TABLE OF CONTENTS

LIST OF APPENDICES

SECTION 1
INTRODUCTION

1.1 PROJECT AUTHORIZATION

Parsons Engineering Science, Inc. (Parsons ES) received Contract No. DACA87-95-D-0018, Delivery Order No. 0025, from the United States Army Corps of Engineers, Huntsville, United States Army Engineering and Support Center, to conduct Preliminary Assessments (PAs) at 15 Defense National Stockpile Center (DNSC) depots. These PAs were performed in accordance with all applicable state and United States Environmental Protection Agency (USEPA) guidance and regulations [e.g., the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance for performing PAs (Reference 1)]. The work was performed under the supervision of a registered professional engineer.

1.2 PURPOSE AND SCOPE

The National Stockpile program was established under the Strategic and Critical Materials Stock Piling Act (P.L. 79-520; July 23, 1946) as an attempt to avoid dependence on foreign sources of essential materials during times of national emergencies. Prior to 1988, management of the National Stockpile was divided between the Federal Emergency Management Agency (FEMA) and the General Services Administration (GSA). Under Executive Order 12626, the President moved management of the National Stockpile to the Secretary of Defense. The DNSC is currently an activity-level agency under the Defense Logistics Agency (DLA).

The DNSC operates a number of depots that are GSA-owned or GSA-leased properties. As a result of the DNSC's operations, there exists a potential for environmental contamination at these depots. The objective of this report is to document the results of the PA at the following Depot:

New Haven Depot
15411 Dawkins Road
New Haven, Indiana
CERCLIS Number: Not Applicable

Specifically, this PA was performed to:

- Determine what materials have been or are currently stored on the site;
- Assess the immediate or potential threat that wastes at the site pose to human health and the environment;
- Assess if there is a need for further site investigation to determine the nature and extent of any potential environmental contamination (i.e., collect information to support a decision regarding the need for further action).

The major activities which were performed in the development of this PA (and which are described in detail herein) include the following:

- Review of available information for the facility. Information reviewed included records and reports provided by the Government, published data, and data available from other sources;
- Interview of personnel knowledgeable of past and present site conditions and operations. Table 1.1 provides a summary of the personnel who were contacted and the topics that were discussed;
- Visual inspection of the site, and collection of additional relevant data that was locally available;
- Preparation of the Potentially Hazardous Waste Site Preliminary Assessment Form (Appendix A); and
- Scoring of the site using the USEPA's PA Scoresheets (Appendix B).

Appendix C provides photographs taken during the site visit conducted on May 18 and 19, 1998. Appendix D provides suggested sampling locations and analytical parameters to be assessed as part of a Focused Site Investigation (Focused SI). Performance of a Focused SI will aid in substantiating or denying the PA hypotheses regarding contaminant migration pathways and possible exposure to human and environmental receptors.

Table 1.1
Summary of Contacts
New Haven

Name	Agency/Title	Telephone No.	Comment
Fred Brooks	New Haven Depot Manager	(219) 749-5953	Depot history and operations
City Clerk	City of New Haven	(219) 749-1911	Drinking water supply
Linda Hofrichter	Allen County Soil Conservation Service	(219) 426-4637, ext 3	Soil descriptions
Tracy	National Weather Service, Midwest Climate Center	(217) 244-8226	Climate information
Dawn	Indiana Geological Survey	(219)	Geological publications
Vicki	City of Fort Wayne Filtration Plant	(219) 427-1254	Drinking water supply
Bob Frost	Frost Associates	(860) 669-5859	Population/water supply search
N/A	Environmental Data Resource, Inc.	(800) 352-0050	Mapping/database search
Paul	Allen County Department of Planning and Zoning	(219) 449-7607	Zoning

SECTION 2
SITE DESCRIPTION, OPERATIONAL HISTORY AND WASTE CHARACTERISTICS

2.1 SITE DESCRIPTION

The New Haven Depot is currently owned by the Federal Government and operated by the Department of Defense (DoD), DLA. The facility is actively operated under the National Stockpile Program for the purpose of storing metallurgical ores and materials necessary for manufacturing defense materials or strategic materials used in national defense. The location is:

DLA/DNSC New Haven (Casad) Depot
15411 Dawkins Road
New Haven, Indiana 46774-9644
(219) 749-5953

The New Haven Depot is located on the north side of State Route 14, approximately 3 miles east of New Haven, Indiana. New Haven is located in the central part of Allen County, Indiana, immediately to the east of the city of Fort Wayne. Access to the site can be made from Fort Wayne by following State Route 14 east through New Haven. Alternatively, access can be made from the greater Fort Wayne area by exiting State Route 469 at U. S. Route 30 east, then proceeding north to State Route 14 via Doyle or Ryan roads, the east on State Route 14 to the site.

The site is situated at latitude 41, 4’, 36” North, and longitude 84, 56’, 20” West. The site lies in all of the northwest quarter and part of the northeast quarter of Section 10, and all of the northeast quarter and part of the northwest quarter of Section 9, Township 30 North, Range 14 East of the Second Principal Meridian. The site location is depicted on Figure 2.1.

The site is currently an active storage depot, engaged in the storage of various materials, including metallic ores, refined metals, mineral substances such as Flourspar and Asbestos, and certain natural organic materials such as Rubber and Tannin extract. Ores are stored in both exterior bulk piles and within various containers at exterior and interior locations. Refined metals in ingot form are stored in exterior and interior locations. Flourspar is stored in bulk, primarily in exterior storage piles. Asbestos and organic materials are stored in bags within warehouses located on the site.

Construction of the New Haven Depot began in 1942, and active operations began the following year.

The site currently covers 268 acres. The site is roughly trapezoidal in shape, and extends roughly 7,500 feet along its maximum east-west axis, and approximately 2,500 feet along its maximum north-south axis. The site is bordered to the south by the main line of the Norfolk Southern Railroad and State Route 14. The northernmost extension of the site is bordered by Edgerton Road; however, the central portion of the site is bordered by a small industrial park situated south of Edgerton Road. Farmland borders the western portion of the site. Property owned by Jefferson Township borders the east side of the site.

A series of rail spurs extending off of the Norfolk Southern rail line cross the site along its east-west axis, converging at the sites' southwestern and southeastern corners. Vehicular access is made from State Route 14 near the center of the site. A guard shack controls vehicular access to the site, which is completely surrounded by a 6-foot fence topped with three-strand barbed wire. Other gates exist at the entry/exit points of rail spurs; these gates are kept closed and locked except when used.

A total of six large warehouse buildings designated as warehouses T-210, T-211, T-212,T- 213, T-214, and T-215 are located within the fenced area surrounding the site. One warehouse, T- 210, is currently operated by the GSA and is not considered to be a part of the site. These warehouses are located in the northcentral portion of the site. Each warehouse covers approximately 14,850 square feet. Warehouses T-213, T-214, and T-215 were previously open sheds of comparable size to the enclosed warehouse structures; however, these structures were enclosed in the late 1950s. A summary of materials stored within these warehouses at the time of the inspection is contained with a site-wide materials inventory dated 2 April 1998 (Reference 2, Appendix E).

Various other smaller structures are located throughout the site, as indicated on Figure 2.2. A summary of these buildings is contained in an undated facility description memo contained within depot files (Reference 3, Appendix E).

South of the warehouses, within the central portion of the site are a number of open storage areas designated as Open Areas 216 through 230. Other open storage areas are located along the rail spur lines within the eastern and western portions of the site. These areas are depicted in Figure 2.2. The storage of metal ingots, drums. and piles of metallic and other ores are conducted in these exterior areas. The facility-wide inventory provides a summary of the types and quantities of materials present in these areas (Reference 2, Appendix E).

Two water wells are currently located on site, and are used to supply potable water and stand-by water for fire fighting. The primary well was installed in August 1992. File information indicates that it was drilled to a finished depth of 396 feet below ground surface (bgs). Its pump is housed in building T-133, at the west pump station (Figure 2-2). File information indicates that the second well is one of two wells dating from the original construction of the facility in 1942. It also is located at the west pump station. It is currently utilized only as a secondary source of water. The other original well is located at building T-304 at the east pump station; however, it is no longer used. The two original wells were drilled to depths of 165 and 225 feet; however, file information does not indicate which well was drilled to which depth.

Electrical power is supplied by Indiana-Michigan Power Company. The primary feed for electrical power into the site is located at a substation situated near building T-111. Natural gas is not supplied to the facility.

A sanitary sewer system is utilized to convey lavatory wastes to four small treatment plants. Each plant consists of a small sewage lift pump, and a sand and gravel disposal field. One set of two adjacent plants is located immediately east of warehouse T-212 and north of the east pumphouse. A second set of two adjacent plants is located to the northwest of warehouse T-210. According to Mr. Brooks, the New Haven Depot Manager, these systems only handle lavatory wastes generated by the washrooms located in the warehouses, offices and other occupied buildings on the site (Reference 4).

File information indicates that a fifth treatment plant and filter bed had once been located immediately to the north of building T-111. Currently, a pumping station is located in this area which transfers sanitary wastes to the western treatment plants.

The site and the surrounding area possess minimal topographic relief. There exists a gentle northerly sloping towards the Maumee River, across the general area where the site is situated. The Maumee River is located approximately 2 miles northwest of the site. A detailed description of surface water drainage on the site and the immediate surrounding area is provided in Subsection 3.3.1.

Land use surrounding the area is predominantly agricultural. The closest farmstead is located off of the south side of State Route 14 immediately opposite the central portion of the site. A small industrial park is situated south of Edgerton Road immediately adjacent to the northcentral portion of the site. This industrial park occupies land once part of the depot, but sold off in the 1970s.

The land immediately to the east of the site is occupied by a park, a model airplane flying field, and an antique railroad club. A small recreational lake utilized for sport fishing is also located in this area. This land also once part of the depot, and was sold to Jefferson Township in the 1970s.

A fire practice area and a burning area, used for fire fighting practice and the burning of wastes generated at the depot, respectively, were located northeast of the existing warehouses, on property which is part of the industrial park. A pistol range was located east of the industrial park, on property now owned by Jefferson Township. Land immediately to the west is under agricultural use. Various small commercial and industrial properties are located in the immediate area. Historical areas on property that has been sold are not being investigated in this preliminary assessment.

2.2 OPERATIONAL HISTORY

The depot began operations in 1943 on 646 acres encompassing all of the land between State Route 14 and Edgerton Road on the south and north, respectively, and by Webster and Ryan roads on the east and west, respectively.

According to depot file information, construction of the depot began in April 1942 and was completed in March 1943. The depot was originally assigned to the Ordnance Department and designated the New Haven Ordnance Depot. It was renamed the Casad Ordnance Depot in April 1943. The depot operated during World War II as a Class II

Installation. It was deactivated in 1947 and assigned to the Corps of Engineers, which maintained the facility in a stand-by fashion.

In April 1948, the facility was redesignated as the Casad Engineer Depot, and operated as an inactive Class II Installation for storing strategic and critical materials for the National Stockpile. In February 1951, the facility was re-designated as an active Class II Installation, and given the added mission of assembling troop supply. Specifically, engineer sets including equipment for camouflage, carpentry, fire fighting, blacksmithing, pipe fitting, surveying, welding, and field mapping were assembled.
The facility was reportedly used as an Army Engineer Training Area until 1955. The Corps of Engineers declared the site as excess land in 1955. In 1958, control of the site was given to the GSA.

In 1959, 130 acres comprising the original western portion of the site were sold. In 1972, parcels which comprised the northcentral and eastern parts of the original site property were sold to various local government and private entities. This included property north of the existing warehouses which was developed into a small industrial park, and properties containing Lake Ashley in the northeast portion of the original site property, as well as the pistol range, fire practice area, and burning area.

In the early 1980s, the National Defense Stockpile Center under the GSA assumed management responsibility for the site. In 1988, the stockpile program was transferred from GSA to the DLA, and the re-named the Defense National Stockpile (DNS). Ownership of the property, however, was never transferred to the DLA from the GSA.

There are currently 13 employees at the New Haven Depot.

2.3 REGULATORY STATUS

The New Haven Depot has been issued federal Facility Index Number IND971500600. The site is currently classified as a conditionally exempt small quantity generator (CESQG) as defined under the Resource Conservation and Recovery Act (RCRA), 40 Code of Federal Regulations (CFR) 261.5, and companion state of Indiana regulations. The facility is therefore regulated under the restricted provisions for CESQGs defined therein. A RCRA generator number has been assigned to the facility; IND5470000600.

