DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA725)
Current Human Exposures Under Control

Facility Name: U.S. Army, Fort Dix
Facility Address: Regional Directorate of Public Works, Fort Dix, New Jersey 08640
Facility EPA ID#: NJ4213720275

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the Resource Conservation and Recovery Act (RCRA) Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved) to track changes in the quality of the environment. The two EIs developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no unacceptable human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all contamination subject to RCRA corrective action at or from the identified facility [i.e., site-wide]).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives, which are currently being used as program measures for the Government Performance and Results Act of 1993 (GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI determination status codes should remain in the Resource Conservation and Recovery Information System (RCRIS) national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The U.S. Army Training Center and Fort Dix (Fort Dix) is located in Burlington and Ocean Counties in New Jersey, approximately 16 miles southeast of Trenton. The installation is currently comprised of

approximately 31,000 acres of land. Fort Dix is located within the New Jersey Pinelands Nature Reserve (Pine Barrens), and it is bordered to the south by the Brendan T. Byrne State Forest. Fort Dix is divided into a Cantonment Area, a Training Area, and a Range and Impact area. The Fort Dix Cantonment Area is bordered by McGuire Air Force Base (AFB) to the east, forest management and training areas to the west and south, and by agricultural land and low-density residential housing to the north. McGuire AFB is also located north of the Training Area and west of the Range Impact Area, while Lakehurst Naval Air Station is located to the east of the Range Impact Area. The Boeing Michigan Aeronautical Research Center (BOMARC) Missile Facility occupies approximately 218 acres within the Fort Dix range and impact area; however, it falls under the jurisdiction of McGuire AFB, which is located 11 miles west of the BOMARC site. Therefore, the BOMARC site will not be considered in this EI determination. (It should be noted that the McGuire AFB CA725 EI Determination, dated September 28, 2006, also did not address the BOMARC site because BOMARC is not included under the McGuire AFB EPA ID number on the GPRA baseline list).

Fort Dix, initially known as Camp Dix, was developed from farmland and forest on July 18, 1917, and used as a cantonment area and training post for World War I troops. The camp served as a demobilization center after the war, and it was used as a training ground for active Army, Army Reserve, and National Guard Units from 1922 to 1926. Camp Dix was inactive from 1926 to 1933, and it was used as a Civilian Conservation Corps reception, discharge, and replacement center from 1933 to 1939. The camp became a permanent Army installation in 1939 and was renamed Fort Dix. It served as a reception and training center during World War II, and it was used as a separation center following the war. The installation was designated a basic training center in 1947 and was officially named the U.S. Army Training Center and Fort Dix in 1956. The last active duty basic training company graduated from Fort Dix in July 1992. In October 1992, the major command was shifted from the U.S. Army Training and Doctrine Command (TRADOC) to Forces Command (FORSCOM). The primary mission under FORSCOM was to provide command, administration, and support of all U.S. Army units attached to the installation; all tenant and satellite units; and the New York Area Command. In October 1997, the major command was again shifted to U.S. Army Reserve Command (USARC), and the current mission of the installation is to provide training for reserve and national guard units. Fort Dix has the capability to mobilize, train, equip, and deploy forces anywhere in the world.

The Fort Dix Cantonment Area contains approximately 1,800 structures, including offices and administrative buildings; training facilities; housing areas; a dependents' school and child care center; an unoccupied hospital; utility buildings; recreational facilities, including a golf course and several ballparks; and warehouse, maintenance, and supply service areas. The Training Area is primarily used for tactical training and is undeveloped, with overgrown vegetation and large sections of swamplands present. The range and impact areas located east of McGuire AFB are restricted areas that are used for activities including artillery and small firearms practices and tank maneuvers. This area is also overgrown and contains swampland, but paved roads provide access to most range areas. Tenant organizations present at Fort Dix include approximately ten U.S. Army organizations, 12 U.S. Army National Guard organizations, 24 U.S. Army Reserves organizations, and 28 non-Army tenants.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from solid waste management units (SWMUs), regulated units (RUs), and areas of concern (AOCs)), been **considered** in this EI determination?

   X If yes - check here and continue with #2 below.

   ___ If no - re-evaluate existing data, or

   ___ If data are not available skip to #6 and enter IN (more information needed) status code

Summary of Areas Requiring Environmental Evaluation (AREEs):

The site characterization and remediation process was initiated at Fort Dix in the 1980s under the Army's Installation Restoration Program (IRP) (Ref. 3). The Fort Dix Sanitary Landfill was closed in 1984 and placed on the National Priorities List (NPL) in 1987; the Record of Decision (ROD) was signed in 1991. A Preliminary Assessment/Site Investigation (PA/SI) was conducted in 1985 and documented in the January 1989 Final PA/SI Report. A Phase I Remedial Investigation (RI) was conducted in 1987, followed by a Phase II RI from 1990-1991; the final RI Report was submitted in 1993. Fort Dix submitted an RI Work Plan to regulators in 1995 and proceeded with RI work as funds became available. RI activities are complete for the majority of sites for which they are required, and many sites have signed Decision Documents (DDs).

An Enhanced PA was completed in March 1992 under the Base Realignment and Closure (BRAC) program. The Enhanced PA identified 42 AREEs, 19 of which were investigated under the BRAC program (Ref. 2). The remaining 23 sites were either recommended for no further action (NFA) or are being addressed under the ongoing IRP. According to the Fort Dix Environmental Division, the 1992 Enhanced PA was approved by the New Jersey Department of Environmental Protection (NJDEP) (Ref. 4); however, an approval letter could not be located in the site file. An Environmental Investigation was conducted at 12 of these 42 AREEs from 1993-1996. Most AREEs were also assigned individual Fort Dix (FTDX) numbers.

Fort Dix has completed work at many AREEs and has either recommended them for NFA or received a formal NFA determination from NJDEP (Ref. 4). It was also determined that no releases occurred at many sites that were historically included in the list of 42 AREEs and three FTDX sites, and that several of these sites were redundant. Thus, the IRP currently contains 18 active AREEs that were considered in this EI determination; and 24 inactive AREEs plus three inactive FTDX sites that either require NFA, did not have a release, or were considered repetitive of active sites. Table 1 below lists the 24 inactive AREEs and three inactive FTDX sites that were not considered in this EI determination.

Table 1: Inactive AREEs and FTDX Sites Not Considered in this EI Determination

AREE #	FTDX #	Area Name
11	15	ANC-9 Landfill
14	21	Area North of Dogwood Lake UST Site
18	28	5700 Area Motor Pool
19		5800 Area Motor Pool
20		5900 Area Motor Pool
21		8100 Area Motor Pool
22	05	Boiler Plants: Bldg 5426
		Boiler Plants: Bldg 5252
		Boiler Plants: Bldg 5324
		Boiler Plants: Bldg 5881
23	N/A	Building 0690 Service Station
24	14	Pathological Waste Landfill
27	03	Resource Recovery Facility
28	27	Hazardous Waste Storage Area
29	29	PCB Transformer Storage Area
30	30	Magazine 2 Area
31	02	Old Sewerage Treatment Plant
	04	Old STP Sludge Drying Beds
32	31	Bivouac 5 Washracks
33	32	PBAS 83 Basin
34	N/A	Midstate Correctional Facility
35	23	Paint Shop
36	08	Range Impact Area

AREE #	FTDX #	FTDX #
37a	N/A	Spills: Bldg xxxx - Petroleum Spill Site
37b		Spills: Bldg xxxx - Petroleum Spill Site
37c		Spills: Bldg 5881 - Petroleum Spill Site
37d		Spills: Bldg 5324/5326 - Petroleum Spill Site
37e		Spills: 5800 Area Motor Pool - Petroleum Spill Site
37f		Spills: 5900 Area Motor Pool - Petroleum Spill Site
37g		Spills: Bldg 5252 - Petroleum Spill Site
37h		Spills: Bldg 5426 - Petroleum Spill Site
39	N/A	ASTs
40	N/A	Asbestos
41	34	Transformers
42	N/A	Radon
N/A	05	Fuel Spills
N/A	20	Old Incinerator
N/A	28	Motor Pools

N/A – not applicable

The Agency for Toxic Substances and Disease Registry (ATSDR) prepared a Public Health Assessment (PHA) for Fort Dix on October 18, 1999. Based on two site visits and a review of relevant documents, ATSDR evaluated whether current or past exposures to contamination at Fort Dix could pose a health hazard to receptors. ATSDR compared soil, sediment, surface water, and groundwater data at all Fort Dix IRP sites to several media-specific comparison values. ATSDR concluded that none of the IRP sites with sufficient data posed a public health hazard (PHH) as a result of exposures to contaminated environmental media. At the time of the PHA, data were unavailable for six IRP sites; thus, ATSDR could not make a public health determination on these sites in the PHA (Ref. 3).

