EPA/ROD/R03-01/567
2001

EPA Superfund
Record of Decision:

LETTERKENNY ARMY DEPOT (SE AREA)
EPA ID: PA6213820503
OU 08
CHAMBERSBURG, PA
07/27/2001

Final

Record of Decision for Phase II Parcels

Letterkenny Army Depot
Chambersburg, Pennsylvania
(SEARCH OU-08)

Delivery Order 0008
Contract Number DACA31-94D-0063

Prepared for

U.S. Army Corps of Engineers
Baltimore District
Baltimore, Maryland

Prepared by

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July 2001

W.O. No. 02281.016.008

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Acronyms

LIST OF ACRONYMS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	contaminant (chemical) of concern
DCA	1,1-dichlorethane
DCE	1,2-dichlorethene
DSERTS	Defense Site Environmental Restoration Tracking System
EPA	U.S. Environmental Protection Agency
ft	feet
LEAD	Letterkenny Army Depot
LIDA	Letterkenny Industrial Development Authority
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PCB	polychlorinated biphenyl
PDO	Property Disposal Office
QA/QC	quality assurance/quality control
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SE	Southeastern
SVOC	semivolatile organic compound
VOC	volatile organic compound
WESTON®	Roy F. Weston, Inc.

Declaration for the ROD

LETTERKENNY ARMY DEPOT

PHASE II PARCELS

CHAMBERSBURG, FRANKLIN COUNTY, PENNSYLVANIA

DECLARATION FOR THE RECORD OF DECISION

JULY 2001

SITE NAME AND LOCATION

Phase II BRAC Parcels
Letterkenny Army Depot
Chambersburg, Franklin County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

The Base Realignment and Closure Act of 1988 (Public Law 100-526, 102 , Statute 2623) (BRAC 88) and the Defense Base Realignment and Closure Act of 1990 (Public Law101-510, 104 Statute 1808) (BRAC 91, 93, 95) designated more than 100 Department of the Army facilities for closure and/or realignment. In 1995, the United States Secretary of Defense ("1995 BRAC Commission") submitted a recommendation to Congress that Letterkenny Army Depot (LEAD) in Chambersburg, Pennsylvania, be selected for realignment. As a result of the recommendations of the 1995 BRAC Commission, the U.S. Department of Army (Army) must realign (i.e., change) the mission at LEAD. As part of the realignment, approximately 1,465 acres at LEAD have been designated for release (i.e., to-be-excessed or transfer of ownership).

The Army's strategy has been to first identify parcels with little or no environmental contamination and prepare them for transfer to a local redevelopment authority known as the Letterkenny Industrial Development Authority (LIDA). Before each property transfer, the Army, in consultation with the U.S. Environmental Protection Agency (EPA) and the Commonwealth of Pennsylvania, investigates the property for hazardous substances that may have been stored, disposed of, or released there. If necessary, the Army and EPA, in consultation with Pennsylvania, select a remedy designed to protect human health and the environment.

The first set of parcels that the Army identified were the "Phase I parcels," which were transferred to LIDA in 1998.

This Record of Decision (also referred to as the "ROD") presents the selected remedy for the second set of parcels, the "Phase II parcels," which consist of 51 parcels covering a total of approximately 374 acres.

The groundwater beneath the Phase II parcels is known to be or potentially is contaminated with volatile organic compounds (VOCs). To expedite transfer, the Army and LIDA have defined the Phase II parcels to exclude the groundwater. The Phase II parcels are defined to include only the surface structures and soil to a depth of 8 feet below ground surface (ft bgs), which is above the seasonal high groundwater table.

The remedy presented in this ROD was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

This document is issued by the Army, the owner of the property and the lead agency under CERCLA, and EPA. The Pennsylvania Department of Environmental Protection (PADEP) (on behalf of the Commonwealth of Pennsylvania) concurs with the selected remedy.

Assessment of the Site

VOCs have been released into the groundwater beneath LEAD, including the Phase II parcels. In addition, hazardous substances have been released into the soil at an area near the Gate 1 Guardhouse (Building 511) and at a few areas referred to as the "former PCB transformer sites" ("PCB" refers to a group chemicals called polychlorinated biphenyls).

The Army and EPA, in consultation with PADEP, have determined that no action is necessary to protect public health or welfare or the environment from the soil at the Phase II parcels, with the exception of soil in an area near the Gate 1 Guardhouse, Building 511.

The remedy selected in this ROD is necessary to protect public health or welfare, or the environment from actual or threatened releases of hazardous substances into the environment.

Description of the Selected Remedy

Remedies for contamination at the Phase II parcels and for the groundwater beneath the parcels are proceeding in several steps. The Army, EPA, and PADEP are currently developing alternatives for a final remedy for the groundwater contamination. In the meantime, this ROD selects an interim remedy, known as "institutional controls," to protect human health from contamination in the groundwater while a final remedy is developed.

At the majority of the Phase II parcels, the Army found no evidence of releases of hazardous substances into the soil. At the few areas where there was evidence of a release (the former PCB transformer sites), the concentrations of hazardous substances are so low that the property can be used for any purpose without unacceptable risk to human health or the environment, with one exception. The exception is an area near the Gate 1 Guardhouse, Building 511. This area may be used for commercial/industrial use without unacceptable risk to human health. However, use of this area for less restrictive uses, such as residential purposes, may pose unacceptable health risks. Therefore, EPA and the Army are selecting institutional controls for the area near the Gate 1 Guardhouse to prevent uses less restrictive than industrial/commercial (such as residential use). This is the final remedy for this area.

For CERCLA administrative purposes the areas where there are known or suspected releases of hazardous substances at LEAD are being evaluated in groups of areas, or groups of type of media (such as groundwater), referred to as "operable units" (OUs). Portions of the Phase II parcels are a subset of soil OU 8, also referred to as SE OU 8, which is located in the part of LEAD referred to as the "Southeastern Area" ("SE Area"). There are three groundwater OUs located below the BRAC Phase II parcels: one in the part of LEAD referred to as the "Property Disposal Office Area" ("PDO Area") (PDO OU 2); and two in the SE Area (SE OU 3 and SE OU 10). These OUs are being addressed separately from the soil OUs and final response actions with regard to VOC groundwater contamination will be presented at a later time in the RODs for these OUs.

There is no "principal threat waste" at the Phase II parcels, i.e., no waste source material that is highly toxic or highly mobile, and that generally cannot be reliably contained or would present a significant threat to human health or the environment should exposure occur.

The institutional controls selected in this ROD consist of deed restrictions and environmental deed provisions for the Phase II parcels. The deed restrictions and the environmental provisions will include the following restrictions:

- Restricting the Gate 1 Guardhouse (Building 511) area to commercial/industrial use (e.g., no residential or daycare use allowed).
- Prohibiting soil excavation, digging, drilling, or other soil-disturbing activities below a depth of 3 ft above the water table without the prior approval of the Army. The 3-ft layer of soil above the water table will be called the "3-ft buffer zone" in this document.
- Prohibiting access to or the use of the groundwater underlying the Phase II parcels without the prior approval of the Army, PADEP, and EPA.
- Prohibiting construction of any subsurface structure for human occupation without the prior approval of the Army, PADEP, and EPA.

In addition, LIDA's final reuse plan calls for industrial/commercial use for the majority of the Phase II parcels, and zoning restrictions imposed by Greene Township (in which most of the Phase II parcels lie) preclude residential use of land in that township. The specific deed restrictions will be coordinated with the regulators and the public as part of a "Finding of Suitability to Transfer" the Phase II parcels.

An agreement among the Army, EPA, and PADEP to implement and maintain the institutional controls will be contained in a "Land Use Control Assurance Plan," which will be executed prior to transfer of the Phase II parcels. The site-specific plan to implement and maintain the institutional controls will be contained in the "Land Use Control Implementation Plan," which will be prepared as an attachment to the Land Use Control Assurance Plan.

Statutory Determinations

The Army and EPA, in consultation with PADEP, have determined that no action is necessary to protect public health or welfare, or the environment from the soil at the Phase II parcels, with the exception of soil in an area near the Gate 1 Guardhouse, Building 511.

The selected remedy for the soil near the Gate 1 Guardhouse, Building 511, 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 utilizes permanent solutions and alternative treatment (or resource recovery) technology to the maximum extent practicable. This remedy does not meet the statutory preference for treatment as a principal element because EPA generally does not expect to use treatment technology where, as here, contamination in soil exists at low concentrations; the contamination is neither highly toxic nor highly mobile; and the risks to humans from the soil are within acceptable limits if the property is used for commercial/industrial purposes.

The selected interim remedy for groundwater beneath the Phase II parcels is protective of human health and the environment in the short term and is intended to provide adequate protection until a final groundwater remedy is selected; waives those Federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost-effective. Under CERCLA, this interim remedy need not comply with applicable or relevant and appropriate requirements (ARARs) of Federal and state environmental laws where, as here, the interim remedy is only part of a total remedial action that will attain such requirements when completed. See CERCLA Section 121(d)(4)(A). The final remedy for groundwater is expected to comply with ARARs of Federal and state environmental laws or justify a waiver of these requirements in accordance with CERCLA.

The groundwater remedy is an interim solution only, and is not intended to utilize permanent solutions and alternative treatment (or resource recovery) technologies

to the maximum extent practicable for groundwater. Because this action does not constitute the final remedy for the groundwater beneath LEAD, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed by the final response action. Subsequent actions are planned to fully address the threats posed by the groundwater contamination at LEAD.

Because the selected remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted closure, a statutory review will be conducted within 5 years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The 5-year review will include an evaluation of the interim groundwater remedy (institutional controls) to determine if deed restrictions related to groundwater can be removed when a final groundwater remedy is implemented. Because the selected remedy includes an interim action for groundwater, review of this site and remedy will be ongoing as the Army, EPA, and PADEP continue to develop remedial alternatives for groundwater.

ROD Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for LEAD.

- # **Chemicals of concern and their respective concentrations:** Section 5, *Site Characteristics*, page 10, and Section 7, *Summary of Site Risks*, page 15.

- # **Baseline risk represented by the chemicals of concern:** Section 7, *Summary of Site Risks*, page 15.

- # **Cleanup levels established for chemicals of concern and the basis for these levels:** This is not addressed because cleanup levels were not established, no removal/treatment is necessary for the soils, and groundwater actions are interim measures.

- # **How source materials constituting principal threats are addressed:** This item is not addressed in the ROD because none of the known source areas for the VOC-contaminated groundwater are in the Phase II parcels. The soils in the Phase II parcels do not pose a principal threat according to EPA guidelines. Although the groundwater beneath the Phase II parcels is contaminated, addressing a final remedy for groundwater contaminated with VOCs above acceptable risk-based levels it is not within the confines of this ROD and will be addressed by the final groundwater response action.

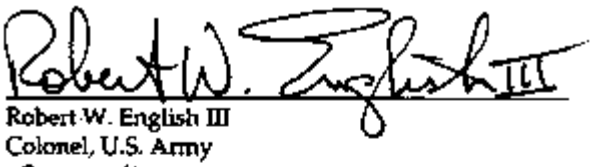
- # **Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD:** Section 6, *Current and Potential Future Land and Resource Uses*, page 14.

- # **Potential land and groundwater use that will be available at the site as a result of the selected remedy:** Section 12, *Selected Remedy*, page 31.

- # **Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected:** Section 9, *Description of Alternatives*, page 26.

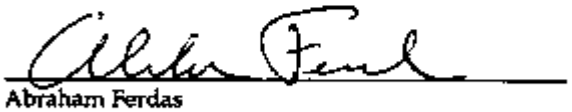
- # **Key factor(s) that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision):** Section 10, *Summary of Comparative Analysis of Alternatives*, page 28.

Authorizing Signatures



Robert W. English III
Colonel, U.S. Army
Commanding
Letterkenny Army Depot

18 JUL 2001
Date



Abraham Ferdas
Director, Hazardous Sites Cleanup Division
EPA, Region III

7/27/01
Date

ROD Decision Summary

LETTERKENNY ARMY DEPOT

PHASE II PARCELS

CHAMBERSBURG, FRANKLIN COUNTY, PENNSYLVANIA

DECISION SUMMARY

JULY 2001

SECTION 1

SITE NAME, LOCATION, AND DESCRIPTION

INTRODUCTION

Letterkenny Army Depot (LEAD) is located in south-central Pennsylvania in Franklin County, 5 miles north of the Borough of Chambersburg (see Figure 1). The Depot covers 19,243 acres, most of which is devoted to ammunition storage (16,614 acres). There are two areas within LEAD that are listed on the National Priorities List (NPL). They are the Property Disposal Office (PDO) Area and the Southeastern (SE) Area. These two areas are separated by a major groundwater/surface-water drainage divide, as depicted in Figure 2. The industrial and maintenance areas, which are primarily located in the southeastern corner of LEAD, encompass approximately 2,500 acres and include warehousing, vehicle storage, administration, industrial/maintenance, recreational activities, and housing. The infrastructure of this area includes roads; permanent, semipermanent, and temporary structures; and utilities. Approximately 1,465 acres at LEAD have been designated for "realignment" under the Base Realignment and Closure (BRAC) initiative. "Realignment" means that the mission at LEAD is to change and approximately 1,465 acres at LEAD have been designated for release (i.e., "to-be-excessed" or transfer of ownership). The BRAC area is concentrated in the southeastern portion of LEAD, but is located in both the PDO and SE Areas. The BRAC area is being transferred to the Letterkenny Industrial Development Authority (LIDA) in phases. The Phase I parcels were transferred in 1998. The Phase II parcels are defined as follows: structures and property to a depth of 8 feet below the ground surface (ft bgs) (which is above the seasonal high groundwater table). The Phase II parcels consist of 51 parcels located in both the PDO and SE Areas, and encompass approximately 374 acres designated by the U.S. Army and LIDA.

What is BRAC?

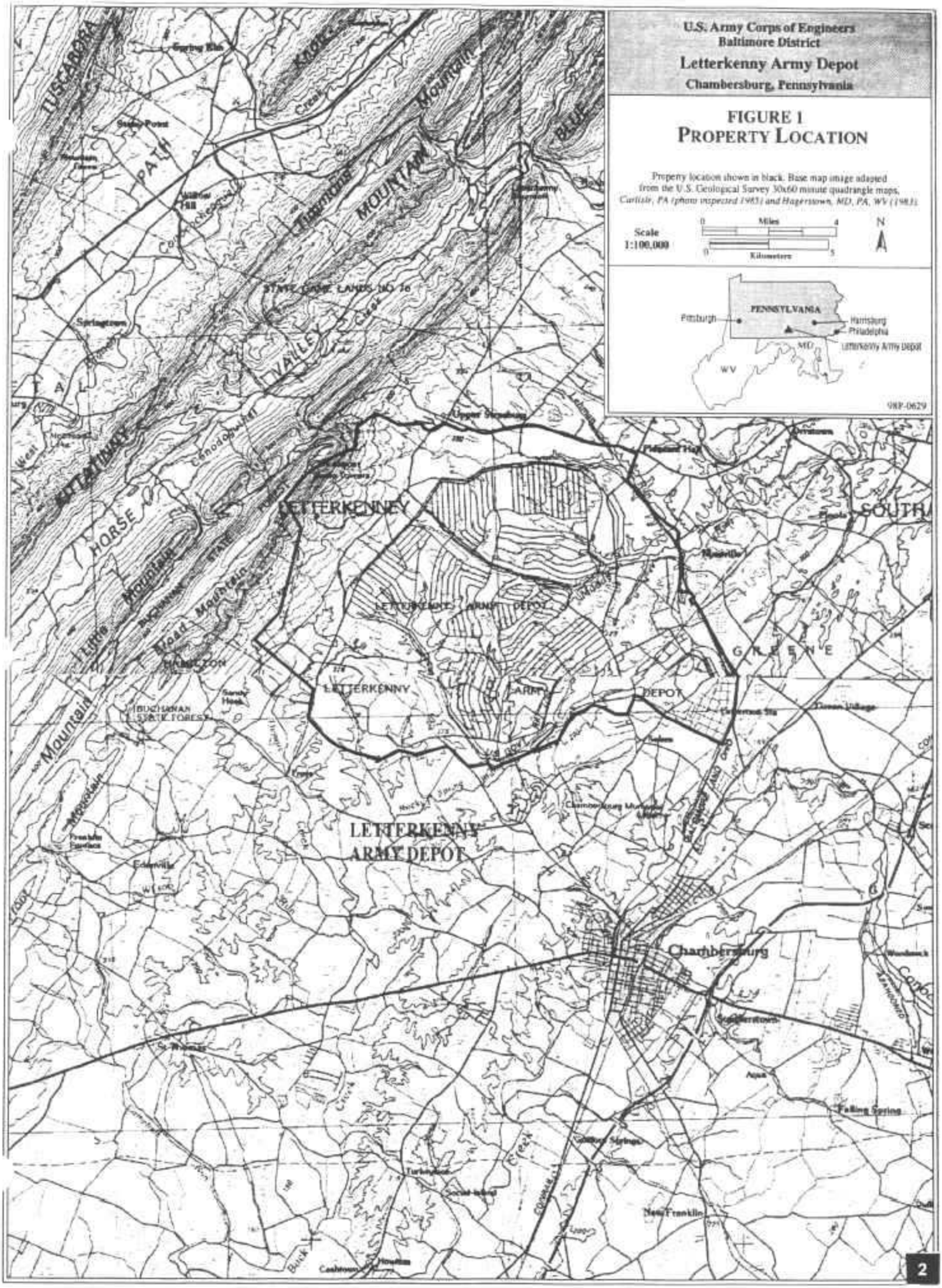
The Base Realignment and Closure Act of 1988 (Public Law 100-526, 102 Statute 2623) (BRAC 88) and the Defense Base Realignment and Closure Act of 1990 (Public Law 101-510, 104 Statute 1808) (BRAC 91, 93, 95) designated more than 100 Department of the Army facilities for closure and/or realignment. In 1995, the U.S. Secretary of Defense ("1995 BRAC Commission") submitted a recommendation to Congress that Letterkenny Army Depot (LEAD) in Chambersburg, Pennsylvania, be selected for "realignment." As a result of the recommendations of the 1995 BRAC Commission, the U.S. Department of the Army (Army) must realign (i.e., change) the mission at LEAD and transfer ownership of property referred to as the "BRAC parcels" or "BRAC area."

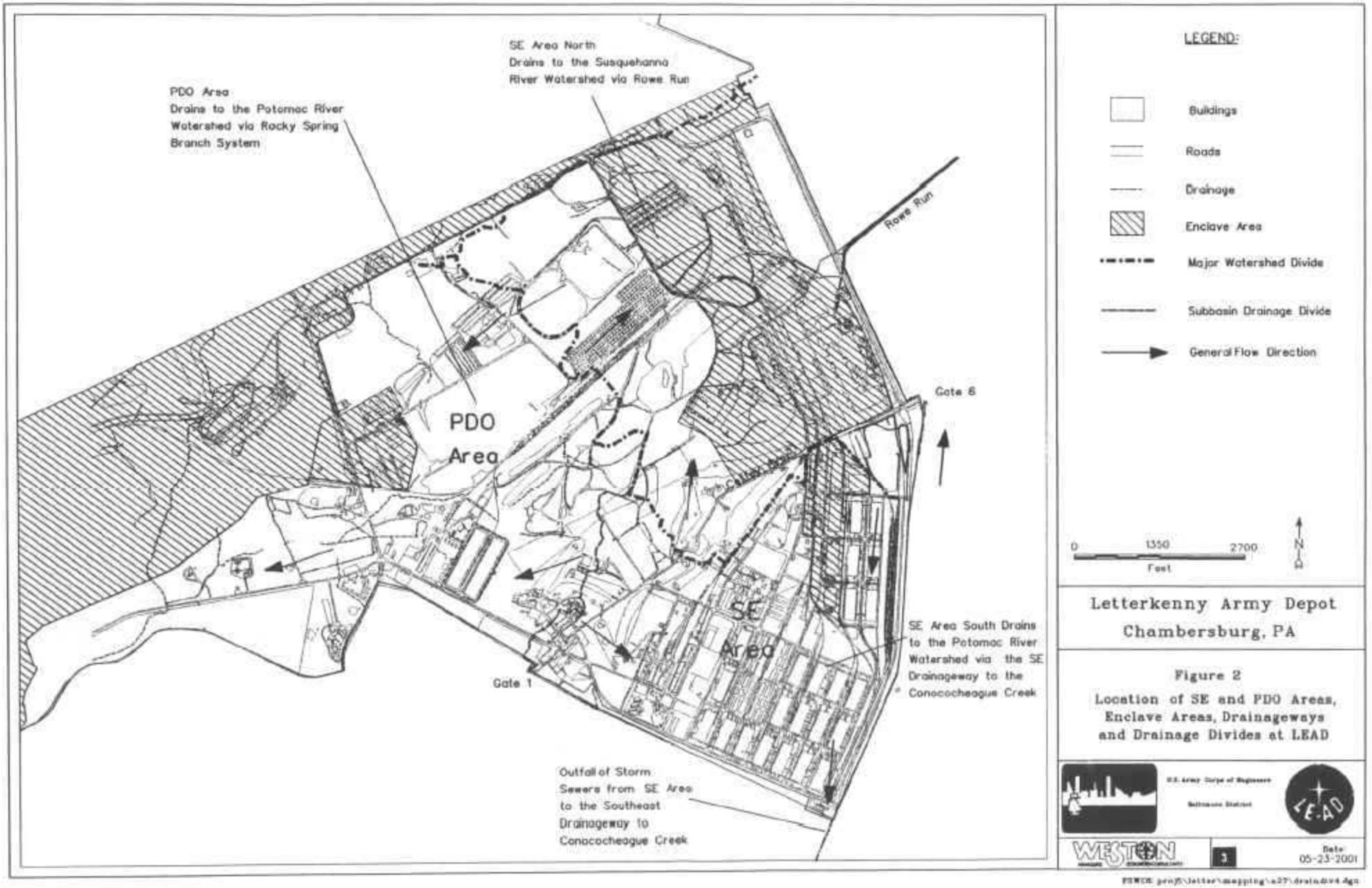
As part of the realignment of the LEAD mission, an environmental baseline survey was completed for the BRAC area. The environmental baseline survey process includes visual inspections of the property as well as record reviews and personnel interviews, which are used to document current and historical conditions with regard to use, storage, or release of hazardous substances and petroleum products.

The environmental baseline survey process is used to identify areas within the BRAC parcels that need further investigation, normally referred to as site or remedial investigations. These are studies typically consisting of sampling and analysis (to see if chemicals are present) of soil, sediment, and/or groundwater and other techniques to identify releases to the environment and to provide data for evaluating potential risks to future users of the land.

Also as part of the BRAC process, the Army prepares a "Finding of Suitability to Transfer" document that provides information to the U.S. Environmental Protection Agency (EPA), the Pennsylvania Department of Environmental Protection (PADEP), the public, and LIDA concerning the environmental condition of the buildings and land being transferred. The Finding of Suitability to Transfer also contains any specific deed restrictions related to environmental issues.

This Record of Decision document, also referred to as a "ROD," addresses soils in the Phase II parcels located in both the PDO and SE Areas, and addresses an interim action for groundwater beneath the Phase II parcels, because the groundwater beneath the Phase II parcels is known


U.S. Army Corps of Engineers
Baltimore District
Letterkenny Army Depot
Chambersburg, Pennsylvania
FIGURE 1
PROPERTY LOCATION
Property location shown in black. Base map image adapted from the U.S. Geological Survey 30x60 minute quadrangle maps, Carlisle, PA (photo inspected 1983) and Hagerstown, MD, PA, WV (1983).
Scale 1:100,000
0 Miles 4
0 Kilometers 5
N
PENNSYLVANIA
Pittsburgh
Harrisburg
Philadelphia
Letterkenny Army Depot
MD
WV
98P-0629
LETTERKENNY ARMY DEPOT
Chambersburg
Falling Spring
New Franklin



Letterkenny Army Depot
Chambersburg, PA

Figure 2
Location of SE and PDO Areas, Enclave Areas, Drainageways and Drainage Divides at LEAD

U.S. Army Corps of Engineers
Baltimore District

LEAD

WESTON

3

Date
05-23-2001

to be or potentially is contaminated. The Army, EPA, and PADEP are currently developing alternatives for a final remedy for the contaminated groundwater beneath LEAD. After the groundwater remedy has been determined to be operating properly and successfully, the Army will transfer the subsurface Phase II parcels to LIDA.

This ROD: (1) addresses and provides the rationale for the selected remedy for contaminated groundwater beneath the Phase II parcels; (2) addresses and provides the rationale for the selected remedy for soils at the Gate 1 Guardhouse, Building 511; and (3) addresses public comments concerning the selected remedy. The evaluation of the remedial alternatives for the soils at the Gate 1 Guardhouse area is documented in the *Feasibility Study Report for the Gate 1 Guardhouse, Building 511* (WESTON, 2001a). In addition, this ROD includes summaries of other cleanup alternatives evaluated for use at the Phase II parcels.

The portion of the Phase II parcels referred to as the Gate 1 Guardhouse, Building 511 (part of Phase II, designated as Parcel 2R-80), is to be transferred to LIDA with deed restrictions to limit the future use of the parcel to commercial/industrial use. The future use of the Phase II parcels is currently planned as community use for Parcel 2-74, residential or community use for Parcel 2-75, and commercial/industrial use for the remaining parcels.

The U.S. Army is the owner of the property and the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA and PADEP have roles as support agencies. The Army and EPA are issuing this ROD. PADEP, on behalf of the Commonwealth of Pennsylvania, concurs with the selected remedy.

NATURAL RESOURCES

The property included in the Phase II parcels consists of industrial land, developed land, small stands of trees, open grassy areas, agricultural areas, and roadways. No wetlands are located within the Phase II parcels, and no Federal or state threatened or endangered species are known or suspected to exist within the Phase II parcels.

PHASE II PARCELS

LIDA developed a list of priority buildings and parcels based on their potential for reuse and redevelopment. The Phase II parcels represent those buildings and properties identified by LIDA that the Army deems environmentally suitable for transfer at this time. This decision is documented in the Finding of Suitability to Transfer for the Phase II parcels (May 2001).

A total of 51 parcels have been selected for the Phase II parcel transfer. The groundwater beneath all of the Phase II parcels is known to be or is potentially contaminated with volatile organic compounds (VOCs) and is being remediated separately. As a result of the groundwater VOC contamination, the Phase II parcels are limited to the property that includes buildings, structures, and soil from the ground surface down to a depth of 8 ft bgs, which is above the seasonal high groundwater table. Total VOC concentrations up to 60 micrograms per liter (µg/L) and 112 µg/L have been detected in groundwater in the PDO and SE Areas, respectively. The final groundwater remedial alternatives are being addressed separately as part of groundwater operable units (OUs) PDO OU 2, SE OU 3, and SE OU 10 (see "Glossary of Terms" for definition of "operable unit").