The site currently possess five underground storage tanks (USTs) used to store regulated petroleum substances. These tank systems are thus regulated under the provisions of RCRA, 40 CFR 280 and companion state of Indiana regulations. In addition, the facility currently possesses four aboveground storage tanks (ASTs). Two of the ASTs were previously used to store petroleum products, but are now inactive. One 1,000-gallon tank is currently used to store motor oil, and a 275-gallon tank is used to store No. 2 diesel fuel. Because of the quantity of petroleum products stored on the site (at least one AST exceeding 660 gallons) and the potential for a release to impact surface water, the facility is regulated from the Spill Prevention Countermeasure and Control (SPCC) requirements under the federal Clean Water Act (CWA).

No active air emissions sources regulated under the federal Clean Air Act (CAA) or companion state of Indiana regulations are known to exist at the facility. Similarly, no industrial wastewater streams are known to be discharged by the facility which would be regulated under the CWA or companion state of Indiana regulations, or any local ordinances for discharge to a Publicly Owned Treatment Works (POTW) developed pursuant to these regulations. The facility has compiled a Stormwater Management Plan that addresses discharge of stormwater from the facility into waters of the United States.

The New Haven Depot underwent an Environmental Program Review (EPR) in 1989 by the United States Army, Environmental Hygiene Agency. The depot also underwent an Environmental Compliance Assessment (ECA) in 1998. The results of the EPR and ECA indicated few, relatively minor infractions of federal or state regulations and DoD/DLA directives.

The site possesses a current license from the Nuclear Regulatory Commission for the storage of radioactive materials.

2.4 FORMER INVESTIGATIONS AND STUDIES

The review of file information for the New Haven Depot indicates that the following environmental studies have been conducted, in addition to the 1989 EPR and the 1998 ECA described above:

- Preliminary Assessment - 1988
- UST Release Investigation - 1990
- Water well sampling - Various dates
- Stormwater Characterization Study - 1996

Circa 1988, the facility submitted the results of a CERCLA PA to the USEPA Region V office. Limited file information suggested that the depot had been placed on the Federal Agency Hazardous Waste Compliance Docket pursuant to Section 120 of the Superfund Amendments and Reauthorization Act (SARA). Placement of the facility on the docket was reportedly the result of the facility procuring a USEPA identification number to secure the proper disposal of pesticides and herbicides (DDT, 2,4-D and 2,4,5-T) left at the facility. Based upon the submitted PA, USEPA determined that the site would be placed into a No Further Remedial Action Planned (NFRAP) category.

In February 1990, releases from UST systems being removed were reported to the Indiana Department of Environmental Management (IDEM). Pursuant to the requirements of 40 CFR 280.63, a site characterization study was undertaken to assess the extent of impact resulting from this release. Monitoring wells were installed in the till around two excavations where heating oil and diesel tanks had been removed. Groundwater flow direction was determined to be to the northwest, and the water bearing unit(s) intercepted by the wells were confined with a pieziometric surface between 2 to 4 feet bgs. Sampling of these wells revealed no detectable concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX), and very low concentrations (between 5 and 7 parts per million

[ppm]) of total petroleum hydrocarbons (TPH) in some of the wells. The over-excavation of one of the excavation areas was recommended prior to the placement of backfill.

The on-site water wells have been sampled in recent years for various chemical, biological and radionuclide parameters. Water samples collected from the primary wellhead at building T-133 (west pumphouse) between 1990 and 1997 for inorganics analyses are summarized in Table 2.1. Analyses of wellhead samples for volatile organic compounds (VOCs) in June 1990, and for radionuclides and pesticides in February 1993, revealed no detectable concentrations of these parameters. The methodologies employed during these sampling events were not well documented. Samples collected in November 1997 revealed unsatisfactory levels of total coliform bacteria in a potable water sample from building T-214. Samples of the potable water supply on the site have not revealed any elevated concentrations of chemical or radionuclide parameters.

Table 2.1

Summary of Wellhead Sampling 1/

	Parameter				
Date	**Nitrate**	**Barium**	**Cadmium**	**Copper**	**Lead**
7/97	0.8	-	-	-	-
3/97	1.5	-	-	-	-
2/8/93 2/	0.31	0.04	0.04	<0.1	0.003
7/90	1.4	0.06	<0.01	0.03	<0.01

1/ All results expressed as milligram per Liter (mg/L)

2/ Silver, Chromium Arsenic, Mercury and Selenium were also analyzed for but were non-detected.

A storm water characterization study was conducted in April 1996 (Reference 5, Appendix E) to support the development of a stormwater management plan for the facility. This study included the collection of water samples from four identified outfall locations designated outfall 001 through 004. These samples were analyzed for inorganic parameters including metals. The study revealed the presence of nitrite/nitrate-nitrogen at all outfalls, above USEPA benchmark concentrations. Oil and grease exceeded benchmark concentrations at outfall 002. TSS exceeded benchmark concentrations at outfall 001, chemical oxygen demand (COD) exceeded benchmark concentrations at outfalls 001, 002, and 003. Aluminum and iron exceeded benchmark concentrations at outfalls 001, 003, and 004, with the highest concentrations at 001 . Zinc exceeded benchmark concentrations at outfall 001. Levels of nitrite/nitrate-nitrogen were believed to be due to the influence of nitrogen fertilizers from surrounding farm land. The elevated concentrations of aluminum, iron, and zinc at outfall 001 were believed to be associated with the high TSS concentration.

2.5 HAZARDOUS SUBSTANCES AND WASTE CHARACTERISTICS

According to the CERCLA Guidance Document, a site is "the area consisting of the aggregation of sources, the areas between sources, and areas that may have been contaminated due to migration from sources; site boundaries are independent of property boundaries." A source is "An area where a hazardous substance may have been deposited, stored, disposed, or placed. Also, soil that may have become contaminated as a result of hazardous substance migration," (Reference 1). Hazardous substances are defined per 40 CFR 302.4. A hazardous substance or constituent is defined as a hazardous pollutant or contaminant listed in CERCLA, Sections 101(14) and 101(33).

Currently, the New Haven Depot facility has a large stockpile of ore and mineral, ingots, and drums, as well as five USTs and four ASTs that may potentially be sources for hazardous or regulated substances. Some of the stockpiled ore and mineral resources contain CERCLA hazardous substances which could be contaminants if they have migrated to, or been deposited in, the soil, air, surface water, and groundwater.
The materials stored on site are primarily in solid form and in different stages of milling or refinement. An inventory listing of stockpiled materials from the facility dated April 1998 is provided in Appendix E (Reference 2, Appendix E). Those ores and minerals which were stored in exterior locations during the site visit are listed on the inventory in designated open areas. Those which are stored in bulk piles are designated by a pile number. Other materials stored in the open areas are in the form of ingots or are containerized in drums. These have been designated on the inventory based upon observations made during the site visit. With the exception of the antimony, titanium and aluminum that is stored in drums, and acid-grade Flourspar which is covered by asphaltic covers, those materials which are or have been stored in exterior locations are exposed to the elements and subject to weathering. The majority of the exterior materials are stored on gravel or bare soil.

A variety of other materials have been stored inside the warehouses on the site. A summary of materials stored in these warehouses is provided in the sites stockpile inventory (Appendix E). With the exception of some storage of lead ingots in warehouse T-211, and the bulk storage of Flourspar within a lined wooden vault within warehouse T-215, these materials are stored in drums, kegs, bags, or other container. The floors of the warehouses are of concrete slab construction. There are no floor drains present in the storage areas of the warehouses. There are no reported accounts of spills or releases from the buildings. Therefore, in the absence of a catastrophic event such as fire, it is highly unlikely that any substances contained in these warehouses would be released to the environment.

2.5.1 Current Materials Stored Outside

2.5.1.1 Flourspar

Large quantities of Flourspar, including 68,006 standard tons of acid-grade Flourspar, and 46, 269 standard tons of metallurgical-grade Flourspar are stored in open areas located throughout the site . Acid-grade Flourspar is stored in large piles covered by asphaltic covers to eliminate airborne losses of fine materials. These piles are surrounded by a "berm" of wooden rail road ties. The metallurgical-grade Flourspar is stored in uncovered piles of small milled pieces; these piles also were typically surrounded by railroad ties. Some fine materials were typically noted around the edges of these uncovered piles. Flourspar is currently being stored in piles in Open Areas 8, 125, 319A, 223, 224, and 325.

2.5.1.2 Ferrochrome

Large quantities of high carbon Ferrochrome ore, totaling 93,701 standard tons, are stored in open areas located throughout the site. Low carbon Ferrochrome ore (7,896 standard tons) is stored in Open Area 600, south of building T-111. These materials are maintained in piles of large milled rocks. Some fine materials were typically noted around the edges of these piles. These piles are generally located on areas of gravel or bare soil.

2.5.1.3 Ferromanganese

Large quantities of high carbon Ferromanganese ore, totaling 55,337 standard tons, are stored in Open Areas 316, 319, and 312 in the eastern portion of the site. These materials are maintained in piles of large milled rocks. Some fine materials were typically noted around the edges of these piles. These piles are located on areas of bare ground.

2.5.1.4 Zinc

Zinc ingots are stored on gravel covered areas in the central portion of the site. A total of 39,572 standard tons of zinc ingots are maintained in Open Areas 2176, 220, and 227.

2.5.1.5 Lead

Lead ingots are stored on gravel covered areas in the central portion of the site. A total of 27,166 standard tons of lead ingots are maintained in Open Areas 216, 219, and 225.

2.5.1.6 Baddelayite

A single 15,991 standard ton pile of Baddelayite, a zirconium-containing radioactive material, is maintained in Open Area 7, in the northwest portion of the site. A second pile containing 1,392 standard tons of Baddelayite-contaminated soil is also maintained in this area. These piles are maintained on bare ground, and are cordoned with fencing at distances from the pile where radiation dropped to background levels. A portion of the current Baddelayite was moved to the site from other depots. The soil pile was generated as a result of removing soil underlying the transferred stockpiles.

2.5.1.7 Aluminum oxide

A 10,058 standard ton pile of fused, crude, aluminum oxide is located in Open Area 125. This pile consists of moderately sized milled pieces of material. This area is gravel covered.

2.5.1.8 Tin

Tin ingots are stored on gravel covered areas in the central portion of the site. A total of 5,258 standard tons of tin lead ingots are maintained in Open Areas 216 and 222.

2.5.1.9 Other Materials

Drums of titanium are stored in Open Area 14, west of the west pumphouse. A total of 1,059 standard tons are stored in this gravel covered area.

A total of 4,815 standard tons of antimony are stored in drums and as ingots in Open Area 216. This area is gravel covered.

A 140 standard ton pile of Kyanite is located at the eastern end of Open Area 224. This pile consists of moderately sized milled pieces of material. This area is gravel covered.

2.5.1.10 Mobility in the Environment

The following tables contain a brief description and analysis of the various stockpiles located throughout the DLA depots. Table 2.2 presents the commodity, its chemical formula (if applicable), a breakdown of its various components, their respective percentages, and a discussion of the uses and/or points of interest concerning the commodity. Table 2.3 includes the general fate and transport properties and background levels of the elements that are associated with the commodities in Table 2.2.

From 1989 to 1992, the DNSC conducted leaching studies to assess the potential for stockpiled ores to leach heavy metals (Reference 6, Appendix E). These studies showed that with the exception of Flourspar, the ores stockpiled at DLA facilities showed limited propensity to leach heavy metals in concentrations exceeding those levels defined within RCRA for determining toxicity characteristics in hazardous waste.

Both Ferromanganese and Ferrochrome may contain traces of various heavy metals including Chromium, Arsenic, Lead, Tin and/or Antimony. The DNSC leach studies showed that Manganese, and to a lesser extent, Chromium, may leach from these ores. These studies also showed that Manganese may also leach from Kyanite.

Based on the original DNSC study described above, a second study was performed to assess the specific leachability of Fluorspar materials. Mineral samples were collected from several stockpiles and analyzed for:

- Total metal concentration,
- TCLP (weak acid),
- Wet-dry leaching via distilled water,
- Wet leaching via distilled water, and
- Mineralogical characterization by electron microprobe.

The total Flourspar concentration was examined to assess the absolute quantity of metals available for dissolution over time. The TCLP tests were performed pursuant to USEPA

Method 1311 to assess the potential for environmental impact due to infiltration of a weak acid (potentially reflecting acid deposition conditions). The wet-dry cycling leach tests were performed to investigate the effects of episodic precipitation events upon the stockpiles. Wet leaching tests were designed to approximate the leaching potential under wetland type conditions where there is constant contact of mineral with standing water (absence of flow).

