	U	420	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	410	U	420	U
HEXACHLOROETHANE	10	1	410	U	420	U
NITROBENZENE	10	1	410	U	420	U
ISOPHORONE	10	1	410	U	420	U
2-NITROPHENOL	10	1	410	U	420	U
2,4-DIMETHYLPHENOL	10	1	410	U	420	U
BIS(2-CHLOROETHOXY)METHANE	10	1	410	U	420	U
2,4-DICHLOROPHENOL	10	1	410	U	420	U
1,2,4-TRICHLOROBENZENE	10	1	410	U	420	U
NAPHTHALENE	10	1	410	U	420	U
4-CHLOROANILINE	10	1	410	U	420	U
HEXACHLOROBUTADIENE	10	1	410	U	420	U
4-CHLORO-3-METHYLPHENOL	10	1	410	U	420	U
2-METHYLNAPHTHALENE	10	1	410	U	420	U
HEXACHLOROCYCLOPENTADIENE	10	1	410	U	420	U
2,4,6-TRICHLOROPHENOL	10	1	410	U	420	U
2,4,5-TRICHLOROPHENOL	25	2.5	1000	U	1000	U
2-CHLORONAPHTHALENE	10	1	410	U	420	U
2-NITROANILINE	25	2.5	1000	U	1000	U
DIMETHYL PHTHALATE	10	1	410	U	420	U
ACENAPHTHYLENE	10	1	410	U	420	U
2,6-DINITROTOLUENE	10	1	410	U	420	U
3-NITROANILINE	25	2.5	1000	U	1000	U
ACENAPHTHENE	10	1	410	U	420	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-24		W-SB-04-32	
LABORATORY ID:			950266-07		950266-08	

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL				
2,4-DINITROPHENOL	25	2.5	1000	U	1000	U
4-NITROPHENOL	25	2.5	1000	U	1000	U
DIBENZOFURAN	10	1	410	U	420	U
2,4-DINITROTOLUENE	10	1	410	U	420	U
DIETHYL PHTHALATE	10	1	410	U	420	U
4-CHLOROPHENYL PHENYL ETHER	10	1	410	U	420	U
FLUORENE	10	1	80	J	71	J
4-NITROANILINE	25	2.5	1000	U	1000	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	1000	U	1000	U
N-NITROSODIPHENYLAMINE	10	1	410	U	420	U
4-BROMOPHENOL PHENYL ETHER	10	1	410	U	420	U
HEXACHLOROBENZENE	10	1	410	U	420	U
PENTACHLOROPHENOL	25	2.5	1000	U	1000	U
PHENANTHRENE	10	1	920		540	
ANTHRACENE	10	1	190	J	77	J
DI-N-BUTYL PHTHALATE	10	10	410	U	420	U
FLUORANTHENE	10	1	2400		980	
CARBAZOLE	10	1	410	U	420	U
PYRENE	10	1	2200		1100	
BUTYLBENZYL PHTHALATE	10	1	410	U	420	U
3,3'-DICHLOROBENZIDINE	10	1	410	U	420	U
BENZO(A)ANTHRACENE	10	10	1500		500	
CHRYSENE	10	1	1200		480	
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	410	U	420	U
DI-N-OCTYL PHTHALATE	10	1	410	U	420	UJ
BENZO(B)FLUORANTHENE	10	1	2000		860	J
BENZO(K)FLUORANTHENE	10	10	570		310	J
BENZO(A)PYRENE	10	10	1400		610	J
INDENO(1,2,3-CD)PYRENE	10	10	470		210	J
DIBENZO(A,H)ANTHRACENE	10	10	150	J	53	J
BENZO(G,H,I)PERYLENE	10	10	490		290	J
% SOLIDS:			80.0		79.0	
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0417		W-FB-0419	
LABORATORY ID:			950237-08		950237-14	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
PHENOL	10	1	10	U	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U	10	U
2-CHLOROPHENOL	10	1	10	U	10	U
1,3-DICHLOROBENZENE	10	1	10	U	10	U
1,4-DICHLOROBENZENE	10	1	10	U	10	U
1,2-DICHLOROBENZENE	10	1	10	U	10	U
2-METHYLPHENOL	10	1	10	U	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	U	10	U
4-METHYLPHENOL	10	1	10	U	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	10	U	10	U
HEXACHLOROETHANE	10	1	10	U	10	U
NITROBENZENE	10	1	10	U	10	U
ISOPHORONE	10	1	10	U	10	U
2-NITROPHENOL	10	1	10	U	10	U
2,4-DIMETHYLPHENOL	10	1	10	U	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U	10	U
2,4-DICHLOROPHENOL	10	1	10	U	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U	10	U
NAPHTHALENE	10	1	10	U	10	U
4-CHLOROANILINE	10	1	10	U	10	U
HEXACHLOROBUTADIENE	10	1	10	U	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U	10	U
2-METHYLNAPHTHALENE	10	1	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U	25	U
2-CHLORONAPHTHALENE	10	1	10	U	10	U
2-NITROANILINE	25	2.5	25	U	25	U
DIMETHYL PHTHALATE	10	1	10	U	10	U
ACENAPHTHYLENE	10	1	10	U	10	U
2,6-DINITROTOLUENE	10	1	10	U	10	U
3-NITROANILINE	25	2.5	25	U	25	U
ACENAPHTHENE	10	1	10	U	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0417		W-FB-0419	
LABORATORY ID:			950237-08		950237-14	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
2,4-DINITROPHENOL	25	2.5	25	U	25	U
4-NITROPHENOL	25	2.5	25	U	25	U
DIBENZOFURAN	10	1	10	U	10	U
2,4-DINITROTOLUENE	10	1	10	U	10	U
DIETHYL PHTHALATE	10	1	10	U	10	U
4-CHLOROPHENYL PHENYL ETHER	10	1	10	U	10	U
FLUORENE	10	1	10	U	10	U
4-NITROANILINE	25	2.5	25	U	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U	10	U
4-BROMOPHENOL PHENYL ETHER	10	1	10	U	10	U
HEXACHLOROBENZENE	10	1	10	U	10	U
PENTACHLOROPHENOL	25	2.5	25	U	25	U
PHENANTHRENE	10	1	10	U	10	U
ANTHRACENE	10	1	10	U	10	U
DI-N-BUTYL PHTHALATE	10	10	10	U	10	U
FLUORANTHENE	10	1	10	U	10	U
CARBAZOLE	10	1	10	U	10	U
PYRENE	10	1	10	U	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	U	10	U
BENZO(A)ANTHRACENE	10	10	10	U	10	U
CHRYSENE	10	1	10	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	2	J	10	U
DI-N-OCTYL PHTHALATE	10	1	10	U	10	U
BENZO(B)FLUORANTHENE	10	1	10	U	10	U
BENZO(K)FLUORANTHENE	10	10	10	U	10	U
BENZO(A)PYRENE	10	10	10	U	10	U
INDENO(1,2,3-CD)PYRENE	10	10	10	U	10	U
DIBENZO(A,H)ANTHRACENE	10	10	10	U	10	U
BENZO(G,H,I)PERYLENE	10	10	10	U	10	U
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-FB-0425		W-RB-0425	
LABORATORY ID:			950266-09		950266-10	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
PHENOL	10	1	10	U	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U	10	U
2-CHLOROPHENOL	10	1	10	U	10	U
1,3-DICHLOROBENZENE	10	1	10	U	10	U
1,4-DICHLOROBENZENE	10	1	10	U	10	U
1,2-DICHLOROBENZENE	10	1	10	U	10	U
2-METHYLPHENOL	10	1	10	U	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	U	10	U
4-METHYLPHENOL	10	1	10	U	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	10	10	U	10	U
HEXACHLOROETHANE	10	1	10	U	10	U
NITROBENZENE	10	1	10	U	10	U
ISOPHORONE	10	1	10	U	10	U
2-NITROPHENOL	10	1	10	U	10	U
2,4-DIMETHYLPHENOL	10	1	10	U	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U	10	U
2,4-DICHLOROPHENOL	10	1	10	U	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U	10	U
NAPHTHALENE	10	1	10	U	10	U
4-CHLOROANILINE	10	1	10	U	10	U
HEXACHLOROBUTADIENE	10	1	10	U	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U	10	U
2-METHYLNAPHTHALENE	10	1	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U	25	U
2-CHLORONAPHTHALENE	10	1	10	U	10	U
2-NITROANILINE	25	2.5	25	U	25	U
DIMETHYL PHTHALATE	10	1	10	U	10	U
ACENAPHTHYLENE	10	1	10	U	10	U
2,6-DINITROTOLUENE	10	1	10	U	10	U
3-NITROANILINE	25	2.5	25	U	25	U
ACENAPHTHENE	10	1	10	U	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-FB-0425		W-RB-0425	
LABORATORY ID:			950266-09		950266-10	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL				
2,4-DINITROPHENOL	25	2.5	25	U	25	U
4-NITROPHENOL	25	2.5	25	U	25	U
DIBENZOFURAN	10	1	10	U	10	U
2,4-DINITROTOLUENE	10	1	10	U	10	U
DIETHYL PHTHALATE	10	1	10	U	10	U
4-CHLOROPHENYL PHENYL ETHER	10	1	10	U	10	U
FLUORENE	10	1	10	U	10	U
4-NITROANILINE	25	2.5	25	U	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U	10	U
4-BROMOPHENOL PHENYL ETHER	10	1	10	U	10	U
HEXACHLOROBENZENE	10	1	10	U	10	U
PENTACHLOROPHENOL	25	2.5	25	U	25	U
PHENANTHRENE	10	1	10	U	10	U
ANTHRACENE	10	1	10	U	10	U
DI-N-BUTYL PHTHALATE	10	10	10	U	10	U
FLUORANTHENE	10	1	10	U	10	U
CARBAZOLE	10	1	10	U	10	U
PYRENE	10	1	10	U	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	U	10	U
BENZO(A)ANTHRACENE	10	10	10	U	10	U
CHRYSENE	10	1	10	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	10	10	U	10	U
DI-N-OCTYL PHTHALATE	10	1	10	U	10	U
BENZO(B)FLUORANTHENE	10	1	10	U	10	U
BENZO(K)FLUORANTHENE	10	10	10	U	10	U
BENZO(A)PYRENE	10	10	10	U	10	U
INDENO(1,2,3-CD)PYRENE	10	10	10	U	10	U
DIBENZO(A,H)ANTHRACENE	10	10	10	U	10	U
BENZO(G,H,I)PERYLENE	10	10	10	U	10	U
DILUTION FACTOR:			1.0		1.0	

SURFACE WATER
PHASE I

(SMC Martin, 1991)

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		3A	5A	6A
LAB ID:		3-S. WATER 8800	5-S. WATER 8803	6-S. WATER 8805
CHEMICAL	CRQL			
N-Nitrosodimethylamine	10	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U
Benzyl alcohol	10	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U
N-Nitroso-di-n-dipropylamine	10	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U
2-Nitrophenol	10	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U
Benzoic acid	50	50 U	50 U	50 U
bis(2-Chloroethoxy) methane	10	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Nitroaniline	50	50 U	50 U	50 U
Dimethylphthalate	10	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		3A	5A	6A
LAB ID:		3-S. WATER 8800	5-S. WATER 8803	6-S. WATER 8805
CHEMICAL	CRQL			
3-Nitroaniline	50	50 U	50 U	50 U
Acenaphthene	10	10 U	10 U	10 U
2,4-Dinitrophenol	50	50 U	50 U	50 U
4-Nitrophenol	50	50 U	50 U	50 U
Dibenzofuran	10	10 U	10 U	10 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U
Diethylphthalate	10	10 U	0.3 J	10 U
4-Chlorophenyl-phenyl ether	10	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U
4-Nitroaniline	50	50 U	50 U	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U	50 U
N-nitrosodiphenylamine	10	10 U	10 U	10 U
1,2-diphenyl hydrazine	10	10 U	10 U	10 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U
Pentachlorophenol	50	50 U	50 U	50 U
Phenanthrene	10	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U
Di-n-butylphthalate	10	0.2 B	0.3 B	0.5 B
Fluoranthene	10	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U
Benzidine	80	80 U	80 U	80 U
Butylbenzylphthalate	10	10 U	10 U	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U
Benzo(a)anthracene	10	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	0.6 B	0.6 B	0.2 B
Di-n-octylphthalate	10	10 U	0.2 J	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U
Analysis Factor:		1.0	1.0	1.0

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		NADC - RINS. BLANK-59	RINS. BLANK-65	RINS. BLANK-72
LAB ID:		9156	9236	9270
CHEMICAL	CRQL			
N-Nitrosodimethylamine	10	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U
Benzyl alcohol	10	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U
N-Nitroso-di-n-dipropylamine	10	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U
2-Nitrophenol	10	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U
Benzoic acid	50	50 U	50 U	50 U
bis(2-Chloroethoxy) methane	10	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	2 J
4-Chloroaniline	10	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Nitroaniline	50	50 U	50 U	50 U
Dimethylphthalate	10	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U

SURFACE WATER
PHASE II

(HNUS, 1992)

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Surface Water Semivolatile Organics Analysis (ug/L)

Sample No.:	W-SW-01 (6B)	W-SW-02 (5B)	W-SW-03 (4B)	W-SW-04 (3B)
Lab Sample ID:	920328-08	920328-10	920328-12	920328-14
Phenol	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)Ether	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U	10 U
N-Nitroso-Di-n-Propylamine	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U
2-Nitrophenol	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)Methane	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 UJ	10 UJ	10 UJ	10 UJ
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U	25 U
Dimethyl Phthalate	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U	25 U
Acenaphthene	10 U	10 U	10 U	10 U

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Surface Water Semivolatile Organics Analysis (ug/L) (continued)

Sample No.:	6B W-SW-01	5B W-SW-02	4B W-SW-03	3B W-SW-04
Lab Sample ID:	920328-08	920328-10	920328-12	920328-14
2,4-Dinitrophenol	25 U	25 U	25 U	25 U
4-Nitrophenol	25 U	25 U	25 U	25 U
Dibenzofuran	10 U	10 U	10 U	10 U
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U	25 U
4,6-Dinitro-2-Methylphenol	25 U	25 U	25 U	25 U
N-Nitrosodiphenylamine	10 U	10 U	10 U	10 U
4-Bromophenyl-penylether	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U
Pentachlorophenol	25 U	25 U	25 U	25 U
Phenanthrene	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U
Di-n-Butylphthalate	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U
Benzo(a)Anthracene	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)Phthalate	10 U	2 B	10 U	3 B
Di-n-Octyl Phthalate	10 U	10 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	10 U	10 U	10 U
Benzo(k)Fluoranthene	10 U	10 U	10 U	10 U
Benzo(a)Pyrene	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	10 U
Dibenz(a,h)Anthracene	10 U	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U	10 U

SURFACE WATER
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0103		W-SW-C2		Young W-SW-C7	
LABORATORY ID:			950005-08		950005-01		950005-14	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL						
PHENOL	10	1	10	U	10	U	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U	10	U	10	U
2-CHLOROPHENOL	10	1	10	U	10	U	10	U
1,3-DICHLOROBENZENE	10	1	10	U	10	U	10	U
1,4-DICHLOROBENZENE	10	1	10	U	10	U	10	U
1,2-DICHLOROBENZENE	10	1	10	U	10	U	10	U
2-METHYLPHENOL	10	1	10	U	10	U	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	UJ	10	U	10	U
4-METHYLPHENOL	10	1	10	U	10	U	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	1	10	U	10	U	10	U
HEXACHLOROETHANE	10	1	10	U	10	U	10	U
NITROBENZENE	10	1	10	U	10	U	10	U
ISOPHORONE	10	1	10	U	10	U	10	U
2-NITROPHENOL	10	1	10	U	10	U	10	U
2,4-DIMETHYLPHENOL	10	1	10	U	10	U	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U	10	U	10	U
2,4-DICHLOROPHENOL	10	1	10	U	10	U	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U	10	U	10	U
NAPHTHALENE	10	1	10	U	10	U	10	U
4-CHLOROANILINE	10	1	10	U	10	U	10	U
HEXACHLOROBUTADIENE	10	1	10	U	10	U	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U	10	U	10	U
2-METHYLNAPHTHALENE	10	1	10	U	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U	10	U	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U	10	U	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U	25	U	25	U
2-CHLORONAPHTHALENE	10	1	10	U	10	U	10	U
2-NITROANILINE	25	2.5	25	U	25	U	25	U
DIMETHYL PHTHALATE	10	1	10	U	10	U	10	U
ACENAPHTHYLENE	10	1	10	U	10	U	10	U
2,6-DINITROTOLUENE	10	1	10	U	10	U	10	U
3-NITROANILINE	25	2.5	25	U	25	U	25	U
ACENAPHTHENE	10	1	10	U	10	U	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0103		W-SW-C2		Young W-SW-C7	
LABORATORY ID:			950005-08		950005-01		950005-14	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL						
2,4-DINITROPHENOL	25	2.5	25	U	25	U	25	U
4-NITROPHENOL	25	2.5	25	U	25	UJ	25	UJ
DIBENZOFURAN	10	1	10	U	10	U	10	U
2,4-DINITROTOLUENE	10	1	10	U	10	U	10	U
DIETHYL PHTHALATE	10	1	3	J	10	U	2	B
4-CHLOROPHENYL-PHENYL ETHER	10	1	10	U	10	U	10	U
FLUORENE	10	1	10	U	10	U	10	U
4-NITROANILINE	25	2.5	25	U	25	U	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U	25	U	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U	10	U	10	U
4-BROMOPHENYL-PHENYL ETHER	10	1	10	U	10	U	10	U
HEXACHLOROBENZENE	10	1	10	U	10	U	10	U
PENTACHLOROPHENOL	25	2.5	25	U	25	U	25	U
PHENANTHRENE	10	1	10	U	10	U	10	U
ANTHRACENE	10	1	10	U	10	U	10	U
DI-N-BUTYL PHTHALATE	10	1	10	U	10	U	10	U
FLUORANTHENE	10	1	10	U	10	U	10	U
CARBAZOLE	10	1	10	U	10	U	10	U
PYRENE	10	1	10	U	10	U	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U	10	U	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	UJ	10	U	10	U
BENZO(A)ANTHRACENE	10	1	10	U	10	U	10	U
CHRYSENE	10	1	10	U	10	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	1	19		10	U	10	U
DI-N-OCTYL PHTHALATE	10	1	10	U	10	U	10	U
BENZO(B)FLUORANTHENE	10	1	10	U	10	U	10	U
BENZO(K)FLUORANTHENE	10	1	10	U	10	U	10	U
BENZO(A)PYRENE	10	1	10	U	10	U	10	U
INDENO(1,2,3-CD)PYRENE	10	1	10	U	10	U	10	U
DIBENZO(A,H)ANTHRACENE	10	1	10	U	10	U	10	U
BENZO(G,H,I)PERYLENE	10	1	10	U	10	U	10	U
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SW-C9
LABORATORY ID: 950005-15

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
PHENOL	10	1	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U
2-CHLOROPHENOL	10	1	10	U
1,3-DICHLOROBENZENE	10	1	10	U
1,4-DICHLOROBENZENE	10	1	10	U
1,2-DICHLOROBENZENE	10	1	10	U
2-METHYLPHENOL	10	1	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	U
4-METHYLPHENOL	10	1	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	1	10	U
HEXACHLOROETHANE	10	1	10	U
NITROBENZENE	10	1	10	U
ISOPHORONE	10	1	10	U
2-NITROPHENOL	10	1	10	U
2,4-DIMETHYLPHENOL	10	1	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U
2,4-DICHLOROPHENOL	10	1	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U
NAPHTHALENE	10	1	10	U
4-CHLOROANILINE	10	1	10	U
HEXACHLOROBUTADIENE	10	1	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U
2-METHYLNAPHTHALENE	10	1	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U
2-CHLORONAPHTHALENE	10	1	10	U
2-NITROANILINE	25	2.5	25	U
DIMETHYL PHTHALATE	10	1	10	U
ACENAPHTHYLENE	10	1	10	U
2,6-DINITROTOLUENE	10	1	10	U
3-NITROANILINE	25	2.5	25	U
ACENAPHTHENE	10	1	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SW-C9
LABORATORY ID: 950005-15

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.5	25	U
4-NITROPHENOL	25	2.5	25	U
DIBENZOFURAN	10	1	10	U
2,4-DINITROTOLUENE	10	1	10	U
DIETHYL PHTHALATE	10	1	10	U
4-CHLOROPHENYL-PHENYL ETHER	10	1	10	U
FLUORENE	10	1	10	U
4-NITROANILINE	25	2.5	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U
4-BROMOPHENYL-PHENYL ETHER	10	1	10	U
HEXACHLOROBENZENE	10	1	10	U
PENTACHLOROPHENOL	25	2.5	25	U
PHENANTHRENE	10	1	10	U
ANTHRACENE	10	1	10	U
DI-N-BUTYL PHTHALATE	10	1	10	U
FLUORANTHENE	10	1	10	U
CARBAZOLE	10	1	10	U
PYRENE	10	1	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	UJ
BENZO(A)ANTHRACENE	10	1	10	U
CHRYSENE	10	1	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	1	10	U
DI-N-OCTYL PHTHALATE	10	1	10	UJ
BENZO(B)FLUORANTHENE	10	1	10	U
BENZO(K)FLUORANTHENE	10	1	10	U
BENZO(A)PYRENE	10	1	10	U
INDENO(1,2,3-CD)PYRENE	10	1	10	U
DIBENZO(A,H)ANTHRACENE	10	1	10	U
BENZO(G,H,I)PERYLENE	10	1	10	U
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:		Young Duplicate
LABORATORY ID:		W-SW-C10
		950005-26