Of these parcels, 37 are located in the SE Area, 5 parcels are located in the PDO Area, and 9 parcels are located on roadways within both the PDO and SE Areas. The locations of these parcels in the PDO and SE Areas are depicted in Figure 3. The roadway parcels are shown in Figure 4.

The identification codes of the parcels are as follows:

Parcels within the SE Area:

- Parcel 2-35
- Parcel 2-36
- Parcel 2-37
- Parcel 2-38
- Parcel 2-39
- Parcel 2-40
- Parcel 2-41
- Parcel 2-42
- Parcel 2-43
- Parcel 2-44
- Parcel 2-45
- Parcel 2-46
- Parcel 2-47
- Parcel 2-48
- Parcel 2-49
- Parcel 2-50
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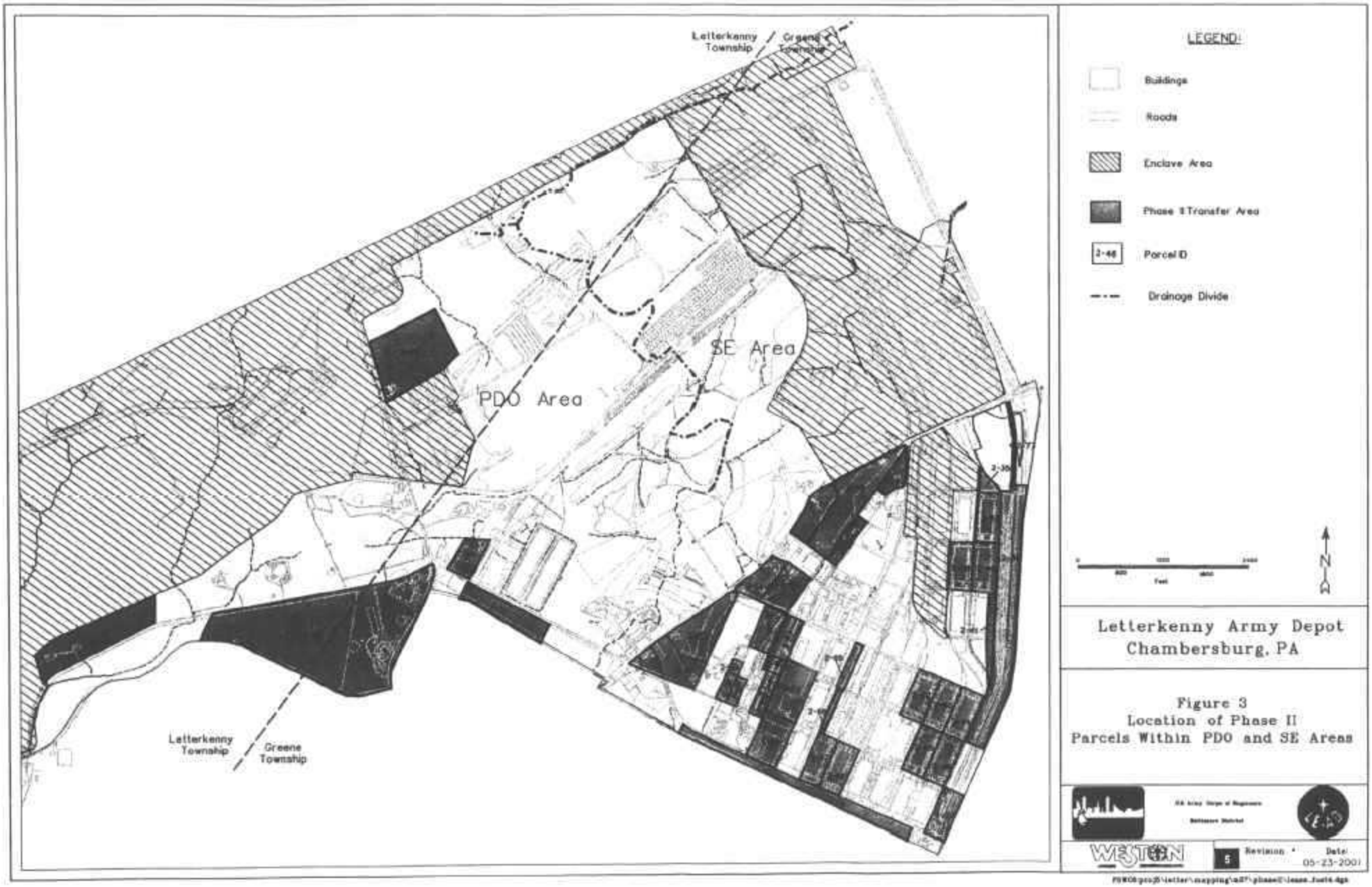
- Parcel 2-57



Letterkenny Army Depot
Chambersburg, PA

Figure 3
Location of Phase II
Parcels Within PDO and SE Areas

WESTON

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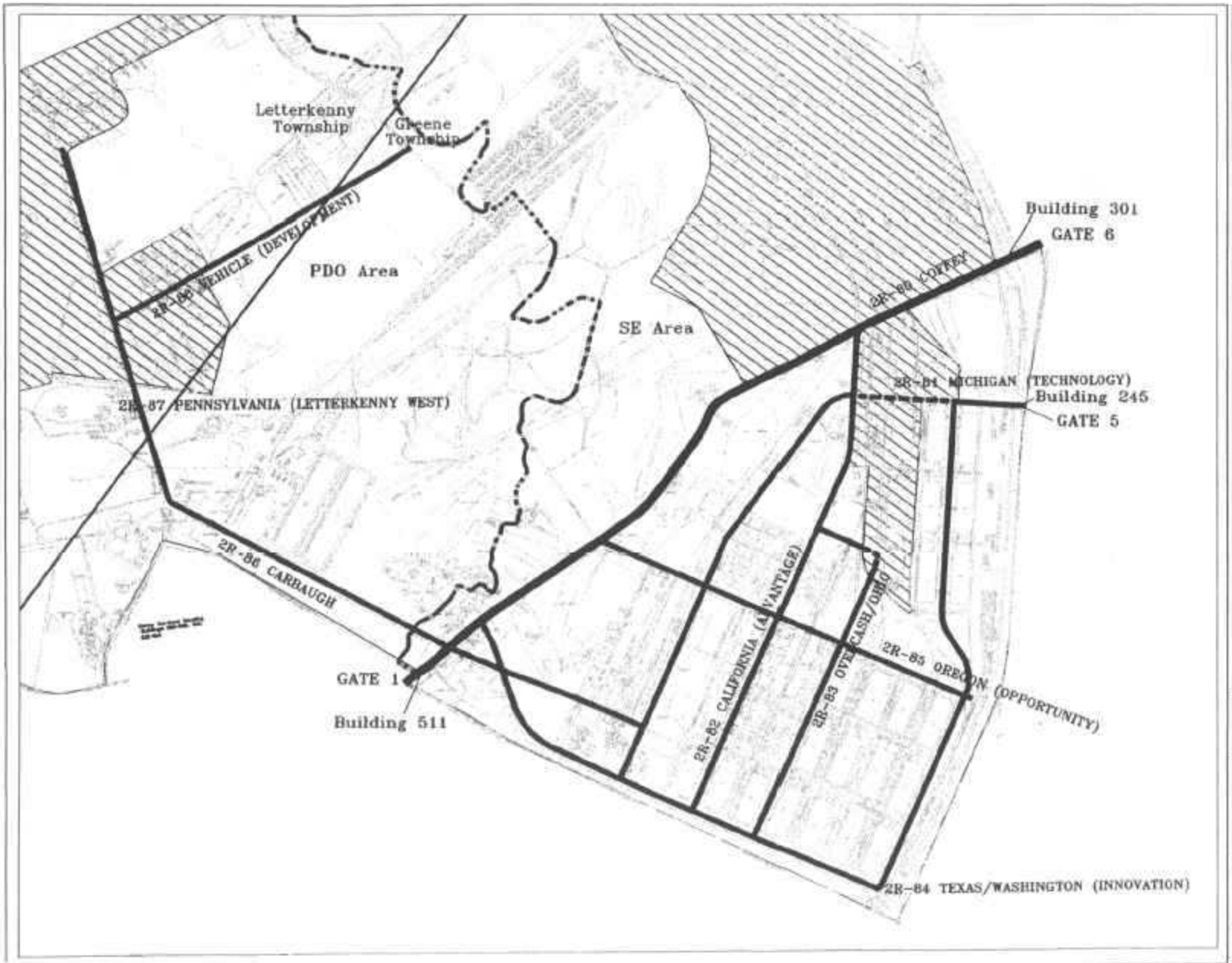
Revision

Date
05-23-2001



Legend:

- Buildings
- Roads
- Enclave Area
- Dashed portions of the road parcels are located in the Enclave area and will not be transferred. Public access to these roads will be permitted.
- Road Parcel

2R-85 = Phase II Parcel ID
Oregon(Opportunity) = LEAD Road Name
(LIDA Designated Road Name)

- Drainage Divide
- Township Line

0 4000
Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 4
Location of Phase II
Road Parcels at LEAD

WESTON

- # Parcel 2-58
- # Parcel 2-59
- # Parcel 2-60
- # Parcel 2-61
- # Parcel 2-62
- # Parcel 2-63
- # Parcel 2-64
- # Parcel 2-65
- # Parcel 2-66
- # Parcel 2-67
- # Parcel 2-68
- # Parcel 2-69
- # Parcel 2-70
- # Parcel 2-77

Parcels within the PDO Area:

- # Parcel 2-71
- # Parcel 2-72
- # Parcel 2-74
- # Parcel 2-75
- # Parcel 2-76

Parcels on Roadways:

- # Parcel 2R-80
- # Parcel 2R-81
- # Parcel 2R-82
- # Parcel 2R-83
- # Parcel 2R-84
- # Parcel 2R-85
- # Parcel 2R-86
- # Parcel 2R-87
- # Parcel 2R-88

SECTION 2
SITE HISTORY AND ENFORCEMENT ACTIVITIES

HISTORY OF SITE ACTIVITIES

Prior to the establishment of LEAD in 1942, the area consisted of agricultural and forest lands. The area was predominantly single-family farms used for both subsistence and commercial purposes.

The Letterkenny Ordnance Depot was established in January 1942 as an ammunition storage facility. In subsequent years, the following missions were added:

- # Reserve storage and export advance storage of parts, tools, supplies, and equipment for combat vehicles, artillery, small munitions, and vehicle fire control equipment (1943).
- # Receipt and storage of hardware, heavy-duty trucks, and parts (1944).
- # Establishment of transport and combat vehicle shops and expansion of the maintenance program (1947).
- # Establishment of a rebuild system for guided missile ground control, launching, and handling equipment; missile propellant systems; and internal guidance systems (1954).
- # Assignment of the special weapons mission (1958).
- # Designation of the Depot as the Eastern Equipment Assembly Area (1959). This mission gave the Depot responsibility for the handling and shipment of equipment for guided missile and special weapons units to overseas locations.
- # Acceptance and destruction of contaminated U.S. Air Force missile fuel (1961).
- # Letterkenny Ordnance Depot renamed as Letterkenny Army Depot (1962).
- # Disposal of explosive ordnance generated from the Army as well as state and local police (1964).
- # Maintenance and storage of U.S. Air Force missiles (1966).
- # Receipt, storage, and dispersal of batteries and tires to Army units (1972).
- # Operation of a washout facility to reclaim explosives from munitions (1973).

These operations consisted of cleaning, stripping, painting, lubrication, and plating activities, which involved the use of solvents, blast media (such as sand from sandblasting operations), paints, chemicals, petroleum products, and metals. Storage, spills, releases, and disposal of these materials led to the current environmental concerns at LEAD.

SUMMARY OF PREVIOUS SITE INVESTIGATIONS

Studies initiated since 1979 have concluded that toxic materials associated with operations at LEAD, along with uncertain past disposal practices and the nature of the hydrogeological regime, offered significant potential for contamination by chlorinated hydrocarbons and subsequent contaminant migration. Between 1980 and the present, numerous environmental investigation programs were conducted at LEAD to evaluate potential contamination in the soil and groundwater at the Depot. In 1986, EPA ranked the LEAD SE Area (including the Disposal Area and the Southeast Industrial Area) and the PDO Area under the Uncontrolled Hazardous Waste Site Ranking System, and proposed these two areas for inclusion on the NPL. The SE Area was placed on the NPL in

July 1987. The PDO Area was added to the NPL list in March 1989. Investigations and remedial actions are currently underway at both NPL sites.

Previous investigations specific to the Phase II parcels are discussed in Section 5 and under the BRAC paragraph in this section.

HISTORY OF CERCLA COMPLIANCE ACTIVITIES

Since the listing of the two NPL sites at LEAD, all of the remedial activities at the site have been Army-led, in coordination with EPA Region III and PADEP South-central Region. No other potentially responsible parties have been identified.

As a result of the proposed NPL ranking, the U.S. Army Toxic and Hazardous Materials Agency, later renamed the U.S. Army Environmental Center, took the initiative in conducting the response actions at LEAD in accordance with Executive Order 12316 and a Memorandum of Understanding of 12 August 1983. The Executive Order was signed on 14 August 1981 by President Reagan. It delegates to the Secretary of Defense the authority to take the lead on CERCLA activities at Federal facilities. The Memorandum of Understanding is between EPA and the U.S. Department of Defense. It defines the relationship for Federal facilities to take the lead on such activities with EPA input.

Executive Order 12580 was signed in January 1987, which superseded Executive Order 12316. This Executive Order transferred authority for site investigations and remedial actions at Federal facilities to the secretaries of the applicable Federal agencies.

On 3 February 1989, a Federal Facilities Agreement was reached under CERCLA Section 120 among the U.S. Department of Defense, EPA, and PADEP (EPA, Army, and PADEP, 1989).

The 1989 Federal Facilities Agreement established the framework for the CERCLA response actions at LEAD and required the review of all documents concerning the investigation of environmental contamination at LEAD produced prior to the Federal Facilities Agreement.

The PDO Area encompasses approximately 1,490 acres in the southern portion of the Depot. It extends approximately south from the southern end of the combat vehicle test track southwest to Rocky Spring Lake. The groundwater in the PDO Area becomes surface-water discharge at Rocky Spring, which flows into the Rocky Spring Branch of the Conococheague Creek, and eventually into the Potomac River. Six OUs exist within the PDO Area. The following is a description of each OU in the PDO Area:

- OU 1: Source Area Soils (soil from the oil burn pit and drum storage revetments).
- OU 2: PDO Area Groundwater and Surface Water.
- OU 3: Mercury Detections in Rocky Spring Lake.
- OU 4: Groundwater Associated with the Oil Burn Pit.
- OU 5: Polychlorinated Biphenyl (PCB) Investigation of the Rocky Spring System.
- OU 6: BRAC Waste Sites.

The response action in this ROD concerns areas in PDO OU 2 (groundwater below the parcels) and PDO OU 6. OU 2 was originally established when the Federal Facilities Agreement was signed. OU 4 was created in December 1992 based on the results of the 1993 Final PDO OU 1 and OU 2 Remedial Investigation Report. The creation of OU 4 allowed for the continued remedial response at OU 2, while additional investigations were conducted at OU 4. OU 6 is comprised of waste sites, located in the to-be-excessed (BRAC) part of the PDO Area, that were identified as part of the environmental baseline survey process.

A draft ROD was completed for OU 2 that identified a response action for groundwater based on the LEAD property line as the surface-water point of compliance. PADEP concluded that the point of compliance is at the springhouse discharge, where water with VOCs exceeds surface-water criteria. Therefore, the response action for groundwater is currently being re-evaluated.

Investigations are continuing and long-term sampling has commenced at OU 2 (to support a future final ROD). Investigations, risk assessments, and feasibility studies are currently being conducted for OU 6 (see the "Glossary of Terms" for definitions of remedial investigation, risk assessment, and feasibility study).

The SE Area consists of the Southeast Industrial Area and the Disposal Area, and encompasses approximately 1,136 acres. A total of 10 OUs exist within the SE Area. The following is a description of each OU in the SE Area:

- OU 1: K Area Contaminated Soils.
- OU 2: Industrial Wastewater Sewers and Contaminated Soils.

- OU 3: VOC-Contaminated Groundwater North of Gate 6.
- OU 4: Stormwater Sewers and Contaminated Sediments.
- OU 5: Areas A and B Contaminated Soils.
- OU 6: SE Area Off-Post Groundwater.
- OU 7: Truck Open Storage Area/Waste Oil Sump.
- OU 8: BRAC Waste Sites (including the former PCB transformer sites and the Gate 1 Guardhouse, Building 511).
- OU 9: Landfill J; near Building 320.
- OU 10: Southern Southeast Industrial Area VOC-Contaminated Groundwater South of Gate 6.

The response action in this ROD concerns areas in SE OU 3 and SE OU 10 (groundwater below the parcels), and SE OU 8 (Phase II parcels). Site/remedial investigations, risk assessments, and feasibility studies are currently being conducted at SE OU 8; investigations and risk assessments have been completed for some portions of SE OU 8. Investigations associated with on-post VOC-impacted groundwater have been conducted for BRAC sites in SE OU 8 under SE OU 3 and SE OU 10. Both SE OU 3 and SE OU 10 are currently in the focused feasibility study stage (see the "Glossary of Terms" for a definition of focused feasibility study). Six groundwater pilot studies have been completed. An extended groundwater pilot study is currently ongoing for SE OU 10.

BASE REALIGNMENT AND CLOSURE (BRAC)

The majority of the administrative, industrial, and housing facilities at LEAD have been designated for "release" ("to-be-excessed" or transfer of ownership of property) from the U.S. Army based on the decision of the 1995 BRAC Commission to realign the LEAD mission. The land designated for release will be transferred to LIDA in a manner that follows BRAC program guidance.

The Ammunition Area (Ammo Area), and selected portions of the industrial/administrative area, will be retained to support LEAD's continuing mission. The retained area is also known as the "Enclave Area."

The LEAD BRAC Cleanup Team was established in 1995 to facilitate the environmental issues involved with the realignment at LEAD. The BRAC Cleanup Team is composed of the LEAD BRAC Environmental Coordinator and the Remedial Project Managers from EPA Region III and PADEP. The BRAC Cleanup Team meets on a monthly basis to discuss environmental issues related to the transfer of property at LEAD. The goal of the BRAC Cleanup Team is to streamline decisions, and to work together toward innovative and timely techniques to facilitate the timely transfer of property.

As part of the realignment of the LEAD mission, an environmental baseline survey was completed for the BRAC parcels. The environmental baseline survey process includes visual inspections of the property as well as record reviews and personnel interviews, which are used to document current and historical conditions with regard to use, storage, or release of hazardous substances and petroleum products. The LEAD environmental baseline survey was finalized in August 1996 (WESTON, 1996). The final Community Environmental Response Facilitation Act letter report, which contains a map showing the environmental conditions at LEAD, was finalized in March 1997. An addendum to the environmental baseline survey, which updated environmental conditions, was finalized in April 1999 (WESTON, 1999a). A follow-up document, Supplement 1 to the environmental baseline survey, was finalized in November 2000 (WESTON, 2000a). This document included several buildings not covered in the environmental baseline survey or the addendum. None of the parcels and buildings covered under this ROD were identified as having any environmental concerns, aside from the Gate 1 Guardhouse and the documented VOC groundwater contamination. None of the Phase II parcels contribute to the documented VOC groundwater contamination in the PDO and SE Areas. Of the Phase II parcels, only those areas that contain or formerly contained transformers that contained PCBs in the past (parts of Parcels 2-36, 2-38, 2-45, 2-50, and 2-55) and the Gate 1 Guardhouse, Building 511 (part of Parcel 2R-80), were identified as needing further study.

Site investigations, remedial investigations, and screening level risk assessments have been completed for the Phase II parcels. Site investigations, remedial investigations, and screening level risk assessments have been completed or are currently underway for other BRAC parcels that have not yet been transferred. A CERCLA site investigation and risk screening was performed on the Phase II parcels to determine if the sites could be cleared for transfer and reuse pursuant to the BRAC program.

The future use of the Phase II parcels is currently planned as community use for Parcel 2-74, residential or community use for Parcel 2-75, and

commercial/industrial use for the remaining parcels. The portion of the Phase II parcels referred to as the Gate 1 Guardhouse, Building 511 (part of Parcel 2R-80), is to be transferred to LIDA with deed restrictions to limit the future use of the parcel to commercial/industrial use. LIDA's final reuse plan (as referenced by the Memorandum of Agreement between the Army and LIDA) specifies the intended future use of the parcels. In addition, zoning restrictions imposed by Greene Township preclude residential use of the BRAC parcels in that township.

SECTION 3
COMMUNITY PARTICIPATION HIGHLIGHTS

Pursuant to CERCLA Section 113(k)(2)(B)(i-v) and Section 117, the Proposed Plan for the Phase II parcels at LEAD was released to the public for comment on 20 February 2001. This document was made available to the public, in the Administrative Record, located in Building 618 at LEAD, and in the Coyle Free Library in Chambersburg.

The notification of the Proposed Plan public meeting was published in *The News Chronicle*, *The Record Herald*, and *The Public Opinion* on 16 February 2001. A public comment period was held from 20 February 2001 to 22 March 2001. On 22 February 2001, a public availability session was held at the Building 10 Letterkenny Great Room to present the Proposed Plan (in the form of a poster presentation) and to entertain questions and comments from the public. A summary of the community participation process is provided in the Responsiveness Summary, which is included as part of this ROD. There were no comments received during the public comment period, and there were no comments or questions during the public availability session.

SECTION 4
SCOPE AND ROLE OF RESPONSE ACTION

The response action selected for the Phase II parcels is a final action with regard to soils at the Gate 1 Guardhouse, and an interim measure with regard to VOC-contaminated groundwater, which together address the environmental concerns at the Phase II parcels. This response action is limited to the Phase II parcels, and is **NOT** intended as a final measure to address the VOC-contaminated groundwater OUs (PDO OU 2, SE OU 3, and SE OU 10). Final remedial actions for these OUs are being developed separately. A draft ROD was prepared for PDO OU 2; further investigations are continuing at PDO OU 2. SE OU 3 and SE OU 10 are in the focused feasibility study stage.

The environmental threat posed by the conditions at the Phase II parcels is the potential exposure to contaminated groundwater and the potential exposure to soils at the Gate 1 Guardhouse area (Parcel R-80), should the property be used for nonindustrial (e.g., residential) purposes. Implementation and enforcement of the selected remedy (institutional controls) will mitigate the potential for exposure and will facilitate the reuse of the property.

The role of the response action selected for the Phase II parcels is to mitigate environmental threats at the properties while making the parcels available for beneficial reuse in a timely manner.

SECTION 5
SITE CHARACTERISTICS

The following information is presented to document the site characteristics of the Phase II BRAC parcels. Some of the environmental setting information is general to all of LEAD, with specific references to the Phase II parcels as appropriate. The Phase II parcels consist of approximately 374 acres. There are no wetlands or other ecologically sensitive areas located in the Phase II parcels. In addition, there are no areas of significant historical or archaeological importance in the Phase II parcels. The information pertaining to the site conceptual model and the nature and extent of contamination is presented following the environmental setting discussion.

ENVIRONMENTAL SETTING

Topography and Surface Drainage

LEAD is located in the Great Valley section of the Valley and Ridge Province of the eastern United States, and is referred to locally as the Cumberland Valley. The Cumberland Valley trends northeast to southwest through central Pennsylvania and is bordered to the west by the Appalachian Mountain Province. The South Mountain section of the Blue Ridge Province is situated east of Chambersburg and marks the eastern edge of the Cumberland Valley.

The Cumberland Valley is characterized by southwest-trending limestone ridges and valleys. The valley floors are filled with rocks of the

Martinsburg, Formation. Weathering of the folded and faulted underlying geological formations imparts a gently rolling aspect to the local topography. The majority of LEAD is located within the Martinsburg Shale terrain, except for bands of carbonate rocks along the eastern and western edges of LEAD. The PDO Area and the Southeast Industrial Area of LEAD are underlain by limestone. Figure 2 shows the general locations of the PDO and SE Areas. Surface elevations throughout LEAD range from approximately 600 to 750 ft above mean sea level, except for the northwestern portion of LEAD, where the elevation increases abruptly to more than 2,300 ft above mean sea level in the vicinity of Broad Mountain (EA, 1991).

Streams cutting through the limestone terrain flow through broad, open valleys and are usually intermittent. In contrast to this, streams cutting through the upper shale units of the Martinsburg Formation usually meander in small, steep-walled valleys and are perennial. Surface drainage at LEAD is divided into two watersheds—the Susquehanna River to the northeast and the Potomac River to the southwest. Both the Susquehanna and Potomac Rivers eventually drain into the Chesapeake Bay.

Surface water from the Phase II parcels located in the PDO Area flows to drainage ditches, and then ultimately flows to the Potomac River watershed via the Rocky Spring Branch system.

Two major stormwater drainage systems serve the southeastern portion of LEAD and contribute to local surface drainage. One system serves the area north of Coffey Avenue and discharges near the industrial wastewater treatment plant into the discharge ditch (located north of the industrial wastewater treatment plant), which discharges to Rowe Run; no Phase II parcels drain to this system. The other stormwater system serves the southeastern warehouse area (where the SE Area Phase II parcels are located). Stormwater is discharged at the stormwater outfall into the southeastern drainageway, which discharges to the Conococheague Creek. Figure 3 illustrates the major drainage divides at LEAD.

Geology

LEAD straddles two major structural features—the South Mountain anticlinorium to the east and the Massanutten synclinorium to the west. The eastern portion of the Depot (underlain by carbonate rocks) is part of the anticlinorium, whereas the western portion of the Depot (underlain by shale) is part of the synclinorium. These structures resulted from folding that occurred during the close of the Paleozoic era. High-angle reverse faulting accompanied the folding of rocks in the eastern portion of LEAD. Several major faults, which strike north to northeast and dip to the southeast at fairly steep angles, cross the PDO Area (WESTON, 1984).

In the vicinity of LEAD, the Great Valley is floored by Ordovician age carbonate rock, as well as Ordovician age shale and greywacke of the Martinsburg Formation. The five formations occurring at LEAD are the shales of the Martinsburg Formation, the limestones of the Chambersburg Formation and the St. Paul Group, the limestones and dolomites of the Rockdale Run Formation, and the dolomites of the Pinesburg Station Formation. These geological formations are fractured and deformed to varying degrees from past geological activity (ESE, 1993a).

