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Record of Decision:

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INSTALLATION RESTORATION PROGRAM

RECORD OF DECISION
FOR EXCAVATION, TREATMENT, AND OFF-SITE DISPOSAL OF LIQUID WASTE DISPOSAL AREA 21 (WP21) AND INDUSTRIAL WASTE BASINS SOIL, WEST MANAGEMENT UNIT
DOVER AIR FORCE BASE, DELAWARE

FEBRUARY 1998

Submitted to
436th SPTG/CEV
Dover Air Force Base, Delaware 19902-6600

Submitted by
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
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for the
U.S. Department of Energy
Under Contract DE-AC05-84OR21400

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ACRONYMS

1,1,1-TCA	1,1,1-Trichloroethane
1,2-DCA	1,2-Dichloroethane
1,2-DCE	1,2-Dichloroethene
ARARs	Applicable or relevant and appropriate requirements
B	Compound detected in associated blank
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CSOIL	Commercial/Industrial Soil Ingestion Scenario
!C	Degree Celsius
!F	Degree Fahrenheit
D	Compound identified in the analysis at a secondary dilution factor
DAF	Dilution attenuation factor
DAFB	Dover Air Force Base
DDD	1,1-Dichloro-2,2-bis(p-chlorophenyl)ethane
DDE	1,1-Dichloro-2,2-bis(p-chlorophenyl)ethene
DDT	1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane
DNREC	State of Delaware Department of Natural Resources and Environmental Control
DRGHW	State of Delaware Regulations Governing Hazardous Wastes
DWPCR	State of Delaware Water Pollution Control Regulations
FS	Feasibility Study
ft	Feet or foot
ft 2	Square feet
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
IWB	Industrial waste basin
J	Value is estimated
MCL	Maximum Contaminant Level
MEK	Methyl ethyl ketone or 2-Butanone
MIBK	4-Methyl-2-pentanone
Ig/kg	Micrograms per kilogram
Ig/L	Micrograms per Liter
mg/kg	Milligrams per kilogram
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
OWS	Oil/water separator
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
POTW	Public owned treatment work
PP	Proposed Plan
RAO	Remedial action objective
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act of 1986 and 1990
SDWA	Safe Drinking Water Act
SSLgw	Soil Screening Levels-Transfers from Soil to Groundwater
SVOC	Semivolatile organic compound
TCE	Trichloroethene
U	Analyte was analyzed for but not detected
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound
WMU	West Management Unit
WP21	Liquid Waste Disposal Area 21

1. DECLARATION OF THE SELECTED REMEDY

1.1 SITE NAME AND LOCATION

Liquid Waste Disposal Area 21 (WP21) and Industrial Waste Basins (IWBs), Area 6, West Management Unit (WMU), Dover Air Force Base (DAFB), Kent County, Delaware.

1.2 STATEMENT OF BASIS AND PURPOSE

This record of decision (ROD) presents the selected remedial action for soil at WP21 and the IWBs which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 1990 and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations Part 300. The U.S. Air Force (USAF), the lead agency, as the owner/operator of the Base, and the U.S. Environmental Protection Agency (USEPA), Region III prepared this decision based on the Administrative Record for the site. The State of Delaware Department of Natural Resources and Environmental Control (DNREC) provided support.

The State of Delaware concurs with the selected remedy. The Information Repository for the Administrative Record contains the information supporting this remedial action decision and is at the Dover Public Library, Dover, Delaware.

1.3 ASSESSMIENT OF THE SITE

Dover AFB identified soil contamination related to the activities that occurred in and around the WP21 and IWBs site area. WP21 and the IWBs are in close proximity to one another. WP21 is the primary location of a former liquid waste disposal basin located in the west-central portion of the Base. The IWBs were the primary liquid waste receiving basins prior to treatment through oil/water separators.

Site WP21 is the most heavily investigated of all the IRP sites at DAFB. The first sampling occurred in 1980 and consisted of a sludge sample from the impoundments. DAFB sampled groundwater in 1982 from three wells-MW101, MW102, and MW103-installed at the perimeter of the impoundments. In 1984, the base sampled surface water and sediment from within the impoundments. After DAFB closed the impoundments in 1986, they performed soil sampling, more extensive groundwater sampling, and soil gas sampling.

Based on the analysis of groundwater and soil from the site, the base identified WP21 as a potential source of chlorinated solvents and metals. Groundwater samples collected in 1982 contained tetrachloroethene (PCE), 1,1,1-trichloroethane(1,1,1-TCA), trichloroethene (TCE), trans-1,2-dichloroethene(trans-1,2-DCE), and vinyl chloride at levels exceeding regulatory action levels. Metals in sludge included cadmium, chromium, copper, iron, lead, silver, and zinc.

Additional surface water and sediment samples collected from the lagoons in 1984 prior to closure (Science Applications International Corporation [SAIC],1986), contained elevated levels of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals above MCLs. The compounds detected in the sediment samples were similar to those present in the surface water samples, however they were below their ingestion RBCs for industrial exposure. On the basis of these data, the material received in the waste impoundments is likely to have contributed solvent-related organics and metals to the surrounding subsurface soils and groundwater.

During the 1997 investigation, the base collected soil samples to evaluate the extent of residual soil contamination that may remain from the operation of the industrial waste basins and the operation and subsequent removal of the waste lagoons at WP21. This investigation showed that the former lagoons do not appear to be a source. Analyses of soil samples from around the IWBs and the associated oil/water separators indicated that these structures are likely sources of groundwater contamination. Elevated levels of chlorinated solvents and petroleum hydrocarbons above their corresponding Soil Screening Levels-Transfers from Soil to Groundwater (SSLgw) were present in the soil intervals below the bottom of the IWB concrete structures. The investigators also found pesticides in shallow soils that are probably related to their use across DAFB.

The USAF and the EPA have decided to excavate, treat and dispose of soil beneath the IWBs because concentrations of hazardous substances in the soil exceed their SSLgw. The potential risks identified at the site are due to the migration of contaminants from the soil to the groundwater downgradient users of the water may ingest. The potential risk at the IWBs/WP21 is primarily attributable to chlorinated solvents, pesticides, and metals in soil.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy consists of excavation of the contaminated soil beneath the IWB concrete structures, and off-site treatment and disposal of the soil. The contractor will level the soil cap on WP21, over the formet lagoons, and will use the material to fill the excavation of the IWB area. Final evaluation of the performance of this remedy, remediation of contaminated groundwater at the site, and compliance with applicable or relevant and appropriate requirements (ARARs) will occur in the final Basewide ROD.