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
PHENOL	10	1	10	U
BIS(2-CHLOROETHYL)ETHER	10	1	10	U
2-CHLOROPHENOL	10	1	10	U
1,3-DICHLOROBENZENE	10	1	10	U
1,4-DICHLOROBENZENE	10	1	10	U
1,2-DICHLOROBENZENE	10	1	10	U
2-METHYLPHENOL	10	1	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	10	U
4-METHYLPHENOL	10	1	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	1	10	U
HEXACHLOROETHANE	10	1	10	U
NITROBENZENE	10	1	10	U
ISOPHORONE	10	1	10	U
2-NITROPHENOL	10	1	10	U
2,4-DIMETHYLPHENOL	10	1	10	U
BIS(2-CHLOROETHOXY)METHANE	10	1	10	U
2,4-DICHLOROPHENOL	10	1	10	U
1,2,4-TRICHLOROBENZENE	10	1	10	U
NAPHTHALENE	10	1	10	U
4-CHLOROANILINE	10	1	10	U
HEXACHLOROBUTADIENE	10	1	10	U
4-CHLORO-3-METHYLPHENOL	10	1	10	U
2-METHYLNAPHTHALENE	10	1	10	U
HEXACHLOROCYCLOPENTADIENE	10	1	10	U
2,4,6-TRICHLOROPHENOL	10	1	10	U
2,4,5-TRICHLOROPHENOL	25	2.5	25	U
2-CHLORONAPHTHALENE	10	1	10	U
2-NITROANILINE	25	2.5	25	U
DIMETHYL PHTHALATE	10	1	10	U
ACENAPHTHYLENE	10	1	10	U
2,6-DINITROTOLUENE	10	1	10	U
3-NITROANILINE	25	2.5	25	U
ACENAPHTHENE	10	1	10	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: Young Duplicate
LABORATORY ID: W-SW-C10 950005-26

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.5	25	U
4-NITROPHENOL	25	2.5	25	U
DIBENZOFURAN	10	1	10	U
2,4-DINITROTOLUENE	10	1	10	U
DIETHYL PHTHALATE	10	1	2	J
4-CHLOROPHENYL-PHENYL ETHER	10	1	10	U
FLUORENE	10	1	10	U
4-NITROANILINE	25	2.5	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U
N-NITROSODIPHENYLAMINE	10	1	10	U
4-BROMOPHENYL-PHENYL ETHER	10	1	10	U
HEXACHLOROBENZENE	10	1	10	U
PENTACHLOROPHENOL	25	2.5	25	U
PHENANTHRENE	10	1	10	U
ANTHRACENE	10	1	10	U
DI-N-BUTYLPHTHALATE	10	1	10	U
FLUORANTHENE	10	1	10	U
CARBAZOLE	10	1	10	U
PYRENE	10	1	10	U
BUTYLBENZYL PHTHALATE	10	1	10	U
3,3'-DICHLOROBENZIDINE	10	1	10	UJ
BENZO(A)ANTHRACENE	10	1	10	U
CHRYSENE	10	1	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	1	10	U
DI-N-OCTYL PHTHALATE	10	1	10	UJ
BENZO(B)FLUORANTHENE	10	1	10	U
BENZO(K)FLUORANTHENE	10	1	10	U
BENZO(A)PYRENE	10	1	10	U
INDENO(1,2,3-CD)PYRENE	10	1	10	U
DIBENZO(A,H)ANTHRACENE	10	1	10	U
BENZO(G,H,I)PERYLENE	10	1	10	U
DILUTION FACTOR:			1.0	

SEDIMENT
PHASE I

(SMC Martin, 1991)

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE SEDIMENT ANALYSES (ug/Kg)

CLIENT ID:		3A	4A
LAB ID:		3-SEDIMENT	4-SEDIMENT
		8801	8802
CHEMICAL	CRQL		
× N-Nitrosodimethylamine	5000	5000 U	5000 U
bis(2-Chloroethyl) ether	5000	5000 U	5000 U
Phenol	5000	5000 U	5000 U
2-Chlorophenol	5000	5000 U	5000 U
1,3-Dichlorobenzene	5000	5000 U	5000 U
1,4-Dichlorobenzene	5000	5000 U	5000 U
× Benzyl alcohol	5000	5000 U	5000 U
1,2-Dichlorobenzene	5000	5000 U	5000 U
2-Methylphenol	5000	5000 U	5000 U
× bis(2-Chloroisopropyl) ether	5000	5000 UJ(c)	5000 UJ(c)
4-Methylphenol	5000	5000 U	5000 U
N-Nitroso-di-n-dipropylamine	5000	5000 U	5000 U
Hexachloroethane	5000	5000 U	5000 U
Nitrobenzene	5000	5000 U	5000 U
Isophorone	5000	5000 U	5000 U
2-Nitrophenol	5000	5000 U	5000 U
2,4-Dimethylphenol	5000	5000 U	5000 U
× Benzoic acid	25000	25000 U	25000 U
bis(2-Chloroethoxy) methane	5000	5000 U	5000 U
2,4-Dichlorophenol	5000	5000 U	5000 U
1,2,4-Trichlorobenzene	5000	5000 U	5000 U
Naphthalene	5000	5000 U	5000 U
4-Chloroaniline	5000	5000 U	5000 U
Hexachlorobutadiene	5000	5000 U	5000 U
4-Chloro-3-methylphenol	5000	5000 U	5000 U
2-Methylnaphthalene	5000	5000 U	5000 U
Hexachlorocyclopentadiene	5000	5000 U	5000 U
2,4,6-Trichlorophenol	5000	5000 U	5000 U
2,4,5-Trichlorophenol	25000	25000 U	25000 U
2-Chloronaphthalene	5000	5000 U	5000 U
2-Nitroaniline	25000	25000 U	25000 U
Dimethylphthalate	5000	5000 U	5000 U
Acenaphthylene	5000	5000 U	60 J
2,6-Dinitrotoluene	5000	5000 U	5000 U

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE SEDIMENT ANALYSES (ug/Kg)

CLIENT ID:		NADC - 5-SEDIMENT	6-SEDIMENT
LAB ID:		8804	8806
		5A	6A
CHEMICAL	CRQL		
N-Nitrosodimethylamine	5000	5000 U	5000 U
bis(2-Chloroethyl) ether	5000	5000 U	5000 U
Phenol	5000	5000 U	5000 U
2-Chlorophenol	5000	5000 U	5000 U
1,3-Dichlorobenzene	5000	5000 U	5000 U
1,4-Dichlorobenzene	5000	5000 U	5000 U
Benzyl alcohol	5000	5000 U	5000 U
1,2-Dichlorobenzene	5000	5000 U	5000 U
2-Methylphenol	5000	5000 U	5000 U
bis(2-Chloroisopropyl) ether	5000	5000 UJ(c)	5000 UJ(c)
4-Methylphenol	5000	5000 U	5000 U
N-Nitroso-di-n-dipropylamine	5000	5000 U	5000 U
Hexachloroethane	5000	5000 U	5000 U
Nitrobenzene	5000	5000 U	5000 U
Isophorone	5000	5000 U	5000 U
2-Nitrophenol	5000	5000 U	5000 U
2,4-Dimethylphenol	5000	5000 U	5000 U
Benzoic acid	25000	25000 U	25000 U
bis(2-Chloroethoxy) methane	5000	5000 U	5000 U
2,4-Dichlorophenol	5000	5000 U	5000 U
1,2,4-Trichlorobenzene	5000	5000 U	5000 U
Naphthalene	5000	5000 U	5000 U
4-Chloroaniline	5000	5000 U	5000 U
Hexachlorobutadiene	5000	5000 U	5000 U
4-Chloro-3-methylphenol	5000	5000 U	5000 U
2-Methylnaphthalene	5000	5000 U	5000 U
Hexachlorocyclopentadiene	5000	5000 U	5000 U
2,4,6-Trichlorophenol	5000	5000 U	5000 U
2,4,5-Trichlorophenol	25000	25000 U	25000 U
2-Chloronaphthalene	5000	5000 U	5000 U
2-Nitroaniline	25000	25000 U	25000 U
Dimethylphthalate	5000	5000 U	5000 U
Acenaphthylene	5000	5000 U	5000 U
2,6-Dinitrotoluene	5000	5000 U	5000 U

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE SEDIMENT ANALYSES (ug/Kg)

CLIENT ID:		NADC - 5-SEDIMENT (5A)	6-SEDIMENT (6A)
LAB ID:		8804	8806
CHEMICAL	CRQL		
3-Nitroaniline	25000	25000 U	25000 U
Acenaphthene	5000	5000 U	5000 U
2,4-Dinitrophenol	25000	25000 U	25000 U
4-Nitrophenol	25000	25000 U	25000 U
Dibenzofuran	5000	5000 U	5000 U
2,4-Dinitrotoluene	5000	5000 U	5000 U
Diethylphthalate	5000	5000 U	5000 U
4-Chlorophenyl-phenyl ether	5000	5000 U	5000 U
Fluorene	5000	110 J	5000 U
4-Nitroaniline	25000	25000 U	25000 U
4,6-Dinitro-2-methylphenol	25000	25000 U	25000 U
N-nitrosodiphenylamine	5000	5000 U	5000 U
1,2-diphenyl hydrazine	5000	5000 U	5000 U
4-Bromophenyl-phenylether	5000	5000 U	5000 U
Hexachlorobenzene	5000	5000 U	5000 U
Pentachlorophenol	25000	25000 U	25000 U
Phenanthrene	5000	1100 J	390 J
Anthracene	5000	230 J	5000 U
Di-n-butylphthalate	5000	150 B	5000 U
Fluoranthene	5000	1300 J	620 J
Pyrene	5000	1100 J	660 J
Benzidine	40000	40000 U	40000 U
Butylbenzylphthalate	5000	5000 U	5000 U
3,3'-Dichlorobenzidine	9900	5000 U	5000 U
Benzo(a)anthracene	5000	420 J	270 J
Chrysene	5000	440 J	290 J
bis(2-Ethylhexyl)phthalate	5000	130 J	5000 U
Di-n-octylphthalate	5000	5000 U	5000 U
Benzo(b)fluoranthene	5000	310 J	5000 U
Benzo(k)fluoranthene	5000	310 J	5000 U
Benzo(a)pyrene	5000	310 J	5000 U
Indeno(1,2,3-cd)pyrene	5000	5000 U	5000 U
Dibenz(a,h)anthracene	5000	5000 U	5000 U
Benzo(g,h,i)perylene	5000	5000 U	5000 U
Analysis Factor:		1.0	1.0

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEMIVOLATILE AQUEOUS ANALYSES (ug/L)

CLIENT ID:		NADC -	FIELD R. BLANK	FIELD BLK-TAP	FIELD BLK-DI	S2-20-RINSATE	FIELD BLANK-27
LAB ID:			8807	8808	8811	8847	8854
CHEMICAL	CRQL						
N-Nitrosodimethylamine	10		10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10		10 U	10 U	10 U	10 U	10 U
Phenol	10		10 U	10 U	10 U	10 U	R(s)
2-Chlorophenol	10		10 U	10 U	10 U	10 U	R(s)
1,3-Dichlorobenzene	10		10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10		10 U	10 U	10 U	10 U	10 U
Benzyl alcohol	10		10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10		10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10		10 U	10 U	10 U	10 U	R(s)
bis(2-Chloroisopropyl) ether	10		10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10		10 U	10 U	10 U	10 U	R(s)
N-Nitroso-di-n-dipropylamine	10		10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10		10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10		10 U	10 U	10 U	10 U	10 U
Isophorone	10		10 U	10 U	10 U	10 U	10 U
2-Nitrophenol	10		10 U	10 U	10 U	10 U	R(s)
2,4-Dimethylphenol	10		10 U	10 U	10 U	10 U	R(s)
Benzoic acid	50		50 U	50 U	50 U	50 U	R(s)
bis(2-Chloroethoxy) methane	10		10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10		10 U	10 U	10 U	10 U	R(s)
1,2,4-Trichlorobenzene	10		10 U	10 U	10 U	10 U	10 U
Naphthalene	10		10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10		10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10		10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10		10 U	10 U	10 U	10 U	R(s)
2-Methylnaphthalene	10		10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10		10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	10		10 U	10 U	10 U	10 U	R(s)
2,4,5-Trichlorophenol	50		50 U	50 U	50 U	50 U	R(s)
2-Chloronaphthalene	10		10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	50		50 U	50 U	50 U	50 U	50 U
Dimethylphthalate	10		10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10		10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10		10 U	10 U	10 U	10 U	10 U

SEDIMENT
PHASE II

(MNVS, 1992)

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Sediment Semivolatile Organics Analysis (ug/ kg) 6B 5B 4B1 3B

Sample No.:	W-SD-01	W-SD-02	W-SD-03	W-SD-04
Lab Sample ID:	920328-03	920328-04	920328-05	920328-6
Phenol	440 U	380 U	360 U	420 U
bis(2-Chloroethyl)Ether	440 U	380 U	360 U	420 U
2-Chlorophenol	440 U	380 U	360 U	420 U
1,3-Dichlorobenzene	440 U	380 U	360 U	420 U
1,4-Dichlorobenzene	440 U	380 U	360 U	420 U
1,2-Dichlorobenzene	440 B	75 B	310 B	75 B
2-Methylphenol	440 U	380 U	360 U	420 U
2,2'-oxybis(1-Chloropropane)	440 U	380 U	360 U	420 U
4-Methylphenol	440 U	380 U	360 U	420 U
N-Nitroso-Di-n-Propylamine	440 U	380 U	360 U	420 U
Hexachloroethane	440 U	380 U	360 U	420 U
Nitrobenzene	440 U	380 U	360 U	420 U
Isophorone	440 U	380 U	360 U	420 U
2-Nitrophenol	440 U	380 U	360 U	420 U
2,4-Dimethylphenol	440 U	380 U	360 U	420 U
bis(2-Chloroethoxy)Methane	440 U	380 U	360 U	420 U
2,4-Dichlorophenol	440 U	380 U	360 U	420 U
1,2,4-Trichlorobenzene	440 B	82 B	330 B	77 B
Naphthalene	440 U	380 U	360 U	420 U
4-Chloroaniline	440 U	380 U	360 U	420 U
Hexachlorobutadiene	440 U	380 U	360 U	420 U
4-Chloro-3-Methylphenol	440 U	380 U	360 U	420 U
2-Methylnaphthalene	440 U	380 U	360 U	420 U
Hexachlorocyclopentadiene	440 U	380 U	360 U	420 U
2,4,6-Trichlorophenol	440 U	380 U	360 U	420 U
2,4,5-Trichlorophenol	1100 U	920 U	880 U	1000 U
2-Chloronaphthalene	440 U	380 U	360 U	420 U
2-Nitroaniline	1100 U	920 U	880 U	1000 U
Dimethyl Phthalate	440 U	380 U	360 U	420 U
Acenaphthylene	440 U	380 U	360 U	420 U
2,6-Dinitrotoluene	440 U	380 U	360 U	420 U
3-Nitroaniline	1100 U	920 U	880 U	1000 U
Acenaphthene	440 U	380 U	120 J	420 U

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Sediment Semivolatile Organics Analysis (ug/ kg) (continued)

Sample No.:	W-SD-01 (6B)	W-SD-02 (5B)	W-SD-03 (4B)	W-SD-04 (3B)
Lab Sample ID:	920328-03	920328-04	920328-05	920328-6
2,4-Dinitrophenol	1100 U	920 U	880 U	1000 U
4-Nitrophenol	1100 U	920 U	880 U	1000 U
Dibenzofuran	440 U	380 U	72 J	420 U
2,4-Dinitrotoluene	440 U	380 U	360 U	420 U
Diethylphthalate	440 U	380 U	360 U	420 U
4-Chlorophenyl-phenylether	440 U	380 U	360 U	420 U
Fluorene	440 U	380 U	140 J	420 U
4-Nitroaniline	1100 U	920 U	880 U	1000 U
4,6-Dinitro-2-Methylphenol	1100 U	920 U	880 U	1000 U
N-Nitrosodiphenylamine	440 U	380 U	360 U	420 U
4-Bromophenyl-penylether	440 U	380 U	360 U	420 U
Hexachlorobenzene	440 U	380 U	360 U	420 U
Pentachlorophenol	1100 U	920 U	880 U	1000 U
Phenanthrene	440 U	380 U	1200	420 J
Anthracene	440 U	380 U	290 J	97 J
Di-n-Butylphthalate	440 U	380 U	360 U	420 U
Fluoranthene	440 U	380 U	1200	550
Carbazole	440 U	380 U	49 J	420 U
Pyrene	440 U	380 U	1400	590
Butylbenzylphthalate	440 U	380 U	360 U	420 U
3,3'-Dichlorobenzidine	440 U	380 U	360 U	420 U
Benzo(a)Anthracene	440 U	380 U	720	280 J
Chrysene	440 U	380 U	740	340 J
bis(2-Ethylhexyl)Phthalate	110 B	93 B	280 B	200 B
Di-n-Octyl Phthalate	440 U	380 U	94 J	420 U
Benzo(b)Fluoranthene	440 U	380 U	820	320 J
Benzo(k)Fluoranthene	440 U	380 U	350 J	200 J
Benzo(a)Pyrene	440 U	380 U	650	260 J
Indeno(1,2,3-cd)Pyrene	440 U	380 U	410	190 J
Dibenz(a,h)Anthracene	440 U	380 U	140 J	53 J
Benzo(g,h,i)Perylene	440 U	380 U	320 J	150 J

SEDIMENT
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SD-C2
LABORATORY ID: 950005-02

TCL SEMIVOLATILE SOILS (UG/L)

ANALYTE	CRQL	MDL		
PHENOL	10	1	480	U
BIS(2-CHLOROETHYL)ETHER	10	1	480	U
2-CHLOROPHENOL	10	1	480	U
1,3-DICHLOROBENZENE	10	1	480	U
1,4-DICHLOROBENZENE	10	1	480	U
1,2-DICHLOROBENZENE	10	1	480	U
2-METHYLPHENOL	10	1	480	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	1	480	U
4-METHYLPHENOL	10	1	480	U
N-NITROSO-DI-N-PROPYLAMINE	10	1	480	U
HEXACHLOROETHANE	10	1	480	U
NITROBENZENE	10	1	480	U
ISOPHORONE	10	1	480	U
2-NITROPHENOL	10	1	480	U
2,4-DIMETHYLPHENOL	10	1	480	U
BIS(2-CHLOROETHOXY)METHANE	10	1	480	U
2,4-DICHLOROPHENOL	10	1	480	U
1,2,4-TRICHLOROBENZENE	10	1	480	U
NAPHTHALENE	10	1	480	U
4-CHLOROANILINE	10	1	480	U
HEXACHLOROBUTADIENE	10	1	480	U
4-CHLORO-3-METHYLPHENOL	10	1	480	U
2-METHYLNAPHTHALENE	10	1	480	U
HEXACHLOROCYCLOPENTADIENE	10	1	480	U
2,4,6-TRICHLOROPHENOL	10	1	480	U
2,4,5-TRICHLOROPHENOL	25	2.5	1200	U
2-CHLORONAPHTHALENE	10	1	480	U
2-NITROANILINE	25	2.5	1200	U
DIMETHYL PHTHALATE	10	1	480	U
ACENAPHTHYLENE	10	1	480	U
2,6-DINITROTOLUENE	10	1	480	U
3-NITROANILINE	25	2.5	1200	U
ACENAPHTHENE	10	1	480	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SD-C2
LABORATORY ID:			950005-02

TCL SEMIVOLATILE SOILS (UG/L)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.5	1200	U
4-NITROPHENOL	25	2.5	1200	U
DIBENZOFURAN	10	1	480	U
2,4-DINITROTOLUENE	10	1	480	U
DIETHYL PHTHALATE	10	1	480	U
4-CHLOROPHENYL-PHENYL ETHER	10	1	480	U
FLUORENE	10	1	480	U
4-NITROANILINE	25	2.5	1200	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	1200	U
N-NITROSODIPHENYLAMINE	10	1	480	U
4-BROMOPHENYL-PHENYL ETHER	10	1	480	U
HEXACHLOROBENZENE	10	1	480	U
PENTACHLOROPHENOL	25	2.5	1200	U
PHENANTHRENE	10	1	480	U
ANTHRACENE	10	1	480	U
DI-N-BUTYL PHTHALATE	10	1	480	U
FLUORANTHENE	10	1	480	U
CARBAZOLE	10	1	480	U
PYRENE	10	1	480	U
BUTYLBENZYL PHTHALATE	10	1	480	U
3,3'-DICHLOROBENZIDINE	10	1	480	U
BENZO(A)ANTHRACENE	10	1	480	U
CHRYSENE	10	1	480	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	1	480	U
DI-N-OCTYL PHTHALATE	10	1	480	U
BENZO(B)FLUORANTHENE	10	1	480	U
BENZO(K)FLUORANTHENE	10	1	480	U
BENZO(A)PYRENE	10	1	480	U
INDENO(1,2,3-CD)PYRENE	10	1	480	U
DIBENZO(A,H)ANTHRACENE	10	1	480	U
BENZO(G,H,I)PERYLENE	10	1	480	U
% SOLIDS:			69.0	
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

			Young Duplicate		Young		
CLIENT ID:			W-SD-C10		W-SD-C7		W-SD-C9
LABORATORY ID:			950005-27		950005-22		950005-23