Therefore, this EI determination will primarily focus on the universe of IRP sites that had insufficient data at the time of the ATSDR PHA. A file review was performed at the Fort Dix Environmental Division on May 8, 2006, and data gaps were subsequently filled during communications between Fort Dix, EPA, and Booz Allen Hamilton personnel. Where available, updated documentation was reviewed for sites that ATSDR determined did not have a PHH in 1999 to ensure that any new information was consistent with this original conclusion.

See Attachment 1 - Status Summary of AREE/ FTDX Sites, which contains the following information for the 18 active sites: (1) a list of all IRP sites considered in this EI determination (see "AREE No.", "FTDX No.", and "Site Name" columns); (2) the ATSDR PHA determination for each site (see "1999 PHA"

column); (3) whether any potentially complete exposures were identified following a review of post-PHA documentation (see "Potential Concern?" column); (4) a summary of the site's history and current status (see "History/Current Status" column); (5) a list of the contaminant classes impacted above New Jersey or other applicable standards in each environmental medium (see "Media and COCs" column); and (6) the reference number corresponding to the references listed below after Question 2 (see "References" column). See Figure 5-2 from the 1992 Enhanced PA for a map of all AREEs, except AREEs 6, 9, and 10 (Ref. 2); these three AREEs are shown on Figure 1-2 from the Draft RI Report (Ref. 1).

References:

1. Draft Remedial Investigation. Prepared by Dames & Moore. Dated January 1992.
2. Enhanced Preliminary Assessment. Prepared by Roy F. Weston, Inc. Dated March 1992.
3. Public Health Assessment for Fort Dix (Landfill Site). Prepared by U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Dated October 18, 1999.
4. Personal communication between Amy Brezin, Booz Allen Hamilton; Bill Lewendoski, U.S. Army, Fort Dix; and Alan Straus, U.S. EPA Region 2. Dated August 11, 2006.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective risk-based levels (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			Metals, Semi-Volatile Organic Compounds (SVOCs), Volatile Organic Compounds (VOCs)
Air (indoors)[2]		X		
Surface Soil (e.g., <2 ft)	X			Metals, SVOCs, VOCs, Herbicides/pesticides
Surface Water	X			Metals, SVOCs, VOCs
Sediment	X			Metals, SVOCs, VOCs
Subsurface Soil (e.g., >2 ft)	X			Metals, SVOCs, Total petroleum hydrocarbons (TPH), VOCs
Air (Outdoor)		X		

___ If no (for all media) - skip to #6, and enter YE, status code after providing or citing appropriate levels, and referencing sufficient supporting documentation demonstrating that these levels are not exceeded.

_X_ If yes (for any media) - continue after identifying key contaminants in each contaminated medium, citing appropriate levels (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

___ If unknown (for any media) - skip to #6 and enter IN status code.

Rationale:

Groundwater

Groundwater beneath Fort Dix exists in two principal aquifer systems: shallow and deep. Shallow groundwater flows in the Cohansey and Kirkwood Formations, which comprise the Kirkwood-Cohansey Aquifer in the Fort Dix area (Ref. 2). This water-table aquifer has been impacted by surface activities. Lower aquifers include the Mt. Laurel-Wenonah Aquifer, the Englishtown Aquifer, and the Potomac-Raritan-Magothy Aquifer, respectively. These aquifers are separated by relatively impermeable units that

[1] "Contamination" and "contaminated" describe media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Department of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

vary in thickness and range from largely semi-confined to confined units (Ref. 2). Groundwater does not tend to migrate between the different aquifers due to these confining layers (Ref. 4). Of particular importance is the 120- to 230-feet thick composite confining unit that separates the shallow Kirkwood-Cohansey Aquifer from the deeper Mt. Laurel-Wenonah Aquifer in the Fort Dix area (Ref. 2). As discussed in Question 3, drinking water at Fort Dix is supplied mainly by surface water sources that are supplemented with groundwater. However, no public drinking water supply wells are drawn from the Kirkwood-Cohansey Aquifer in the vicinity of Fort Dix; instead, most of the public water supplies and industry in Burlington County (including Fort Dix and McGuire AFB) obtain groundwater from the deep Potomac-Raritan-Magothy Aquifer for potable use (Ref. 2).

Shallow groundwater discharges where the water table intersects the ground surface, which creates surface water bodies or seeps (Ref. 4). Thus, shallow groundwater flow directions are variable and generally point toward lowland areas where water is discharged to Crosswick Creek, Rancocas Creek, and minor tributaries (Ref. 4).

A table summarizing the maximum detected contaminant concentrations in groundwater was not prepared, primarily due to the large number of sites. Refer to Attachment 1 for a summary of the major contaminant classes that were detected in groundwater above applicable New Jersey Ground Water Quality Criteria (NJ GWQC) by IRP site.

Air (Indoors)

No assessment of impacts to indoor air had been conducted at Fort Dix prior to this EI determination. EPA's Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (EPA Guidance), dated November 2002 (Ref. 15), was used to screen Fort Dix sites for potential vapor intrusion to indoor air, using the most recent shallow groundwater monitoring data available. All sites but one, the Golf Course Leaking UST site (AREE 38, FTDX 19-6), were screened out through this process.

As noted in Attachment 1, an active golf clubhouse is located within this IRP site. Groundwater concentrations of benzene within 100 feet of the clubhouse exceeded the EPA Target Groundwater Concentration Corresponding to Target Indoor Air Concentration for 1 x 10^{-5} risk, which is 14 micrograms per liter (µg/L) (see Table 2b of the EPA Guidance). Multiple exceedances were noted in wells surrounding the building, ranging from 21.1 µg/L in shallow well GLF-53 on 7/19/2000 (Ref. 8), to 1,200 µg/L in FDGCC-GW10 (unknown depth and sampling date) (Ref. 24). As a result, EPA Region 2 attempted to gain access to the clubhouse to perform paired sub-slab and indoor air sampling to expedite the vapor intrusion investigation for the purposes of this CA725 EI determination. Upon learning that Fort Dix would not grant consent for sub-slab sampling, EPA decided to proceed with indoor air sampling only.

From August 16-17, 2006, EPA collected three indoor air samples and one field duplicate from inside the clubhouse and one ambient (background) air sample from outside the clubhouse (Ref. 41). The samples were analyzed for VOCs using Modified EPA Method TO-15 Selective Ion Monitoring (SIM). Benzene was detected above the reporting limit of 0.068 parts per billion volume (ppbv) in all three samples (range 0.24 – 0.34 ppbv), but it was detected below the EPA Target Indoor Air Concentration for 1 x 10^{-5} risk (0.98 ppbv). Other gasoline-related compounds (e.g., ethylbenzene, toluene, m,p-xylene, o-xylene, and methyl-tert-butyl ether [MTBE]) were also detected in all three samples above their respective reporting limits, but well below their EPA Target Indoor Air Concentrations. Finally, tetrachloroethene (PCE) and trichloroethene (TCE) were detected in sample FD-CH-IN-03, taken from the snack bar area. PCE (0.58 ppbv) was detected below its Target Indoor Air Concentration of 1.2 ppbv, but TCE (0.25 ppbv) exceeded

its Target Indoor Air Concentration of 0.041 ppbv. However, neither of these compounds were detected in groundwater monitoring wells surrounding the clubhouse building, which is a strong indicator that no subsurface source exists for these constituents. Additionally, PCE and TCE were not detected in the other two indoor air samples or the ambient air sample, indicating a localized background source for the detected concentrations. Thus, indoor air is not known or reasonably suspected to be contaminated above appropriate risk-based levels via the vapor intrusion pathway on the Fort Dix site.

