N00164.AR.000565
NSWC CRANE
5090.3a

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:

5090
Ser 095/0149

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
ATTN: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits responses to comments by the U.S. Environmental Protection Agency regarding revised Risk Screening Documentation for the Sanitary Landfill - Lithium Battery Burial, Sludge Drying Beds A and B, and Highway 58 Dumpsite B Solid Waste Management Units (SWMUs 14/00, 24/00, and 26/08D, respectively). The documents were revised by Morrison Knudsen Corporation in accordance with the U.S. EPA comments of February 22, 2000 and April 27, 2000 and are hereby submitted as enclosure (1). The Certification Statement, as required by the permit, is provided as enclosure (2).

NAVSURFWARCENDIV Crane point of contact is Mr. Thomas J. Brent, Code 09510, telephone 812-854-6160.

Sincerely,

JAMES M. HUNSICKER
Director, Environmental
Protection Department
By direction of
the Commander

Encl:
(1) Risk Screening Documents for SWMUs 14/00, 24/00, and 26/08D
(2) Certification Statement

Copy to:
Administrative Record
SOUTHNAVFACENGCOM (Code 1864) (w/o encl)
IDEM (Doug Griffin) (w/o encl)
MK (Alan Fosdick) (w/o encl)

Risk Screening Documents
for
SWMUs 14/00, 24/00, and 26/08D

Enclosure (1)

U.S. EPA Comments and MK Responses to Comments on Risk Screening Documentation for SWMUs 14/00, 24/00, and 26/08D

February 22, 2000 Comments:

Comment 1:

In the SWMU 24/00 - Sludge Drying Beds A & B report, Beryllium has been included in Table 4 and identified as a contaminant of concern though it has not been included in Tables 1 through 3 or in Section 3.0. Additionally, Section 6.2, Ecological Receptor Exposure Pathways mistakenly refers to routes of exposure for *human* receptors.

MK response to Comment 1:

a) Beryllium has been identified as a contaminant of concern in Section 3.0, and sample analytical results for beryllium have been added to Tables 1, 2, and 3.

b) Section 6.2 has been corrected to refer to ecological receptor instead of human receptors.

Comment 2:

In the SWMU 14/00 - Sanitary Landfill & Lithium Battery report, it is stated that the Lithium cleanup level was set at 1600 mg/kg in agreement with the USEPA. However, the units for Lithium cleanup level in the Highway Dump Site B report (Table 3) are presented as ug/kg. Please correct this discrepancy. Also, the EDQL values in Table 3 of the Lithium Battery report are in ug/kg while Note 1 states that all levels are reported in mg/kg.

MK response to Comment 2:

a) EDQL values in Table 3 (now Table 4) of the Lithium Battery report (SWMU 14/00) have been corrected to the proper units (mg/kg).

b) Sample analytical results in the three Risk Screening Documents (SWMU's 14/00, 24/00, and 26/08D) have been changed where appropriate so that all results are presented in mg/kg units.

Comment 3:

For the Highway Dump Site B report and the Lithium Battery report, please reformat Section 6.0 to present exposure pathways similar to the Sludge Drying Beds report.

MK response to Comment 3:

Section 6 has been reformatted in the Highway 58 Dump Site B (SWMU 26/08D) and Lithium Battery (SWMU 14/00) reports to be similar to Section 6 in the Sludge Drying Beds (SWMU 24/00) report.

Comment 4:

What is the rationale for further groundwater investigation at Highway Dump Site B, but not at the other two units (i.e., Sludge Bed B and Lithium Battery)? Include an explanation in the reports.

MK response to Comment 4:

The requested rationale for further groundwater testing at Highway 58 Dump Site B (SWMU 26/08D) has been added to Section 6.0. The concern at SWMU 26/08D is that contaminants could have leached into the groundwater from the solid waste prior to remediation. This concern was not present for SWMU's 14/00 and 24/000 for the following reasons:

- SWMU 14/00 (Sanitary Landfill and Lithium Battery Disposal Area) - Groundwater monitoring after remediation around the Sanitary Landfill have not indicated problems with groundwater contamination.

- SWMU 24/00 (Sludge Drying Beds A and B) - The only contaminant encountered at these sites was 4'4-DDT, which is not likely to be found in significant quantities in groundwater.

April 27, 2000 Comments:

Comment 1:

In Section 6.1 and 6.2 of the PCB Capacitor report, the Highway 58 Dump Site B report, the second sentence is not very clear as written. Please reformat these sections (see Comment 3 - February 22, 2000 comments).

MK response to Comment 1:

See MK response to comment 3 above.

Comment 2:

For the SWMU 14/00 - Sanitary Landfill & Lithium Battery Report, please attach a copy of the MK letter NAV/MKC-170 dated August 14, 1995 regarding cleanup levels for Lithium. Section 4.0 discusses the construction of the Bioremediation facility on the Lithium Battery site. Please provide a discussion of the potential risk reduction created (if any) by the construction of the Biofacility at the site (e.g. exposure reduction due to paved areas).

MK response to Comment 2:

a) The letter from the Navy to MK, NAV/MKC-170, has been added as Attachment 1 to the SWMU 14/00 report.

b) A discussion of the effect the Bioremediation Facility will have on potential risk reduction has been added to Section 7.0 of the Lithium Battery report (SWMU 14/00).

Comment 3:

For the SWMU 14/00 - Sanitary Landfill & Lithium Battery Report, Section 3.0 states that arsenic, beryllium, and cobalt were found to exceed cleanup levels in the confirmation samples, but were determined to be present due to natural background levels. Note that there are no Arsenic values in Table 2 which exceed the cleanup level of 9.4 mg/kg. Please provide evidence that the background levels compare to those of the Base-Wide Background study or, if the results of the Base-Wide Background study are currently unavailable, show that these metals are not statistically significant from background.

MK response to Comment 3:

a) The reference that Arsenic exceeds the Cleanup Goals has been removed from Section 3.0 of the Lithium Battery report (SWMU 14/00).

b) Table 2 - "NSWC Crane Background/Backfill Samples Analytical Results Summary" has been added to the Lithium Battery report (SWMU 14/00). The table numbers for former Tables 2, 3, and 4, and references to these tables in the text of the report have been updated because of this addition.

c) The Base-wide Background Study is not currently available. The levels of arsenic, beryllium,

and cobalt in the remaining soil are comparable to the levels in the background/backfill samples as presented in the attached Risk Screening Documentations, and are likely to be comparable to the regional background levels.

Comment 4:

For the Highway Dump Site B report, please reformat Table 2 to create separate tables for progress samples and confirmation samples.

MK response to Comment 4:

Table 2 of the Highway 58 Dump Site B report (SWMU 26/08D) has been split into two tables (Table 2, "Progress Sample Analytical Results Summary", and Table 3 "Confirmation Sample Analytical Results Summary"), as requested. The table numbers for former Tables 2, 3, and 4, and references to these tables in the text of the report have been updated because of this addition.

Risk Screening Documentation

NSWC Crane, SWMU 14/00
Sanitary Landfill and Lithium Battery Disposal Area
NSWC Crane, Indiana

Unit Identification Code: N00164
Contract No. N62467-93-D-1106

June 2000

Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina
29419-9010

RISK SCREENING DOCUMENTATION
SWMU 14/00
SANITARY LANDFILL and LITHIUM BATTERY DISPOSAL AREA

NSWC CRANE, INDIANA

June 2000

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0009
STATEMENT OF WORK #007

Prepared for

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Prepared by:

MORRISON KNUDSEN CORPORATION
1500 West 3rd Street
Cleveland, Ohio 44113

PREPARED/APPROVED BY:

Al Brillinger
MK Project Engineer

6-18-01
Date

APPROVALS:

for:
Gregory J. Jones
MK Program Manager

6-18-01
Date

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1
1.1	SUMMARY OF FACILITY	1
1.2	SUMMARY OF SOLID WASTE MANAGEMENT UNIT (SWMU)	1
1.3	INTERIM MEASURE PERFORMED	5
2.0	IDENTIFICATION OF CONTAMINATED MEDIA	7
3.0	IDENTIFICATION OF CONTAMINANTS OF CONCERN	7
4.0	CURRENT CONDITIONS	12
5.0	CURRENT AND FUTURE LAND USES	12
6.0	DESCRIPTION OF EXPOSURE PATHWAYS	12
6.1	HUMAN RECEPTOR EXPOSURE PATHWAYS	12
6.2	ECOLOGICAL RECEPTOR EXPOSURE PATHWAYS	12
7.0	CURRENT RISKS VS. REMEDIATION GOALS	13
8.0	RISK SCREENING EVALUATION SUMMARY	14
9.0	REFERENCES	16

LIST OF ATTACHMENTS

ATTACHMENT		
1	MK Letter No. NAV/MKC-170	17

LIST OF FIGURES

FIGURE		
1	NSWC Crane Vicinity Map	2
2	Surface Drainage of NSWC Crane	3
3	NSWC Crane SWMU 14 Location	4
4	Sanitary Landfill and Lithium Battery Disposal Area Access Roads	6

LIST OF TABLES

TABLE		
1	SWMU 14/00 Characterization, Backfill, and Background Samples Analytical Results Summary	8
2	NSWC Crane Background/Backfill Samples Analytical Results Summary	9
3	SWMU 14/00 Confirmation Samples Analytical Results Summary	10
4	SWMU 14/00 Contaminants of Concern, Summary of Soil Analytical Data, Cleanup Goals, and Risk Levels	15

ACRONYMS AND ABBREVIATIONS

CAAA	Crane Army Ammunition Activity
CFR	Code of Federal Regulations
EDQL	Ecological Data Quality Limit
HSWA	Hazardous and Solid Waste Amendments
IDEM	Indiana Department of Environmental Management
IM	Interim Measure
IRIS	Integrated Risk Information System
ISBH	In-State Board of Health
MK	Morrison Knudsen Corporation
NAVFACENGCOM	Naval Facilities Engineering Command
NSWC	Naval Surface Warfare Center
NEESA	Naval Energy and Environmental Support Activity
RFI	RCRA Facilities Investigation
RCRA	Resource Conservation and Recovery Act
SWMU	Solid Waste Management Unit
SSL	Soil Screening Level
U.S. EPA	United States Environmental Protection Agency
WES	United States Army Corps of Engineers Waterways Experiment Station

1.0 INTRODUCTION

1.1 SUMMARY OF FACILITY

Naval Surface Warfare Center (NSWC) Crane consists of 62,463 acres located approximately 75 miles south of Indianapolis, Indiana, as shown in Figure 1. The facility provides support for equipment, shipboard weapons systems, and ordnance. In addition, NSWC Crane supports the Crane Army Ammunition Activity (CAAA), including production and renovation of conventional ammunition, as well as storage, shipment, demilitarization, and disposal of conventional ammunition.

The topography of NSWC Crane consists of flat to gently rolling terrain dissected by numerous well-defined drainage ways. Surface elevation ranges from approximately 470 feet at the drainage exiting the southern boundary of NSWC Crane to 860 feet on a ridge in the west-central portion of the facility. Ridge crests generally lie at elevations of 750 to 800 feet [NEESA, 1983].

The surface drainage at NSWC Crane has formed a dense, dendritic pattern throughout the installation. Five drainage basins have been identified at NSWC Crane. The Sanitary Landfill and Lithium Battery Disposal Area is located in Basin V which occupies the southwest portion of the facility as shown in Figure 2. Surface drainage in the immediate area of the lithium battery disposal area empties into Seed Tick Creek. All surface drainage from the NSWC empties into the East Fork of the White River south of the installation [NEESA, 1983].

NSWC Crane is underlain by unconsolidated deposits of Quaternary (Pleistocene) age and residual soil derived from Pennsylvanian and Mississippian bedrock. The unconsolidated deposits are limited to the small floodplains and are composed of alluvial, colluvial, and paludal (marshland) silt, sand, and gravel; lacustrine clay, silt, and sand; and outwash plain gravel, sand, and silt. The remainder of NSWC Crane surficial deposits consists of residual clays and silt from the Pennsylvanian Raccoon Creek Group and Mississippian Stephensport and West Baden Groups with small areas of Quaternary clay, silt, and sand (Lacustrine deposits). The bedrock units beneath the facility, primarily Raccoon Creek and Stephensport Groups, reportedly dip gently from the Cincinnati Arch to the Illinois Basin in the southwest [NEESA, 1983].

From boring logs collected from the facility, the major soil type is a two to three-inch thick surface layer of brown to tan organic clay loam underlain by clay intermixed with silts and sand. Occasionally, a clay hardpan occurs between twenty-five and thirty-two inches below the surface [NEESA, 1983].

1.2 SUMMARY OF SOLID WASTE MANAGEMENT UNIT (SWMU)

Promulgation of the United States Environmental Protection Agency's (U.S. EPA's) regulatory program under the Resource Conservation and Recovery Act (RCRA) provided the impetus to identify and control environmental contamination from past practices at NSWC Crane. On December 23, 1989, the U.S. EPA issued the federal portion of the final RCRA Part B permit for NSWC Crane to the U.S. Navy and issued the permit renewal for a period of five years on July 31, 1995. This permit contains both the Federal and state permit conditions, which were issued separately by the State of Indiana RCRA program. It establishes the Hazardous and Solid Waste Amendment (HSWA) Corrective Action Requirements and Compliance Schedules obligating the U.S. Navy to perform RCRA Facility Investigations (RFIs) at 30 Solid Waste Management Units (SWMUs), to conduct Corrective Measures Studies and to implement corrective measures if needed. Interim measures were performed at SWMU 14/00 (Sanitary Landfill and Lithium Battery Disposal Area) as part of the RCRA Part B Permit requirements for NSWC Crane.

SWMU 14/00, Sanitary Landfill and Lithium Battery Disposal Area, is located in the southwest portion of NSWC Crane, as shown in Figure 3. The sanitary landfill area, covering approximately 2200 feet by