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL						
PHENOL	300	30	540	U	540	U	470	U
BIS(2-CHLOROETHYL)ETHER	300	30	540	U	540	U	470	U
2-CHLOROPHENOL	300	30	540	U	540	U	470	U
1,3-DICHLOROBENZENE	300	30	540	U	540	U	470	U
1,4-DICHLOROBENZENE	300	30	540	U	540	U	470	U
1,2-DICHLOROBENZENE	300	30	540	U	540	U	470	U
2-METHYLPHENOL	300	30	540	U	540	U	470	U
2,2'-OXYBIS(1-CHLOROPROPANE)	300	30	540	U	540	U	470	U
4-METHYLPHENOL	300	30	540	U	540	U	470	U
N-NITROSO-DI-N-PROPYLAMINE	300	30	540	U	540	U	470	U
HEXACHLOROETHANE	300	30	540	U	540	U	470	U
NITROBENZENE	300	30	540	U	540	U	470	U
ISOPHORONE	300	30	540	U	540	U	470	U
2-NITROPHENOL	300	30	540	U	540	U	470	U
2,4-DIMETHYLPHENOL	300	30	540	U	540	U	470	U
BIS(2-CHLOROETHOXY)METHANE	300	30	540	U	540	U	470	U
2,4-DICHLOROPHENOL	300	30	540	U	540	U	470	U
1,2,4-TRICHLOROBENZENE	300	30	540	U	540	U	470	U
NAPHTHALENE	300	30	540	U	540	U	470	U
4-CHLOROANILINE	300	30	540	U	540	U	470	U
HEXACHLOROBUTADIENE	300	30	540	U	540	U	470	U
4-CHLORO-3-METHYLPHENOL	300	30	540	U	540	U	470	U
2-METHYLNAPHTHALENE	300	30	540	U	540	U	470	U
HEXACHLOROCYCLOPENTADIENE	300	30	540	U	540	U	470	U
2,4,6-TRICHLOROPHENOL	300	30	540	U	540	U	470	U
2,4,5-TRICHLOROPHENOL	800	80	1300	U	1300	U	1100	U
2-CHLORONAPHTHALENE	300	30	540	U	540	U	470	U
2-NITROANILINE	800	80	1300	U	1300	U	1100	U
DIMETHYL PHTHALATE	300	30	540	U	540	U	470	U
ACENAPHTHYLENE	300	30	540	U	540	U	470	U
2,6-DINITROTOLUENE	300	30	540	U	540	U	470	U
3-NITROANILINE	800	80	1300	U	1300	U	1100	U
ACENAPHTHENE	300	30	540	U	540	U	77	J

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL SEMIVOLATILE SOILS (UG/KG)

CLIENT ID:			Young Dup W-SD-C10		Young W-SD-C7		W-SD-C9	
LABORATORY ID:			950005-27		950005-22		950005-23	
ANALYTE	CRQL	MDL						
2,4-DINITROPHENOL	800	80	1300	U	1300	U	1100	U
4-NITROPHENOL	800	80	1300	U	1300	U	1100	U
DIBENZOFURAN	300	30	540	U	540	U	470	U
2,4-DINITROTOLUENE	300	30	540	U	540	U	470	U
DIETHYL PHTHALATE	300	30	540	U	540	U	470	U
4-CHLOROPHENYL-PHENYL ETHER	300	30	540	U	540	U	470	U
FLUORENE	300	30	540	U	540	U	120	J
4-NITROANILINE	800	80	1300	U	1300	U	1100	U
4,6-DINITRO-2-METHYLPHENOL	800	80	1300	U	1300	U	1100	U
N-NITROSODIPHENYLAMINE	300	30	540	U	540	U	470	U
4-BROMOPHENYL-PHENYL ETHER	300	30	540	U	540	U	470	U
HEXACHLOROBENZENE	300	30	540	U	540	U	470	U
PENTACHLOROPHENOL	800	80	1300	U	1300	U	1100	U
PHENANTHRENE	300	30	340	J	330	J	1100	
ANTHRACENE	300	30	540	U	55	J	320	J
DI-N-BUTYL PHTHALATE	300	30	540	U	540	U	470	U
FLUORANTHENE	300	30	710		540		1700	
CARBAZOLE	300	30	540	U	540	U	81	J
PYRENE	300	30	1500	J	690		2000	
BUTYLBENZYL PHTHALATE	300	30	540	U	540	U	470	U
3,3'-DICHLOROBENZIDINE	300	30	540	U	540	U	470	U
BENZO(A)ANTHRACENE	300	30	440	J	260	J	880	
CHRYSENE	300	30	450	J	270	J	670	J
BIS(2-ETHYLHEXYL)PHTHALATE	300	30	82	J	71	J	74	J
DI-N-OCTYL PHTHALATE	300	30	540	U	540	U	470	U
BENZO(B)FLUORANTHENE	300	30	520	J	330	J	910	
BENZO(K)FLUORANTHENE	300	30	300	J	150	J	280	J
BENZO(A)PYRENE	300	30	410	J	230	J	660	
INDENO(1,2,3-CD)PYRENE	300	30	240	J	160	J	420	J
DIBENZO(A,H)ANTHRACENE	300	30	80	J	540	U	86	J
BENZO(G,H,I)PERYLENE	300	30	310	J	180	J	480	
% SOLIDS			61.0		61.0		69.0	
DILUTION FACTOR:			1.0		1.0		1.0	

TCL PESTICIDES/PCBS

SURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-01		W-SS-04-07		W-SS-04-09		W-SS-04-10		W-SS-04-21	
LABORATORY ID:			950222-01		950222-10		950222-12		950222-13		950222-14	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
BETA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
DELTA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
GAMMA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
HEPTACHLOR	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
ALDRIN	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
HEPTACHLOR EPOXIDE	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
ENDOSULFAN I	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
DIELDRIN	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
4,4'-DDE	0.1	0.02	4.2	UJ	4.1	UJ	6.0	J	3.9	UJ	4.0	UJ
ENDRIN	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ENDOSULFAN II	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
4,4'-DDD	0.1	0.02	4.2	UJ	4.1	UJ	22	J	3.9	UJ	4.0	UJ
ENDOSULFAN SULFATE	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
4,4'-DDT	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
METHOXYCHLOR	0.5	0.1	21	UJ	21	UJ	21	UJ	20	UJ	21	UJ
ENDRIN KETONE	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ENDRIN ALDEHYDE	0.1	0.02	4.2	UJ	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ALPHA-CHLORDANE	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
GAMMA-CHLORDANE	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
TOXAPHENE	5	1.67	210	UJ	210	UJ	210	UJ	200	UJ	210	UJ
AROCLOR-1016	1	0.33	42	UJ	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1221	2	0.67	85	UJ	83	UJ	82	UJ	79	UJ	82	UJ
AROCLOR-1232	1	0.33	42	UJ	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1242	1	0.33	42	UJ	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1248	1	0.33	42	UJ	41	UJ	64	J	79	J	200	J
AROCLOR-1254	1	0.33	42	UJ	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1260	1	0.33	42	UJ	41	UJ	41	UJ	39	UJ	40	UJ
% SOLIDS:			79.0		80.0		81.0		84.0		82.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SS-04-13
LABORATORY ID: 950222-19

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	2.0	UJ
BETA-BHC	0.05	0.01	2.0	UJ
DELTA-BHC	0.05	0.01	2.0	UJ
GAMMA-BHC	0.05	0.01	2.0	UJ
HEPTACHLOR	0.05	0.01	2.0	UJ
ALDRIN	0.05	0.01	2.0	UJ
HEPTACHLOR EPOXIDE	0.05	0.01	2.0	UJ
ENDOSULFAN I	0.05	0.01	2.0	UJ
DIELDRIN	0.1	0.02	4.0	UJ
4,4'-DDE	0.1	0.02	4.0	UJ
ENDRIN	0.1	0.02	4.0	UJ
ENDOSULFAN II	0.1	0.02	4.0	UJ
4,4'-DDD	0.1	0.02	4.0	UJ
ENDOSULFAN SULFATE	0.1	0.02	4.0	UJ
4,4'-DDT	0.1	0.02	4.0	UJ
METHOXYCHLOR	0.5	0.1	20	UJ
ENDRIN KETONE	0.1	0.02	4.0	UJ
ENDRIN ALDEHYDE	0.1	0.02	4.0	UJ
ALPHA-CHLORDANE	0.05	0.01	2.0	UJ
GAMMA-CHLORDANE	0.05	0.01	2.0	UJ
TOXAPHENE	5	1.67	200	UJ
AROCLOR-1016	1	0.33	40	UJ
AROCLOR-1221	2	0.67	81	UJ
AROCLOR-1232	1	0.33	40	UJ
AROCLOR-1242	1	0.33	40	UJ
AROCLOR-1248	1	0.33	40	UJ
AROCLOR-1254	1	0.33	40	UJ
AROCLOR-1260	1	0.33	40	UJ
% SOLIDS:			83.0	
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SS-04-16
LABORATORY ID: 950222-22

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	2.0	U
BETA-BHC	0.05	0.01	2.0	U
DELTA-BHC	0.05	0.01	2.0	U
GAMMA-BHC	0.05	0.01	2.0	U
HEPTACHLOR	0.05	0.01	2.0	U
ALDRIN	0.05	0.01	2.0	U
HEPTACHLOR EPOXIDE	0.05	0.01	2.0	U
ENDOSULFAN I	0.05	0.01	2.0	U
DIELDRIN	0.1	0.02	3.9	U
4,4'-DDE	0.1	0.02	3.9	U
ENDRIN	0.1	0.02	3.9	U
ENDOSULFAN II	0.1	0.02	3.9	U
4,4'-DDD	0.1	0.02	3.9	U
ENDOSULFAN SULFATE	0.1	0.02	3.9	U
4,4'-DDT	0.1	0.02	3.9	U
METHOXYCHLOR	0.5	0.1	20	U
ENDRIN KETONE	0.1	0.02	3.9	U
ENDRIN ALDEHYDE	0.1	0.02	3.9	U
ALPHA-CHLORDANE	0.05	0.01	2.0	U
GAMMA-CHLORDANE	0.05	0.01	2.0	U
TOXAPHENE	5	1.67	200	U
AROCLOR-1016	1	0.33	39	U
AROCLOR-1221	2	0.67	79	U
AROCLOR-1232	1	0.33	39	U
AROCLOR-1242	1	0.33	39	U
AROCLOR-1248	1	0.33	39	U
AROCLOR-1254	1	0.33	39	U
AROCLOR-1260	1	0.33	39	U
% SOLIDS:			84.0	
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL PESTICIDE/PCB SOILS (UG/KG)

CLIENT ID:			W-BG-01		W-BG-02		W-BG-03		W-BG-04		W-BG-05	
LABORATORY ID:			950238-01		950238-02		950238-03		950238-04		950238-05	
ANALYTE	CRQL	MDL										
ALPHA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
BETA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
DELTA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
GAMMA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
HEPTACHLOR	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
ALDRIN	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
HEPTACHLOR EPOXIDE	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
ENDOSULFAN I	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
DIELDRIN	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
4,4'-DDE	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
ENDRIN	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
ENDOSULFAN II	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
4,4'-DDD	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
ENDOSULFAN SULFATE	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
4,4'-DDT	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
METHOXYCHLOR	0.5	0.1	21	UJ	21	UJ	21	UJ	21	UJ	20	UJ
ENDRIN KETONE	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
ENDRIN ALDEHYDE	0.1	0.02	4.0	UJ	4.0	UJ	4.1	UJ	4.0	UJ	3.9	UJ
ALPHA-CHLORDANE	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
GAMMA-CHLORDANE	0.05	0.01	2.1	UJ	2.1	UJ	2.1	UJ	2.1	UJ	2.0	UJ
TOXAPHENE	5	1.67	210	UJ	210	UJ	210	UJ	210	UJ	200	UJ
AROCLOR-1016	1	0.33	40	UJ	40	UJ	41	UJ	40	UJ	39	UJ
AROCLOR-1221	2	0.67	81	UJ	82	UJ	83	UJ	81	UJ	80	UJ
AROCLOR-1232	1	0.33	40	UJ	40	UJ	41	UJ	40	UJ	39	UJ
AROCLOR-1242	1	0.33	40	UJ	40	UJ	41	UJ	40	UJ	39	UJ
AROCLOR-1248	1	0.33	40	UJ	40	UJ	41	UJ	40	UJ	39	UJ
AROCLOR-1254	1	0.33	40	UJ	40	UJ	41	UJ	40	UJ	39	UJ
AROCLOR-1260	1	0.33	40	UJ	40	UJ	41	UJ	40	UJ	39	UJ
% SOLIDS:			82.0		82.0		80.0		82.0		83.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL PESTICIDE/PCB SOILS (UG/KG)

CLIENT ID:			W-BG-06		W-BG-07		W-BG-08		W-BG-09	
LABORATORY ID:			950238-06		950238-07		950238-08		950238-09	
ANALYTE	CRQL	MDL								
ALPHA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
BETA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
DELTA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
GAMMA-BHC	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
HEPTACHLOR	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
ALDRIN	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
HEPTACHLOR EPOXIDE	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
ENDOSULFAN I	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
DIELDRIN	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
4,4'-DDE	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ENDRIN	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ENDOSULFAN II	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
4,4'-DDD	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ENDOSULFAN SULFATE	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
4,4'-DDT	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
METHOXYCHLOR	0.5	0.1	21	UJ	21	UJ	20	UJ	21	UJ
ENDRIN KETONE	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ENDRIN ALDEHYDE	0.1	0.02	4.1	UJ	4.1	UJ	3.9	UJ	4.0	UJ
ALPHA-CHLORDANE	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
GAMMA-CHLORDANE	0.05	0.01	2.1	UJ	2.1	UJ	2.0	UJ	2.1	UJ
TOXAPHENE	5	1.67	210	UJ	210	UJ	200	UJ	210	UJ
AROCLOR-1016	1	0.33	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1221	2	0.67	82	UJ	84	UJ	80	UJ	81	UJ
AROCLOR-1232	1	0.33	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1242	1	0.33	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1248	1	0.33	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1254	1	0.33	41	UJ	41	UJ	39	UJ	40	UJ
AROCLOR-1260	1	0.33	41	UJ	41	UJ	39	UJ	40	UJ
% SOLIDS:			81.0		79.0		83.0		82.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0414
LABORATORY ID: 950238-10

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	0.05	U
BETA-BHC	0.05	0.01	0.05	U
DELTA-BHC	0.05	0.01	0.05	U
GAMMA-BHC	0.05	0.01	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U
ALDRIN	0.05	0.01	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U
DIELDRIN	0.1	0.02	0.1	U
4,4'-DDE	0.1	0.02	0.1	U
ENDRIN	0.1	0.02	0.1	U
ENDOSULFAN II	0.1	0.02	0.1	U
4,4'-DDD	0.1	0.02	0.1	U
ENDOSULFAN SULFATE	0.1	0.02	0.1	U
4,4'-DDT	0.1	0.02	0.1	U
METHOXYCHLOR	0.5	0.1	0.5	U
ENDRIN KETONE	0.1	0.02	0.1	U
ENDRIN ALDEHYDE	0.1	0.02	0.1	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U
TOXAPHENE	5	1.67	5	U
AROCLOR-1016	1	0.33	1	U
AROCLOR-1221	2	0.67	2	U
AROCLOR-1232	1	0.33	1	U
AROCLOR-1242	1	0.33	1	U
AROCLOR-1248	1	0.33	1	U
AROCLOR-1254	1	0.33	1	U
AROCLOR-1260	1	0.33	1	U
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0410
LABORATORY ID: 950222-02

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	0.05	U
BETA-BHC	0.05	0.01	0.05	U
DELTA-BHC	0.05	0.01	0.05	U
GAMMA-BHC	0.05	0.01	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U
ALDRIN	0.05	0.01	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U
DIELDRIN	0.1	0.02	0.1	U
4,4'-DDE	0.1	0.02	0.1	U
ENDRIN	0.1	0.02	0.1	U
ENDOSULFAN II	0.1	0.02	0.1	U
4,4'-DDD	0.1	0.02	0.1	U
ENDOSULFAN SULFATE	0.1	0.02	0.1	U
4,4'-DDT	0.1	0.02	0.1	U
METHOXYCHLOR	0.5	0.1	0.5	U
ENDRIN KETONE	0.1	0.02	0.1	U
ENDRIN ALDEHYDE	0.1	0.02	0.1	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U
TOXAPHENE	5	1.67	5	U
AROCLOR-1016	1	0.33	1	U
AROCLOR-1221	2	0.67	2	U
AROCLOR-1232	1	0.33	1	U
AROCLOR-1242	1	0.33	1	U
AROCLOR-1248	1	0.33	1	U
AROCLOR-1254	1	0.33	1	U
AROCLOR-1260	1	0.33	1	U
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0412
LABORATORY ID: 950222-30

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	0.05	U
BETA-BHC	0.05	0.01	0.05	U
DELTA-BHC	0.05	0.01	0.05	U
GAMMA-BHC	0.05	0.01	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U
ALDRIN	0.05	0.01	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U
DIELDRIN	0.1	0.02	0.1	U
4,4'-DDE	0.1	0.02	0.1	U
ENDRIN	0.1	0.02	0.1	U
ENDOSULFAN II	0.1	0.02	0.1	U
4,4'-DDD	0.1	0.02	0.1	U
ENDOSULFAN SULFATE	0.1	0.02	0.1	U
4,4'-DDT	0.1	0.02	0.1	U
METHOXYCHLOR	0.5	0.1	0.5	U
ENDRIN KETONE	0.1	0.02	0.1	U
ENDRIN ALDEHYDE	0.1	0.02	0.1	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U
TOXAPHENE	5	1.67	5	U
AROCLOR-1016	1	0.33	1	U
AROCLOR-1221	2	0.67	2	U
AROCLOR-1232	1	0.33	1	U
AROCLOR-1242	1	0.33	1	U
AROCLOR-1248	1	0.33	1	U
AROCLOR-1254	1	0.33	1	U
AROCLOR-1260	1	0.33	1	U
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:	W-BG-09A		W-BG-10	
LABORATORY ID:	950254-02		950254-03	

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL				
ALPHA-BHC	0.05	0.01	2.0	UR	2.0	U
BETA-BHC	0.05	0.01	2.0	UR	2.0	U
DELTA-BHC	0.05	0.01	2.0	UR	2.0	U
GAMMA-BHC	0.05	0.01	2.0	UR	2.0	U
HEPTACHLOR	0.05	0.01	2.0	UR	2.0	U
ALDRIN	0.05	0.01	2.0	UR	2.0	U
HEPTACHLOR EPOXIDE	0.05	0.01	2.0	UR	2.0	U
ENDOSULFAN I	0.05	0.01	2.0	UR	2.0	U
DIELDRIN	0.1	0.02	3.9	UR	4.0	U
4,4'-DDE	0.1	0.02	3.9	UR	4.0	U
ENDRIN	0.1	0.02	3.9	UR	4.0	U
ENDOSULFAN II	0.1	0.02	3.9	UR	4.0	U
4,4'-DDD	0.1	0.02	3.9	UR	4.0	U
ENDOSULFAN SULFATE	0.1	0.02	3.9	UR	4.0	U
4,4'-DDT	0.1	0.02	3.9	UR	4.0	U
METHOXYCHLOR	0.5	0.1	20	UR	20	U
ENDRIN KETONE	0.1	0.02	3.9	UR	4.0	U
ENDRIN ALDEHYDE	0.1	0.02	3.9	UR	4.0	U
ALPHA-CHLORDANE	0.05	0.01	2.0	UR	2.0	U
GAMMA-CHLORDANE	0.05	0.01	2.0	UR	2.0	U
TOXAPHENE	5	1.67	200	UR	200	U
AROCLOR-1016	1	0.33	39	UR	40	U
AROCLOR-1221	2	0.67	79	UR	81	U
AROCLOR-1232	1	0.33	39	UR	40	U
AROCLOR-1242	1	0.33	39	UR	40	U
AROCLOR-1248	1	0.33	39	UR	40	U
AROCLOR-1254	1	0.33	39	UR	40	U
AROCLOR-1260	1	0.33	39	UR	40	U
% SOLIDS:			84.0		83.0	
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0421
LABORATORY ID: 950254-11

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	0.05	UJ
BETA-BHC	0.05	0.01	0.05	UJ
DELTA-BHC	0.05	0.01	0.05	UJ
GAMMA-BHC	0.05	0.01	0.05	UJ
HEPTACHLOR	0.05	0.01	0.05	UJ
ALDRIN	0.05	0.01	0.05	UJ
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	UJ
ENDOSULFAN I	0.05	0.01	0.05	UJ
DIELDRIN	0.1	0.02	0.1	UJ
4,4'-DDE	0.1	0.02	0.1	UJ
ENDRIN	0.1	0.02	0.1	UJ
ENDOSULFAN II	0.1	0.02	0.1	UJ
4,4'-DDD	0.1	0.02	0.1	UJ
ENDOSULFAN SULFATE	0.1	0.02	0.1	UJ
4,4'-DDT	0.1	0.02	0.1	UJ
METHOXYCHLOR	0.5	0.10	0.5	UJ
ENDRIN KETONE	0.1	0.02	0.1	UJ
ENDRIN ALDEHYDE	0.1	0.02	0.1	UJ
ALPHA-CHLORDANE	0.05	0.01	0.05	UJ
GAMMA-CHLORDANE	0.05	0.01	0.05	UJ
TOXAPHENE	5	1.67	5	UJ
AROCLOR-1016	1	0.33	1	UJ
AROCLOR-1221	2	0.67	2	UJ
AROCLOR-1232	1	0.33	1	UJ
AROCLOR-1242	1	0.33	1	UJ
AROCLOR-1248	1	0.33	1	UJ
AROCLOR-1254	1	0.33	1	UJ
AROCLOR-1260	1	0.33	1	UJ
DILUTION FACTOR:			1.0	

SUBSURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			WSB0401		WSB0402		WSB0403		WSB0404		WSB0405	
LABORATORY ID:			950237-02		950237-03		950237-06		950237-07		950237-10	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
BETA-BHC	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
DELTA-BHC	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
GAMMA-BHC	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
HEPTACHLOR	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
ALDRIN	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
HEPTACHLOR EPOXIDE	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
ENDOSULFAN I	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
DIELDRIN	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
4,4'-DDE	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
ENDRIN	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
ENDOSULFAN II	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
4,4'-DDD	0.1	0.02	4.9	L	4.1	UJ	4.6	UJ	4.9	UJ	24	U
ENDOSULFAN SULFATE	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
4,4'-DDT	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
METHOXYCHLOR	0.5	0.1	22	UL	21	UJ	24	UJ	25	UJ	120	U
ENDRIN KETONE	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
ENDRIN ALDEHYDE	0.1	0.02	4.3	UL	4.1	UJ	4.6	UJ	4.9	UJ	24	U
ALPHA-CHLORDANE	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	24	
GAMMA-CHLORDANE	0.05	0.01	2.2	UL	2.1	UJ	2.4	UJ	2.5	UJ	12	U
TOXAPHENE	5	1.67	220	UL	210	UJ	240	UJ	250	UJ	1200	U
AROCLOR-1016	1	0.33	43	UL	41	UJ	46	UJ	49	UJ	240	U
AROCLOR-1221	2	0.67	88	UL	84	UJ	93	UJ	99	UJ	480	U
AROCLOR-1232	1	0.33	43	UL	41	UJ	46	UJ	49	UJ	240	U
AROCLOR-1242	1	0.33	43	UL	41	UJ	46	UJ	49	UJ	240	U
AROCLOR-1248	1	0.33	65	J	46	J	150	L	110	J	1300	J
AROCLOR-1254	1	0.33	43	UL	41	UJ	46	UL	49	UJ	240	U
AROCLOR-1260	1	0.33	43	UL	41	UJ	46	UL	49	UJ	240	U
% SOLIDS:			76.0		79.0		72.0		67.0		69.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		5.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			WSB0406		WSB0430		WSB0431	
LABORATORY ID:			950237-11		950237-12		950237-13	

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL						
ALPHA-BHC	0.05	0.01	2.1	UL	10	U	2.1	UR
BETA-BHC	0.05	0.01	2.1	UL	10	U	2.1	UR
DELTA-BHC	0.05	0.01	2.1	UL	10	U	2.1	UR
GAMMA-BHC	0.05	0.01	2.1	UL	10	U	2.1	UR
HEPTACHLOR	0.05	0.01	2.1	UL	10	U	2.1	UR
ALDRIN	0.05	0.01	2.1	UL	10	U	2.1	UR
HEPTACHLOR EPOXIDE	0.05	0.01	2.1	UL	10	U	2.1	UR
ENDOSULFAN I	0.05	0.01	2.1	UL	10	U	2.1	UR
DIELDRIN	0.1	0.02	4.1	UL	42	J	4.1	UR
4,4'-DDE	0.1	0.02	4.1	UL	20	U	4.1	UR
ENDRIN	0.1	0.02	4.1	UL	20	U	4.1	UR
ENDOSULFAN II	0.1	0.02	4.1	UL	20	U	4.1	UR
4,4'-DDD	0.1	0.02	4.1	UL	20	U	4.1	UR
ENDOSULFAN SULFATE	0.1	0.02	4.1	UL	20	U	4.1	UR
4,4'-DDT	0.1	0.02	4.1	UL	20	U	4.1	UR
METHOXYCHLOR	0.5	0.1	21	UL	100	U	21	UR
ENDRIN KETONE	0.1	0.02	4.1	UL	20	U	4.1	UR
ENDRIN ALDEHYDE	0.1	0.02	4.1	UL	20	U	4.1	UR
ALPHA-CHLORDANE	0.05	0.01	2.1	UL	35		2.1	UR
GAMMA-CHLORDANE	0.05	0.01	2.1	UL	10	U	2.1	UR
TOXAPHENE	5	1.67	210	UL	1000	U	210	UR
AROCLOR-1016	1	0.33	41	UL	200	U	41	UR
AROCLOR-1221	2	0.67	82	UL	410	U	84	UR
AROCLOR-1232	1	0.33	41	UL	200	U	41	UR
AROCLOR-1242	1	0.33	41	UL	200	U	41	UR
AROCLOR-1248	1	0.33	41	UL	200	U	41	UR
AROCLOR-1254	1	0.33	41	UL	1000	J	41	UR
AROCLOR-1260	1	0.33	41	UL	200	U	41	UR
% SOLIDS:			80.0		81.0		80.0	
DILUTION FACTOR:			1.0		5.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			WSB0407		WSB0408		WSB0409		WSB0410	
LABORATORY ID:			950255-02		950255-03		950255-04		950255-05	
TCL PESTICIDE/PCB SOILS (UG/KG)										
ANALYTE	CRQL	MDL								
ALPHA-BHC	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
BETA-BHC	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
DELTA-BHC	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
GAMMA-BHC	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
HEPTACHLOR	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
ALDRIN	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
HEPTACHLOR EPOXIDE	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
ENDOSULFAN I	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
DIELDRIN	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
4,4'-DDE	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
ENDRIN	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
ENDOSULFAN II	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
4,4'-DDD	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
ENDOSULFAN SULFATE	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
4,4'-DDT	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
METHOXYCHLOR	0.5	0.1	22	U	340	U	22	U	20	U
ENDRIN KETONE	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
ENDRIN ALDEHYDE	0.1	0.02	4.2	U	66	U	4.2	U	3.9	U
ALPHA-CHLORDANE	0.05	0.01	2.2	U	33	J	2.2	U	2.0	U
GAMMA-CHLORDANE	0.05	0.01	2.2	U	34	U	2.2	U	2.0	U
TOXAPHENE	5	1.67	220	U	3400	U	220	U	200	U
AROCLOR-1016	1	0.33	42	U	660	U	42	U	39	U
AROCLOR-1221	2	0.67	86	U	1300	U	85	U	79	U
AROCLOR-1232	1	0.33	42	U	660	U	42	U	39	U
AROCLOR-1242	1	0.33	42	U	660	U	42	U	39	U
AROCLOR-1248	1	0.33	42	U	3500	J	130	J	56	
AROCLOR-1254	1	0.33	42	U	660	U	42	U	39	U
AROCLOR-1260	1	0.33	42	U	660	U	42	U	39	U
% SOLIDS:			77.0		50.0		78.0		84.0	
DILUTION FACTOR:			1.0		10.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-11		W-SB-04-12		W-SB-04-13		W-SB-04-14		W-SB-04-15	
LABORATORY ID:			950261-02		950261-03		950261-04		950261-05		950261-06	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
BETA-BHC	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
DELTA-BHC	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
GAMMA-BHC	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
HEPTACHLOR	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
ALDRIN	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
HEPTACHLOR EPOXIDE	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
ENDOSULFAN I	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
DIELDRIN	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
4,4'-DDE	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
ENDRIN	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
ENDOSULFAN II	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
4,4'-DDD	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
ENDOSULFAN SULFATE	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
4,4'-DDT	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	6300	
METHOXYCHLOR	0.5	0.1	20	U	21	U	21	U	21	U	4000	U
ENDRIN KETONE	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
ENDRIN ALDEHYDE	0.1	0.02	3.9	U	4.1	U	4.0	U	4.0	U	770	U
ALPHA-CHLORDANE	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
GAMMA-CHLORDANE	0.05	0.01	2.0	U	2.1	U	2.1	U	2.1	U	400	U
TOXAPHENE	5	1.67	200	U	210	U	210	U	210	U	40000	U
AROCLOR-1016	1	0.33	39	U	41	U	40	U	40	U	7700	U
AROCLOR-1221	2	0.67	79	U	84	U	82	U	82	U	16000	U
AROCLOR-1232	1	0.33	39	U	41	U	40	U	40	U	7700	U
AROCLOR-1242	1	0.33	39	U	41	U	40	U	40	U	7700	U
AROCLOR-1248	1	0.33	39	U	41	U	40	U	40	U	7700	U
AROCLOR-1254	1	0.33	39	U	41	U	40	U	40	U	7700	U
AROCLOR-1260	1	0.33	39	U	41	U	40	U	40	U	7700	U
% SOLIDS:			83.0		79.0		81.0		82.0		84.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		200.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-16		W-SB-04-17		W-SB-04-18	
LABORATORY ID:			950261-07		950261-08		950261-09	

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL						
ALPHA-BHC	0.05	0.01	160	U	2.1	U	2.2	U
BETA-BHC	0.05	0.01	160	U	2.1	U	2.2	U
DELTA-BHC	0.05	0.01	160	U	2.1	U	2.2	U
GAMMA-BHC	0.05	0.01	160	U	2.1	U	2.2	U
HEPTACHLOR	0.05	0.01	160	U	2.1	U	2.2	U
ALDRIN	0.05	0.01	160	U	2.1	U	2.2	U
HEPTACHLOR EPOXIDE	0.05	0.01	160	U	2.1	U	2.2	U
ENDOSULFAN I	0.05	0.01	160	U	2.1	U	2.2	U
DIELDRIN	0.1	0.02	310	U	4.0	U	4.2	U
4,4'-DDE	0.1	0.02	310	U	4.0	U	4.2	U
ENDRIN	0.1	0.02	310	U	4.0	U	4.2	U
ENDOSULFAN II	0.1	0.02	310	U	4.0	U	4.2	U
4,4'-DDD	0.1	0.02	680	J	4.0	U	4.2	U
ENDOSULFAN SULFATE	0.1	0.02	310	U	4.0	U	4.2	U
4,4'-DDT	0.1	0.02	2900		4.0	U	4.2	U
METHOXYCHLOR	0.5	0.1	1600	U	21	U	22	U
ENDRIN KETONE	0.1	0.02	310	U	4.0	U	4.2	U
ENDRIN ALDEHYDE	0.1	0.02	310	U	4.0	U	4.2	U
ALPHA-CHLORDANE	0.05	0.01	160	U	2.1	U	2.2	U
GAMMA-CHLORDANE	0.05	0.01	160	U	2.1	U	2.2	U
TOXAPHENE	5	1.67	16000	U	210	U	220	U
AROCLOR-1016	1	0.33	3100	U	40	U	42	U
AROCLOR-1221	2	0.67	6300	U	81	U	86	U
AROCLOR-1232	1	0.33	3100	U	40	U	42	U
AROCLOR-1242	1	0.33	3100	U	40	U	42	U
AROCLOR-1248	1	0.33	3100	U	40	U	42	U
AROCLOR-1254	1	0.33	3100	U	40	U	42	U
AROCLOR-1260	1	0.33	3100	U	40	U	42	U
% SOLIDS:			85.0		82.0		77.0	
DILUTION FACTOR:			80.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-19		W-SB-04-20		W-SB-04-21		W-SB-04-22		W-SB-04-23	
LABORATORY ID:			950266-02		950266-03		950266-04		950266-05		950266-06	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
BETA-BHC	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
DELTA-BHC	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
GAMMA-BHC	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
HEPTACHLOR	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
ALDRIN	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	J
HEPTACHLOR EPOXIDE	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
ENDOSULFAN I	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
DIELDRIN	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	5.4	R
4,4'-DDE	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
ENDRIN	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
ENDOSULFAN II	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
4,4'-DDD	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.3	J
ENDOSULFAN SULFATE	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
4,4'-DDT	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
METHOXYCHLOR	0.5	0.1	20	UL	21	U	20	U	20	U	21	U
ENDRIN KETONE	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
ENDRIN ALDEHYDE	0.1	0.02	3.9	UL	4.0	U	3.9	U	3.9	U	4.0	U
ALPHA-CHLORDANE	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
GAMMA-CHLORDANE	0.05	0.01	2.0	UL	2.1	U	2.0	U	2.0	U	2.1	U
TOXAPHENE	5	1.67	200	UL	210	U	200	U	200	U	210	U
AROCLOR-1016	1	0.33	39	UL	40	U	39	U	39	U	40	U
AROCLOR-1221	2	0.67	79	UL	81	U	79	U	79	U	81	U
AROCLOR-1232	1	0.33	39	UL	40	U	39	U	39	U	40	U
AROCLOR-1242	1	0.33	39	UL	40	U	39	U	39	U	40	U
AROCLOR-1248	1	0.33	39	UL	40	U	39	U	39	U	180	J
AROCLOR-1254	1	0.33	39	UL	40	U	39	U	39	U	40	U
AROCLOR-1260	1	0.33	39	UL	40	U	39	U	39	U	40	U
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	
% SOLIDS:			84.0		82.0		84.0		84.0		81.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-24		W-SB-04-32	
LABORATORY ID:			950266-07		950266-08	

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL				
ALPHA-BHC	0.05	0.01	2.1	U	2.2	U
BETA-BHC	0.05	0.01	2.1	U	2.2	U
DELTA-BHC	0.05	0.01	2.1	U	2.2	U
GAMMA-BHC	0.05	0.01	2.1	U	2.2	U
HEPTACHLOR	0.05	0.01	2.1	U	2.2	U
ALDRIN	0.05	0.01	2.1	U	2.2	U
HEPTACHLOR EPOXIDE	0.05	0.01	2.1	U	2.2	U
ENDOSULFAN I	0.05	0.01	2.1	U	2.2	U
DIELDRIN	0.1	0.02	4.1	U	4.2	U
4,4'-DDE	0.1	0.02	4.1	U	4.2	U
ENDRIN	0.1	0.02	4.1	U	4.2	U
ENDOSULFAN II	0.1	0.02	4.1	U	4.2	U
4,4'-DDD	0.1	0.02	4.1	U	4.2	U
ENDOSULFAN SULFATE	0.1	0.02	4.1	U	4.2	U
4,4'-DDT	0.1	0.02	4.1	U	4.2	U
METHOXYCHLOR	0.5	0.1	21	U	22	U
ENDRIN KETONE	0.1	0.02	4.1	U	4.2	U
ENDRIN ALDEHYDE	0.1	0.02	4.1	U	4.2	U
ALPHA-CHLORDANE	0.05	0.01	2.1	U	2.2	U
GAMMA-CHLORDANE	0.05	0.01	2.1	U	2.2	U
TOXAPHENE	5	1.67	210	U	220	U
AROCLOR-1016	1	0.33	41	U	42	U
AROCLOR-1221	2	0.67	84	U	85	U
AROCLOR-1232	1	0.33	41	U	42	U
AROCLOR-1242	1	0.33	41	U	42	U
AROCLOR-1248	1	0.33	41	U	42	U
AROCLOR-1254	1	0.33	41	U	42	U
AROCLOR-1260	1	0.33	41	U	42	U
DILUTION FACTOR:			1.0		1.0	
% SOLIDS:			80.0		79.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			WRB0417		WFB0419	
LABORATORY ID:			950237-08		950237-14	

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL				
ALPHA-BHC	0.05	0.01	0.05	U	0.05	U
BETA-BHC	0.05	0.01	0.05	U	0.05	U
DELTA-BHC	0.05	0.01	0.05	U	0.05	U
GAMMA-BHC	0.05	0.01	0.05	U	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U	0.05	U
ALDRIN	0.05	0.01	0.05	U	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U	0.05	U
DIELDRIN	0.1	0.02	0.1	U	0.1	U
4,4'-DDE	0.1	0.02	0.1	U	0.1	U
ENDRIN	0.1	0.02	0.1	U	0.1	U
ENDOSULFAN II	0.1	0.02	0.1	U	0.1	U
4,4'-DDD	0.1	0.02	0.1	U	0.1	U
ENDOSULFAN SULFATE	0.1	0.02	0.1	U	0.1	U
4,4'-DDT	0.1	0.02	0.1	U	0.1	U
METHOXYCHLOR	0.5	0.1	0.5	U	0.5	U
ENDRIN KETONE	0.1	0.02	0.1	U	0.1	U
ENDRIN ALDEHYDE	0.1	0.02	0.1	U	0.1	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U	0.05	U
TOXAPHENE	5	1.67	5	U	5	U
AROCLOR-1016	1	0.33	1	U	1	U
AROCLOR-1221	2	0.67	2	U	2	U
AROCLOR-1232	1	0.33	1	U	1	U
AROCLOR-1242	1	0.33	1	U	1	U
AROCLOR-1248	1	0.33	1	U	1	U
AROCLOR-1254	1	0.33	1	U	1	U
AROCLOR-1260	1	0.33	1	U	1	U
DILUTION FACTOR:			1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-FB-0425		W-RB-0425	
LABORATORY ID:			950266-09		950266-10	

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL				
ALPHA-BHC	0.05	0.01	0.05	U	0.05	U
BETA-BHC	0.05	0.01	0.05	U	0.05	U
DELTA-BHC	0.05	0.01	0.05	U	0.05	U
GAMMA-BHC	0.05	0.01	0.05	U	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U	0.05	U
ALDRIN	0.05	0.01	0.05	U	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U	0.05	U
DIELDRIN	0.1	0.02	0.1	U	0.1	U
4,4'-DDE	0.1	0.02	0.1	U	0.1	U
ENDRIN	0.1	0.02	0.1	U	0.1	U
ENDOSULFAN II	0.1	0.02	0.1	U	0.1	U
4,4'-DDD	0.1	0.02	0.1	U	0.1	U
ENDOSULFAN SULFATE	0.1	0.02	0.1	U	0.1	U
4,4'-DDT	0.1	0.02	0.1	U	0.1	U
METHOXYCHLOR	0.5	0.1	0.5	U	0.5	U
ENDRIN KETONE	0.1	0.02	0.1	U	0.1	U
ENDRIN ALDEHYDE	0.1	0.02	0.1	U	0.1	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U	0.05	U
TOXAPHENE	5	1.67	5	U	5	U
AROCLOR-1016	1	0.33	1	U	1	U
AROCLOR-1221	2	0.67	2	U	2	U
AROCLOR-1232	1	0.33	1	U	1	U
AROCLOR-1242	1	0.33	1	U	1	U
AROCLOR-1248	1	0.33	1	U	1	U
AROCLOR-1254	1	0.33	1	U	1	U
AROCLOR-1260	1	0.33	1	U	1	U
DILUTION FACTOR:			1.0		1.0	

SURFACE WATER
PHASE I

(SMC Martin, 1991)

SMC March, 1991

SITE: WARMINSTER
CASE NO 9710-40004
LABORATORY: RMC

PESTICIDE/PCB AQUEOUS ANALYSES (ug/L)

CLIENT ID:		3A	5A
LAB ID:		3-S. WATER	5-S. WATER
		8800	8803
CHEMICAL	CRQL		
alpha-BHC	0.05	0.05 UL	0.05 U
beta-BHC	0.05	0.05 UL	0.05 U
delta-BHC	0.05	0.05 UJ (c)	0.05 UJ (c)
Lindane (gamma-BHC)	0.05	0.05 UL	0.05 U
Heptachlor	0.05	0.05 UJ (c)	0.05 UJ (c)
Aldrin	0.05	0.05 UL	0.05 U
Heptachlor epoxide	0.05	0.05 UJ (c)	0.05 UJ (c)
Endosulfan I	0.05	0.05 UJ (c)	0.05 UJ (c)
Dieldrin	1.0	0.1 UL	0.1 U
4,4'-DDE	1.0	0.1 UJ (c)	0.1 UJ (c)
Endrin	1.0	0.1 UL	0.1 U
Endosulfan II	1.0	0.1 UL	0.1 U
4,4'-DDD	1.0	0.1 UJ (c)	0.1 UJ (c)
Endosulfan sulfate	1.0	0.1 UJ (c)	0.1 UJ (c)
4,4'-DDT	1.0	R(x)	R(x)
Methoxychlor	0.05	0.05 UJ (c)	0.05 UJ (c)
Endrin ketone	1.0	0.1 UL	0.1 U
Chlordane	0.05	0.5 UL	0.5 U
Toxaphene	1.0	1.0 UL	1.0 U
Aroclor-1016	0.05	0.5 UL	0.5 U
Aroclor-1221	0.05	0.5 UL	0.5 U
Aroclor-1232	0.05	0.5 UL	0.5 U
Aroclor-1242	0.05	0.5 UL	0.5 U
Aroclor-1248	0.05	0.5 UL	0.5 U
Aroclor-1254	1.0	1.0 UL	1.0 U
Aroclor-1260	1.0	1.0 UL	1.0 U
Analysis Factor:		1.0	1.0

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

PESTICIDE/PCB AQUEOUS ANALYSES (ug/L)

6A

CLIENT ID:		6-S. WATER
LAB ID:		8805
CHEMICAL	CRQL	
alpha-BHC	0.05	0.05 U
beta-BHC	0.05	0.05 U
delta-BHC	0.05	0.05 UJ (c)
Lindane (gamma-BHC)	0.05	0.05 U
Heptachlor	0.05	0.05 UJ (c)
Aldrin	0.05	0.05 U
Heptachlor epoxide	0.05	0.05 UJ (c)
Endosulfan I	0.05	0.05 UJ (c)
Dieldrin	1.0	0.1 U
4,4'-DDE	1.0	0.1 UJ (c)
Endrin	1.0	0.1 U
Endosulfan II	1.0	0.1 U
4,4'-DDD	1.0	0.1 UJ (c)
Endosulfan sulfate	1.0	0.1 UJ (c)
4,4'-DDT	1.0	R(x)
Methoxychlor	0.05	0.05 UJ (c)
Endrin ketone	1.0	0.1 U
Chlordane	0.05	0.5 U
Toxaphene	1.0	1.0 U
Aroclor-1016	0.05	0.5 U
Aroclor-1221	0.05	0.5 U
Aroclor-1232	0.05	0.5 U
Aroclor-1242	0.05	0.5 U
Aroclor-1248	0.05	0.5 U
Aroclor-1254	1.0	1.0 U
Aroclor-1260	1.0	1.0 U
Analysis Factor:		1.0

57

SURFACE WATER
PHASE II

(HNUS, 1992)