As a general note, it is recommended that Fort Dix identify and attempt to remove potential sources of TCE in the snack bar area, since TCE was detected above the Target Indoor Air Concentration for 1×10^{-5} risk, which is the screening level used for EIs per the EPA Guidance. However, it should be noted that the detected concentration of 0.25 ppbv does not exceed the Target Indoor Air Concentration of 0.41 ppbv for 1×10^{-4} risk, so it falls within the EPA acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}. Additionally, these target concentrations were developed for the residential use scenario and are likely to be conservative when applied to the snack bar area of a golf clubhouse, where human exposures are generally expected to be less intense than those under the residential scenario.

Surface/Subsurface Soil

Surface soil (less than 2 feet below ground surface [bgs]) and subsurface soil (more than 2 feet bgs) have been impacted at the IRP sites by metals, pesticides/herbicides, SVOCs, TPH, and VOCs above the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NJ NRDCSCC). Only those contaminants exceeding the NJ NRDCSCC are of concern for most IRP sites because these sites are located in industrial (i.e., nonresidential) sections of the installation. During the 2001-2003 Environmental Baseline Survey (EBS), pesticides were also detected in surface soil above applicable New Jersey Residential Direct Contact Soil Cleanup Criteria (NJ RDCSCC) at multiple residential sampling locations. The Final EBS Report identified the likely source of pesticides as chlordane that was used to control termites at the housing parcels in the past; however, there is no bulk storage, mixing, or disposal of pesticides in the housing areas (Ref. 26). As such, the pesticides were applied as directed in this area and are regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); associated soil remediation does not appear to be required. Thus, the pesticide exceedances at the housing areas do not reflect releases from RCRA units and will not be considered further in this EI determination.

A table summarizing the maximum detected contaminant concentrations in soil was not prepared, primarily due to the large number of sites. Refer to Attachment 1 for a summary of the major contaminant classes that were detected in surface and subsurface soil above applicable soil cleanup criteria by IRP site. In some cases, available information did not specify whether samples were obtained from surface or subsurface soil; these contaminants are simply designated as "soil" impacts.

Surface Water/Sediment

The western and northern portions of Fort Dix are drained by several perennial and intermittent tributaries of Crosswick Creek, which flows six miles north and west before joining the Delaware River. The eastern and southern portions of the installation drain to the North Branch of Rancocas Creek, which is located immediately south of Fort Dix and flows westward into the Delaware River (Ref. 26). Fort Dix is estimated to contain 54 miles of stream channels (both intermittent and perennial), and it also has several ponds and lakes. Several of the streams are bordered by swamps, indicating relatively shallow depths to groundwater (Ref. 2).

Tables summarizing the maximum detected contaminant concentrations in surface water and sediment were not prepared, primarily due to the large number of sites. Refer to Attachment 1 for a summary of

the major contaminant classes that were detected in surface water and sediment above applicable criteria (New Jersey Surface Water Quality Criteria [NJ SWQC] and NJ NRDCSCC, respectively) by IRP site.

One area of sediment contamination that was not included in the ATSDR PHA is the Hanover Lake Dam Area. Hanover Lake and its tributaries are located adjacent to Firing Range Nos. 24 through 27 in the southern edge of the installation; the lake water discharges over a small spillway down Gaunt's Brook to Mirror Lake (Ref. 7). In 1999, it was discovered that lead-contaminated berm soil from a firing range had inadvertently been used as backfill to shore up the dam and serve as erosion control (Ref. 33). Lead was detected in sediment above NJ RDCSCC and in surface water above NJ SWQC, but it was determined by NJDEP not to pose a public health threat (Refs. 5, 23). In 2005-2006, sediment was removed and sampled until confirmation samples met applicable NJ sediment standards for lead (Ref. 40), which are well below the NJ RDCSCC. The dam was rebuilt, but a final report on the remedial actions has not yet been produced (Ref. 40).

Air (Outdoors)

Several assessments of impacts to outdoor air have been conducted at Fort Dix as part of landfill post-closure monitoring and site investigations. As part of the final cover system for the NPL Sanitary Landfill, a 53-vent passive venting system was constructed and air monitoring was performed for VOCs from 1997 through 1999 (Ref. 3). On May 11, 2000, NJDEP approved Fort Dix's request to eliminate landfill gas testing based on a human health risk assessment that demonstrated negligible risk (Ref. 5).

A short-term air monitoring program was conducted at AREE 3/FTDX 24, the Fire Tank Training Area, and AREE 15/FTDX 35, the Golf Course Pesticide Mixing and Storage Area, during the 1990 RI to evaluate the potential for airborne transport of soil contaminants (Ref. 1). TPH was detected at less than 1 microgram per cubic meter ($\mu g/cm^3$) at AREE 3, and was attributed mostly to automobile exhaust because values were higher at the upwind sampler, which was closer to the roadway and less likely to be affected by site contaminants (Ref. 1). The air sample filter analysis was below laboratory detection limits at AREE 15 (Ref. 1).

Additionally, limited migration of contaminants bound to airborne particulate matter is expected at this site based on the amount of surface cover in the industrial areas (e.g., buildings, roads, and parking lots) and pattern of contamination. VOC and SVOC detections above NJ NRDCSCC in surface soil were limited. In addition, volatile emissions of detected VOCs from groundwater to outdoor air are not expected to be of concern due to the natural dispersion of these contaminants once they reach the surface. Thus, the migration of particulates entrained on dust and/or volatile emissions is not expected to cause adverse impact to outdoor air at the Fort Dix site.

References:

1. Draft Remedial Investigation. Prepared by Dames & Moore. Dated January 1992.
2. Final Fort Dix Environmental Investigation Report. Prepared by ICF Kaiser Engineers, Inc. Dated May 1997.
3. Construction Completion Report, Closure and Post-Closure Requirements for Remedial Design Phase II, Fort Dix Sanitary Landfill (NPL). Prepared by Law Engineering and Environmental Services, Inc. Dated September 1997.
4. Public Health Assessment for Fort Dix (Landfill Site). Prepared by U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Dated October 18, 1999.

5. Letter from Iclal Atay, NJDEP, to Engineering and Environmental Division, U.S. Army, Fort Dix, re: Air Pollution Control Permit – Log # 01-93-4497 for Landfill Gas Passive Vents. Dated May 11, 2000.
6. Work Plan for the Range Landfill Remedial Investigation/ Feasibility Study. Prepared by IT Corporation. Dated August 2000.
7. Phase III Through IX Soil, Surface Water and Sediment Investigation Findings, Hanover Lake Project Area, Volume I. Prepared by AMEC Earth & Environmental, Inc. Dated January 5, 2001.
8. Draft Site Investigation Report, Golf Course Sites. Prepared by Pacific Western Technologies, Ltd. Dated February 13, 2001.
9. Final Remedial Investigation Report (ELIN A009), Boiler Blowdown Area. Prepared by KEMRON Environmental Services, Inc. Dated May 23, 2001.
10. Final Remedial Investigation Report, Fire Tank Training Area. Prepared by KEMRON Environmental Services, Inc. Dated August 2001.
11. Final Magazine Area 1 Decision Document. Prepared by Harding ESE, Inc. Dated August 2002.
12. Final Decision Document for the Golf Course Pesticide Mixing and Storage Area. Prepared by Pacific Western Technologies, Ltd. Dated February 20, 2002.
13. Decision Document for Remedial Design and Remedial Action, Taxi Stand Underground Storage Tank Site. Prepared by U.S. Army, Fort Dix. Dated May 20, 2002.
14. Final EPIC-8 Landfill Decision Document: Institutional Controls. Prepared by EM Federal Corporation. Dated August 2002.
15. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. Prepared by EPA. Dated November 2002.
16. Draft Remedial Investigation for the ANC-2 Landfill RI/FS. Prepared by Shaw Environmental and Infrastructure. Dated November 2002.
17. Draft ARDC Test Facility Decision Document. Prepared by Harding ESE, Inc. Dated February 2003.
18. Site Investigation Report for the Former Group 5 UST Sites (Site 6605 and the Range Road Sites). Prepared by Shaw Environmental and Infrastructure, Inc. Dated March 2003.
19. Final 4300 Area Spill Site, 4400 Area Spill site Decision Document: Remedial Action. Prepared by EM Federal Corporation. Dated May 2003.
20. Final Property Disposal Office Landfill Decision Document: Remedial Action. Prepared by EM Federal Corporation. Dated November 2003.
21. Draft Final Remedial Investigation Report, New Egypt Armory, Fort Dix, New Jersey. Prepared by Kemron Environmental Services. Dated January 15, 2004.
22. Draft Remedial Investigation of the Former Pesticide Control Shop, Fort Dix, New Jersey. Prepared by Tetrahedron, Inc. Dated March 2004.
23. Fact Sheet Hanover Lake Dam Area, Fort Dix, N.J. Prepared by U.S. Army, Fort Dix. Web site updated April 15, 2004; accessed August 14, 2006. http://www.dix.army.mil/ENVIRONMENT/fact_sheet_hanover_lake_dam_area.htm
24. Final Remedial Action Work Plan, 7 Former UST Sites. Prepared by Shaw Environmental, Inc. Dated May 2004.
25. Final Remedial Investigation Addendum for the Boiler Blowdown and Fire Tank Training Areas and Remedial Action Work Plan for the Armaments Research and Development Center Test Facility and the Golf Course Pesticide Mixing and Storage Area. Prepared by Shaw Environmental, Inc. Dated May 2004.
26. Environmental Baseline Survey for Housing Privatization at Fort Dix, New Jersey. Prepared by Parsons. Dated August 2004.
27. Final Remedial Action Work Plan for the Property Disposal Office Landfill. Prepared by Shaw Environmental, Inc. Dated August 2004.