1.5 STATUTORY DETERMINATIONS

The selected remedial action satisfies the remedial selection process requirements of CERCLA and NCP. As required under CERCLA, the selected remedy provides the best balance of trade-offs among the nine evaluation criteria. The selected action provides protection of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the action, and is cost effective. This remedy uses permanent solutions and alternative treatment technology to the maximum extent practicable and satisfies the statutory preference for remedies that use treatments that reduce toxicity, mobility, or volume as a principal element.

Because the remedy will result in the removal of the contaminated soil and there will be no hazardous substances in the site soils above action levels, no further review (i.e., 5-year review) will be necessary to ensure the remedy provides adequate protection of human health and the environment in accordance with NCP Section 300.430 (f)(4)(ii).

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2. DECISION SUMMARY

2.1 INTRODUCTION

DAFB recently completed a summary soil sampling report and Remedial Investigation (RI) that addressed soil in the immediate vicinity of the WP21 and two IWBs that are located along its northwestern boundary at DAFB, Delaware. The site is located in what is called Area 6 of the West Management Unit (WMU). Groundwater for the site is being addressed under a ROD for Natural Attenuation of Groundwater, Target Area 1 of Area 6 in the WMU.

The remedial action is undertaken as part of the USAF's Installation Restoration Program (IRP). The basis for the remedial action is primarily found in the document Summary Report WP21 Soil Sampling, Dover Air, Force Base, Dover, Delaware (Dames & Moore, September 1997). Other information relevant to the site are found in the Basewide Remedial Investigation, West Management Unit, Dover Air Force Base (Dames & Moore, August 1997) and the Area 6 Remedial Investigation, Dover Air Force Base, Dover, Delaware reports which characterized contamination and evaluated potential risks to public health and the environment.

This ROD explains the nature of the contaminated soil at Site WP21 and IWBs, summarizes the history and principal findings of previous field investigations, briefly describes the selected alternative, and presents the rationale for the selected alternative. The State of Delaware concurs with the remedy selected in this ROD.

As an aid to the reader, a glossary of the technical terms used in this ROD is provided at the end of the document.

2.2 PUBLIC PARTICIPATION

DAFB offered opportunities for public input and community participation during the investigations and Proposed Plan (PP) for WP21 and the IWBs in the WMU. The PP was made available to the public in the Administrative Record. Documents composing the Information Repository for the Administrative Record for the site are available at the Dover Public Library, Dover, Delaware. The notice of availability for the PP was published in the local newspaper and the Base newspaper. A public comment period was held from Monday, January 12,1998, until Wednesday, February 11, 1998. The public comment period was not extended as there were no requests for an extension. No written comments were received

from the public, and no public meeting was requested. These community participation activities fulfill the requirements of Section 113(k)(2)(B)(I-v) and 117(a)(2) of CERCLA.

2.3 SITE BACKGROUND

DAFB is located in Kent County, Delaware, 3.5 miles southeast of the city of Dover (Figure 1) and is bounded on the southwest by the St. Jones River. DAFB comprises ~4,000 acres of land, including annexes, easements, and leased property (Figure 2). DAFB is relatively flat, with elevations ranging from ~10 to 30 ft above mean sea level. The surrounding area is primarily cropland and wetlands.

DAFB began operation in December 194 1. Since then, various military services have operated out of DAFB. The current host organization is the 436th Airlift Wing. Its mission is to provide global airlift capability, including transport of cargo, troops, equipment, and relief supplies.

DAFB is the U.S. East Coast home terminal for the C-5 Galaxy aircraft. DAFB also serves as the joint services port mortuary, designed to accept casualties in the event of war. The C-5 Galaxy, a cargo transport plane, is the largest aircraft in the USAF, and DAFB is one of the few military bases at which hangars and runways are designed to accommodate these planes.

The portion of DAFB addressed in this ROD-IRP Site WP21-is located within the WMU, one of four management units into which the Base has been divided (Figure 2).

DAFB owned and operated two surface impoundments that received hazardous waste from 1963 until 1984 (Figure 3). The former impoundments, known as IRP Site WP21, are located in the western portion of DAFB, adjacent to Atlantic Suva and southwest of Building 719. WP21 covers ~19,200 ft 2 and is secured by a locked chain-link fence. Access is limited and controlled by personnel at the DAFB water plant. Currently, the site is occupied by two concrete IWBs that are connected to the Industrial Waste Collection Drain (IRP Site OT41) and two oil/water separators (OWSs) (IRP Site OT46).

The treatment system at WP21 was initially built in 1963 to receive wastes from the engine overhaul shop (Building 719). The system consisted of primary receiving basins (IWBs) (12,000-gallon capacity), the secondary impoundments (WP21) (170,000-gallon capacity), and an underground pipeline through which waste flowed after passing through the OWSs (OT46). In 1968 the system was expanded to accept wastes from other facilities (Building 724-metal plating shop and Building 582-wash racks). When in operation, wastewater from the various facilities was discharged to the IWBs. Untreated wastewater was processed through an OWS located at the end of each IWB. Separated oils were pumped to a 15,000-gallon underground storage tank (IRP Site WP33). Treated wastewater was sent to the unlined surface impoundments (Site WP21). The flow of treated wastewater from unlined surface impoundments varied over time and is summarized below:

- Between 1963 through 1969, treated wastewater was sent to the north drainage ditch (Site SD12).
- Between l969 through 1975, treated wastewater was sent to the DAFB Wastewater Treatment Plant (Site OT28).
- Between 1975 through 1985/1986 (closure of the two surface water impoundments), treated wastewater was sent to the Kent County Regional Wastewater Treatment Plant.
- Between 1985/1986 to preseny, at the time the two surface impoundments were closed, two OWSs (OT46) were installed near the end of each IWB to provide additional treatment prior to discharge to the sanitary sewer and ultimately the Kent County Regional Wastewater Treatment Plant.

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Each OWS is constructed of steel with internal coalescing plates and contains a 300-gallon holding tank. The OWSs measure 53.5 in. wide by 142 in. long by 61 in. deep and work by gravity separation. Separated water is discharged directly to the sanitary sewer.

The two unlined surface impoundments known as WP21 were closed in August 1986. According to design specifications provided by DAFB, the impoundments were ~4 ft deep. During removal, the sludge within the unlined impoundments was excavated along with ~6 in. of soil beneath them. The amount of sludge and soil removed is unknown. The area was backfilled with unaffected soil, capped with a synthetic material and clay, and covered with grass under the supervision of the State of Delaware's DNFLEC. The impoundments were certified as closed on September 4,1986. The 15,000-gal

underground waste storage tank (WP33) was removed in or around 1984.

When the surface impoundments were listed on DAFB's Part A permit under the Resource Conservation and Recovery Act (RCRA), they were interim status, which required compliance with standards of 40 Code of Federal Regulations (CFR) Part 265. After receipt of an incomplete post-closure notice, DNREC issued a Secretary's Order for compliance with the Delaware Regulations Governing Hazardous Waste (DRGHW), which was amended on May 10, 1989. DAFB was required to begin quarterly groundwater monitoring and to statistically evaluate the data obtained as part of the Secretary's Order.