SITE: WARMINSTER NAVAL BASE

Surface Water Pesticide Organics Analysis (u g/L) 6B 5B 4B 3B

Sample No.:	W-SW-01	W-SW-02	W-SW-03	W-SW-04
Lab Sample ID:	920328-08	920328-10	920328-12	920328-14
alpha-BHC	0.05 U	0.05 U	0.05 U	0.05 U
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor	0.05 U	0.05 U	0.05 U	0.05 U
Aldrin	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor epoxide	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan I	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDE	0.1 U	0.1 U	0.1 U	0.1 U
Endrin	0.1 U	0.1 U	0.1 U	0.1 U
Endosulfan II	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDD	0.1 U	0.1 U	0.1 U	0.1 U
Endosulfan sulfate	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDT	0.1 U	0.1 U	0.1 U	0.1 U
Methoxychlor	0.5 U	0.5 U	0.5 U	0.5 U
Endrin ketone	0.1 U	0.1 U	0.1 U	0.1 U
Endrin aldehyde	0.1 U	0.1 U	0.1 U	0.1 U
alpha-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U
Toxaphene	5 U	5 U	5 U	5 U
Aroclor-1016	1 U	1 U	1 U	1 U
Aroclor-1221	2 U	2 U	2 U	2 U
Aroclor-1232	1 U	1 U	1 U	1 U
Aroclor-1242	1 U	1 U	1 U	1 U
Aroclor-1248	1 U	1 U	1 U	1 U
Aroclor-1254	1 U	1 U	1 U	1 U
Aroclor-1260	1 U	1 U	1 U	1 U

HNUS, 1992

SURFACE WATER
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0103		Young W-SW-C7		W-SW-C9	
LABORATORY ID:			950005-08		950005-14		950005-15	
TCL PESTICIDE/PCB WATERS (UG/L)								
ANALYTE	CRQL	MDL						
ALPHA-BHC	0.05	0.01	0.05	U	0.05	U	0.05	U
BETA-BHC	0.05	0.01	0.05	U	0.05	U	0.05	U
DELTA-BHC	0.05	0.01	0.05	U	0.05	U	0.05	U
GAMMA-BHC (LINDANE)	0.05	0.01	0.05	U	0.05	U	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U	0.05	U	0.05	U
ALDRIN	0.05	0.01	0.05	U	0.05	U	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U	0.05	U	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U	0.05	U	0.05	U
DIELDRIN	0.1	0.02	0.10	U	0.10	U	0.10	U
4,4'-DDE	0.1	0.02	0.10	U	0.10	U	0.10	U
ENDRIN	0.1	0.02	0.10	U	0.10	U	0.10	U
ENDOSULFAN II	0.1	0.02	0.10	U	0.10	U	0.10	U
4,4'-DDD	0.1	0.02	0.10	U	0.10	U	0.10	U
ENDOSULFAN SULFATE	0.1	0.02	0.10	U	0.10	U	0.10	U
4,4'-DDT	0.1	0.02	0.10	U	0.10	U	0.10	U
METHOXYCHLOR	0.5	0.1	0.50	U	0.50	U	0.50	U
ENDRIN KETONE	0.1	0.02	0.10	U	0.10	U	0.10	U
ENDRIN ALDEHYDE	0.1	0.02	0.10	U	0.10	U	0.10	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U	0.05	U	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U	0.05	U	0.05	U
TOXAPHENE	5	1.67	5.0	U	5.0	U	5.0	U
AROCLOR-1016	1	0.33	1.0	U	1.0	U	1.0	U
AROCLOR-1221	2	0.67	2.0	U	2.0	U	2.0	U
AROCLOR-1232	1	0.33	1.0	U	1.0	U	1.0	U
AROCLOR-1242	1	0.33	1.0	U	1.0	U	1.0	U
AROCLOR-1248	1	0.33	1.0	U	1.0	U	1.0	U
AROCLOR-1254	1	0.33	1.0	U	1.0	U	1.0	U
AROCLOR-1260	1	0.33	1.0	U	1.0	U	1.0	U
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: Young Duplicate
LABORATORY ID: W-SW-C10
950005-26

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.01	0.05	U
BETA-BHC	0.05	0.01	0.05	U
DELTA-BHC	0.05	0.01	0.05	U
GAMMA-BHC (LINDANE)	0.05	0.01	0.05	U
HEPTACHLOR	0.05	0.01	0.05	U
ALDRIN	0.05	0.01	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	U
DIELDRIN	0.1	0.02	0.10	U
4,4'-DDE	0.1	0.02	0.10	U
ENDRIN	0.1	0.02	0.10	U
ENDOSULFAN II	0.1	0.02	0.10	U
4,4'-DDD	0.1	0.02	0.10	U
ENDOSULFAN SULFATE	0.1	0.02	0.10	U
4,4'-DDT	0.1	0.02	0.10	U
METHOXYCHLOR	0.5	0.1	0.50	U
ENDRIN KETONE	0.1	0.02	0.10	U
ENDRIN ALDEHYDE	0.1	0.02	0.10	U
ALPHA-CHLORDANE	0.05	0.01	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	U
TOXAPHENE	5	1.67	5.0	U
AROCLOR-1016	1	0.33	1.0	U
AROCLOR-1221	2	0.67	2.0	U
AROCLOR-1232	1	0.33	1.0	U
AROCLOR-1242	1	0.33	1.0	U
AROCLOR-1248	1	0.33	1.0	U
AROCLOR-1254	1	0.33	1.0	U
AROCLOR-1260	1	0.33	1.0	U
DILUTION FACTOR			1.0	

SEDIMENT
PHASE I

(SMC Martin, 1991)

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

PESTICIDE/PCB SEDIMENT ANALYSES (ug/Kg)

CLIENT ID:		3A	4A	5A
LAB ID:		3-SEDIMENT 8801	4-SEDIMENT 8802	5-SEDIMENT 8804
CHEMICAL	CRQL			
alpha-BHC	8.0	12 U	8.0 U	12 UL
beta-BHC	8.0	12 U	8.0 U	12 UL
delta-BHC	8.0	12 UJ(c)	8.0 UJ(c)	12 UJ(c)
Lindane (gamma-BHC)	8.0	12 U	8.0 U	12 UL
Heptachlor	8.0	12 UJ(c)	8.0 UJ(c)	12 UJ(c)
Aldrin	8.0	12 U	8.0 U	12 UL
Heptachlor epoxide	8.0	12 UJ(c)	8.0 UJ(c)	12 UJ(c)
Endosulfan I	8.0	12 U	8.0 U	12 UL
Dieldrin	16.0	24 U	16 U	24 UL
4,4'-DDE	16.0	24 UJ(c)	16 UJ(c)	24 UJ(c)
Endrin	16.0	24 U	16 U	24 UL
Endosulfan II	16.0	24 U	16 U	24 UL
4,4'-DDD	16.0	24 UJ(c)	16 UJ(c)	24 UJ(c)
Endosulfan sulfate	16.0	24 UJ(c)	16 UJ	24 UJ(c)
4,4'-DDT	16.0	R(x)	R(x)	R(x)
Methoxychlor	80	120 UJ(c)	80 UJ(c)	120 UJ(c)
Endrin ketone	16.0	24 U	16 U	24 UL
Chlordane	80	120 U	80 U	120 UL
Toxaphene	160	240 U	160 U	240 UL
Aroclor-1016	80	120 U	80 U	120 UL
Aroclor-1221	80	120 U	80 U	120 UL
Aroclor-1232	80	120 U	80 U	120 UL
Aroclor-1242	80	120 U	80 U	120 UL
Aroclor-1248	80	120 U	80 U	120 UL
Aroclor-1254	160	240 U	160 U	240 UL
Aroclor-1260	160	240 U	160 U	240 UL
Analysis Factor:		1.5	1.0	1.5

SMC March, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

PESTICIDE/PCB SEDIMENT ANALYSES (ug/Kg) 6A

CLIENT ID:		6-SEDIMENT
LAB ID:		8806
CHEMICAL	CRQL	
alpha-BHC	8.0	12 U
beta-BHC	8.0	12 U
delta-BHC	8.0	12 UJ(c)
Lindane (gamma-BHC)	8.0	12 U
Heptachlor	8.0	12 UJ(c)
Aldrin	8.0	12 U
Heptachlor epoxide	8.0	12 UJ(c)
Endosulfan I	8.0	12 U
Dieldrin	16.0	24 U
4,4'-DDE	16.0	24 UJ(c)
Endrin	16.0	24 U
Endosulfan II	16.0	24 U
4,4'-DDD	16.0	24 UJ(c)
Endosulfan sulfate	16.0	24 UJ(c)
4,4'-DDT	16.0	R(x)
Methoxychlor	80	120 UJ(c)
Endrin ketone	16.0	24 U
Chlordane	80	120 U
Toxaphene	160	240 U
Aroclor-1016	80	120 U
Aroclor-1221	80	120 U
Aroclor-1232	80	120 U
Aroclor-1242	80	120 U
Aroclor-1248	80	120 U
Aroclor-1254	160	240 U
Aroclor-1260	160	240 U
Analysis Factor:		1.5

SEDIMENT
PHASE II

(HNUS, 1992)

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Sediment Pesticide Organics Analysis (ug/kg)	6B	5B	4B	3B
Sample No.:	W-SD-01	W-SD-02	W-SD-03	W-SD-04
Lab Sample ID:	920328-03	920328-04	920328-05	920328-6
alpha-BHC	2.3 U	2	1.9 U	2.2 U
beta-BHC	2.3 U	2	1.9 U	2.2 U
delta-BHC	2.3 U	2	1.9 U	2.2 U
gamma-BHC (Lindane)	2.3 U	2	1.9 U	2.2 U
Heptachlor	2.3 U	2	1.9 U	2.2 U
Aldrin	2.3 U	2	1.9 U	2.2 U
Heptachlor epoxide	2.3 U	2	1.9 U	2.2 U
Endosulfan I	2.3 U	2	1.9 U	2.2 U
Dieldrin	4.4 U	3.8	3.7 U	4.2 U
4,4'-DDE	4.4 U	3.8	3.7 U	4.2 U
Endrin	4.4 U	3.8	3.7 U	4.2 U
Endosulfan II	4.4 U	3.8	3.7 U	4.2 U
4,4'-DDD	4.4 U	3.8	3.7 U	4.2 U
Endosulfan sulfate	4.4 U	3.8	3.7 U	4.2 U
4,4'-DDT	4.4 U	3.8	3.7 U	4.2 U
Methoxychlor	23 U	20	19 U	22 U
Endrin ketone	4.4 U	3.8	3.7 U	4.2 U
Endrin aldehyde	4.4 U	3.8	3.7 U	4.2 U
alpha-Chlordane	2.3 U	2	1.9 U	2.2 U
gamma-Chlordane	2.3 U	2	1.9 U	2.2 U
Toxaphene	230 U	200	190 U	220 U
Aroclor-1016	44 U	38	37 U	42 U
Aroclor-1221	89 U	78	74 U	86 U
Aroclor-1232	44 U	38	37 U	42 U
Aroclor-1242	44 U	38	37 U	42 U
Aroclor-1248	44 U	38	37 U	42 U
Aroclor-1254	44 U	38	37 U	42 U
Aroclor-1260	44 U	38	37 U	42 U

HNUS, 1992

SITE: WARMINSTER NAVAL BASE

Surface Water Pesticide Organics Analysis (u g/L)

Sample No.:	W-SW-01 (6B)	W-SW-02 (5B)	W-SW-03 (4B)	W-SW-04 (3B)
Lab Sample ID:	920328-08	920328-10	920328-12	920328-14
alpha-BHC	0.05 U	0.05 U	0.05 U	0.05 U
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor	0.05 U	0.05 U	0.05 U	0.05 U
Aldrin	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor epoxide	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan I	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDE	0.1 U	0.1 U	0.1 U	0.1 U
Endrin	0.1 U	0.1 U	0.1 U	0.1 U
Endosulfan II	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDD	0.1 U	0.1 U	0.1 U	0.1 U
Endosulfan sulfate	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDT	0.1 U	0.1 U	0.1 U	0.1 U
Methoxychlor	0.5 U	0.5 U	0.5 U	0.5 U
Endrin ketone	0.1 U	0.1 U	0.1 U	0.1 U
Endrin aldehyde	0.1 U	0.1 U	0.1 U	0.1 U
alpha-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U
Toxaphene	5 U	5 U	5 U	5 U
Aroclor-1016	1 U	1 U	1 U	1 U
Aroclor-1221	2 U	2 U	2 U	2 U
Aroclor-1232	1 U	1 U	1 U	1 U
Aroclor-1242	1 U	1 U	1 U	1 U
Aroclor-1248	1 U	1 U	1 U	1 U
Aroclor-1254	1 U	1 U	1 U	1 U
Aroclor-1260	1 U	1 U	1 U	1 U

SEDIMENT
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SD-C2
LABORATORY ID: 950005-02

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL		
ALPHA-BHC	1.7	0.50	2.5	UL
BETA-BHC	1.7	0.50	2.5	UL
DELTA-BHC	1.7	0.50	2.5	UL
GAMMA-BHC (LINDANE)	1.7	0.50	2.5	UL
HEPTACHLOR	1.7	0.50	2.5	UL
ALDRIN	1.7	0.50	2.5	UL
HEPTACHLOR EPOXIDE	1.7	0.50	2.5	UL
ENDOSULFAN I	1.7	0.50	2.5	UL
DIELDRIN	3.3	1.0	4.8	UL
4,4'-DDE	3.3	1.0	4.8	UL
ENDRIN	3.3	1.0	4.8	UL
ENDOSULFAN II	3.3	1.0	4.8	UL
4,4'-DDD	3.3	1.0	4.8	UL
ENDOSULFAN SULFATE	3.3	1.0	4.8	UL
4,4'-DDT	3.3	1.0	4.8	UL
METHOXYCHLOR	17	5.0	25	UL
ENDRIN KETONE	3.3	1.0	4.8	UL
ENDRIN ALDEHYDE	3.3	1.0	4.8	UL
ALPHA-CHLORDANE	1.7	0.50	2.5	UL
GAMMA-CHLORDANE	1.7	0.50	2.5	UL
TOXAPHENE	170	57	250	UL
AROCLOR-1016	33	11	48	UL
AROCLOR-1221	67	22	97	UL
AROCLOR-1232	33	11	48	UL
AROCLOR-1242	33	11	48	UL
AROCLOR-1248	33	11	48	UL
AROCLOR-1254	33	11	48	UL
AROCLOR-1260	33	11	48	UL
% SOLIDS:			69.0	
DILUTION FACTOR:			1.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TCL PESTICIDE/PCB SOILS (UG/KG)

CLIENT ID:			Young Dup		Young			
LABORATORY ID:			W-SD-C10		W-SD-C7		W-SD-C9	
			950005-27		950005-22		950005-23	
ANALYTE	CRQL	MDL						
ALPHA-BHC	1.7	0.50	2.8	U	2.8	U	2.4	U
BETA-BHC	1.7	0.50	2.8	U	2.8	U	2.4	U
DELTA-BHC	1.7	0.50	2.8	U	2.8	U	2.4	U
GAMMA-BHC (LINDANE)	1.7	0.50	2.8	U	2.8	U	2.4	U
HEPTACHLOR	1.7	0.50	2.8	U	2.8	U	2.4	U
ALDRIN	1.7	0.50	2.8	U	2.8	U	2.4	U
HEPTACHLOR EPOXIDE	1.7	0.50	2.8	U	2.8	U	2.4	U
ENDOSULFAN I	1.7	0.50	2.8	U	2.8	U	2.4	U
DIELDRIN	3.3	1.0	5.4	U	5.4	U	4.7	U
4,4'-DDE	3.3	1.0	5.4	U	5.4	U	4.7	U
ENDRIN	3.3	1.0	5.4	U	5.4	U	4.7	U
ENDOSULFAN II	3.3	1.0	5.4	U	5.4	U	4.7	U
4,4'-DDD	3.3	1.0	5.4	U	5.4	U	4.7	U
ENDOSULFAN SULFATE	3.3	1.0	5.4	U	5.4	U	4.7	U
4,4'-DDT	3.3	1.0	5.4	U	5.4	U	5.6	
METHOXYCHLOR	17	5.0	28	U	28	U	24	U
ENDRIN KETONE	3.3	1.0	5.4	U	5.4	U	4.7	U
ENDRIN ALDEHYDE	3.3	1.0	5.4	U	5.4	U	4.7	U
ALPHA-CHLORDANE	1.7	0.50	2.8	U	2.8	U	2.4	U
GAMMA-CHLORDANE	1.7	0.50	2.8	U	2.8	U	2.4	U
TOXAPHENE	170	57	280	U	280	U	240	U
AROCLOR-1016	33	11	54	U	54	U	47	U
AROCLOR-1221	67	22	110	U	110	U	96	U
AROCLOR-1232	33	11	54	U	54	U	47	U
AROCLOR-1242	33	11	54	U	54	U	47	U
AROCLOR-1248	33	11	54	U	54	U	47	U
AROCLOR-1254	33	11	61		88		47	U
AROCLOR-1260	33	11	54	U	54	U	47	U
DILUTION FACTOR:			1.0		1.0		1.0	
% SOLIDS:			61.0		61.0		69.0	

GROUNDWATER

(HNUS, 1995c)

HNUS, 1995c

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-MW-HN[redacted]S		W-RB-1222	
LABORATORY ID:			941106-20		941106-22	

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL				
ALPHA-BHC	0.05	0.01	0.05	UL	0.05	U
BETA-BHC	0.05	0.01	0.05	UL	0.05	U
DELTA-BHC	0.05	0.01	0.05	UL	0.05	U
GAMMA-BHC (LINDANE)	0.05	0.01	0.05	UL	0.05	U
HEPTACHLOR	0.05	0.01	0.05	UL	0.05	U
ALDRIN	0.05	0.01	0.05	UL	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.01	0.05	UL	0.05	U
ENDOSULFAN I	0.05	0.01	0.05	UL	0.05	U
DIELDRIN	0.1	0.02	0.10	UL	0.10	U
4,4'-DDE	0.1	0.02	0.10	UL	0.10	U
ENDRIN	0.1	0.02	0.10	UL	0.10	U
ENDOSULFAN II	0.1	0.02	0.10	UL	0.10	U
4,4'-DDD	0.1	0.02	0.10	UJ	0.10	U
ENDOSULFAN SULFATE	0.1	0.02	0.10	UL	0.10	U
4,4'-DDT	0.1	0.02	0.10	UL	0.10	U
METHOXYCHLOR	0.5	0.1	0.50	UL	0.50	U
ENDRIN KETONE	0.1	0.02	0.10	UL	0.10	U
ENDRIN ALDEHYDE	0.1	0.02	0.10	UJ	0.10	U
ALPHA-CHLORDANE	0.05	0.01	0.05	UL	0.05	U
GAMMA-CHLORDANE	0.05	0.01	0.05	UL	0.05	U
TOXAPHENE	5	1.67	5.0	UL	5.0	U
AROCLOR-1016	1	0.33	1.0	UL	1.0	U
AROCLOR-1221	2	0.67	2.0	UL	2.0	U
AROCLOR-1232	1	0.33	1.0	UL	1.0	U
AROCLOR-1242	1	0.33	1.0	UL	1.0	U
AROCLOR-1248	1	0.33	1.0	UL	1.0	U
AROCLOR-1254	1	0.33	1.0	UL	1.0	U
AROCLOR-1260	1	0.33	1.0	UL	1.0	U
DILUTION FACTOR			1.0		1.0	