28. Final Closure Report for the Removal of PCB Contaminated Soils at the New Egypt Armory, Fort Dix, New Jersey. Prepared by Kemron Environmental Services. Dated March 30, 2005.
29. Final Remedial Action Work Plan Addendum for Groundwater, MAG-1 Area. Prepared by Shaw Environmental, Inc. Dated June 2005.
30. Final Five-Year Review Report for U.S. Army Fort Dix (NPL Landfill Site). Prepared by U.S. Army Corps of Engineers. Dated September 2005.
31. Letter from George Pavlou, U.S. EPA Region 2, to R. David McNeil, US Army, re: CERCLA Five-Year Review Fort Dix Sanitary Landfill. Dated September 29, 2005.
32. Fort Dix Installation Restoration Program, AREE List and Status Spreadsheet. Prepared by U.S. Army, Fort Dix. Dated November 2005.
33. Letter from David A. Peckham, U.S. Army, Fort Dix, to Anthony Fontana, NJDEP. Dated November 23, 2005.
34. Draft 2005 Sampling and Analysis Report for Groundwater, Surface Water, and Sediment for the Fort Dix Sanitary Landfill. Prepared by EA Engineering, Science, and Technology, Inc. Dated December 2005.
35. Draft Final FY2006 Fort Dix Installation Action Plan. Prepared by Fort Dix. Dated December 22, 2005.
36. Draft Remedial Investigation Addendum, Fire Tank Training Area. Prepared by Shaw Environmental, Inc. Dated February 2006.
37. E-mail from Alan Straus, EPA Region 2, to Amy Brezin, Booz Allen Hamilton, re: U.S. Army, Fort Dix. Dated March 10, 2006.
38. Sampling and Analysis Report for Groundwater at the Petroleum, Oil, and Lubricants (POL) Site. Prepared by EA Engineering, Science, and Technology, Inc. Dated July 2006.
39. Sampling and Analysis Report for Groundwater, Surface Water, and Sediment at the Transportation Motor Pool. Prepared by EA Engineering, Science, and Technology, Inc. Dated July 2006.
40. Personal communication between Amy Brezin, Booz Allen Hamilton, Bill Lewendoski, U.S. Army, Fort Dix, and Alan Straus, U.S. EPA Region 2. Dated August 11, 2006.
41. Electronic Report. Prepared by Air Toxics Ltd. Dated August 25, 2006.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
*Potential **Human Receptors** (Under Current Conditions)*

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[3]
Groundwater	No	No	No	Yes	–	–	No
~~Air (indoor)~~							
Surface Soil (e.g. < 2 ft)	No	No	No	No	No	No	No
Surface Water	No	No	–	Yes	No	No	No
Sediment	No	No	–	Yes	No	No	No
Subsurface Soil (e.g., > 2 ft)	–	–	–	Yes	–	–	No
~~Air (outdoors)~~						~~–~~	~~–~~

Instruction for Summary Exposure Pathway Evaluation Table :

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media — Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces. These spaces instead have dashes ("--"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

___ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_X_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

___ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale :

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish)

For the purposes of this EI determination, on-site residents are defined as those residents living in military housing within Fort Dix property. By contrast, trespassers are defined as potential receptors who can enter Fort Dix property (inside or outside the fenceline) from surrounding locations. Food was not designated a potentially complete pathway for any media because it was considered unlikely that on-site residents would grow gardens on an active military installation.

Groundwater

As discussed in response to Question 2, installation activities have impacted the shallow aquifer system, but the presence of a thick confining layer effectively prevents migration to the deeper aquifers (Ref. 3). The water supply for Fort Dix is drawn from surface water and groundwater sources. The surface water supply is supplemented with groundwater from five drinking water wells located throughout the Cantonment Area that all draw from the deeper Raritan-Magothy formation (Ref. 3), which has not been affected by Fort Dix activities. Well water is chlorinated before being pumped into the Fort Dix water distribution system, and iron and manganese are removed from well water in two of the five wells (Ref. 3). Therefore, ingestion of contaminated groundwater is an incomplete pathway for all on-site receptors.

Groundwater data collected to date do not indicate that contaminated groundwater has migrated off the Fort Dix site. A well search was conducted for the installation in the mid-1990s using records from NJDEP, the Burlington County Department of Health, and Pemberton Township (Ref. 1). This search identified two private wells in the town of Browns Mills, one that was screened in the Vincetown Formation and one in the Kirkwood Formations (Ref. 3). ATSDR analyzed the results of this well search and determined that impacted groundwater from nearby AREE sites was not expected to affect either of these private wells (Ref. 3). ATSDR did not consider ingestion of contaminated groundwater to be a complete exposure pathway for any receptors in the PHA dated October 18, 1999 (Ref. 3). More recent well searches have been conducted on a site-specific basis as part of the Record of Decision (ROD) process, and a review of available documentation did not reveal a concern for downgradient wells screened in the shallow aquifer. A Classification Exception Area (CEA)/Well Restriction Area (WRA) was proposed at the Fort Dix Cantonment Area in 1999 to prohibit groundwater from the Kirkwood-Cohansey aquifer from being withdrawn for potable use (Ref. 2), and a separate CEA was established for AREE 7/FTDX 10, the Sanitary Landfill, in 2002 (Ref. 4). The CEA/WRA proposed in 1999 was finalized in 2004 and includes all sites requiring long-term monitoring across the installation, not just those in the Cantonment Area (Ref. 6). Because shallow groundwater is not used for potable purposes at the site or in the surrounding area downgradient of the installation, exposure to contaminated groundwater associated with the site via ingestion is not a concern for any receptor at this time.

Given that shallow groundwater can be encountered at depths less than 10 feet bgs at Fort Dix, there is potential for on-site remedial workers (considered to be construction workers for the purposes of this EI determination) to come into contact with contaminated groundwater during sampling and excavation/remedial activities. However, ATSDR did not consider direct contact with contaminated groundwater to be a potential exposure pathway of concern for sites evaluated in the PHA dated October 18, 1999 (Ref. 3). Therefore, for the purposes of this EI determination, the potential for remedial workers to come into direct contact with contaminated groundwater will be examined only for those IRP sites that were not evaluated in the PHA. Direct contact with shallow groundwater is being considered a potentially complete exposure pathway for an on-site remedial worker at AREE 2/FTDX 13, the POL Area; AREE 5/FTDX 12, the TMP Area; AREE 8/FTDX 6, the Pesticide Control Storage Shop; and AREE 9/FTDX 26, the New Egypt Armory.

Surface/Subsurface Soil

As presented in response to Question 2, metals, SVOCs, VOCs, TPH, and herbicides/pesticides were detected in surface and subsurface soil above NJ NRDCSCC. The surface of the Cantonment Area is mostly covered with mowed grass, buildings, roads, parking lots, and moderate vegetation. ATSDR did not consider direct contact with on-site contaminated surface/subsurface soil to be a complete exposure pathway for any receptors in the PHA dated October 18, 1999 (Ref. 3). Therefore, for the purposes of this EI determination, potentially complete exposure pathways for soil impacts will be examined by receptor only for those IRP sites that were not evaluated in the PHA.