Results from the TCLP and wet-dry leaching tests are the most appropriate for the conditions at the New Haven Depot. Twenty-nine samples were analyzed for the following constituents:

- Arsenic
- Mercury
- Selenium
- Lead
- Cadmium
- Chromium
- Silver
- Barium

With respect to the TCLP results, lead and mercury were the only constituents that were detected at concentrations that exceeded the TCLP limit. Twelve of the 29 samples had Lead concentrations that exceeded the TCLP limit of 5 mg/L. It was found that leaching of Lead is higher when it is in the mineral form of Cerrusite (PbCO3), whereas Galena (PbS) is less soluble. The TCLP limit for Mercury of 0.2 mg/L was exceeded in 6 of 29 samples. The wet-dry leach test study results indicate that leaching of the natural resource stockpiles is not expected under normal precipitation conditions. The highest barium concentration was 1.1 mg/L compared to a TCLP limit of 100 mg/L. The highest cadmium concentration was 0.06 mg/L, whereas the TCLP limit is 1 mg/L. Chromium was analyzed at a maximum concentration of 0.04 mg/L and the TCLP limit is 5 mg/L. The highest Lead result was 0.5 mg/L in comparison to the TCLP standard of 5 mg/L. The analysis was performed by both the graphite furnace atomic adsorption spectrometry as well as inductively coupled plasma/optical emission spectrometry techniques, and the results were comparable. The results of the wet-dry study predict that the natural resource stockpiles do not leach significantly under normal precipitation conditions.

The original leaching study conducted by the DNSC also demonstrated that the amount of metal contaminant leached from the ore is related to the size of the ore particle, with significantly greater leaching occurring in smaller sized material. No leachability studies have been conducted on Tin and Lead ingots stockpiled at DNSC sites; however, one investigation suggested significant leaching of Lead from stockpiled ingots had resulted in high Lead concentrations in wood pallets upon which they had been stored.

In addition to leaching, fines material within ore piles may physically be transported by runoff during heavy precipitation events. Thus, transport of material from the ore piles via physical and chemical means is favored by smaller particle size.

The fate of heavy metals in aquatic systems depends on partitioning between soluble and particulate solid phases. Adsorption, precipitation, co-precipitation, and complexation are processes that affect partitioning. These same processes, which are influenced by pH, redox potential, the ionic strength of the water, the concentration of complexing ions, and the metal concentration and type, affect the adsorption of heavy metals to soil.

2.5.2 Other Materials and Areas of Concern

2.5.2.1 Herbicides and Pesticides

Herbicides and pesticides historically were used and stored on site. File information indicates that circa 1986, containers of DDT, 2,4-D and 2,4,5-T were removed from the site. According to Mr. Brooks, these were the unused portions of pesticides previously utilized at the depot. The herbicides were sprayed around the base of ore piles and along the fence lines. The volume of pesticides historically used is unknown. Currently, only minimal quantities of herbicides and pesticides are used on site. These are reportedly used in accordance with regulatory standards by an outside contractor. The facility currently maintains a Pest Management Plan, which emphasizes minimizing the use of pesticides and the use of outside contractors for pesticide applications.

2.5.2.2 Petroleum Storage Tanks

The New Haven Depot currently has five regulated USTs and four regulated ASTs. In 1990, the existing USTs were removed. These were bare steel tanks which dated from the original construction of the depot. At the time of the removal, notification of a release of regulated materials from at least two of the tanks was made. A subsurface investigation was subsequently conducted to investigate the extent of soil and groundwater impacts (refer to Subsection 2.4).

Currently, the site possesses five USTs that were installed in 1990 and utilized to store fuel oil and gasoline. All five tanks are of fiberglass construction. Four ASTs are also located on the site; two are actively used to store petroleum products.

Although a release of petroleum material occurred from two of the previously removed USTs, petroleum is exempt under CERCLA and any potential impacts from a petroleum release would be addressed pursuant to other federal or state regulations.

2.5.2.3 Septic/Sanitary Sewer System

As described in Subsection 2.1, the New Haven Depot possesses four wastewater treatment plants which are used to handle sanitary wastes generated at the facility. These are located east of warehouse T-215 and northwest of warehouse T-210. According to Mr. Brooks, only sanitary wastes from the facility lavatories is or has historically been disposed of in these beds.

2.5.2.4 Polychlorinated Biphenyls

In December 1997, Transformer Service, Inc. conducted testing of 30 transformers located at the facility. Dielectric fluids were tested for total polychlorinated biphenyl (PCB) concentration. This testing revealed that all but one of these transformers possessed PCBs levels below 50 parts per million (ppm), and are thus classified as non-PCB units. One transformer was found to contain 62 ppm PCBs, classifying it as a PCB-contaminated unit. File information suggests that other PCB-contaminated and PCB-containing transformers had previously existed at the site, but apparently have been removed.

2.5.2.5 Other Hazardous Materials and Hazardous Wastes

A wide variety of other hazardous substances and other environmentally-sensitive materials are stored within the warehouses on site. This includes Lead ingots, bags of asbestos, bags of tannin extract, and various drums, barrels, and boxes of ore materials and other substances. A wooden vault structure in warehouse T-215 is used to store acid-grade Flourspar. The recent stockpile inventory lists the various commodities, their locations, and quantities (Reference 2, Appendix E).

Hazardous materials used at the New Haven Depot include oils, paints and painting-related substances, and other materials used for facility maintenance. A recent hazardous chemicals inventory of the depot provided a detailed listing of the type, quantity, and location of these various materials. These are stored in a maintenance building (T-111) and a storage building (T-141).

Any hazardous or otherwise environmentally sensitive wastes such as waste oil, spent paints, etc., generated from routine depot operations are stored in building T-111. No evidence of spills or releases were noted during the site visit. The New Haven Depot has a hazardous waste management program that includes a contract with *Safety Kleen* for disposal of hazardous wastes. The current hazardous waste practices at the depot are not considered to be a source of contamination.

2.5.3 Historical Commodities Stored and Waste Disposal

2.5.3.1 Historical Material Stockpiling

File information at the depot indicated that various commodities, including those no longer maintained at the facility, have historically been stored in different locations on the site. Table 2.4 provides a summary of commodities and storage locations obtained from historical photographs and documents maintained in the facility files. These files also include inventory reports, receiving reports, and other documents showing the historic storage locations for various commodities. The facility has used these records to summarize the historic storage locations of Lead at the site (Reference 7, Appendix E).

Table 2.4
Summary of Historical Commodity Stockpiling Locations

Commodity	Open Area Storage Location
Aluminum ingots	311A, 322, 325A, 218, 221
Tungsten disulfide	311B,
Manganese	316, 319
Fourspar	325, 223, 224
Lead ingots	219, 223
Brass billets	218
Copper ingots	218
Chrome	218, 223
Magnesium ingots	218, 218, 221, 222, 223
Zinc	220, 221
Tin	222
Kyanite	224
Aluminum oxide	316A
Ferrochromium	223

2.5.3.2 Chlorinated Solvents

According to file information. a solvent-based degreaser had previously been used during the time when the facility was assembling troop supply. This degreaser was located in one of the warehouses.

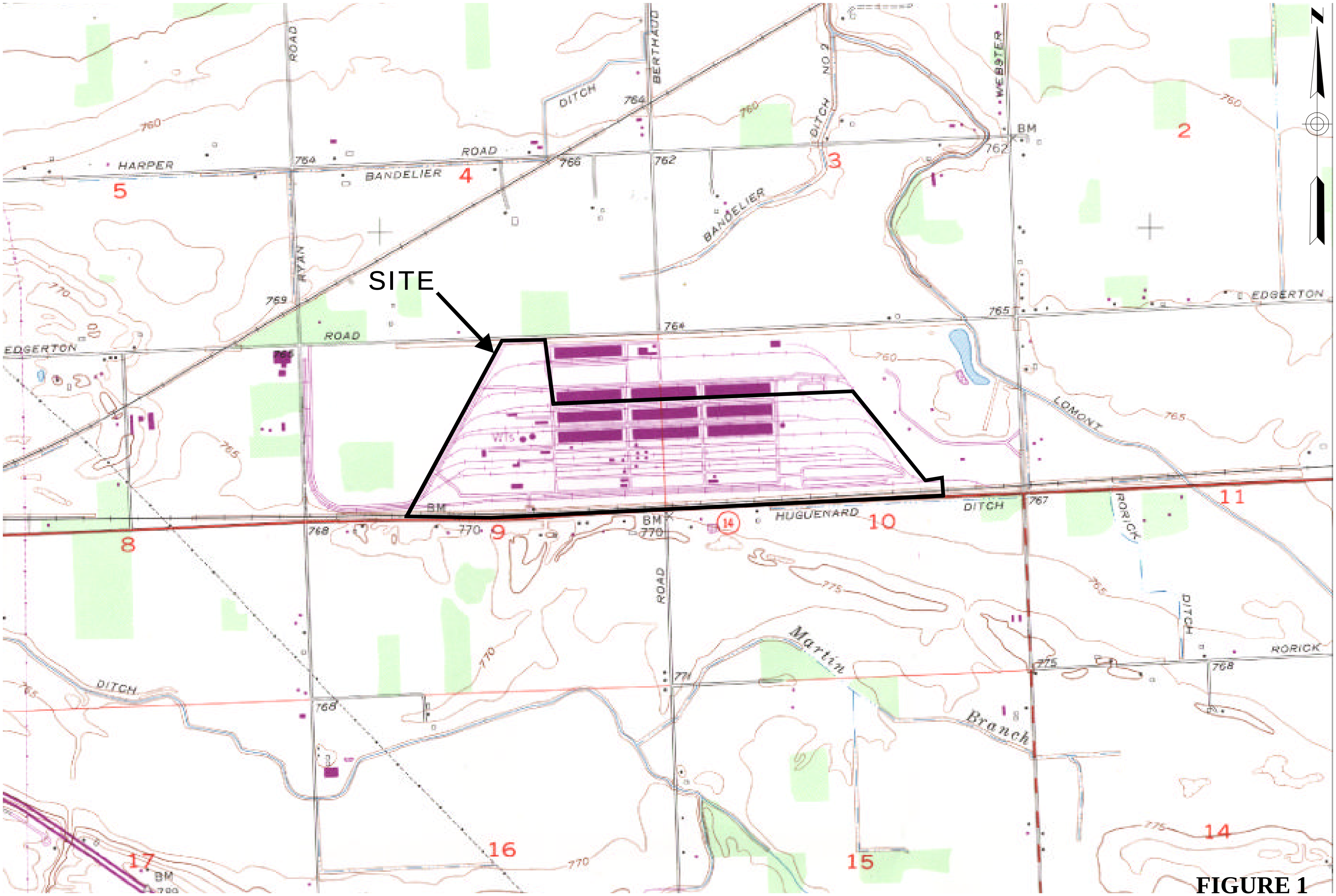

FIGURE 1
SITE LOCATION MAP
New Haven Depot
New Haven, Indiana

PARSONS ENGINEERING SCIENCE, INC.