Quarterly groundwater monitoring samples have been analyzed and evaluated from WP21 from April 1990 through January 1994. Biannual samples are now being collected in accordance with the Post Closure Permit.

The Columbia Formation is the shallowest water-bearing unit and holds the water table aquifer. Deeper aquifers are protected by the extensive upper clay of the Calvert Formation. The upper portion of the Columbia Formation is finer grained and contains more silt and clay lenses than the deeper portions. The deeper portion of the Columbia Formation typically consists of fine-to-coarse-grained sand with occasional lenses of fine-to-medium sand and discontinuous gravel lenses interpreted as channel lag deposits. The maximum thickness of the Columbia Formation at WP21 is ~38 ft. The water table is generally encountered at a depth of ~11 ft below ground surface (bgs) at WP21 but varies seasonally.

Site WP21 is the most heavily investigated of all the IRP sites at DAFB. The first sampling occurred in 1980 and consisted of a sludge sample from the impoundments. Groundwater was sampled in 1982 from three wells-MW101, MW102, and MW103-installed at the perimeter of the impoundments. In 1984, surface water and sediment from within the impoundments were sampled. Soil sampling, more extensive groundwater sampling, and soil gas sampling were performed after the impoundments were closed.

Based on the analysis of materials from the impoundments prior to closure, WP21 was identified as a potential source of chlorinated solvents and metals in groundwater. Groundwater samples collected in 1982 contained PCE, 1,1,1-TCA, TCE, trans-1,2-DCE, and vinyl chloride each at less than 50 Ig/L. Metals in sludge included cadmium (1,900 mg/kg), chromium (33,000 mg/kg), copper (333 mg/kg), iron (11,000 mg/kg), lead (8,200 mg/kg), silver (15.9 mg/kg), and zinc (4,300 mg/kg).

Additional surface water and sediment samples were collected from impoundments in 1984 prior to closure (SAIC, 1986). The surface water samples SW001 and SW002 were collected from separate impoundments and were analyzed for VOCs and metals. The detected analytes and concentrations are shown in Table 1.

Table 1. Constituents in Surface Water (Ig/L)

Sample ID:	SW001	SW002	Sample ID:	SW001	SW002
Date:	12/12/84	12/12/84	Date:	12/12/84	12/12/84
1,1,1-TCA	390	900	Cadmium	139	121
1,1-DCA	23	100	Chromium	2495	783
1,1-DCE	2.0	3.2	Copper	99.9	44.9
1,2-DCA	0.5	2.0	Iron	2.51	1.84
Benzene	22	70	Lead	67.5	51.2
Ethylbenzene	14	36	Mercury	0.10	
Methylene chloride	9000		Nickel	28.4	15.7
PCE	6.1	100	Silver	1.18	0.80
Toluene	610	480	Zinc	104	271
trans-1,2-DCE	7.1	48			
TCE	4.4	10			

Sediment samples collected from the impoundments at the same time were analyzed for VOCs, SVOCs, and metals (SAIC, 1986). SD01 was collected from the top 6 in. of sediment/sludge in the smaller impoundment, whereas SD02 was collected from 4 to 5 ft below the sediment in the other impoundment.

The compounds detected in the sediment samples are similar to those present in the surface water samples (Table 2). On the basis of these data, the material received in the waste impoundments is likely to have contributed solvent-related organics and metals to the surrounding subsurface soils and groundwater. However, the downward migration to several feet below the basins was apparently retarded as indicated by lower constituent concentrations in the subsoil of SD02.

Soil samples were also collected during the installation of the monitoring wells at WP21 in 1988. The monitoring wells were located beyond the actual surface impoundments, either upgradient or downgradient of WP21. Therefore, these soil data did not necessarily reflect source specific constituents. Soil samples collected from the two closest monitoring well pairs (MW211 and MW212) are summarized in Table 3 (VOC data only). These wells were located substantially downgradient and beyond the area of the waste lagoons at WP21.

Table 2. Constituents In Sediment (Ig/kg)

Sample ID:	SD01	SD02	Sample ID:	SD01	SD02
Date:	12/12/84	12/12/84	Date:	12/12/84	12/12/84
1,1,1-TCA	12	2.9	Arsenic	4.05	37.2
1,1-DCA	202		Cadmium	15.20	2.71
1,1-DCE	8.2		Chromium	378	68.1
1,2-DCA	1.1		Copper	17.2	6.63
1,2-Dichloropropane	0.60		Iron	0.22	0.46
Benzene	40.70		Lead	102	24
Chlorobenzene	1.8		Mercury	0.06	0.02
Methylene chloride	45.9		Nickel	5.08	5.78
PCE	105	4.5	Silver	0.25	0.05
Toluene	659		Zinc	66.6	22.6
trans-1,2-DCE	229				
TCE	65.5	2.4			
1,2-Dichlorobenzene	273	1.2			
1,3-Dichlorobenzene	34.3				
1,4-Dichlorobenzene		0.60			
Phenol	3.2				

Table 3. Summary of the 1988 VOC Soil Data

Analyte	Highest concentration (Ig/kg)	Number of hits	Number of samples
1,1,1-TCA	260D	2	6
1,1-DCA	68	1	6
1,1-DCE	38	1	6
1,2-DCA	61	1	6
1,2-DCE	29	1	6
2-Butanone	500D	2	6
4-Methyl-2-Pentanone	45	2	6
Acetone	160B	6	6
Chloroform	3BJ	4	6
Methylene Chloride	140B	6	6
Toluene	6J	2	6
TCE	27	3	6

B - Compound was detected in associated blank.
D - Compound identified in the analysis after dilution.
J - Value is estimated.
U - Analyte was analyzed for but not detected.

During the 1997 investigation, soil samples were collected to evaluate the extent of residual soil contamination that may remain from the operation of the industrial waste basins and the operation and subsequent removal of the waste lagoons at WP21. Analytical data are summarized in Tables 4 and 5 for the IWBs/OWSs area and in Tables 6, 7, and 8 for the former lagoons area of WP21.