Surface soil contamination subject to this EI determination has not been identified in residential, day care, or recreational (e.g., golf course, ballparks) areas of the installation. Fort Dix is sufficiently secured to prevent trespasser access to most industrial portions of the installation. In 2003, construction was completed on a seven-foot high chain link perimeter fence with triple barbed wire that encloses the entire Cantonment Area. The fence has 16 gates, of which four are fully manned with guards, 11 are manually locked, and one has electric operators and remotes (Ref. 5). For a diagram of the fence and gates, see Figure A-21 of the March 2003 Environmental Assessment for the Perimeter Fence Project (Ref. 5). Due to national security concerns, the installation is now a closed post with access limited to Fort Dix personnel (Ref. 5). Site access controls at the IRP sites located outside of the main gate (see AREE Nos. 6, 7, 9, 10, 12, 25, 26, and 38/FTDX 19-5 in Attachment 1) are discussed by site in Attachment 1; trespasser contact with contaminated surface soil was not identified as a concern at these sites.

On-site workers have access to restricted areas of Fort Dix, and thus could potentially come into direct contact with contaminated surface soil at IRP sites. The only area not evaluated in the ATSDR PHA that contains exposed surface soil contamination is AREE 8/FTDX 6, the Former Pesticide Control Shop. However, exposure to this small area is considered to be unlikely due to its location between the paved parking lot and the building, and any contact that did occur is expected to be brief and infrequent. Therefore, direct contact with contaminated surface soil was not identified as a concern for on-site workers at any site.

Additionally, because investigative and remedial activities are ongoing, direct contact with on-site contaminated subsurface soil is being considered a potentially complete exposure pathway for on-site remedial workers (i.e., construction workers) at this time. This pathway was determined to be potentially complete at AREE 2/FTDX 13, the POL Area; AREE 5/FTDX 12, the TMP Area; and AREE 9/FTDX 26, the New Egypt Armory.

Surface Water/Sediment

As mentioned above, the water supply for Fort Dix is drawn from surface water and groundwater sources. Potable surface water is supplied from Greenwood Branch, which is a tributary of the North Branch of Rancocas Creek (Ref. 1). This water supply is located in New Lisbon and is not likely to be affected by groundwater quality in the shallow aquifer at Fort Dix, due to its upstream location relative to the confluence of Greenwood Branch and the North Branch of Rancocas Creek (Ref. 1). Water is pumped through the water supply intake at New Lisbon to the Fort Dix Water Filtration Plant, where it is treated and released into the installation's water supply network. Besides Fort Dix, there is no known private or public potable use of surface water resources in the immediate vicinity of the installation. It is possible that farmlands along the streams may occasionally divert water for irrigation purposes (Ref. 1); however, groundwater and surface water are not currently migrating off site at unacceptable levels from any of the AREEs.

ATSDR also did not consider direct contact with contaminated surface water or sediment to be a complete exposure pathway for any receptor in the PHA dated October 18, 1999 (Ref. 3). However, given that further investigation of on-site streams is likely as part of current or future site investigations, the potential for remedial workers to come into direct contact with contaminated surface water or sediment will be examined in this EI determination for those IRP sites that were not evaluated in the PHA. The potential for on-site remedial workers (i.e., construction workers) to come in direct contact with contaminated surface water/sediment at AREE 5/FTDX 12 (the TMP Area) is being considered a potentially complete exposure pathway at this time.

References:

1. Final Fort Dix Environmental Investigation Report. Prepared by ICF Kaiser Engineers, Inc. Dated May 1997.
2. Final Fort Dix Cantonment Area Classification Exception Area. Prepared by ICF Kaiser Engineers. Dated February 1999.
3. Public Health Assessment for Fort Dix (Landfill Site). Prepared by U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. Dated October 18, 1999.
4. Final Classification Exception Area, The Fort Dix Sanitary Landfill. Prepared by EA Engineering, Science, and Technology. Dated March 2002.
5. Environmental Assessment, Perimeter Fence Project, Cantonment Area. Prepared by U.S. Army Fort Dix, Directorate of Public Works, Environmental Branch. Dated March 26, 2003.
6. Personal communication between Bill Lewendoski, Fort Dix Environmental Division, and Amy Brezin, Booz Allen Hamilton. Dated September 14, 2006.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**[4] (i.e., potentially "unacceptable") because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks?

_X_ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

___ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

___ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code.

Rationale:

Groundwater

As discussed in response to Question 3, the potential for on-site remedial workers to come into direct contact with contaminated shallow groundwater is being considered a potentially complete exposure pathway at this time. However, any exposures that may occur are not expected to be significant. Remedial workers are assumed to wear personal protective equipment (PPE), as necessary, and adhere to strict Occupational Safety and Health Administration (OSHA) guidelines to minimize exposure to contamination because Fort Dix requires all remedial contractors to prepare Health and Safety Plans before performing remedial work (Ref. 1). Thus, direct exposures to on-site contaminated groundwater for construction (i.e., remedial) workers conducting remedial activities are not expected to pose a significant risk.

Surface/Subsurface Soil

As discussed in response to Question 3, the potential for on-site remedial workers to come in direct contact with contaminated subsurface soil is being considered a potentially complete exposure pathway at this time. However, any exposures that may occur are not expected to be significant because remedial workers are assumed to wear PPE and adhere to strict OSHA guidelines to minimize exposure to contamination, per the project-specific Health and Safety Plans required by Fort Dix (Ref. 1). Thus, direct exposures to on-site contaminated subsurface soil for construction (i.e., remedial) workers conducting remedial activities are not expected to pose a significant risk.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a Human Health Risk Assessment specialist with appropriate education, training, and experience.

Surface Water/Sediment

As discussed in response to Question 3, the potential for on-site remedial workers to come in direct contact with contaminated surface water/sediment is being considered a potentially complete exposure pathway at this time. However, any exposures that may occur are not expected to be significant because remedial workers are assumed to wear PPE and adhere to strict OSHA guidelines to minimize exposure to contamination, per the project-specific Health and Safety Plan required by Fort Dix (Ref. 1). Thus, direct exposures to on-site contaminated surface water for construction (i.e., remedial) workers conducting remedial activities are not expected to pose a significant risk.

References:

1. Personal communication between Bill Lewendoski, Fort Dix Environmental Division, and Amy Brezin, Booz Allen Hamilton. Dated September 14, 2006.

5. Can the "significant" **exposures** (identified in #4) be shown to be within acceptable limits?

____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

____ If no (there are current exposures that can be reasonably expected to be "unacceptable") - continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code.

Rationale :

Not applicable. See the response to Question 4.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

X YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the U.S. Army, Fort Dix site, EPA ID# NJ4213720275, located at 5417 Alabama Avenue in Pemberton Township, Burlington County, New Jersey, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

___ NO - "Current Human Exposures" are NOT "Under Control."

___ IN - More information is needed to make a determination.

Completed by: _____ Date:_____
Amy Brezin
Environmental Consultant
Booz Allen Hamilton

Reviewed by: _____ Date:_____
Kristin McKenney
Environmental Consultant
Booz Allen Hamilton

Also reviewed by: _____ Date:_____
Alan Straus, Project Manager
RCRA Programs Branch
EPA Region 2

_____ Date:_____
Barry Tornick, New Jersey Section Chief
RCRA Programs Branch
EPA Region 2

Approved by: Original signed by:_____ Date: September 25, 2006
Adolph Everett, Chief
RCRA Programs Branch
EPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at U.S. EPA, Region 2.