Two major faults, the Pinola fault and the Letterkenny fault, and several other unnamed faults, extend through the LEAD site boundary. Although an east-to-west cross fault was identified between these two faults, both the position and surface trace are open to question (Becher and Taylor, 1982).

The Letterkenny fault is one of the few faults in the region that parallels the tectonic grain, yet is an early formed, eastward-dipping, thrust that moved material from within the syncline up onto the anticline to the west (EA, 1991).

The Pinola fault, located west of the Letterkenny fault, is considered to be an east-dipping, high-angle, thrust fault (because older beds are located east of the fault). Because it is almost impossible to trace faults through the Martinsburg terrain, the fault trace is projected through the Martinsburg Formation on the basis of a ridge-forming unit that extends through it (Becher and Taylor, 1982).

Hydrogeology

The regional surface-water flow system of Franklin County controls the general groundwater flow patterns within LEAD. The surface-water drainage divide, discussed previously, also divides the groundwater flow system into two basins. Groundwater elevation contours within LEAD generally reflect surface topography. The water table is located at moderate depth in areas of topographic highs, and is shallow near stream valleys and other topographic lows (ERM, 1995).

The shale and carbonate rock that underlie LEAD have been disturbed and faulted during deformational events that ultimately formed the Great Valley. The two major faults located within the confines of LEAD (the Pinola fault and the

Letterkenny fault) influence groundwater flow. Where faulting is present and dissimilar rocks have been brought into contact, the fault tends to act as a barrier to groundwater movement, occasionally in low-lying areas forcing water within the formation to discharge as a fault spring. Where similar rocks are in contact along a fault (i.e., two limestone units), the groundwater movement may be only minimally affected (ERM, 1995).

Fracture systems within the Martinsburg Formation are generally small but are numerous and well connected, thus allowing groundwater to generally follow a regional flow path. Groundwater flow within the limestone of the Chambersburg Formation and St. Paul Group is more complex because it occurs predominantly through more isolated fractures and solution cavities typical of karst terrain. Fractures in the limestones are mostly aligned with the regional northeast tectonic grain and are much more irregular and widely spaced than those in the adjacent shales. Where solution cavities are present in the limestone, groundwater flow more closely resembles open channel flow rather than the fracture flow described previously. The quantity and density of fractures and solution cavities within the limestone units are generally greatest in the upper 150 ft and generally decrease with depth. During three-quarters of the year (high and base flow conditions) groundwater levels are above the soil-bedrock interface.

Leaching or resuspension of any materials or potential contaminants buried in the overburden soils may be enhanced during high water table conditions (ERM, 1995).

Groundwater "recharge" occurs primarily through precipitation. "Recharge" refers to replenishing of supplies of groundwater. Recharge areas occur throughout the central part of LEAD, wherever fractured and jointed sandstone, siltstone, and shale bedrock are close to the surface. Actual points of recharge for the limestone aquifers have not been determined; however, the most likely routes are the many faults, joints, and sinkholes present at LEAD (ERM, 1995).

Groundwater underlying LEAD generally occurs under unconfined conditions, with local areas of artesian conditions. These artesian conditions occur along a moderately steep slope located near the northwestern edge of LEAD in the Ammunition Area.

Soils

Surface soils present at LEAD are predominantly shaley to very shaley silt loams that developed through weathering of the Martinsburg Shale and the interbedded siltstones and sandstones. According to the Soils Survey Bulletin of Franklin County, these soils have been classified as part of the Weikert-Berks-Bedington Association. Soils on the eastern edge of LEAD associated with the limestone have been identified as part of the Hagerstown-Duffield Association. These soils are deep, level or sloping, somewhat poorly drained, and mostly rocky, silty, clay loams. Along the western side of LEAD, outside the BRAC area, are soils of both the Laidig-Very stony land-Buchanan Association (formed from sandstone) and the Morrill-Laidig Association (formed on the foot of mountain slopes).

NATURE AND EXTENT OF CONTAMINATION

Soil

Numerous studies have been conducted in both the PDO and SE Areas at LEAD. These studies identified several areas of soil contamination. None of the identified soil contamination areas that require action lie within the Phase II parcels. Based on the environmental baseline survey, several of the Phase II parcel areas underwent limited investigations of the soils to rule out the potential for soil contamination due to past operations. The remainder of the Phase II parcels were determined to be unaffected by activities at LEAD and, therefore, investigations and sampling were not warranted.

To facilitate the transfer of the Phase II BRAC parcels where limited sampling was performed, a screening level risk assessment for human health effects was performed. The screening level risk assessment is a screening protocol (including comparison of the results to available risk-based criteria) that was developed by the Army, EPA, and PADEP, as discussed in more detail in Section 7 of this ROD.

The results of the screening level risk assessment indicated that there was an acceptable risk due to potential direct contact with and/or inhalation of very low levels of PCBs in soil and concrete at the former PCB transformer sites based on future unlimited use and unrestricted exposure. In addition, the results of the Gate 1 Guardhouse screening level risk assessment indicated that there was acceptable risk based on the current and future industrial/commercial use. However, based on an

unlimited use scenario (i.e., residential or daycare), the results of the Gate 1 Guardhouse screening level risk assessment showed unacceptable risk due to potential direct contact with and/or inhalation of low levels of polyaromatic hydrocarbons and arsenic present in soil.

These results support the conclusion that no remedial action is necessary to protect public health, welfare, or the environment at the Gate 1 Guardhouse based on the intended future use of the site, but that remedial action is necessary for unlimited use and unrestricted exposure (i.e., residential or daycare use). In addition, these results support the conclusion that no remedial action is necessary to protect public health, welfare, or the environment at the former PCB transformer sites.

A No Further Action Decision Document has been prepared to close out the former PCB transformer areas of concern. This ROD for the Phase II parcels documents the decision to limit the use of the Gate 1 Guardhouse (Building 511) area to commercial/industrial use, and to prohibit residential or daycare use of this area. There were no constituents of concern associated with the former PCB transformer sites; therefore, a discussion of the site conceptual model for soils is not necessary. There were no constituents of concern for the Gate 1 Guardhouse based on the intended future use; there are constituents of concern based on unlimited use and unrestricted exposure. Potential exposure routes for soils at the Gate 1 Guardhouse are direct contact (including ingestion) and inhalation of chemicals that are contained in soil in the area. Information pertaining to the soil investigations at the former PCB transformer sites and the Gate 1 Guardhouse is discussed in more detail in the following paragraphs.

Former PCB Transformer Sites (Parcels 2-36, 2-38, 2-45, 2-50, and 2-55)

The Phase II parcel identification numbers and the buildings closest to where the former PCB transformers were located are as follows:

- Parcel 2-36 (Building 211)
- Parcel 2-38 (Building 7)
- Parcel 2-45 (Building 42)
- Parcel 2-50 (Building 18)
- Parcel 2-55 (Building 436)

Parcel 2-36 is approximately 27 acres in size and is located on the eastern boundary of LEAD. The parcel is currently comprised of a railroad yard (Yard #1), a perimeter patrol road, open grassy areas, and Buildings 211 and 245. A PCB-containing transformer was removed in January 1994.

Parcel 2-38 is approximately 5.5 acres in size and is located north of Building 8 and east of Building 4. The parcel consists of Buildings 7 and 1-7, and parking areas. Three PCB-containing transformers were removed in April 1993.

Parcel 2-45 is approximately 5.3 acres in size and is located north of Building 52 and east of Building 43. The parcel contains Building 42. A PCB-containing transformer was removed in April 1995.

Parcel 2-50 is approximately 2.9 acres in size and consists of some open storage space and Building 18. The parcel is located south of Building 38-1 and west of Michigan Avenue. Two PCB-containing transformers were present at Parcel 2-50; one was removed in November 1986 and the other in January 1988.

Parcel 2-55 is approximately 0.7 acre is size and is located north of Carbaugh Avenue and west of New York Avenue. The parcel consists of Building 436. Two transformers, at least one of which contained PCBs, were located on a utility pole on this parcel; the transformers were removed in January 1995. The transformer was associated with Building 426 for sampling purposes, but is located in Parcel 2-55.

A detailed description of the former PCB transformer site investigation is presented in the *Decision Document, Former PCB Transformer Sites in the Southeastern (SE) Area* (WESTON, 2000b). In 1980, a sampling program was conducted at LEAD under the Toxic Substances Control Act to determine the PCB content of the electrical transformers. Some of these transformers were located within the boundaries of the Phase II parcels within the SE Area.

Once these PCB-containing transformers were identified they were tracked in a program where they were checked every 3 months for leaks. There are no known records indicating that any of the PCB-containing transformers in the BRAC parcel leaked prior to removal.

A field-sampling program was conducted in 1999 to determine if there was PCB contamination at these sites. Soil and asphalt/concrete chip samples were collected adjacent to the former PCB-transformer locations. Samples were focused toward stained and/or vegetatively stressed areas. PCBs were detected in low concentrations in asphalt and soil samples, ranging from 0.051 J to 0.340 J milligrams per kilogram (mg/kg). (The “J” following the

numbers is a ”data qualifier.” It means that the samples definitely contained PCBs, but the concentrations of PCBs in the samples could not be precisely measured and are estimates.) Potential human health risks at the former PCB transformer sites were evaluated by screening the sample results against the risk-based screening criteria developed in the screening level risk assessment process and standards contained in the Toxic Substances Control Act regulations. The analytical results indicated that none of the sampling locations had PCB concentrations in excess of the 1 mg/kg cleanup level as defined in the Toxic Substances Control Act regulations. Note that the Toxic Substances Control Act cleanup level of 1 part per million PCBs was used to evaluate the potential risk from the concrete/asphalt samples because it is difficult to evaluate human health risk from PCBs in concrete or asphalt using standard risk assessment calculations. These locations are Building 7 in Parcel 2-38 and Building 42 in Parcel 2-45; the levels of PCBs detected do not pose an unacceptable risk to human health.

The analytical results from the soil samples collected from the former PCB transformer site at Parcel 2-50 (Building 18), the former PCB transformer site located near Building 211 (Parcel 2-36), and the former PCB transformer site near Building 436 (Parcel 2-55) indicated that the levels of PCBs detected do not pose an unacceptable risk to human health.

Gate 1 Guardhouse (Building 511) (Parcel 2R-80)

Parcel 2R-80 is approximately 15.3 acres in size and consists of Coffey Avenue between Gate 1 and Gate 6. The parcel includes Buildings 301 (Gate 6 Guardhouse) and 511 (Gate 1 Guardhouse). Building 511 serves as the gatehouse for entrance No. 1 to LEAD but is now vacant. Information from employee interviews and site records indicated that the building was heated by a furnace fueled by a 300-gallon heating oil aboveground storage tank formerly located adjacent to the building. An underground storage tank (still in place) was used to store the heating oil prior to the use of the aboveground storage tank. An investigation was completed to determine if the underground storage tank had released any petroleum in the past. The details of the investigation are documented in the *Gate 1 Guardhouse RI/RA* (WESTON, 2001b).

The Gate 1 Guardhouse (Building 511) is located in Parcel 2R-80. Soil samples were collected from the vicinity of the guardhouse due to the presence of an abandoned underground storage tank at the site. Concentrations of polyaromatic hydrocarbons ranging from 0.039 J to 50 mg/kg, and some metals, including arsenic concentrations (ranging from 4.2 to 11 mg/kg), exceeded the human-health risk-based concentrations for residential soils. However, the screening level risk assessment found that the level of risk was acceptable (based on EPA guidelines) based on a scenario of industrial/commercial use.

Groundwater

VOC-contaminated groundwater is known to exist or is suspected to be present beneath the Phase II parcels in the PDO and SE Areas. The primary chemicals of concern (COCs) detected are trichloroethene,1,1,1-trichloroethane, 1,1-dichlorethane,.1,2-dichloroethene, and tetrachloroethene, all of which have been detected at concentrations exceeding their respective maximum contaminant levels. Total VOC concentrations up to 60 micrograms per liter (µg/L) and 112 µg/L have been detected in groundwater in the PDO and SE Areas, respectively. Risk assessments were performed for groundwater beneath the Phase II parcels, as discussed in more detail in Section 7 of this ROD, *Summary of Site Risks.* The conclusions of these risk assessments were that there is no unacceptable level of health risk from the groundwater pathways as long as groundwater use is restricted and the depth to groundwater is 3 or more feet away from (below) the floor or the workspace (including the bottom of the excavation floor for construction and utility work). This 3-ft (or more) space is called a “buffer zone.” A detailed site conceptual model for the groundwater is not presented herein because this ROD focuses on soils (i.e., the ROD supports the limited depth property transfer of the Phase II parcels, which does not include groundwater). However, the conceptual model for routes of exposure for groundwater is presented in Section 7, *Summary of Site Risks.*

SECTION 6
CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

LAND USE

The majority of the land in the Phase II parcels portion of the SE Area is used for industrial, commercial (office space), and storage (warehousing) activities. There are areas of open land (including the golf course) interspersed in the Phase II parcels in the SE Area, which are

characterized as maintained grassy areas and small groves of trees.

The Phase II parcels in the PDO Area consist of former base housing buildings, industrial activities, and open areas, some of which are leased for agricultural activities. Open lands in the Phase II parcels in the PDO Area include: large groves of secondary growth deciduous trees; grassy, maintained areas; vegetated natural and manmade drainageways; and fallow fields. To the west and north/northwest of the Phase II parcels in the SE Area are the PDO Area and the Ammunition Area of LEAD, respectively.

In accordance with the LEAD reuse strategy report and discussions between the Army and LIDA, the future use of the Phase II parcels scheduled to be transferred to LIDA is planned for commercial/industrial use, with community/open space reuse for Parcel 2-74 and residential or community/open space use for Parcel 2-75. The majority of the Phase II parcels in the SE Area will continue to be used for industrial, commercial (office space), and storage (warehousing) activities. LIDA currently has specified plans in-place for industrial development at several Phase II parcels. One of the Phase 11 parcels in the PDO Area was leased for agricultural purposes; this area may continue to be leased by LIDA for agricultural use for the next few years. Parcel 2-74 is to be transferred to the Chambersburg Area School District with a planned future use as open space, community, agricultural (for education), and/or educational. Parcel 2-75 is to be transferred to the Chambersburg Area School District with continued use as residential housing, open space, community, agricultural (for education), and/or educational.

GROUNDWATER USE

When LEAD was first constructed, Rocky Spring served as the Depot's water supply. In the 1950s a groundwater study prepared for the U.S. Army Corps of Engineers (USACE) concluded that there was not a viable source of groundwater available within LEAD boundaries to supply the Depot's new industrial mission (Acker, 1995). LEAD subsequently built a 300-million-gallon reservoir in Roxbury that continues to serve as the Depot's water supply.

The only use of groundwater in the area is off-post of LEAD, where some homes use individual water wells to supply their needs. Groundwater is also used off-post of LEAD as a water supply for livestock. Any homes on well water that exceeded the EPA regulatory value, which is referred to as the maximum contaminant level, were initially supplied with bottled water, and later connected to public water.

Currently, there are restrictions on the on-post groundwater at LEAD (i.e., the groundwater is not used for drinking, irrigation, cooling, or any other purpose on Depot because of VOC contamination). Upon transfer of the Phase II parcels to LIDA, the groundwater underlying the parcels will not be used for any purpose without the prior written approval of the Army, PADEP, and EPA. The groundwater use restrictions will be imposed through the environmental provisions of the property deed and a Land Use Control Assurance Plan.

SURFACE-WATER USE

There are no surface water bodies in the Phase II BRAC parcels.

SECTION 7
SUMMARY OF SITE RISKS

Based on the results of the environmental baseline survey (WESTON, 1996, 1999a, 2000a), the Phase II parcels containing the Gate 1 Guardhouse (Parcel 2R-80) and several former PCB transformer sites (Parcels 2-36, 2-38, 2-45, 2-50, and 2-55) were found to have elevated levels of chemicals in soils. These levels indicated that hazardous substances have been released into the soil at some of the Phase II parcels, including an area near the Gate 1 Guardhouse. Prior to an evaluation of risk, it was thought that these chemicals could potentially pose human health risks to people who may be exposed to those soils. Therefore, for these sites, a screening level risk assessment was conducted to determine if the human health risk associated with potential exposure to soils was within a range considered acceptable by the Base Closure Team.

A screening level risk assessment compares the concentrations of hazardous substances in soil to chemical concentrations corresponding to fixed levels of risk, e.g., a lifetime cancer risk of one-in-one-million (1-in-1,000,000 or 1×10^{-6}). Not as comprehensive as a baseline risk assessment, it nevertheless incorporates the principal technical elements of a baseline assessment. The Army, EPA Region III, and PADEP reviewed and agreed upon the screening level risk assessment methodology. The screening level approach is consistent with EPA policy, *Land Use in the CERCLA Remedy Selection Process* (Office of Solid Waste and Emergency

Response [OSWER] Directive No. 9355.7-04, 25 May 1995) (EPA, 1995). The approach is outlined in Figure 2-1 in Attachment 2 to this ROD. The screening level risk assessment process is described in more detail in the inset on the following page.

In addition to soil contamination at the Gate 1 Guardhouse and the former PCB transformer sites, VOCs have been released into the groundwater underlying a number of the Phase II parcels in the PDO and SE Areas; a number of other chemicals were also found in groundwater. The health risks associated with current and potential future exposure to groundwater at the PDO and the SE Area sites were evaluated in the documents:

- *Risk Assessment of the Property Disposal Office Area at Letterkenny Army Depot Operable Units 1 and 2, Final Report* (ESE, 1993b).

- *Risk Assessment of the Southeastern Area at Letterkenny Army Depot Operable Units One and Three, Final Report* (ESE, 1994).

Summaries of the media-specific human health evaluations are provided in the following subsection.

The remedy selected in this ROD is necessary to protect public health or welfare or the environment from actual releases of hazardous substances into the environment.

The Army and EPA, in consultation with PADEP, have determined that no action is necessary to protect public health or welfare or the environment from the soil at the Phase II parcels, with the exception of soil in an area near the Gate 1 Guardhouse.

SUMMARY OF HUMAN HEALTH RISKS

A multistep process was used in the screening level risk assessments that were performed for soils of the Gate 1 Guardhouse and the former PCB transformer sites, as well as the baseline risk assessments for the groundwater underlying the Phase II parcels. The steps and the technical elements of each of those steps used in the baseline risk assessment and the screening level risk assessments are provided in the inset on this page.

Human health risks were evaluated for exposures to contaminants (also referred to as chemicals of concern [COCs]). COCs are chemicals that are found in site media, such as soil, groundwater, or air, that are identified for further risk evaluation based on a number of factors. These factors include the chemical's degree of toxicity, concentration, frequency of detection, and chemical properties important to the release, transport, and potential to come in contact with people. COCs are specific to each site and medium of concern (e.g., soil, air, groundwater).

WHAT IS RISK AND HOW IS IT CALCULATED?
Baseline Risk Assessment

A CERCLA human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a CERCLA site, the Army, EPA, and PADEP undertake a four-step process:

Step 1: Identification of Chemicals of Concern
Step 2: Exposure Assessment
Step 3: Toxicity Assessment
Step 4: Risk Characterization

In Step 1, the concentrations of contaminants found at a site, as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable), are considered. Comparisons between site-specific concentrations and concentrations reported in past studies help determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure are considered. Using this information, a "reasonable maximum exposure" (RME) scenario is calculated, which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, the information from Step 2 is used in combination with information on the toxicity of each chemical to assess potential health risks. There are two types of risk: cancer risk and noncancer risk. The likelihood of any kind of cancer resulting from a CERCLA site is generally expressed as an upperbound probability; for example, a "1-in-1,000,000 chance." In other words, for every 1,000,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that 1 more person could get cancer than would normally be expected to from all other causes. For noncancer health effects, a "hazard index" (HI) is calculated. The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which noncancer health effects are no longer predicted.

In Step 4, a determination is made on whether site risks are great enough to cause health problems for people at or near the CERCLA site. The results of the three previous steps are combined, evaluated, and summarized. The potential risks from the individual exposure pathways are added to provide the total risk.

The completion of the dual-step screening level risk assessment process and subsequent site-specific background (i.e., reference) data comparison is intended to provide the necessary information to facilitate a decision by the BRAC Cleanup Team to recommend site clearance or a more detailed investigation such as additional sampling or a baseline risk assessment.

WHAT IS RISK AND HOW IS IT CALCULATED?
Screening Level Risk Assessment

The screening level risk assessment process is a streamlined approach for identifying potential contaminants of concern (COCs) and estimating health risks at sites (also referred to here as parcels) not known or not expected to have widespread contamination. The first step (i.e., Level 1) in the human health screening level risk assessment process determines the potential COCs by comparing the maximum levels of chemicals found at the site to published (or calculated using published EPA guidance) risk-based benchmarks, also referred to as screening levels, developed for sites to be used for residential purposes. This method measures risks to human health by comparing concentrations of hazardous substances found in the soil with theoretical concentrations developed by EPA and PADEP, which are considered not to pose an unacceptable risk to human health. Chemicals that have maximum concentrations greater than the lowest benchmark are carried into the second step of the evaluation. Residentially based benchmarks are more conservative than those based on industrial use, and at the request of EPA Region III, are used to ensure that a conservative list of potential COCs is selected.

For sites that have chemicals exceeding the Level 1 screen, the assessment of potential health effects is refined in the second step (i.e., Level 2) by calculating estimates of the cancer and noncancer risks for those potentially exposed to soils at the site. This is done by first determining the "exposure point concentration" for each chemical by statistically evaluating the site data. The "exposure point concentration" represents a concentration of chemicals(s) that a person at the site may be exposed to, in a worst case. Then site-specific, risk-based health benchmarks are calculated based on specified risk level goals for each exposure scenario. This means that the benchmark number is calculated to represent a concentration of chemical that, if a site user or worker were exposed to the chemical at levels above this benchmark concentration, their health may be at risk at an unacceptable level. Exposure scenario refers to an evaluation of what types of people use the site, how people use the site now, and will use the site in the future, and ways in which they can be exposed to chemicals, such as ingestion of soil due to lawn maintenance by a maintenance worker. The cancer and noncancer risks are then estimated with a calculation procedure that uses the exposure point concentration and the site-specific benchmarks. If the estimated risk is not unacceptable (see inset on acceptable levels of exposure), then the parcel is deemed suitable for property transfer.

If any chemicals exceed Level 2 benchmarks, the levels of those potential COCs at the site are compared statistically to levels of the chemicals found in soil samples from areas not affected by past activities at the site (also referred to as site-specific "background"). If the values at the site are not statistically different than "background" concentrations, then it can be determined that detected levels of chemicals are not site-related. If the screening level risk assessment results determine that a parcel does not pose a threat to human health based on the present and intended future use (e.g., industrial/commercial), the parcel is deemed suitable for property transfer.

WHAT ARE ACCEPTABLE LEVELS OF EXPOSURE ?

Current Federal guidelines for acceptable exposures are:

(1) an individual lifetime excess carcinogenic risk in the range of a one-in-ten-thousand (1-in-10,000 or 1 x 10^{-4}) to one-in-one-million (1-in-1,000,000 or 1 x 10^{-6}); and (2) a maximum hazard index equal to 1.0 for noncancer (also referred to as noncarcinogenic) effects. A hazard index greater than 1.0 indicates a potential for noncancer effects.

Soil

Gate 1 Guardhouse (Building 511)

A detailed description of the risk assessment that was performed for the Gate 1 Guardhouse is presented in the *Remedial Investigation and Risk Assessment Report for the Gate 1 Guardhouse, Building 511, Southeastern Area (SE) Operable Unit (OU) 8, Final* (WESTON, 2001b). The following is a summary of the risk assessment.

Identification of Chemicals of Concern (COCs)

The Gate 1 Guardhouse (Building 511) is located in Parcel 2R-80. Soil samples were collected from the vicinity of the guardhouse due to the presence of existing or former storage tanks at the site. Polyaromatic hydrocarbon organics and several metals were identified as COCs. A complete list of COCs and their ranges of concentrations are provided in Attachment 2, Table 1A.

Exposure Assessment

Present Use Scenarios

Under current conditions, potential exposure at the Gate 1 Guardhouse is limited to workers engaged in property maintenance. Risks to current site workers were quantitatively evaluated for exposure to contaminants in surface soil through incidental ingestion of contaminated soil and dermal contact with contaminated soil.

Future Use Scenarios

Commercial and industrial future use scenarios were evaluated based on the anticipated future use of the site at the time this assessment was prepared. Under potential future site conditions, risks to commercial and industrial site workers and construction workers at the Gate 1 Guardhouse were quantitatively evaluated for exposures to surface and subsurface soils. The exposure routes selected for evaluation included ingestion of contaminated soil, dermal contact with contaminated soil, and inhalation of contaminated dust. For this assessment, it was assumed that exposure to commercial and industrial workers would occur over a conservative period of 25 years, the assumed duration of employment at any one location. Exposures of construction workers to surface and subsurface soils were assumed to occur in a short-term (less than 1 year) period of construction requiring excavation of soils.

Toxicity Assessment

In evaluating potential health risks, both cancer-causing and noncancer-causing effects from exposure to soil were considered. The potential for

producing cancer-causing effects is limited to those substances that have been shown to produce cancer in animals and/or humans. Excessive exposure to all substances, carcinogenic or not, can produce adverse noncancer health effects. Therefore, cancer slope factors were identified for those chemicals classified as carcinogens and reference doses, when available, were identified for every chemical selected regardless of its classification. Reference doses indicate the potential for adverse health effects from exposure to COCs exhibiting noncancer effects.

Carcinogens

EPA has developed cancer slope factors for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic COCs. Cancer slope factors are derived from the results of human epidemiological studies or animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. Cancer slope factors used in the screening level risk assessment were obtained from EPA's Integrated Risk Information System (IRIS) database. Slope factors not available on IRIS were obtained from EPA's second most current source of toxicity information, the Health Effects Assessment Summary Tables (HEAST). At this time, slope factors are not available for the dermal route of exposure. Dermal slope factors used in the assessment have been extrapolated from oral slope values used in this assessment.

Noncarcinogens

EPA has developed media-specific reference doses for indicating the potential for adverse health effects from exposure to COCs exhibiting noncancer effects. Reference doses are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied. Reference doses used in the screening level risk assessment were obtained from EPA's IRIS database. Reference doses not available on IRIS were obtained from EPA's second most current source of toxicity information, HEAST.