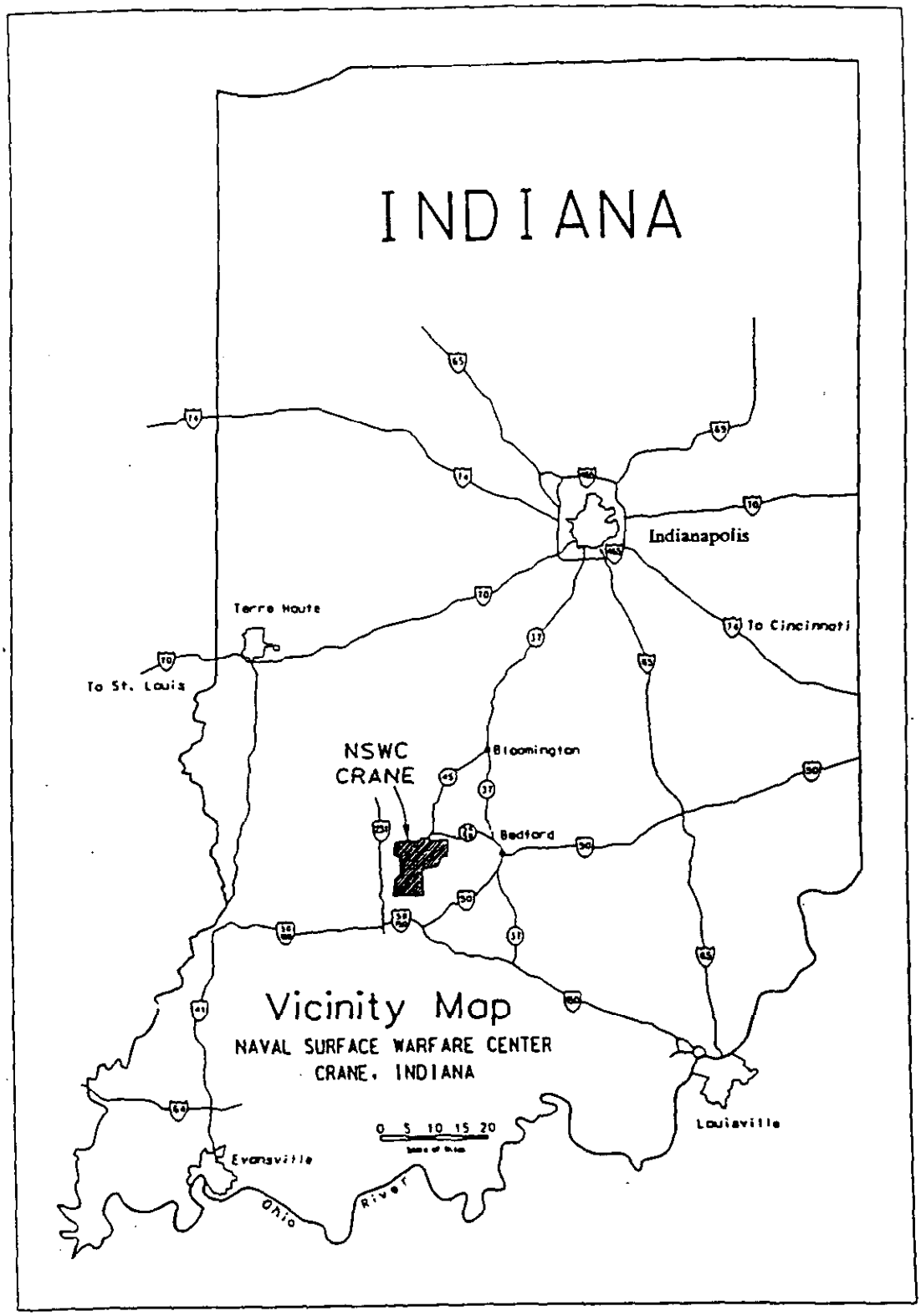


FIGURE 1
NSWC CRANE VICINITY MAP

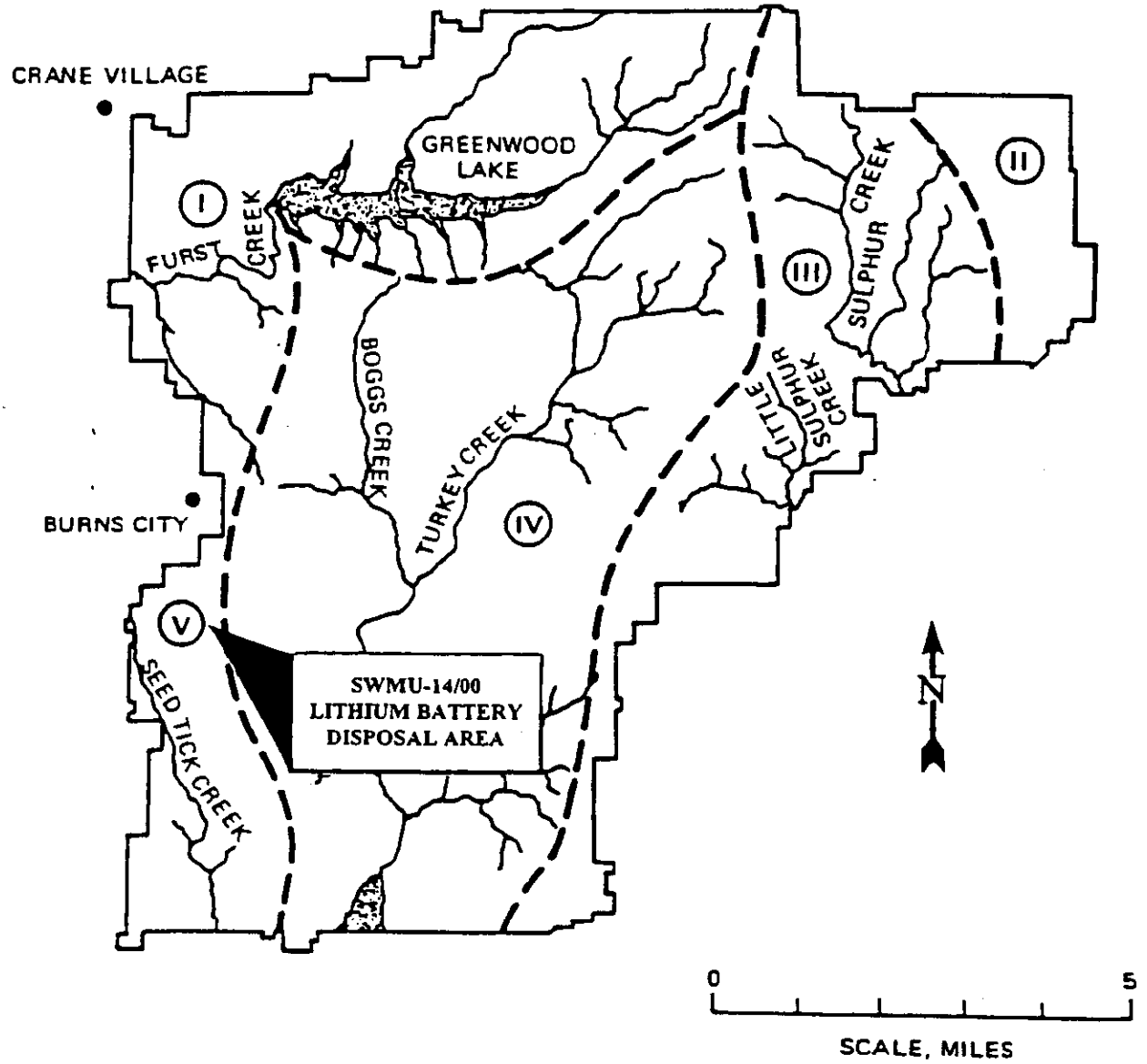


FIGURE 2
SURFACE DRAINAGE OF NSWC CRANE

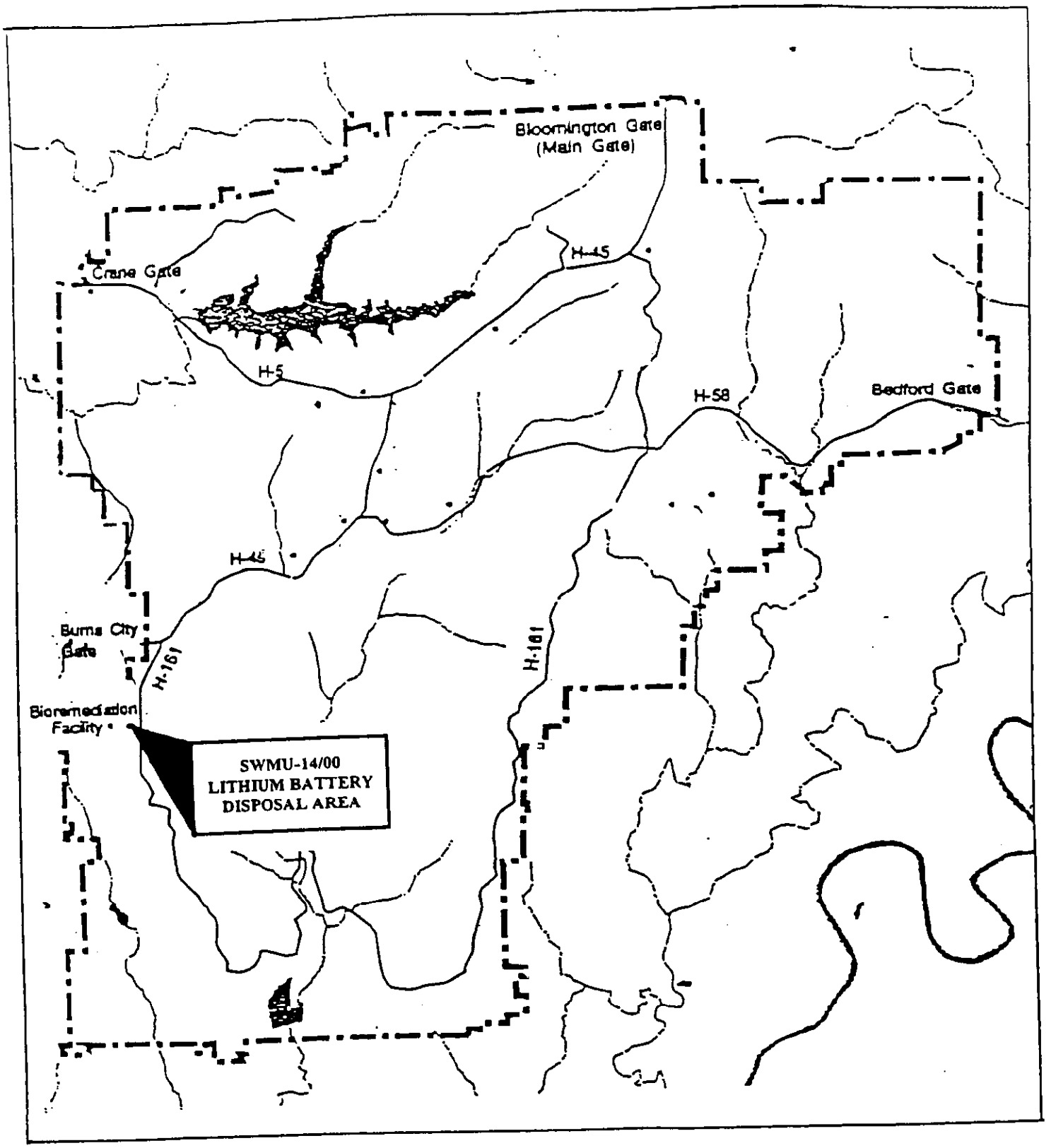


FIGURE 3
NSWC CRANE SWMU 14 LOCATION

1100 feet, is fairly flat and grass covered. The area surrounding the landfill is heavily wooded. Access to the site is via an access road off of Highway 161 (Figure 4).

The Indiana State Board of Health (ISBH) granted approval in 1981 - 82 to bury neutralized lithium batteries in the landfill [Haliburton, 1992]. Figure 4 shows the location of lithium battery burial area. [Haliburton, 1992].

1.3 INTERIM MEASURE PERFORMED

The objectives at SWMU 14/00 were to locate, excavate, remove, and dispose of buried lithium batteries and contaminated soil based on anomalies established in a geophysical investigation performed in November 1994 by the U.S. Army Corps of Engineers, Waterways Experiment Station [WES, 1996], and approved by the U.S. EPA on June 9, 1999. MK prepared the following project documents that describe the procedures used to execute the voluntary Interim Measure (IM) at SWMU 14/00:

- *Work Plan and Task Specific Site Safety and Health Plan for Solid Waste Management Units 14/00 and 17/04,* Revision 0, dated May 26, 1995, [MK, 1995a]

- *General Project Plans for Interim Measures Cleanup, Revision C*, August 18, 1995, consisting of the following plans:

    - *Quality Control Plan*, Rev. C, August 18, 1995, [MK, 1995b]
    - *Quality Assurance Project Plan*, Rev. C, December 29, 1995, [MK, 1995c]
    - *Waste Management Plan*, Rev. C, August 18, 1995, [MK, 1995d]
    - *Sampling and Analysis Plan*, Rev. C, August 18, 1995, [MK, 1995e]
    - *Environmental Protection Plan*, Rev. C, August 18, 1995, [MK, 1995f]

MK received approval of the Work Plan for SWMU-14/00 from the U.S. EPA on June 13, 1995.

The target cleanup levels for this IM were taken from *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects,* June 18, 1994, [U.S. EPA, 1994]. These cleanup levels were used for this IM cleanup in the absence of site specific health risk-based levels. A cleanup level for lithium was not included in the guidance document. Cleanup levels for lithium of 1,600 milligrams per kilogram (mg/kg) for soil and 730 micrograms per liter (µg/L) for water were used based on an agreement between the U.S. EPA Region V, the Indiana Department of Environmental Management (IDEM) and the Navy, in a letter dated August 14, 1995 (Attachment 1). These levels are the Integrated Risk Information System (IRIS) levels.

The initial excavation began on July 27, 1995 and was completed in August, 1995. Debris (e.g., batteries, rebar, wire, etc.) was removed from SWMU-14/00 as needed, using hand and machine methods. Soils at the site with levels of nickel or lithium greater than 1,600 mg/kg were excavated until the top of bedrock was encountered. Twenty-two crates of lithium batteries and parts were removed from SWMU-14/00. They were disposed of through explosive detonation at the NSWC Crane Demolition Range under NSWC Crane's authority, granted by their Interim Status. A total of 337.34 tons of contaminated soil was disposed of as special waste at the Rumpke Waste Collection and Disposal Systems facility in Cincinnati, Ohio, and Heritage Environmental Services Inc., in Indianapolis, Indiana.

Following completion of the excavation, confirmation samples were obtained from the excavation. Final sample results indicated all constituents below the established cleanup levels, with the exception of arsenic, beryllium, and cobalt which naturally occur in the Crane geologic region [MK, 1996]. The levels of these compounds detected were determined to be consistent with the respective background levels for these compounds. The excavation was then backfilled, graded, seeded, and mulched.

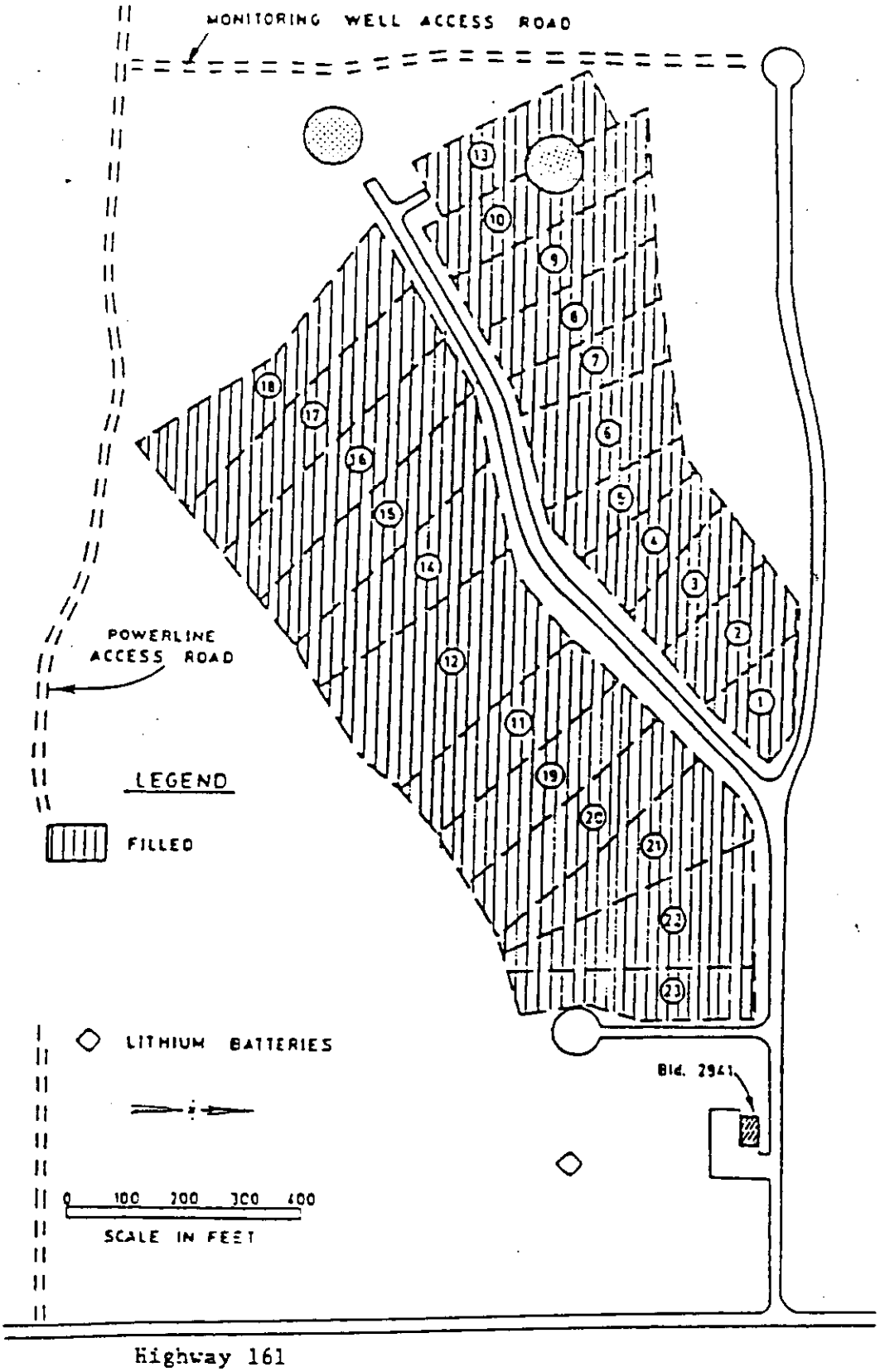


FIGURE 4
SANITARY LANDFILL AND LITHIUM BATTERY DISPOSAL AREA ACCESS ROADS

In August 1996, excavation and grading activities were underway in preparation for construction of the Bioremediation Facility. This excavation was being performed in the same area as the previous lithium battery removal activities. During excavation, additional lithium batteries were uncovered. These areas had not been identified during the site investigation [WES, 1996]. The batteries and contaminated soil were excavated and removed using the same procedures/methods as used for the original battery removal. The batteries were removed and placed in twelve additional crates (for a total of 34 crates removed from the site) and disposed of by explosive detonation. The contaminated soil was excavated and placed directly into plastic-lined trucks for transportation and off-site disposal at the landfills previously discussed. The excavation was then backfilled, graded, seeded, and mulched.

A complete report of the IM activities is in the *Draft Interim Measures Report, NSWC Crane, SWMUs 14/00 and 17/04, Sanitary Landfill and Lithium Disposal Area, and PCB Capacitor Burial-Pole Yard, NSWC Crane, Indiana*, [MK, 1997].

2.0 IDENTIFICATION OF CONTAMINATED MEDIA

All contaminated media has been removed from SWMU 14/00 [MK, 1997]. The primary source of contamination at SWMU 14/00 prior to remediation was the lithium batteries disposed of at the sanitary landfill. The primary source contaminated the soil (secondary source) in and around the disposal area as the batteries disintegrated after burial. Thirty-four crates of lithium batteries and parts were removed from SWMU-14/00, along with 337.34 tons of contaminated soil. All soil was excavated to bedrock and removed from the site. Soil to groundwater contamination is not likely at the remediated SWMU due to the following reasons:

- Groundwater was not encountered in the excavations.
- All soil above the target cleanup goals was excavated to bedrock and disposed of at off-site landfills.

All soil above the target cleanup goals has been removed from the site and properly disposed of, therefore, soil to surface water cross-media contamination is not likely at the remediated SWMU.

3.0 IDENTIFICATION OF CONTAMINANTS OF CONCERN

Prior to excavation and removal activities, initial characterization samples (14/00-001, and 14/00-003 through 14/00-007) and background sample, 14/00-002, were collected on June 28, 1995 [MK, 1997]. These samples were analyzed for applicable Title 40 Code of Federal Regulations (CFR) 264 Appendix IX metals and lithium. The analytical results of the characterization, background, and backfill material samples for SWMU 14/00 are summarized in Table 1. Table 2 summarizes background/backfill sample analytical results. The results of characterization sampling identified the following compounds as contaminants of concern, with concentrations above the cleanup goals:

- Lithium, as high as 5,030 milligrams per kilogram (mg/kg)
- Arsenic, as high as 11 mg/kg
- Beryllium, as high as 0.98 mg/kg
- Cobalt, as high as 16.4 mg/kg

Confirmation samples were obtained and analyzed after excavation to verify that the soils remaining in the excavation after remediation were at, or below, cleanup levels (Table 3). The confirmation sample results indicated elevated levels as high as 7,890 mg/kg of nickel, in addition to concentrations above reporting limits for other metals such as chromium, arsenic, beryllium, and cobalt. Samples NSWC-14/00-019 through 028 consistently had high levels of arsenic, beryllium, and cobalt, which naturally occur in the NSWC Crane geologic region (MK, 1996); however the high levels of nickel and chromium occur in only one sample, NSWC-14/00-023. Additional soil was excavated in this area and a final confirmation sample collected (NSWC-14/00-029), which verified that the remaining soil in this area was clean.