TAL METALS

SURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-01		W-SS-04-02		W-SS-04-03		W-SS-04-04		W-SS-04-05	
LABORATORY ID:			950222-01		950222-04		950222-05		950222-06		950222-07	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	20	1.3	11600		11400		11800		12100		10200	
ANTIMONY	6	5	4.5	U	4.0	U	4.1	U	4.5	U	4.3	U
ARSENIC	1	0.2	4.5	L	4.0	L	3.9	L	4.7		2.2	L
BARIUM	20	0.1	45.8		116		45.5		64.8		25.6	
BERYLLIUM	0.5	0.1	0.78		0.83		0.77		0.79		0.57	
CADMIUM	0.5	0.3	0.27	UL	0.24	UL	0.25	UL	0.27	UL	0.26	UL
CALCIUM	500	10	1010		10200		1670		1170		1350	
CHROMIUM	1	0.5	20.8		17.7		15.7		17.3		16.6	
COBALT	5	0.3	6.7	L	7.0		8.6		7.6		8.2	
COPPER	2.5	0.2	10.7		18.9		12.8		11.4		53.3	
IRON	10	0.3	21000		18100		18900		18300		16200	
LEAD	0.3	0.2	9.7		30.2		15.1		15.1		5.3	
MAGNESIUM	500	10	2660		4450		2330		2040		2090	
MANGANESE	1.5	0.1	184		474		367		499		245	
MERCURY	0.1	0.05	0.05	U	0.21		0.06	U	0.05	U	0.05	U
NICKEL	4	0.9	10.1	B	15.0		10.8		9.3	B	12.3	
POTASSIUM	500	10	851		929		823		686		206	
SELENIUM	0.5	0.4	0.36	UL	0.32	UL	0.33	UL	0.36	UL	0.34	UL
SILVER	1	0.4	0.36	U	0.32	U	0.33	U	0.36	U	0.34	U
SODIUM	500	10	56.2		128		64.4		109		68.6	
THALLIUM	1	0.5	0.45	UL	0.40	UL	0.41	UL	0.45	UL	0.43	UL
VANADIUM	5	0.2	32.7		35.3		25.7		25.7		23.3	
ZINC	2	0.3	34.6		64.6		33.8		31.3		16.0	
CYANIDE	1	1	1.2	U	1.2	U	1.1	U	1.1	U	1.1	U
% SOLIDS:			79.6		85.2		81.1		82.9		80.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-20		W-SS-04-06		W-SS-04-07		W-SS-04-08		W-SS-04-09	
LABORATORY ID:			950222-08		950222-09		950222-10		950222-11		950222-12	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	20	1.3	8500		11000		9360		12000		13100	
ANTIMONY	6	5	4.5	U	5.4	U	4.7	U	5.0	U	4.2	U
ARSENIC	1	0.2	1.9	L	3.8	L	3.4	L	4.6	L	3.8	L
BARIUM	20	0.1	23.9		57.6		62.7		69.1		46.7	
BERYLLIUM	0.5	0.1	0.46		0.76		0.67		0.98		0.64	
CADMIUM	0.5	0.3	0.27	UL	0.32	UL	0.28	UL	0.30	UL	0.46	B
CALCIUM	500	10	1050		989		728		817		674	
CHROMIUM	1	0.5	15.5		14.6		18.9		21.9		22.7	
COBALT	5	0.3	7.5		5.7	L	7.5		8.9		6.9	
COPPER	2.5	0.2	43.0		17.8		10.4		12.3		51.0	
IRON	10	0.3	14200		17300		18100		23300		25000	
LEAD	0.3	0.2	5.3		20.1		9.8		11.4		21.3	
MAGNESIUM	500	10	1730		1770		2210		2580		2300	
MANGANESE	1.5	0.1	248		140		163		147		201	
MERCURY	0.1	0.05	0.05	U	0.06	U	0.05	U	0.06	U	0.06	U
NICKEL	4	0.9	10.2		10.2	B	10.9		10.5		12.0	
POTASSIUM	500	10	200		668		711		977		853	
SELENIUM	0.5	0.4	0.36	UL	0.43	UL	0.38	UL	0.40	UL	0.34	UL
SILVER	1	0.4	0.36	U	0.43	U	0.38	U	0.40	U	0.34	U
SODIUM	500	10	63.1		59.5		74.7		91.1		55.9	
THALLIUM	1	0.5	0.45	UL	0.54	UL	0.47	UL	0.50	UL	0.42	UL
VANADIUM	5	0.2	21.2		23.8		28.8		32.2		28.2	
ZINC	2	0.3	14.6		50.1		27.3		28.5		60.5	
CYANIDE	1	1	1.1	U	1.2	U	1.2	U	1.2	U	1.2	U
% SOLIDS:			88.2		75.6		80.4		83.1		81.9	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SS-04-10		W-SS-04-21		W-SS-04-11		W-SS-04-12		W-SS-04-13	
LABORATORY ID:			950222-13		950222-14		950222-15		950222-18		950222-19	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	20	1.3	12300		11400		11000		9390		10500	
ANTIMONY	6	5	4.8	U	4.5	U	4.6	U	4.3	U	4.9	U
ARSENIC	1	0.2	4.5	L	5.1		4.7		2.9	L	3.6	L
BARIUM	20	0.1	77.5		80.7		58.1		62.3		63.8	
BERYLLIUM	0.5	0.1	1.0		1.0		0.82		0.78		0.71	
CADMIUM	0.5	0.3	0.29	UL	0.27	UL	0.28	UL	0.26	UL	0.30	UL
CALCIUM	500	10	1010		3100		1080		874		1080	
CHROMIUM	1	0.5	20.1		17.7		15.9		16.6		19.2	
COBALT	5	0.3	8.6		9.5		6.4		8.6		6.5	L
COPPER	2.5	0.2	9.0		8.4		6.9		16.6		11.6	
IRON	10	0.3	22000		19600		18800		17000		21700	
LEAD	0.3	0.2	18.3		17.7		20.1		8.0		12.7	
MAGNESIUM	500	10	2230		3360		1890		2340		1750	
MANGANESE	1.5	0.1	545		794		229		291		594	
MERCURY	0.1	0.05	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
NICKEL	4	0.9	12.0		11.8		9.6	B	9.0	B	7.8	B
POTASSIUM	500	10	1040		861		617		813		539	
SELENIUM	0.5	0.4	0.38	UL	0.36	UL	0.41	J	0.34	UL	0.39	UL
SILVER	1	0.4	0.38	U	0.36	U	0.37	U	0.34	U	0.39	U
SODIUM	500	10	61.1		57.3		74.9		60.8		98.2	
THALLIUM	1	0.5	0.48	UL	0.45	UL	0.46	UL	0.43	UL	0.49	UL
VANADIUM	5	0.2	28.2		26.6		25.0		22.3		28.9	
ZINC	2	0.3	45.0		61.4		34.9		25.3		24.5	
CYANIDE	1	1	1.1	U	1.1	U	1.2	U	1.2	U	1.1	U
% SOLIDS:			82.0		82.7		81.5		84.1		82.6	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SS-04-14
LABORATORY ID: 950222-20

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL		
ALUMINUM	20	1.3	11200	
ANTIMONY	6	5	5.0	U
ARSENIC	1	0.2	3.7	L
BARIUM	20	0.1	74.1	
BERYLLIUM	0.5	0.1	1.0	
CADMIUM	0.5	0.3	0.30	UL
CALCIUM	500	10	1150	
CHROMIUM	1	0.5	20.0	
COBALT	5	0.3	9.0	
COPPER	2.5	0.2	16.6	
IRON	10	0.3	21100	
LEAD	0.3	0.2	12.9	
MAGNESIUM	500	10	2560	
MANGANESE	1.5	0.1	311	
MERCURY	0.1	0.05	0.05	U
NICKEL	4	0.9	11.1	
POTASSIUM	500	10	1230	
SELENIUM	0.5	0.4	0.40	UL
SILVER	1	0.4	0.40	U
SODIUM	500	10	83.5	
THALLIUM	1	0.5	0.50	UL
VANADIUM	5	0.2	26.9	
ZINC	2	0.3	26.9	
CYANIDE	1	1	1.1	U
% SOLIDS:			85.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0412
LABORATORY ID: 951222-30

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	13.0	13.0	U
ANTIMONY	60	50.0	50.0	U
ARSENIC	10	2.0	2.0	UL
BARIUM	200	1.0	1.7	B
BERYLLIUM	5	1.0	1.0	U
CADMIUM	5	3.0	3.0	UL
CALCIUM	5000	100	102	B
CHROMIUM	10	5.0	5.0	UL
COBALT	50	3.0	3.0	U
COPPER	25	2.0	2.0	U
IRON	100	3.0	22.2	B
LEAD	3	2.0	2.0	U
MAGNESIUM	5000	100	100	U
MANGANESE	15	1.0	1.0	U
MERCURY	0.2	0.1	0.13	U
NICKEL	40	9.0	9.0	U
POTASSIUM	5000	100	100	U
SELENIUM	5	4.0	4.0	UL
SILVER	10	4.0	6.2	K
SODIUM	5000	100	274	B
THALLIUM	10	5.0	5.0	UL
VANADIUM	50	2.0	2.0	U
ZINC	20	3.0	10.1	B
CYANIDE	10	10.0	10.0	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-BG-01		W-BG-02		W-BG-03		W-BG-04		W-BG-05	
LABORATORY ID:			950238-01		950238-02		950238-03		950238-04		950238-05	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	40	2.6	14900		14600		15000		16800		13200	
ANTIMONY	12	6.6	6.3	UR	6.4	UR	7.2	UR	7.5	UR	6.7	UR
ARSENIC	2	0.4	5.6		6.1		4.4	L	5.1		5.2	
BARIUM	40	0.2	61.8		39.8		38.1		45.0		37.2	
BERYLLIUM	1	0.2	0.88		0.64		0.72		0.76		0.69	
CADMIUM	1	0.6	0.57	U	0.58	U	0.65	U	0.68	U	0.60	U
CALCIUM	1000	0.8	877		684		508		532		603	
CHROMIUM	2	1.0	20.9		21.4		19.4		23.3		18.1	
COBALT	10	0.6	9.0		8.9		9.3		10.8		7.9	
COPPER	5	0.4	9.2	K	11.5	K	11.5	K	11.8	K	12.1	K
IRON	20	0.6	22400		23600		22000		25600		20900	
LEAD	0.6	0.4	13.2		10.0		8.2		10.3		9.6	
MAGNESIUM	1000	0.2	2380		2490		2790		3050		2500	
MANGANESE	3	0.2	352		305		310		377		217	
MERCURY	0.1	0.05	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
NICKEL	8	1.8	13.4	K	13.1	K	12.8	K	14.4	K	11.6	B
POTASSIUM	1000	12.6	816		795		963		1250		921	
SELENIUM	1	0.8	0.76	UR	0.77	UR	0.87	UR	0.90	UR	0.81	UR
SILVER	2	0.8	0.76	UR	0.77	UR	0.87	UR	0.90	UR	0.81	UR
SODIUM	1000	2.6	59.2	B	52.9	B	66.9	B	70.0	B	52.7	B
THALLIUM	2	1.0	0.95	U	0.96	U	1.1	U	1.1	UL	1.0	U
VANADIUM	10	0.4	32.3		35.8		36.3		40.1		30.4	
ZINC	4	0.6	31.5		31.9		30.8		33.8		28.8	
CYANIDE	1	1.0	1.2	U	1.2	U	1.2	U	1.2	U	1.2	U
% SOLIDS:			82.4		81.8		82.1		81.9		82.7	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-BG-06		W-BG-07		W-BG-08		W-BG-09	
LABORATORY ID:			950238-06		950238-07		950238-08		950238-09	
TAL METAL SOILS (MG/KG)										
ANALYTE	CRDL	IDL								
ALUMINUM	40	2.6	17600		17900		14000		16700	
ANTIMONY	12	6.6	6.8	UR	7.6	UR	6.4	UR	6.7	UR
ARSENIC	2	0.4	7.2		6.9		4.2	L	3.7	L
BARIUM	40	0.2	48.1		113		76.2		34.1	
BERYLLIUM	1	0.2	0.82		1.1		0.83		0.68	
CADMIUM	1	0.6	0.62	U	0.69	U	0.59	U	0.61	U
CALCIUM	1000	0.8	553		960		972		1020	
CHROMIUM	2	1.0	27.0		22.6		15.8		20.2	
COBALT	10	0.6	10.7		8.7		6.6		7.1	
COPPER	5	0.4	11.5	K	10.9	K	10.1	K	7.9	K
IRON	20	0.6	28800		21900		15300		20000	
LEAD	0.6	0.4	11.3		11.3		11.8		6.7	
MAGNESIUM	1000	0.2	3080		2670		1810		1910	
MANGANESE	3	0.2	319		573		338		132	
MERCURY	0.1	0.05	0.05	U	0.06	U	0.06	B	0.06	U
NICKEL	8	1.8	14.7	K	15.0	K	11.5	B	10.7	B
POTASSIUM	1000	12.6	1240		839		516		681	
SELENIUM	1	0.8	0.82	UR	0.93	UR	0.78	UR	0.81	UR
SILVER	2	0.8	0.82	UR	0.93	UR	0.78	UR	0.81	UR
SODIUM	1000	2.6	60.6	B	58.6	B	53.1	B	63.2	B
THALLIUM	2	1.0	1.0	UL	1.2	U	0.98	U	1.0	U
VANADIUM	10	0.4	42.8		38.0		24.5		31.6	
ZINC	4	0.6	35.3		50.2		25.6		19.6	
CYANIDE	1	1.0	1.2	U	1.2	U	1.2	U	1.2	U
% SOLIDS:			81.1		80.8		82.0		82.8	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-BG-09 A		W-BG-10	
LABORATORY ID:			950254-02		950254-03	

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL				
ALUMINUM	40	2.6	11200		13100	
ANTIMONY	12	6.6	5.4	U	5.6	U
ARSENIC	2	0.4	6.3		6.0	
BARIUM	40	0.2	37.3		77.4	
BERYLLIUM	1	0.2	0.84		1.1	
CADMIUM	1	0.6	0.49	UL	0.51	UL
CALCIUM	1000	0.8	1070		1100	
CHROMIUM	2	1.0	12.0		14.0	
COBALT	10	0.6	6.2		8.9	
COPPER	5	0.4	9.3		22.7	
IRON	20	0.6	15100		19100	
LEAD	0.6	0.4	7.7		19.0	
MAGNESIUM	1000	2.6	2580		2480	
MANGANESE	3	0.2	185		414	
MERCURY	0.1	0.09	0.06	UL	0.06	UL
NICKEL	8	1.8	8.1		9.9	
POTASSIUM	1000	12.6	766		1060	
SELENIUM	1	0.8	0.65	U	0.68	U
SILVER	2	0.8	0.65	UL	0.68	UL
SODIUM	1000	2.6	57.9	B	64.7	B
THALLIUM	2	1.0	0.81	U	0.86	U
VANADIUM	10	0.4	18.1		21.3	
ZINC	4	0.6	20.2		33.0	
CYANIDE	1	1.0	1.1	U	1.1	U
% SOLIDS:			84.7		84.1	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0414
LABORATORY ID: 950238-10

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	13.0	16.6	B
ANTIMONY	60	33.0	33.0	UJ
ARSENIC	10	2.0	2.0	UL
BARIUM	200	1.0	1.0	U
BERYLLIUM	5	1.0	1.0	U
CADMIUM	5	3.0	3.0	U
CALCIUM	5000	4.0	116	B
CHROMIUM	10	5.0	5.0	U
COBALT	50	3.0	3.0	U
COPPER	25	2.0	2.0	U
IRON	100	3.0	17.6	B
LEAD	3	2.0	2.0	UL
MAGNESIUM	5000	1.0	14.5	B
MANGANESE	15	1.0	1.0	U
MERCURY	0.2	0.1	0.11	U
NICKEL	40	9.0	9.0	U
POTASSIUM	5000	63.0	108	B
SELENIUM	5	4.0	4.0	UJ
SILVER	10	4.0	4.0	UR
SODIUM	5000	13.0	233	B
THALLIUM	10	5.0	5.0	U
VANADIUM	50	2.0	2.0	U
ZINC	20	3.0	3.8	B
CYANIDE	10	10.0	10.0	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0421
LABORATORY ID: 950254-11

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	13	60.9	B
ANTIMONY	60	33	37.3	B
ARSENIC	10	2	2.0	U
BARIUM	200	1	2.3	B
BERYLLIUM	5	1	1.0	U
CADMIUM	5	3	3.0	U
CALCIUM	5000	4	94.8	B
CHROMIUM	10	5	5.0	U
COBALT	50	3	3.0	U
COPPER	25	2	2.5	B
IRON	100	3	38.8	B
LEAD	3	2	2.0	U
MAGNESIUM	5000	13	46.3	B
MANGANESE	15	1	2.2	B
MERCURY	0.2	0.1	0.13	U
NICKEL	40	9	9.0	U
POTASSIUM	5000	63	161	B
SELENIUM	5	4	4.0	U
SILVER	10	4	4.0	U
SODIUM	5000	13	305	B
THALLIUM	10	5	5.0	U
VANADIUM	50	2	2.4	B
ZINC	20	3	3.0	U
CYANIDE	10	10	10.0	U

SUBSURFACE SOIL
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-01		W-SB-04-02		W-SB-04-03		W-SB-04-04		W-SB-04-05	
LABORATORY ID:			950237-02		950237-03		950237-06		950237-07		950237-10	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	20	1.3	9960		11100		9770		7940		12100	
ANTIMONY	6	3.3	2.9	U	3.0	U	2.8	U	3.3	U	2.9	U
ARSENIC	1	0.2	3.2		2.8	L	3.0	L	2.5	L	3.8	L
BARIUM	20	0.1	113		99.1		72.7		60.9		72.5	
BERYLLIUM	0.5	0.1	1.3		1.2		0.78		0.69		0.84	
CADMIUM	0.5	0.3	0.71	B	1.4	B	0.38	B	1.1	B	0.26	U
CALCIUM	500	0.4	1090		1910		797		716		855	
CHROMIUM	1	0.5	17.6		20.5		17.1		15.6		19.9	
COBALT	5	0.3	8.1		9.4		7.4		6.7		7.6	
COPPER	2.5	0.2	7.6		10.4		15.5		11.5		12.9	
IRON	10	0.3	13600		16300		16600		17000		19200	
LEAD	0.3	0.2	31.2		85.7		22.0		25.5		11.1	
MAGNESIUM	500	1.3	2350		3700		2080		1610		1990	
MANGANESE	1.5	0.1	148		261		231		326		415	
MERCURY	0.1	0.05	0.06	B	0.05	UL	0.06	UL	0.06	UL	0.06	UL
NICKEL	4	0.9	11.7		13.0		11.0		9.3		9.5	
POTASSIUM	500	6.3	1170		1670		770		705		702	
SELENIUM	0.5	0.4	0.36	U	0.36	U	0.35	U	0.47	K	0.35	U
SILVER	1	0.4	0.36	UL	0.36	UL	0.35	UL	0.54	L	0.35	UL
SODIUM	500	1.3	75.1	B	93.7	B	79.8	B	88.2	B	85.7	B
THALLIUM	1	0.5	0.45	U	0.45	U	0.43	U	0.50	U	0.44	U
VANADIUM	5	0.2	20.1		20.9		25.3		19.9		28.5	
ZINC	2	0.3	54.8		71.0		44.3		68.6		31.6	
CYANIDE	1	1.0	1.4	U	1.3	U	1.4	U	1.6	U	1.2	U
% SOLIDS:			69.2		74.5		72.0		62.6		81.9	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-06		W-SB-04-30		W-SB-04-31	
LABORATORY ID:			950237-11		950237-12		950237-13	

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL						
ALUMINUM	20	1.3	6740		8390		9880	
ANTIMONY	6	3.3	2.6	U	2.8	U	2.7	U
ARSENIC	1	0.2	1.8		2.4	L	3.8	L
BARIUM	20	0.1	57.0		69.9		71.9	
BERYLLIUM	0.5	0.1	0.36		0.54		0.75	
CADMIUM	0.5	0.3	0.24	U	0.25	U	0.75	B
CALCIUM	500	0.4	472		816		1720	
CHROMIUM	1	0.5	17.0		17.5		19.4	
COBALT	5	0.3	4.4		6.0		7.6	
COPPER	2.5	0.2	7.9		9.7		19.5	
IRON	10	0.3	9250		12900		21300	
LEAD	0.3	0.2	5.8		6.7		21.0	
MAGNESIUM	500	1.3	1620		2260		2320	
MANGANESE	1.5	0.1	91.8		184		937	
MERCURY	0.1	0.05	0.06	UL	0.50	B	0.05	UL
NICKEL	4	0.9	5.8	K	9.4		20.1	
POTASSIUM	500	6.3	431		587		621	
SELENIUM	0.5	0.4	0.32	U	0.34	U	0.33	U
SILVER	1	0.4	0.32	UL	0.34	UL	0.33	UL
SODIUM	500	1.3	61.6	B	71.6	B	89.9	B
THALLIUM	1	0.5	0.40	U	0.42	U	0.41	U
VANADIUM	5	0.2	20.8		25.4		27.4	
ZINC	2	0.3	18.1		24.4		54.5	
CYANIDE	1	1.0	1.2	U	1.2	U	1.2	U
% SOLIDS:			81.4		79.8		81.1	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-07		W-SB-04-08		W-SB-04-09		W-SB-04-10	
LABORATORY ID:			950255-02		950255-03		950255-04		950255-05	
TAL METAL SOILS (MG/KG)										
ANALYTE	CRDL	IDL								
ALUMINUM	200	13	15300		7030		10100		8580	
ANTIMONY	60	50	6.4	U	8.5	U	6.1	U	6.3	U
ARSENIC	10	2	3.5		5.2		3.1		2.8	
BARIUM	200	9	52.9		77.7		660		75.7	
BERYLLIUM	5	0.1	0.63	B	0.72	B	1.3		0.96	
CADMIUM	5	3	0.58	U	0.78	U	0.77	B	0.57	U
CALCIUM	5000	100	433	B	851	B	1370		1250	
CHROMIUM	10	5	22.7		21.4		16.5		12.6	
COBALT	50	9	5.7	B	8.1	B	9.4		7.3	B
COPPER	25	6	8.4		21.0		21.8		44.9	
CYANIDE	10	10	1.1	U	1.6	U	1.2	U	1.1	U
IRON	100	3	16700		10700		19100		13700	
LEAD	3	2	10.4		28.3		11.3		7.4	
MAGNESIUM	5000	100	2050		1970		2540		2680	
MANGANESE	15	5	81.4		107		539		363	
MERCURY	0.2	0.1	0.06	U	1.3		0.05	U	0.05	U
NICKEL	40	9	8.1		21.1		12.7		9.5	
POTASSIUM	5000	100	650	B	594	B	965		1160	
SELENIUM	5	4	0.77	U	1.0	U	0.73	U	0.76	U
SILVER	10	5	0.77	U	2.6	B	0.73	U	0.76	U
SODIUM	5000	100	62.9	B	77.5	B	119	B	125	B
THALLIUM	10	5	0.96	U	1.3	U	0.92	U	0.96	U
VANADIUM	50	5	35.8		16.9		24.3		20.1	
ZINC	20	5	52.6		80.7		336		30.5	
% SOLIDS:			78.7		59.0		80.2		83.0	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-11		W-SB-04-12		W-SB-04-13		W-SB-04-14		W-SB-04-15	
LABORATORY ID:			950261-02		950261-03		950261-04		950261-05		950261-06	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	40	2.6	7770	J	8940	J	10600	J	9960	J	11400	J
ANTIMONY	12	6.6	6.3	UL	5.9	UL	5.9	UL	6.1	UL	5.2	UL
ARSENIC	2	0.4	4.4		4.3		1.9		2.6		3.3	
BARIUM	40	0.2	101	J	106	J	31.6	J	48.1	J	48.6	J
BERYLLIUM	1	0.2	1.8	K	1.8	K	0.59	K	0.70	K	0.87	K
CADMIUM	1	0.6	0.57	UL	0.54	UL	0.53	UL	0.56	UL	0.47	UL
CALCIUM	1000	0.8	1460		1470		1190		1830		2050	
CHROMIUM	2	1.0	23.3		21.3		15.8		11.3		13.8	
COBALT	10	0.6	6.4	B	8.5		5.0	B	10.5		8.1	
COPPER	5	0.4	11.0	K	13.4		54.5		61.5		26.8	
IRON	20	0.6	20100		19100		13000		11600		15400	
LEAD	0.6	0.4	7.6	J	7.3	J	6.1	J	5.1	J	17.8	J
MAGNESIUM	1000	2.6	2600		2810		2040		2370		1980	
MANGANESE	3	0.2	192		326		135		433		455	
MERCURY	0.1	0.05	0.06	U	0.05	U	0.06	U	0.06	U	0.09	
NICKEL	8	1.8	11.3	B	12.5	B	10.1	B	10.3	B	12.1	B
POTASSIUM	1000	12.6	530		727		287		219		655	
SELENIUM	1	0.8	0.76	UJ	0.72	UJ	0.71	UJ	0.74	UJ	0.63	UJ
SILVER	2	0.8	0.76	UR	0.72	UR	0.71	UR	0.74	UR	0.63	UR
SODIUM	1000	2.6	96.4	B	89.9	B	81.1	B	87.3	B	68.4	B
THALLIUM	2	1.0	0.95	UL	0.89	UL	0.89	UL	0.93	UL	0.78	UL
VANADIUM	10	0.4	33.8	J	30.2	J	30.9	J	18.8	J	29.1	J
ZINC	4	0.6	26.1		29.8		18.3		16.3		33.3	
CYANIDE	1	1.0	1.1	U	1.2	U	1.2	U	1.1	U	1.1	U
% SOLIDS:			83.1		81.6		81.3		81.5		91.2	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-16		W-SB-04-17		W-SB-04-18	
LABORATORY ID:			950261-07		950261-08		950261-09	