Risk Characterization

The results of the screening level risk assessment indicated that the risks to industrial or commercial workers from site soil are within limits considered acceptable to EPA.

None of the scenarios of exposure through industrial or commercial use exceeded these guidelines for acceptable exposure. Therefore, Parcel 2R-80 is suitable for use for industrial/commercial purposes. Parcel 2R-80 will be included in the Phase II parcel transfer because there are no unacceptable risks based on the intended industrial/commercial use.

Published screening values used for the screening level risk assessment follow; the assumptions for calculating these values are available in the citations listed.

Adjusted EPA Region III Risk-Based Concentrations (U.S. Environmental Protection Agency, *Risk-Based Concentration Tables*, EPA Region III, Philadelphia, PA 19103, 5 November 2000).

EPA Region III maintains a list of risk-based concentrations (RBCs) for chemicals in various media (e.g., soil, water, air) that correspond to a target cancer risk of 1×10^{-6} (1-in-1,000,000) or a target noncancer hazard quotient (referred to as a hazard index when calculated for a site) of 1. For the purposes of identifying the contaminants of potential concern, the residential soil ingestion risk-based concentrations were adjusted to reflect a risk-based screening concentration (i.e., RBSC). Risk-based screening concentrations for carcinogens were developed at a target risk of 1×10^{-6}. For chemicals associated with noncancer health effects, the target hazard quotient was adjusted to 0.1, thus lowering the noncancer risk-based concentration values presented in the risk-based table by an order of magnitude to address the additivity of noncancer effects when there is exposure to multiple chemicals. As noted in the EPA Region III risk-based concentration table, carcinogens that are adjusted to a 0.1 hazard quotient become the more conservative value than the carcinogenic value at a target risk of 1×10^{-6}. In these instances, the noncancer value was used.

EPA Site Screening Levels for VOCs and Particulate Inhalation (U.S. Environmental Protection Agency, 1996, *Soil Screening Guidance: Technical Background Document*, EPA/540/R-956/128, PB96-963502, Office of Solid Waste and Emergency Response, Washington, DC. May 1996; U.S. Environmental Protection Agency, *Soil Screening Guidance: Technical Background Document and Soil Screening Guidance: User's Guide*, 9355-4.23, EPA/540/R-96/018, PB96-963505, Office of Solid Waste and Emergency Response, Washington, DC, April 1996; and U.S. Environmental Protection Agency, Soil Screening Calculations, www.epa.gov/oerrpage/superfund/programs/risk/calc_sta.htm).

Site screening levels (SSLs) for inhalation exposure to organic compounds (VOCs) and metals (particulates) from soil were calculated for all detected chemicals for each site using the EPA Soil Screening Guidance calculations. The target risk and

target hazard quotient are identical to those used in calculating risk-based screening concentrations. For the purposes of contaminant of potential concern screening, oral reference doses were extrapolated to the inhalation route when no inhalation toxicity criteria were available.

Conventionally, inhalation soil screening levels were evaluated using the acceptable daily intake approach, which uses the unit risk factor or reference concentration values for an adult exposure. The inhalation soil screening level calculation method and input assumptions for cancer effects, as described in the EPA guidance, were modified at the request of EPA Region III to estimate values for the age-adjusted child and adult. EPA Region III requested that the Army estimate noncancer inhalation soil screening levels based on childhood exposure. Because the inhalation equations defined in the soil screening level guidance use unit risk factor or reference concentration values, the calculation method was adjusted to reflect the child's body weight and inhalation rate.

The volatilization factors were estimated on a chemical-specific basis. The Harrisburg region was selected as the input value to the calculation for wind dispersion because this location is the one closest to Chambersburg, PA.

EPA Soil Screening Levels for Protection of Groundwater (see EPA soil screening level citations listed previously).

Soil screening levels for groundwater protection were calculated for all detected site chemicals. The conventional method of using the EPA maximum contaminant level (MCL), action level, or health-based limit in the EPA *Soil Screening Guidance* was modified by substituting these criteria with the EPA Region III tap water risk-based concentrations at a target cancer risk of 1×10^{-6} or at an adjusted target hazard quotient of 0.1. A dilution-attenuation factor of 1 was used to achieve the most conservative soil screening level; this means that one is assuming that there is little dilution if a contaminant would migrate to groundwater. Default (or standard) inputs provided in the EPA guidance were used for all other values. Any chemical exceeding soil screening levels for groundwater protection were qualitatively evaluated in the screening level risk assessment for its potential impact on groundwater.

PADEP Medium-Specific Concentrations (MSCs) (Commonwealth of Pennsylvania, Rules and Regulations, Title 25 – Environmental Protection, Environmental Quality Board [25 PA Code Chapter 250], Administration of the Land Recycling Program [Act 2], Pennsylvania Bulletin, Vol. 27, No. 33, 16 August 1997).

If EPA Region III risk-based concentrations or soil screening levels were not available for a chemical, and a toxicity value for the chemical in question could not be obtained through the National Center for Environmental Assessment or other source provided by the EPA Region III toxicologist, then Pennsylvania Act 2 guidance was consulted for medium-specific concentrations for soil ingestion and inhalation of VOCs or particulates. Medium-specific concentrations are chemical-specific risk-based concentrations developed in a way similar to the EPA Region III risk-based concentrations. The medium-specific concentration tables are based on a target risk of 1×10^{-5} and a target hazard quotient of 1. For the purposes of the screening evaluation, the target risk was adjusted to 1×10^{-6}, and the target hazard quotient adjusted to 0.1. The PADEP Act 2 guidance contains the calculation methods.

Because EPA Region III does not recommend the use of PADEP benchmarks for contaminants of potential concern screening, any contaminants of potential concern that will be selected only as a result of medium-specific concentration comparisons will be footnoted in the respective tables and discussed in the uncertainty analysis relative to their impacts on contaminants of potential concern selection.

Former PCB Transformer Sites

A detailed description of the risk assessment that was performed for the former PCB transformer sites is presented in the *Decision Document, Former PCB Transformer Sites in Southeastern (SE) Area, Operable Unit (OU) 8, (DSERTS Site LEAD-125), Final* (WESTON, 2000b). The following is a summary of the risk assessment.

The screening level assessment for the former PCB transformer sites focused on PCBs because the potential risk associated with contaminated soils at the sites was limited to PCBs. The investigation at the former PCB transformer sites included sampling and analysis of concrete and asphalt samples, which cannot be evaluated using the standard risk assessment approach or the screening level risk assessment procedure. Therefore, the risk evaluation for the former PCB transformers sites also included comparison to regulations under the Toxic Substances Control Act designed to be protective of human health and the environment.

The Phase II parcels containing PCB transformers that were evaluated for human health risk are as follows:

- # Parcel 2-36, Building 211
- # Parcel 2-38, Building 7
- # Parcel 2-45, Building 42
- # Parcel 2-50, Building 18
- # Parcel 2-55, Building 436

COCs at each of these parcels were limited to PCBs. The analytical results of the soil were compared with the lowest applicable EPA and PADEP criteria as provided in Attachment 2, Tables 1B and 1C. The asphalt/concrete samples were compared to the standards under the Toxic Substances Control Act as shown in Table 1C. The analytical results indicated that none of the locations where concrete and asphalt samples were collected had PCB concentrations in excess of the 1-mg/kg cleanup-level as defined in the regulations established under the Toxic Substances Control Act. These locations are Building 7 in Parcel 2-38, and Building 42 in Parcel 2-45.

The 1-mg/kg concentration is the Toxic Substances Control Act cleanup level for PCB remediation waste for a "high occupancy area." A high occupancy area means any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: 840 hours or more (an average of 16.8 hours or more per week) for nonporous surfaces, and 335 hours or more (an average of 6.7 hours or more per week) for bulk PCB remediation waste. Examples include a residence, school, daycare center, sleeping quarters, a single or multiple occupancy 40 hours per week work station, a school classroom, a cafeteria in an industrial facility, a control room, and a work station on an assembly line.

The analytical results of the soil samples collected from Parcel 2-50 (Building 18) and Parcel 2-55 (Building 436) indicated that PCB concentrations were less than the most restrictive soil screening level of 0.25 mg/kg (Attachment 2, Table 1C). This soil-screening level is a concentration in soil that is considered to be protective of underlying drinking water.

An average soil value of 0.32 mg/kg at Parcel 2-36 (Building 211) was slightly above the soil concentration published by EPA, which was developed to be protective of groundwater (0.25 mg/kg). Because a number of very conservative assumptions are used by the agency to derive this value and the resultant risk is very close to 1×10^{-6}, the soils at Building 211 (Parcel 2-36) do not present an unacceptable risk.

GROUNDWATER

Identification of Chemicals of Concern (COCs)

PDO Area

A summary of the COCs in the groundwater underlying the PDO Area is presented in Attachment 2, Table 2.

The COCs included VOCs, semivolatile organic compounds (SVOCs), pesticides, and metals.

SE Area

A list of the COCs in groundwater underlying the SE Area is presented in Attachment 2, Table 3. As with the PDO Area, the COCs for the SE Area included VOCs, SVOCs, pesticides, and metals.

The COCs and concentrations of these COCs in groundwater used for the evaluation of groundwater vapor intrusion into buildings and trenches are presented in Attachment 2, Table 4. This exposure scenario was limited exclusively to VOCs because they are the only chemicals with the potential to volatilize from groundwater into buildings. These COCs apply to both the SE Area and the PDO Area.

Exposure Assessment

For Phase II parcels in both the PDO and SE Areas, a conceptual model of human exposure was developed that identified potential pathways by which exposure could occur; characterized the potentially exposed populations (e.g., workers and recreational users); and estimated the magnitude, frequency, and duration of exposure. Conceptual site models of human exposure to groundwater in the PDO and SE Areas are provided in Figures 5 and 6, respectively.

PDO Area

The exposure scenarios evaluated under current land use conditions at the Phase II parcels in the PDO Area included the following:

- # On-site worker: inhalation of VOCs that volatilize from underlying groundwater.

The receptors and pathways of exposure that were evaluated under the future land use conditions included:

- # On-site industrial/commercial worker: inhalation of COCs that volatilize from underlying groundwater; consumption of COCs in groundwater:

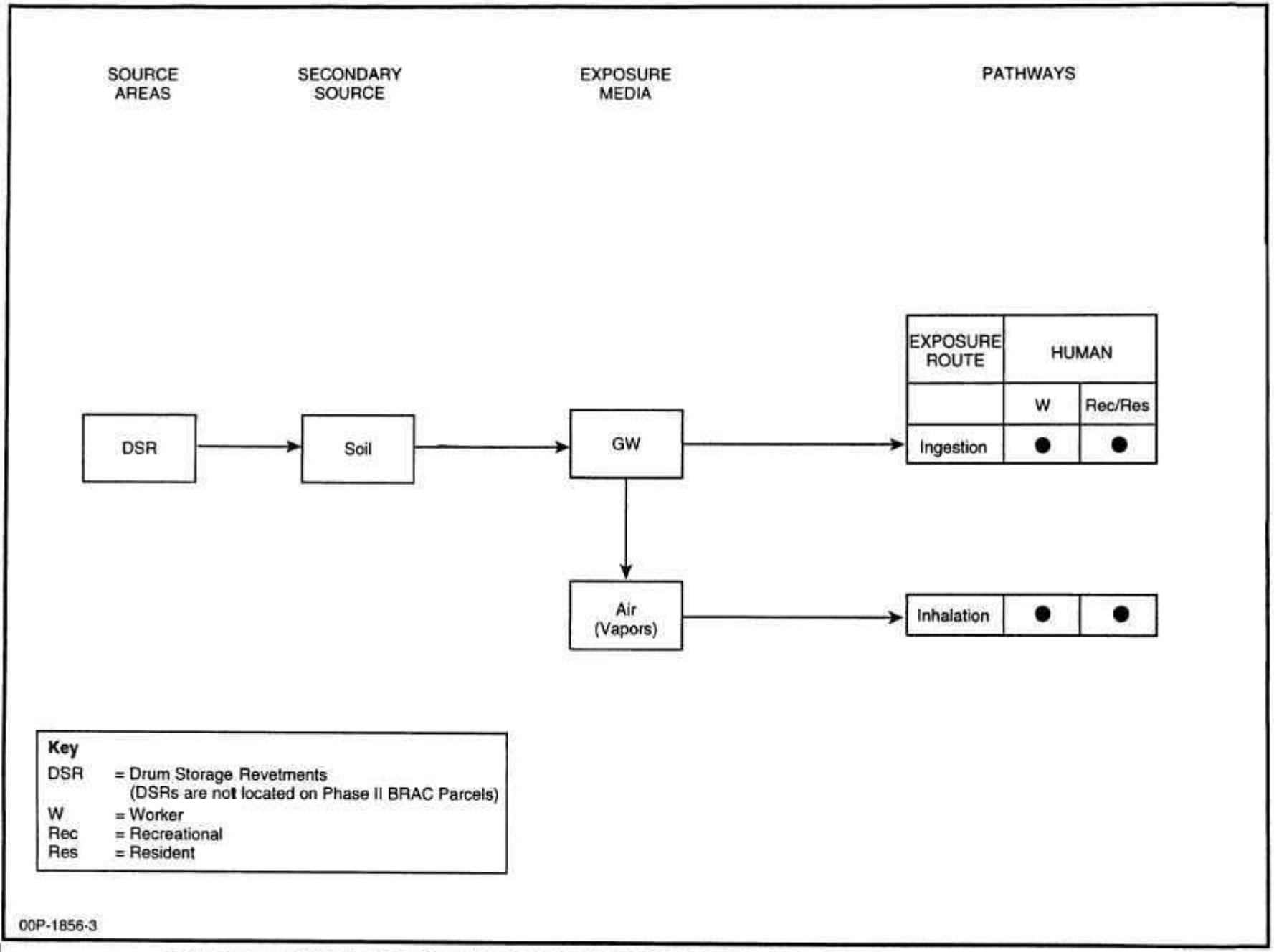


FIGURE 5 CONCEPTUAL SITE MODEL FOR LEAD PDO AREA GROUNDWATER RISK ASSESSMENT

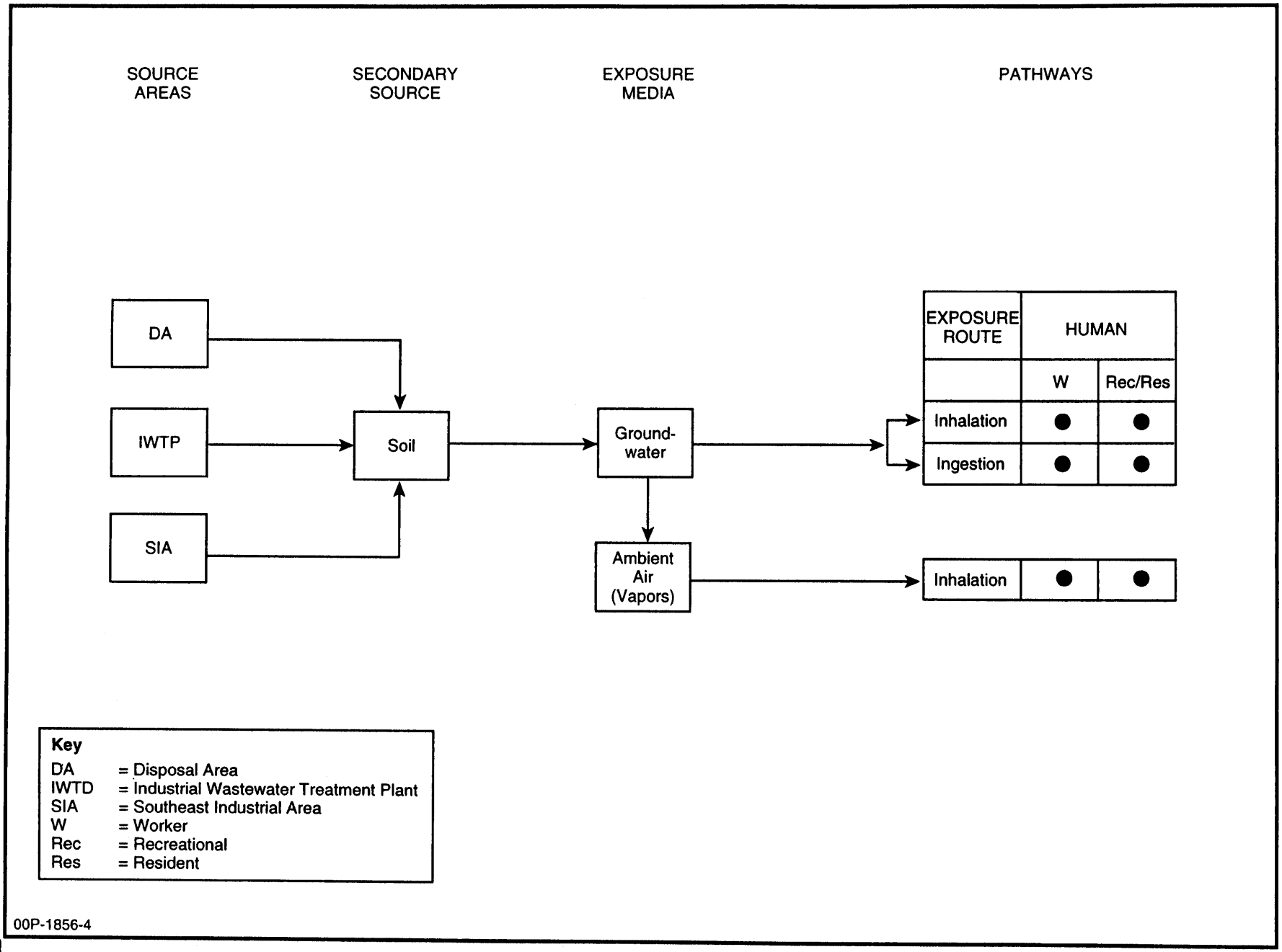


FIGURE 6 CONCEPTUAL SITE MODEL FOR LEAD SE AREA GROUNDWATER RISK ASSESSMENT

- On-site industrial/commercial worker: inhalation of VOCs while showering; inhalation of COCs that volatilize from groundwater and migrate through building floors to basements and other inhabited areas.

- On-site construction worker: inhalation of COCs that volatilize from underlying groundwater into construction trenches.

- On-site adult and child resident and recreational users: inhalation of COCs that volatilize from groundwater and migrate through building floors to basements and other inhabited areas.

SE Area

The exposure scenarios evaluated under current land use conditions at the Phase II parcels in the SE Area included the following:

- On-site worker: inhalation of COCs that volatilize from underlying groundwater.

The exposure scenarios evaluated under potential future use conditions at the Phase II parcels in the SE Area included the following:

- On-site commercial/industrial worker: inhalation of COCs that volatilize from underlying groundwater, consumption of groundwater, and inhalation of VOCs while showering.

- On-site commercial/industrial worker: inhalation of COCs that volatilize from groundwater and migrate through building floors into basements and other occupied areas.

- On-site construction worker: inhalation of COCs that volatilize from underlying groundwater into construction trenches.

- On-site adult and child resident and recreational users: inhalation of COCs that volatilize from groundwater and migrate through building floors to basements and other inhabited areas.

All pathways were quantified for potential exposure and consequent risk. Exposure models and assumptions used to estimate exposure for the 1993 and 1994 risk assessments (ESE, 1993b, 1994) are provided in Attachment 2, Table 5.

Assumptions for the evaluation of groundwater vapor intrusion into buildings and trenches are presented in Attachment 2, Table 6.

Toxicity Assessment

In evaluating potential health risks, both cancer-causing and noncancer-causing effects from exposure to groundwater were considered. The potential for producing cancer-causing effects is limited to those substances that have been shown to produce cancer in animals and/or humans. Excessive exposure to all substances, carcinogenic or not, can produce adverse noncancer health effects. Therefore, cancer slope factors were identified for those chemicals classified as carcinogens, and reference dose, when available, were identified for every chemical selected regardless of its classification.

Carcinogens

EPA has developed cancer slope factors for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic COCs. Cancer slope factors are derived from the results of human epidemiological studies or animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. The weight-of-evidence classifications for potential carcinogens evaluated in the assessment of human health risk are provided in Attachment 2, Table 7. The cancer slope factors used in the evaluation of cancer risk due to exposure to groundwater in the PDO and SE Areas at LEAD are provided in Attachment 2, Table 8.

Noncarcinogens

EPA has developed media-specific reference doses for indicating the potential for adverse health effects from exposure to COCs exhibiting noncancer effects. Reference doses are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied. The reference doses used in the evaluation of noncancer risks resulting from exposure to groundwater in the PDO and SE Areas at LEAD are provided in Attachment 2, Table 8.

The toxicity values used for the evaluation of groundwater vapor intrusion into buildings and trenches are presented in Attachment 2, Table 9.

Risk Characterization

The risk characterization presents the nature and the degree of the potential carcinogenic and noncarcinogenic (noncancer) risks posed to the current and future human health receptors presented previously in the exposure assessment.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = CDI \times CSFs$$

Where:

Risk = A unitless probability of an individual developing cancer.

CDI = Chronic daily intake averaged over 70 years (mg/kg-day).

CSF = Cancer slope factor, expressed as $(mg/kg\text{-}day)^{-1}$.

These risks are probabilities that usually are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1-in-1,000,000 chance of developing cancer as a result of site-related exposure. EPA's generally acceptable range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

The potential for noncancer effects is evaluated by comparing an exposure level over a specified time period with a reference dose for a similar exposure period. A reference dose represents a level that an individual may be exposed to that is not expected to cause any harmful effects. The ratio of exposure to toxicity is called a hazard quotient (HQ). A hazard quotient less than 1 (<1) indicates that a receptor's dose of a single contaminant is less than the reference dose, and that toxic noncancer effects from that chemical are unlikely. The hazard index (HI) is generated by adding the hazard quotients for all COCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium (e.g., soil, groundwater, or air) or across all media to which a given individual may be reasonably exposed. A hazard index less than 1 (<1) indicates that the noncancer effects from all contaminants are unlikely. A hazard index greater than 1 (> 1) indicates that site-related exposures may present a risk to human health.

The hazard quotient is calculated as follows:

$$Noncancer\ HQ = CDI/RfD$$

Where:

CDI = Chronic daily intake.

RfD = Chemical-specific reference dose.

PDO Area

The worker exposed through the potential consumption of groundwater, a highly unlikely scenario, and the inhalation of volatiles was evaluated for the PDO Area. The cumulative risk associated with the consumption of groundwater and the inhalation of volatiles was estimated at 4×10^{-4} or four-in-ten thousand (4-in-10,000), which is above EPA's acceptable range for site-related exposures.

Those chemicals presenting the most significant risk due to exposure to groundwater were 1,1-dichloroethene and 1,1-dichloroethane. These chemicals represented more than 90% of the total cancer risk, primarily through groundwater consumption. A cumulative noncancer risk, resulting in a hazard index of 3.3, was due principally to exposure to 1,2-dichloroethene (total) and thallium. These chemicals represented more than 90% of the total noncancer risk.

Indirect exposure resulting from the migration of VOCs from groundwater into construction trenches and through building floors into basements or other workspaces was evaluated. The results of this evaluation are provided in the *Groundwater Vapor Intrusion Risk Assessment* report (WESTON, 2001c).

For the PDO Area, the risk of cancer to residents (unrestricted use scenario) associated with exposure through the inhalation of COCs volatilized from groundwater into homes is within the current EPA guidelines for acceptable exposure (risk to an adult: 8.27×10^{-6}; risk to a child: 4.99×10^{-6}). These numbers are conservative because they represent a sitewide risk based on maximum groundwater concentrations found throughout both the PDO Area and SE Area. For the PDO Area (and the SE Area), exposure to residents from the inhalation of COCs volatilized from groundwater, expressed in a noncancer risk, is well below EPA's hazard index threshold of 1 (adult: 0.008; child: 0.02). This result assumes that there is a 3-ft buffer zone maintained between the buildings or the bottom of the trench and the level of groundwater below. None of the results indicate that this pathway poses an unacceptable human health risk to future construction and commercial workers, child recreational users, or residents at the Phase II parcels in the PDO Area.

SE Area

Although considered a highly unlikely exposure scenario, the carcinogenic and noncancer risks associated with the potential consumption of groundwater by a future worker were evaluated. The results of this evaluation indicated a potential cancer risk of as much as 6.0×10^{-3} or an excess lifetime cancer risk of 6-in-10,000. Exposure to vinyl chloride represented more than 75% of the cancer risk. Other chemicals found in groundwater that significantly contribute to the cancer risk were groundwater consumed included trichloroethylene, 1,1-dichloroethene, and 1,2-dichloroethane. In addition, the noncancer risk associated with this exposure resulted in a hazard index of 110. The majority of the noncancer risk resulted from potential consumption of trichloroethylene in groundwater.

Indirect exposure resulting from the migration of VOCs from groundwater into construction trenches and through building floors into basements or other workspaces was evaluated. The results of this evaluation are provided in the *Groundwater Vapor Intrusion Risk Assessment* report (WESTON, 2001c). The results for this pathway are the same as shown above for the PDO Area because these results represent sitewide risk for residential use based on maximum groundwater concentrations found throughout the site. None of these results indicate that this pathway poses an unacceptable human health risk to future construction or commercial workers, child recreational users, or residents at the Phase II parcels in the SE Area.

SUMMARY OF ECOLOGICAL RISKS

Soils

With the exception of the Gate 1 Guardhouse and the former PCB transformer sites, the soils of the Phase II parcels were unaffected by site activities, and therefore, there are no unacceptable risks to plants and animals that may use these areas. At both the Gate 1 Guardhouse and the former PCB transformer sites, no suitable habitats exist for significant use by wildlife; consequently, an assessment of ecological risk was not performed.

Groundwater

The potential for plants and animals to be exposed to groundwater in the Phase II parcels is minimal. Groundwater does not come to the surface or discharge to surface streams, ponds, or wetlands in the Phase II parcels, and therefore, no pathway of exposure to plants and wildlife exists. Therefore, there is no ecological risk posed by contaminated groundwater to wildlife receptors that inhabit the Phase II parcels.

UNCERTAINTY ANALYSIS

Virtually every step in the risk assessment process requires a number of assumptions, all of which contribute to uncertainty in the assessment of risk. In the absence of site-specific information, assumptions are developed based on “best estimates” of data quality (e.g., are there enough samples?), exposure parameters (e.g., how often would a worker contact the soil outside the building in which he works?), and toxicity information (how valid is the extrapolation of toxicity data taken from rat studies to humans?). To assist in the development of these estimates, EPA has developed and recommends the use of “standard” factors that are designed to promote consistency in risk assessments and provide a plausible estimate of the risk. In the absence of site-specific information (please note that much of this assessment was performed for workers who may use these sites in the future), the risk assessments conducted here used EPA’s “standard” (also known as “default”) assumptions. The extent to which these factors accurately predict risk depends on how close they are to site-specific conditions.