TABLE 1
SWMU 14/00 CHARACTERIZATION, AND BACKGROUND SAMPLES
ANALYTICAL RESULTS SUMMARY

		CHARACTERIZATION					BACKGROUND
	SAMPLE #	14/00-001	14/00-003	14/00-005	14/00-006	14/00-007	14/00-002
	SAMPLE DATE	6/29/95	6/29/95	7/26/95	7/27/95	7/26/95	7/12/95
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	31	<2.5	<2.8	<2.7	---	---	<2.6
Arsenic	9.4	***11.1**	***9.9**	9.3	---	---	8.1
Barium	5,500	51.6	81.5	115	---	---	86
Beryllium	0.68	***0.85**	***0.83**	***0.98**	---	---	0.68
Cadmium	39	<0.51	<0.56	<0.54	---	---	<0.53
Chromium	940	10.2	24.1	23	---	---	19.6
Cobalt	8.2	***9.5**	***13.4**	***16.4**	---	---	8.2
Copper	2900	12.2	11.4	13.4	---	---	11.4
Lead	500	19.4	19.1	30.8	---	---	22.2
Lithium	1,600	566	393	224	***5030**	***3920**	<13.2
Mercury	23	<0.11	<0.14	<0.12	---	---	<0.13
Nickel	1600	416	191	111	---	---	14
Selenium	390	<0.63	1.1	1.3	---	---	<0.66
Silver	390	<1.0	<1.1	<1.1	---	---	<1.1
Thallium	Not established	<1.3	<1.4	<1.3	---	---	<1.3
Tin	47000	<31.7	<34.9	<33.5	---	---	<32.9
Vanadium	550	23.6	36.3	43.4	---	---	21.1
Zinc	23000	54.8	52.3	56.7	---	---	31.8

Notes: 1) Centered and bold italic sample results with asterisk indicates that sample analytical result is greater than the cleanup goal.
2) Cleanup goals taken from "*RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects,* " June 1994 [U.S. EPA, 1994]. Lithium cleanup goal obtained from MK letter NAV/MKC-170, August 1995.
Background levels are used as cleanup goals for beryllium and cobalt.
Backfill levels are used as cleanup goals for arsenic.
3) --- = not analyzed
4) mg/kg = milligrams per kilogram

TABLE 2
NSWC CRANE BACKGROUND/BACKFILL SAMPLES
ANALYTICAL RESULTS SUMMARY

	SAMPLE # (NSWC)	BP\BF-001	BP\BF-002	BP\BF-003	BP\BF-004	BF\BF-005	BF\BF-005RE	BF\BF-006
	SAMPLE DATE	8/12/95	8/12/95	10/12/95	10/12/95	10/27/95	10/27/95	10/27/95
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Methylene Chloride	22	0.021	0.016	<0.0058	0.01	0.041(B)	0.009(B)	0.019(B)
Acetone	9,200	0.011(J)	0.0077(J)	<0.12	<0.11	<0.11	<0.11	<0.11
Arsenic	9.4	9.4	9.0	7.8	6.3	1.9	--	1.8
Cobalt	8.2	3.9	4.6	***8.6***	7	2.4	--	3.2
Beryllium	0.68	0.57	0.56	0.74	0.81	<0.21	--	<0.22
Lithium	1,600	12.8	11.7	--	--	--	--	--
Nickel	1,600	10	10.8	14.5	13.5	6.2	--	--
Chloroform	0.96	<0.0062	<0.0061	<0.0058	<0.0057	<0.0053	<0.0053	<0.0056
MEK (2-Butanone)	5,200	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11
Bromodichloromethane	3	<0.0062	<0.0061	<0.0058	<0.0057	<0.0053	<0.0053	<0.0056
4-methyl-2-pentanone	2,000	<0.062	<0.061	<0.058	<0.0057	<0.053	<0.053	<0.056
4,4, DDT	0.008	<0.0081	<0.0081	<0.0077	--	<0.0035	--	<0.0037
Tetrachloroethene	Not Established	<0.0062	<0.0061	<0.0058	0.034	<0.0053	0.0014(J)	<0.0056
Toluene	Not Established	<0.0062	<0.0061	<0.0058	0.016	<0.0053	<0.0053	<0.0056
m+p Xylene	Not Established	<0.0062	<0.0061	<0.0058	0.0047(J)	<0.0053	0.0033(J)	<0.0056
o Xylene	Not Established	<0.0062	<0.0061	<0.0058	<0.0057	<0.0053	0.0013(J)	<0.0056

Notes:

1) -- = Not Analyzed
2) (B) indicates the compound was also present in the associated field or trip blank.
3) (J) indicates the value is estimated
4) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.
5) Cleanup goals taken from "RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [U.S. EPA, 1994]. Background levels used as cleanup goals for arsenic and cobalt. Backfill levels are used as cleanup goal for arsenic.
6) mg/kg = milligrams per kilogram
7) Sample No. BF/BF-005RE was analyzed for volatile compounds only.

TABLE 3
SWMU 14/00 CONFIRMATION SAMPLES ANALYTICAL RESULTS SUMMARY

	SAMPLE #	14/00-010	14/00-011	14/00-012	14/00-013	14/00-014	14/00-015	14/00-016	14/00-017	14/00-019	14/00-020
	SAMPLE DATE	8/21/96	8/21/96	8/21/96	8/21/96	8/21/96	8/21/96	8/22/96	8/22/96	8/16/96	8/16/96
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	31	<2.4	<2.5	<2.4	<2.2	<2.2	<2.3	<2.4	<2.4	0.29	<0.25
Arsenic	9.4	2.6	4.9	4.1	5.8	2.7	6.1	<1.2	4.3	3.5	2
Barium	5,500	435	162	98.3	84.6	36.1	39.7	29.6	122	70.6	113
Beryllium	0.68	***1.4***	***1.3***	***0.95***	***0.94***	***0.86***	0.52	0.56	***0.93***	***1***	***0.9***
Cadmium	39	<0.49	<0.5	<0.47	<0.44	<0.45	<0.45	<0.48	<0.47	0.4	0.2
Chromium	940	22.9	19.7	47.3	35.4	17.5	14.9	16.3	25.8	18.4	19.5
Cobalt	8.2	***33***	***20.7***	***12.9***	***9.7***	***10.3***	4.8	***9.3***	***12.6***	***13.6***	7.7
Copper	2900	17.1	8.7	15.7	12.3	109	12.8	13	16	20.7	15.8
Lead	500	19.6	18.4	13.1	12.8	11.3	8.4	10.3	12.1	13.2	7.4
Lithium	1,600	27.8	13.2	119	71.9	177	83.9	281	346	36	18.6
Mercury	23	<0.12	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11	<0.126	<0.114
Nickel	1600	53.8	24.4	148	80.5	253	12.1	48.4	77.1	33.2	19
Selenium	390	<0.61	<0.63	<0.59	<0.55	<0.56	<0.57	<0.59	<0.59	<0.377	<0.343
Silver	390	<0.98	<1.0	<0.94	<0.88	<0.89	<0.91	<0.95	<0.95	<0.075	<0.068
Thallium	Not Established	<1.2	<1.3	<1.2	<1.1	<1.1	<1.1	<1.2	<1.2	<0.389	0.4
Tin	47000	<30.6	<31.5	<29.4	<27.5	<27.9	<28.4	<29.7	<29.6	2.7	2
Vanadium	550	25.8	30.6	21.6	24.4	15.2	23.7	12.2	18	22.3	25.1
Zinc	23000	79.4	30.9	64.2	47.4	157	43.8	75.1	111	80.5	47.9

Notes:

-- = Not Analyzed

1) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.

2) Cleanup goals taken from "*RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [U.S. EPA, 1994].*
Lithium cleanup goal obtained from MK letter NAV/MKC-170, August 1995.
Background levels are used as cleanup goals for beryllium and cobalt.
Backfill levels are used as cleanup goal for arsenic.

3) mg/kg = milligrams per kilogram

TAB 3
SWMU 14/00 CONFIRMATION SAMPLES ANALYTICAL RESULTS SUMMARY

	SAMPLE #	14/00-021	14/00-022	14/00-023	14/00-024	14/00-025	14/00-026	14/00-027	14/00-028	14/00-029
	SAMPLE DATE	8/16/96	8/16/96	8/16/96	8/16/96	8/16/96	8/16/96	8/16/96	8/16/96	8/28/96
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	31	<0.247	0.3	<0.251	0.4	<0.26	0.8	1	0.7	--
Arsenic	9.4	1.1	1.3	3.3	6.1	2.6	2	7.3	1.9	--
Barium	5,500	44.5	72.9	172	97.2	69.8	80.2	60.7	92	--
Beryllium	0.68	***1.2**	***1.1**	***1.1**	***0.8**	***1**	***1**	***1**	***1.1**	--
Cadmium	39	0.3	0.4	0.1	0.2	0.2	0.2	0.1	0.2	--
Chromium	940	23.6	19.7	***1040**	29.5	17.8	96.7	172	68.8	14.9
Cobalt	8.2	***11.9**	***16.7**	***73.3**	***13**	***13.1**	***23.9**	***12.5**	***21.6**	--
Copper	2900	17.1	19.5	22.1	15	19.9	24.6	21	24.5	--
Lead	500	11.2	13.1	12.4	12.9	13.9	16.1	15.5	19.9	--
Lithium	1,600	81.6	77.6	362	93.5	38.1	238	139	67.7	--
Mercury	23	0.1	<0.108	<0.114	<0.115	<0.118	<0.113	<0.123	<0.121	--
Nickel	1600	34.2	41.1	***7890**	55.6	75.9	124	165	81.1	9.3
Selenium	390	<0.336	<0.325	<0.342	<0.345	<0.354	<0.338	<0.368	<0.362	--
Silver	390	<0.067	<0.065	<0.068	<0.069	<0.071	<0.067	<0.073	<0.072	--
Thallium	Not Established	0.4	<0.336	0.4	<0.357	<0.366	0.6	<0.38	<0.374	--
Tin	47000	1.8	2	1.2	2.7	2.4	1.8	2.9	2.2	--
Vanadium	550	19.9	17.5	30.9	30.8	20.2	21.3	33	20	--
Zinc	23000	59.1	67.2	92	46.7	84.7	84.4	64.5	85.8	--

Notes:

-- = Not Analyzed

1) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.
2) Cleanup goals taken from "*RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [U.S. EPA, 1994].*
   Lithium cleanup goal obtained from MK letter NAV/MKC-170, August 1995.
   Background levels are used as cleanup goals for beryllium and cobalt.
   Backfill levels are used as cleanup goal for arsenic.
3) mg/kg = milligrams per kilogram

4.0 CURRENT CONDITIONS

Remediation of the site involved removing contaminated soil to bedrock and backfilling with clean soil. The area was then graded and seeded. After remediation, a Bioremediation Facility was constructed on the site (see Section 5.0 for a discussion on the Bioremediation Facility). Little or no potential for exposure to contamination from the lithium batteries exists in this area as the batteries and soils impacted by the batteries have been removed from the site. The results of confirmation sampling and backfill sampling are provided in Tables 2 and 3.

5.0 CURRENT AND FUTURE LAND USES

The site of SWMU 14/00 is used as the location for NSWC Crane's Bioremediation Facility. The facility was constructed in 1996 and is used to remediate explosive compounds by composting impacted soils from other areas of the facility. There are no plans to change the use of the Bioremediation Facility in the future.

6.0 DESCRIPTION OF EXPOSURE PATHWAYS

6.1 HUMAN RECEPTOR EXPOSURE PATHWAYS

All soil with chemical concentrations above the clean-up goals or natural background levels believed to be present in the region was removed from the Sanitary Landfill and Lithium Battery Disposal Area. The excavation was backfilled with soil from on-site borrow areas, graded and seeded. After remediation, a Bioremediation Facility was constructed on the site. Humans are potentially exposed to several routes of exposure. The following routes of exposure are considered for human receptors:

Soil — The soil contaminants remaining around the SWMU, and soil used to backfill areas around the SWMU disturbed during excavation, are below the clean-up goals or within background levels for this site. Humans would be exposed to the soil at the site by traveling through the site, or digging at the site. Human exposure to contaminants in soil has been limited by removal of soil with contaminant levels above the cleanup goals. The excavated area has been backfilled, graded, and seeded. The site is currently the location of a Bioremediation Facility.

Groundwater — Groundwater is not currently being used in the vicinity of the site. Leaching of contaminants from the soil to the groundwater has been limited by the removal of soils above the cleanup levels or background levels . Groundwater monitoring after remediation around the Sanitary Landfill have not indicated problems with groundwater contamination.

Surface water — Surface water is not present at SWMU 14.

Air — Wind erosion and atmospheric dispersion of contaminants at the site are limited by removal of soil with contaminant levels above the cleanup goals or background levels and backfilling the area with clean soil. The area was also seeded and the Bioremediation Facility constructed at the site. The grass covered area and Bioremediation Facility will limit soil dispersal from the site.

6.2 ECOLOGICAL RECEPTOR EXPOSURE PATHWAYS

All soil with chemical concentrations above the clean-up goals or natural background levels believed to be present in the region have been removed from the Sanitary Landfill and Lithium Battery Disposal Area. The excavation was then backfilled with soil from on-site borrow areas, graded and seeded. After remediation, a Bioremediation Facility was constructed on the site. Ecological receptors are

potentially exposed to several routes of exposure. The following routes of exposure are considered for ecological receptors:

Soil — The soil contaminants remaining around the SWMU, and soil used to backfill areas around the SWMU disturbed during excavation, are below the clean-up goals or within the background levels for this site. Ecological receptors would be exposed to the soil at the site by traveling through the site, or digging at the site. Ecological receptor exposure to contaminants in soil has been limited by removal of soil with contaminant levels above the cleanup goals. The excavated area has been backfilled, graded, and seeded. The site is currently the location of the Bioremediation Facility.

Groundwater — Groundwater is not currently being used in the vicinity of the site. Leaching of contaminants from the soil to the groundwater has been limited by the removal of soils above the cleanup levels or background levels. Groundwater monitoring after remediation around the Sanitary Landfill have not indicated problems with groundwater contamination.

Surface water — Surface water is not present at SWMU 14.

Air — Wind erosion and atmospheric dispersion of contaminants at the site are limited by removal of soil with contaminant levels above the cleanup goals or background levels and backfilling the area with clean soil. The area was also seeded and a Bioremediation Facility constructed at the site. The grass covered area and Bioremediation Facility will limit soil dispersal from the site.

7.0 CURRENT RISKS VS. REMEDIATION GOALS

A quality assurance program, in accordance with the procedures set forth in the *Quality Control Plan for Interim Measures Cleanup* [MK, 1995], was followed for the IM at SWMU 14/00. A complete description of the quality assurance program and its relationship to the remediation goals for the IM at SWMU 14/00 is contained in the IMR, and is summarized as follows:

- All samples collected from SWMU 14/00 were transported from the field to the laboratory using proper chain-of-custody procedures.
- Field quality control samples were collected to identify potential sources of error or cross contamination that may have occurred during collection, storage, or shipment of samples to the laboratory. Field quality control samples included trip blanks, field duplicates, and an equipment rinsate sample.
- The laboratory performed method blank, sample matrix spike, sample matrix spike duplicate, surrogate, and standard matrix spike analyses in order to evaluate laboratory accuracy, precision, representativeness, comparability, and completeness.

Overall, data quality objectives for accuracy, precision, representativeness, comparability, and completeness were met, and the data was considered acceptable.

The buried lithium batteries and associated contaminated soil above the cleanup goals or natural background levels believed to be present in the region have been removed from the site. The target cleanup levels for these interim measures were taken from the *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects*, June 18, 1994 [U.S. EPA, 1994]. Background levels of arsenic, beryllium, and cobalt exceeded the guidance document levels, therefore, background levels were used as the cleanup goals. No value existed in the guidance document for lithium, the primary contaminant of concern at the site. The lithium cleanup level was established by an agreement between the Navy and U.S. EPA, and documented in a letter from the Navy to MK (Attachment 1). There are no longer any exposure pathways by which human and ecological receptors can be exposed

because the sources of contamination have been removed. Therefore, there is currently little, or no, risk to human and ecological receptors. The construction of the Bioremediation Facility has little or no effect on the reduction of risk at the site, since the contaminated media and the exposure pathways were removed from the site prior to construction.

Human Soil Screening Levels (SSLs) and ecological receptor Ecological Data Quality Limits (EDQLs) have not been established for lithium, however, the soil remaining at the site has concentrations of lithium well below the site cleanup levels. Other compounds detected above the site cleanup goals are due to natural background conditions. Table 4 summarizes the contaminants of concern, soil analytical data, and the cleanup goals.

8.0 RISK SCREENING EVALUATION SUMMARY

Considering the work performed at SWMU-14/00, the requirements and objectives of the Interim Measures Cleanup Activities have been met. All contaminated soil above the clean-up goals or natural background levels for this site has been excavated to bedrock and removed from the site. Since the sources of contamination have been removed, there are no longer any exposure pathways by which human and ecological receptors can be exposed. Therefore, there is currently little, or no, risk to human and ecological receptors. It is recommended that no further action be taken at NSWC Crane SWMU-14/00.

TABLE 4
SWMU 14 CONTAMINANTS OF CONCERN
SUMMARY OF SOIL ANALYTICAL DATA, CLEANUP GOALS, AND RISK LEVELS
NSWC CRANE, INDIANA

Element	Cleanup Goal	Range		Ecological Risk	Human Risk	
		Confirmation Samples	Backfill/Background Samples	EDQL	Ingestion	Inhalation
Lithium	1600	13.2 - 362	ND - 12.8	NA	NA	NA
Nickel	1600	9.3 - 7890	6.2 - 14.5	13.6	1600	13000
Arsenic	9.40	ND - 7.3	1.8 - 9.4	5.7	0.4	750
Beryllium	0.68	0.52 - 1.4	ND - 0.81	1.06	0.1	1,300
Cobalt	8.2	4.8 - 73.3	2.4 - 8.2	0.14	NA	NA

Notes:
1) All levels in mg/kg
2) Ranges of Confirmation samples obtained from Table 3
3) Ranges of Backfill and Background samples obtained from Tables 1 and 2
4) Ecological Risk levels obtained from Region 5 Model QAP Appendix C
5) EDQL = Ecological Data Quality Limit
6) Human Risk levels obtained from Region 5 Model QAP Appendix D
7) Cleanup goals taken from "*RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [U.S. EPA, 1994].*
Lithium cleanup goal obtained from Navy letter to MK (NAV/MKC-170), August 1995.
Background or backfill levels are used as cleanup goals for arsenic, beryllium, and cobalt.
8) ND = Not Detected
9) NA = Not Available

9.0 REFERENCES

Haliburton, 1992. *RCRA Facility Investigation Phase I Environmental Monitoring Reports: Solid Waste Management Units #15/06, #14/00 and #16/16, Naval Surface Warfare Center, Crane Division, Crane, Indiana.* Haliburton NUS Environmental Corp., November 1992.

Morrison Knudsen Corporation, (MK) 1995a. *Work Plan and Task-Specific Site Safety and Health Plan for Interim Measures Cleanup at Solid Waste Management Units #14/00 and #17/04,* Revision 0, dated May 26, 1995.

Morrison Knudsen Corporation, (MK) 1995b. *Quality Control Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana*, Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995c. *Quality Assurance Project Plan for RCRA Corrective Action Interim Measures Cleanup, NSWC Crane, Crane, Indiana*, Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995d. *Waste Management Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana*, Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995e. *Sampling and Analysis Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana*, Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995f. *Environmental Protection Plan Interim Measures Cleanup, NSWC Crane, Crane, Indiana*, Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1996. *Interim Measure Report, SWMU 23/00 Battery Shop, Naval Surface Warfare Center Crane, Crane, Indiana,* Draft, September 1996.

Morrison Knudsen Corporation, (MK) 1997. *Interim Measures Report, NSWC Crane, SWMUs 14/00 and 17/04, Sanitary Landfill and Lithium Disposal Area, and PCB Capacitor Burial-Pole Yard, NSWC Crane, Indiana*, Draft, February 1997.

Naval Energy and Environmental Support Activity, (NEESA) 1983. *Initial Assessment Study of Naval Weapons Support Center Crane, Indiana.* NEESA 13-003, May.