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL						
ALUMINUM	40	2.6	13800	J	13500	J	14500	J
ANTIMONY	12	6.6	6.6	UL	5.9	UL	6.0	UL
ARSENIC	2	0.4	3.3		4.9		5.1	
BARIUM	40	0.2	56.3	J	64.3	J	58.2	J
BERYLLIUM	1	0.2	0.99	K	1.1	K	1.0	K
CADMIUM	1	0.6	0.60	UL	0.54	UL	0.54	UL
CALCIUM	1000	0.8	2440		788		684	
CHROMIUM	2	1.0	15.4		17.1		19.5	
COBALT	10	0.6	13.6		8.4		9.4	
COPPER	5	0.4	35.8		8.5	K	9.2	K
IRON	20	0.6	18800		19800		21900	
LEAD	0.6	0.4	22.7	J	13.2	J	12.4	J
MAGNESIUM	1000	2.6	2280		1890		2070	
MANGANESE	3	0.2	676		487		411	
MERCURY	0.1	0.05	0.06		0.06	U	0.06	U
NICKEL	8	1.8	11.5	B	8.7	B	9.5	B
POTASSIUM	1000	12.6	851		608		693	
SELENIUM	1	0.8	0.81	UJ	0.72	UJ	0.72	UJ
SILVER	2	0.8	0.81	UR	0.72	UR	0.72	UR
SODIUM	1000	2.6	82.9	B	54.8	B	54.9	B
THALLIUM	2	1.0	1.0	UL	0.90	UL	0.90	UL
VANADIUM	10	0.4	33.0	J	30.7	J	33.1	J
ZINC	4	0.6	35.3		30.1		29.7	
CYANIDE	1	1.0	1.1	U	1.1	U	1.2	U
% SOLIDS:			78.8		81.7		81.4	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-19		W-SB-04-20		W-SB-04-21		W-SB-04-22		W-SB-04-23	
LABORATORY ID:			950266-02		950266-03		950266-04		950266-05		950266-06	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	40	2.6	12000		14300		8790		7370		10200	
ANTIMONY	12	6.6	5.9	U	5.9	U	5.6	U	5.9	U	6.3	U
ARSENIC	2	0.4	6.1		6.0		3.9		3.2		3.9	
BARIUM	40	0.2	34.6		42.0		67.7		51.0		71.3	
BERYLLIUM	1	0.2	0.67	K	0.75	K	0.94	K	0.67	K	0.79	K
CADMIUM	1	0.6	0.54	UL	0.54	UL	0.51	UL	0.54	UL	4.2	
CALCIUM	1000	0.8	240		315		828		745		1510	
CHROMIUM	2	1.0	23.0		23.5		25.0		13.2		19.1	
COBALT	10	0.6	7.6		9.4		3.9		6.5		6.5	
COPPER	5	0.4	12.0		10.7		12.7		16.6		13.2	
IRON	20	0.6	23700		25800		17300		13300		16700	
LEAD	0.6	0.4	9.0		11.9		6.4		5.3		19.2	
MAGNESIUM	1000	2.6	2250		2380		2380		1750		2040	
MANGANESE	3	0.2	335		343		116		370		318	
MERCURY	0.1	0.05	0.06	U	0.05	U	0.05	U	0.06	U	0.06	U
NICKEL	8	1.8	9.7	B	12.1	B	9.0	B	7.2	B	9.0	B
POTASSIUM	1000	12.6	728		855		494		396		451	
SELENIUM	1	0.8	0.72	UL	0.72	UL	0.68	UL	0.72	UL	0.77	UL
SILVER	2	0.8	0.72	U	0.72	UL	0.68	U	0.72	U	0.77	U
SODIUM	1000	2.6	76.5	B	57.1	B	80.3	B	74.8	B	95.6	B
THALLIUM	2	1.0	0.90	UL	0.90	UL	0.85	UL	0.90	UL	0.96	UL
VANADIUM	10	0.4	35.1		37.9		29.6		22.6		30.9	
ZINC	4	0.6	24.8		30.0		23.7		15.1		51.6	
CYANIDE	1	1.0	1.2	U	1.2	U	1.1	U	1.2	U	1.2	U
% SOLIDS:			82.6		81.4		83.9		82.0		77.4	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SB-04-24		W-SB-04-32	
LABORATORY ID:			950266-07		950266-08	

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL				
ALUMINUM	40	2.6	11900		10100	
ANTIMONY	12	6.6	6.3	U	6.0	U
ARSENIC	2	0.4	5.3		4.4	
BARIUM	40	0.2	65.6		62.7	
BERYLLIUM	1	0.2	0.84	K	0.73	K
CADMIUM	1	0.6	0.57	UL	0.55	UL
CALCIUM	1000	0.8	1100		1190	
CHROMIUM	2	1.0	21.3		18.3	
COBALT	10	0.6	7.2		6.3	
COPPER	5	0.4	9.5		8.3	
IRON	20	0.6	21300		20200	
LEAD	0.6	0.4	15.6		14.6	
MAGNESIUM	1000	2.6	2090		1780	
MANGANESE	3	0.2	336		348	
MERCURY	0.1	0.05	0.06	U	0.06	U
NICKEL	8	1.8	10.3	B	8.6	B
POTASSIUM	1000	12.6	592		433	
SELENIUM	1	0.8	0.76	UL	0.73	UL
SILVER	2	0.8	0.76	U	0.73	U
SODIUM	1000	2.6	104	B	88.9	B
THALLIUM	2	1.0	0.95	UL	0.91	UL
VANADIUM	10	0.4	33.9		29.5	
ZINC	4	0.6	33.6		29.0	
CYANIDE	1	1.0	1.2	U	1.1	U
% SOLIDS:			80.9		80.9	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-RB-0425
LABORATORY ID: 950266-10

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	13	13.0	U
ANTIMONY	60	33	33.0	U
ARSENIC	10	2	2.0	U
BARIUM	200	1	1.5	B
BERYLLIUM	5	1	1.0	U
CADMIUM	5	3	3.0	UL
CALCIUM	5000	4	106	B
CHROMIUM	10	5	5.0	U
COBALT	50	3	3.0	U
COPPER	25	2	2.0	U
IRON	100	3	19.7	B
LEAD	3	2	2.0	U
MAGNESIUM	5000	13	13.0	U
MANGANESE	15	1	1.4	B
MERCURY	0.2	0.1	0.10	U
NICKEL	40	9	9.0	U
POTASSIUM	5000	63	91.8	
SELENIUM	5	4	4.0	UL
SILVER	10	4	4.0	U
SODIUM	5000	13	240	B
THALLIUM	10	5	5.0	UL
VANADIUM	50	2	2.0	U
ZINC	20	3	5.0	B
CYANIDE	10	10	10.0	U

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0417		W-FB-0419	
LABORATORY ID:			950237-08		950237-14	

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL				
ALUMINUM	200	13.0	13.0	U	13.0	U
ANTIMONY	60	33.0	33.0	U	33.0	U
ARSENIC	10	2.0	2.0	U	10.6	
BARIUM	200	1.0	1.0	U	136	
BERYLLIUM	5	1.0	1.0	U	1.0	U
CADMIUM	5	3.0	3.0	U	3.0	U
CALCIUM	5000	4.0	45.1	B	22000	
CHROMIUM	10	5.0	5.0	UR	5.0	UR
COBALT	50	3.0	3.0	U	3.0	U
COPPER	25	2.0	2.0	U	6.1	
CYANIDE	10	10.0	10.0	U	10.0	U
IRON	100	3.0	3.0	U	362	
LEAD	3	2.0	2.0	U	2.0	U
MAGNESIUM	5000	13.0	13.0	U	12100	
MANGANESE	15	1.0	1.1	K	44.4	
MERCURY	0.2	0.1	0.28	L	0.13	UL
NICKEL	40	9.0	9.0	U	9.0	U
POTASSIUM	5000	63.0	63.0	U	991	
SELENIUM	5	4.0	4.0	U	4.0	U
SILVER	10	4.0	4.0	UR	4.0	UR
SODIUM	5000	13.0	208	B	18400	
THALLIUM	10	5.0	5.0	U	5.0	U
VANADIUM	50	2.0	2.0	U	2.0	U
ZINC	20	3.0	3.0	UL	83.3	

SURFACE WATER
PHASE I

(SMC Martin, 1991)

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

AQUEOUS TAL METALS ANALYSES (mg/L)

CLIENT ID:			3A	5A	6A
LAB ID:			3-S. WATER	5-S. WATER	6-S. WATER
			8800	8803	8805
CHEMICAL	CRDL	IDL			
Aluminum	200	1.0	1.0 U	1.0 U	1.0 U
Antimony	60	0.01	0.01 U	0.01 U	0.01 U
Arsenic	10	0.002	0.002 U	0.002 U	0.002 U
Barium	200	0.50	0.50 U	0.50 U	0.50 U
Beryllium	5	0.0005	0.0005 U	0.0010 B	0.0005 U
Cadmium	5	0.002	0.004	0.002	0.002 U
Calcium	5000	0.50	17 B	21 B	26 B
Chromium	10	0.002	0.003 B	0.003 B	0.003 B
Cobalt	50	0.002	0.002 U	0.002 U	0.002 U
Copper	25	0.025	0.025 U	0.025 U	0.025 U
Iron	100	0.10	0.32 B	0.27 B	0.32 B
Lead	3	0.002	0.002 U	0.002 U	0.002 B
Magnesium	5000	0.50	8 B	9 B	14 B
Manganese	15	0.10	0.10 U	0.10	0.10 U
Mercury	0.2	0.0002	0.0002 U	0.0002 U	0.0002 U
Nickel	40	0.01	0.01 U	0.01 U	0.01 U
Potassium	5000	0.50	2.0 B	1.2 B	1.3 B
Selenium	5	0.002	0.002 U	0.002 U	0.002 U
Silver	10	0.002	0.002 U	0.002 U	0.002 U
Sodium	5000	0.50	8.4 B	13 B	9.5 B
Thallium	10	0.002	0.002 U	0.002 U	0.002 U
Vanadium	50	0.01	0.01 U	0.01 U	0.01 U
Zinc	20	0.02	0.02 U	0.02 U	0.02 B

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

AQUEOUS TAL METALS ANALYSES (mg/L)

CLIENT ID:			NADC - RINS. BLANK-59	RINS. BLANK-65	RINS. BLANK-72
LAB ID:			9156	9236	9270
CHEMICAL	CRDL	IDL			
Aluminum	200	1.0	1.0 U	1.0 U	1.0 U
Antimony	60	0.01	0.01 U	0.01 U	0.01 U
Arsenic	10	0.002	0.002 U	0.002 U	0.002 U
Barium	200	0.50	0.50 U	0.50 U	0.60
Beryllium	5	0.0005	0.0005 U	0.0005 U	0.0005 U
Cadmium	5	0.002	0.002 U	0.002 U	0.002 U
Calcium	5000	0.50	0.50 U	0.50 U	0.50 U
Chromium	10	0.002	0.002 U	0.002 U	0.002 U
Cobalt	50	0.002	0.002 U	0.002 U	0.002 U
Copper	25	0.025	0.025 U	0.025 U	0.025 U
Iron	100	0.10	0.10 U	0.10 U	0.10 U
Lead	3	0.002	0.002 U	0.002 U	0.002 U
Magnesium	5000	0.50	0.50 U	0.50 U	0.50 U
Manganese	15	0.10	0.10 U	0.10 U	0.10 U
Mercury	0.2	0.0002	0.0002 U	0.0002 U	0.0002 U
Nickel	40	0.01	0.01 U	0.01 U	0.01 U
Potassium	5000	0.50	0.9	0.50 U	0.50 U
Selenium	5	0.002	0.002 U	0.002 U	0.002 U
Silver	10	0.002	0.002 U	0.002 U	0.002 U
Sodium	5000	0.50	0.50 U	0.50 U	0.50 U
Thallium	10	0.002	0.002 U	0.002 U	0.002 U
Vanadium	50	0.01	0.01 U	0.01 U	0.01 U
Zinc	20	0.02	0.02 U	0.02 U	0.02 U

SURFACE WATER
PHASE II

(HNUS, 1992)

HNUS, 1992

DATE: 09/28/92
PAGE: 26

	6B	5B	4B	3B
SAMPLE ID NUMBER:	TWSW01	TWSW02	TWSW03	TWSW04
SAMPLE TYPE:	TOTAL	TOTAL	TOTAL	TOTAL
UNITS:	ug/L	ug/L	ug/L	ug/L
COMPOUND				
ALUMINUM	196.00 B	189.00 B	165.00 B	501.00 B
ANTIMONY	49.00 U	49.00 U	49.00 U	49.00 U
ARSENIC	3.00 UL(n)	3.00 UL(n)	3.00 UL(n)	3.00 UL(n)
BARIUM	43.00	39.00	93.00	60.00
BERYLLIUM	3.00 B	3.00 B	3.00 B	3.00 B
CADMIUM	3.00 U	3.00 B	3.00 U	3.00 U
CALCIUM	8590.00	13300.00	42800.00	15900.00
CHROMIUM	5.00 U	5.00 U	5.00 U	5.00 U
COBALT	6.00 U	6.00 U	6.00 B	6.00 U
COPPER	4.00 U	4.00 B	5.00 B	4.00 U
CYANIDE	10.00 U	10.00 U	10.00 U	10.00 U
IRON	293.00	239.00	186.00	630.00
LEAD	1.60 B	1.40 B	1.00 B	1.40 B
MAGNESIUM	4150.00	6150.00	13700.00	6590.00
MANGANESE	25.00	36.00	(159.00)	83.00
MERCURY	0.20 U	0.20 U	0.20 U	0.20 U
NICKEL	17.00 U	17.00 U	18.00 B	17.00 U
POTASSIUM	1570.00	1290.00	2150.00	1700.00
SELENIUM	5.00 U	5.00 U	5.00 U	5.00 U
SILVER	10.00 U	10.00 U	10.00 U	10.00 U
SODIUM	7050.00	7320.00	42900.00	9960.00
THALLIUM	2.00 U	2.00 U	2.00 U	2.00 U
VANADIUM	9.00 B	5.00 U	6.00 B	8.00 B
ZINC	5.00 B	9.00 B	23.00 B	24.00 B

HWUS, 1992

SAMPLE ID NUMBER:	6B	5B	4B	3B
SAMPLE TYPE:	DWSWF01	DWSWF02	DWSWF03	DWSWF04
UNITS:	DISSO	DISSO	DISSO	DISSO
	ug/L	ug/L	ug/L	ug/L
COMPOUND				
ALUMINUM	146.00 B	114.00 B	71.00 B	108.00 B
ANTIMONY	49.00 U	49.00 U	49.00 U	49.00 U
ARSENIC	3.00 UL(n)	3.00 UL(n)	3.00 UL(n)	3.00 UL(n)
BARIUM	50.00	38.00	122.00	53.00
BERYLLIUM	3.00 B	3.00 B	4.00 B	3.00 B
CADMIUM	3.00 B	3.00 B	4.00 B	3.00 U
CALCIUM	9860.00	13200.00	48100.00	15200.00
CHROMIUM	5.00 U	5.00 U	5.00 U	5.00 U
COBALT	6.00 U	7.00 B	6.00 U	6.00 U
COPPER	4.00 U	4.00 U	4.00 B	4.00 U
CYANIDE				
IRON	93.00 B	177.00	44.00 B	84.00 B
LEAD	1.00 UL(p)	1.00 UL(p)	1.00 U	1.00 UL(p)
MAGNESIUM	4610.00	6170.00	15900.00	6320.00
MANGANESE	25.00	34.00	162.00	73.00
MERCURY	0.20 U	0.20 U	0.20 U	0.20 U
NICKEL	17.00 U	17.00 U	17.00 B	17.00 U
POTASSIUM	1690.00	1280.00	2320.00	1290.00
SELENIUM	5.00 U	5.00 U	5.00 U	5.00 U
SILVER	10.00 U	10.00 U	10.00 U	10.00 U
SODIUM	7810.00	7200.00	45600.00	9530.00
THALLIUM	2.00 U	2.00 U	2.00 U	2.00 U
VANADIUM	9.00 B	7.00 B	5.00 U	5.00 B
ZINC	4.00 B	5.00 B	16.00 B	4.00 U

SURFACE WATER
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			Young Duplicate	
LABORATORY ID:			W-SW-C10	
			952005-26	

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	14	93.0	B
ANTIMONY	60	32	32.0	UL
ARSENIC	10	2	2.0	U
BARIUM	200	1	66.3	B
BERYLLIUM	5	1	1.0	UL
CADMIUM	5	3	3.0	U
CALCIUM	5000	4	19200	
CHROMIUM	10	5	5.0	U
COBALT	50	3	3.0	UL
COPPER	25	2	4.1	B
IRON	100	7	232	B
LEAD	3	1	1.0	U
MAGNESIUM	5000	22	6440	
MANGANESE	15	1	32.1	
MERCURY	0.2	0.1	0.13	UJ
NICKEL	40	7	7.0	UL
POTASSIUM	5000	69	1390	
SELENIUM	5	2	2.0	UJ
SILVER	10	4	4.0	UL
SODIUM	5000	18	10400	
THALLIUM	10	3	4.2	B
VANADIUM	50	1	1.0	UL
ZINC	20	3	26.5	L

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

Young Duplicate

CLIENT ID: W-SW-C10
LABORATORY ID: 953005-26

TAL METAL WATERS, DISSOLVED (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	14	14.0	U
ANTIMONY	60	32	32.0	UL
ARSENIC	10	2	2.0	U
BARIUM	200	1	62.5	
BERYLLIUM	5	1	1.0	UL
CADMIUM	5	3	3.0	U
CALCIUM	5000	4	19600	
CHROMIUM	10	5	5.0	U
COBALT	50	3	3.0	UL
COPPER	25	2	4.8	L
IRON	100	7	72.9	B
LEAD	3	1	1.0	U
MAGNESIUM	5000	22	6410	
MANGANESE	15	1	29.8	
MERCURY	0.2	0.1	0.13	U
NICKEL	40	7	7.0	UL
POTASSIUM	5000	69	1440	
SELENIUM	5	2	2.0	U
SILVER	10	4	4.0	UL
SODIUM	5000	18	10300	
THALLIUM	10	3	4.2	B
VANADIUM	50	1	1.0	UL
ZINC	20	3	21.5	B

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-RB-0103		W-SW-C1	
LABORATORY ID:			950005-08		950005-03	

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL				
ALUMINUM	200	14	37.0	B	458	B
ANTIMONY	60	32	32.0	UL	32.0	UL
ARSENIC	10	2	2.0	U	2.0	U
BARIUM	200	1	1.0	U	65.2	B
BERYLLIUM	5	1	1.0	UL	1.0	UL
CADMIUM	5	3	3.0	U	3.0	U
CALCIUM	5000	4	134	B	10400	
CHROMIUM	10	5	5.0	U	5.0	U
COBALT	50	3	3.0	UL	3.0	UL
COPPER	25	2	2.0	UL	3.1	B
IRON	100	7	66.7	B	794	
LEAD	3	1	1.0	U	1.1	K
MAGNESIUM	5000	22	22.0	U	4070	
MANGANESE	15	1	1.0	UL	74.4	
MERCURY	0.2	0.1	0.13	UL	0.13	UL
NICKEL	40	7	7.0	UL	7.0	UL
POTASSIUM	5000	69	69.0	U	795	
SELENIUM	5	2	2.0	UJ	2.0	UJ
SILVER	10	4	4.0	UL	4.0	UL
SODIUM	5000	18	397	B	7810	
THALLIUM	10	3	3.0	UL	3.0	UL
VANADIUM	50	1	1.0	UL	1.4	B
ZINC	20	3	3.0	UL	17.2	B

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TAL METAL WATERS (UG/L)