2.4 SUMMARY OF SITE RISKS

Ordinarily, the risks posed by hazardous substances at a Superfund site are analyzed in several stages. At an early stage of the analysis, concentrations of hazardous substances at the site are compared with health-based "screening" levels. If the concentration of a hazardous substance at the site is lower than the screening levels, then that substance poses no unacceptable risk to human health or the environment; the substance is excluded from further study. On the other hand, if the concentration of a

Table 4. Summary of the 1997 VOCs Industrial Waste Basin Soil Sample Results

Analyte	Highest concentration (ug/kg)	Number of hits	Number of samples	RBC for CSOIL* (ug/kg)	SSLgw 20 DAF** (ug/kg)	Background concentration (ug/kg)
1,1,1-TCA	90,700D	4	8	4.1E+07	2000	
1,1-DCA	1010	5	8	2.0E+08	23,000	
1,1-DCE	4600D	2	8	9.5E+03	60	
Acetone	43.5J	3	8	2.0E+08	16,000	
Benzene	7.04J	1	8	2.0E+05	30	
Chlorobenzene	17.6J	1	8	4.1E+07	1000	
Chloroethane	15.5	1	8	2.2E+05		
cis-1,2-DCE	503	5	8	2.0E+07	400	
Ethylbenzene	772	2	8	2.0E+08	13,000	
Methylene Chloride	50.6	1	8	7.6E+05	20	
PCE	309	2	8	1.1E+05	60	
Toluene	527	2	8	4.1E+08	12,000	
TCE	607	1	8	5.2E+05	60	
Xylene (total)	9030D	1	8	1.0E+09	190,000	

* CSOIL-USEPA Region III Risk-Based Concentration/Industrial Soil Ingestion Scenario.
** SSLgw-UWEPA Soil Screening Guidance for Soil Screening Levels - Transfers from Soil to Groundwater with a default dilution-attenuation factor (DAF) of 20.
Bold values indicate exceedances.

Table 5. Summary of the 1997 SVOCs/Pesticides/Metals Industrial Waste Basin Soil Sample Results

Analyte	Highest concentration (ug/kg)	Number of hits	Number of samples	RCB for CSOIL (ug/kg)	SSL gw 20 DAF (ug/kg)	Background concentration (ug/kg)
2-Methylnaphthalene	6720J	1	8			
Bis(2-ethylhexyl)phthalate	184J	2	8	41,000	3.6E+06	
Di-n-butyl phthalate	225J	3	8		2.3E+06	
Naphthalene	8290	1	8		84,300	
Chlordane-alpha	4.24	1	8	16,000	10,000	
Chlordane-gamma	3.23J	1	8	16,000	10,000	
DDD	172	3	8	24,300	16,000	
DDE	219	4	8	17,000	54,300	
DDT	89.9	2	8	17,000	32,000	
Endosulfan I	2.06	1	8	1.2E+07	18,000	
Endrin	5.24J	2	8	6.1E+05	1000	
Heptachlor epoxide	0.342J	1	8	630	700	
Calcium	2.54E+06	8	8			1,080,000
Silver	2130	2	8	1.0E+07	34,300	970

* CSOIL-USEPA Region III Risk-Based Concentration for Commercial/Industrial Soil Ingestion Scenario.
** SSLgw-USEPA soil Screening Guidance for Soil Screening Levels-Transfers from Soil to Groundwater with a default dilution-attenuation factor (DAF) of 20.
Bold values indicate exceedances.

Table 6. Summary of the 1997 VOCs WP21 Lagoon Area Soil Sample Results

Analyte	Highest concentration (µg/kg)	Number of hits	Number of samples	RBC for CSOIL (µg/kg)	SSLgw 20 DAF (µg/kg)	Background concentration (µg/kg)
2-Butanone (MEK)	124	2	19	1.0E+09		
4-Methyl-2-Pentanone (MIBK)	12	1	19	1.6E+08		
Acetone	71.8	7	19	2.0E+08	16,000	
Methylene Chloride	4.74	3	19	7.6E+05	20	
TCE	1.67	1	19	5.2E+05	60	

* CSOIL-USEPA Region III Risk-Based Concentration for Commercial/Industrial Soil Ingestion Scenario.
** SSLgw-USEPA Soil Screening Guidance for Soil Screening Levels-Transfers from Soil to Groundwater with a default dilution-attenuation factor (DAF) of 20.
Bold values indicate exceedances.

Table 7. Summary of the 1997 SVOCs WP21 Soil Sample Results

Analyte	Highest concentration (ıg/kg)	Number of hits	Number of samples	RBC for CSOIL* (ıg/kg)	SSLgw 20 DAF** (ıg/kg)	Background concentration (ıg/kg)
Benzopyrene	299J	3	19	780	8000	
Benzo[a]anthracene	1180	3	19	7800	2000	
Benzo[b]fluoranthene	1470	3	19	7800	5000	
Benzo[g,h,i]perylene	588J	1	19			
Benzo[k]fluoranthene	543J	3	19	78,000	49,000	
Chrysene	1160	3	19	7.8E+05	1.6E+05	
Di-a-butyl phthalate	171J	2	19		2.3E+06	
Fluoranthene	2400	3	19	8.2E+07	4.3E+06	
Indeno(1,2,3-CD)pyrene	537J	3	19	7800	14,300	
Phenanthrene	1140	3	19			
Pyrene	1860	3	19	6.1E+07	4.2E+06	

* CSOIL-USEPA Region III Risk-Based Concentration for Commercial/Industrial Soil Ingestion Scenario.
** SSLgw-USEPA Soil Screening Guidance for Soil Screening Levels-Transfers from Soil to Groundwater with a default dilution-attenuation factor (DAF) of 20.
Bold values indicate exceedances.

Table 8. 1997 Pesticides/PCBs/Metals WP21 Lagoon Area Soil Sample Results

Analyte	Highest concentration (µg/kg)	Number of hits	Number of samples	RBC for CSOIL* (µg/kg)	SSLgw 20 DAF** (µg/kg)	Background concentration (µg/kg)
Alpha-BHC	7.72J	3	19	910	0.5	
Chlordane-alpha	3.52J	2	19	16,000	10,000	
Chlordane-gamma	25.8	3	19	16,000	10,000	
DDD	351	5	19	24,300	16,000	
DDE	2090	7	19	17,000	54,300	
DDT	2460	7	19	17,000	32,000	
Dieldrin	172	2	19	360	4	
Gamma-BHC (Lindane)	65.8J	3	19	4400	9	
PCB 1016	95.9	1	19	1.4E+06	1000***	
PCB 1260	154	1	19	41,000	1000***	
Calcium	782	19	19			1.08E+06
Silver	3370	11	19	1.0E+07	34,300	970

* CSOIL-USEPA Region III Risk-Based Concentration for Commercial/Indstrial Soil Ingestion Scenario.
** SSLgw-USEPA Soil Screening Guidance for Soil Screening Levels-Transfers from Soil to Groundwater with a default dilution-attenuation factor (DAF) of 20.
*** Preliminary Remediation Goal
Bold values indicate exceedances.

hazardous substance is higher than the screening levels, then that substance is studied further in a site-specific baseline risk assessment. The baseline risk assessment is designed to identify which hazardous substances pose risks that require a remedy, and which pose risks that are within acceptable limits. Ordinarily, remedial action is taken only after the site-specific baseline risk assessment determines that one or more substances pose unacceptable risks to human health or the environment.