Contact telephone and e-mail numbers: Alan Straus
(212) 637-4160
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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

Attachments

The following attachments have been provided to support this EI determination:

- Attachment 1 - Status Summary of AREE/ FTDX Sites

Attachment 1: Status Summary of AREE/FTDX Sites

U.S. Army, Fort Dix
NJ4213720275

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
1	07	Magazine 1 Area	No PHH	No	This area was used as an ammunition and weapon storage and vapor-degreasing area from 1917 through approximately 1965. TCE was apparently used to remove Cosmoline, a petroleum product used for packing rifles, and drums of Cosmoline-saturated TCE were reportedly poured into the holes of an on-site rubble pile for disposal. A septic tank that drained into an open pit and a fuel oil underground storage tank (UST) were located east of the rubble pile and are no longer in use; the UST was removed in 1997 with no reported contamination (Ref. 10). This site is currently used for sorting and recycling spent ammunition (Ref. 4) and is surrounded by a chain-link fence (Ref. 10). The selected remedies for this area include excavation and off-site treatment in an asphalt batching system for surface soil; monitored natural attenuation and source control with HRC™ for groundwater; and additional sampling and a five-year review for sediment, as no unacceptable human risks were determined to be present (Ref. 10). The remedy also includes land-use restrictions to limit residential development of the site and groundwater-use restrictions to prohibit the installation of supply wells at or downgradient of the site (Ref. 10). The soil removal has been completed (Ref. 37).	Groundwater: Metals, SVOCs, VOCs Subsurface soil: Metals, VOCs Surface Soil: SVOCs Sediment: Metals, pesticides, SVOCs	4, 11, 29, 32
2	13	Petroleum, Oil, & Lubricants (POL) Area	Not evaluated	Yes (Ground-water, subsurface soil)	This area is located at the intersection of Rancocas Road and Lexington Avenue, in the northwest portion of the Cantonment Area. The POL Area served a warehouse and central supply function for approximately 50 years. In 1988, Fort Dix removed five USTs, two of which were reported to be leaking diesel fuel and Type II dry cleaning solvent (i.e., 100 percent aliphatic naptha) and impacted soil (Ref. 38). The subsurface soil contamination is within the paved and fenced area of the site (Ref. 37). Groundwater at this site was observed from depths of approximately 9.6 to 17.4 feet bgs (Ref. 38).	Groundwater: Metals, SVOCs Subsurface soil: TPH	37, 38

[1] The reference numbers listed in this column correspond to the references at the end of the response to Question 2.

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
3	24	Fire Training Tanks [FTT]	No PHH	No	This area is located in the northwestern part of the Cantonment Area, southeast of the Fort Dix Fire Station. Two fire training tanks were formerly located in this area, with one removed in 1989 and one removed in 2004. Both tank areas were surrounded by earthen berms with plastic liners, which were removed in 2004. The FTT area was used for fire training exercises from approximately the early 1960s to the early 1980s. During these exercises, the tanks were filled with flammable wastes and set on fire. The waste products were discharged to the ground surface once the fires were extinguished. From the early 1980s until their removal, both tanks were allowed to fill and overflow with rainwater. Dogwood Brook flows along the southeast perimeter of the FTT area. During RI Addendum activities, 65 cubic yards of TPH, VOC, SVOC, and dieldrin-impacted soil were excavated from around the former tank areas and disposed/recycled, and confirmation samples indicated no residual contamination above NJ RDCSCC. Potentially non-contaminated soil from the earthern berms was analyzed, and soil determined to be clean was reused as backfill, along with virgin soil as necessary. The 2006 Draft RI Addendum Report recommended NFA for soil and groundwater (Ref. 36). Fort Dix and NJDEP agreed that additional sediment and surface water sampling would be performed during the planned investigation at the Transportation Motor Pool Area, which is the suspected source of this contamination (Ref. 36).	Groundwater: Metals Sediment: Metals, SVOCs Surface Water: Metals, SVOCs	4, 10, 36
5	12	Transportation Motor Pool [TMP]	Not evaluated	Yes (Ground-water, subsurface soil, sediment, surface water)	The TMP Area is located in the north central portion of the Cantonment Area, west of the FTT Area. This area is an active fuel dispensing and vehicle parking facility. The majority of the area is paved, and surface water runoff is collected by the storm sewer system that traverses the southern half of the TMP site and discharges to Dogwood Brook, located southeast of the site. Investigations conducted between 1985 and 1993 indicated that environmental media at the TMP Area may have been impacted by fuel dispensing activities, including TPH in soil. A 2006 groundwater, surface water, and sediment investigation confirmed exceedances of manganese in groundwater and surface water, and several metals and one PAH in sediment. Depth to groundwater at this site has historically ranged from 4 to 12 feet bgs.	Groundwater: Metals Subsurface Soil: TPH Sediment: Metals, SVOCs Surface Water: Metals	39
6	25	Armaments Research & Development Center (ARDC) Test Site	No PHH	No	The ARDC Test Site includes buildings 9985 through 9999 and a motor Fuel Storage Area east of Building 9999. It is located in a remote section of the Range and Impact Area and was used for weapons testing and analysis; spills have been documented in this area (Ref. 4). An x-ray photographic processing laboratory was also located at the site. The Fuel Storage Area contains two ASTs for fuel and 55-gallon drums for waste oils. Approximately 25 gallons of diesel fuel was spilled in the Fuel Storage Area in 1984; the top one foot of soil affected by the spill was subsequently removed and backfilled (Ref. 25). The site is occasionally used as a bivouac area for visiting troops. Two locked, chain-linked fences controlled by the Fort Dix Range Control limit site access (Ref. 16). Additionally, the site is inactive and located in a remote area. The selected remedy included excavation of VOC-impacted soils to the groundwater surface and off-site treatment and/or disposal of approximately 130 cubic yards of PCE-contaminated soil; land use restrictions through amendment of the base master plan; sampling and long-term monitoring (LTM) to determine the effectiveness of natural attenuation processes in groundwater, surface water, and sediment; and a Five-Year Review (Ref. 16). The soil removal was complete as of November 2005 (Ref. 35).	Groundwater: Metals, SVOCs, VOCs Sediment: Metals Surface Water: Metals, VOCs	4, 16, 25, 35

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
7	10	NPL Sanitary Landfill	No PHH	No	The 130-acre Fort Dix Sanitary Landfill is located south of Browns Mills-Lewistown Road in the southern portion of the Cantonment Area. Wastes were disposed at the landfill from 1950 to 1984. Although landfill disposal records are incomplete, they indicate that the following types of wastes were historically disposed at the landfill: solid wastes; wash rack sludge; and waste paints, solvents, thinners, and pesticides. Groundwater monitoring wells were installed around the perimeter of the landfill in 1979 and 1982, and results from downgradient wells indicated the presence of VOCs at up to 14,000 parts per billion (ppb). The landfill was subsequently closed in 1984 and placed on the NPL in 1987. A ROD was signed for the landfill in 1991, and remedial action was completed in August 1996. Remedial actions included: placement of a cap over 53 acres and maintaining two feet of cover on the remainder; LTM for groundwater, surface water, and sediment; installation of a chain-link fence around the landfill perimeter; long-term operation and maintenance of the cap; implementation of deed restrictions and a classification exception area (CEA) on the landfill area; and regular risk assessments using the data obtained in the monitoring program (Ref. 30). Five-year review reports were completed in 2000 and 2005. The requirement for a CEA was fulfilled in 2002, and four additional monitoring wells were installed in 2005 to serve as sentinel wells for the CEA monitoring (Ref. 35). EPA concurred with the human health protectiveness statement in the 2005 Five-Year Review, indicating that the remedy protects human health and should continue to do so as long as the existing site controls are properly operated, monitored, and maintained (Ref. 31).	Groundwater: Metals, pesticides, SVOCs, VOCs Subsurface soil: Metals Sediment: Metals Surface Water: Metals, pesticides, SVOCs, VOCs	4, 30, 31, 34, 35
8	06	Pesticide Control Storage Shop	Not evaluated	Yes (Ground-water)	Building 5352 is located on the northeastern portion of the Cantonment Area. Building 5352 was formerly used as the installation Pesticide Control Shop (PCS) and is currently used as a self-help shop. It contains home improvement supplies (e.g., paint, caulking) and is used by base residents to obtain supplies or attend training classes. Paved parking areas exist to the north, east, and south of the building. Surface water runoff drains into storm sewers that likely flow south to the outlet channel of Dogwood Lake, or north into an eastward-flowing unnamed brook. Depth to groundwater is approximately 8 to 9 feet bgs. The site is currently either paved or vegetated, so significant exposure to soil contaminants is not expected. A small area of pesticide-contaminated soil (SB-6) is present in the narrow grass strip between the northern parking lot and the building. The RI proposed performing a FS to develop alternatives for remediating the identified contamination at this site.	Groundwater: Metals Subsurface soil: Metals, SVOCs Surface Soil: Metals, herbicides/ pesticides, SVOCs Sediment: Herbicides Surface Water: Metals	22