U. S. Army Corps of Engineers (USCOE) Waterways Experiment Station, (WES) 1996. *Final Geophysical Investigation at Solid Waste Management Units 14/00 and 17/04, Naval Surface Warfare Center, Crane, Indiana.* January 1996.

U. S. Environmental Protection Agency (USEPA) 1994. *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects.* June 18, 1994.

ATTACHMENT 1

Letter from Navy to MK on Lithium Cleanup Levels
(MK Letter No. NAV/MKC-170)

Crane RECEIVED

AUG 18 1995

MK-CRANE

RECEIVED

AUG 14 1995

MK CORP

5090
Code 18011
14 Aug 95

NAV/MKC-170

Morrison Knudsen Corporation
2420 Mall Drive
Corporate Square 1 Suite 211
North Charleston, SC 29406

Subj: CONTRACT N62467-93-D-1106, DELIVERY ORDER 9, RESPONSE ACTION CONTRACT, NSWC CRANE, IN

Gentlemen:

This letter is to serve as technical direction for the following actions:

In cooperation with the Navy, USEPA Region V and Indiana Department of Environmental Management the following shall be done at the Lithium battery SWMU # 14: the batteries or pieces of batteries found will be disposed of by NSWC EOD. The soils whose lithium and/or nickel concentrations are above 1600 ppm shall be contained and disposed of off site as special waste. All sludge shall be disposed of as special waste. Soils whose lithium and/or nickel concentrations are less than 1600 ppm are to be used as backfill. Any water whose lithium and/or nickel concentrations are greater than 730 ppb are to be disposed of in a sewer treatment facility if it meets the facilities criteria and if not it will be disposed of off site.

The concentrations listed above are IRIS risk-based levels.

You shall proceed promptly with the performance of this technical direction. You are to provide a budgetary impact of this direction to the Contracting Officer within 5 days of its issuance. If in your opinion, this direction falls within any of the categories defined in paragraph (b) of clause G8, Technical Direction, of your contract, you shall promptly notify the Contracting Officer in writing. You shall take no action until the Contracting Officer has issued a modification to the delivery order or otherwise resolved the issue.

NSWC-CR
4324-00

PROJECT MEMBER		
PROJECT MANAGER		
PROJECT ENGINEER	Y	
GNL SUPT		
SAFETY AND HEALTH		
QA/QC SUPERVISOR		
PROJECT CONTROLS		
FIELD ENGINEERING		
PMO-CHARLESTON		
FILE:	13.050.0	
FILE:	10-02	
FILE:	11.012	

C-4324	I	A	R
ST	✓		
4	✓		
M	✓		
M		✓	
RCH			
TIM			
M			
FETY			
Y			
		✓	

11-2.9

If you have any questions, contact Jimmy Jones, Code 18011, at 803-743-0544 or DSN 563-0544.

J. F. Jones
COTR RAC II

Copy to:
Code 0232RH
Code 1864
Code 052CH
Code 18B8
Brent Robertson- ROICC NSWC Crane

Risk Screening Documentation
SWMU - 24/00
Sludge Drying Beds A and B

NSWC Crane
Crane, Indiana

Unit Identification Code: N00164
Contract No. N62467-93-D-1106

June 2000

Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina
29419-9010

RISK SCREENING DOCUMENTATION
SWMU - 24/00
Sludge Drying Beds A and B

NSWC CRANE
CRANE, INDIANA

June 2000

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0009
STATEMENT OF WORK #007

Prepared for

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Prepared by:

MORRISON KNUDSEN CORPORATION
1500 West 3rd Street
Cleveland, Ohio 44113

PREPARED/APPROVED BY:

Allan B. Brillinger — 6-18-01
Allan B. Brillinger — Date
MK Senior Geologist

APPROVALS:

for: — 6-18-01
Gregory J. Jones — Date
MK Program Manager

TABLE OF CONTENTS

SECTION		PAGES
1.0	INTRODUCTION	1
1.1	SUMMARY OF FACILITY	1
1.2	SUMMARY OF SWMU	1
1.3	INTERIM MEASURE PERFORMED	5
2.0	IDENTIFICATION OF CONTAMINATED MEDIA	7
3.0	IDENTIFICATION OF CONTAMINANTS OF CONCERN	7
4.0	CURRENT CONDITIONS	9
5.0	CURRENT AND FUTURE LAND USES	9
6.0	DESCRIPTION OF EXPOSURE PATHWAYS	9
6.1	HUMAN RECEPTOR EXPOSURE PATHWAYS	9
6.2	ECOLOGICAL RECEPTOR EXPOSURE PATHWAYS	12
7.0	CURRENT RISKS VS. REMEDIATION GOALS	12
8.0	RISK SCREENING EVALUATION SUMMARY	13
9.0	REFERENCES	15

LIST OF FIGURES

FIGURE		
1	Vicinity Map of NSWC Crane	2
2	Surface Drainage of NSWC Crane	3
3	Location of Solid Waste Management Units	4

LIST OF TABLES

TABLES		
1	SWMU 24/00 Characterization Samples Analytical Results Summary	6
2	NSWC Crane Background/Backfill Samples Analytical Results Summary	8
3	SWMU 24/00 Sludge Bed B Confirmation and Progress Samples Analytical Results Summary	10
4	SWMU 24/00 Contaminants of Concern, Summary of Soil Analytical Data, Cleanup Goals, and Risk Levels	14

ACRONYMS AND ABBREVIATIONS

CAAA	Crane Army Ammunition Activity
CFR	Code of Federal Regulations
EDQL	Ecological Data Quality Limit
HSWA	Hazardous and Solid Waste Amendments
IDEM	Indiana Department of Environmental Management
IM	Interim Measure
IMR	Interim Measures Report
MK	Morrison Knudsen Corporation
NSWC	Naval Surface Warfare Center
RFI	RCRA Facilities Investigation
RCRA	Resource Conservation and Recovery Act
SWMU	Solid Waste Management Unit
SSL	Soil Screening Level
U.S. EPA	United States Environmental Protection Agency
WES	United States Army Corps of Engineers Waterways Experiment Station

1.0 INTRODUCTION

1.1 SUMMARY OF FACILITY

Naval Surface Warfare Center (NSWC) Crane consists of 62,463 acres located approximately 75 miles south of Indianapolis, Indiana as shown in Figure 1. The site provides support for equipment, shipboard weapons systems, and ordnance. In addition, NSWC Crane supports The Crane Army Ammunition Activity (CAAA), including production and renovation of conventional ammunition, as well as storage, shipment, demilitarization, and disposal of conventional ammunition.

The topography of NSWC Crane consists of flat to gently rolling terrain dissected by numerous well-defined drainage basins. Surface elevation ranges from approximately 470 feet at the drain exiting the southern boundary of Crane to 860 feet on a ridge in the west-central portion of the facility. Ridge crests generally range in elevation from 750 to 800 feet [NEESA, 1983].

Natural surface drainage at NSWC Crane are dendritic and define five drainage basins (Figure 2). Sludge Bed A is located in Basin IV which occupies the central portion of the facility. Basin IV eventually empties into a reservoir at the southern boundary of the facility. Sludge Bed B is located in the Basin I drainage area which drains the north and northwest portions of the facility. Basin I eventually empties into Furst Creek, which flows in a westerly direction and crosses the facility boundary [NEESA, 1983]. Both areas are on relatively flat-lying land.

NSWC Crane is underlain by unconsolidated deposits of Quaternary (Pleistocene) age and residual soil derived from Pennsylvanian and Mississippian bedrock. The unconsolidated deposits are limited to the small floodplains and are composed of alluvial, colluvial and paludal (marshland) silt, sand, and gravel; lacustrine clay, silt, and sand; and outwash plain gravel, sand and silt. The remainder of NSWC Crane surficial deposits consist of residual clays and silt from the Pennsylvanian Raccoon Creek Group and Mississippian Stephensport and West Baden Groups with small area of Quaternary clay, silt and sand (Lacustrine deposits). The bedrock units beneath the facility, primarily Raccoon Creek and Stephensport Groups containing predominately sandstone and shale, reportedly dip gently from the Cincinnati Arch to the Illinois Basin in the Southwest [NEESA, 1983]).

Boring logs collected from the facility show the major soil type as a 2- to 3-inch-thick surface layer of brown to tan organic clay loam underlain by clay intermixed with silts and sand. Occasionally, a clay hardpan occurs between 25 to 32 inches below the surface (NEESA 1983).

1.2 SUMMARY OF SOLID WASTE MANAGEMENT UNIT (SWMU)

Promulgation of the United States Environmental Protection Agency's (U.S. EPA's) regulatory program under the Resource Conservation and Recovery Act (RCRA) provided the impetus to identify and control environmental contamination from past practices at NSWC Crane. On December 23, 1989, the EPA issued the federal portion of the final RCRA Part B permit for NSWC Crane to the U.S. Navy and issued the permit renewal for a period of five years on July 31, 1995. This permit contains both the federal and state permit conditions, which were issued separately by the State of Indiana RCRA program. It establishes the Hazardous and Solid Waste Amendment (HSWA) Corrective Action Requirements and Compliance Schedules obligating the U.S. Navy to perform RCRA Facility Investigations (RFIs) at 30 SWMUs, to conduct Corrective Measures Studies and to implement corrective measures, if needed. Interim measures were performed at SWMU 24/00 (Sludge Drying Beds) as part of the RCRA Part B Permit for NSWC Crane.

SWMU 24/00 consists of Sludge Drying Beds A and B. Sludge Bed A is located at the sewage treatment plant, in the east central section of NSWC Crane, as shown in Figure 3. The sewage treatment plant processes wastes from industrial wastewater and sanitary sewer treatment systems. The area is divided into three separate "beds" by two eight-inch wide concrete walls. The individual beds are

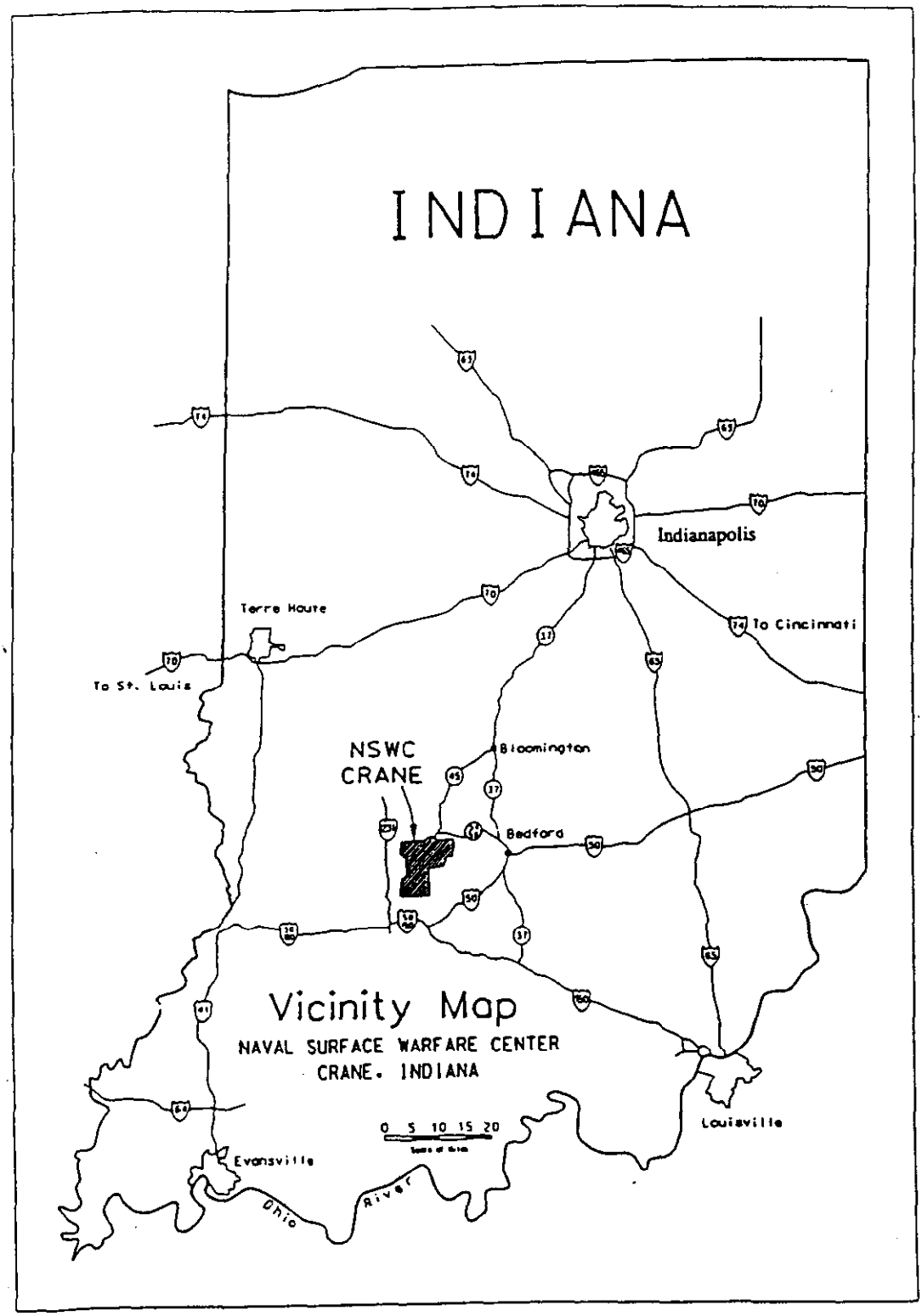


FIGURE 1
NSWC CRANE VICINITY MAP

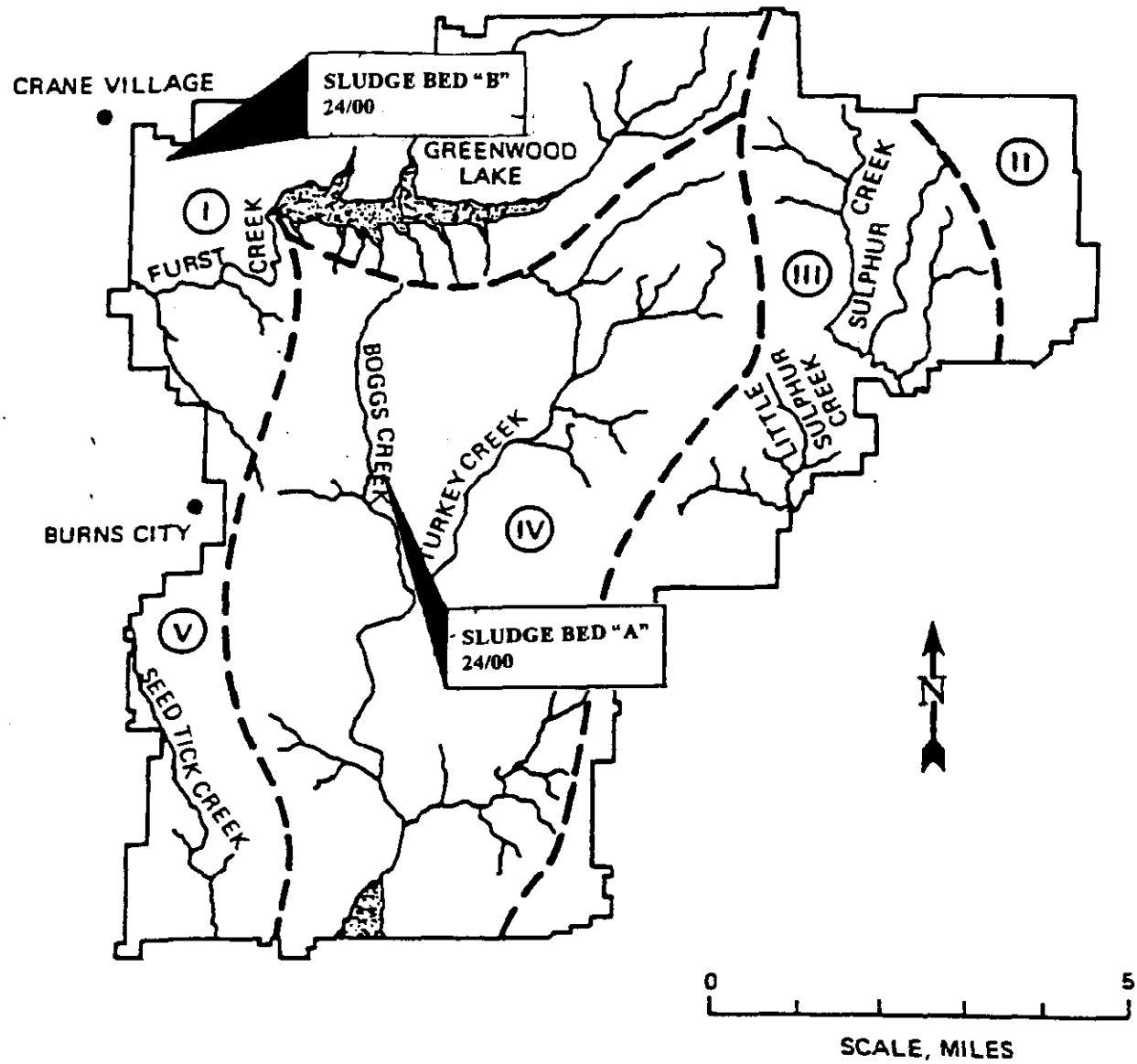


FIGURE 2
SURFACE DRAINAGE OF NSWC CRANE

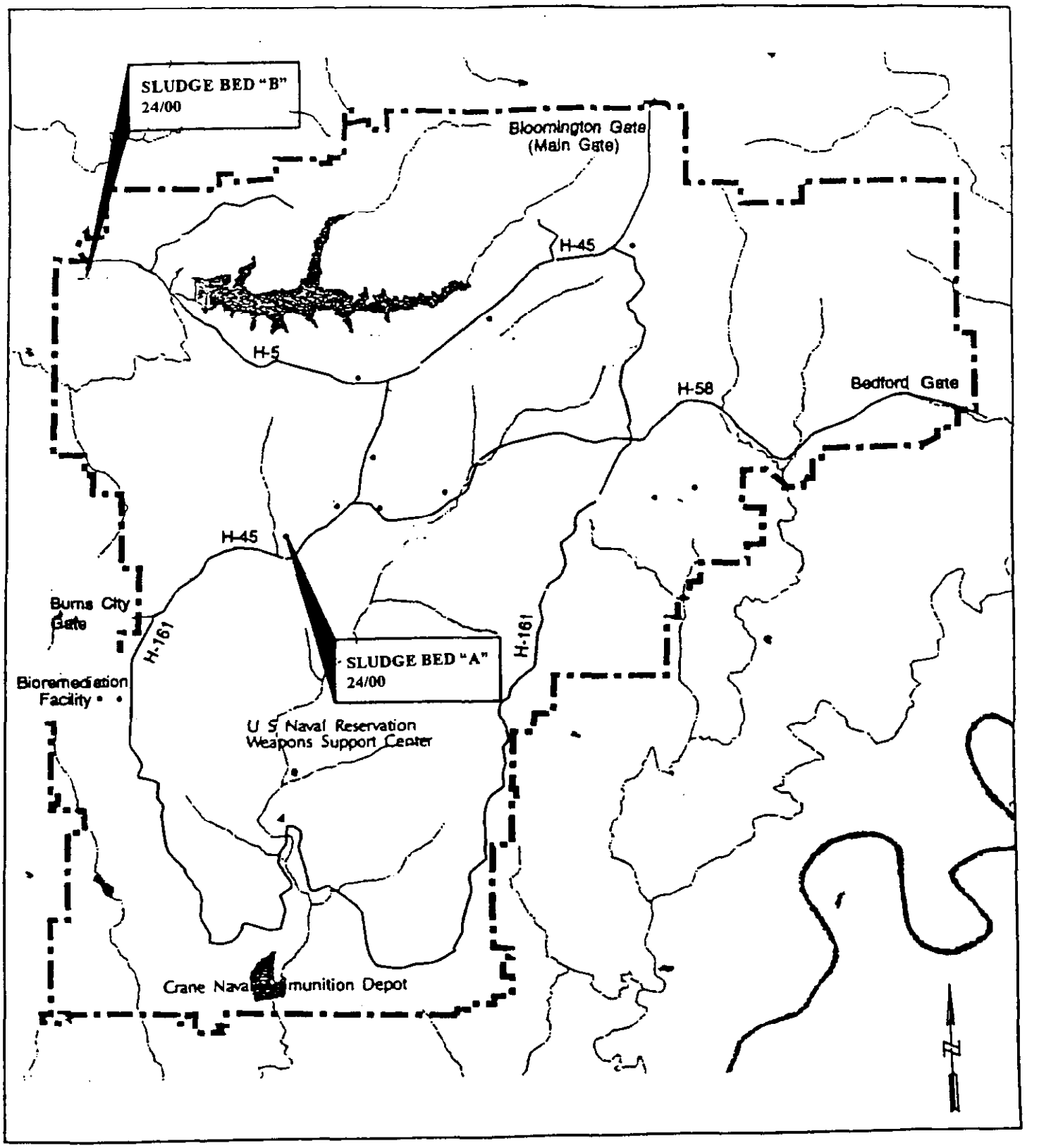


FIGURE 3
LOCATION OF SOLID WASTE MANAGEMENT UNITS

26 feet wide by 50 feet long (inside dimensions). Each bed has an earthen base with clay drainage pipes covered by several layers of gravel. The sludge drying beds have occasionally been used to dewater finished sludges from the treatment plant. Based upon process knowledge, it was believed that Sludge Bed A had the possibility for being contaminated with metals, pesticides and/or herbicides.