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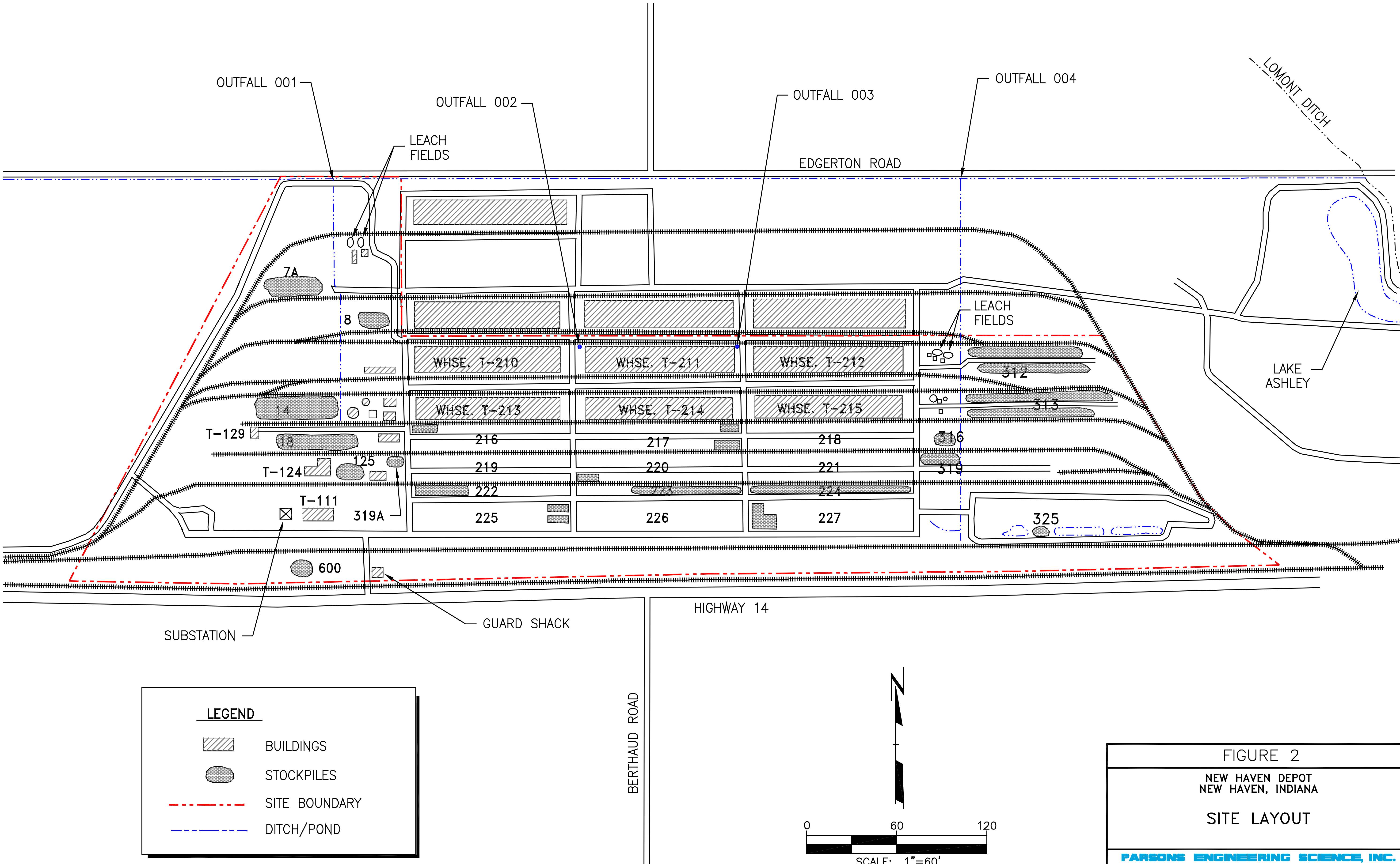

FIGURE 2

NEW HAVEN DEPOT
NEW HAVEN, INDIANA

SITE LAYOUT

PARSONS ENGINEERING SCIENCE, INC.
DESIGN * RESEARCH * PLANNING
1000 JORIE BLVD. * OAKBROOK, ILLINOIS 60523 * 630) 990-7200
OFFICES IN PRINCIPAL CITIES

DATE: 8/19/98 [NP]
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SECTION 3
PATHWAY AND ENVIRONMENTAL HAZARD ASSESSMENT

3.1 INTRODUCTION

Targets are physical or environmental receptors that are within a specified distance limit for the pathway. Based on professional judgment, a primary target is designated as one with a high likelihood of exposure to a hazardous substance and a secondary target as one with a relatively low likelihood of exposure to a hazardous substance.

3.2 GROUNDWATER PATHWAY

The groundwater pathway assessment accounts for hazardous substance migration to and within aquifers, and accounts for potential threats to targets such as drinking water supplies. The target population is the human population associated with the site and/or its targets. Target populations consist of those people who use target wells. The target distance limit for groundwater is a 4-mile radius around the site.

3.2.1 Geologic and Hydrogeologic Setting

The site is located in the Maumee Lake plain unit of the Central Lowland Physiographic Province. The Maumee Lake plain is flat and poorly drained, and was developed from lacustrine deposits from an archaic glacial lake situated east of present-day New Haven. According to the United States Department of Agriculture (USDA), Soil Conservation Service (SCS), surficial soils in the area of the site belong to the Hoytville-Napanee Association, which are described as “deep, somewhat poorly drained to very poorly drained, nearly level, medium-textured to finely-textured soils on uplands,” (Reference 8).

The site is underlain by wave scoured, lake bottom till. This till is part of the New Holland Member of the Largo Formation, and is comprised of lacustrine deposits described as massive, firm, pale brown to light gray clay loam and silty clay loam. Local lenses of sand and plastic clay may exist. To the west and immediate south of the site are thin sand and gravel deposits overlying the till that developed along the ancient lake margin. These thin deposits are generally not sources of water supply. According to a publication from the Indiana Department of Natural Resources, Geological Survey (Reference 9, Appendix E), three prior sand and gravel pits had been located where the site is situated (refer to Figure 17 in Appendix E.7). Possibly these were old operations which removed very localized and thin lake margin deposits, and may correspond to the three small ponds located on Open Area 325.

The unconsolidated deposits at the location of the site extend to approximately 70 feet bgs. Bedrock deposits of Devonian limestone and dolomite of the Traverse and Detroit rivers formations underlie the till.

Groundwater occurs predominantly in the till/bedrock formations or the upper bedrock units. Groundwater reportedly lies between 50 to 70 feet bgs, and flows in a northwesterly direction.

As described in Subsection 2.1, the primary on-site well installed in 1992 was reportedly drilled to a finished depth of 396 feet bgs. When installed, a water level of 29.5 feet was recorded, indicating the aquifer or aquifers intercepted by this well are under confining conditions. The file information did not provide details on the depths intercepted by this well.

An environmental database report obtain through Environmental Data Resources, Inc. (EDR) report did not list the on-site wells (Reference 10, Appendix E). A plot of water wells in Allen County made by the Indiana Geological Survey (IGS) (Reference 9, Appendix E) indicates a number of both bedrock and unconsolidated wells in the immediate vicinity of the site (refer to Figure 17 in Reference 9, Appendix E.7) According to the IGS, within the Maumee lake plain "... the shallowest aquifer, either a sand or gravel bed at the base of the drift or bedrock, is almost everywhere the used aquifer" (Reference 10, Appendix E).

3.2.2 Potential for Release to Groundwater

Mean annual precipitation in the Fort Wayne area is 34.75 inches (Reference 11). According to the IGS, the Maumee Lake plain is flat and poorly drained, much of Allen County is "underlain by soils too impermeable and/or too wet to accept septic influent properly." (Reference 10, Appendix E). Because of the low permeabilities of the till soils in the area of the site, significant vertical migration of heavy metals is not anticipated. Potential releases of organic solvents would have a greater propensity to migrate downward within the soil profile; however, there has been limited use and handling of such materials at this site. While there may be a small potential for impacts to occur in shallow, water-bearing zones within the upper portion of the till, these shallow zones are not utilized as a potable water resource (Reference 9, Appendix E).

Some sampling of the on-site wells has been conducted, as summarized in Subsection 2.4. This limited sampling does not indicate any impacts to the bedrock aquifer underlying the site.

The ore piles are considered potential groundwater contaminant sources due to their exposure to weather and, in the some cases, their direct contact with the surrounding soils. The potential source locations are depicted on Figure 2.2.

In addition to the ore piles, the use of the sanitary waste treatment plants on the site may represent a potential source of groundwater contamination if hazardous substances have historically been discharged into the sanitary sewer system on the site. Although no direct evidence for such discharge was found, the potential does exist that discharges of wastes such as spent solvents may have occurred.

3.2.3 Groundwater Use

Regional groundwater in the area is believed to flow to the northwest. Based upon surface topography, the shallow, unconsolidated aquifers in the till likely flow in this direction. The bedrock surface in the area of the site is reported to tilt slightly to the northwest (Reference 9, Appendix E).

The city of New Haven's water department reported that they purchase their water supply from the city of Fort Wayne (Reference 12). The city of Fort Wayne reported that they derive their water source solely from the St. Joseph River. No groundwater wells are utilized as a secondary water source (Reference 13).

Because of the rural setting of the site, the local farms and small businesses in the area are anticipated to utilize private groundwater wells for supplying potable water.

3.2.4 Groundwater Pathways and Targets

Based upon census data obtained for the area surrounding the site, there are 1,141 groundwater targets within a 4-mile radius of the site (Reference 14, Appendix E). The total population served by private wells within this 4-mile radius is 3,248.

3.3 SURFACE WATER

The surface water pathway accounts for hazardous substance migration to surface water bodies, drinking water supplies, the human food chain, and sensitive environments. The target population consists of those people who use surface water for drinking water or consume food chain species taken from target fisheries. The target distance limit for the surface water pathway is 15-miles downstream from the probable point-of-entry to surface water at the storm sewer outfalls.

3.3.1 Hydrologic Setting

The U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) conducted a stormwater management study in April 1996 which characterized surface water drainage patterns and sampled stormwater at outfalls to support the development of a stormwater pollution prevention plan (SWPPP). A SWPPP was subsequently developed by the USACHPPM in September 1996. The stormwater study identified four main stormwater outfalls, all located along the northern edge of the site. Sampling during the study yielded concentrations of COD, TSS, nitrate/nitrites, aluminum, iron and zinc which exceeded USEPA benchmark concentrations. The study concluded, however, that the presence of these contaminants was not the result of hazardous materials storage at the site, but rather the result of neighboring agricultural activities and sediment loading contributing to elevated concentrations of metals (Reference 5, Appendix E).

Surface water drainage on the site is directed by a series of open swales, ditches, and underground storm sewers. Most surface water is diverted to the north of the site via two north-south oriented drainage ditches located in the western and the eastern portions of the site (Figure 2.2). The westernmost ditch flows into an east-west oriented surface water ditch located along the south side of Edgerton Road. This point is designated as outfall 001 in the SWPPP. This ditch contained water; however, no discernible flow was observed at the time of the site visit. According to the current USGS topographic quadrangle, flow in this ditch is from west to east. The easternmost ditch was observed to extend northward off the site at a point east of warehouse T212. This point is designated as outfall 004 in the SWPPP. According to the original facility as-built plans (Appendix E), this ditch discharges to the Edgerton Road ditch, however this point of discharge was not observed during the site visit.

Stormwater sewers around the facility warehouses drain to the other two of the four outfalls identified in the SWPPP, which are sewer manholes located along the central portion of the north site boundary, adjacent to the industrial park. According to as-built plans, these discharged to open ditches extending through an area slated for future warehouses, up to the Edgerton Road ditch. It is presumed that subsequent development of this area, which is no longer part of the depot property, entailed the elimination of these ditches and the construction of additional storm water sewers connecting the depot storm sewers to the Edgerton Road ditch.

The as-built plans also show the Edgerton Road ditch discharging to the Lomont Ditch. The Lomont Ditch confluences with other ditches to the north of the site which appear to be constructed along natural and man-made routes, presumably by a local drainage commission. According to the USGS topographic quadrangle, these ditches confluence into Gar Creek, which discharges to the Maumee River approximately 3 and1/8 stream miles to the north of the site. The Maumee River flows from this point easterly into Ohio. The Village of Antwerp, Ohio, is located along the Maumee River approximately 9 miles east-northeast of the Gar Creek confluence; however, due to the meandering of the river, the number of stream miles between Gar Creek and the village exceeds 12 miles, thus placing Antwerp in excess of 15 miles downstream of the site.

The SWPPP cites that surface water discharges to Ashely Lake, a small recreational lake located to the northeast of the site on Township-owned property which had been part of the depot facility at one time. This lake was built after the depot was constructed, apparently resulting from borrow operations conducted in the area. According to the USGS topographic quadrangle, there is no surficial hydrological connection between this small lake and the Lomont Ditch. According to Mr. Brooks, under normal conditions there is no connection between the ditch and the lake; however, during flood conditions an overland connection may occur.

A series of three small pond areas exist near Flourspar pile 91 in Open Area 325. During the site visit, these areas contained standing water, and supported various submerged and emergent aquatic vegetation. Ms. Huddleston, the Assistant Depot Manager, indicated that these small ponds typically possess standing water throughout the year (Reference 4, Appendix E). As described in the following subsection, other wetlands areas have been identified on and near the site.

3.3.2 Potential for Release to Surface Water

There are four identified stormwater outfalls that discharge surface runoff from most of the New Haven Depot. All of these outfalls appear to lead directly or indirectly to the Lomont Ditch, which is a man-made drainage ditch that discharges to Gar Creek, which in turn discharges to the Maumee River (Reference 5, Appendix E). The Maumee River flows easterly into Ohio. The cities of New Haven and Fort Wayne derive their municipal water supply from the St. Joseph River (Subsection 3.2.3), upgradient from the Maumee River. In portions of the site, runoff appears to be directed to various wetland areas (see below).