CLIENT ID:			W-SW-C2		W-SW-C4		W-SW-C5		Young W-SW-C7		W-SW-C8	
LABORATORY ID:			950005-01		950005-12		950005-06		950005-14		950005-13	
ANALYTE	CRDL	IDL										
ALUMINUM	200	14	500	B	2360		2090		62.8	B	62.1	B
ANTIMONY	60	32	35.8	B	32.0	UL	32.0	UL	32.0	UL	32.0	UL
ARSENIC	10	2	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
BARIUM	200	1	80.7		62.9	B	81.1		64.4	B	60.6	B
BERYLLIUM	5	1	1.0	UL	1.0	UL	1.0	UL	1.0	UL	1.0	UL
CADMIUM	5	3	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
CALCIUM	5000	4	10800		20200		19300		19000		18300	
CHROMIUM	10	5	5.0	U	5.8	K	5.0	U	5.0	U	5.0	U
COBALT	50	3	3.0	UL	3.0	UL	3.7	B	3.0	UL	3.0	UL
COPPER	25	2	3.2	B	6.9	B	15.5	L	3.6	B	2.0	UL
IRON	100	7	1300		2960		4900		165	B	110	B
LEAD	3	1	3.2	K	9.5		22.7		1.0	U	1.0	U
MAGNESIUM	5000	22	4220		11200		11500		6180		7240	
MANGANESE	15	1	65.3		130		364		25.6	L	22.3	B
MERCURY	0.2	0.1	0.27	L	0.13	UL	0.14	UL	0.14	UL	0.13	UL
NICKEL	40	7	7.2	L	7.6	L	7.0	UL	7.0	UL	7.0	UL
POTASSIUM	5000	69	763		1220		3410		1270		1130	
SELENIUM	5	2	2.0	UJ	2.0	UJ	2.0	UJ	2.0	UJ	2.0	UJ
SILVER	10	4	4.0	UL	4.0	UL	4.0	UL	4.0	UL	4.0	UL
SODIUM	5000	18	8090		7430		7520		9700		8980	
THALLIUM	10	3	6.4	B	3.0	UL	3.0	UL	3.0	UL	4.2	B
VANADIUM	50	1	3.4	B	4.3	B	10.1	B	1.0	UL	1.0	UL
ZINC	20	3	11.6	B	42.8		49.6		23.6	L	3.8	B

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SW-C9
LABORATORY ID: 950005-15

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	14	570	B
ANTIMONY	60	32	32.0	UL
ARSENIC	10	2	2.0	U
BARIUM	200	1	88.0	
BERYLLIUM	5	1	1.0	UL
CADMIUM	5	3	3.0	U
CALCIUM	5000	4	20100	
CHROMIUM	10	5	5.0	U
COBALT	50	3	3.0	UL
COPPER	25	2	2.4	B
IRON	100	7	983	
LEAD	3	1	2.5	K
MAGNESIUM	5000	22	8410	
MANGANESE	15	1	109	
MERCURY	0.2	0.1	0.14	UL
NICKEL	40	7	7.0	UL
POTASSIUM	5000	69	1240	
SELENIUM	5	2	2.0	UJ
SILVER	10	4	4.0	UL
SODIUM	5000	18	9490	
THALLIUM	10	3	3.0	UL
VANADIUM	50	1	1.0	B
ZINC	20	3	27.0	L

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SW-C1		W-SW-C2	
LABORATORY ID:			951005-03		951005-01	

DISSOLVED METAL WATERS (UG/L)

ANALYTE	CRDL	IDL				
ALUMINUM	200	14	14.0	U	16.4	B
ANTIMONY	60	32	32.0	UL	32.0	UL
ARSENIC	10	2	2.0	U	2.0	U
BARIUM	200	1	52.1		55.1	
BERYLLIUM	5	1	1.0	UL	1.0	UL
CADMIUM	5	3	3.0	U	3.0	U
CALCIUM	5000	4	9220		9820	
CHROMIUM	10	5	5.0	U	5.0	U
COBALT	50	3	3.0	UL	3.0	UL
COPPER	25	2	15.4	L	16.6	L
IRON	100	7	83.3	B	61.3	B
LEAD	3	1	1.0	U	1.0	U
MAGNESIUM	5000	22	3770		3980	
MANGANESE	15	1	28.5	L	43.6	
MERCURY	0.2	0.1	0.14	UL	0.14	UL
NICKEL	40	7	7.0	UL	7.0	UL
POTASSIUM	5000	69	663		748	
SELENIUM	5	2	2.0	U	2.0	U
SILVER	10	4	4.0	UL	4.0	UL
SODIUM	5000	18	7470		7830	
THALLIUM	10	3	5.2	B	7.4	B
VANADIUM	50	1	1.0	UL	1.0	UL
ZINC	20	3	16.0	B	12.1	B

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SW-C4		W-SW-C5		Young W-SW-C7		W-SW-C8		W-SW-C9	
LABORATORY ID:			951005-12		951005-06		951005-14		951005-13		951005-15	
DISSOLVED METAL WATERS (UG/L)												
ANALYTE	CRDL	IDL										
ALUMINUM	200	14	14.0	U	135	B	14.8	B	20.5	B	14.0	U
ANTIMONY	60	32	32.0	UL	32.0	UL	32.0	UL	32.0	UL	32.0	UL
ARSENIC	10	2	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
BARIUM	200	1	39.3	B	35.9	B	56.1		59.4		59.8	
BERYLLIUM	5	1	1.0	UL	1.0	UL	1.0	UL	1.0	UL	1.0	UL
CADMIUM	5	3	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
CALCIUM	5000	4	18900		18800		18100		19100		16900	
CHROMIUM	10	5	5.0	U	5.2	B	5.0	B	5.5	B	5.0	U
COBALT	50	3	3.0	UL	3.0	UL	3.0	UL	3.0	UL	3.0	UL
COPPER	25	2	12.6	L	22.3	L	16.2	L	14.8	L	15.7	L
IRON	100	7	28.7	B	772		72.5	B	63.0	B	52.1	B
LEAD	3	1	1.0	U	2.2	B	1.0	U	1.0	U	1.0	U
MAGNESIUM	5000	22	10100		11100		5990		7610		7030	
MANGANESE	15	1	3.0	B	131		27.5	L	25.0	L	24.7	L
MERCURY	0.2	0.1	0.14	UL	0.14	UL	0.14	UL	0.14	UL	0.13	UL
NICKEL	40	7	7.0	UL	7.0	UL	7.0	UL	7.0	UL	7.0	UL
POTASSIUM	5000	69	984		3120		1400		1310		1100	
SELENIUM	5	2	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
SILVER	10	4	4.0	UL	4.0	UL	4.0	UL	4.0	UL	4.0	UL
SODIUM	5000	18	7190		7890		9690		9440		8270	
THALLIUM	10	3	3.1	B	3.0	U	3.0	U	3.1	B	4.8	B
VANADIUM	50	1	1.0	UL	1.0	UL	1.0	UL	1.0	UL	1.0	UL
ZINC	20	3	13.8	B	26.6	B	22.8	B	10.2	B	12.6	B

SEDIMENT
PHASE I

(SMC Martin, 1991)

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEDIMENT TAL METALS ANALYSES (mg/Kg)

CLIENT ID:			3A	4A
LAB ID:			3-SEDIMENT	4-SEDIMENT
			8801	8802
CHEMICAL	CRDL	IDL		
Aluminum	40	100	4000	3700
Antimony	12	1.0	1.0 U	1.0 U
Arsenic	2	0.20	2.3	3.4
Barium	40	50	50 U	50 U
Beryllium	1	0.05	0.52	0.65
Cadmium	1	0.20	0.20 U	0.20
Calcium	1000	50	2000 B	9900 B
Chromium	2	0.20	8.2	14
Cobalt	10	0.20	4.4	6.0
Copper	5	1.0	8.6 B	15.4 B
Iron	20	10	5800	16200
Lead	0.6	0.20	0.20 U	30
Magnesium	1000	50	1400 B	4600 B
Manganese	3	10	220	500
Mercury	0.2	0.07	0.07 U	0.07 U
Nickel	8	1.0	6.0	10
Potassium	1000	50	200 B	700 B
Selenium	1	0.20	0.20 U	0.20 U
Silver	2	0.20	0.20 U	0.20 U
Sodium	1000	50	50 U	50 B
Thallium	2	0.20	0.20 U	0.20 U
Vanadium	10	1.0	13 K	18 K
Zinc	4	2.0	56	59

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

SEDIMENT TAL METALS ANALYSES (mg/Kg)

CLIENT ID:			NADC - 5-SEDIMENT	6-SEDIMENT
LAB ID:			8804	8806
			5A	6A
CHEMICAL	CRDL	IDL		
Aluminum	40	100	2300	2400
Antimony	12	1.0	1.0 U	1.0 U
Arsenic	2	0.20	0.55	1.2
Barium	40	50	50 U	50 U
Beryllium	1	0.05	0.49	0.93
Cadmium	1	0.20	0.20 U	0.20 U
Calcium	1000	50	800 B	760 B
Chromium	2	0.20	4.1	6.0
Cobalt	10	0.20	2.3	2.6
Copper	5	1.0	5.2 B	6.4 B
Iron	20	10	400	4400
Lead	0.6	0.20	8.8	8.6
Magnesium	1000	50	400 B	550 B
Manganese	3	10	200	96
Mercury	0.2	0.07	0.07 U	0.07 U
Nickel	8	1.0	9.0	18
Potassium	1000	50	130 B	200 B
Selenium	1	0.20	0.20 U	0.20 U
Silver	2	0.20	0.20 U	0.20 U
Sodium	1000	50	50 U	50 U
Thallium	2	0.20	0.20 U	0.20 U
Vanadium	10	1.0	5.9 K	9.2 K
Zinc	4	2.0	40	55

2

SMC Martin, 1991

SITE: WARMINSTER
CASE NO. 9710-40004
LABORATORY: RMC

AQUEOUS TAL METALS ANALYSES (mg/L)

CLIENT ID:			NADC - FIELD R. BLANK	FIELD BLK-TAP	FIELD BLK-DI	S2-20-RINSATE	FIELD BLANK-27
LAB ID:			8807	8808	8811	8847	8854
CHEMICAL	CRDL	IDL					
Aluminum	200	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Antimony	60	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Arsenic	10	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Barium	200	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Beryllium	5	0.0005	0.0007	0.0006	0.0005 U	0.0007	0.0005 U
Cadmium	5	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Calcium	5000	0.50	0.50 U	34	0.50 U	0.50 U	70
Chromium	10	0.002	0.003	0.007	0.002 U	0.002 U	0.002 U
Cobalt	50	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Copper	25	0.025	0.025	0.075	0.025 U	0.025 U	0.098
Iron	100	0.10	0.20	0.10 U	0.10 U	0.10 U	0.10 U
Lead	3	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.003
Magnesium	5000	0.50	0.50 U	13.5	0.50 U	0.50 U	26
Manganese	15	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Mercury	0.2	0.0002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	40	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Potassium	5000	0.50	0.50 U	4	0.50 U	0.50 U	2
Selenium	5	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Silver	10	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Sodium	5000	0.50	0.50 U	24	0.50 U	0.50 U	17
Thallium	10	0.002	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium	50	0.01	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Zinc	20	0.02	0.02 U	0.09	0.02 U	0.05	0.07

SEDIMENT
PHASE II

(HNUS, 1992)

DATE: 09/28/92
PAGE: 24

HNUS, 1992

SAMPLE ID NUMBER:	6B	5B	4B	3B
SAMPLE TYPE:	TWSD01	TWSD02	TWSD03	TWSD04
UNITS:	TOTAL	TOTAL	TOTAL	TOTAL
	mg/Kg	mg/Kg	mg/Kg	mg/Kg
COMPOUND				
ALUMINUM	2240.00 J(d)	2670.00 J(d)	5240.00 J(d)	3250.00 J(d)
ANTIMONY	12.70 UJ(m,d)	12.30 UJ(m,d)	10.80 UJ(m,d)	11.90 UJ(d,m)
ARSENIC	0.76 B	2.90 B	3.10 B	2.80 B
BARIUM	38.20	38.80	74.60	31.40
BERYLLIUM	1.00 B	1.00 B	1.30 B	0.97 B
CADMIUM	0.78 B	1.00 B	3.10 B	1.50 B
CALCIUM	376.00 J(d,o)	592.00 J(d,o)	20300.00 J(d,o)	1290.00 J(d,o)
CHROMIUM	5.50 B	7.30 B	20.50 J(d,m)	11.70 J(d,m)
COBALT	3.10 B	3.50 B	9.30 K(i)	5.10 B
COPPER	3.10 B	2.80 B	34.60 J(d,o,i)	7.50 J(d,o)
CYANIDE	1.30 U	1.50 U	2.20 U	2.00 U
IRON	5570.00	9610.00	25400.00	11200.00
LEAD	13.90 K(c)	10.70 K(c)	20.40 K(c)	24.60 J(c)
MAGNESIUM	670.00 J(d,o)	747.00 J(d,o)	12700.00 J(d,o)	1320.00 J(d,o)
MANGANESE	29.60 J(o,m)	125.00 J(o,m)	848.00 J(o,m)	144.00 J(o,m)
MERCURY	0.11 UJ(m)	0.10 UJ(m)	0.10 UJ(m)	0.11 UJ(m)
NICKEL	6.80 B	4.30 U	13.20 B	6.80 B
POTASSIUM	152.00	351.00	924.00	421.00
SELENIUM	1.20 UJ(m)	1.10 UJ(m)	1.20 UJ(m)	1.20 UJ(m)
SILVER	2.60 U	2.50 U	2.20 U	2.40 U
SODIUM	197.00 J(o)	288.00 J(o)	732.00 J(o,i)	340.00 J(o)
THALLIUM	0.46 R(m)	0.46 R(m)	0.49 R(m)	0.50 R(m)
VANADIUM	7.80 B	11.80	34.20 K(i)	13.60
ZINC	13.80 J(d)	16.80 J(d)	61.40 J(d)	57.20 J(d)

SEDIMENT
PHASE III

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

TAL METAL SOILS (MG/KG)

CLIENT ID:			Young Dupl		Young			
LABORATORY ID:			W-SD-C10		W-SD-C7		W-SD-C8	
			952005-27		952005-22		952005-21	
ANALYTE	CRDL	IDL						
ALUMINUM	40	2.8	8080		7420		2920	
ANTIMONY	12	6.4	7.5	UL	9.1	UL	6.3	UL
ARSENIC	2	0.4	5.4		11.5	K	2.8	
BARIUM	40	0.2	75.1	J	73.3	J	40.6	J
BERYLLIUM	1	0.2	0.96	L	0.79	L	0.62	L
CADMIUM	1	0.6	1.9	B	8.2	R	0.80	B
CALCIUM	1000	0.8	2430	J	2510	J	1060	J
CHROMIUM	2	1.0	17.1	J	19.5	J	7.7	J
COBALT	10	0.6	6.4	B	8.4	J	3.5	B
COPPER	5	0.2	12.9	J	46.5	J	5.4	J
IRON	20	1.4	13900		82600		9010	
LEAD	0.6	0.2	42.7	J	41.6	J	9.8	J
MAGNESIUM	1000	4.4	2110	J	1730	J	1040	J
MANGANESE	3	0.2	324	J	455	J	219	J
MERCURY	0.1	0.05	0.06	UJ	0.06	UJ	0.05	UJ
NICKEL	8	1.4	10.8	J	23.2	J	4.4	J
POTASSIUM	1000	13.8	553		535		288	
SELENIUM	1	0.4	0.47	UJ	0.57	UJ	0.40	UJ
SILVER	2	0.8	0.94	UJ	3.8	J	0.79	UJ
SODIUM	1000	3.6	328		124	B	67.2	B
THALLIUM	2	0.6	0.71	UL	0.85	UL	0.59	UL
VANADIUM	10	0.2	25.1		25.8		11.8	L
ZINC	4	0.6	93.7		219		32.9	
% SOLIDS			63.9		64.8		76.6	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: W-SD-C9
LABORATORY ID: 952005-23

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL		
ALUMINUM	40	2.8	5840	
ANTIMONY	12	6.4	8.5	B
ARSENIC	2	0.4	3.1	
BARIUM	40	0.2	74.0	J
BERYLLIUM	1	0.2	0.78	L
CADMIUM	1	0.6	1.3	B
CALCIUM	1000	0.8	1220	
CHROMIUM	2	1.0	12.7	J
COBALT	10	0.6	4.5	B
COPPER	5	0.2	8.7	J
IRON	20	1.4	11700	
LEAD	0.6	0.2	16.1	J
MAGNESIUM	1000	4.4	1380	J
MANGANESE	3	0.2	168	J
MERCURY	0.1	0.05	0.06	UJ
NICKEL	8	1.4	8.5	J
POTASSIUM	1000	13.8	439	
SELENIUM	1	0.4	0.48	UJ
SILVER	2	0.8	0.97	UJ
SODIUM	1000	3.6	164	B
THALLIUM	2	0.6	0.73	UL
VANADIUM	10	0.2	18.5	L
ZINC	4	0.6	43.4	
% SOLIDS			71.3	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SD-C1		W-SD-C2		W-SD-C3	
LABORATORY ID:			950005-04		950005-02		950005-05	
TAL METAL SOILS (MG/KG)								
ANALYTE	CRDL	IDL						
ALUMINUM	40	2.8	10800		8950		15700	
ANTIMONY	12	6.4	11.1	UL	9.0	UL	7.5	UL
ARSENIC	2	0.4	4.8		4.2		6.4	
BARIUM	40	0.2	92.9		84.5		42.2	
BERYLLIUM	1	0.2	1.2	L	1.1	L	0.58	L
CADMIUM	1	0.6	1.0	U	0.92	B	2.7	B
CALCIUM	1000	0.8	1030		646		735	
CHROMIUM	2	1	13.6		15.1		23.4	J
COBALT	10	0.6	7.8	B	6.3	B	5.3	B
COPPER	5	0.4	8.5	L	5.5	L	11.6	L
IRON	20	1.4	14300		11900		25600	
LEAD	0.6	0.2	27.9		15.9		12.1	
MAGNESIUM	1000	4.4	1620		1440		2230	
MANGANESE	3	0.2	242		96.8		126	
MERCURY	0.1	0.1	0.10	UL	0.07	UL	0.05	UL
NICKEL	8	1.4	11.3	L	8.3	L	7.3	L
POTASSIUM	1000	13.8	427		306		638	
SELENIUM	1	0.4	0.69	UJ	0.56	UJ	0.82	J
SILVER	2	0.8	1.4	UL	1.1	UL	0.94	UL
SODIUM	1000	3.6	129	B	84.1	B	88.9	B
THALLIUM	2	0.6	1.0	UL	0.84	UL	0.71	UL
VANADIUM	10	0.2	23.8		20.7		43.4	
ZINC	4	0.6	46.4		30.3		35.0	
CYANIDE	10	10	NR		NR		NR	
% SOLIDS:			42.5		63.6		77.1	

CTO 159, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID:			W-SD-C4		W-SD-C5	
LABORATORY ID:			950005-19		950005-07	

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL				
ALUMINUM	40	2.8	4820		10100	
ANTIMONY	12	6.4	6.6	UL	6.4	UL
ARSENIC	2	0.4	4.3	K	5.1	
BARIUM	40	0.2	40.8		50.4	
BERYLLIUM	1	0.2	1.1	L	0.71	L
CADMIUM	1	0.6	3.8	B	1.9	B
CALCIUM	1000	0.8	4140		1010	
CHROMIUM	2	1	9.9	J	15.9	
COBALT	10	0.6	6.9	B	7.9	L
COPPER	5	0.4	29.4		12.2	
IRON	20	1.4	34600		17300	
LEAD	0.6	0.2	28.2		14.9	
MAGNESIUM	1000	4.4	3370		2010	
MANGANESE	3	0.2	528		372	
MERCURY	0.1	0.1	0.06	UL	0.06	UL
NICKEL	8	1.4	16.8		8.9	L
POTASSIUM	1000	13.8	630		517	
SELENIUM	1	0.4	0.41	UJ	0.40	UJ
SILVER	2	0.8	0.83	UL	0.80	UL
SODIUM	1000	3.6	72.9	B	70.1	B
THALLIUM	2	0.6	0.62	UL	0.60	UL
VANADIUM	10	0.2	14.7		28.1	
ZINC	4	0.6	310		28.5	
CYANIDE	10	10	NR		NR	
% SOLIDS:			73.6		72.8	

GROUNDWATER

(HNUS, 1995c)
(HNUS, 1995d)

HNUS, 1995c

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

CLIENT ID: 4S W-MW-HN28S
LABORATORY ID: 941106-20

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	14	22900	K
ANTIMONY	60	32	32.0	U
ARSENIC	10	2	16.4	
BARIUM	200	1	665	
BERYLLIUM	5	1	2.2	
CADMIUM	5	3	3.0	U
CALCIUM	5000	4	32500	
CHROMIUM	10	5	25.3	
COBALT	50	3	4.9	B
COPPER	25	2	9.8	
IRON	100	7	14800	K
LEAD	3	1	24.3	
MAGNESIUM	5000	22	16800	
MANGANESE	15	1	342	
MERCURY	0.2	0.1	0.13	UR
NICKEL	40	7	23.7	B
POTASSIUM	5000	69	4220	
SELENIUM	5	2	2.0	UJ
SILVER	10	4	4.0	UL
SODIUM	5000	18	24100	
THALLIUM	10	3	6.1	B
VANADIUM	50	1	12.2	B
ZINC	20	3	55.3	

CTO 116, NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
CEIMIC CORPORATION

HNVS, 1945d

CLIENT ID: W-HN-29X
LABORATORY ID: 950172-04

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	13.0	4150	J
ANTIMONY	60.0	50.0	50.0	UJ
ARSENIC	10.0	2.0	2.0	U
BARIUM	200	9.0	121	
BERYLLIUM	5.0	1.0	1.0	U
CADMIUM	5.0	3.0	3.0	U
CALCIUM	5000	100	28000	
CHROMIUM	10.0	5.0	5.0	U
COBALT	50.0	9.0	9.0	U
COPPER	25.0	6.0	18.6	K
IRON	100	3.0	3300	J
LEAD	3.0	2.0	2.0	UL
MAGNESIUM	5000	100	15500	
MANGANESE	15.0	5.0	387	
MERCURY	0.20	0.10	0.14	U
NICKEL	40.0	9.0	9.0	U
POTASSIUM	5000	100	727	
SELENIUM	5.0	4.0	4.0	U
SILVER	10.0	5.0	5.0	U
SODIUM	5000	100	8210	
THALLIUM	10.0	5.0	7.2	
VANADIUM	50.0	5.0	5.0	U
ZINC	20.0	5.0	17.0	B