Sludge Bed B is located in the northwest section of NSWC Crane, off H-5 as shown in Figure 3. The site was used to dewater sludges from both industrial wastewater and sanitary sewer treatment systems. Sludge Bed B had been out of service for a significant amount of time and was overgrown with vegetation. The area was divided into three separate "beds" by concrete walls which showed signs of deterioration. The individual beds were 19.5 feet wide by 50.25 feet long (inside dimensions). The inside walls were 8-inch wide concrete. Each bed had an earthen base covered with gravel. It was believed that Sludge Bed B was possibly contaminated with metals, pesticides and/or herbicides.

1.3 INTERIM MEASURE PERFORMED

Morrison Knudsen Corporation (MK) prepared the following project documents which describe the procedures to be used in execution of the voluntary Interim Measure (IM) at SWMU 24/00:

> *Work Plan and Task-Specific Health and Safety Plans for SWMUs 16/16 and 24/00,* Revision B, as amended, dated August 18, 1995 [MK, 1995a].
>
> *General Project Plans for Interim Measures Cleanup, Revision C*, August 18, 1995, consisting of the following plans:
>
> - *Quality Control Plan*, Rev. C, August 18, 1995 [MK, 1995b].
> - *Quality Assurance Project Plan*, Rev. C, December 29, 1995 [MK, 1995c].
> - *Waste Management Plan*, Rev. C, August 18, 1995 [MK, 1995d].
> - *Sampling and Analysis Plan*, Rev. C, August 18, 1995 [MK, 1995e].
> - *Environmental Protection Plan*, Rev. C, August 18, 1995 [MK, 1995f].

The *Draft Interim Measures Report, SWMU - 24/00, Sludge Drying Beds A and B, NSWC Crane, Indiana*, (IMR), [MK, 1997] provides a complete summary of the IM activities. This report was submitted by the U.S. Navy to the U.S. EPA on February 25, 1997, and approved by the U.S. EPA on August 3, 1999.

Prior to finalization of the Work Plan, characterization sampling was conducted at Sludge Beds A and B. The characterization sampling was conducted to determine if the industrial sludge deposited in the sludge beds contained organic or inorganic contaminants above target cleanup levels. The target cleanup levels for this IM were taken from *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects,* June 18, 1994 [U.S. EPA, 1994] as site-specific risk based cleanup levels had not been developed for NSWC Crane. As is discussed in Section 3, background levels for arsenic and cobalt were used as the cleanup levels, instead of the guidance document levels.

MK received approval of the Work Plan for SWMU 24/00 from the U.S. EPA on October 10, 1995. The IM at Sludge Bed A was deleted from the work because the characterization sampling did not identify any constituents over the target cleanup criteria (See Table 1). Consequently, Sludge Bed A remained in operation and an IM was conducted at Sludge Bed B, which included complete excavation, backfilling, and seeding to match the original grade.

Approximately 378 tons of excavated sludge and concrete from Sludge Bed B were classified as special waste and transferred to the on-site landfill. Confirmation soil samples were collected following the completion of sludge removal. Fourteen samples (24/00-055 through 24/00-068) were collected on October 17, 1995 and analyzed for Title 40 Code of Federal Regulations (CFR) 264, Appendix IX criteria. The results were below the target cleanup levels except for sample 24/00-068 which contained

TABLE 1
SWMU 24/00 CHARACTERIZATION SAMPLES
ANALYTICAL RESULTS SUMMARY

		SLUDGE BED A			SLUDGE BED B							
	SAMPLE #	24/00-044	24/00-045	24/00-046	24/00-047	24/00-048	24/00-049	24/00-050	24\00-051	24/00-052	24/00-053	24/00-054
	DATE	7/12/95	7/12/95	7/12/95	7/12/95	7/12/95	7/12/95	7/12/95	9/18/95	9/18/95	9/18/95	9/18/95
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Total Sulfide	NA*	82	<40	<41	57	<42	84	41				
Methylene Chloride	22	0.012 (B)	0.026 (B)	0.018 (B)	0.015 (B)	0.011 (B)	0.019 (B)	0.013 (B)				
Acetone	9,200	0.0031 (J)	0.0041 (J)	<0.1	0.0084 (J)	0.0061 (J)	0.0067 (J)	0.0044 (J)				
Chloroform	0.96	<0.0051	<0.0051	<0.0051	<0.007	<0.0052	<0.0052	<0.0052	<0.05	<0.05	<0.05	<0.05
MEK (2-Butanone)	5,200	<0.1	<0.1	<0.1	<0.14	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	2.9	<0.0051	<0.0051	<0.0051	<0.007	<0.0052	<0.0052	<0.0052				
Arsenic	9.4	1.5	2.3	2.3	2.3	1.7	1.6	1.5	<0.02	<0.02	<0.02	<0.02
Berylium	0.4	<0.21	<0.21	<0.22	<0.3	<0.19	<0.2	<0.19				
Cobalt	8.6	4.6	5	5.1	4.8	3.5	4.8	4.4				
Dieldrin	0.053	<0.0033	<0.0033	<0.0033	0.0041 (J)	<0.0034	<0.0034	<0.0034				
Chlordane	0.66	0.033	<0.0033	<0.0033	0.047	0.053	0.034	0.048				
4-methyl-2-pentanone	2,000	<0.051	<0.051	<0.051	<0.07	<0.052	<0.052	<0.052				
4,4, DDT	0.008	<0.0033	<0.0033	<0.0033	***0.0085 (P)***	<0.0034	0.0071 (P)	0.0068 (P)				
4,4, DDE	2.5	<0.0033	<0.0033	<0.0033	0.0051	<0.0034	0.0063	0.0052				
4,4, DDD	3.5	<0.0033	<0.0033	<0.0033	0.0057 (P)	<0.0034	0.015(P)	0.012(P)				
Barium	5.5	28.6	66.1	20.5	16.5	12.2	14	17.7	1.09	0.94	1.21	0.887
Reactive Sulfide									48	<40	<40	<40
Flashpoint									>203	>203	>203	>203
pH									8.7	9.1	9	9.9

Notes:
1) NA* = None Available
2) (P) indicates there is a greater than 25% difference for detected concentrations between the two GC columns. The lower value is reported.
3) (B) indicates the compound was also present in the associated field or trip blank.
4) (J) indicates the value is estimated
5) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.
6) Cleanup goals taken from "RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [U.S. EPA, 1994]. Background/backfill levels are used as cleanup goals for arsenic and cobalt.
7) mg/kg = milligrams per kilogram
8) Blank space indicates compound not analyzed.

4,4-DDT levels above the target cleanup level. Additional excavation was performed on an area approximately five feet long by 10 feet wide with the sample location in the center. Once the removal was complete, five additional confirmation samples (24/00-069 through 24/00-073) were collected and analyzed for constituents listed in 40 CFR 264, Appendix IX. The results were below the target cleanup levels or site background levels.

Upon review of the results, the U.S. EPA approved the area for backfilling [MK, 1997]. The area was backfilled with material from an approved on-site borrow source. The approval for the on-site backfill is in the modified Work Plan contained in Appendix A of the IMR. The backfill, including topsoil, was placed and the site was restored to original grade. The area was seeded, mulched, and subsequently monitored to ensure establishment of adequate ground cover to prevent erosion.

2.0 IDENTIFICATION OF CONTAMINATED MEDIA

All contaminated media was removed from SWMU 24/00 [MK, 1997]. The Sludge Bed B material was determined to be special waste and required approval for landfilling from the Indiana Department of Environmental Management (IDEM). MK filed a special waste approval application with IDEM and was granted *Special Waste Certification no. 50852* to dispose of the waste at the on-site sanitary landfill. The IM performed at this site removed soil and sludge with chemical concentrations above target cleanup levels. Soil to groundwater cross-media contamination is not likely at the remediated SWMU due to the following reasons:

- Groundwater was not encountered in the excavation.
- All soils above the target cleanup goals have been removed from the site and properly disposed of in the on-site landfill. Remaining soils are below the target cleanup goals.

Soil to surface water cross-media contamination is not likely at the remediated SWMU due to the following reason:

- Remaining soils are below the target cleanup goals. All soils above the target cleanup goals have been removed from the site and properly disposed.

3.0 IDENTIFICATION OF CONTAMINANTS OF CONCERN

On July 12, 1995, characterization samples were collected from Sludge Beds A and B to determine contaminant concentrations in the beds and evaluate disposal options. Three samples were collected along the longitudinal centerline of each Sludge Bed at an approximate depth of eight inches. Sample 24/00-044, 24/00,-045, and 24/00-046 were collected from Sludge Bed A. Sample 24/00-047, 24/00-048, 24/00-049, and duplicate sample 24/00-050 were collected from Sludge Bed B. The six soil samples and one duplicate soil sample were analyzed for constituents listed in 40 CFR 264, Appendix IX.

Sludge Bed A characterization sample (24/00-044 through 24/00-046) results were compared to the RCRA cleanup levels [U.S. EPA, 1994] for IM (Table 1) for all detected analytes. Results showed arsenic and cobalt above the target cleanup levels. Background and borrow source samples (BP\BF-001 through BP\BF-006) were collected from undisturbed soil and analyzed for 40 CFR 264, Appendix IX analytes and beryllium (Table 2). The analysis indicated that the background concentrations for arsenic and cobalt are naturally occurring and are above the target cleanup levels. Based on the levels of arsenic and cobalt that are naturally occurring in the surrounding soil, the determination that Sludge Bed A would not require an interim measure was made with the concurrence of IDEM and U.S. EPA. Thus, when the Work Plan was finalized, the IM for Sludge Bed A had been removed.

TABLE 2
NSWC CRANE BACKGROUND/BACKFILL SAMPLES
ANALYTICAL RESULTS SUMMARY

	SAMPLE # (NSWC)	BP\BF-001	BP\BF-002	BP\BF-003	BP\BF-004	BF\BF-005	BF\BF-005RE	BF\BF-006
	SAMPLE DATE	8/12/95	8/12/95	10/12/95	10/12/95	10/27/95	10/27/95	10/27/95
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Methylene Chloride	22	0.021	0.016	<0.0058	0.01	0.041(B)	0.009(B)	0.019(B)
Acetone	9,200	0.011(J)	0.0077(J)	<0.12	<0.11	<0.11	<0.11	<0.11
Arsenic	9.4	9.4	9.0	7.8	6.3	1.9	--	1.8
Cobalt	8.6	3.9	4.6	8.6	7	2.4	--	3.2
Beryllium	0.4	***0.57***	***0.56***	***0.74***	***0.81***	<0.21	--	<0.22
Chloroform	0.96	<0.0062	<0.0061	<0.0058	<0.0057	<0.0053	<0.0053	<0.0056
MEK (2-Butanone)	5,200	<0.12	<0.12	<0.12	<0.11	<0.11	<0.11	<0.11
Bromodichloromethane	3	<0.0062	<0.0061	<0.0058	<0.0057	<0.0053	<0.0053	<0.0056
4-methyl-2-pentanone	2,000	<0.062	<0.061	<0.058	<0.0057	<0.053	<0.053	<0.056
4,4, DDT	0.008	<0.0081	<0.0081	<0.0077	--	<0.0035	--	<0.0037
Tetrachloroethene	Not Established	<0.0062	<0.0061	<0.0058	0.034	<0.0053	0.0014(J)	<0.0056
Toluene	Not Established	<0.0062	<0.0061	<0.0058	0.016	<0.0053	<0.0053	<0.0056
m+p Xylene	Not Established	<0.0062	<0.0061	<0.0058	0.0047(J)	<0.0053	0.0033(J)	<0.0056
o Xylene	Not Established	<0.0062	<0.0061	<0.0058	<0.0057	<0.0053	0.0013(J)	<0.0056

Notes:

1) -- = Not Analyzed
2) (B) indicates the compound was also present in the associated field or trip blank.
3) (J) indicates the value is estimated
4) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.
5) Cleanup goals taken from "RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects," June 1994 [U.S. EPA, 1994]. Background levels used as cleanup goals for arsenic and cobalt.
6) mg/kg = milligrams per kilogram
7) Sample No. BF/BF-005RE was analyzed for volatile compounds only.

Sludge Bed B characterization samples (24/00-047 through 24/00-050) also indicated levels of arsenic and cobalt above the target cleanup levels but within background concentrations. However, sample 24/00-047 contained the pesticide 4,4-DDT at a level above the target cleanup levels. These results are summarized in Table 1, which indicates the compounds in excedence of the interim cleanup levels. Levels of arsenic ranging from 1.3 to 5.3 mg/kg were detected in all of the samples collected. Cobalt was also detected in levels as high as 5.1 mg/kg. Samples collected from virgin soil borrow sources confirmed that levels of arsenic and cobalt above the established cleanup levels are naturally present in soils in the surrounding area. Beryllium was not detected in the characterization samples for Sludge Bed B, but was detected above established cleanup levels in samples collected from virgin soil borrow sources. Table 2 summarizes the background samples (BP/BF-005, BP/BF-006) collected off-site. Beryllium was not detected in the confirmation and progress samples 24/00-055 and -064. Beryllium was detected at levels ranging from 0.23 to 0.46 mg/kg in samples 24/00-056 through -063, and at levels ranging from 0.215 to 0.478 mg/kg in samples 24/00-065 through -073 (Table 3).

Four additional characterization samples (24/00-051 through 24/00-053 and duplicate sample 24/00-054) were collected at Sludge Bed B and analyzed for additional compounds and RCRA characteristics to determine disposal characterization (Table 1). These samples were collected from the same locations as the original four characterization samples at Sludge Bed B but at a depth of 12 inches.

4.0 CURRENT CONDITIONS

The excavated area was backfilled with material from the approved on-site borrow source. The backfill, including topsoil, was placed and the site was restored to original grade. The area was seeded, mulched, and subsequently monitored to ensure establishment of adequate ground cover to prevent erosion. The area is grass covered and surrounded by woods.

5.0 CURRENT AND FUTURE LAND USES

Based on analytical results of the characterization samples collected at Sludge Bed A, it was determined that Interim Measures would not be required. Sludge Bed A is currently being used to process sludges from industrial wastewater and sanitary sewer systems. This use is expected to continue in the future.

Former Sludge Bed B has been totally excavated and disposed of at an on-site disposal area. The excavated area was backfilled, graded, and seeded. The area currently is grass covered and surrounded by woods. The site is currently being used as a habitat for local wildlife. It is not currently being used by the NSWC Crane facility, and there are no plans for the facility to use this site in the future.