Analytical results of stormwater runoff sampling indicated that elevated concentrations of COD, TSS, nitrate/nitrite, aluminum iron, and zinc were detected in the discharge of one or more of the outfalls at concentrations above USEPA benchmark levels**.**
The majority of the storage piles are not covered and thus are subject to weathering with the potential generation of leachate or runoff containing contaminants. Upon site inspection, however, no visible signs of impacts to the on-site stormwater drainage pathways were noted areas. Contaminants from most site sources would runoff into the Lomont Ditch and become diluted.

The U.S. Department of Interior, Fish and Wildlife Service wetland map indicates wetland areas immediately adjacent to, or in direct contact with drainage from the New Haven Depot, as shown on Figure 3.2 (Reference 15, Appendix E). A number of small wetland areas, including the three small ponds located in Open Area 325, are identified in the eastern portion of the site. All of these, with the exception of one small pond are classified as PUBFx, designating a palustrine or marsh system (P) with an unconsolidated bottom (UB), semi-permanently flooded (F), and formed by excavation (x). One of the three ponds in Open Area 325 is designated PEMCx, designating a palustrine, emergent vegetation (EM) seasonally flooded (C), excavated wetlands. To the east of the site, Ashley Lake and an immediately adjacent area are classified as PUBGx wetlands, designating a palustrine system with an unconsolidated bottom, intermittently exposed (G), excavated system. The Lomont Ditch and Gar Creek are classified as R2UBHx, designating a lower perennial riverine or stream habitat (R2), with an unconsolidated bottom, permanently flooded (H), and formed by excavation.

Three small scattered wetlands are also identified in the far western portion of the site, these also are designated either PUBFx or PEMCx. A larger wetlands is located in a wooded area to the west of the site. This is classified as PFO1A, designating a palustrine, wetlands which is forested with broad-leaved deciduous trees (FO1) and temporarily flooded (A). This wetlands does not appear to be hydraulically connected to the site.

The ore piles, are considered potential surface water contaminant sources, specifically those piles that are exposed directly to the soil and not contained with any berm structure.

3.3.3 Surface Water Use

The cities of New Haven and Fort Wayne derive their potable water supply from the St. Joseph River, which is upgradient of the site. There are no municipalities located along Lomont Ditch, Gar Creek or the Maumee River within 15 stream miles of the site. Individual residences and businesses in the general vicinity of the site are anticipated to derive their potable water through private groundwater wells.

The Maumee River is used for sport fishing. In addition, Lake Ashley is also used for sport fishing, however, there is normally not a hydraulic connection between surface drainage from the site and this water body.

3.3.4 Surface Water Pathways and Targets

Direct contact with the surface water through swimming and boating is one pathway exposure route. Fishing and consuming of fish is a second exposure pathway.

As previously noted, wetlands are in potential direct contact with surface runoff from the New Haven Depot. The Indiana Department of Natural Resources indicate that there are no endangered species on the New Haven Depot. Furthermore, no endangered, threatened, or rare species were reported to be located in the general vicinity of the New Haven Depot Reference 16, Appendix E).

3.4 SOIL EXPOSURE

The target distance limit for the soil exposure pathway is 200 feet for residential population and 1-mile for the nearby population. The target distance radius for soil pathway is provided on Figure 3.1. The pathway for soil exposure accounts for the potential threat to people on or near the site who may come into contact with exposed materials and areas of suspected contamination. This includes both ingestion and dermal exposure.

3.4.1 Potential for Release to Soil

Most ore piles are situated on gravel or bare ground, with no underlying impervious pad or base.

3.4.2 Soil Pathways and Targets

Potential receptors for soil and air exposure to contamination include any residences, schools, or daycare facilities located within 200 feet from the facility. The 13 depot employees are considered primary targets. There is one residence located within 200 feet of the boundaries of the site; the farmstead located on the south side of Highway 14, immediately south of the site. There is a public park immediately to the east of the site, onland once part of the depot. This park constitutes an institutional land use with access by the general public, including children, the elderly, and other sensitive subpopulations.

According to the Allen County Department of Planning and Zoning, the site is located in an industrial zoned area (I-3). Much of the land around the site is zoned for general agricultural usage (A-1), however, some areas just to the south of the site, along Webster Road in Sections 10 and 11, are zoned as Agricultural - Exclusive (AE). This designation allows intensive agricultural development of the areas, and allows the county to restrict sell-offs of the property for non-agricultural uses.

3.5 AIR RELEASE PATHWAY

The air pathway accounts for hazardous substance migration, in gaseous or particulate form, through the air. Airborne deposition is a potential threat to people and sensitive environments. Target populations under the air pathway consist of people who reside, work, or go to school within the target distance limit. The target distance limit for the air pathway is a 4-mile radius around the site and is divided into incremental distances.

3.5.1 Potential for Release to Air

The surficial soils in the area consist of medium- to fine-grained soils which would become readily airborne during dry and windy conditions. Therefore, contaminants carried in soils could potentially be transported.

3.5.2 Air Pathways and Targets

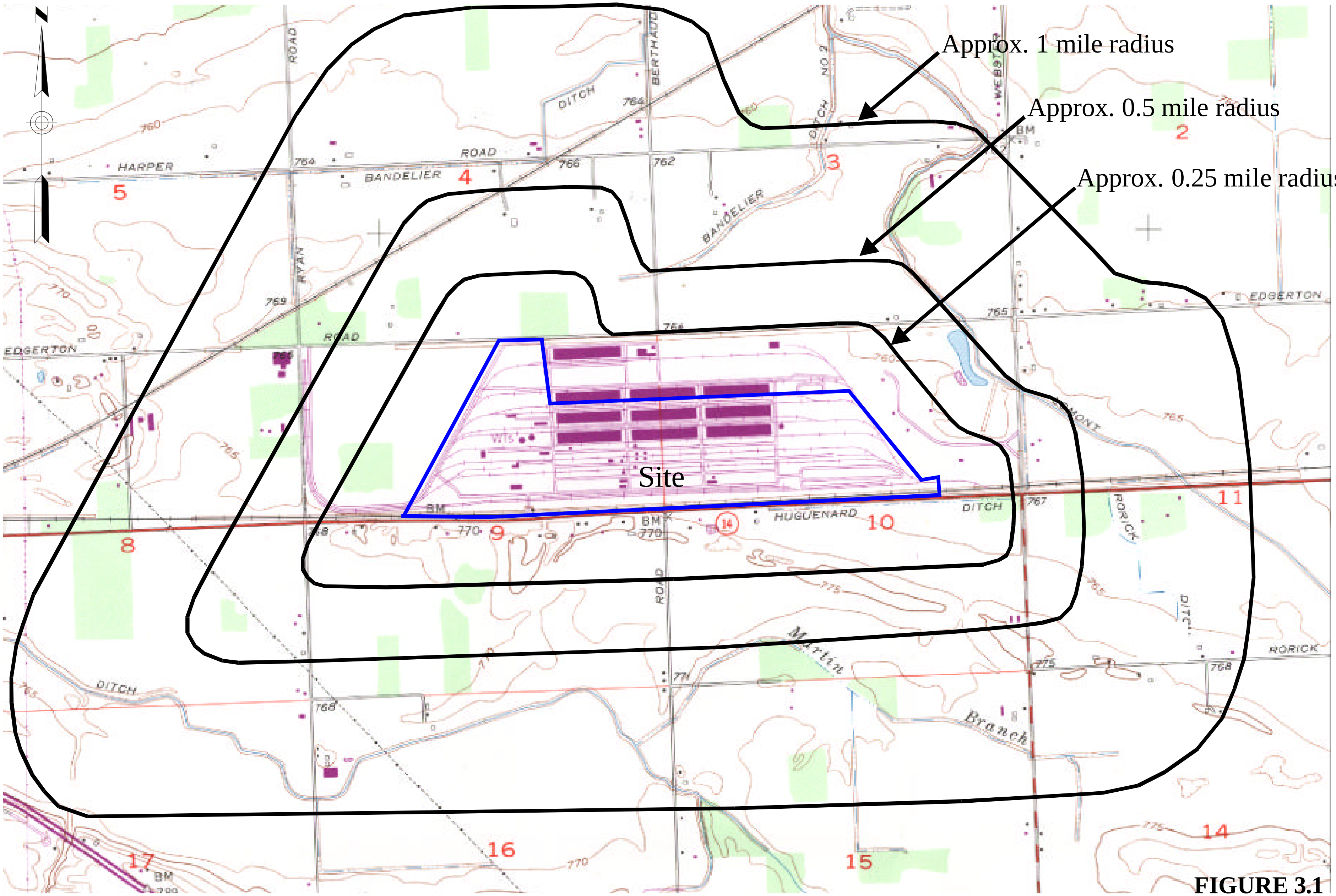
The facility personnel stated that dust is not generated during stockpile loading activities, and that no fugitive dust control measures are undertaken during these tasks. No reports of odors have been made or no health complaints have been reported. Further, there is no evidence of stressed vegetation around the New Haven Depot.

According to the PA guidance, when a release is suspected, all populations and sensitive environments out to and including 1/4-mile distance are evaluated and scored as primary targets. Because air releases are quickly diluted in the atmosphere, targets beyond 1/4-mile are evaluated as secondary targets. The population accounted for in the air radius from 0- to 1/4-mile is 102 people. There are no sensitive environments located within 1/4-mile of the facility.

The secondary target population accounted for in the air pathway for the New Haven Depot is as follows:

- From 1/4- to 1/2-mile — 70 people
- From 1/2- to 1-mile — 220 people
- From 1- to 2-miles — 789 people
- From 2- to 3-miles — 2,148 people
- From 3- to 4-miles — 7,943 people

The total population for the entire 4-mile radius is 11,272, including workers on site.



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SCALE IN FEET

FIGURE 3.1
RADIUS MAP
New Haven Depot
New Haven, Indiana

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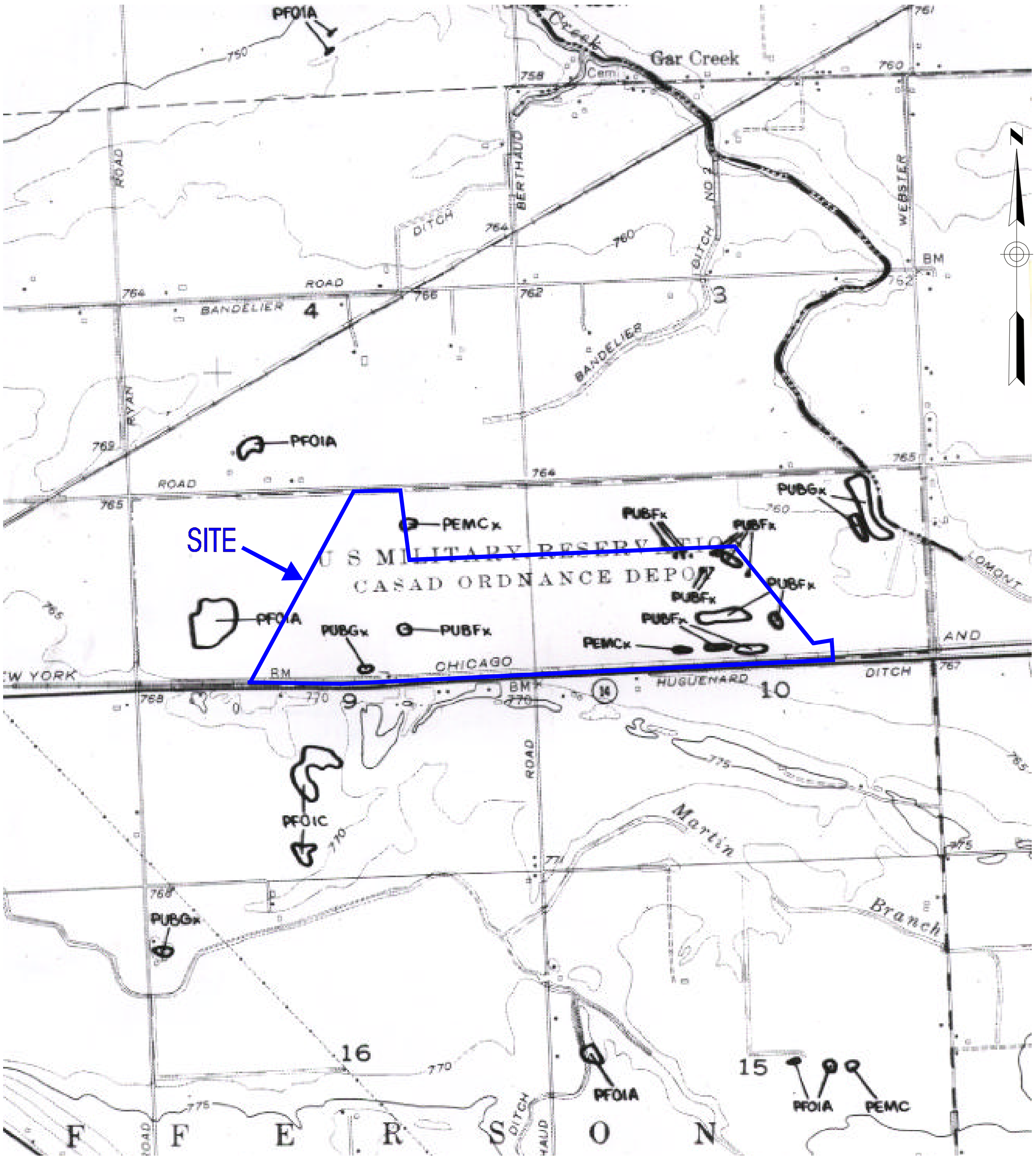

FIGURE 3.2

WETLANDS MAP

NEW HAVEN DEPOT
NEW HAVEN, INDIANA

PARSONS ENGINEERING SCIENCE, INC.