In the presence of such uncertainty, EPA and the risk assessor have the obligation to make conservative assumptions such that the chance is very small for the actual health risk to be greater than that determined through the risk process. On the other hand, the process is not to yield absurdly conservative risk values that have no basis in reality. That balance was kept in mind in the development of exposure assumptions and pathways, and in the interpretation of data and guidance for the baseline risk assessment for the Phase II parcels. The environmental condition of the groundwater below the Phase II parcels is expected to improve based on the actions planned or in progress at the other OUs.

SECTION 8
REMEDIAL ACTION OBJECTIVES

The land encompassing the Phase II parcels is to be transferred to LIDA with deed restrictions to limit the use of and contact with groundwater, to prevent exposure to groundwater at all of the parcels, and to limit the Gate 1 Guardhouse, Building 511, area to commercial/industrial use. These restrictions are being put in place to protect people from exposure to contaminated groundwater and the vapors that emanate from the groundwater, and to prevent

exposure to soils at the Gate 1 Guardhouse area should it be used for unrestricted purposes (e.g., residential or daycare). Therefore, the development of remedial action objectives was focused on protection of human health and the environment, and placing restrictions on preventing the use of the property for unauthorized purposes. The following remedial action objectives were identified for the Phase II parcels:

- Protect human health and the environment.
- Comply with all applicable or relevant and appropriate Federal and state environmental laws and regulations (ARARs).
- Prevent direct contact and ingestion of soil under residential use scenarios at Gate 1 Guardhouse.
- Prevent exposure to groundwater (including inhalation of groundwater vapors).
- Take appropriate legal measures to ensure proper enforcement of site restrictions.
- Provide a suitable remedial alternative such that the land transfer recipient can have beneficial use of the property with minimal limitations.

SECTION 9
DESCRIPTION OF ALTERNATIVES

CERCLA requires that each selected site remedy be protective of human health and the environment, be cost effective, comply with all applicable or relevant and appropriate Federal and state environmental laws and regulations (ARARs), and use permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

A treatment alternative has not been included for the Phase II parcels because EPA generally does not expect to use treatment technology where, as here, contamination in soil exists at low concentrations; the contamination is neither highly toxic nor highly mobile; and the risks to humans from the soil are within acceptable limits if the property is used for commercial/industrial purposes. Based on the current conditions as discussed in the summary of site risks, the soils in the parcels to be transferred do not pose a threat to human health and the environment. Therefore, the soils do not require treatment, and the soils at the Gate 1 Guardhouse do not require treatment if the future use of the property is limited to the intended use. Final groundwater remedial actions will be addressed in the future. The selected interim remedy for groundwater beneath the Phase II parcels is protective of human health and the environment in the short term and is intended to provide adequate protection until a final groundwater remedy is selected.

Remedial alternatives for the Phase II parcels were developed to meet the remedial action objectives. The public needs to be protected from consuming or coming into direct contact with contaminated groundwater beneath the Phase II parcels. The public also needs to be protected from inhaling vapors that may enter a building or work area from the contaminated groundwater below the parcels, when the bottom floor of the building or bottom of a work area, such as a trench, is within 3 ft of the water table.

Therefore, a remedial alternative was developed to prevent consumption of groundwater, direct contact with groundwater, and working within 3 ft of the water table.

As noted above, soil at the Gate 1 Guardhouse contains low levels of organic compounds and metals. As long as the parcel is used for industrial/commercial purposes, and not residential purposes, no remedial action is necessary to protect human health or the environment from exposure to soil at the Gate 1 Guardhouse. Therefore, a remedial alternative was developed to ensure that the Gate 1 Guardhouse will continue to be used for commercial or industrial purposes in the future, and to prevent unrestricted (e.g., residential or daycare) use of the area.

Finally, as noted above, no remedial action is necessary for soil at any of the remaining Phase II parcels. The soils in these parcels are suitable for unrestricted use. Therefore, no remedial alternative was developed for soil at any Phase II parcel, except the Gate 1 Guardhouse.

In addition, a no action alternative was included as a baseline alternative, as required by CERCLA, against which the other alternatives may be compared.

Based on this information, the Army has developed the following two alternatives:

- Alternative 1: No Action
- Alternative 2: Institutional Controls

These alternatives are discussed in the following subsections. The evaluation of the alternatives against the nine CERCLA-mandated criteria is presented in Section 10.

ALTERNATIVE 1: NO ACTION

(All costs are present worth costs calculated based on an annual discount rate of 2.5%.)

Capital Cost:	$0
Operation and Maintenance Costs:	
5-Year CERCLA Review (for cost comparison purposes, cost for years 5 and 10)	$41,630
Total Present Worth Cost (including administrative, overhead, and contingency costs)	**$54,120**

CERCLA guidance requires that the no-action alternative be considered as a baseline for comparison of other alternatives. No remedial actions would be implemented under this technology. The present worth cost is based on two 5-year performance evaluation reviews/reports.

ALTERNATIVE 2: INSTITUTIONAL CONTROLS

(All costs are present worth costs calculated based on an annual discount rate of 2.5%.)

Capital Cost:	
Administrative costs for deed restrictions, and installation of monitoring wells and remote control groundwater monitoring equipment to monitor groundwater levels	$137,500
Operation and Maintenance Costs:	
Maintenance of institutional controls including: maintenance of remote control groundwater level monitoring equipment (data loggers); groundwater monitoring; inspection; maintaining deed restrictions(for cost comparison purposes, cost annually for 30 years); and report preparation (for cost comparison purposes, cost annually, for 10 years)	*$180,270*
5-Year CERCLA Review (for cost comparison purpose, cost for years 5 and 10; it is anticipated that beyond year 10, the 5-year review will be included as part of the groundwater 5-year review process)	*$41,630*
Total Operation and Maintenance Costs:	$221,900
Total Present Worth Cost (including administrative, overhead, and contingency costs)	**$467,200**

This alternative involves the use of institutional controls. The present worth cost is based on two 5-year performance evaluation reviews/reports and 10 years of operation and maintenance costs, including inspections. Institutional controls are non-engineered instruments, such as administrative or legal controls, that minimize the potential for human exposure to contamination by limiting land or resource use. Initially, the institutional controls to prohibit activities that would result in any exposure to the contaminants in the groundwater and prohibit nonindustrial use of the Gate 1 Guardhouse area will become part of LEAD policy via an amendment to the LEAD Master Plan. At the time of the property transfer, the institutional controls will take the form of deed restrictions to protect human health and the environment by:

- Restricting the Gate 1 Guardhouse, Building 511, area to commercial/industrial use (e.g., no residential or daycare use allowed).
- Prohibiting soil excavation, digging, drilling, or other disturbance of soil activities below a depth of 3 ft above the water table (a.k.a. 3-ft buffer zone) without the prior approval of the Army.*
- Prohibiting access to or use of the groundwater underlying the property without the prior approval of the Army, PADEP, and EPA.
- Prohibiting construction of any subsurface structure for human occupation without the prior approval of the Army, PADEP, and EPA.

The specific deed restrictions will be coordinated with the regulators and the public as part of the Finding of Suitability to Transfer for the Phase II parcels. The deed containing these restrictions will be recorded at the Franklin County Courthouse,

*Because the groundwater elevations vary at LEAD, the permissible soil disturbance/construction depth needs to be determined on a parcel-by-parcel basis. The information necessary for land transfer recipients to make this determination and monitor wells that should be used to measure depth to groundwater are provided in Attachment 3.

Recorder of Deeds Office within 30 days following the transfer of the property to LIDA.

An agreement among the Army, EPA, and PADEP to implement and maintain the institutional controls will be contained in a "Land Use Control Assurance Plan," which will be executed prior to transfer of the Phase II parcels. The site-specific plan to implement and maintain the institutional controls will be contained in a "Land Use Control Implementation Plan," which will be prepared as an attachment to the Land Use Control Assurance Plan. The Army will be responsible for implementing and maintaining the institutional controls. The Army, with EPA and PADEP approval, may arrange with other entities such as LIDA to maintain land use controls. The Army remains ultimately responsible for protecting human health and the environment through this remedy.

SECTION 10
SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria as outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These criteria fall into three broad categories: threshold criteria, primary balancing criteria, and modifying criteria. The evaluation criteria within each of these categories are as follows:

- Threshold Criteria: To be considered for remedy selection, an alternative must meet the following two threshold criteria:

  1. Overall protection of human health and the environment.

  2. Compliance with ARARs.

- Primary Balancing Criteria: Primary balancing criteria are used to determine which alternative provides the best combination of attributes:

  3. Long-term effectiveness and permanence.

  4. Reduction in toxicity, mobility, or volume through treatment.

  5. Implementability.

  6. Short-term effectiveness.

  7. Cost.

- Modifying Criteria: The preferred alternative is evaluated further against the following two modifying criteria:

  8. State acceptance.

  9. Community acceptance.

Evaluation of the alternatives against the nine criteria is presented in the following subsections.

THRESHOLD CRITERIA

1. Overall Protection of Human Health and the Environment

Alternative 2 is more protective of human health than Alternative 1. Alternative 2 uses administrative and legal controls to reduce the risk of being exposed to potentially contaminated soils and preventing exposure to groundwater. Alternative 1, by contrast, would do nothing to reduce potential risks. The two alternatives are equivalent in protecting the environment.

2. Compliance with ARARs

Both alternatives comply with all applicable or relevant and appropriate Federal and state environmental laws and regulations (ARARs) for soil.

Chemical-Specific ARARs: The ARARs for soil are the following:

- Commonwealth of Pennsylvania, Rules and Regulations, Title 25 — Environmental Protection, Environmental Quality Board [25 PA Code, Chapter 250], Administration of the Land Recycling Program (Act 2): Table 3A, Medium-Specific Concentrations for Organic Regulated Substances in Soil, Direct Contact Numeric Values, Residential Values (0-15 feet) for the following chemicals: acetone, benzene, acenaphthene, benz(a)anthracene, benzo(b)fluoranthene, fluorene, and naphthalene; and Table 4A, Inorganic Regulated Substances in Soil, Residential Values (0-15 feet) for the following chemicals: aluminum, arsenic, barium, chromium, cobalt, iron, lead, manganese, nickel, selenium, thallium, vanadium, and zinc. Source: *Pennsylvania Bulletin*, Volume 27, Number 33, 16 August 1997.

- U.S. Environmental Protection Agency, 40 Code of Federal Regulations, Part 761, Disposal of Polychlorinated Biphenyls, Final Rule under the Toxic Substances Control Act (TSCA), Section

761.61(a)(4)(i)(A), Cleanup Levels for Bulk PCB Remediation Waste, High Occupancy Areas: action is required for concentrations greater than 1 part per million (equivalent to milligrams per kilogram for soil or solid materials). Source: *Federal Register,* Volume 63, Number 124, 29 June 1998, pp 35383-35474).

The ARARs for soil are met because hazardous substances found in soils in the Phase II parcels are at concentrations less than the values listed in the citations referenced above.

Neither alternative complies with the ARARs for groundwater. However, the groundwater remedies discussed here are merely interim remedies. EPA does not require interim remedies to comply with ARARs where, as here, a final remedy is under development. Thus, groundwater ARARs are not identified here. ARARs for groundwater will be discussed in more detail in the ROD for the final remedy for groundwater, which will be required to comply with all ARARs or to justify a waiver of ARARs.

Action-Specific and Location-Specific ARARS:
Neither alternative would be subject to action-specific ARARs. In addition, no location-specific ARARs were identified for the Phase II parcels.

PRIMARY BALANCING CRITERIA

3. Long-Term Effectiveness and Permanence

Alternative 2 is more effective in the long term than Alternative 1.

Implementation of the no-action alternative could be effective and permanent in the long term if the soil alone is considered because there is no contamination present, with the exception of the Gate 1 Guardhouse. There is acceptable risk associated with the soils at the Gate 1 Guardhouse, assuming continued industrial use. However, in the long term, other tenants/owners of the property could be exposed to contamination through exposure to groundwater, excavation, and contact with the groundwater or volatilization of VOCs from groundwater through soil (if the 3-ft buffer zone is not maintained). In addition, the Gate 1 Guardhouse property could be used for nonindustrial or noncommercial purposes, possibly increasing the risk to human health. Therefore, Alternative 1 does not meet the requirements for long-term effectiveness and permanence. For Alternative 2, the long-term effectiveness of the institutional controls will be contingent upon enforcement of restrictions for use of the property to prevent groundwater exposure (including inhalation of vapors if the 3-ft buffer zone is not maintained) and to restrict the Gate 1 Guardhouse site to industrial/commercial use. The restrictions will be initially enforced by the Army through the LEAD Master Plan, and after transfer, through enforcement of the environmental deed restrictions.

Implementation of this alternative would maintain the industrial/commercial (intended future) use of the Gate 1 Guardhouse property and reduce the future risk of exposure to groundwater by the development and enforcement of environmental deed restrictions. Because these restrictions would become a permanent part of the real estate documentation and would be required to be included in any subsequent sales, transfers, and/or lease agreements, this alternative would be a long-term and permanent remedial action. In addition, a Land Use Control Assurance Plan (formerly referred to as Memorandum of Agreement) for institutional controls will be in-place at the time of property transfer. This Land Use Control Assurance Plan, along with the Land Use Control Implementation Plan (which will be implemented as part of the Land Use Control Assurance Plan) will provide a long-term mechanism to ensure that the institutional controls are enforced in the future.

4. Reduction in Toxicity, Mobility, or Volume

Neither alternative results in a change in toxicity, mobility, or volume because the alternatives do not involve physical remedial actions. Soil in the Phase II parcels, except for the Gate 1 Guardhouse, can be used for any purpose, including residential uses, without being treated or otherwise remediated. Soil at the Gate 1 Guardhouse can be used for commercial/industrial purposes without being treated or otherwise remediated. Therefore, treatment is unnecessary to protect human health or the environment from soil in the Phase II parcels as long as the Gate 1 Guardhouse is used only for industrial/commercial uses (i.e., no residential or daycare use) in the future.

Because groundwater contamination and the groundwater source areas are being addressed under separate OUs, the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, or volume as a principal element will be addressed by the final groundwater response.

5. Implementability

Both alternatives meet this requirement.

Under Alternative 1, the no-action alternative, there are no measures to implement.

Alternative 2 can be implemented easily. The short-term implementation of the preferred alternative would involve amending the LEAD Master Plan to include the institutional controls that are already in-place informally at the Depot. Once the amendment is added, appropriate directorates at LEAD (the environmental division, Public Works, security, or as otherwise designated by the Army) would be provided with a copy and with the enforcement action chain-of-command for infractions.

Concurrent with this activity, the Department of the Army will be developing deed restrictions for the Phase II parcels. These deed restrictions will be coordinated with the regulators and the public as part of the Finding of Suitability to Transfer for the Phase II parcels. The site-specific plan to implement and maintain the institutional controls will be contained in the Land Use Control Implementation Plan, which will be prepared as an attachment to the Land Use Control Assurance Plan. Both the Land Use Control Assurance Plan and Land Use Control Implementation Plan have been effectively implemented at other facilities.

6. Short-Term Effectiveness

Alternative 1 would not meet the requirements for short-term effectiveness, whereas Alternative 2 would meet the requirements. Currently, LEAD prohibits the use of or contact with groundwater. After the property is transferred to a private entity, there would be no legal provision under Alternative 1 to keep future land users from being exposed to the contaminated groundwater, or from using the Gate 1 Guardhouse property for nonindustrial or noncommercial purposes.

Under Alternative 2, institutional controls would be implemented to mitigate risk due to exposure to groundwater, and prevent uses other than industrial/commercial for the Gate 1 Guardhouse property. The Army is currently restricting use of groundwater at LEAD so part of the remedy is already in-place. This alternative would be effective in the short term because the Army would formally document the requirements of the institutional controls by amending the LEAD Master Plan. This will provide effectiveness from the finalization of the ROD until the date of transfer. The environmental deed restrictions would be in place immediately after the date of transfer (the deed will be recorded within 30 days of the transfer date). Those restrictions would be maintained as directed in the Land Use Control Assurance Plan.

7. Cost

For comparison purposes only, Alternative 1 has the estimated costs for two 5-year reviews associated with its implementation. The costs presented for Alternative 2 are estimated, and may vary depending on the number of parcels that are transferred via separate phases of land transfer. Alternative 2 is estimated to be more costly to implement ($467,200) than Alternative 1 ($54,120).

MODIFYING CRITERIA

8. State Acceptance

PADEP, on behalf of the Commonwealth of Pennsylvania, concurs with the selected remedy.

9. Community Acceptance

The community does not object to the selected remedy. No written or verbal comments were received during the public comment period on the Proposed Plan. The public review and community involvement process is discussed in more detail in the Responsiveness Summary of this ROD.

SECTION 11
PRINCIPAL THREAT WASTE

Principal threat wastes are “source materials” considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contaminants to groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, nonaqueous phase liquids in groundwater may be viewed as a source material.

There are no principal threats associated with Phase II parcels under this response action because there are no contaminant sources present in the soil. Although the groundwater beneath the Phase II parcels is known to be or is potentially contaminated with VOCs above acceptable risk-based levels, a final remedy for groundwater contamination with VOCs is not within the confines of this ROD. However, to eliminate any potential risks posed by

groundwater, groundwater use restrictions are documented in this ROD as the interim action for groundwater beneath the Phase II parcels. Final actions for groundwater will be addressed separately in the groundwater operable units (PDO OU 2, SE OU 3, and SE OU 10).

SECTION 12
SELECTED REMEDY

SUMMARY OF THE RATIONALE FOR THE SELECTED REMEDY

Based on the requirements of CERCLA and the NCP, and on a detailed analysis of the response alternatives using the nine criteria (which includes public and state comments), the Army and EPA have selected Alternative 2 (institutional controls) as the remedy for this site.

Institutional controls was selected over the no action alternative because it is the only alternative of the two that achieves the remedial action objectives, thereby achieving long-term protection of human health and the environment under the current and intended future use of the property. The selected alternative, institutional controls, will accomplish the following:

- Reduce risks to human health by preventing exposure to contaminated groundwater.
- Be easy to implement, at a cost that is not prohibitive.
- Address risk while making the property available quickly for public reuse and benefit.

DESCRIPTION OF THE SELECTED REMEDY

The selected alternative, institutional controls, will include the following components:

- Restrict the Gate 1 Guardhouse, Building 511, area to commercial/industrial use (e.g., no residential or daycare use allowed).
- Prohibit soil excavation, digging, drilling, or other disturbance of soil activities below a depth of 3 ft above the water table (a.k.a. 3-ft buffer zone) without the prior approval of the Army.*
- Prohibit access or use of the groundwater underlying the property without the prior approval of the Army, PADEP, and EPA.
- Prohibit construction of any subsurface structure for human occupation without the prior approval of the Army, PADEP, and EPA.

These restrictions will be instituted through an amendment of LEAD's Master Plan for the Phase II parcels to reflect these controls until the date of transfer. At the time the property is transferred, the restrictions will be implemented through the use of deed restrictions, which will be recorded within 30 days of the property transfer date. In addition, upon transfer of the property, the Army, in consultation with EPA and PADEP, will establish periodic inspection procedures as described in the Land Use Control Assurance Plan and the Land Use Control Implementation Plan to ensure adherence to the institutional controls.

By means of the Land Use Control Assurance Plan (which is a Memorandum of Agreement with EPA and PADEP), LEAD, on behalf of the Department of the Army, will agree to implement Depotwide, certain periodic site inspection, condition certification, and agency notification procedures designed to ensure the maintenance by Army personnel (or other approved designee) of any site-specific land use controls deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of the agreement will be that through the Army's substantial good-faith compliance with the procedures called for therein, reasonable assurances would be provided to EPA and PADEP as to the permanency of those remedies that included the use of specific land use controls. The Army, with EPA and PADEP approval, may arrange with other entities such as LIDA to maintain land use controls. The Army remains ultimately responsible for protecting human health and the environment through this remedy.

Although the terms and conditions that will be included in the Land Use Control Assurance Plan are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by the Army, EPA, and PADEP that the contemplated permanence of the remedy reflected herein will be dependent on the Army's substantial good-faith compliance with the specific land use control maintenance commitments that will be

*Because the groundwater elevations vary at LEAD, the permissible soil disturbance/construction depth needs to be determined on a parcel-by-parcel basis. The information necessary for land transfer recipients to make this determination and monitor wells that should be used to measure depth to groundwater are provided in Attachment 3.

reflected therein. Should such compliance not occur or should the Land Use Control Assurance Plan be terminated, it is understood that the protectiveness of the remedy may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

SUMMARY OF THE ESTIMATED REMEDY COSTS

A summary of the major components of the cost estimate is presented in Section 9. The information in this cost estimate summary is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50% to -30% of the actual project cost. The total present worth cost of the selected remedy is estimated at $467,200.

EXPECTED OUTCOMES OF THE SELECTED REMEDY

The expected outcomes consist of use restrictions enforced through legal restrictions. These restrictions, as summarized in the following paragraphs, will be written in the property deed as the Environmental Deed Provisions. The outcomes are summarized as follows:

- All Phase II parcels (except the Gate 1 Guardhouse) are protective of human health and the environment when used for residential, daycare, or any other purposes, as long as the prohibitions and restrictions on excavation, subsurface construction, and groundwater use listed below are complied with.
- The Gate 1 Guardhouse, Building 511, area (shown on the map in Figure 4) will be available only for commercial and industrial use activities (e.g., no residential or daycare allowed) as long as the prohibitions and restrictions on excavation, construction of subsurface structures, and groundwater use listed below are complied with.
- Soil may not be excavated within a 3-ft depth to the water table without the prior approval of the Army.
- Construction of any subsurface structure for human occupation may not be conducted without the prior approval of the Army, PADEP, and EPA.
- Groundwater underlying the Phase II parcels may not be used for any purpose without the prior written approval of the Army, PADEP, and EPA.

PERFORMANCE STANDARDS OF THE SELECTED REMEDY

The selected remedy does not employ treatment of soil. The institutional controls employed in the selected remedy are well-known legal procedures used in real estate property transfers.

The Base Master Plan will be amended to fully and properly implement the selected remedy as specified in the Land Use Control Implementation Plan. The changes to the Base Master Plan will be communicated to LEAD's Environmental Division, Public Works Division, and Security Division. The enforcement of the actions related to the selected remedy will be implemented as specified in the Land Use Control Implementation Plan.

A deed that fully and properly implements the selected remedy will be properly recorded with the Franklin County Courthouse Recorder of Deeds Office within 30 days after the deed is fully executed by LIDA and the Army (the United States of America acting by and through the Secretary of the Army).

SECTION 13
STATUTORY DETERMINATIONS

Under CERCLA Section 121, the Army and EPA must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following subsections discuss the remedy in light of these statutory requirements.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will be protective of human health and the environment. The institutional controls will ensure that an acceptable risk level is maintained for both carcinogenic and noncarcinogenic risks as described in Section 7.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected final remedy with regard to soils will be in full compliance with all ARARs. The ARARs for soil are the following:

- Commonwealth of Pennsylvania, Rules and Regulations, Title 25 – Environmental Protection, Environmental Quality Board [25 PA Code, Chapter 250], Administration of the Land Recycling Program (Act 2): Table 3A, Medium-Specific Concentrations for Organic Regulated Substances in Soil, Direct Contact Numeric Values, Residential Values (0-15 feet) for the following chemicals: acetone, benzene, acenaphthene, benz(a)anthracene, benzo(b)fluoranthene, fluorene, and naphthalene; and Table 4A, Inorganic Regulated Substances in Soil, Residential Values (0-15 feet) for the following chemicals: aluminum, arsenic, barium, chromium, cobalt, iron, lead, manganese, nickel, selenium, thallium, vanadium, and zinc. Source: *Pennsylvania Bulletin,* Volume 27, Number 33, 16 August 1997.

- U.S. Environmental Protection Agency, 40 Code of Federal Regulations, Part 761, Disposal of Polychlorinated Biphenyls, Final Rule under the Toxic Substances Control Act (TSCA), Section 761.61(a)(4)(i)(A), Cleanup Levels for Bulk PCB Remediation Waste, High Occupancy Areas: action is required for concentrations greater than 1 part per million (equivalent to milligrams per kilogram for soil or solid materials). Source: *Federal Register,* Volume 63, Number 124, 29 June 1998, pp 35383-35474).

The ARARs for soil are met because hazardous substances found in soils in the Phase II parcels are at concentrations less than the values listed in the citations referenced.

Because the remedy regarding groundwater is an interim measure, final response objectives and ARARs are not identified here. Groundwater ARARs, including providing a detailed list of current groundwater ARARs, will be addressed in subsequent PDO, OU 2 SE OU 3, and SE OU 10 RODs.

COST EFFECTIVENESS

The selected remedy, institutional controls, was chosen because it provides the best balance among criteria used to evaluate the alternatives considered in the detailed analysis. The alternative was found to achieve both adequate protection of human health and the environment, and to meet the statutory requirements of Section 121 of CERCLA. The selected remedy was found to be cost-effective. The cost of Alternative 2 has been estimated to be $467,200.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA and the Army have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective and timely manner for the Phase II parcels. The groundwater portion of this action, however, is interim and is not intended to utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy for the Phase II parcels, institutional controls, does not satisfy the statutory preference for treatment as a principal element of the remedy. With respect to the soils, the selected remedy does not meet the statutory preference for treatment as a principal element because EPA generally does not expect to use treatment technology where, as here, contamination in soil exists at low concentrations; the contamination is neither highly toxic nor highly mobile; and the risks to humans from the soil are within acceptable limits if the property is used for commercial/industrial purposes (Gate 1 Guardhouse).

As for the groundwater, because the selected action does not constitute a final remedy, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed by the final groundwater response action and in subsequent RODs.

SECTION 14
DOCUMENTATION OF SIGNIFICANT CHANGES

There were no significant changes made in this ROD for the selected remedy identified in the Proposed Plan.