6.0 DESCRIPTION OF EXPOSURE PATHWAYS (SLUDGE DRYING BED B)

6.1 HUMAN RECEPTOR EXPOSURE PATHWAYS

All soil with chemical concentrations above the clean-up goals was removed from the Sludge Bed B location. The excavation was backfilled with soil from on-site borrow areas. Humans are potentially exposed to several routes of exposure. The following routes of exposure are considered for human receptors:

<u>Soil</u> The soil contaminants remaining around the SWMU, and soil used to backfill areas around the SWMU disturbed during excavation, are below the clean-up goals for this site. Humans would be exposed to the soil at the site by traveling through the site, or digging at the site. Human exposure to contaminants in soil has been limited by

TABLE 3
SWMU 24/00 SLUDGE BED B CONFIRMATION AND PROGRESS SAMPLES
ANALYTICAL RESULTS SUMMARY

	SAMPLE #	24/00-055	24/00-056	24/00-057	24/00-058	24/00-059	24/00-060	24/00-061	24/00-062	24/00-063	24/00-064	24/00-065	24/00-066	24/00-067	24/00-068
	DATE	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95	10/17/95
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Total Sulfide	NA*	--	--	--	--	--	--	--	--	66	--	--	--	--	--
Methylene Chloride	22	0.008	<0.0053	0.0038 (J)	<0.0055	0.057	0.0051(J)	0.0048 (J)	0.0039 (J)	0.014	0.0036 (J)	0.011	0.015	0.018	0.013
Acetone	9,200	0.023 (J)	<0.11	0.017 (J)	0.019(J)	0.011(J)	0.010 (J)	0.015 (J)	0.013 (J)	0.018 (J)	0.0091 (J)	0.024 (J)	0.022 (J)	<0.11	<0.11
4-methyl-2-pentanone	2,000	<0.055	<0.053	<0.056	<0.055	<0.054	<0.053	<0.056	<0.056	<0.056	<0.054	<0.056	<0.057	<0.053	0.013 (J)
Tetrachloroethene	22	0.0051 (J)	0.013	0.015	0.0059	0.0037(J)	0.0021 (J)	0.004 (J)	0.0034 (J)	0.0091	<0.0054	0.007	0.0034 (J)	0.026	0.0066
Trichloroethene	14	<0.0055	0.004J	0.0047J	<0.0055	0.0018J	0.019	0.0022J	<0.0056	0.03	<0.0054	0.005J	0.0073	0.025	0.035
Toluene	280	<0.0055	<0.0053	<0.0056	0.012	<0.0054	<0.0053	<0.0056	<0.0056	<0.0056	<0.0054	<0.0056	<0.0057	0.0039J	<0.0053
Arsenic	9.4	1.7	2.9	4.3	4	3.1	3.7	3.1	2.8	4.7	1.3	5.3	3.4	3.4	3.2
Cobalt	8.6	1.4	3.3	2.2	3	3.8	4.8	4.4	2.2	2.3	2	3.4	4.2	4.2	4.3
Beryllium	0.4	<0.21	0.27	***0.46***	0.37	0.26	0.25	0.27	0.23	0.3	<0.21	***0.41***	0.3	0.26	0.24
Phenanthrene	0.66	<0.36	<0.34	<0.36	0.077J	0.037J	<0.35	<0.36	<0.36	<0.36	<0.35	<0.37	<0.37	0.068J	<0.35
Fluoranthene	1,600	<0.36	<0.34	<0.36	0.078J	<0.36	0.081J	<0.36	<0.36	<0.36	<0.35	<0.37	<0.37	0.063J	0.041J
Pyrene	1,200	<0.36	<0.34	<0.36	0.087J	<0.36	0.067J	<0.36	<0.36	<0.36	<0.35	<0.37	<0.37	0.066J	0.036J
Benzo(a)anthracene	0.66	<0.36	<0.34	<0.36	0.039J	<0.36	<0.35	<0.36	<0.36	<0.36	<0.35	<0.37	<0.37	<0.34	<0.35
Chrysene	0.8	<0.36	<0.34	<0.36	<0.36	<0.36	0.044J	<0.36	<0.36	<0.36	<0.35	<0.37	<0.37	<0.34	<0.35
1,2,3,4,6,7,8,9-OCDD	NA*	0.000427	<0.0003	<0.00039	<0.00034	<0.00033	0.000353	<0.00033	--	0.000246	<0.00009	<0.00017	0.000389	0.000524	0.000601
2,4,D	390	<0.055	<0.51	<0.056	<0.053	<0.051	<0.049	<0.055	<0.05	<0.052	<0.05	<0.048	<0.057	<0.051	<0.052
Silvex	0.11	<0.055	<0.51	<0.056	<0.053	<0.051	<0.049	<0.055	<0.05	<0.052	<0.05	<0.048	<0.057	<0.051	<0.052
4,4 DDT	0.008	<0.0036	<0.0035	<0.0037	<0.0036	<0.0036	<0.017	<0.0036	<0.0036	<0.0036	<0.0035	<0.0037	<0.0038	<0.017	0.012(P)
4,4-DDE	2.5	<0.0036	<0.0035	<0.0037	<0.0036	<0.0036	0.019	<0.0036	<0.0036	<0.0036	<0.0035	<0.0037	0.0044(P)	<0.017	0.0091
Chlordane	0.66	<0.036	<0.035	<0.037	<0.036	<0.036	<0.17	<0.036	<0.036	<0.036	<0.035	<0.037	<0.038	<0.17	0.012(P)
Endosulfan	2	<0.0018	<0.0017	<0.0018	0.0018	0.0022(P)	<0.0087	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	<0.0019	0.0086(P)	<0.0039

Notes:

1) NA* = None Available

2) '-- = Not Analyzed

3) (B) indicates the compound was also present in the associated field,trip, or method blank.

4) (J) indicates the value is estimated

5) (P) indicates there is a greater than 25% difference for detected concentrations between the two GC columns. The lower value is reported.

6) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.

7) Cleanup goals taken from "RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [USEPA, 1994]. Background levels used as cleanup goals for arsenic and cobalt.

8) mg/kg = milligrams per kilogram

TABLE 3
SWMU 24/00 SLUDGE BED B CONFIRMATION AND PROGRESS SAMPLES
ANALYTICAL RESULTS SUMMARY

	SAMPLE #	24\00-069	24/00-070	24/00-071	24/00-072	24/00-073
	DATE	2/7/96	2/7/96	2/7/96	2/7/96	2/7/96
	TYPE	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOUND	CLEANUP LEVEL mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Methylene Chloride	22,000	0.003 (J,B)	0.004 (J,B)	0.003 (J,B)	0.003 (J,B)	0.003 (J,B)
Acetone	9,200,000	0.012	0.007 (J)	<0.012	<0.011	<0.013
Cobalt	8.6	1.97 (B)	0.844 (B)	1.69 (B)	1.89 (B)	2.34 (B)
Arsenic	9.4	5	2.99	4.57	2.53	4.85
Beryllium	0.4	0.37 (B)	0.31 (B)	***0.48 (B)***	0.25 (B)	0.21 (B)
Dieldrin	0.053	0.00033 (J)	0.00011(J,P)	0.000089 (J,P)	<0.0015	<0.000082 (J,P)
4,4-DDE	2.5	0.0002(J,P)	0.0003	0.00019(J,P)	<0.0035	0.00019(J,P)
4,4-DDD	3.5	<0.0041	<0.0041	0.00018 (J,P)	<0.0035	<0.0041
4,4-DDT	0.008	<0.0041	0.00018 (J,P)	0.00027(J)	<0.0035	<0.0041
Endosulfan I	2	<0.0018	<0.0017	0.00013 (J,B,P)	<0.0015	<0.0017
Endosulfan II	2	<0.0041	0.00016(J,P)	<0.0041	<0.0035	<0.0041
Methoxychlor	200	0.00074(J)	0.00041(J,P)	<0.0041	<0.0035	<0.00029 (J,P)
delta BHC	0.00603	<0.0012	0.000088 (J,P)	0.000081(J)	<0.00099	0.000068(J)
alpha BHC	0.0201	<0.0012	<0.0012	<0.0012	0.00010(J,P)	<0.012

Notes:

1) NA* = None Available

2) '– = Not Analyzed

3) (B) indicates the compound was also present in the associated field,trip, or method blank.

4) (J) indicates the value is estimated

5) (P) indicates there is a greater than 25% difference for detected concentrations between the two GC columns. The lower value is reported.

6) Centered and bold italic sample results with asterisk indicate that sample analytical result is greater than the cleanup goal.

7) Cleanup goals taken from "RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects, " June 1994 [USEPA, 1994]. Background levels used as cleanup goals for arsenic and cobalt.

8) mg/kg = milligrams per kilogram

removal of soil with contaminant levels above the cleanup goals. The excavated area has been backfilled, graded, and seeded and there are currently no plans to excavate at the site. The site is currently grass covered.

Groundwater — Groundwater is not currently being used in the vicinity of the site. Leaching of contaminants from the soil to the groundwater has been limited by the removal of soils above the cleanup levels. The only contaminant encountered at this site was the pesticide 4'4-DDT, which is not likely to be found in groundwater in significant quantities.

Surface water — Surface water is not present at SWMU 24.

Air — Wind erosion and atmospheric dispersion of contaminants at the site are limited by removal of soil with contaminant levels above the cleanup goals and backfilling the area with clean soil. The area was also seeded and is currently grass covered. The grass covered area will limit soil dispersal from the site.

6.2 ECOLOGICAL RECEPTOR EXPOSURE PATHWAYS

All soil with chemical concentrations above the clean-up goals have been removed from the Sludge Bed B location. The excavation was then backfilled with soil from on-site borrow areas. Ecological receptors are potentially exposed to several routes of exposure. The following routes of exposure are considered for ecological receptors:

Soil — The soil contaminants remaining around the SWMU, and soil used to backfill areas around the SWMU disturbed during excavation, are below the clean-up goals for this site. Ecological receptors would be exposed to the soil at the site by traveling through the site, or digging at the site or in the case of vegetation, growing at the site. Ecological receptors' exposure to contaminants in soil has been limited by removal of soil with contaminant levels above the cleanup goals.

Groundwater — Groundwater is not currently being used in the vicinity of the site. Leaching of contaminants from the soil to the groundwater has been limited by the removal of soils above the cleanup levels. The only contaminant encountered at this site was the pesticide 4'4-DDT, which is not likely to be found in groundwater in significant quantities.

Surface water — Surface water is not present at SWMU 24.

Air — Wind erosion and atmospheric dispersion of contaminants at the site are limited by removal of soil with contaminant levels above the cleanup goals and backfilling the area with clean soil. The area was also seeded and is currently grass covered. The grass covered area will limit soil dispersal from the site.

7.0 CURRENT RISKS VS. REMEDIATION GOALS

A quality assurance program, in accordance with the procedures set forth in the *Quality Control Plan for Interim Measures Cleanup* [MK, 1995], was followed for the IM at SWMU 24/00. A complete description of the quality assurance program and its relationship to the remediation goals for the IM at SWMU 24/00 is contained in the IMR, and is summarized as follows:

- All samples collected from SWMU 24/00 were transported from the field to the laboratory using proper chain-of-custody procedures.

- Field quality control samples were collected to identify potential sources of error or cross contamination that may have occurred during collection, storage, or shipment of samples to the laboratory. Field quality control samples included trip blanks, field duplicates, and an equipment rinsate sample.

- The laboratory performed method blank, sample matrix spike, sample matrix spike duplicate, surrogate, and standard matrix spike analyses in order to evaluate laboratory accuracy, precision, representativeness, comparability, and completeness.

Overall, data quality objectives for accuracy, precision, representativeness, comparability, and completeness were met, and the data was considered acceptable.

The sludge and associated contaminated soil above the cleanup goals have been removed from Drying Bed B. The target cleanup levels for these interim measures were taken from the *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects*, June 18, 1994 (U.S. EPA, 1994). The excavated soils were replaced with soil from on-site borrow areas. Table 4 presents comparisons of the confirmation, background and borrow source sample concentrations, cleanup levels, and human and ecological receptor Ecological Data Quality Limit (EDQL) and Soil Screening Levels (SSL) values for the contaminants of concern at Sludge Bed B. A summary of the values in Table 4 follows:

- Cobalt concentrations in the background and backfill samples are above the EDQL. The confirmation concentrations are within the range of concentrations detected in the background and backfill samples.

- 4,4-DDT concentrations were not detected in the confirmation, background and backfill samples and are less than the cleanup goals, EDQL, and the SSL (ingestion).

- Beryllium was detected in one confirmation sample above the cleanup goal and above the SSL for ingestion, but below the EDQL and SSL for inhalation.

- Arsenic concentrations were detected below the SSL for inhalation, but above the EDQL and SSL for ingestion. The arsenic concentrations for the confirmation samples were within the range of concentrations detected for the backfill and background samples.

8.0 RISK SCREENING EVALUATION SUMMARY

The final confirmation sampling results (samples 24/00-069 through -073 dated February 7, 1996) indicate the levels of the constituents analyzed are below the criteria established for interim measures cleanup. The Navy submitted these results to the U.S. EPA, who compared them to Region V Data Quality Limits. The U.S. EPA accepted the confirmation sampling results and approved the area for backfill and restoration. Considering the work performed at SWMU 24/00, the confirmation sample results and the acceptance of the physical work by the Navy, it is recommended that this site be considered as meeting the requirements and objectives of the Interim Measures Cleanup Activities and requiring no further action.

TABLE 4
SWMU 24 CONTAMINANTS OF CONCERN
SUMMARY OF SOIL ANALYTICAL DATA, CLEANUP GOALS, AND RISK LEVELS
NSWC CRANE, INDIANA

Element	Cleanup Goal	Range		Ecological Risk	Human Risk	
		Confirmation Samples	Background/ Backfill Samples	EDQL	Ingestion	Inhalation
4,4-DDT	0.008	ND - 0.00027	ND	0.018	2	NA
Beryllium	0.4	ND - 0.478	ND - 0.81	1.06	0.1	1,300
Cobalt	8.6	0.844 - 3.3	2.4 - 8.6	0.140	NA	NA
Arsenic	9.4	1.3 - 5.3	1.8 - 9.4	5.7	0.4	750

Notes:
1) All levels in mg/kg
2) Ranges of confirmation samples obtained from Table 3
3) Ranges of Backfill and Background samples obtained from Table 2
4) Ecological Risk levels obtained from Region 5 Model QAP Appendix C
5) EDQL = Ecological Data Quality Limit
6) Human Risk levels obtained from Region 5 Model QAP Appendix D
7) NA = Not Available
8) ND = Not Detected
9) Cleanup goals taken from "*RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects," [U.S. EPA, 1994].*
Background levels are used as cleanup goals for arsenic and cobalt.

9.0 REFERENCES

Morrison Knudsen Corporation, (MK) 1995a. *Work Plan for Interim Measures Cleanup at Solid Waste Management Units #16/16 AND #24/00*, Revision B, as amended dated August 18, 1995.

Morrison Knudsen Corporation, (MK) 1995b. *Task-Specific Site Safety and Health Plan, Supplement to Work Plan for Solid Waste Management Units #16/16 AND #24/00*, Revision B, dated August 18, 1995.

Morrison Knudsen Corporation, (MK) 1995c. *Quality Control Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995d. *Quality Assurance Project Plan for RCRA Corrective Action Interim Measures Cleanup, NSWC Crane, Crane, Indiana* Revision C, December 1995.

Morrison Knudsen Corporation, (MK) 1995e. *Waste Management Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995f. *Sampling and Analysis Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995g. *Environmental Protection Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1997. *Draft Interim Measures Report, SWMU - 24/00, Sludge Drying Beds A and B, Volumes 1 and 2*, February 1997.

Naval Energy and Environmental Support Activity. (NEESA) 1983. *Initial Assessment Study of Naval Weapons Support Center Crane, Indiana.* NEESA 13-003, May.

U.S. Environmental Protection Agency (U.S. EPA) 1994. *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects.* June 18, 1994.

Risk Screening Documentation
SWMU-26/08D
Highway 58 Dump Site B

NSWC Crane
Crane, Indiana

Unit Identification Code: N00164
Contract No. N62467-93-D-1106

June 2000

Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina
29419-9010

RISK SCREENING DOCUMENTATION
SWMU-26/08D
Highway 58 Dump Site B

NSWC CRANE
CRANE, INDIANA

June 2000

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0009
STATEMENT OF WORK #007

Prepared for

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Prepared by:

MORRISON KNUDSEN CORPORATION
1500 West 3rd Street
Cleveland, Ohio 4113

PREPARED/APPROVED BY:

Al Brillinger — 6-18-01
Al Brillinger — Date
MK Senior Geologist

APPROVALS:

for: — 6-18-01
Gregory J. Jones — Date
MK Program Manager

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1
	1.1 SUMMARY OF FACILITY	1
	1.2 SUMMARY OF SOLID WASTE MANAGEMENT UNIT (SWMU)	1
	1.3 INTERIM MEASURE PERFORMED	5
2.0	IDENTIFICATION OF CONTAMINATED MEDIA	5
3.0	IDENTIFICATION OF CONTAMINANTS OF CONCERN	7
4.0	CURRENT CONDITIONS	7
5.0	CURRENT AND FUTURE LAND USES	18
6.0	DESCRIPTION OF EXPOSURE PATHWAYS	18
	6.1 HUMAN RECEPTOR EXPOSURE PATHWAYS	18
	6.2 ECOLOGICAL RECEPTOR EXPOSURE PATHWAYS	18
7.0	CURRENT RISKS VS. REMEDIATION GOALS	19
8.0	RISK SCREENING EVALUATION SUMMARY	21
9.0	REFERENCES	22

LIST OF FIGURES

FIGURES		
1	NSWC Crane Vicinity Map	2
2	Surface Drainage of NSWC Crane	3
3	Location of Solid Waste Management Units	4
4	Sample Locations	6

LIST OF TABLES

TABLES		
1	Characterization Sample Analytical Results Summary	8
2	Progress Sample Analytical Results Summary	10
3	Confirmation Sample Analytical Results Summary	16
4	Background and Borrow Pit Analytical Results	17
5	SWMU 26 Contaminants of Concern, Summary of Soil Analytical Data, Cleanup Goals, and Risk Levels	20

ACRONYMS AND ABBREVIATIONS

CAAA	Crane Army Ammunition Activity
CFR	Code of Federal Regulations
HSWA	*Hazardous and Solid Waste Amendments*
IM	Interim Measure
IMR	Interim Measures Report
MK	Morrison Knudsen Corporation
NSWC	Naval Surface Warfare Center
NEESA	Naval Energy and Environmental Support Activity
RFI	RCRA Facilities Investigation
RCRA	Resource Conservation and Recovery Act
SWMU	Solid Waste Management Unit
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

1.1 SUMMARY OF FACILITY

Naval Surface Warfare Center (NSWC) Crane consists of 62,463 acres located approximately 75 miles south of Indianapolis, Indiana, as shown in Figure 1. The facility provides support for equipment, shipboard weapons systems, and ordnance. In addition, NSWC Crane supports the Crane Army Ammunition Activity (CAAA) that includes the production, renovation, storage, shipment, demilitarization and disposal of conventional ammunition.

The topography of NSWC Crane consists of flat to gently rolling terrain dissected by numerous well-defined drainage basins. Surface elevation ranges from approximately 470 feet at the drainage exiting the southern boundary of Crane to 860 feet on a ridge in the west-central portion of the facility. Ridge crests generally range in elevation from 750 to 800 feet [NEESA, 1983].

Natural surface drainage at NSWC Crane is dendritic and consists of five drainage basins. Dump Site B is located in Basin IV which occupies the central portion of the facility (Figure 2). Surface drainage in the immediate area of Dump Site B empties into Turkey Creek. All surface drainage from the NSWC empties into the East Fork of the White River south of the installation [NEESA, 1983].

NSWC Crane is underlain by unconsolidated deposits of Quaternary (Pleistocene) age and residual soil derived from Pennsylvanian and Mississippian bedrock. The unconsolidated deposits are limited to the small floodplains and are composed of alluvial, colluvial, and paludal (marshland) silt, sand, and gravel; lacustrine clay, silt, and sand; and outwash plain gravel, sand, and silt. The remainder of NSWC Crane surficial deposits consist of residual clays and silt from the Pennsylvanian Raccoon Creek Group and Mississippian Stephensport and West Baden Groups with small area of Quaternary clay, silt, and sand (Lacustrine deposits). The bedrock units beneath the facility, primarily Raccoon Creek and Stephensport Groups containing predominately sandstone and shale, reportedly dip gently from the Cincinnati Arch to the Illinois Basin in the Southwest [NEESA, 1983].