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SECTION 4
SUMMARY AND CONCLUSIONS

4.1 SUMMARY

The New Haven Depot stores strategic ores and minerals which may contain hazardous substances as defined in CERCLA Section 101(14) and found in 40 CFR Part 302.4. A release of hazardous substances could result from leachate deriving from the on-site ore piles. Therefore, a potential for release exists for the four pathways: groundwater, surface water, soil, and air. The overall score for the facility is high due to the large quantities of materials stored on site in conjunction with identified primary targets.

After assessing the contamination to each of the four pathways (groundwater, surface water, soil, and air) the site score was calculated. The site score shows the summary for the potential of a release at New Haven Depot was calculated to be 69.6. A summary of the site score calculation is provided in Table 4.1.

According to the USEPA CERCLA Guidance Document, a score of 28.5 or greater should receive a further action recommendation. The site inspection sampling recommended for the New Haven Depot is detailed in Appendix D.

Groundwater Pathway: Some of the exterior stockpiles are in direct contact with the soil, and there is evidence that materials have eroded. However, the underlying soils possess low permeability. While shallow water-bearing zones might be affected, impacts to deeper aquifers used for potable purposes are not considered likely.
The calculated groundwater pathway score was 40.6 It is hypothesized that minerals are not leaching from the piles at concentrations that exceed groundwater protection standards. This relatively low score is due to the lack of targets using groundwater around the New Haven Depot.

Table 4.1: Site Score Calculation

PATHWAY	SITE SCORE (S)
Groundwater (S_{sw})	40..6
Surface Water (S_{sw})	100
Soil Exposure (S_s)	84
Air (S_a)	25.4
Site Score: $\sqrt{(S_{gw}^2+S_{sw}^2+S_s^2+S_s^2)}$ /4	69.6

Surface Water Pathway: There are four stormwater outfall points at the facility that discharge indirectly into the Maumee River. Contamination of surface water was detected in stormwater runoff samples collected from the site in 1996. No drinking water intake structures are located within 15 stream miles downstream of the New Haven

Depot. Surface water is used for drinking water in the area; however, the water is withdrawn from a tributary river upgradient of the point-of-discharge into the Maumee River. The Maumee River is considered a sport fishery. Additionally, there are sensitive environments (wetlands) that are potentially from the New Haven Depot runoff.

The majority of the storage piles are not covered and thus are subject to weathering and the potential generation of leachate containing contaminants. Upon site inspection, visible signs of erosion of piles were evident for some areas. The surface water pathway received a score of 100 as a result of the sensitive environments on and near the site.

Soil Pathway: Potential receptors for soil and air contamination include any residences, schools, or daycare facilities located within 200 feet from the facility. Site workers and the farmstead south of the site represent the only target populations present within 200 feet of the New Haven Depot that would potentially be affected by contact with soil. The soil pathway received a high score of 84 as a result of the evidence of erosion of some of the piles, in conjunction with the proximity of the public park, homestead, and site workers. The soil pathway is potentially contaminated because there is a large quantity of hazardous substances in the stockpile, and there is evidence of stockpile erosion deposits on the soils. It is recommended that site soils and sediments be sampled (Append ix D).

Air Pathway: Airborne deposition is suspected to occur primarily when the materials are being loaded or unloaded. There are 102 primary targets for the air pathway. There are 11,170 secondary targets around the New Haven Depot. The air pathway received a moderate score of 25.4 as a result of the proximity of one residence and a public park to the site, and the presence of 13 workers at the facility.

SECTION 5
REFERENCES

A list of the references used in the preparation of this PA is presented below. Selected copies/excerpts of the references used are contained in Appendix E of this report.

Reference 1 - *Guidance for Performing Preliminary Assessments Under CERCLA.* Comprehensive Environmental Response, Compensation, and Liability Act, United States Environmental Protection Agency, Publication 9345.0-01A, September 1991.

Reference 2 - *Stockpile Inventory, DLA-DNSC-MONH New Haven Depot, New Haven, IN,* Spreadsheet of depot stockpile inventory printed 2 May 1998, provided by Lois Huddleston on 18 May, 1998. *Hazardous Chemical Inventory List,* Spreadsheet of depot chemical inventory survey conducted 27 January 1998, provided by Fred Brooks on 18 May, 1998.

Reference 3 - *Description of Facility*, undated, unreferenced document contained in DLA/DNSC Environmental Office, Ft. Belvoir, VA.

Reference 4 - Interviews with Mr. Fred Brooks and Ms. Lois Huddleston on 19 May 1998, 1330 hours. Reference 5 - *Wastewater Management Study No. 32-EE-4636-96, Stormwater Characterization, New Haven Defense National Stockpile Center, New haven, Indiana, 20-24 April 1996,* U.S. Army Center for Health Promotion and Preventative Medicine, April 1996

Reference 6 - *A Study of the Characteristic Leaching Potential of Defense National Stockpile Ores, Minerals, and* Alloys, Circa 1992, Defense Logistics Agency, Kevin Riley

Reference 7 - *Historic Lead Storage Areas*, Spreadsheet of historic exterior lead ingot locations provided by Lois Huddleston on 18 May, 1998.

Reference 8 - *Soil Survey of Allen County,* Indiana, United Stated Department of Agriculture Soil Conservation Service, July 1972.

Reference 9 - *EDR Radius Map with GeocheckTM, New Haven Depot,15411 Dawkins Road, New Haven, IN 46774, Inquiry Number 250863.4s,* Environmental Data Resources, Inc., May 1, 1998.

Reference 10 - *Environmental Geology of Allen County,* Special Report 13, State of Indiana, Department of Natural Resources, Geological Survey, 1978

Reference 11 - Telephone Conversation, Midwestern Climate Center, National Weather Service, 24 August, 1998.

Reference 12 - Telephone conversation with City Clerk, City of New Haven, Indiana on 17 August, 1998.

Reference 13 - Telephone conversation with Vicki, City of Fort Wayne Filtration Plant, Analytical Laboratory, on 18 August 1998.

Reference 14 - *CENTRACTS Report, New Haven, Indiana Site.* Correspondence detailing census information on population, households and private water wells from Frost Associates to Parsons Engineering Science, Inc., 10 August 1998.

Reference 15 - *National Wetlands Inventory, Maples, IND.*, United States Department of the Interior, Fish and Wildlife Service, 1987.

Reference 16 - Correspondence from the Indiana Department of Natural Resources Dated July 30, 1998.

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APPENDIX D
RECOMMENDED SITE INVESTIGATION STRATEGY

D.1 BACKGROUND

The results of the preliminary assessment (PA) performed for the New Haven Depot indicate that some of the natural resources stored on the site offer the potential for hazardous substances to be released to the environment with subsequent exposure to these substances by human and ecological receptors. The basis for these hypotheses is documented elsewhere in this report. The site received a high score on the PA scoresheet primarily because there are potential surface water target receptors that could be exposed to hazardous substances stored in locations that are exposed to the elements.

To assess whether a hazardous substance release has occurred, a site investigation (SI) is recommended for this site. The purpose of the SI is to determine whether hazardous substances have been released to the environment and the likelihood they have or may impact specific targets. The strategy outlined below is based on USEPA guidance for performing SIs under CERCLA (USEPA, 1992: Directive 9345.1-05). The target receptors could be impacted by the stockpiled natural resources (containing hazardous substances) only if there is a release and a transport mechanism by which the hazardous substances could migrate to the receptors. There are no impacts if the hazardous substances are not released and do not migrate. The purpose of this SI is to collect and analyze a limited number of samples to determine whether there has been a release and whether migration is indicated which may expose the target receptors to the hazardous substances.

D.2 CHOICE OF SI APPROACH

There are three basic approaches to performing an SI (USEPA, 1992: Directive 9345.1-05), namely:

- ***Focused SI* -** Tests PA hypotheses requiring further investigation and may be used to screen sites to determine the need for further action;
- ***Expanded SI*** - Gathers all information necessary to fulfill the Hazard Ranking System (HRS) requirements for sites with a high probability of qualifying for the NPL; and
- ***Single SI* -** Combines the functions of the focused and expanded SIs and may be chosen under certain conditions.

Of these three options, use of the focused SI sampling scheme at this site will allow investigators to test critical PA hypotheses without the potential to expend time and resources unnecessarily. If critical PA hypotheses are determined to be incorrect, a "no further action" conclusion may be considered. On the other hand, if the PA hypotheses are verified, investigators may conclude that additional sampling is warranted to fill any data gaps to allow HRS scoring.

D.3 RECOMMENDED SAMPLING LOCATIONS AND ANALYTICAL PARAMETERS

As noted above, the focused SI attempts to verify PA hypotheses regarding hazardous substances that may have been released to the environment, the potential migration pathways these constituents may have taken, and whether these constituents have reached receptors. The following discussion outlines the rationale for the sample location and analytes deemed necessary to test the critical PA hypotheses at the New Haven Depot.

D.3.1 PATHWAYS TO EVALUATE WITH SAMPLES

Based on the results of the scoring and in conjunction with known environmental conditions and previous studies, the anticipated primary pathway by which hazardous substances may migrate involve source, to soil, to surface water transfer. Some transfer from source to air, or from source to soil to air, may occur on a limited basis, primarily during stockpile movement operations. Transfer from source to soil to groundwater is not expected to be a primary consideration at the New Haven Depot.

The primary source materials at the site are the large stockpiles of natural resource ores and minerals. Historical file information indicates the prior use of recalcitrant pesticides such as DDT which could have resulted in soil contamination at areas of use. Finally, the historical use of a solvent degreaser is indicated in depot file materials. Though apparently limited, there is a potential for the mishandling of such solvents (i.e., disposal in the sanitary sewers) to impact soils or other media.

Most of the material stockpiles piles are exposed to weathering. It is hypothesized that the primary means for the spread of contamination from these stockpiles would be via erosion and deposition to adjacent surface soils. Once eroded, the contaminants could be carried by stormwater and discharged to on-site wetlands or to on-site drainage ditches which eventually flow off-site. Transport of eroded sediments will be characterized by cyclical suspension in the water column sediments during high-flow periods (i.e., precipitation events) and re-deposition in sediments during low flow periods. Thus, mobility is influenced by particle size, stream velocity, and possibly by chemical influences. The movement of soils impacted by recalcitrant pesticides would be anticipated to show similar migration patterns.

Results from sampling stormwater discharged at some of the outfall points indicate that contamination is present at levels above the EPA Benchmark concentrations in the stormwater, although this study concluded that these exceedances did not appear to be the result of stockpiling operations. Those samples that had contaminants above the EPA Benchmark values also had the highest suspended solids. Leachability studies concluded that leaching and subsequent migration of dissolved contaminants is generally quite limited This supports the hypothesis that contaminants from stockpiled materials move within surface water primarily as suspended particulates, and that movement as dissolved, liquid-phase contamination plays a much less significant role

Considering the low leaching propensity of most of the stockpiled materials, the low permeabilities of the till soils at the site, as well as the relatively high cation exchange capacities anticipated for these soils, vertical migration of both heavy metals and low solubility recalcitrant pesticides is anticipated to be very restricted. Vertical migration of organic solvents could be considerably greater, however, the use of solvents at the site is anticipated to be much more restricted in quantity and location. Therefore, it is hypothesized that the groundwater beneath the New Haven site is not likely contaminated due to DLA operations.