Glossary of Terms

GLOSSARY OF TERMS

Administrative Record	A file that is maintained, and contains all the information used by the lead agency (Letterkenny Army Depot) to make its decision on the selection of a response action under CERCLA. This file is to be available for public review and a copy established at or near the site, usually at one of the information repositories (Coyle Free Library).
Applicable or Relevant and Appropriate Requirements (ARARs)	"Applicable requirements" are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. "Relevant and appropriate requirements" are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.
Base Realignment and Closure (BRAC)	The process by which the U.S. Department of Defense is "rightsizing." As part of this procedure, excess infrastructure and property that are no longer needed to support the defense mission are being closed and/or realigned.
Commercial/Industrial Use	As referenced in this Record of Decision document, means includes, but is not limited to, administrative/office space, manufacturing, warehousing, restaurants, hotels/ motels, and retail activities. Under this definition residential and daycare use are prohibited.
Community Use	As referenced in this ROD, means use as educational facilities for children from 6 years old or older, occasional use retreat facilities for educational purposes, nature walk areas, fitness trails, office space to support educational functions, indoor and outdoor sporting activities, horticulture programs (indoor and outdoor), and livestock pasture (residential use prohibited).
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA) to investigate and clean up abandoned and uncontrolled hazardous waste sites. U.S. Department of Defense cleanups are funded by the defense budget.
Environmental Baseline Survey	A detailed search and review of available information (Army, Federal, state, and local), analysis of aerial photographs, interviews with current and/or former employees, review of ongoing response actions, visual inspections, and identification of sources of contamination to determine the environmental condition of the BRAC property.

GLOSSARY OF TERMS (Continued)

Feasibility Study or Focused Feasibility Study	Analysis of the practicability of a proposal; e.g., a description and analysis/evaluation of the potential cleanup alternatives for a site or alternatives for a CERCLA site. The feasibility study usually recommends selection of a viable cost-effective alternative. It usually starts as soon as the remedial investigation is underway. Together they are commonly referred to as the "RI/FS." The term can apply to a variety of proposed corrective or regulatory actions. A focused feasibility study, usually referred to as an FFS, is a feasibility study where the technologies or alternatives evaluated have already been narrowed-down to a smaller number, usually because previous research such as "pilot studies" or "bench-scale" studies have been performed. A pilot study or bench-scale study refers to a test where a treatment alternative is performed on a small scale to see if it is effective for the contaminants at a site. Bench-scale studies are normally performed in a laboratory, and the pilot-scale studies are performed at the site or at a larger setting than the laboratory.
Information Repository	A file containing current information, technical reports, reference documents, and other information on a CERCLA site. The information repository includes the Administrative Record file. This is maintained by LEAD.
National Oil and Hazardous Substances Pollution Contingency Plan (NCP)	The Federal regulation that guides the CERCLA program. The NCP was revised in February 1990.
National Priorities List (NPL)	EPA's list of uncontrolled or abandoned hazardous waste sites that are priorities for long-term remedial evaluation and response.
Operable Unit	Term for each of a number of separate activities or actions that each comprises an incremental step toward comprehensively addressing environmental problems at a CERCLA site. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may, for example, address geographical portions of a site or specific site problems, such as groundwater contamination.
PCBs	PCBs are polychlorinated biphenyls. PCBs belong to a family of manmade chlorinated organic compounds (chemicals containing carbon, hydrogen, and chlorine) used since 1926 in electrical transformers as insulators and coolants, and in lubricants, carbonless copy paper, adhesives, and caulking compounds. PCBs are produced in certain combustion processes. PCBs were marketed as various mixtures under different trade names; the most common name for PCBs is Aroclors. The manufacture of PCBs was discontinued in the United States in 1977.
Pilot Study	A pilot study or bench-scale study refers to a test where a treatment alternative is performed on a small scale to see if it is effective for the contaminants at a site. Bench-scale studies are normally performed in a laboratory, and the pilot-scale studies are performed at the site or at a larger setting than the laboratory.
Proposed Plan	A document that describes, for public review and comment, the preferred cleanup strategy, the rationale for the preference, and the alternatives presented in a detailed analysis of the remedial investigation/feasibility study.

GLOSSARY OF TERMS (Continued)

Record of Decision (ROD)	A public document that explains which cleanup alternative will be used at an NPL site. The ROD is based on information and technical analysis generated during the remedial investigation/feasibility study and consideration of public comments and community concerns.
Remedial Investigation	An in-depth study designated to gather the data necessary to determine the nature and extent of contamination at a CERCLA site (by sampling and analysis of soil, groundwater, or other media); establish criteria for cleaning up the site; identify alternatives for remedial actions; and support the technical cost analyses of the alternatives. The remedial investigation is usually conducted with the feasibility study. Together they are usually referred to as the "RI/FS."
Residential Use	As referenced in this ROD, means including, but not limited to, housing, daycare facilities, schools (excluding education and training programs for persons over 18 years of age), assisted living facilities, and outdoor recreational activities. Unrestricted use (community and commercial/industrial included) is permitted under this definition.
Resource Conservation and Recovery Act (RCRA)	A Federal law that established a regulatory system to track hazardous wastes from their generation to disposal. The law (enacted in 1980) requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous wastes. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.
Risk Assessment	Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.
Semivolatile Organic Compounds	These are organic compounds that volatilize slowly at standard (i.e., room) temperature and pressure. An example is benzo(a)pyrene, which is one of the semivolatiles also referred to as a polyaromatic hydrocarbon.
Superfund Amendments and Reauthorization Act (SARA)	Modification to CERCLA enacted on 17 October 1986.
Toxic Substances Control Act	This act was enacted by Congress in 1976 (effective 1 January 1977,15 United States Code [U.S.C.] Section 601 et seq. and amended by Public Law 97-129 on 29 December 1981) to protect human health and the environment from unreasonable risks of injury caused by the manufacture, processing, distribution, use, or disposal of chemical substances and mixtures.
Volatile Organic Compound	An organic (carbon-containing) compound that evaporates (volatilizes) readily at room temperature. Examples of VOCs are trichloroethylene (TCE), and dichloroethene (DCE).

Responsiveness Summary

LETTERKENNY ARMY DEPOT

PHASE II PARCELS

CHAMBERSBURG, FRANKLIN COUNTY, PENNSYLVANIA

RESPONSIVENESS SUMMARY

JULY 2001

SECTION 1
OVERVIEW

Based on an assessment of site conditions and remedial alternatives, the U.S. Department of the Army (Army) and the U.S. Environmental Protection Agency (EPA) selected a remedy for the Phase II parcels at Letterkenny Army Depot (LEAD), Chambersburg, PA. The selected remedy addresses the threat associated with the contaminated groundwater beneath the parcels, and the potential threat associated with the soils at the Gate 1 Guardhouse area (Parcel 2R-80) in the event of nonindustrial land use. As specified in this Record of Decision (ROD), the remedy involves the implementation of deed restrictions and other institutional controls that will be protective of human health and the environment.

Based on the fact that no comments were received during the public comment period, the residents and Letterkenny Industrial Development Authority (LIDA) appear not to object to the implementation of the institutional controls alternative for the Phase II parcels. No written or verbal comments were received during the public comment period on the Proposed Plan.

SECTION 2
BACKGROUND ON COMMUNITY INVOLVEMENT

CHRONOLOGY OF COMMUNITY INVOLVEMENT

Community relations activities at LEAD to date have included public meetings; review and coordination meetings with Federal and state regulatory personnel; site visits; meetings with elected Federal, state, and local officials and with community groups; news releases to the local media; and direct contact with nearby property owners.

Community interviews were conducted in 1988 as part of the process of developing the Public Involvement and Response Plan, which was published in 1990. At the time of the 1988 community interviews, the primary areas of concern to the community were the groundwater contamination problem and associated health and property value issues.

LEAD has a Restoration Advisory Board, which began meeting in 1996 and focuses primarily on the restoration activities related to the Defense Environmental Restoration Account and Base Realignment and Closure (BRAC) actions. The Restoration Advisory Board replaced the Technical Review Committee, formed in 1988, which was the previous vehicle by which the community could provide comments and review progress on the environmental programs at LEAD. LEAD representatives attend Restoration Advisory Board meetings and Letterkenny Industrial Development Authority (LIDA) meetings (formerly the Franklin County Reuse Committee) and provide status updates on environmental activities at LEAD.

Meetings with regulatory agency personnel have been conducted regularly and are held with representatives from LEAD, the U.S. Army Corps of Engineers, the Pennsylvania Department of Environmental Protection (PADEP), EPA Region III, Department of the Army, and the U.S. Army Aviation and Missile Command (which is a subordinate Command of the U.S. Army Materiel Command). Topics of discussion at these meetings generally include review of project status, review of new technical information, resolution of problem areas, and direction and schedule of further studies. In addition to the formal meetings, LEAD, the U.S. Army Corps of Engineers, PADEP, and EPA personnel maintain frequent telephone and E-mail contact on an as-needed basis.

Site visits to LEAD have been made by representatives of the Restoration Advisory Board, the U.S. Army Corps of Engineers, PADEP, EPA Region III, and contractors. Numerous site visits by the regulatory agency representatives have promoted communication among LEAD, PADEP, and EPA.

Periodically since June 1982, when the groundwater contamination problem was first identified, formal

news releases have been issued by LEAD concerning the groundwater issue and other sources of contamination. These news releases typically contain information on the initial phases of investigation and / or remedial work. Recently, much of the news coverage has concerned cleanup with regard to the BRAC parcels and the status of lease and transfer of the property.

The residents in the vicinity of LEAD have generally reacted favorably to the efforts made by the Army with regard to the identification and cleanup programs underway and proposed. The off-post sampling of wells for potential groundwater contamination during the 1980s made nearby residents more aware of the contamination problems existing at LEAD. However, the proactive approach by the Army to identify potential problems and mitigate exposure (by providing connections to a public drinking water source for residents whose wells had potential or known contamination) was received favorably.

KEY COMMUNITY CONCERNS

The community is greatly concerned about the CERCLA sites and LEAD over the long term. Community interviews were conducted on 26-28 June 1997 at the Depot as part of the revised Community Relations Plan. Telephone interviews were conducted prior to and after the on-site interviews. Each interview participant was asked 37 questions. A total of 19 individuals participated in the interviews: 2 Depot residents and 17 Chambersburg-area residents. Persons interviewed for the revised Community Relations Plan identified seven areas of concern.

Cleanup Activities

Generally, the interviewees were pleased with the ongoing environmental cleanup activities. Several people noted that for the last 8 to 10 years, Depot staff have worked hard to solve environmental problems at the site. Some interviewees expressed concern that the cleanup activities were taking too long. The majority of interviewees agreed that the government is committed to cleaning up the hazardous wastes at LEAD. Most of the interviewees wanted to know the status of specific cleanup activities (e.g., data, results, costs, and schedule). One mentioned that some of the environmental reports were too technical to understand.

Some wanted the government to finish the remedial process as quickly as possible, whereas others thought that the government should take the time needed to conduct a thorough remedial process. One individual believed that the Army's environmental standards may not be as stringent as the public's standards in the level of cleanup activities. Several expressed a concern to return areas to farmland use and to coordinate efforts to preserve existing farmland. A few residents noted that farmers do not seem to be concerned about contamination because farming activities continue on property adjacent to LEAD.

Some were concerned that cleanup activities would continue after areas were open for public reuse. One resident said that $350 million was too much to pay for groundwater contamination cleanup on-site and that documentation of the historic value of a warehouse before tearing it down was "foolish."

Reuse

Noting the economic impact of having fewer civilian jobs with the realignment of LEAD, the majority of the interviewees have accepted LIDA's reuse plan.

Some thought the reuse of areas of LEAD was a positive step in preserving farmland/agriculture and pristine areas of Franklin County.

Some thought the reuse plan was overly optimistic and that the public would have to pay for the reuse activities. Many interviewees were concerned about the feasibility of taking care of the reuse areas of LEAD. Many were concerned about the potential liability if additional Army-generated contamination is discovered in the reuse areas.

A few were concerned about the types of industry that may be brought in and the potential for re-contaminating the site and creating noise or traffic problems. Some were concerned with how the Army will provide access to the reuse areas, grant public use of the reservoir, and share the Depot's infrastructure (electricity, water, sewer, etc.). One person suggested that the state establish a low-level radioactive waste disposal facility as a reuse option at LEAD.

Contamination

Several interviewees stated that the extent of contamination is unknown and that more contamination may be discovered. One said that the Army brought materials from across the country for disposal at the Depot. Another said that studies show that the contamination is spreading. Residents are concerned that the solvents in the groundwater and streams will directly affect the population. Several mentioned concerns about specific areas at the Depot:

- Apartment complex (Kenny Gardens housing).
- Old quarry (Fagan's Quarry).

- Rocky Spring Lake.
- Mercury in the lake.
- Fire practice-training areas.
- Lead contamination at the ammunition detonation area.
- Discharge from LEAD (below Gate 6) into streams after a heavy rain.

Air Quality

A few residents said that the Army needs to address air quality in addition to soils and groundwater contamination.

Ammunition Detonation

Many residents expressed concern about the ammunition detonation activities at the Depot. They said the Army sometimes conducts this activity on weekends during the noon hour. Some interviewees believe that the blasting is causing plaster to crack in homes adjacent to and about a mile from LEAD. One resident said that the impact of the detonations is worse for homes a greater distance from LEAD than the homes nearer the Depot. Several mentioned that contaminants must be released into the air as a result of the ammunition detonation. Residents voiced concern about noise, air quality, and dust control regarding the detonation activities.

Government

Half of the interviewees said that the general public mistrusts Federal and state government agencies. One resident said, "No matter what an individual thinks, the government will do what they want and that the government does not think an individual is important to consider." However, the majority of the interviewees believe that PADEP is the most credible government agency regarding environmental issues.

Army

The majority of the interviewees believe that the Army is committed to cleaning up the contamination at LEAD. One resident was pleased that LEAD is a government site because the Army is obligated to clean up the site, whereas a commercial venture could opt to abandon a contaminated property. Some specific concerns include the following:

- The Army is rushing to transfer areas to the public because of community pressure and could compromise environmental cleanup activities.
- The Army cannot meet the deadlines because of the holdup caused by complex environmental problems.
- Some individuals have reservations about some information received from LEAD and are concerned that they may not be getting all of the information. One individual participated in two tours of the facility and questioned the use and contents of a building with concertina wire. The question was not answered to the individual's satisfaction; therefore, this person believes the Army is hiding something.
- There was a lack of response from the LEAD Public Affairs Officer when residents complained about the blasting and poor quality of the office's answering machine (very short tape).

Of the 19 interviewees, 18 said they had an understanding of the BRAC activities at LEAD. The majority of the interviewees were favorable toward the cleanup activities related to the BRAC parcels. In addition, the majority of the interviewees were supportive of LIDA's reuse plan. Most individuals also were favorable toward the cooperation and interaction between the Army and LIDA in freeing the to-be-excessed parcels as soon as possible.

SECTION 3
SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

The public comment period on the Proposed Plan for the Phase II parcels was held from 20 February to 22 March 2001. No comments were received during this time. On 22 February 2001, a public availability session was held at the Building 10, Letterkenny Great Room to present the Proposed Plan (in the form of a poster presentation) and to entertain questions and comments from the public. There were no questions and no comments were made during the public availability session.

Attachment 1
References

ATTACHMENT 1

REFERENCES

ATTACHMENT 1

REFERENCES

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Attachment 2
Risk Assessment Tables

ATTACHMENT 2

RISK ASSESSMENT TABLES

Table 1A

**Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations,
Gate 1 Guardhouse, DSERTS Site LEAD-126, SE OU 8,
Letterkenny Army Depot,
Chambersburg, PA**

Scenario Timeframe:	Future Resident Screen
Medium:	Soil
Exposure Medium:	Soil
Exposure Point:	Contaminants are in soil and exposure to soil is evaluated

Chemical of Potential Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
	Min.	Max.					
Acetone	0.05 J	0.069 J	mg/kg	2/11	0.0357	mg/kg	95% UCL-T
Benzene	0.004 J	0.004 J	mg/kg	1/11	0.004	mg/kg	Maximum
Naphthalene	0.078 J	15 J	mg/kg	14/24	7.73	mg/kg	95% UCL-T
Acenaphthene	0.056 J	3.3	mg/kg	13/24	1.79	mg/kg	95% UCL-T
Benz[a]anthracene	0.053 J	4.1	mg/kg	14/24	0.907	mg/kg	95% UCL-T
Benzo[a]pyrene	0.046 J	4 J	mg/kg	11/24	0.729	mg/kg	95% UCL-T
Benzo[b]fluoranthene	0.043 J	2.9 J	mg/kg	13/24	0.637	mg/kg	95% UCL-T
Dibenz[a,h]anthracene	0.042 J	0.61 J	mg/kg	6/24	0.248	mg/kg	95% UCL-T
Indeno[1,2,3-cd]pyrene	0.046 J	1.5 J	mg/kg	12/24	0.41	mg/kg	95% UCL-T
Fluorene	0.058 J	5.5 J	mg/kg	16/24	2.79	mg/kg	95% UCL-T
Aluminum	8,450 J	19,300 J	mg/kg	11/11	14,674	mg/kg	95% UCL-N
Arsenic	4.2	11	mg/kg	11/11	8.34	mg/kg	95% UCL-N
Barium	63.1	166	mg/kg	11/11	114	mg/kg	95% UCL-T
Chromium	16.5	27.6	mg/kg	11/11	23.2	mg/kg	95% UCL-N
Cobalt	3.6	25	mg/kg	11/11	16.4	mg/kg	95% UCL-N
Iron	25,400	45,400	mg/kg	11/11	38,477	mg/kg	95% UCL-N
Lead	8	37 J	mg/kg	11/11	23.2	mg/kg	95% UCL-N
Manganese (nonfood)	75.2	2,860	mg/kg	11/11	1,402	mg/kg	95% UCL-N
Nickel	10.3	28.6	mg/kg	11/11	23	mg/kg	95% UCL-N
Selenium	0.78	1.9	mg/kg	11/11	1.49	mg/kg	95% UCL-N
Thallium	0.27	0.27	mg/kg	1/11	0.155	mg/kg	95% UCL-T
Vanadium	15.6	34.2	mg/kg	11/11	26.5	mg/kg	95% UCL-N
Zinc	31.8 J	97.9 J	mg/kg	11/11	68.8	mg/kg	95% UCL-N

Note: The table presents the chemicals of concern (COCs) and exposure point concentrations for each of the COCs detected in soil (i.e., the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration, and how the exposure point concentration was derived.

mg/kg = Milligrams per kilogram.
95% UCL = 95% upper confidence limit.

Table 1B

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations,
PCB Transformer Sites,
Letterkenny Army Depot,
Chambersburg, PA

Scenario Timeframe:	Future Resident Screen
Medium:	Soil
Exposure Medium:	Soil
Exposure Point:	Contaminants are in soil and exposure to soil is evaluated

Chemical of Potential Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units
	Min.	Max.				
PCB	0.070 J	0.320 J	mg/kg	2/2	0.32	mg/kg

Note: The table presents the chemicals of concern (COCs) and exposure point concentrations for each of the COCs detected in soil (i.e., the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration, and how the exposure point concentration was derived.

mg/kg = Miligrams per kilogram.
PCB = Polychlorinated biphenyl.

Table 1C

Comparison of Analytical Results with Risk-Based Screening Levels at Former PCB Transformer Sites, Letterkenny Army Depot, Chambersburg, PA

Location	Medium	PCB Concentration (mg/kg)[a]	Lowest Screening Level (mg/kg)	Screening-Level Reference[b]
Building 7 (Parcel 2-38)	Asphalt	0.051 J	1.0	TSCA
	Asphalt	0.340 J	1.0	TSCA
	Asphalt	ND		TSCA
Building 18 (Parcel 2-50)	Soil	0.070 J	0.32/ 0.25	RBC/SSL M-GW
Building 211 (Parcel 2-36)	Soil	0.320 J	0.32/ 0.25	RBC/SSL M-GW
Building 42 (Parcel 2-45)	Asphalt	ND	1.0	TSCA
	Asphalt	ND	1.0	TSCA

[a]Duplicate results were averaged.

[b]TSCA = Total PCB value from 40 CFR 761.61(a)(4) for high occupancy area. *Please note that there are no regulatory requirements for concentrations less than 1 mg/kg;* RBC = EPA Region III residential soil level; SSL M-GW = EPA soil screening levels, migration to groundwater, 1 dilution attenuation factor [DAF].

A high occupancy area means any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: 840 hours or more (an average of 16.8 hours or more per week) for nonporous surfaces, and 335 hours or more (an average of 6.7 hours or more per week) for bulk PCB remediation waste. Examples include a residence; school; daycare center; sleeping quarters; a single or multiple occupancy, 40 hours per week work station; a school classroom; a cafeteria in an industrial facility; a control room; and a work station on an assembly line.

J = Analyte present. Reported value may not be accurate or precise (estimated value).

mg/kg = Milligrams per kilogram.

ND = Not detected at reporting limit.

Table 2

Summary of Final Chemicals of Concern for Groundwater Underlying the PDO Area (1993 Risk Assessment), Letterkenny Army Depot, Chambersburg, PA

Final COCs
ORGANICS
Chlordane
Chloroform
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethene
Pentachlorophenol
Trichloroethene
INORGANICS
Arsenic
Thallium

Source: *Remedial Investigation of the Property Disposal Office Area at Letterkenny Army Depot,* Final Report. Environmental Science & Engineering, Inc. January 1993.

Table 3

Summary of Final Chemicals of Concern for Groundwater Underlying the SE Area (1994 Risk Assessment), Letterkenny Army Depot, Chambersburg, PA

Final COCs
ORGANICS
Benzene
Carbon tetrachloride
Chloroform
1,1-Dichloroethane
1,2-Dichloroethane
1,2-Dichloroethene
Methylene chloride
Tetrachloroethene
Trichloroethene
Vinyl chloride
INORGANICS
Arsenic
Beryllium
Manganese
Thallium

Source: *Remedial Investigation of the Southern Area at Letterkenny Army Depot*, Final Report. Environmental Science & Engineering, Inc. June 1993.

Table 4

Summary of Final Chemicals of Concern for Groundwater (2001 Vapor Intrusion Risk Assessment), Letterkenny Army Depot, Chambersburg, PA

Final COCs	Maximum Groundwater Concentration (µg/L)
ORGANICS	
1,1-Dichloroethene	35
Vinyl choloride	90

Source: *Final Groundwater Vapor Intrusion Risk Assessment, Letterkenny Army Depot.* Roy F. Weston, Inc. February 2001.

Table 5

Formulas/Assumptions for Intake Calculations (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA

Ambient Air, Inhalation Exposure (Volatilization from Soil and Surface Water to Outdoor Air)

$$\text{Intake (mg / kg – day)} = \frac{CA_a \times IR_{aa} \times EF_{aa} \times ED}{BW \times AT}$$

Where:

CA_a	=	Chemical concentration in shower air (mg/m^3).
IR_{aa}	=	Intake rate for shower air (m^3/day).
EF_{aa}	=	Exposure frequency for shower air (days/year).
ED	=	Exposure duration (years).
BW	=	Body weight (kg).
AT	=	Period of time over which exposure is average (days).

Groundwater, Inhalation Exposure (Theoretical Worker Exposure to Vapors While Showering)

$$\text{Intake (mg / kg – day)} = \frac{CA_s \times IR_{as} \times EF_{as} \times ED}{BW \times AT}$$

Where:

CA_s	=	Chemical concentration in shower air (mg/m^3).
IR_{as}	=	Intake rate for shower air (m^3/day).
EF_{as}	=	Exposure frequency for shower air (days/year).
ED	=	Exposure duration (years).
BW	=	Body weight (kg).
AT	=	Period of time over which exposure is average (days).

Groundwater, Oral Exposure

$$\text{Intake (mg / kg – day)} = \frac{CGW \times IR_{gw} \times EF_{gw} \times ED}{BW \times AT}$$

Where:

CGW	=	Chemical concentration in groundwater (mg/L).
IR_{gw}	=	Intake rate for groundwater (L/day).
EF_{gw}	=	Exposure frequency for contaminated groundwater (days/year).
ED	=	Exposure duration (years).
BW	=	Body weight (kg).
AT	=	Period of time over which exposure is average (days).

Table 5

Formulas/Assumptions for Intake Calculations (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA (Continued)

Exposure Parameters Used for PDO and SE Area Groundwater Risk Assessments:

AT

Carcinogenic effects	70 years x 365 days/year	EPA, 1989c
Noncancer effect	ED (years) x 365 days/years	EPA, 1989c

BW

Adult (Residential, Worker)

70 kg	Average (male and female) of 50th percentile values for age = 18 to 75 years	EPA, 1991a

CA_a

The concentrations of chemical in ambient air (at the source and 400 meters downwind of the source) that have volatilized for soil are modeled values based on chemical-specific parameters (i.e., soil concentration, Henry's Law constant, K_{oc}, etc.) and site-specific parameters (i.e., soil depth, soil porosity, wind velocity, etc.).

CA_s

The concentration of VOCs in shower air is a modeled value based on the average values presented by McKone (1987) for the chemicals of concern (COCs)at the site. McKone values were used because they are the most realistic and most conservative.

1.	CGW	Measured value
2.	Ration of chemical concentration in shower air to chemical concentration in water (mg/L)	18 L/m^3

$$CA_s\ (mg/m^3) \times CGW\ (mg/L) \times 18\ (L/m^3)$$

CGW

The upper 95% confidence limit (UCL_{95}) of the mean chemical concentration was used to represent the reasonable maximum exposure (RME) concentration. If the UCL_{95} exceeded the maximum detected chemical concentration, the maximum concentration was used to represent the RME.

Table 5

Formulas/Assumptions for Intake Calculations (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA (Continued)

ED		
Adult (Worker)		
25 years	National 95th percentile time at one workplace	EPA, 1991b
EF_{aa}		
Worker (Adult)—(Current)		
12 days/years	Assumes that grass in the contamination areas is cut 2 times per month during the average growing season of 162 days/year.	
Other than incidental dermal, inhalation, and oral exposure to soil by maintenance personnel cutting grass or performing other minor duties in the potentially contaminated areas, no other worker exposure to soil is expected to occur at these sites.		
Worker (Adult)—Future		
250 days/year	Amount of time spent at work	EPA, 1991b
EF_{gw}		
250 days/year	Number of days spent at work	EPA, 1991b
Site groundwater is not used as a water supply on the base. Evaluation of future worker exposure to groundwater has been requested by EPA and PADEP; therefore, this pathway has been included as a conservative estimate of a theoretical future exposure.		
IR_{aa}		
Worker (Adult)—Current		
5 m^3/day	Based on a reasonable upper-bound occupational inhalation rate for an 8-hour workday (20 m^3/day [EPA, 1991b]) and assumes that maintenance personnel may work in the area 2 hours/day.	
Worker (Adult)—Future		
20 m^3/day	Reasonable upper-bound occupational inhalation rate for an 8-hour work day.	EPA, 1991b

Table 5

Formulas/Assumptions for Intake Calculations (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA (Continued)

IR_{gw}

1.0 L/day	Reasonable occupational ingestion rate	EPA, 1991b

Site groundwater is not currently used as a water supply on the base. Evaluation of future worker exposure to groundwater has been requested by EPA and PADEP; therefore, this pathway has been included as a conservative estimate of a theoretical future exposure.