Boring logs collected from the facility show the major soil type is a 2- to 3-inch-thick surface layer of brown to tan organic clay loam underlain by clay intermixed with silts and sand. Occasionally, a clay hardpan occurs between 25 and 32 inches below the surface [NEESA, 1983].

1.2 SUMMARY OF SOLID WASTE MANAGEMENT UNIT (SWMU)

Promulgation of the United States Environmental Protection Agency's (U.S. EPA's) regulatory program under the Resource Conservation and Recovery Act (RCRA) provided the impetus to identify and control environmental contamination from past practices at NSWC Crane. On December 23, 1989, the U.S. EPA issued the Federal portion of the final RCRA Part B permit for NSWC Crane to the U.S. Navy. The permit renewal, for a period of five years, was issued on July 31, 1995. This permit also contains the State permit conditions, which were issued separately by the State of Indiana RCRA program. The permit establishes the Hazardous and Solid Waste Amendment (HSWA) corrective action requirements and compliance schedules which obligate the U.S. Navy to perform a RCRA Facility Investigation (RFI) at 30 SWMUs, to conduct Corrective Measures Studies, and to implement corrective measures if needed. Voluntary interim measures were performed at SWMU-26/08D (Highway 58 Dump Site B) as part of the RCRA Part B Permit for NSWC Crane.

SWMU 26/08D, Highway 58 Dump Site B, is located in the central portion of NSWC Crane, as shown in Figure 3. The disposal area, covering approximately 160 feet by 43 feet, is located at the bottom of a stone cliff and slopes gently toward the south. The area surrounding SWMU 26/08D is heavily wooded

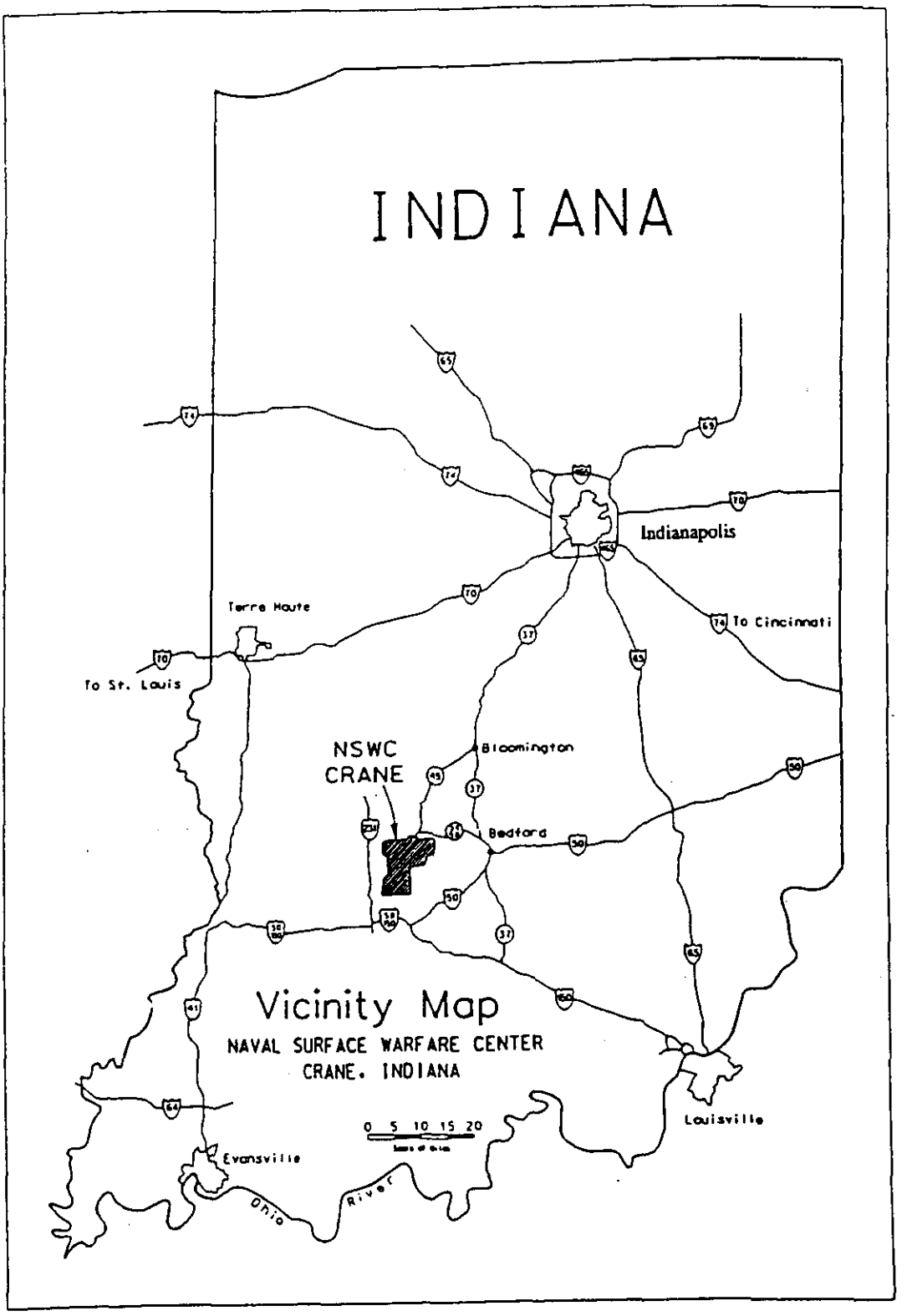


FIGURE 1
NSWC CRANE VICINITY MAP

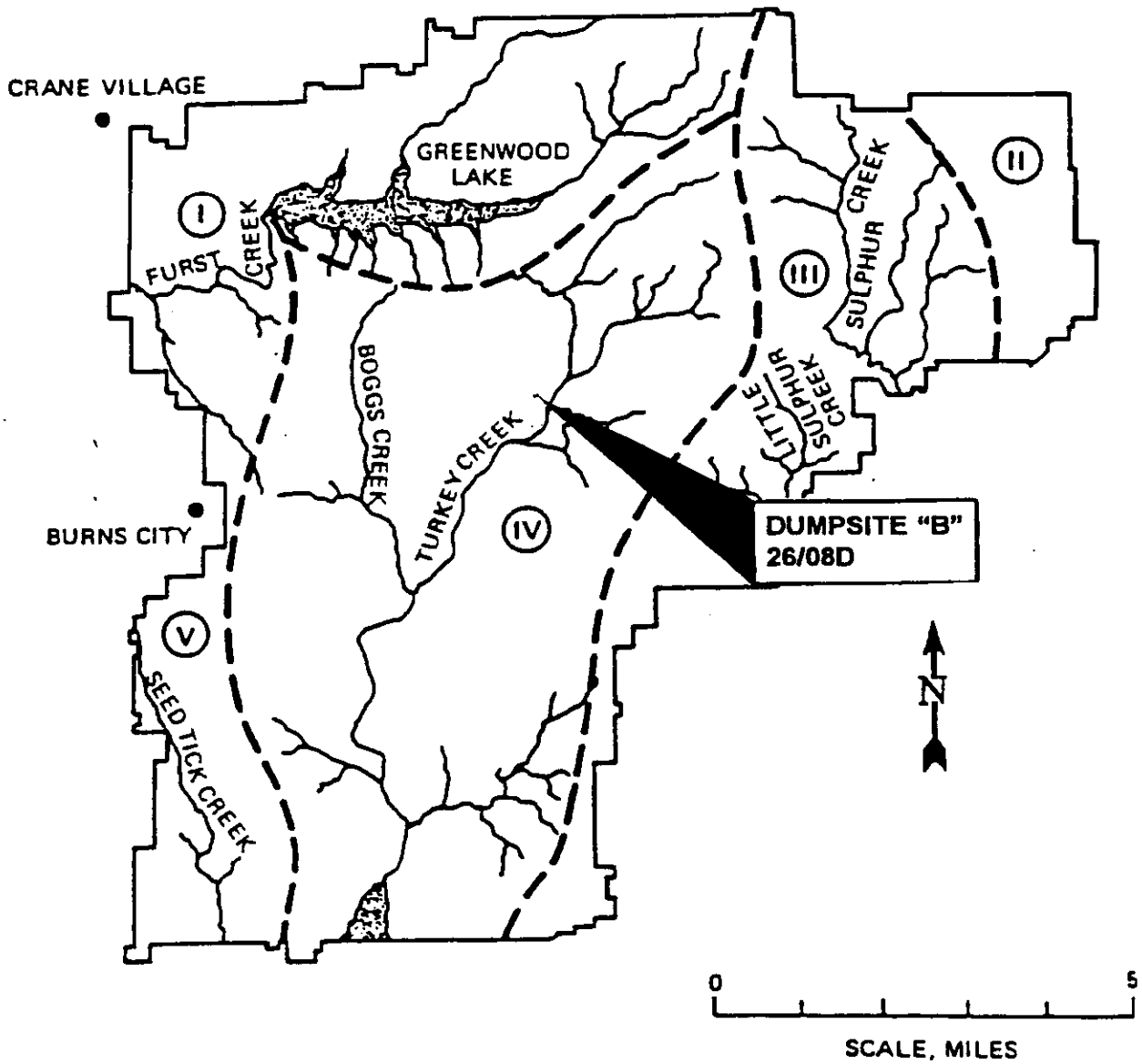


FIGURE 2
SURFACE DRAINAGE OF NSWC CRANE

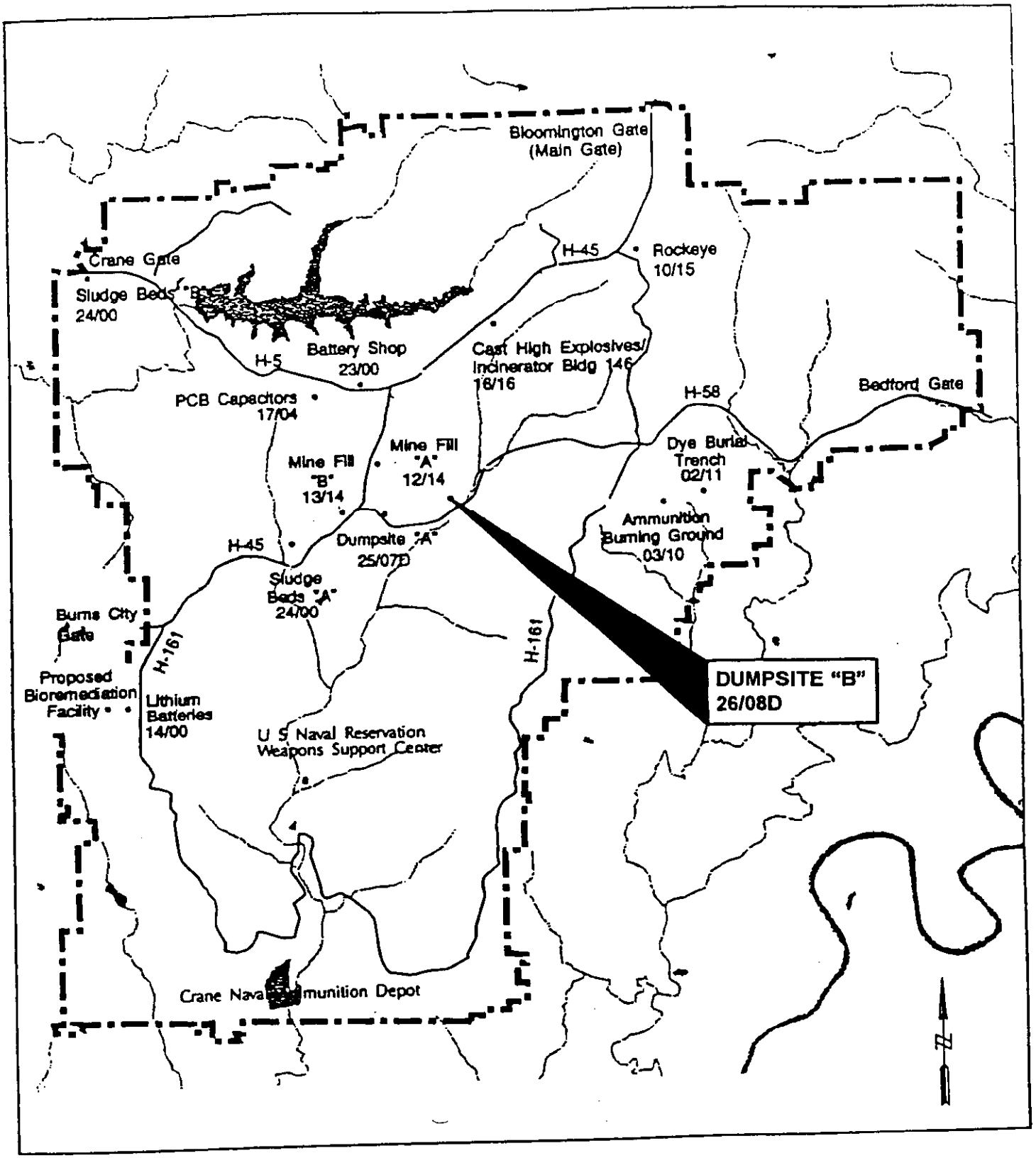


FIGURE 3
LOCATION OF SOLID WASTE MANAGEMENT UNITS

with underbrush and a thick layer of leaves covering the ground. SWMU 26/08D currently is exposed bedrock with a covering of leaves and brush piles. Access to the site is via a gravel lane off Highway 58 (H-58).

1.3 INTERIM MEASURE PERFORMED

Morrison Knudsen Corporation (MK) prepared the following project documents that described the procedures used to execute the voluntary Interim Measure (IM) at SWMU-26/08D :

- *Work Plan for Interim Measures Cleanup at Solid Waste Management Units #23/00, #25/07D, and #26/08D*, Revision B, as amended dated August 25, 1995 [MK, 1995a]

- *Task-Specific Site Safety and Health Plan, Supplement to Work Plan for Solid Waste Management Units #23/00, #25/07D, and #26/08D*, Revision B, dated August 25, 1995 [MK, 1995b]

- *General Project Plans for Interim Measures Cleanup*, Revision C, August 18, 1995, consisting of the following plans:

  - *Quality Control Plan*, Rev. C, August 18, 1995 [MK, 1995c]
  - *Quality Assurance Project Plan*, Rev. C, December 29, 1995 [MK, 1995d]
  - *Waste Management Plan*, Rev. C, August 18, 1995 [MK, 1995e]
  - *Sampling and Analysis Plan*, Rev. C, August 18, 1995 [MK, 1995f]
  - *Environmental Protection Plan*, Rev. C, August 18, 1995 [MK, 1995g]

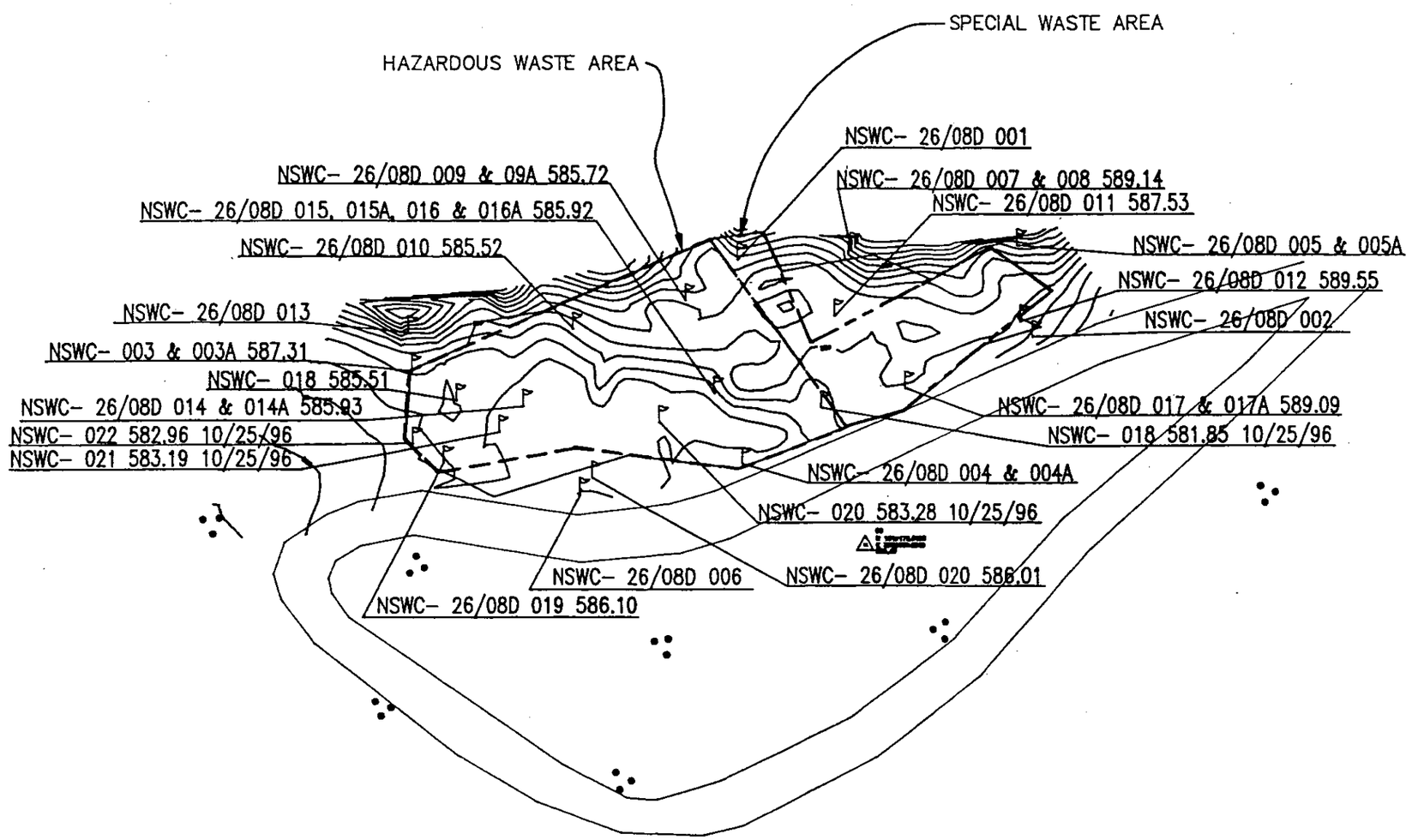
MK received approval of the Work Plan for SWMUs #23/00, #25/07D, and #26/08D on September 27, 1995.