The air pathway is hypothesized to be a potentially significant pathway primarily during pile movement operations that can be addressed via best management practices.

The following sections describe the rationale and sampling strategy for each pathway. Table D-1 provides a summary of the proposed sampling.

TABLE D-1 SAMPLE RATIONAL

Sample Identification	Sample Location	Rational
Sediment/Surface water		
NH-01-SS	West drainage ditch upgradient of stormwater outfall 001. Near Baddelayite pile (Open Area 7A).	Sediment and surface water samples of the site runoff via ditch.
NH-02-SS	West drainage ditch upgradient of NH-01-SS. Near Lead storage area (Open Area 14).	Sediment sample of site runoff via ditch.
NH-03-SS	Storm sewer - outfall 002.	Sediment and surface water sample of site runoff via storm sewer.
NH-04-SS	Storm sewer - outfall 003.	Sediment and surface water sample of site runoff via storm sewer.
NH-05-SS	East drainage ditch upgradient of stormwater outfall 004. Near Ferromanganese piles.	Sediment and surface water samples of the site runoff via ditch.
NH-06-SS	East drainage ditch upgradient of NH-05-SS. Near Ferromanganese storage areas (Open Areas 316 and 319).	Sediment and surface water samples of the site runoff via ditch.
NH-07-SS	Wetlands west of Flourspar pile (Open Area 07)	Sediment and surface water sample to assess potential impact to sensitive environment.
NH-08-SS	Wetlands east of Flourspar pile (Open Area 07)	Sediment and surface water sample to assess potential impact to sensitive environment.
Surface Soil		
NH-SB001	Located on downgradient side of Flourspar piles, Open Area 8.	Assess potential impacts to surface soils from Flourspar storage.
NH-SB002	Located on downgradient side of Lead ingot storage in Open Area 18.	Assess potential impacts to surface soils from Lead storage.

Sample Identification	Sample Location	Rational
Sediment/Surface water		
NH-SB003	Located on downgradient side of Lead and Antimony ingot storage in Open Area 216.	Assess potential impacts to surface soils from Lead and Antimony storage.
NH-SB004	Located on downgradient side of Zinc ingot storage in Open Area 217.	Assess potential impacts to surface soils from Zinc storage
NH-SB--5	Located on downdgradient side of Lead ingot storage in Open Area 225.	Assess potential impacts to surface soils from Lead storage
NH-SB006	Located adjacent Ferrochrome and Flourspar piles in Open Area 223.	Assess potential impacts to surface soils from Ferrochrome and Flourspar storage.
NH-SB007	Located adjacent to Ferrochrome and Flourspar piles in Open Area 224.	Assess potential impacts to surface soils from Ferrochrome and Flourspar storage.
NH-SB008	Located adjacent to Kyanite pile in Open Area 224.	Assess potential impacts to surface soils from Kyanite storage.
NH-SB009	Located adjacent to Flourspar pile in Open Area 325.	Assess potential impacts to surface spoils from Flourspar storage near sensitive environment.
NH-SB010	Located adjacent to Ferrochrome piles in Open Area 313.	Assess potential impacts to surface soils from Ferrochrome storage.
NH-SB011	Located adjacent to Ferromanganese piles in Open Area 312.	Assess potential impacts to surface soils from Ferromanganese storage.
NH-SB012	Located along eastern boundary of site.	Assess potential impacts to surface soils from atmospheric deposition near public park land.
NH-BK01	Located along western boundary of site.	Establish background soil concentrations.
NH-BK02	Located along western boundary of site.	Establish background soil concentrations.

D.3.1.1Soil Pathway

As indicated, impacts to soils by eroded stockpile materials and recalcitrant pesticides are anticipated to be restricted to the upper soil profile. Therefore, discrete soil samples will be collected at 12 locations at depths of 0.0 to 0.5 feet, and 1.5 to 2 feet below ground surface (bgs) using a hand auger or Geoprobe®. The location of the soil samples is identified on Figure D-1. The rationale for there location is summarized in Table D-1 above.

Prior leaching studies have shown that Flourspar has a greater potential propensity to leach heavy metal contaminants including Lead and Mercury than the other ore materials stockpiled at the DNSC depots. Another study suggest significant leaching may occur from stockpiled Lead ingots. Both Lead and Mercury possess significant inherent toxicities. Therefore, the sampling approach outlined in Table D-1 has paid particular attention to areas where these materials have been or are being stockpiled, and their location relative to surface water receptors such as drainage ditches and wetlands (refer to Subsection D.3.1.2). Other samples have been selected to assess potential impacts to soils from storing other stockpiled materials.

One soil sample (NH-012) has been selected to assess potential atmospheric deposition of contaminants along the eastern boundary of the site, which is the downgradient position relative to the predominant east to west wind direction (Reference 11) in the area. It is also adjacent to the public park and east of the site.

The primary inorganic analytes of interest include the following hazardous substances:

- Antimony
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

The samples will be analyzed for the Target Analyte List (TAL) heavy metals which include the heavy metal elements listed above in addition to Arsenic, Beryllium, Cadmium, Selenium, Silver, and Thallium. This general analytical sweep was selected because some of the other elements are found at trace levels within some of the stockpiled ores and minerals. To assess potential impacts from the historic use of pesticides at the facility, samples will also be analyzed for chlorinated pesticides . The sampling approach assumes that historic pesticide use was widespread throughout the facility, and not restricted to a specific location(s).

Two soil samples, NH-BK001 and NH-BK002, have been identified as locations to assess background concentrations of heavy metals and chlorinated pesticides (given the rural nature of the site, ubiquitous low-level contamination by various pesticides is a possibility).

Organic solvent materials have also been identified as potential contaminants of concern, due to the historical use of a vapor degreaser on the site. Details on the volume of solvents used in association with this historic degreasing operation are not known. Therefore, a field screening technique will be used to assess potential impacts to surface soils by solvent spillage or discharge. Specifically, a photoionization detector (PID) will be utilized to screen soil samples for the presence of organic vapors potentially indicate of the presence of solvents. Samples which show elevated readings (10 units or greater above background) will be submitted for analyses of Target Compound List (TCL) volatile organic compounds (VOCs). Soils samples will be screened from locations at each of the leachfields associated with the wastewater treatment plants.

D.3.1.2Surface Water Pathway

The sampling strategy is developed using on-site samples to determine if there are releases to surface waters from site activities. Because impacts to the sediment phase of on-site surface water bodies are anticipated to be greater than within the water column itself, the sampling approach emphasizes the characterization of sediments. Sediment samples will be collected from drainage ditches, storm sewers, and wetlands to assess contaminant concentrations in this medium. Sediment samples will be collected from areas such as pools where the rate of flow slows down and suspended solids would precipitate. Eight sediment samples shown on Figure D-1 will be collected at a depth within the first 6 inches. Water samples will also be collected at seven of the eight locations. These locations were selected based upon their proximity and relation to potential source areas. All sediment samples will be analyzed for TAL metals, chlorinated pesticides, and PCBs. This last parameter was selected to assess impacts from the historic usage of PCB-containing transformers at the facility. Because these transformers were apparently located throughout the facility, and no specific information on potential releases from these units are available, sediment sampling has been selected as a means of assessing potential impacts. If a given sediment sample exhibits impacts by PCBs, assessment of upland soils in the watershed draining to that point may need to be assessed.

One of the sediment/surface water samples, NH-01-SS, will also be sampled for radionuclide concentrations due to its proximity to the Baddelayite pile.

In addition, one background sediment sample (NH-BK03) will be collected off-site along Edgerton Road upgradient of the site for TAL metals and chlorinated pesticides.

D.3.1.3Groundwater Pathway

The groundwater pathway received a relatively low PA score due to anticipated low potential for vertical migration of contaminants within the subsurface, and lack of any documented impacts to on-site potable wells by contaminants contained within the stockpiled materials. No groundwater samples are planned at this time. However, if concentrations of hazardous substances in soil samples collected at depth are elevated, then future groundwater sampling may be warranted.

D.3.1.4Air Pathway

The air pathway is not considered to be a primary pathway of contaminant migration. The piles that have the highest potential for wind abrasion are the unmilled natural resources that are comprised of minerals mixed with soils. In fact, much of the material that is transported by wind is the soil. Many of the unmilled piles are protected from wind and water erosion by plants that have grown on the piles. These piles are most susceptible to wind abrasion when they are being excavated or deposited. Dust suppression measures can be implemented during operations as a best management practice to reduce the impacts from wind abrasion. Therefore, atmospheric samples are not proposed during the focused SI.

D.3.2 TARGETS TO EVALUATE WITH SAMPLES

Surface water appears to be the primary target of concern at the site. Transport of contaminated sediments and/or surface water could impact sensitive environments and an active sport fishery. Potential exposure of on-site workers from impacted soils is another target of potential concern.

D.3.3 SAMPLES TO VERIFY A RELEASE

The sediment samples specified in Section D.3.1.2 are intended to verify whether surface water is a pathway of contaminant release to the environment from the sources at the New Haven Depot.

The soil samples specified in Section D.3. 1.1 are intended to determine if there has been a release of contaminants from the natural resource stockpiles.

D.3.4 BACKGROUND AND QA/QC SAMPLES

Two soil samples (NH-BK01 and NH-BK02),and one sediment sample (NH-BK03) will be collected from background locations, and will be analyzed for TAL metals, chlorinated pesticides and organophosphate pesticides. Soil samples will be taken from two locations along the west fence line (property boundary) because of the prevailing wind direction, and locations hydraulically removed from stockpile areas. The sediment sample will be collected from the Edgerton Road ditch, upgradient of the four outfall points. The locations of these samples are identified on Figure D-1. The samples will be collected at depths from zero to six inches. At the soil sample locations, an additional sample will be collected from one and one half to two feet. These samples will be used for comparison to site soils and sediment samples. If the samples show evidence of a potential contamination , then off site background location may be required

During the focused SI, QA/QC samples will be collected to ensure that sample results have not been influenced by contamination introduced during field activities. QA/QC sampling for the soil/sediment investigation will consist of one rinseate sample. The QA/QC sample will be analyzed for the same constituents as are the investigative samples.

D.3.5 EXISTING ANALYTICAL DATA

The prior stormwater monitoring discussed in Subsection 3.2.1 demonstrate that stormwater discharge from the site may be impacted as a result of stockpiling activities at the site. Therefore, it was determined that surface water sampling would be necessary. Appendix E provides the study results.

The results from the EP Toxicity and TCLP studies performed at other DLA facilities in 1992, and 1996 indicate that potential impacts to site soils, and subsequently to downgradient sediments and surface water may occur. Appendix E also provides the detailed results of the studies.

EP TOXICITY AND TCLP TEST ANALYSIS

Introduction

The Defense National Stockpile Center (DNSC) has various sites around the nation where large amounts of minerals, alloys and ores are stored in open air conditions. The weathering of these minerals (causing dissociation into their constituent elemental metals) and potential transport through the surrounding soil and groundwater is of question. It was therefore deemed necessary to examine the potential for the various minerals to leach and the levels of heavy metals that might then be transported. To achieve this end, the conservative EP Toxicity and TCLP studies were performed.

EP Toxicity Study

The DNSC initiated a study to determine the actual characteristic leaching potential of the ores, minerals, and alloys maintained in their stockpiles. Environmental Protection Agency (EPA) standard, reproducible leaching tests were performed on samples of all DNSC ores, minerals, and alloys in a “worst case scenario” situation. Test materials were crushed to extremely small particles to expose as much surface area as possible to the acid leaching procedure.

Three characteristic leaching tests were performed on each of the seventeen stockpile materials. Field size samples were also subjected to the same EPA extraction procedure for comparison to the “worst case scenario” test results.

The characteristic leaching test results clearly show that, with the exception of fluorspar, the stockpile ores, minerals, and alloys leach but not to a degree to present an environmental hazard. All of the results fell within prescribed EPA levels for the heavy metals of concern even under the “worst case scenario” situation using crushed samples under acidic conditions. Analytical results clearly indicated that the outdoor, generally unprotected storage of DNSC ores, minerals, and alloys leach limited quantities of the heavy metals of environmental concern and should have minimal negative affect on the local environment.

Resource procurement specifications for the stockpile material were reviewed to determine the chemical composition of each material. From these procurement specifications, seventeen specific potential environmental contaminants (heavy metals) were noted and are listed below.