References

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Table 5

Formulas/Assumptions for Intake Calculations (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA (Continued)

References (continued):

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Ryan, E.A., E.T. Hawkins, B. Magee, and S.L. Santos. 1987. "Assessing Risk from Dermal Exposure at Hazardous Waste Sites." In: *Proceedings of the 8th, National Superfund Conference*. Hazardous Materials Control Research Institute. Silver Spring, MD.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA

Johnson and Ettinger Model:

Can be run as a "forward calculation" to calculate indoor air concentrations based on actual groundwater data, or it can be run as a "reverse calculation" to calculate groundwater risk-based screening concentrations (RBSCs) based on indoor inhalation exposure assumptions.

Sources:

Environmental Quality Management, Inc. 1997. *User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings*. Prepared for E.H. Pechan & Associates, Inc. Springfield, VA. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC. September 1997.

Johnson, P.C, and R.A. Ettinger.1991. "Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings." *Environ. Sci. Technology*, 25:1445-1452.

Worker Exposure:

Inhalation risk-based air concentrations (C_{worker}) were calculated for noncancer and carcinogenic effects for each chemical of potential concern (COPC). C_{worker} for carcinogens was based on a target risk (TR) of 1E-06. For noncarcinogens, a target hazard quotient (THQ) of 0.1 was used.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Model for Calculating Noncancer Inhalation Risk-Based Concentration–Construction/Utility Worker:

Inhalation of VOCs[a]

$$C_{worker}\ (\mu g/m^3) = \frac{THQ \times AT \times BW \times 1{,}000\ \mu g/mg}{IR \times EF \times ED \times (1/RfD_i)}$$

Parameter	Definition	Value
THQ	Target hazard quotient.	0.1
AT	Averaging time (days).	365
BW	Body weight (kg).	70
IR	Inhalation rate (m^3/day).	16[b]
EF	Exposure frequency (days/year).	42
ED	Exposure duration (years).	1.0
RfD_i	Inhalation reference dose (mg/kg-day).	Chemical-specific

[a] VOCs are defined as those chemicals with a Henry's Law constant greater than 0.00001 and a molecular weight less then 200 Daltons.

[b] Outdoor worker breathes 1.5 m^3/day (moderate activity) for 4 hours and 2.5 m^3/day (heavy activity) for 4 hours.

C_{worker} = Construction/ utility worker inhalation risk-based concentration based on a target cancer risk of 1E-06.

kg = Kilograms of body weight.

m^3/day = Cubic meters per day.

$\mu g/m^3$ = Micrograms per cubic meter.

mg/kg-day = Milligrams per kilogram per day.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Model for Calculating Carcinogenic Inhalation Risk-Based Concentration–Construction/Utility Worker:

Inhalation of VOCs[a]

$$C_{worker}\ (\mu g/m^3) = \frac{TR \times AT \times BW \times 1{,}000\ \mu g/mg}{IR \times EF \times ED \times CSF_i}$$

Parameter	Definition	Value
TR	Target cancer risk.	1.00E-06
AT	Averaging time (days).	25,550
BW	Body weight (kg).	70
IR	Inhalation rate (m^3/day).	16[b]
EF	Exposure frequency (days/year).	42
ED	Exposure duration (years).	1.0
CSF_i	Inhalation cancer slope factor $(mg/kg\text{-}day)^{-1}$.	Chemical-specific

[a] VOCs are defined as those chemicals with a Henry's Law constant greater than 0.00001 and a molecular weight less then 200 Daltons.

[b] Outdoor worker breathes 1.5 m^3/day (moderate activity) for 4 hours and 2.5 m^3/day (heavy activity) for 4 hours.

C_{worker} = Construction/ utility worker inhalation risk-based concentration based on a target cancer risk of 1E-06.

kg = Kilograms of body weight.

m^3/day = Cubic meters per day.

$\mu g/m^3$ = Micrograms per cubic meter.

mg/kg-day = Milligrams per kilogram per day.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Calculating Trench Air Concentration:

These values were used to evaluate the risk to a worker in a trench. Trench was assumed to be a closed space with very little air exchange. The following is a modified indoor air model from the *Air/Superfund National Technical Guidance Study Series, Assessing Potential Indoor Air Impacts for Superfund Sites* (EPA-451/R-92-002):

$$C_{trench} = \frac{J \times A \times F \times 3{,}600}{ACH \times V \times 10^{-6}}$$

Where:

C_{trench} = Concentration of contaminant in the trench ($\mu g/m^3$).

J = Contaminant flux estimated from source model, grams per square meter per second (g/m^2-sec).

A = Area of the trench floor (square meters [m^2]).

F = Fraction of floor through which contaminant flux can enter. (If this were a building, F = 0.001 for a slab, F = 1 for a dirt floor.) Because this is a trench, set F = 1.

3,600 = Constant, seconds per hour (sec/hour).

ACH = Air changes per hour (hr^{-1}) (assume this value is 2).

V = Volume of the trench (m^3).

10^{-6} = Conversion factor (micrograms per gram [$\mu g/g$]).

Potential Residential Exposure:

A forward calculation of the model was used to predict the indoor residence air concentration based on the maximum, sitewide groundwater concentration for each compound. This indoor air concentration ($C_{building}$) was then compared to inhalation risk-based screening concentrations calculated for the adult resident and child resident for both noncancer and carcinogenic effects. The target cancer risk was 1E-06 and the target hazard quotient was 0.1. As was done for the construction/utility worker scenario, these risk-based screening concentrations ($C_{resident}$) were compared with the $C_{building}$ concentrations to determine contaminants of potential concern.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Model for Calculating Noncancer Inhalation Risk-Based Concentration–Adult Resident:

Inhalation of VOCs[a]

$$C_{adult}\ (\mu g/m^3) = \frac{THQ \times AT \times BW \times 1{,}000\ \mu g/mg}{IR \times EF \times ED \times (1/RfD_i)}$$

Parameter	Definition	Value
THQ	Target hazard quotient.	0.1
AT	Averaging time (days).	365 x ED
BW	Body weight (kg).	70
IR	Inhalation rate (m^3/day).	13.3[b]
EF	Exposure frequency (days/year).	350
ED	Exposure duration (years).	30
RfD_i	Inhalation reference dose (mg/kg-day).	Chemical-specific

[a] VOCs are defined as those chemicals with a Henry's Law constant greater than 0.00001 and a molecular weight less than 200 Daltons.

[b] Adult (19-65+ years) resident long-term inhalation rate based on male/female average.

C_{adult} = Adult resident inhalation risk-based concentration based on a target hazard quotient of 0.1.

kg = Kilograms of body weight.

m^3/day = Cubic meters per day.

$\mu g/m^3$ = Micrograms per cubic meter.

mg/kg-day = Milligrams per kilogram per day.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Model for Calculating Carcinogenic Inhalation Risk-Based Concentration–Adult Resident:

Inhalation of VOCs[a]

$$C_{adult}\ (\mu g/m^3) = \frac{TR \times AT \times BW \times 1{,}000\ \mu g/mg}{IR \times EF \times ED \times CSF_i}$$

Parameter	Definition	Value
TR	Target cancer risk.	1.00E-06
AT	Averaging time (days).	365 x 70
BW	Body weight (kg).	70
IR	Inhalation rate (m^3/day).	13.3[b]
EF	Exposure frequency (days/year).	350
ED	Exposure duration (years).	30
CSF_i	Inhalation cancer slope factor $(mg/kg\text{-}day)^{-1}$.	Chemical-specific

[a] VOCs are defined as those chemicals with a Henry's Law constant greater than 0.00001 and a molecular weight less then 200 Daltons.

[b] Adult (19-65+ years) resident long-term inhalation rate based on male/female average.

C_{adult} = Adult resident inhalation risk-based concentration based on a target cancer risk of 1E-06.

kg = Kilograms of body weight.

m^3/day = Cubic meters per day.

$\mu g/m^3$ = Micrograms per cubic meter.

mg/kg-day = Milligrams per kilogram per day.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Model for Calculating Noncancer Inhalation Risk-Based Concentration–Child Resident:

Inhalation of VOCs[a]

$$C_{child}\ (\mu g/m^3) = \frac{THQ \times AT \times BW \times 1{,}000\ \mu g/mg}{IR \times EF \times ED \times (1/RfD_i)}$$

Parameter	Definition	Value
THQ	Target hazard quotient.	0.1
AT	Averaging time (days).	365 x ED
BW	Body weight (kg).	15
IR	Inhalation rate (m^3/day).	8.6[b]
EF	Exposure frequency (days/year).	350
ED	Exposure duration (years).	6
RfD_i	Inhalation reference dose (mg/kg-day).	Chemical-specific

[a] VOCs are defined as those chemicals with a Henry's Law constant greater than 0.00001 and a molecular weight less than 200 Daltons.

[b] Child resident long-term inhalation rate based on average of children 1-2, 3-5, and 6-8 years old.

C_{child} = Child inhalation risk-based concentration based on a target hazard quotient of 0.1.

kg = Kilograms of body weight.

m^3/day = Cubic meters per day.

$\mu g/m^3$ = Micrograms per cubic meter.

mg/kg-day = Milligrams per kilogram per day.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Model for Calculating Carcinogenic Inhalation Risk-Based Concentration–Child Resident:

Inhalation of VOCs[a]

$$C_{child}\ (\mu g/m^3) = \frac{TR \times AT \times BW \times 1{,}000\ \mu g/mg}{IR \times EF \times ED \times CSF_i}$$

Parameter	Definition	Value
TR	Target cancer risk.	1.00E-06
AT	Averaging time (days).	365 x 70
BW	Body weight (kg).	15
IR	Inhalation rate (m^3/day).	8.6[b]
EF	Exposure frequency (days/year).	350
ED	Exposure duration (years).	6
CSF_i	Inhalation cancer slope factor $(mg/kg\text{-}day)^{-1}$.	Chemical-specific

[a] VOCs are defined as those chemicals with a Henry's Law constant greater than 0.00001 and a molecular weight less than 200 Daltons.

[b] Child resident long-term inhalation rate based on average of children 1-2, 3-5, and 6-8 years old.

C_{child} = Child inhalation risk-based concentration based on a target cancer risk of 1E-06.

kg = Kilograms of body weight.

m^3/day = Cubic meters per day.

$\mu g/m^3$ = Micrograms per cubic meter.

mg/kg-day = Milligrams per kilogram per day.

Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Estimation of cancer risks and hazard quotients for adult and child resident using a risk-ratio approach as follows:

Incremental lifetime cancer risk is determined for each chemical of potential concern (COPC) by the following algorithm:

$$\text{Cancer risk} = (C_{building} * 1E\text{-}06) / (C_{resident})$$

Where:

$C_{building}$ = Indoor air concentration based on maximum sitewide groundwater concentration (milligrams per kilogram [mg/kg]).

$C_{resident}$ = Inhalation risk-based concentration (RBC) (mg/kg) for the adult or child resident, target cancer risk of 1E-06.

The hazard quotients (HQs) for each COPC are evaluated using the following algorithm:

$$HQ = (C_{building} * 0.1) / (C_{resident})$$

Where:

$C_{building}$ = Indoor air concentration based on maximum sitewide groundwater concentration (mg/kg).

$C_{resident}$ = Inhalation RBC (mg/kg) for the adult or child resident, target HQ of 0.1.

Sources:

EA (EA Engineering, Science, and Technology). 1991. *Site Investigation,* LEAD.

EPA (U.S. Environmental Protection Agency). 2000. *Integrated Risk Information System* (IRIS). Peer-reviewed toxicity database maintained by the U.S. Environmental Protection Agency, Washington, DC.

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Table 6

Primary Formulas for Groundwater Vapor Intrusion into Buildings/Trenches, Letterkenny Army Depot, Chambersburg, PA (Continued)

Sources (continued):

E PA (U.S. Environmental Protection Agency). 1996. *Soil Screening Guidance: Technical Background Document*. EPA/540/R-956/128. PB96-963502. Office of Solid Waste and Emergency Response, Washington, DC. May 1996.

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Table 7

Weight-of-Evidence Classification System for Potential Carcinogens, Letterkenny Army Depot, Chambersburg, PA

EPA Category	Description of Group	Description of Evidence
Group A	Human carcinogen	Sufficient evidence from epidemiological studies to support a causal association between exposure and cancer.
Group B1	Probable human carcinogen	Limited evidence-of carcinogenicity in humans from epidemiological studies.
Group B2	Probable human carcinogen	Sufficient evidence of carcinogenicity in animals, but inadequate data in humans.
Group C	Possible human carcinogen	Limited evidence of carcinogenicity in animals and no data in humans.
Group D	Not classified	Inadequate evidence of carcinogenicity in animals.
Group E	No evidence of carcinogenicity in humans	No evidence of carcinogenicity in at least two adequate in humans animal tests or in both epidemiological and animal studies.

Source: U.S. Environmental Protection Agency (EPA). 1989. *Risk Assessment Guidance for Superfund (RAGS)*, Volume I, *Human Health Evaluation Manual, Part A.* Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-89/002.

Table 8

Chronic Dose-Response Toxicity Constants for the COCs in the SE and PDO Areas at LEAD (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA

Chemical	Oral RfD (UF)*	Inhal RfD (UF)*	Oral CSF*	Oral WoE*	Inhal CSF*	Inhal WoE*
Inorganic Chemical (IOC)						
Arsenic	3×10^{-4} (3)	–	1.8[I1]	A	50	A
Beryllium	5×10^{-3} (100)	–	4.3	B2	8.4[#]	B2
Cadmium (aqueous matrix)	5×10^{-4} (10)	–	–		–	
Cadmium (solid matrix)	1×10^{-3} (10)	–	–		6.1[#]	B1
Chromium, total[I2]	5×10^{-3} (500)	ND[I3]	–		41[#]	A
Copper	$3.7 \times 10^{-2\ \#,\ I4}$ (2)	–	–			
Lead	–[I5]	–	ND[I6]	B2	ND[I6]	B2
Manganese (aqueous matrix)	5×10^{-3} (1)	–	–		–	
Manganese (solid matrix)	1.4×10^{-1} (1)	1.1×10^{-4} (900)	–		–	
Nickel	2×10^{-2} (300)	–	–		$8.4 \times 10^{-1\ \#,\ I7}$	A
Thallium	$7 \times 10^{-5\ \#,\ I10}$ (3,000)	–	–		–	
Zinc	3×10^{-1} (10)	–	–		–	
Pesticides/Polychlorinated Biphenyls (PCBs)						
Chlordane, total	6×10^{-5} (1,000)	–	1.3	B2	1.3[#]	B2
Heptachlor	5×10^{-4} (100)	–	4.5	B2	4.5[#]	B2
Semivolatile Organic Chemicals (SOC)						
Bis(2-ethylhexyl)phthalate	2×10^{-2} (1,000)	–	1.4×10^{-2}	B2	ND[S1]	B2
Diethyl phthalate	8×10^{-1} (1,000)	–	–		–	
Pentachlorophenol	3×10^{-2} (100)	–	1.2×10^{-1}	B2	ND[S1]	B2
Volatile Organic Chemicals (VOC)						
Acetone	1×10^{-1} (1,000)	–				
Benzene	$2 \times 10^{-2\ V1}$ (NA)	$5.7 \times 10^{-5\ V2}$ (NA)	2.9×10^{-2}	A	$2.9 \times 10^{-2\ \#}$	A
Bromodichloromethane	2×10^{-2} (1,000)	–	1.3×10^{-1}	B2	ND[V3]	B2
Carbon tetrachloride	7×10^{-4} (1,000)	–	1.3×10^{-1}	B2	$5.3 \times 10^{-2\ \#}$	B2
Chloroform	1×10^{-2} (1,000)	–	6.1×10^{-3}	B2	$8.1 \times 10^{-2\ \#}$	B2
Dichloroethane, 1,1-	$1 \times 10^{-1\ \#}$ (1,000)	1×10^{-1} (1,000)	ND[V3]	C	ND[V4]	C
Dichloroethane, 1,2-	$7 \times 10^{-2\ V5}$ (100)	$2 \times 10^{-3\ V2}$ (NA)	9.1×10^{-2}	B2	$9.1 \times 10^{-2\ \#}$	B2
Dichloroethene, 1,1-	9×10^{-3} (1,000)		6×10^{-1}	C	1.8×10^{-1}	C

Table 8

Chronic Dose-Response Toxicity Constants for the COCs in the SE and PDO Areas at LEAD (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA (Continued)

Chemical	Oral RfD (UF)*	Inhal RfD (UF)*	Oral CSF*	Oral WoE*	Inhal CSF*	Inhal WoE*
Dichloroethene, 1,2-, total	9×10^{-3} (1,000)	S	S		S	
Methylene chloride	6×10^{-2} (100)	8.6×10^{-1} (100)	7.5×10^{-3}	B2	1.6×10^{-3}	B2
Tetrachloroethene	1×10^{-2} (1,000)	S	5.1×10^{-2} V6	B2 V6	1.8×10^{-3} V6	B2 V6
Toluene	2×10^{-1} (1,000)	1.1×10^{-1} # (100)	S		S	
Trichloroethane, 1,1,1-	9×10^{-2} (1,000)	3×10^{-1} # (1,000)	S		S	
Trichloroethane, 1,1,2-	4×10^{-3} (1,000)	S	5.7×10^{-2}	C	5.7×10^{-2} #	C
Trichloroethene	6×10^{-3} V2	S	1.1×10^{-2} V6	B2 V6	6×10^{-3} V2	B2 V6
Trichlorofluoromethane	3×10^{-1} (1,000)	2×10^{-1} # (10,000)	S		S	
Vinyl chloride	S	S	1.9 #	A	3×10^{-1} #	A

Notes:
CSF = Cancer slope factor [$(mg/kg\text{-}day)^{-1}$].
inhal = Inhalation
NA = Not available.
ND = Not determined.
RfD = Reference dose (mg/kg-day).
UF = Uncertainty factor (includes any applicable modifying factor).
WoE = Weight-of-evidence for ranking as a human carcinogen (see Table 4).

(I1) CSF for arsenic based on unit cancer risk of 5×10^{-5} micrograms per liter $(\mu g/L)^{-1}$ proposed by Risk Assessment Forum (EPA, 1991a).

(I2) All values are for hexavalent chromium; a less conservative oral RfD of 1E+00 mg/kg-day for trivalent chromium is also available.

(I3) Inhalation RfD for chromium has been withdrawn from IRIS pending further EPA review.

(I4) RfD for copper based on the maximum contaminant level (MCL) of 1.3 mg/ L (56 FR 26460) and assumes that a healthy 70-kg adult consumes 2 L of water per day.

(I5) EPA prefers to use a biokinetic uptake model to evaluate lead exposure rather than the reference dose method.

(I6) Although EPA has classified lead as a Group B2 suspect human carcinogen via ingestion and inhalation, no CSF has been developed for either of these exposure pathways.

(I7) Inhalation of CSF for nickel refinery dust.

(I10) This value (for soluble thallium salts) has been withdrawn from IRIS pending further review.

Table 8

Chronic Dose-Response Toxicity Constants for the COCs in the SE and PDO Areas at LEAD (1993 and 1994 Risk Assessments), Letterkenny Army Depot, Chambersburg, PA (Continued)

(S1) Although EPA has classified this synthetic organic compound (SOC) as a Group B2 suspect human carcinogen via inhalation, no CSF has been developed for this exposure pathway.

(V1) RfD for benzene based on the EPA 10-day health advisory of 0.235 mg/ L (EPA, 1987) and assumes that a healthy 10-kg child consumes 1 L of water per day.

(V2) Interim value obtained from EPA Environmental Criteria and Assessment Office (ECAO), as recommended by EPA Region III.

(V3) Although EPA has classified this chemical as a Group C possible human carcinogen via ingestion, no CSF has been developed for this exposure pathway.

(V4) Although EPA has classified this chemical as a Group C possible human carcinogen via inhalation, no CSF has been developed for this exposure pathway.

(V5) RfD for 1,2-dichloroethane based on a chronic oral no-observed-adverse-effect level (NOAEL) for rats of 7 mg/ kg-day (ATSDR, 1988) and an uncertainty factor of 100 (10X for sensitive human subpopulations and 10X for animal-to-human extrapolation).

(V6) CSFs and WoEs for this VOC have been withdrawn from IRIS pending further review; the listed value is from EPA / HEAST (1991).

*All RfDs, CSFs, and WoEs are available in IRIS (1993), unless otherwise noted.
#This value is available in EPA / HEAST (1992).

Sources: ATSDR (Agency for Toxic Substance and Disease Registry). 1988. *Toxicological Profile for 1,2-Dichloroethane*. Prepared by Clement Associates. U.S. Public Health Service, Atlanta, GA. NTIS No. PB90-171422.

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Table 9

Toxicity Values for Chemicals of Potential Concern from Groundwater Vapor Intrusion Risk Assessment, Letterkenny Army Depot, Chambersburg, PA

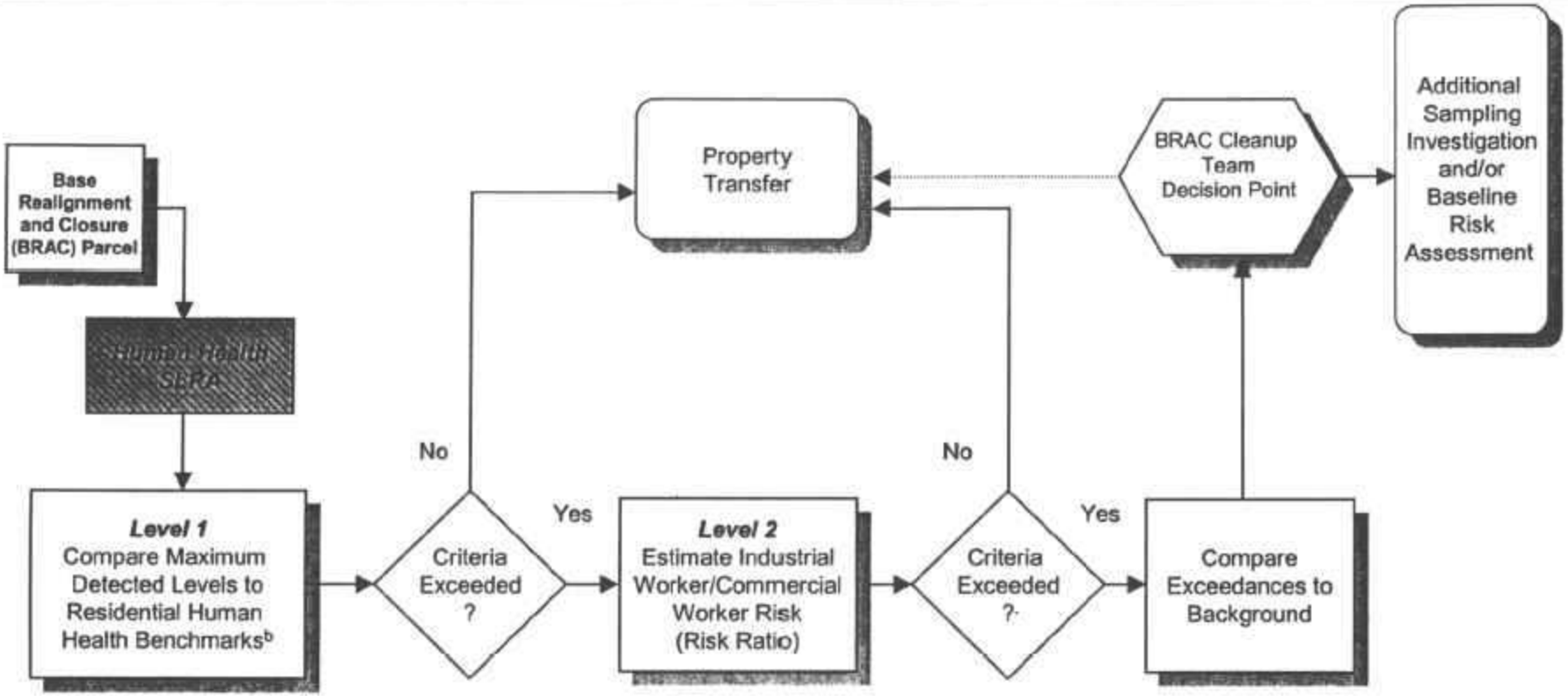
Chemical	RfD_i (mg/kg-day)	RfC[a] (mg/m^3)	CSF[i] $(mg/kg\text{-}day)^{-1}$	URF[b] $(\mu g/m^3)^{-1}$
Acetone	1.00×10^{-1} [c]	3.5×10^{-1} [c]	NTV	NTV
Benzene	1.70×10^{-3}	5.95×10^{-3}	2.90×10^{-2}	8.29×10^{-6}
Bromodichloromethane	2.00×10^{-2} [c]	7.00×10^{-2} [c]	6.20×10^{-2} [c]	1.77×10^{-5} [c]
Carbon tetrachloride	5.71×10^{-4}	2.00×10^{-3}	5.30×10^{-2}	1.51×10^{-5}
Chloroethane	2.90	10.2	2.90×10^{-3} [c]	8.29×10^{-7} [c]
Chloroform	8.60×10^{-5}	3.01×10^{-4}	8.10×10^{-2}	2.31×10^{-5}
1,1-Dichloroethane	1.40×10^{-1}	4.90×10^{-1}	NTV	NTV
1,2-Dichloroethane	1.40×10^{-3}	4.90×10^{-3}	9.10×10^{-2}	2.60×10^{-5}
1,1-Dichloroethene	9.00×10^{-3} [c]	3.15×10^{-2} [c]	1.75×10^{-1}	5.00×10^{-5}
1,2-Dichloroethene	9.00×10^{-3} [c]	3.15×10^{-2}	NTV	NTV
cis-1,2-Dichloroethene	1.00×10^{-2} [c]	3.50×10^{-2} [c]	NTV	NTV
trans-1,2-Dichloroethene	2.00×10^{-2} [c]	7.00×10^{-2} [c]	NTV	NTV
Ethylbenzene	2.90×10^{-1}	1.02	NTV	NTV
Methylene chloride	8.60×10^{-1}	3.01	1.65×10^{-3}	4.71×10^{-7}
Tetrachloroethene	1.40×10^{-1}	4.90×10^{-1}	2.00×10^{-3}	5.71×10^{-7}
1,1,2,2-Tetrachloroethane	6.00×10^{-2} [c]	2.10×10^{-1} [c]	2.00×10^{-1}	5.71×10^{-5}
Toluene	1.14×10^{-1}	3.99×10^{-1}	NTV	NTV
1,1,1-Trichloroethane	6.30×10^{-1}	2.21	NTV	NTV
1,1,2-Trichloroethane	4.00×10^{-3} [c]	1.40×10^{-2} [c]	5.60×10^{-2}	1.60×10^{-5}
Trichloroethene	6.00×10^{-3} [c]	2.10×10^{-2} [c]	6.00×10^{-3}	1.71×10^{-6}
Vinyl chloride	2.80×10^{-2}	9.80×10^{-2}	3.00×10^{-2}	8.57×10^{-6}
Xylene, total	2.00 [c]	7.00 [c]	NTV	NTV

Source: *Final Groundwater Vapor Intrusion Risk Assessment, Letterkenny Army Depot*. February 2001. Roy F. Weston, Inc.