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
9	26	New Egypt Armory	Not evaluated	Yes (Ground-water, subsurface soil)	The New Egypt Armory (NEA) is located in the northwest corner of the Range and Impact Area, with the site entrance located along NJ Route 539 on the eastern boundary of Fort Dix. The site was formerly used by the Army and Air Force for radar work. The NEA is currently used for maintenance and storage of National Guard vehicles, tanks, and artillery. Runoff from this site is not expected to reach a small tributary to Jumping Brook, located approximately 1,000 feet downgradient, due to obstacles including a bermed road. The site is completely enclosed by chain link fence with a gate at the entrance. Two 1,000-gallon waste oil USTs were removed in 1997; confirmatory sampling indicated the presence of polychlorinated biphenyls (PCBs) at up to 15.3 milligrams per kilogram (mg/kg). Stockpiled soil from the excavation contained TPH at up to 4.960 mg/kg and PCBs (up to 24.4 mg/kg) above the NJ RDCSCC/NRDCSCC (0.49 mg/kg and 2 mg/kg, respectively). VOC, SVOC, and metal concentrations did not exceed the NJ NRDCSCC. The excavation was lined with polyethylene and filled with clean fill, and the PCB-contaminated soil was sent for off-site disposal. Soil and groundwater were subsequently sampled on multiple occasions through 2003 as part of the RI program. PCBs in soil were delineated to NJDEP standards, and Fort Dix performed an interim removal action (IRA) in late 2004 to remove 6,900 tons of non-hazardous PCB waste and 843.52 tons of hazardous PCB waste (Ref. 40). Confirmatory samples were collected for off-site analysis once soil field screening indicated that PCB samples were equal to or less than 1 mg/kg (Ref. 28), and the sample results confirmed that PCBs were removed above NJ RDCSCC (Ref. 40). Clean fill soil and clean site soil were used to backfill the excavations, which were then graded and subsequently seeded in early spring 2005. Excavated soil was characterized and sent off site for proper recycling and/or disposal. Exposure of site workers to PCB-contaminated surface soil is no longer a potentially complete exposure pathway due to the IRA and subsequent site restoration with clean fill and revegetation. Information on depth to groundwater is not available for this site, so it was conservatively estimated to be less than 10 feet bgs.	Groundwater: Metals, PCBs, VOCs	21, 28, 40
10	16	Range Landfill	Not evaluated	No	The Range Landfill is a 21-acre site located in the northeastern portion of the Range and Impact Area, just southwest of the BOMARC site. The site is unfenced but is located in a remote area. The Range Landfill was reportedly used from approximately 1940 to 1975 for disposing of wastes (including rubble, refuse, old storage tanks, and miscellaneous metals) from the Range and Impact Area (Ref. 6). One of the debris areas is currently exposed at the surface, although Fort Dix plans to cover it (Ref. 40). This area is currently used as a driver training site on dirt roads between the thick brush and debris piles (Ref. 40). There is no known surface contamination (Ref. 37) and no reason for the drivers to get out of their vehicles within the landfill area (Ref. 40). Although this area is unfenced, it is located in a remote area and surrounded by dense vegetation, including brush and trees. No trespassing has been observed in this area (Ref. 40), and trespassing is considered unlikely. A 2000 Work Plan for the Range Landfill RI/FS outlined additional tasks to be performed, including an aerial survey, geophysical survey, and soil and groundwater screening (Ref. 6). Depth to groundwater ranges from 40 to 50 feet bgs (Ref. 6).	Groundwater: Metals	6, 37, 40

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
12	18	ANC-2 Disposal Area	Not evaluated	No	The ten-acre ANC-2 Disposal Area is located in the northwestern portion of the Cantonment Area, and approximately 7.5 acres are accessible to vehicles. However, a locked gate secures the site's only access road, preventing vehicles from entering the site; densely forested areas surrounding the 10-15 foot high soil berms around the remainder of the site further restrict access. The site was previously used for waste disposal activity, as evidenced by a pile of mounded material and debris on the site surface (Ref. 16), and it was also reportedly used as a sand and gravel excavation pit that has been backfilled (Ref. 4). More recent disposal practices have reportedly included limited landscaping materials such as grass, leaves, and wood chips. Disposal of materials other than landscaping materials is strictly prohibited, and no recent dumping was observed at the time of the RI activities. Most of the existing miscellaneous rubble and construction debris appears to be located in mounds throughout the eastern portion of the site and near the base of the soil berms at the perimeter. Depth to groundwater ranges from 25 to 35 feet bgs across the site (Ref. 16). At this time, Fort Dix has no plans to remove the debris located at this site (Ref. 16).	Groundwater: Metals	4, 16
13	22	Boiler Blowdown Area	No PHH	No	The Boiler Blowdown Area is located in the northeast portion of the Cantonment Area, one-third of a mile east of the Boiler Plant Building 5426. The site consists of an unnamed stream and its surrounding channel, which is situated approximately 12-15 feet bgs; the channel banks are very steep and are covered with heavy vegetation. Boiler blowdown was reportedly discharged to the Fort Dix storm sewer until approximately 1979. Since then, boiler blowdown has been discharged to the sanitary sewer system. Beryllium was detected at 2.75 mg/kg in one surface soil sample (NJ NRDCSCC = 2 mg/kg) in 1998 and several metals were detected above either NJ SWQC or EPA federal surface water quality criteria (water and fish ingestion), where a NJ SWQC level was unavailable. Given the one minor (less than 1.5 times), isolated surface soil exceedance, and the fact that human exposures to surface water in this area are not currently occurring (Ref. 9), no potentially complete exposure pathways were identified for this area. Fort Dix recommended NFA for the Boiler Blowdown Area (Ref. 9).	Surface soil: Metals Surface Water: Metals	4, 9
15	35	Golf Course Pesticide Mixing & Storage Area	No PHH	No	This site is located adjacent to the Golf Course Leaking UST Area (AREE 39, FTDX 19-6), within the golf maintenance portion of the Cantonment Area. This area includes Building 3150 (former Pesticide Storage Building), Building 3151 (former Herbicide Storage Building), and the pesticide mixing area located east of Building 3150. Herbicides and pesticides were historically stored and mixed for application to the golf course; pesticide mixing reportedly occurred at the site until 1985 (Ref. 12). Buildings 3150 and 3151 currently serve as maintenance and storage areas for golf course equipment. The golf course is currently in use and open to Army officers, enlisted men, and their families (Ref. 12). The selected remedial action for this area included installation of a security fence around the site perimeter to prevent direct contact with surface soil contamination, installation of signs, and performance of Five-Year Reviews (Ref. 12). The fence construction is complete (Ref. 32).	Surface Soil: Metals, pesticides/ herbicides	4, 12, 32
16	05 B	4300 Area Motor Pool	No PHH	No	This area contains the MOTAC refueling center, the HHC 36th Transportation Battalion Motor Pool, and parking facilities. Historical fuel spills occurred in this area (Ref. 4). VOC contamination in groundwater at this site is below applicable standards; however, it was included in the remedial action for the 4400 Area Motor Pool (Ref. 19). See the AREE 17/FTDX 05B entry for a description of the selected remedy.	None	4, 19