Antimony	Magnesium
Arsenic	Manganese
Barium	Mercury
Beryllium	Nickel
Cadmium	Selenium
Chromium	Silver
Copper	Vanadium
Iron	Zinc
Lead	

Materials were tested using the EP Toxicity Test as outlined in the Federal Register, Volume 45, No. 98, May 19, 1980. The EP Toxicity Test is a standard test required by the EPA to determine whether or not a material (waste) can be safely placed in a landfill. Sample material was crushed to a size no greater than 9.5 millimeters (mm.) in order to increase the surface area of the test material, in turn increasing the materials ability to leach. This approach created a "worst case" situation since stockpiled materials are much larger in size (average size 2 to 6 inches). In order to more closely simulate the extracting potential of acid rain, a solution with a pH of 4 standard units was used in addition to the method required solution of 5 pH standard units.

Representative samples of seventeen ores and minerals were collected and submitted to several laboratories that specialize in the chemical evaluation of ores and minerals and were capable of crushing the material to the mesh size required. Approximately four pounds of each material were crushed to meet the requirements of the EP Toxicity Test procedure and submitted to Gannett-Fleming Environmental Engineers Inc., a Pennsylvania Department of Environmental Resources certified laboratory. The seventeen ores and minerals are listed below.

Aluminum oxide	Ferrochrome (Low Carbon)
Celestite	Chromite (Refractory Grade)
Manganese Dioxide (Battery Grade)	Fluorspar (Chemical Grade)
Silicon Carbide	Feromanganese (High Carbon)
Bauxite (Metallurgical)	Fluorspar (Metallurgical)
Fluorspar (Acid Grade)	Chromite (Metallurgical)
Ferrochrome (High Carbon)	Manganese Ore (Metallurgical)
Kyanite	Beryl Ore
Ferromanganese (Low Carbon)	

During the testing period from May 1989 to September 1992, the EPA finalized their new Toxicity Characteristic Leaching Procedure (TCLP) to replace the EP toxicity test Procedure. The new TCLP procedure is used for the same purpose but involves a much more aggressive analytical procedure. The TCLP uses various extraction reagents at lower pH than the EP Toxicity Test and according to the EPA provides an additional margin of safety to the environment. After the new procedure was finalized, DNSC requested that Gannett-Fleming, in addition to the other tests being performed, also perform the new TCLP test.

The information presented above was taken from the report "A Study of the Characteristic Leaching Potential of Defense National Stockpile Ores, Mineral, and Alloys" prepared by F. Kevin Reilly of the DLA/DNSC. This report is included in Appendix XX of this document and includes a description of materials, location of materials, summary of results, laboratory analytical reports, gradation curves, material inspection and quality control, and photographs. A brief summary of findings is presented below.

The leaching potential of materials tested using pH 5, pH 4, and TCLP tests indicated that all of the results, with the exception of fluorspar, fell within the established EP Toxicity and/or TCLP limits for the heavy metals evaluated. The fluorspar (acid grade) did leach significant amounts of lead, 15.3 mg/L, 10.2 mg/L, and 13.8 mg/L for pH 4, pH 5, and

TCLP, respectively. Table XX presents a summary of the highest concentration for each constituent in both EP Tox tests and the TCLP test.

All of the other materials showed little if any leaching. The most pronounced leachable constituent that was analyzed for was manganese. Manganese, which is highly soluble, was generally several factors higher than the other analyzed materials. Since ferro manganese (high carbon) and ferro chrome (high carbon) leached considerable amounts of manganese and slightly elevated levels of chromium, DNSC used these materials in another test to determine the relationship between the laboratory scale test and a "field size test".

Standard EP Toxicity and TCLP methods require that samples be crushed to a size no greater than 9.5 mm or about three eights of an inch. One hundred grams of this crushed material is subjected to the acid extraction procedure for leachate analysis. DNSC performed a modified EP Toxicity test on a large size sample to typify the actual size of the material maintained within the stockpile. The sample was not crushed but was mixed with sixteen times its weight in water in a 150-gallon tank. The pH was maintained at a pH 5 and pH 4 as in the other tests, and stirred with a large mixer for 24 hours. Compressed air was also fed into the tank during the mixing process. Results of the modified test were drastically reduced as would be expected using the surface area/weight relationship. The exposed surface area to weight relationship of a 100 grams of crushed material no larger than 3/8ths of an inch is significantly greater, in the order of 10 to 1000 times, than the surface area of a 2 to 6 inch, 32 pound cube of the same material. Similar results were noted in the ferro chromium test but were not as dramatic as those of the ferro manganese. A comparison of the standard and modified methods is presented below.

Ferro Manganese (high carbon)

Standard Method using 100 grams of crushed ferro manganese and leachate analyzed for manganese:

pH 4 - 5,250 mg/L

pH 5 - 2,200 mg/L

modified method using a 32 pound sample of ferro manganese approximately 5 inches cubed and leachate analyzed for manganese:

pH 4 - 1.37 mg/L

pH 5 - 0.38 mg/L

The following mathematical equation shows the reduced leachability of the field size sample as compared to the standard crushed size sample:

$$\text{3/8" Sphere – surface area} = 4(\pi)r^2 = 4(\pi)(0.1875)^2 = 0.04418\ \text{in}^2$$

$$\text{volume} = 4/3(\pi)r^3 = 4/3(\pi)(0.1875)^3 = 0.0276\ \text{in}^3$$

$$\text{5" Cube – surface area} = 6(w)(h) = 150\ \text{in}^2$$

$$\text{volume} = (w)(h)(d) = 125\ \text{in}^3$$

$$\text{calculating density} = 32\ \text{lbs}/125\ \text{in}^3 = 0.256\ \text{lbs/ in}^3$$

$$0.256\ \text{lbs/ in}^3 \times 453.59\ \text{gms/1 lbs} = 116\ \text{gms/ in}^3$$

$$\text{weight of 1 –3/8" sphere} = 0.0276\ \text{in}^3 \times 116\ \text{gms/ in}^3 = 3.2\ \text{grams}$$

$$\text{100 gram sample contains 100/3.2 grams} = 31.25\ \text{spheres}$$

100 gram sample contains 31.25 spheres x 0.4418 in^2 /sphere = 13.8 in^2

consequently, in the EP Tox procedure – 100 grams of 3/8 spheres offers

13.8 in^2 /100 grams = 0.138 in^2 /gram for acid digestion

testing on the 5" cube would offer 150 in^2 /32 lbs x 11 lbs/453.59 gms^2

equals 0.0101 in^2 /gram for acid digestion.

If a linear relationship is assumed between the surface area and per unit weight of the material and EP Tox results, the following ratio can be set up to calculate the theoretical EP Tox result for a field size sample - the 5 inch cube test.

0.0101/0.138 = X/5250 mg/L	0.0101/0.138 = X/2200 mg/L
X = 384.24 mg/L	x = 161.01 mg/L

The scenario is based on the premise that all the pieces of the crushed sample are symmetrical 3/8 inch spheres, which as noted in the actual procedure, is not true. The EP Tox procedure specifically states that "the solid material has a surface area per gram equal to or greater than 3.1 cm squared or passes through a 9.5 mm or 0.375 inch standard sieve. This statement depicts many particles 3/8 inch in size and smaller passing through the sieve and available for acid digestion. This is a major reason this model does not equate to the results received. It would appear that a complete sizing of all the particle present in the actual EP Tox test would be necessary for this model to balance out correctly.

To further define and evaluate the standard EP Toxicity and TCLP results with the field size sample results, three additional representative field size samples were collected. Samples of ferro manganese in sizes of approximately one inch, two inch, and three inch cubes were submitted to Gannett-Fleming for analysis along with crushed samples for a determination of the particle size distribution of a standard sample as used normally in the EP Tox and TCLP method. Results of these test are explained in further detail in Appendix 6 of the report "A Study of the Characteristic Leaching Potential of Defense National Stockpile Ores, Minerals, and Alloys" included as Appendix XX of this document.

Fluorspar TCLP Study

Based on the EP toxicity study described above, a second study was performed to assess the specific leachability of Fluorspar materials. This TCLP study was performed for the DLA at the University of Colorado (Boulder, Colorado) in 1996 to investigate the potential for metals to leach from the Fluorspar stockpiles and contribute to groundwater contamination. Mineral samples were collected from several stockpiles for the laboratory study. The samples were analyzed for:

- Total metal concentration,
- TCLP (weak acid),
- Wet-dry leaching via distilled water,
- Wet leaching via distilled water, and
- Mineralogical characterization by electron microprobe.

The total Flourspar concentration was examined to assess the absolute quantity of metals available for dissolution over time. The TCLP tests were performed pursuant to EPA approved method 1311 to assess the potential for environmental impact due to infiltration of a weak acid (potentially reflecting acid deposition conditions). The wet-dry cycling leach tests were performed to investigate the effects of episodic precipitation events upon the stockpiles. Wet leaching tests were designed to approximate the leaching potential under wetland type conditions where there is constant contact of mineral with standing water (absence of flow). Results from the TCLP and wet-dry leaching tests are the most appropriate for the conditions at the Point Pleasant Depot. Twenty-nine samples were analyzed for the following constituents:

- Arsenic,
- Mercury,
- Selenium,
- Lead,
- Cadmium,
- Chromium,
- Silver, and
- Barium.

With respect to the TCLP results, lead and mercury were the only constituents that were detected at concentrations that exceeded the TCLP limit. Twelve of the twenty-nine samples had lead concentrations that exceeded the TCLP limit of 5 mg/L. It was found that the leachability of lead is higher when it is in the mineral form of cerrusite (PbCO3), whereas galena (PbS) is less soluble. The TCLP limit for mercury of 0.2 mg/L was exceeded in six of twenty-nine samples. The wet-dry leach test study results indicate that leaching of the natural resource stockpiles is not expected under normal precipitation conditions. The highest barium concentration was 1.1mg/L compared to a TCLP limit of 100 mg/L. The highest cadmium concentration was 0.06 mg/L, whereas the TCLP limit is 1 mg/L Chromium was analyzed at a maximum concentration of 0.04 mg/L and the TCLP limit is 5 mg/L. The highest lead result was 0.5 mg/L in comparison to the TCLP standard of 5 mg/L. The analysis was performed by both the graphite furnace atomic adsorption spectrometry as well as inductively coupled plasma/optical emission spectrometry techniques, and the results were comparable. The results of the wet-dry study predict that the natural resource stock piles do not leach significantly under normal precipitation conditions.

Study Summary

Both the initial EP Toxicity and TCLP studies clearly showed the potential leachability of lead as did the subsequent Fluorspar TCLP study. The level of lead transport in the field will be site specific and may be shown to be significantly less than that of laboratory conditions. It should be noted that the TCLP test is a highly conservative approach to assess the leachability of a substance and may overstate the potential for an element of concern (lead) to be transported through porous media. Not overstated is the awareness and concern for the levels of metals (such as lead) that may have a higher propensity to leach as compared to other elements.

Lead Contamination of Soil

The types of metals that are subject to transport at the DNSC sites varies with respect to the minerals and ores on site. Two metals that are commonly stored at DLA Depots that were not evaluated for leachability are lead and zinc ingot stockpiles. The following is a brief discussion of potential risk associated of exposure to lead in soil.
The levels of lead in any porous media are of great concern due to the high toxicity associated with this contaminant. Dr. Charles Xintaras of the Agency for Toxic Substances and Disease Registry (ATSDR) stated that a concentration of as little as 10 micrograms per deciliter (µg/ dL) can have adverse health effects on children (Xintaras 92). Xintaras also noted that lead may easily mobilize when lead-bearing soil particles run off to surface waters during heavy rain events. Although the downward movements of lead through soil are very slow under natural conditions, site specific abatement may be necessary in the upper regions of surface soils based on site conditions. Toxicity Characteristic Leaching Procedure (TCLP) tests are used to determine if remediation and/or disposal of a substance which has been in contact with lead is necessary.

Dunnage Study for the Soctia Depot

The transport of lead from a stock pile in outdoor surroundings is highly likely and has been documented. In the case of lead transport at the Scotia, NY site it was demonstrated that lead leached from the stockpile to wood pallets that supported the pile. When a composite sample of the wood was analyzed, a lead level of 42.62 mg/L was determined using the TCLP Method SW846 1311 extraction, 7000 series (SCILAB ALBANY, INC.). The Department of Environmental Conservation (DEC) of New York and the USEPA regulate the disposal of hazardous lead waste. A TCLP of greater that 5.0 mg/L is considered hazardous waste, thus rendering this material a regulated waste. The level of lead in the wood was of sufficient magnitude to generate concern for the surrounding soil at this site, and may be indicative that lead could be mobilized at other sites were lead is stockpiled.