[b] Adjustment factor applied to inhalation slope factor to calculate unit risk factor = 20 m^3 / day x 1 / 70 kg x 1,000 µg / mg.

[c] Assumed route-to-route extrapolation.

CSF_i = Inhalation cancer slope factor.
µg/m^3 = Micrograms per cubic meter.
mg/m^3 = Milligrams per cubic meter.
mg/kg-day = Milligrams per kilogram per day.
NTV = No toxicity value
RfC = Reference concentration.
RfD_i = Inhalation reference dose.
URF = Unit risk factor.



[a] See Section 7 of ROD for description of screening level risk assessment process.

[b] Risk-based screening concentration (adjusted EPA Region III risk-based screening concentrations for residential soil ingestion), EPA soil-screening level (inhalation and groundwater protection), and PADEP Act 2 medium-specific concentrations, direct contact, residential soil.

Figure 2-1
Screening Level Risk Assessment[a] Process
Letterkenny Army Depot
Chambersburg, PA

Attachment 3
Groundwater Level Monitoring Program to Support Transfer of Phase II BRAC Parcels at Letterkenny Army Depot

ATTACHMENT 3

GROUNDWATER LEVEL MONITORING PROGRAM TO SUPPORT TRANSFER OF BASE REALIGNMENT AND CLOSURE (BRAC) PARCELS AT LETTERKENNY ARMY DEPOT, CHAMBERSBURG, PA

ATTACHMENT 3

GROUNDWATER LEVEL MONITORING PROGRAM TO SUPPORT TRANSFER OF BASE REALIGNMENT AND CLOSURE (BRAC) PARCELS, LETTERKENNY army DEPOT, CHAMBERSBURG, PA

INTRODUCTION

The information presented herein provides supporting information to current and future landowners and tenants of BRAC parcels at Letterkenny Army Depot (LEAD) concerning groundwater elevations at LEAD, and how to determine if the owner/ tenant can safely perform excavation activities (i.e., comply with environmental deed provisions) within the BRAC parcels. Based on many years of groundwater monitoring at LEAD, it is known that the groundwater levels fluctuate. The deed restrictions are in-place due to the presence of and to prevent potential exposure to volatile organic compounds (VOCs) in groundwater beneath the BRAC parcels. Therefore, to provide the owner/tenant with a general understanding of where groundwater can occur at the shallower conditions documented over the years, the groundwater elevation data were summarized in a map as discussed in more detail in the following paragraphs. The shallower conditions are historically experienced in seasons with greater amounts of precipitation. Therefore, these shallower groundwater conditions are often referred to as "seasonally high groundwater conditions."

This information is also used to establish a real-time system for determining whether excavation activities in the various BRAC parcels would be allowed based on the environmental provisions in-place for the property. The attached quick-reference tables provide an easy method for the landowners to determine whether groundwater conditions within their parcels are suitable for excavation activities at various depths. In accordance with the environmental deed provisions of the BRAC property transfer (as determined by risk evaluations conducted for the BRAC parcels and as established by the Army because groundwater levels vary at the site), soil excavation or other soil disturbance activities and construction of human-occupied subsurface structures are prohibited within 3 feet (ft) of the groundwater level at a particular parcel, unless approved by the Army. The allowance for excavation or other soil activities will be determined by monitoring the groundwater at or near the subject parcel as described in the following paragraphs. The allowance for subsurface structures will be determined by the seasonal high groundwater conditions described here.

If soil excavation activities are necessary within 3 ft of groundwater, at its seasonal high (or as measured prior to construction or soil disturbance activities), then additional health and safety measures must be implemented by the owner/tenant/contractor (e.g., Occupational Safety and Health Administration [OSHA]-trained workers must be used and a Health and Safety Plan [HASP] must be written/implemented) to prevent potential exposure to VOC-contaminated groundwater during excavation or other soil disturbance activities. In addition, human occupied structures cannot be constructed without prior permission of the Army, the Pennsylvania Department of Environmental Protection (PADEP) and the U.S. Environmental Protection. Agency (EPA) if the floor of the structure will be within 3 ft or less of the seasonal high groundwater level. This attachment details the methodology for developing the basewide shallow groundwater map and presents the proposed groundwater monitoring program for the BRAC parcels at LEAD.

BACKGROUND

Figure 3-1* shows the areas where seasonally high groundwater exists at depths of 8 ft or less below ground surface (bgs) (At this time, the Army is transferring only surface structures and soil to a depth of 8 ft bgs.) This figure was developed using water-level measurements collected from existing wells as part of numerous remedial investigations (RIs) conducted at LEAD since 1987 and the calculation method discussed in this attachment (see reference list). The historical water-level measurements provided direct information on the depth and variability of the groundwater level below ground surface. Groundwater levels across the base fluctuate in

* The Open Vehicle Storage Area (OVSA) (this area is not one of the Phase II parcels) was not included in this mapping effort because groundwater sampling results to date indicate that this topographically high area of the Depot, which is underlain by shale bedrock, has not been impacted by VOCs. In addition, data for areas north of the test track were not included because there are no Phase II BRAC parcels in this area and data from recently installed wells are still being collected and interpreted.

response to recharge from precipitation. The shallowest groundwater typically occurs in the spring, when a larger amount of precipitation (rain and snowmelt) infiltrates the subsurface to recharge the shallow aquifer.

The seasonally high groundwater level was determined through a statistical analysis of historical water-level monitoring data as follows: the 95% prediction limit was calculated as described in *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance* (EPA, 1989). The statistically determined 95% prediction limit means that there is a 95% probability (or very high likelihood) that when groundwater elevations are measured in the future, the levels will not be shallower than 8 ft bgs. The formula for calculating the prediction limit is as follows:

Prediction Limit = Mean + [Student's *"t"* * standard deviation * (1 + 1/square root of the number of samples)]

Figure 3-1 contains the 95% prediction limit for individual wells and contour lines showing areas with relatively shallow groundwater. Shallow groundwater typically occurs in stream bottoms and low-lying areas. Topography and surface-water features were used to construct the contours between wells with water-level data.

GROUNDWATER LEVEL MONITORING PROGRAM—BRAC PARCELS

Using the map of seasonally high groundwater areas at LEAD, a number of wells located within these shallow groundwater areas were selected for continuous water-level monitoring on a parcel-by-parcel basis for the Phase II parcels (see Table 3-1). The listed locations of monitor wells in Table 3-1 are shown in reference to the Phase II BRAC parcels in Figures 3-2 and 3-3. Groundwater levels in these wells will be continuously monitored to determine whether excavation activities within nearby BRAC parcels would encounter shallow groundwater within the 3-ft buffer zone beneath the base of a given excavation. The continuous water-level data will be collected to also evaluate the seasonal and short-term variation in groundwater height throughout the year to help support any future construction activities involving intrusive actions (i.e., utilities, foundation, or subsurface structure). Access to these wells will also be made available for manual water-level measurements in the event that the electronic data are unavailable. Included in Table 3-1 are the minimum water-level depths that must exist at each location for the various excavation depths. If these minimum depth-to-water values cannot be met, OSHA-trained workers and implementation of a HASP, as well as approval from the Army, would be required for the excavation work.

The continuous depth-to-water measurements will be collected using electronic datalogging devices that have been or will be installed in the selected monitor wells cited in Table 3-1. Wells in the vicinity of Building 37 will provide data for both the continuous groundwater monitoring program, as well as for the ongoing bioremediation project. The electronic groundwater level data from the dataloggers will be provided to the Letterkenny Industrial Development Authority (LIDA) from the Army.

REFERENCES

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WESTON (Roy F. Weston, Inc.). *Oil Burn Pit Groundwater Investigation—PDO OU 4—Letterkenny Army Depot, Chambersburg,* PA. 1998 - Present/Ongoing.

Table 3-1

Phase II Parcels and Associated Monitoring Wells for Determining Excavation Limits, Letterkenny Army Depot, Chambersburg, PA

Parcel ID	Well(s)	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Casing Stick-Up (ft)	Minimum Depth-to-Water (ft TOC) Required for Various Excavation Depths (See Explanation Below[a])					
					8 ft	7 ft	6 ft	5 ft	4 ft	3ft
2-35	83-1	687.40	684.1	3.3	14.3	13.3	12.3	11.3	10.3	9.3
2-36	83-12	688.00	685.1	2.9	13.9	12.9	11.9	10.9	9.9	8.9
2-37	00-SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-38	83-12	688.0	685.1	2.9	13.9	12.9	11.9	10.9	9.9	8.9
2-39										
2-40										
2-41	83-12	688.0	685.1	2.9	13.9	12.9	11.9	10.9	9.9	8.9
2-42	97-37-18	683.52	684.71	-1.19	9.81	8.81	7.81	6.81	5.81	4.81
2-43	**In these areas depth to groundwater during seaonally high groundwater conditions is greater than 11 ft bgs.[b]**									
2-44										
2-45	96-37-16	693.52	690.45	3.07	14.07	13.07	12.07	11.07	10.07	9.07
2-46										
2-47	**In these areas depth to groundwater during seaonally high groundwater conditions is greater than 11 ft bgs.[b]**									
2-48										
2-49										
2-50										
2-51										
2-52										
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2-59										
2-60										
2-61										
2-62										
2-63										
2-64										
2-65										
2-66										
2-67	97-37-18	683.52	684.71	-1.19	9.81	8.81	7.81	6.81	5.81	4.81
2-68										
2-69	00-SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-70	**In these areas depth to groundwater during seaonally high groundwater conditions is greater than 11 ft bgs.[b]**									
2-71										
2-72										
2-74										
2-75	99-PDO-PZ1	639.40	639.4	0	11	10	9	8	7	6
2-76	00-PDO-5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-77	83-1	687.40	684.10	3.3	14.3	13.3	12.3	11.3	10.3	9.3

Table 3-1

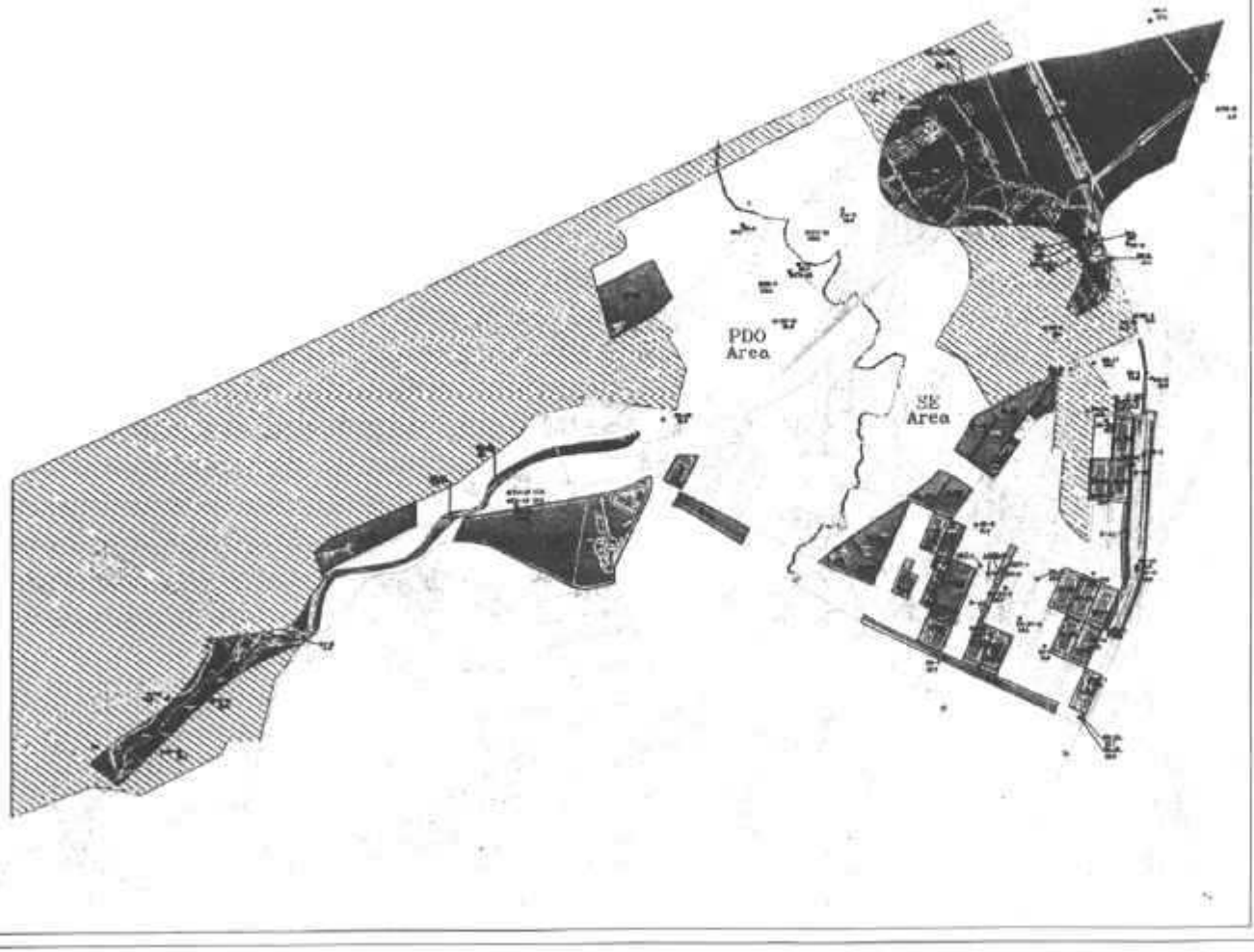
Phase II Parcels and Associated Monitoring Wells for Determining Excavation Limits, Letterkenny Army Depot, Chambersburg, PA (Continued)

Parcel ID	Well(s)	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Casing Stick-Up (ft)	Minimum Depth-to-Water (ft TOC) Required for Various Excavation Depths (See Explanation Below[a])					
					8 ft	7 ft	6 ft	5 ft	4 ft	3 ft
2R-80 (Coffey) 100 ft	83-1	687.4	684.1	3.3	14.3	13.3	12.3	11.3	10.3	9.3
2R-81 (Michigan)										
2R-82 (California)	96-37-16	693.52	690.45	3.07	14.07	13.07	12.07	11.07	10.07	9.07
2R-83 (Overcash)	97-37-18	683.52	684.71	-1.19	9.81	8.81	7.81	6.81	5.81	4.81
2R-84 (Texas &	00-SE-1 (T)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wash.)	83-12 (W)	688.0	685.1	2.9	13.9	12.9	11.9	10.9	9.9	8.9
2R-85 (Oregon)	**Depth to seasonally high groundwater is greater than 11 ft bgs in this area.[b]**									
2R-86 (Carbaugh Ave.)	98-PDO-5	668.22	668.88	-0.66	10.34	9.34	8.34	7.34	6.34	5.34
2R-87 (Penn. Ave.)	00-PDO-5 (N)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	98-PDO-5 (S)	668.22	668.88	-0.66	10.34	9.34	8.34	7.34	6.34	5.34
2R-88 (Vehicle Rd.)	**Depth to seasonally high groundwater is greater than 11 ft bgs in this area.[b]**									

[a] For example, if the excavation depth is planned for 4 ft, then the depth to groundwater that is measured from the top of the monitor well casing has to be equal to or greater than the measurement shown above (in feet). If this criterion is not met, then the Army must be notified and a HASP must be implemented and 40-hour trained OSHA workers must be used. The allowable excavation depths shown in these columns include a 3-ft buffer zone between the bottom of the excavation and the top of the groundwater table.

[b] Groundwater is deeper than the property transfer depth of 8 ft plus the 3-ft buffer zone, thus, there should not be a concern if excavating at any depth up to 8 ft bgs.

bgs = Below ground surface.
ft = Feet
HASP = Health and Safety Plan.
msl = Mean sea level.
N/A = Denotes well(s) to be installed in 2001.



LEGEND

Buildings

Roads

Enclave Area to be Retained by LEAD

Phase II Parcels

Boundary of SE and PDO Areas

TYPICAL DEPTH TO SEASONALLY HIGH GROUNDWATER IN AREAS IMPACTED WITH VOC's

0-8 FT

>8 FT

94-16-TDS Monitoring Well Location

23.5 95% Prediction Limit Value for Depth to Groundwater Below Ground Surface

Note: Map does not include data for area north of the Test Track

Source: IT CORPORATION, Roy F. Weston, Inc., and Epsys Corporation

0 1800 3600
Feet

N

Letterkenny Army Depot
Chambersburg, PA

Figure 3-1

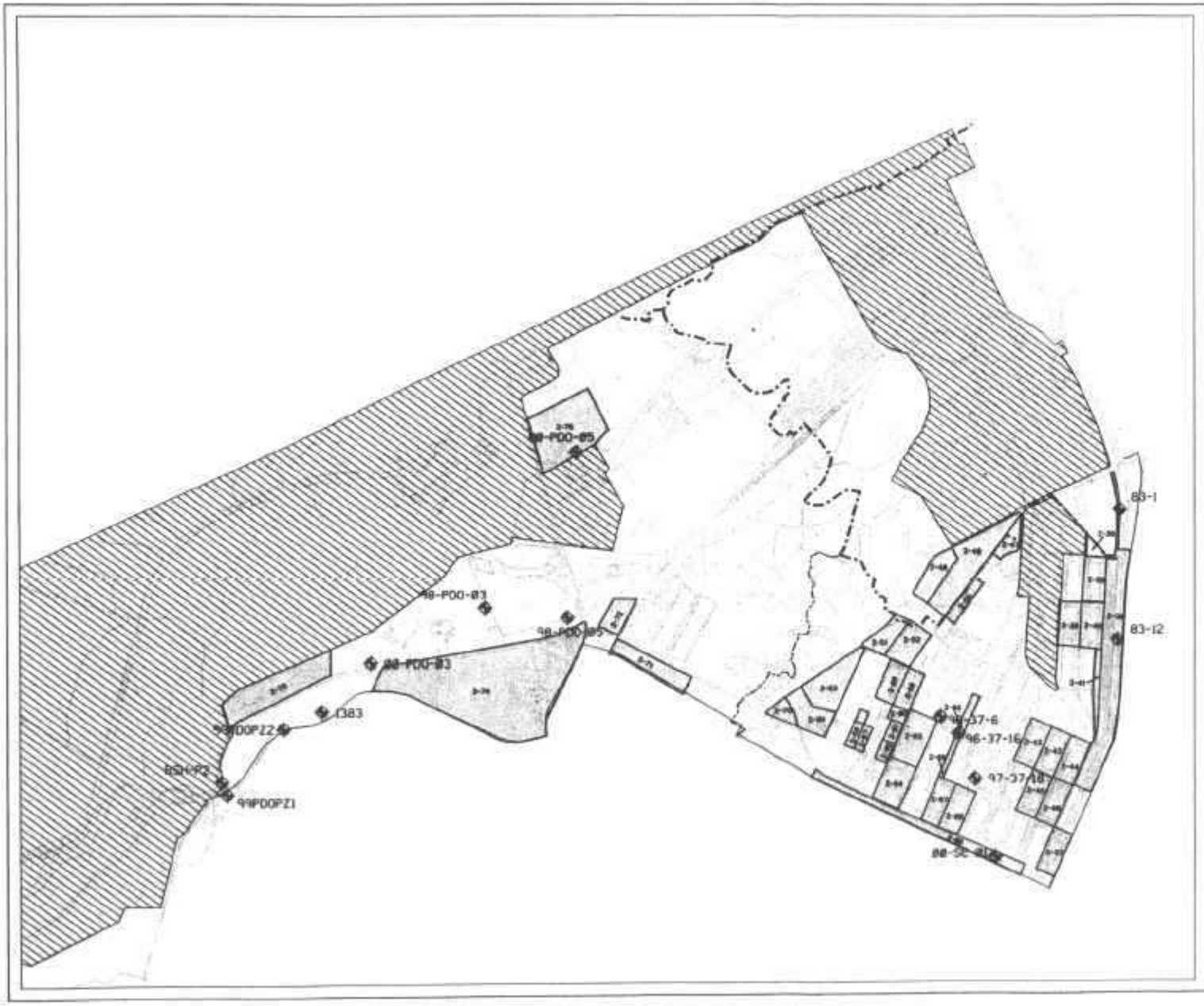
Depth to Seasonally High Groundwater (Based on 95% Confidence) In Areas Containing VOC Impacted Groundwater

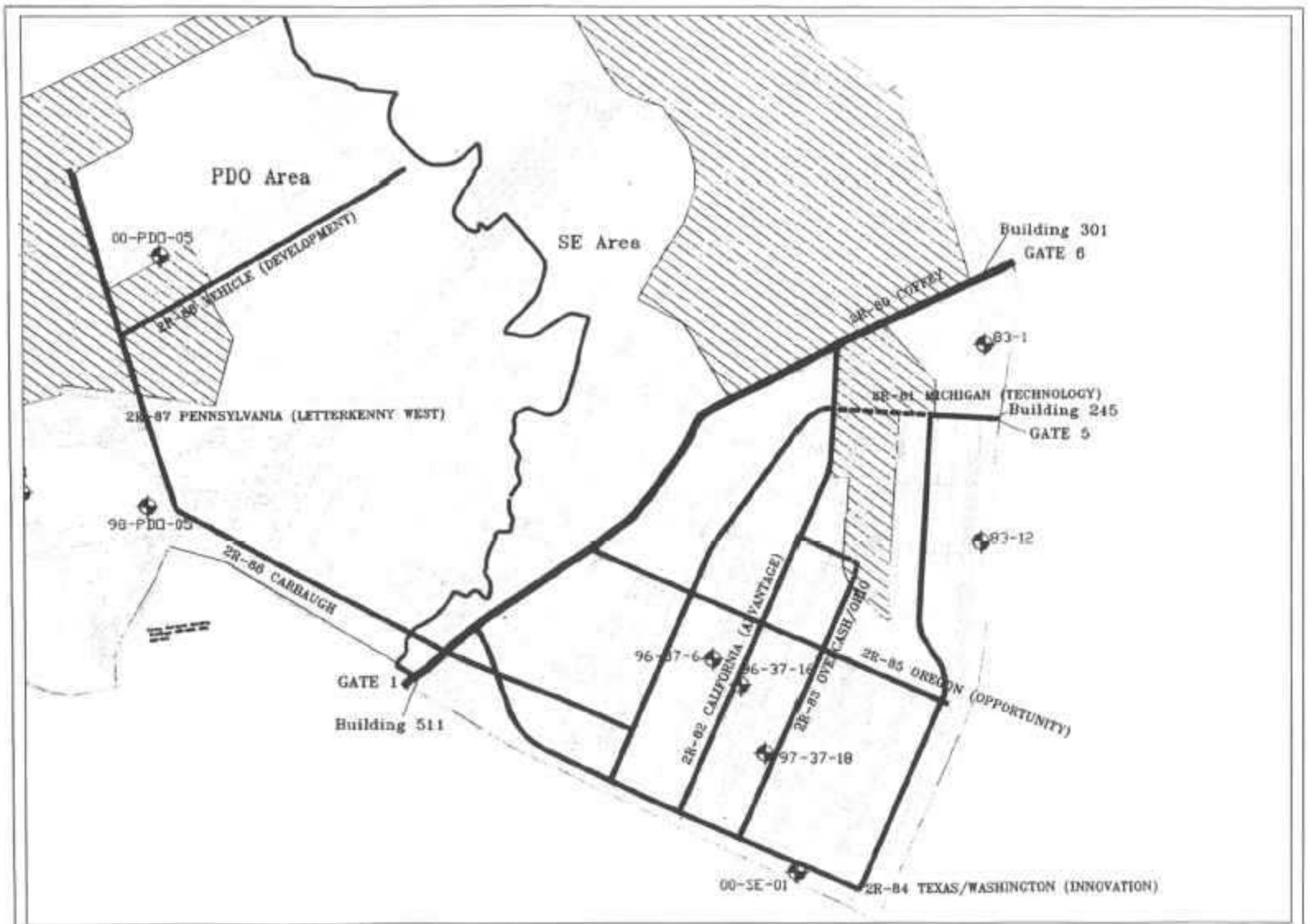
WESTON

3-6

Date: 05-23-2001

P:\WC\proj\letter\acad\depth_to_gw.dwg


98-POO-85
98-POO-83
98-POO-84
98-POO-82
I383
99PDOPZ2
BSH-P2
99PDOPZ1
83-1
83-12
96-37-6
96-37-16
97-37-18
LEGEND:
Buildings
Roads
Drainage Divide
Proposed Existing Well Location for Groundwater Level Monitoring for the Phase II BRAC Parcels
Phase II Transfer Area
Enclave Area
0
1500
3000
Feet
N
Letterkenny Army Depot
Chambersburg, PA
Figure 3-2
Proposed Monitor Well Locations for Groundwater Level Monitoring Within BRAC Parcels at LEAD
U.S. Army Corps of Engineers
Baltimore District
LEAD
WESTON
3-7
Revision #
Date
05-23-2001



Legend:

- Buildings
- Roads
- Enclave Area
- Dashed portions of the road parcels are located in the Enclave area and will not be transferred. Public access to these roads will be permitted.
- Road Parcel

2R-86 = Phase II Parcel ID
Oregon(Opportunity) = LEAD Road Name
(LIDA Designated Road Name)

- Drainage Divide
- Groundwater Level Monitoring Well Location for the Phase II BRAC Parcels

0 200
Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 3-3
Well Locations for Groundwater Level Monitoring Within Phase II Roadway Parcels at LEAD

U.S. Army Corps of Engineers
Baltimore District

LEAD

WESTON

3-8

PSWCR q:\letter\army\BRAC_roads_3-3.dwg 05/22/2001