At this site, however, the USAF and EPA have decided to take remedial action at an early stage-the screening stage-rather than wait for the results of a more detailed site-specific baseline risk assessment. The concentrations of several hazardous substances in soil beneath the IWBs exceed the Soil Screening Levels for Ground Water Transfer (SSLgw), as explained in more detail below. The USAF and EPA agree, based upon this data, that the soil containing these hazardous substances should be excavated, treated and disposed of in order to prevent hazardous substances in the soil from migrating to ground water below. Given the particular circumstances at this site, the decision to proceed with a remedy, without awaiting a more detailed site-specific baseline risk assessment, is consistent with the directive in the NCP that "Remedial actions are to be implemented as soon as site data and information make it possible to do so." 40 C.F.R. º 300.430(a)(1).

USAF and EPA have determined that, in the particular circumstances of this site, them is enough information and site data available to choose a remedy without conducting a more detailed site-specific baseline risk assessment. The USAF and EPA's decision to proceed with excavation, treatment and disposal at this site, without conducting a more elaborate site-specific baseline risk assessment, is not intended to set a precedent for other sites.

Soil data are compared with several sets of criteria. For organics (VOCs, SVOCs, and pesticide/polychlorinated biphenyls [PCBs]), positive detections are compared with USEPA Region III Risk-Based Concentrations (RBCs) established for soil ingestion under an industrial/commercial scenario (CSOIL) and the USEPA Soil Screening Guidance: Technical Background Document for Soil Screening Levels-Transfers from Soil to Groundwater (SSLgw). SSLgw criteria tend to be more stringent than the CSOIL criteria and final risk assessment cleanup levels, but are generally used for guidance only. The metal results are compared to DAFB-specific background levels as established during the Basewide RI or the USEPA Region III RBCs.

The potential risks associated with WP21 are those that would adversely affect human health or the environment, effects that could occur under current or potential future use conditions if the contamination is not remediated. The principal risk at WP21 is due to the potential migration of hazardous substances from soil to groundwater. Some constituents of concern in the soil beneath the IWBs exceed the SSLgw criteria. This situation may present an unacceptable risk to downgradient users of groundwater. The soils will be removed because they failed to comply with the SSLgw criteria. This remedial action will eliminate the potential migration of the contaminants from the soil to the groundwater and the potential risk exposure related to this site.

A potential short-term risk would be as a result of the remedial action itself. Site workers and visitors may be exposed to site contaminants through inhalation and ingestion of contaminated soil particles and volatilized constituents, and direct dermal-contact with contaminated materials. Target populations only include site workers and visitors. Appropriate health and safety precautions will be implemented during the removal action to protect site workers and visitors. No site-specific risk calculations have been performed for WP21 soil, but environmental risks for WP21 will be addressed in the Basewide ROD.

It should be noted that only the site soils are being addressed in this ROD. The site groundwater (Columbia Aquifer) is not used by the Base for industrial, residential, and recreational purposes. Institutional controls are currently in-place for both the site soil and groundwater. Groundwater contamination is to be addressed in the Basewide ROD.

Details concerning the potential human health risks for the Area 6, of which WP21 is a part, may be reviewed in the Area 6 Remedial Investigation Report, Dover Air Force Base, Dover, Delaware, July 1994. Tables 4 through 8 provide summaries of the constituents of concern and their corresponding RBC and/or background concentration that will be used in the remediation of the site soil.

No VOCs, SVOCs, pesticide/PCBs were detected above the CSOIL-RBCs for the Site WP21 and the IWB areas. Except for calcium and silver, all metals were detected at concentrations below the CSOIL-RBCs and Base-specific background levels. Calcium, detected in every sample, exceeded its background level in one sample-B3304A. Silver, the only other metal to exceed its background level (0.97 mg/kg), was detected at concentrations up to 3.37 mg/kg in 11 of the 19 samples collected from the former lagoons area. All silver detections were below its CSOIL and SSLgw criteria of 1.0E+07, Ig/kg and 3.4E+05,ug/kg, respectively.

Chlorinated compounds and fuel-related constituents were detected at 8 to 10 ft bgs near the IWBs, especially Basin A (B3301B). Since no VOCs were detected at the 2- to 4 -foot interval in either boring

flanking Basin A, a release from the bottom of the basin is most likely. Similar constituents were detected in Basin B, but at much lower concentrations, indicating significantly smaller releases compared with Basin A. Low levels (<16 Ig/kg) of four solvents were detected in B3303A (2 to 4ft bgs) and B3304A (6 to 8 ft bgs) collected on either side of Basin B. These detections may be remnants of small surface spills from the IWBS. An upgradient source of these constituents is unlikely because they were not detected in other soil samples or upgradient groundwater.

2.5 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are media-specific goals to be reached during site remediation that are protective of human health and the environment. These objectives are typically achieved by preventing exposure and reducing contaminant levels (Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, USEPA, October 1988). The RAOs for the WP21 former sludge lagoons and industrial waste basins are: 1) For soil within the boundaries shown on Figure 4, down to the water table, reduce the contaminants to their SSLgw level; 2) If soil at the boundaries shown on Figure 4, at any depth down to the water table contains concentrations of any hazardous substance(s) listed in Tables 4 through 8 of this ROD greater than the CSOIL concentrations for the substance(s), then reduce the concentration of such substance(s) to the CSOIL concentration for the substance(s), or less. The principal threat at WP21 is the potential migration of hazardous substances from soil to groundwater. The remedial action will eliminate this threat by removing and treating the contaminated soil.

2.6 SUMMARY OF ALTERNATIVES

Remedial alternatives were categorized and specific process options were identified based on a review of literature, vendor information, performance data, and experience developing other remedial programs under CERCLA. Applicable remedial alternatives were evaluated for each of the three general response actions. The three general response actions are described in Table 9.

General response actions are the steps that could be taken to achieve the RAOs for the soil at WP21. Based on the results of the initial screening of the response action technologies and representative process options, the following two technologies are considered applicable:

- Alternative 1 - No Action
- Alternative 2 - Excavation, Off-Site Treatment and Disposal

These remedial alternatives are described in the following subsections. In addition, the capital, annual operation and maintenance (O&M), and present worth costs of each alternative are provided.

Table 9. General Response Actions and Potential Remedial Technologies for Soils
Site WP21, Dover Air Force Base

General response action	Soil technology description	Description
No Action	None	None
Soil Removal	Excavation	Excavation of contaminated soils is required before any ex situ treatment technology implementation.
Treatment	Thermal Desorption	Soil is excavated and treated by a licensed facility using thermal desorption at temperatures between 800 and 10005F. Off gases are treated using a bag house and a thermal oxidizer.