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
17	05 B	4400 Area Motor Pool	No PHH	No	This area contains the 39th Battalion (Buildings 4439 and 4440), G-4 Maintenance (Buildings 4429 through 4434), and 195th Ordnance Battalion (Buildings 4465 through 4471) Motor Pools. Areas surrounding the associated buildings are primarily gravel or asphalt-covered and a locked, barbed wire fence surrounds each motor pool. These areas are used for storage of military vehicles and a helicopter hangar. Historical fuel spills occurred in this area (Ref. 4). The selected remedy for the 39th Battalion portion of this site includes installation of an air sparging/soil vapor extraction system combined with granular activated carbon to capture organic vapor (Ref. 19). LTM of groundwater and surface water/sediment was proposed for both the 4300/4400 Area Motor Pools, and a CEA/Well Use Restriction (WUR) will be implemented through the Base Master Plan to restrict groundwater use in these areas (Ref. 19).	Groundwater: Metals, VOCs Soil: Metals Surface Water: VOCs	4, 19
25	17	EPIC-8 Landfill	No PHH	No	This five-acre landfill was used until sometime in the 1950s (i.e., before the Fort Dix Sanitary Landfill opened), and records indicate that no disposal restrictions were in place during its use. Material was disposed using the trench excavation method. The site is surrounded by a locked fence (Ref. 14) and is located in a remote location south of the Cantonment Area (Ref. 4). The selected remedy for the EPIC-8 Landfill includes inspection and maintenance of the existing fence at least annually, and land use restriction through the base master plan (Ref. 14). This area will be subject to five-year reviews (Ref. 14).	Groundwater: Metals Soil: Metals, SVOCs	4, 14
26	33	Property Disposal Office (PDO) Landfill	No PHH	No	The PDO Landfill is a five-acre site that was used for storage and the unauthorized disposal of materials including domestic waste, demolition material, and miscellaneous trash, until the 1970s. There is also evidence of previous coal storage. Buildings have been removed, and this site is generally located within a remote portion of the Training Area but it is near a residential section (Ref. 4). The site is heavily vegetated with grasses, trees, and vines (Ref. 20). During an inspection of the site in March 2006, EPA observed gates at the road entrances and a fence at the adjacent residential area; the area is generally remote, wooded, and heavily vegetated (Ref. 37). A narrow stream runs through the site approximately 600 feet to the southwest of the landfill in the downgradient direction (Ref. 20). Mercury was detected in surface water and sediment samples in the first 1,400 feet of the stream downgradient of the PDO Landfill, but it was not detected in surface water or sediment approximately two miles downstream (Ref. 20). It should be noted that the maximum detected concentration of mercury in sediment (4.7 mg/kg) does not exceed the NJ RDCSCC of 14 mg/kg. However, for ecological considerations, the selected remedy includes: delineation of mercury-impacted sediments and surface water, hot spot removal along stream/wetlands, stream/wetlands restoration, groundwater monitoring, inclusion in the CEA/WUR, and a five-year review (Ref. 20).	Groundwater: Metals Surface Water: Metals, VOCs	4, 20, 27, 37

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
38	19 A	UST: Taxi Stand Site	No PHH	No	This site is located near industrial portions of the Cantonment Area and previously served as a taxi pickup area. One 1,000-gallon and two 3,000- gallon gasoline USTs, and one 1,000-gallon diesel fuel UST were located at the site; three of these were determined to have holes. The four USTs and associated contaminated soil were removed in 1993-1994. No buildings are present; the site is currently an open grassy area with large, mature trees (Ref. 4). Currently, no surface contamination is present at this site (Ref. 37). Groundwater occurs at a depth of approximately 20 feet bgs and is contaminated with benzene, toluene, ethylbenzene, toluene (BTEX) and free product gasoline (Ref. 13). The selected remedy consists of characterization of non-aqueous phase liquid (NAPL) and saturated soil zones, followed by in-situ chemical oxidation destruction of NAPL and BTEX, and subsequent long-term groundwater monitoring (Ref. 13). The groundwater treatment is currently underway (Ref. 32).	Groundwater: Metals, SVOCs, VOCs	4, 13, 32
38	19-1	UST @ Former Bldg. 3379	No PHH	No	Former Building 3379 is located within the 3300 block of the Cantonment Area and was formerly occupied by military barracks/housing. A 20,000-gallon steel UST containing heating oil was removed around 1997; the building was subsequently demolished and is now a grassy field that serves as a training area for the Army Reserve and National Guard Units (Ref. 24). The selected remedial action is delineation of TPH, which is expected to be below the unrestricted use standard of 10,000 mg/kg of total organic carbon (TOC); and injection of hydrogen release compounds (HRCs) into the VOC groundwater plume to enhance naturally occurring anaerobic bioremediation (Ref. 24), combined with groundwater monitoring (Ref. 24). The first round of HRC treatment is reportedly complete at this site (Ref. 40).	Groundwater: VOCs Subsurface soil: TPH	4, 24, 40
38	19-2	UST @ Bldg. 5390	No PHH	No	Building 5390 is located in the Cantonment Area and was formerly a government-owned fuel service station. The removed infrastructure included three 6,000-gallon USTs and one 10,000-gallon UST containing gasoline and related piping and dispenser islands (Ref. 24). The building was subsequently used as a Dough Nut Shop until 2006. The contaminants of concern at this site were BTEX compounds in subsurface soil and MTBE in groundwater. The selected remedial action included bioventing of vadose zone soils and in-situ bioremediation of soil and groundwater, combined with groundwater monitoring (Ref. 24). The most recent groundwater sampling results reportedly came back clean; therefore, the bioventing was discontinued at this site (Ref. 40). Building 5390 had not been re-occupied as of August 11, 2006 (Ref. 40).	Groundwater: None* *This could not be confirmed with available documentation.	4, 24, 40
38	19-3	UST @ Bldg. 6045	No PHH	No	Building 6045 formerly functioned as a gasoline station with a gasoline UST of unknown capacity, associated piping, and one 1,000-gallon heating oil UST. Following removal of the gasoline UST and piping, MTBE-contaminated groundwater was identified (Ref. 24). One round of chemical oxidation treatment was reportedly performed and xylene-impacted soil (below NJ RDCSCC) was reportedly removed from Building 6045 (Ref. 40). This building is currently used for storage of recreation equipment (Ref. 37).	Groundwater: VOCs	4, 24, 37, 40
38	19-4	UST @ Bldg. 6605	No PHH	No	This site is located in the 6600 block of the Cantonment Area and was originally constructed as a leaded gasoline fueling station. Three corroded 2,500-gallon USTs were removed in March 1998, but post-excavation samples were below applicable soil criteria (Ref. 24). The building was demolished prior to September 2000. Natural attenuation has occurred at this site and only one well reported VOC concentrations above NJ GWQC in March 2003 (Ref. 24). Monitored natural attenuation was the selected remedy at this site (Ref. 24).	Groundwater: VOCs	4, 24

AREE No.	FTDX No.	Site Name	1999 PHA	Potential Concern?	History/Description	Media and COCs	References[1]
38	19-5	UST @ Bldg. 7061	No PHH	No	Building 7061 is the New Lisbon potable water pumping station and is located off the main Fort Dix site. A 290-gallon UST was removed in 1997 and observed to be in poor condition (Ref. 24). The selected remedial action was installation of an additional groundwater monitoring well, bioventing of soil impacted by xylenes below NJ RDCSCC, injection of oxygen release compounds (ORCs) to treat BTEX-contaminated groundwater, and groundwater monitoring (Ref. 24).	Groundwater: VOCs	4, 24
38[2]	19-6	Golf Course Leaking UST	No PHH	Yes (Indoor Air)	A 1,000-gallon steel UST dating from 1960 was removed in 1984, after an oily sheen was observed on the surface of a nearby stream. The leaking tank and associated soil were removed and remediated in 1984. The primary contaminants of concern are petroleum-related compounds that were released from the leaking UST (Ref. 8). An actively used golf clubhouse (Building 3152) and parking lot are located just south of the former UST location. In March 1998, excavation performed for a demolition/construction project at the clubhouse uncovered oily soil, which was excavated and disposed. A leaking 1,000-gallon fuel oil UST located upgradient from the impacted soil had been removed in February 1997 (Ref. 8). Subsurface soil and groundwater contamination remain underneath the clubhouse and parking lot (Ref. 37). The Draft 2001 Site Investigation Report presented the results of natural attenuation modeling suggesting that benzene in groundwater was undergoing natural bioremediation and recommended monitored natural attenuation combined with LTM and inclusion in the CEA (Ref. 8). This site has been included in the final Fort Dix CEA and a Five-Year Review is planned (Ref. 8).	Groundwater: Metals, SVOCs, VOCs Subsurface soil: TPH	4, 8, 37
38	19-7	UST @ Range Road Areas A, B, C	No PHH	No	The Range Road sites are located in the 8100 and 8200 blocks of Fort Dix in the Training Area and include 24 former heating oil USTs. These sites were formerly military barracks that were demolished prior to the UST removals. The southern half of the 8200 block is currently used as an active motor pool. The suggested remedial action is installation of ORC socks at four monitoring wells to enhance existing microbial activity, monitored natural attenuation, and inclusion of these sites in the Final CEA for Fort Dix (Ref. 18).	Groundwater: SVOCs, VOCs Subsurface soil: TPH	4, 18

[2] AREE 38, FTDX 19-6 was previously designated as AREE 4, FTDX 11 (Ref. 32).