2.6.1 Alternative 1-No Action

Alternative 1, the No Action alternative, is considered in the range of alternatives to serve as a baseline or to address sites that do not require active remediation. The NCP and CERCLA guidance require that the No Action alternative be evaluated. This alternative assumes that no remedial action will occur and that the site would be left in its present condition. No efforts are undertaken to reduce soil contaminants. Any changes to the site would be a direct result of natural processes, and no monitoring would be conducted to document changes in contaminant levels. No cost is associated with this alternative.

Alternative 1

Cost category	Cost ($)
Capital	0
Annual Operations and Maintenance	0
Present Worth	0

2.6.2 Alternative 2-Excavation, Off-Site Treatment and Disposal

The excavation, off-site treatment and disposal alterative shall consist of excavating and transporting the VOC-contaminated soils from the WP21 site to an off-site, licensed treatment and disposal facility. The treatment option shall use thermal desorption to drive off the volatile contaminants from the soil. Off-gases and particulate shall be captured and/or destroyed. Treated residuals shall be disposed into a licensed landfill. The tasks to be performed during this alternative shall include: 1) removal of the IWBs, OWSs, a lift station, and associated piping; 2) removal of contaminated soils associated with these structures; 3) treatment of contaminated soil through thermal desorption; 4) disposal of treated soil at a licensed landfill as daily cover material; 5) removal of the WP21 soil cap; and 6) restoration of the site to a usable condition.

The contaminated soils from the IWBs and OWSs shall be excavated to the water table, estimated to be 12 ft bgs, within the boundaries outlined in Figure 4 of this ROD. The excavated soil shall be packaged for bulk shipment and transported by tractor trailer rig (18 yd 3 capacity) to the thermal desorption treatment facility. The treated residuals shall be disposed at a licensed landfill as daily cover material.

The contaminated soil will be excavated using common construction equipment. Backhoes could excavate the soil to a depth of 12 ft bgs and stockpile the soil for loading and packaging for shipment. Front-end loaders could be used to load the soil into lined, 18 yd 3 end-dump trailers for bulk transportation. Soil removal involves the use of heavy equipment to excavate the contaminated soil from the site. This response action relies on common construction equipment such as bulldozers, excavators, and dump trucks. The excavation technology of Alternative 2 is well demonstrated and reliable.

The total volume of soil in the area to be excavated is estimated at 2600 yd 3. This excludes soil volume from the WP21 cap. The volume of contaminated soil at the IWB/OWS area is assumed to be 50% of the total soil volume because the investigative results showed that contaminants were primarily released from the bottom of the IWBS. With an additional soil volume from the lift station and all piping, assumed to be 10% of the excavated volume, the total estimated volume of contaminated soil is 1400 yd 3. An excess 1500 yd 3 of clean soil will be stockpiled/disposed on the Base. Figure 4 provides an illustration of the approximate limits of the soil excavation to be conducted at Site WP21.

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The estimated total volume of clean soil, above the geomembrane on the WP21 cap is 2200 yd 3. There is sufficient volume of clean soil from the WP21 cap cover to use as the fill in the excavations at the IWBs, OWSs, lift station, and associated piping. Excess clean soil can be transported to a location designated by the Base. The time for all tasks to be completed under this alternative is estimated to be three months.

Alternative 2

Cost category	Cost ($)
Capital	$653,725
Annual Operations and Maintenance	$0
Present Worth	$653,725

2.7 COMPARISON OF REMEDIAL ALTERNATIVES

This section provides a comparative analysis of the two remedial alternatives. The focus of the comparative analysis is on the relative advantages and disadvantages offered by each of the alternatives in relation to the seven evaluation criteria that were analyzed. A detailed summary of the technology screening and analysis is provided in Table 10.

2.7.1 Overall Protection of Human Health and the Environment

The overall protectiveness criterion is a composite of other evaluation criteria, especially short-term effectiveness, long-term effectiveness, and compliance with ARARs. Alternative 1 (No Action) would not be protective of human health and the environment because of potential leaching of contaminants to groundwater.

Alternative 2 (Excavation/Off-Site Treatment and Disposal) is considered to be protective of human health because of institutional controls now in place and the removal and treatment of a potential source of groundwater contamination. The removal action will effectively reduce risk by removing a potential source of groundwater contamination. In addition, risk to human health through exposure to contaminated soils will be reduced.

2.7.2 Compliance with ARARs

Alternative 1 (No Action) provides no mechanism to evaluate compliance with ARARs and therefore does not comply with ARARs.

Because Alternative 2 relies on proven methods for removing and treating of contaminated soils, this alternative will comply with all chemical-, location-, and action-specific ARARs. Table 11 provides a summary of the ARARs for Alternative 2. Because an on-site thermal desorption system would require a lengthy permitting and trial burn testing, the use of an off-site, thermal desorption system was evaluated. The most likely applicable or relevant and appropriate requirements for this alternative would include permitting for intrastate transport and disposal of a special or hazardous material. An air permit from DNREC addressing fugitive dust emmissions generated during soil excavation may be necessary, and there may be excavation permitting requirements from the Base.

A number of other ARARs-including the Clean Water Act and RCRA-must be considered. Primary among them are compliance with VOC emission limitations to the atmosphere, land treatment regulations, and effluent discharge limitations to surface water. The selected alternative will comply with all ARARs.

2.73 Long-Term Effectiveness and Permanence

The No Action alternative does not provide controls to reduce concentrations of organics in the soil to levels below RBCs and groundwater protection standards. The No Action Alternative does not provide for long-term effectiveness and permanence. Excavation, off-site treatment and disposal is an extremely effective treatment technology for the destruction of organic contaminants. Destruction and removal efficiencies can range from 95% to 99.9999%, depending on combustion temperature and residence time in the treatment unit. Under current federal guidelines, VOCs are candidates for thermal treatment in a rotary dryer or thermal screw at 6005-12005C. Thermal desorption is not effective for inorganic contaminants, such as metals. The metals generally remain in the soil, but they may be released as particulate in the off-gas and trapped in the air pollution control system. The technology would achieve both the short- and long-term effectiveness criteria.

2.7.4 Reduction in Toxicity, Mobility, and Volume

The No Action Alternative does not employ removal or treatment processes to address soil contamination. Therefore there would be no reduction of toxicity, mobility, or volume of contaminants in soil. This alternative will not satisfy the statutory preference for treatment as a principal component of remedial action.

Excavation and thermal desorption reduces the potential threat to human health and the environment by removing the organic contaminants from the soil for subsequent capture and destruction. Metals occurring in the soil remain in the soil residual or may be contained in the air pollution control system and must be properly disposed of. Additional treatment (stabilization) may be required for the metals before disposal.

2.7.5 Short-Term Effectiveness

The No Action Alternative does not provide any remedial actions; therefore, short-term risks to the community or environment would not result from implementation.

No risks to the community or environment would be expected during implementation of the treatment alternative if an off-site, thermal desorption system is used. The major routes of exposure during treatment are contact with the contaminated soil and inhalation of off-gas vapors or particulates. Dust suppression measures will be implemented during excavation activities to minimize exposure to airborne dust particles and contaminants. Protection from exposure to the public and the environment is provided by proper packaging

Table 10. Soil Remedial Technology Screening
Site WP21, Dover Air Force Base, Delaware

General response action	Technology	Advantages	Disadvantages	Screening status	Comments
No Action	None	Easily implemented.	Contaminated soils will continue to be a source of environmental contamination.	Retained	Required by the NCP as a baseline in feasibility, study analysis, and comparison.
		Low potential for exposure to contamination during implementation.	Would not reduce mobility, toxicity, or volume of contaminants.		Will not meet removal action objectives
		Minimal imppact to environment during implementation.	Long-term monitoring would be required.		
Soil Removal	Excavation	Relies on common construction equipment.	Fugitive emissions could be a problem during operation.	Retained	Required for any ex situ alternative including treatment and/or disposal.
		Easily implemented.	Depth and composition of material requiring excavation must be considered.		
		A component of various treatment/disposal technologies.			
Treatment	Thermal Treatment	Technology is reliable and has been demonstated for treating a wide range of organic contaminants at full-scale including PCBs and pesticides.	Off-gas treatment of metals may require air pollution control equipment.	Retained	More efficient when treating larger volumes.
		Destruction and removal efficiencies up to 99.99%, thus reducing volume or organic wastes.	Subsequent treatment of inorganic contamination remaining in residual soil potentially required.		Could be used off base.
			Off-base treatment would require transportation because no local facilities are available.		Could be used in combination with other technologies for disposal of soil containing a range of contaminants.
			High clay/silt content may result in poor processing performance.		Potentially capable of treating a wide range of contaminants in soil.

Table 11. Summary of ARARs for Site WP21

Environmental laws and regulations	Consideration as an ARAR
1. RCRA (42 USC 6901-92k, esp. 6921-39e), Delaware Hazardous Waste Management Act(7 Del. Code Ann. 6301-19, esp 6303-07), Deleware Solid Waste Management Act(7 Del. Code Ann. 6401-60)	
A. Delaware Hazardous Waste Management Regulations (Delaware Regulations Governing Hazardous Waste [DRGHW])	
1. Standards applicable to containers and tanks (DRGHW Part 264, Subpart I and J)	During the action, soil may be dewatered. Contaminated water may be temporarily stored onsite tanks or containers awaiting treatment. The tanks and containers shall meet all the requirements of Part 264, Subpart I & J.
2. Standards applicable to waste piles (other than closure and post-closure requirments) (DRGHW Part 264, Subpart L)	Excavated soil may be temporarily stored in piles awaiting shipment for offsite disposal. The piles shall meet the requirments of DRGHW Part 264, Subpart L.
3. Transportion Standards (DRGHW Part 263)	Any shipment of hazardous waste off-base must comply with transporter standards and maanifesting requirments.
4. Land Disposal Restrictions (DRGHW Part 268)	Land disposal restriction and treatment requirments shall be met with respect to residuals generated by this alternative.
II. Deleware Environmental Control Act (7 Del. Code Ann. 6001-93) and Deleware Water Pollution Control Regualtions (11 Code of Del. Reg. 70 500-005)	
A. Deleware National Pollutant Discharge Elimination System (NPDES) Regulations (Delaware Water Pollution Control Regulations (DWPCR) Section 4	Discharge of groundwater contained in excavated soil to surface water shall meet NPDES requirements.
B. Delaware Industrial Waste Effluent (DWRCR Section 8)	The remedy may distrub the existing surface water drainage system. Effluents, from a surface water drainage system, may require pretreatment. Any effluent discharge to public owned treatment works (POTWs) shall meet pretreatment standards.
C. Delaware Water Quality Standars (DNREC Surface Water Quality Standards)	Effluents from the surface water drainage system shall not adversely affect water quality above acceptable limits.

Environmental laws and regulations	Consideration as an ARAR
III. Clean Water Act, 33 USC 1251-1387, esp. 1311-17	
A. Effluent guidelines (40 Code of Federal Regulations [CFR] 403)	Effluents, from surface water drainage systems, discharged to a POTW shall be subject to general pretreatment guidelines.
B. Ambient Water Quality Criteria (Federal Register 1980; 1985)	Erosion of soils during remediation activities may affect the surrounding surface water. Erosion shall be controlled during the remedial action to prevent violations of AWQC.
IV. Clean Air Act (42 USC Sections 7401-7671q)	
A. National Ambient Air Quality Standards (NAAQS)(40 CRF Part 50); Delaware Regulations Governing Control of Air Pollution (8 Code of Del. Reg. 70100 003 (NAAQS))	Excavation may cause VOC and fugitive dust emissions to the air. VOC and fugitive dust emissions shall be controlled according to the substantive requirements on an emission permit.
V. U.S. Department of Transportion Regulations (49 CFR Parts 170-179)	Waste shall be transported off-site for treatment or disposal in accordance with 49 CFR Parts # 170-179.
VI. Preservation of Scientific, Historic, or Achaeological Data (National Hsitoric Preservation Act 16 U.S.C. 470, 40 CFR 6.301(b), 36 CFR 800; Archaeological and Historic Preservation Act of 1974, 16 USC 469, 40 CFR 6.301(c); Historic Sites, Buildings, and Antiquities Act, 15 USC 461-467; 40 CFR 6.301(a), 36 CFR Part 65)	Scientific, historic, or archaeological sites are located in the vicinity of the site. Consultations with State Historic Preservation officials have been made.
VII. Deleware Erosion and Sedimentation Act(7 Delaware Code Annotated Chapter 40)	Disturbance of soil will require measures to control erosion. Erosion controls shall be implemented in accordance with the Delaware Erosion and Sediment Act.

and transport of the soil to the treatment facility. Protection from exposure to the facility workers is accomplished by the implementation of institutional controls and the use of proper protection equipment, such as respirators and protective clothing. Air pollution control equipment is used to minimize the threat of airborne contaminants. Air monitoring is used to ensure there is no significant threat from the inhalation of vapors or particulates.

2.7.6 Implementablility

Three main factors are considered under this criterion: technical feasibility, administrative feasibility, and availability of services and materials. Because the No Action Alternative does not provide any remedial actions, there are no technical or administrative difficulties associated with it. In addition, the No Action Alternative would not limit or interfere with the ability to perform future remedial actions.

Alternative 2 is technically and administratively feasible, and the required services and materials are readily available. The treatment alternative uses thermal desorption technology, which has been used for a number of years to treat volatile hazardous materials. It is easy to implement and is particularly applicable as a treatment alternative for VOCs. The technology is readily available, and several licensed facilities are located in the Mid-Atlantic Region of the U.S. for either treatment and/or disposal.

2.7.7 Cost

No direct costs are associated with the implementation of Alternative 1 (No Action). The estimated costs of the Alternative 2, including capital costs, annual O&M costs, and present net worth, are summarized in Table 12. Total cost for the Alternative 2 is estimated to be $653,725. The total amount of soil to be excavated from the IWBs, OWSs, lift station, and associated piping is estimated at 2600 cubic yards. The estimated soil volume requiring treatment, including packaging, transport, disposal, and a 15% "soil expansion" factor is 1400 cubic yards. Treatment and disposal costs were estimated at $35/ton. A conversion factor of 1.6 tons per cubic yard was used to compute costs.

2.7.8 Regulatory Acceptance

The USEPA and the State of Delaware have reviewed the alternatives and are in agreement with the selected remedy for Site WP21.

2.7.9 Community Acceptance

No comments were received during the public comment period and no community opposition to the selected remedy was noted.

2.8 SELECTED REMEDIAL ALTERNATIVE

The selected remedial action is Alternative 2, soil excavation with off-site treatment and disposal. The soil excavation and off-site treatment and disposal of contaminated soil shall be protective of human health and the environment, shall comply with ARARs, and shall offer long-term effectiveness. Excavation and off-site treatment is considered easy to implement and effective at treating the constituents of concern at the site. The selected alternative also meets the statutory preference for treatment.

2.9 PERFORMANCE STANDARDS

The selected Alternative shall meet the following performance standards: 1) excavation of soil, down to the water table within the boundaries outlined in Figure 4, and 2) if soil at the boundaries outlined on Figure 4, at any depth down to the water table, contains concentrations of any hazardous substance(s) listed in Tables 4 through 8 of this ROD that an greater than the CSOIL concentrations for the substances, all soil with hazardous substance(s) that exceed CSOIL concentrations shall be excavated.

2.10 STATUTORY DETERMINATION

Based on consideration of the requirements of CERCLA, the comparative analysis, and comments, DAFB, USEPA, and the State of Delaware believe Alternative 2 provides the best balance of the trade-offs among the alternatives with respect to the criteria used to evaluate remedies. The selected remedy is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, is cost-effective, and uses permanent solutions and alternative treatment to the maximum extent practicable.

The reliance on excavation, treatment, and disposal mechanisms for the cleanup of organic- and

inorganic-based media has been demonstrated at various sites around the country to be cost effective and, if properly monitored, is an environmentally sound solution to soil contamination. It results in permanent reduction in concentrations of contaminants in the subsurface. Therefore, Alternative 2 is the selected remedial action for the IWBs at Site WP21.

Table 12. Dover AFB, Site WP21 Cost Analysis
Alternative 2: Excavation, Off-Site Treatment and Disposal
Cost Estimating Worksheet (-30% to +50% Level)*

Cost component	Total capital cost*	Comments and references
1. Mobilization	$186,000	Includes site preparation activities for performing the excavation, site utilities hookups, construction of decon pad, etc.
2. Demolition and Excavation	$76,325	Includes demolition of piping, concrete cutting, lift station demolition, hauling, soil excavation, etc.
3. WP21 Restoration	$48,500	Includes removal of WP21 soil cap, hauling of excess soil, surveying, site restoration, etc.
4. Thermal Treament and Disposal	$99,900	Includes transporting, treating, and disposing of soil.
5. Demobilization	$12,000	Includes site demob and disconnection of utilities.
6. Reporting	$10,000	Documentation of site activities.
7. Contractor Costs - Direct	$433,625	
8. Profit, Insurance, Bonds, Permits	$86,700	
Total Direct Capital Costs	$520,325	
9. Contractoes costs - Indirect	$133,400	Includes engineering design and construction services.
Total Capital Costs	$653,725	

* All costs are rounded to the nearest significant dollar value. The following costs were estimated and provided by a vendor with an thermal desorption facility in New Castle, Delaware. The costs were based on an excavated soil volume from a 1.4-acre site. Factors and unit costs for soil expansion, packaging, transportation, actual treatment and actual disposal were not broken out. These vendor estimated costs are provided for information only.

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GLOSSARY

aquifer - A geologic formation capable of yielding water to wells and springs.

Applicable or Relevant and Appropriate Requirements (ARARs) - Criteria set forth by federal, state, or local regulations that must be considered in the evaluation of remedial alternatives and govern the environmental actions at a particular site.

Capital Cost - Cost incurred for the construction and startup of a facility.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)- A federal law passed in 1980 and revised in 1986 by the Superfund Amendments and Reauthorization Act (SARA). CERCLA provides federal authority and money for the USEPA to respond directly to the release or threatened release of hazardous substances into the environment at inactive sites.

The State of Delaware Department of Natural Resources and Environmental Control (DNREC)- State regulatory agency in charge of overseeing environmental programs at DAFB.

Feasibility Study - A study to develop and evaluate options for remedial actions.

Groundwater - Subsurface water residing in a zone of saturation.

Installation Restoration Program (IRP) - The Department of Defense (DOD) program designed to identify, report, and correct environmental deficiencies at DOD installations. At DAFB, this program implements the requirements for cleanup under CERCLA.

leachate - The solubilization and transport of constituents in soil through the percolation of surface water to groundwater.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) - The federal regulation that provides a contingency plan for discharges or releases of hazardous substances, pollutants, contaminants, or oil into the environment that may present an immediate danger to public health or welfare.

Operation and Maintenance Costs (O&M) - Annual costs incurred for operation and maintenance of a facility.

Record of Decision (ROD) - A legal document that explains the specific clean-up alternative to be implemented at a Superfund site.

Remedial Action Objective (RAO) - Cleanup goal established for remediation.

Remedial Investigation (RI) - An investigation that involves sampling the air, soil, and water to determine the nature and extent of contamination at an abandoned wage site and the human health and environmental risks that result from that contamination.

Resource Conservation and Recovery Act (RCRA) - Federal law enacted to address environmental issues created by current waste disposal, spills, and handling practices.

Selected Alternative - The cleanup strategy that offers the best chance of success in protecting human health and the environment from contamination at a site. The selected alternative is selected from several clean-up strategies because it satisfies USEPA criteria for effectiveness, implementability, cost, and public and regulatory acceptance.

Superfund Amendments and Reauthorization Act (SARA) - A congressional act that modified CERCLA. SARA was enacted in 1986 and again in 1990 to authorize additional funding for the Superfund program.

U.S. Environmental Protection Agency (USEPA) - The federal regulatory agency in charge of overseeing environmental programs at DAFB.

RESPONSIVENESS SUMMARY

(None received)