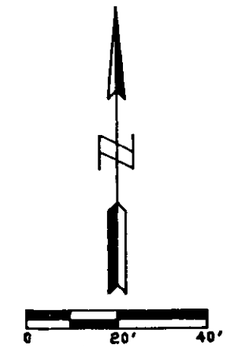
Debris was removed from Dump Site B using hand and machine methods in late 1995 and early 1996. Excavation continued until bedrock was exposed. Approximately 849 tons of soil containing non-friable asbestos material (transite), 120 tons of soil contaminated with barium and lead classified as hazardous waste, and 44 tons of soil classified as non-hazardous "special waste" were removed from SWMU-26/08D. The asbestos-containing material was loaded into trucks and transported to the Southside Landfill in Indianapolis, Indiana. The hazardous and "special" wastes were transported to Heritage Environmental Services in Indianapolis, Indiana. Twenty-five progress and confirmation samples were obtained in 1996 at the locations shown in Figure 4. Review of the analytical results for these samples shows that material remaining in the excavation is below the target cleanup levels, with the exception of arsenic and cobalt. The concentration of these compounds remaining in the soil are comparable to natural background levels. The site was restored and graded in Fall, 1996. Minimal backfilling was required due to the entire area being excavated down to bedrock. Therefore, soil erosion was not a concern and revegetation was not required.

The *Draft Interim Measures Report (IMR), SWMU -26/08D, Highway 58 Dump Site B, NSWC Crane, Indiana*, [MK, 1997], is a complete report of the IM activities.

2.0 IDENTIFICATION OF CONTAMINATED MEDIA

All contaminated soil and associated debris have been removed from SWMU 26/08D [MK, 1997]. The primary source of contamination at SWMU 26/08D prior to remediation was the material disposed of in Dump Site B. The primary source contaminated the soil (secondary source) in and around the dump site. Visual inspection of Highway 58 Dump Site B revealed scattered debris consisting of paper,





LEGEND

- MANHOLE
- SAMPLES
- GUARD POST
- SIGN

Special Waste Area = 1847 SQ FT.

Hazardous Waste Area = 3635 SQ FT.

SWMU-26/08D
DUMP SITE B
NSWC CRANE
CRANE, INDIANA

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FIGURE 4
SAMPLE LOCATIONS

SOURCE: MSE CORPORATION, 1996

DWG DATE: 6/28/00

DWG NAME: CRANE

cardboard containers, styrofoam, plastics, glass, scrap metal, containers, drums, cinder block fragments, corrugated pipe, and transite siding. Approximately 849 tons of soil containing non-friable asbestos material (transite), 120 tons of soil contaminated with barium and lead classified as hazardous waste, and 44 tons of soil classified as non-hazardous special waste were removed from SWMU-26/08D. All contaminated soil and associated debris were removed from the site. Furthermore, all soils above the target cleanup goals were been removed from the site and properly disposed of, therefore, soil to surface water cross-media contamination is not likely at the remediated SWMU. Groundwater quality has not been determined as of this submittal, and will be evaluated at a later date.

3.0 IDENTIFICATION OF CONTAMINANTS OF CONCERN

Soil sample analyses were performed following U.S. EPA SW-846 [U.S. EPA, 1996] methodologies. Sample locations are shown in Figure 4. Initial and supplemental characterization samples were analyzed for Title 40 Code of Federal Regulations (CFR) 264, Appendix IX analytes, hazardous constituents, RCRA characteristics, and asbestos. Results indicated the presence of antimony, arsenic, barium, beryllium, cobalt, lead and asbestos above the target cleanup levels. The target cleanup levels for these interim measures were taken from the *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects*, June 18, 1994 [U.S. EPA, 1994]. Additional metallic and organic constituents listed in 40 CFR 261 Appendix VIII were detected above the target cleanup levels, such as arsenic at 14.6 milligrams per kilogram (mg/kg), beryllium at 0.88 mg/kg, cobalt at 3.5 mg/kg as well as benzo[b]fluoranthene (810 mg/kg), benzo[k]fluoranthene (710 mg/kg), benzo[a]pyrene (680 mg/kg), dibenz[a,h]anthracene (170 mg/kg), and benzo[g,h,i]perylene (870 mg/kg). Table 1 summarizes all analytes from the characterization samples.

Progress samples were analyzed for similar compounds and confirmation samples were analyzed for barium and lead to verify that contaminants were removed to below cleanup levels. Tables 1, 2 and 3 provide a comparison of conditions at the site prior to, during, and following remedial actions taken during the interim measures activities. Arsenic, beryllium, and cobalt, were detected in the progress samples above cleanup levels at concentrations as high as 14.2 mg/kg, 0.920 mg/kg, and 12.7 mg/kg, respectively. However, high levels are not uncommon in undisturbed soils in the area. Table 4 summarizes the results of background samples collected from the on-site borrow pit, off-site virgin soil borrow sources, and the topsoil from the Biofacility construction area, confirming that concentrations of these compounds above established interim measures cleanup levels are naturally present in soils in the surrounding area. Analytical results of the progress sampling also indicated that soil containing elevated levels of asbestos, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, and benzo[g,h,i]perylene are not present in levels above the cleanup goals in the remaining soil. The primary contaminants of concern following the removal of asbestos-containing material were barium and lead. Analytical results of the confirmation samples indicate that the remaining soil contains levels of barium and lead below the cleanup goals.

4.0 CURRENT CONDITIONS

SWMU 28/08D, Highway 58 Dump Site B is located in the central portion of NSWC Crane, as shown in Figure 3. The former disposal area, covering approximately 160 feet by 43 feet, is located at the bottom of a stone cliff. The surrounding area is heavily wooded with underbrush and a thick layer of leaves covering the ground. SWMU 26/08D currently is exposed bedrock with a covering of leaves and brush piles. All contaminated soil and debris has been removed from the site. Remediation of SWMU 26/08D involved excavating the soil to bedrock, removing the soil, and disposing of it at off-site disposal areas. The area was not revegetated because soil erosion was not a concern. Areas immediately surrounding the site that were disturbed by the remedial excavation were backfilled and graded as needed, and brush piles relocated as needed to provide ground cover. Little or no potential for exposure to

TABLE 1
SWMU 26/08D CHARACTERIZATION SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-001 7/18/95 SOIL	26/08D-001RE 7/18/95 SOIL	26/08D-002 7/18/95 SOIL	26/08D-003 11/15/96 SOIL	26/08D-004 11/15/96 SOIL	26/08D-005 11/15/96 SOIL	26/08D-003A 12/15/95 SOIL	26/08D-003ARE 12/15/95 SOIL	26/08D-004A 12/15/95 SOIL	26/08D-004ARE 12/15/95 SOIL	26/08D-005A 12/15/95 SOIL	26/08D-006 2/8/96 SOIL
TOTALS RESULTS														
Methylene Chloride	22	mg/kg	0.075	0.1 B	0.014	N/A	N/A	N/A	0.012	0.05	0.029	N/A	0.013	N/A
Acetone	230	mg/kg	<0.12	<0.12	0.0068 JB	N/A	N/A	N/A	<0.12	<0.12	<0.13	N/A	<0.13	N/A
Tetrachloroethene	22	mg/kg	<0.0059	<0.0059	<0.0057	<0.05	<0.05	<0.05	0.0087	0.028	0.007	N/A	0.0084	N/A
Toluene	280	mg/kg	<0.0059	<0.0059	<0.0057	N/A	N/A	N/A	<0.0062	0.0065	0.0031 J	N/A	<0.0065	N/A
Naphthalene	80	mg/kg	100 J	N/A	0.078 J	N/A	N/A	N/A	<0.4	N/A	0.055 J	0.056 J	<2.2	N/A
Acenaphthylene	36	mg/kg	<0.34	N/A	<0.33	N/A	N/A	N/A	<0.4	N/A	0.11 J	0.076 J	<2.2	N/A
2-Methylnaphthalene	0.66	mg/kg	0.06 J	N/A	0.076 J	N/A	N/A	N/A	<0.4	N/A	<0.43	<0.43	<2.2	N/A
Dibenzofuran	0.66	mg/kg	0.041 J	N/A	<0.33	N/A	N/A	N/A	<0.4	N/A	<0.43	<0.43	<2.2	N/A
Anthracene	1.9	mg/kg	0.035 J	N/A	<0.33	N/A	N/A	N/A	<0.4	N/A	0.086 J	0.097 J	<2.2	N/A
Phenanthrene	0.66	mg/kg	0.25 J	N/A	0.058 J	N/A	N/A	N/A	0.27 J	N/A	0.29 J	0.29 J	<2.2	N/A
Fluoranthene	1600	mg/kg	0.41	N/A	<0.33	N/A	N/A	N/A	0.21 J	N/A	0.71	0.86	<2.2	N/A
Pyrene	1200	mg/kg	0.35	N/A	<0.33	N/A	N/A	N/A	0.25 J	N/A	1.5	1.1	<2.2	N/A
Benzo[a]anthracene	0.66	mg/kg	0.31 J	N/A	<0.33	N/A	N/A	N/A	0.28 J	N/A	0.65	0.65	<2.2	N/A
Chrysene	0.8	mg/kg	0.34 J	N/A	<0.33	N/A	N/A	N/A	0.39 J	N/A	0.62	0.68	<2.2	N/A
Di-n-octylphthalene	780	mg/kg	<0.34	N/A	<0.33	N/A	N/A	N/A	<0.4	N/A	<0.43	0.12 J	<2.2	N/A
Benzo[b]fluoranthene	0.66	mg/kg	0.33 J	N/A	<0.33	N/A	N/A	N/A	0.51	N/A	***0.780***	***0.810***	<2.2	N/A
Benzo[k]fluoranthene	0.66	mg/kg	0.23 J	N/A	<0.33	N/A	N/A	N/A	0.34 J	N/A	***0.690***	***0.710***	<2.2	N/A
Benzo[a]pyrene	0.66	mg/kg	0.28 J	N/A	<0.33	N/A	N/A	N/A	0.39 J	N/A	0.61	***0.680***	<2.2	N/A
Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.2 J	N/A	<0.33	N/A	N/A	N/A	0.24 J	N/A	0.66	0.54	<2.2	N/A
Dibenz[a,h]anthracene	0.12	mg/kg	***0.120*** J	N/A	<0.33	N/A	N/A	N/A	***0.170*** J	N/A	<0.43	<0.43	<2.2	N/A
Benzo[g,h,i]perylene	0.66	mg/kg	0.22 J	N/A	<0.33	N/A	N/A	N/A	0.27 J	N/A	***0.870***	0.65	<2.2	N/A
Antimony	31	mg/kg	***37.80*** N	N/A	<0.02	N/A	N/A	N/A	<2.5	N/A	6.1 N	N/A	***40.6*** N	N/A
Arsenic	0.97	mg/kg	***14.1***	N/A	0.1	N/A	N/A	N/A	***7.2*** C	N/A	9.1 C	N/A	***14.6*** C	N/A
Barium	5500	mg/kg	***51300***	N/A	73.6	N/A	N/A	N/A	3680 E	N/A	***22400*** E	N/A	***7030*** E	N/A
Beryllium	0.4	mg/kg	***0.88***	N/A	0.01	N/A	N/A	N/A	***0.680***	N/A	***0.720***	N/A	***0.81***	N/A
Cadmium	39	mg/kg	14.6 N	N/A	0.04 N	N/A	N/A	N/A	4.4 N	N/A	6.7 N	N/A	15.1 N	N/A
Chromium	940	mg/kg	69.8 EN	N/A	0.35 EN	N/A	N/A	N/A	24 NC	N/A	54.4 NC	N/A	111 NC	N/A
Cobalt	0.1	mg/kg	***1.2***	N/A	0.07	N/A	N/A	N/A	***3.5***	N/A	<63.4	N/A	***2.2***	N/A
Copper	2900	mg/kg	756	N/A	0.85	N/A	N/A	N/A	118	N/A	260	N/A	821	N/A
Lead	500	mg/kg	***7040***	N/A	2.8	N/A	N/A	N/A	142 EN	N/A	***765*** EN	N/A	***8670*** EN	N/A
Mercury	23	mg/kg	0.27	N/A	0.11	N/A	N/A	N/A	<0.12	N/A	0.2	N/A	0.3	N/A
Nickel	1600	mg/kg	55.9	N/A	0.37	N/A	N/A	N/A	31.4	N/A	39.2	N/A	62.5	N/A
Selenium	390	mg/kg	<0.56	N/A	<0.01	N/A	N/A	N/A	<0.62	N/A	<0.58	N/A	<0.65	N/A
Silver	390	mg/kg	2.4	N/A	<0.01	N/A	N/A	N/A	<0.95	N/A	<1.0	N/A	1.5	N/A
Vanadium	550	mg/kg	39.6	N/A	0.18	N/A	N/A	N/A	16.2	N/A	18.5	N/A	15.8	N/A
Zinc	23000	mg/kg	1370 E	N/A	2.7 E	N/A	N/A	N/A	212 EN	N/A	744 EN	N/A	1740 EN	N/A
Tin	47000	mg/kg	911	N/A	<28.3	N/A	N/A	N/A	<24.7	N/A	89 N	N/A	4850 N	N/A
Pronamide	2900	mg/kg	<0.0019	N/A	0.096 P	N/A	N/A	N/A	<0.05	N/A	<0.052	N/A	<0.106	N/A
Tetraethyl dithiopyrophosphate	20	mg/kg	5.8 P	N/A	6.5	N/A	N/A	N/A	<4.99	N/A	<5.2	N/A	<10.77	N/A
1,2,3,4,6,7,8,9-OCDD	Not Established	mg/kg	0.000873	N/A	0.00044	N/A	N/A	N/A	<0.0002	N/A	<0.000694	N/A	0.00087	N/A
2,3,7,8-TCDF	Not Established	mg/kg	0.00013	N/A	<5.8E-5	N/A	N/A	N/A	<0.00014	N/A	<0.000185	N/A	<0.000203	N/A
1,2,3,4,6,7,8-HpCDF	Not Established	mg/kg	0.000162	N/A	<7.6E-5	N/A	N/A	N/A	<0.00023	N/A	<0.000292	N/A	<0.000321	N/A
Total Sulfide	Not Established	mg/kg	<47	N/A	46	<40	<40	<40	<62	N/A	77	N/A	<65	<500
Total Cyanide	1600	mg/kg	<1.2	N/A	<1.2	<2	<2	<2	<1.2	N/A	<1.3	N/A	3.9	<250

TABLE 1
SWMU 26/08D CHARACTERIZATION SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-001 7/18/95 SOIL	26/08D-001RE 7/18/95 SOIL	26/08D-002 7/18/95 SOIL	26/08D-003 11/15/96 SOIL	26/08D-004 11/15/96 SOIL	26/08D-005 11/15/96 SOIL	26/08D-003A 12/15/95 SOIL	26/08D-003ARE 12/15/95 SOIL	26/08D-004A 12/15/95 SOIL	26/08D-004ARE 12/15/95 SOIL	26/08D-005A 12/15/95 SOIL	26/08D-006 2/8/96 SOIL
TCLP RESULTS														
Barium	100	mg/L	N/A	N/A	N/A	***143***	***210***	86.2	***108***	N/A	***275***	N/A	69.2	63.4
Cadmium	1	mg/L	N/A	N/A	N/A	<0.04	0.115	0.218	0.0356	N/A	0.0228	N/A	0.0851	0.0169
Chromium	5	mg/L	N/A	N/A	N/A	<0.1	<0.1	<0.1	<0.01	N/A	<0.01	N/A	<0.01	0.0019 B
Lead	5	mg/L	N/A	N/A	N/A	0.118	***12.3***	***16.4***	0.0434	N/A	0.122	N/A	2	0.0628
Selenium	1	mg/L	N/A	N/A	N/A	<0.02	<0.02	<0.02	<0.05	N/A	<0.005	N/A	<0.005	0.0068
ASBESTOS RESULTS														
Total Asbestos	any detection		N/A	N/A	N/A	ND	ND	***1%***	N/A	N/A	N/A	N/A	N/A	N/A

Notes:
1. Centered and bold italic sample results with asterisk indicate a sample level above the Interim Measures Cleanup Level.
2. Flagcode explanations:
   - J: Estimated concentration below reporting limit.
   - B: (for Organic Analytes): Analyte also found in corresponding Blank sample(s).
   - P: Value from quantitation and confirmation columns differed by more than 25%. Data flagged and lower of two values reported.
   - C: (for metals): indicates laboratory duplicate analysis not within control limits.
   - B: (for metals): indicates a concentration below reporting limit.
   - E: (for metals): indicates an estimated value because of the presence of an interference.
   - N: (for metals): indicates spike sample recovery not within control limits.
3. N/A: indicates Not Analyzed
4. ND indicates asbestos was not detected.
5. All sample results not shown in this table are non-detects.
6. A trip blank (26/08D-TB8) was taken with samples 003A through 005A on 12/15/95. No volatile organics were detected in the trip blank.

TABLE 2
SWMU 26/08D PROGRESS SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-007 3/12/96 SOIL		26/08D-008 3/12/96 SOIL		26/08D-009 3/12/96 SOIL		26/08D-010 3/12/96 SOIL		26/08D-011 3/12/96 SOIL		26/08D-012 3/12/96 SOIL		26/08D-013 3/12/96 SOIL		26/08D-014 3/12/96 SOIL	
TOTALS RESULTS																		
Methylene Chloride	22	mg/kg	0.007	JB	<0.01		0.009	JB	0.01	JB	0.012	B	0.016	B	<0.013		0.013	B
Acetone	230	mg/kg	0.01	JB	<0.01		0.01	JB	0.012	JB	0.012	B	0.027	B	<0.018		<0.012	
1,1,1-Trichloroethane	300	mg/kg	<0.011		<0.01		<0.012		<0.013		<0.012		<0.012		<0.013		<0.012	
Phenanthrene	0.66	mg/kg	<0.67		<0.64		<0.78		<0.82		<0.73		<0.73		<0.73		0.053	J
Benzo[a]anthracene	0.66	mg/kg	<0.71		<0.69		<0.82		<0.67		<0.78		<0.78		<0.84		0.11	J
Di-n-butylphthalate	3900	mg/kg	0.97		0.31	J	0.22	J	0.52	J	0.62	J	0.36	J	0.82	J	0.3	J
Fluoranthene	1600	mg/kg	<0.99		<0.96		<1.2		<1.2		<1.1		<1.1		<1.2		0.19	J
Pyrene	1200	mg/kg	<0.78		<0.76		<0.91		<0.96		<0.86		<0.86		<0.92		0.2	J
bis(2-ethylhexyl)Phthalate	61	mg/kg	<0.81		<0.78		<0.94		0.051	J	<0.88		0.11	J	0.045	J	0.052	J
Chrysene	0.8	mg/kg	<0.58		<0.56		<0.68		<0.71		<0.64		<0.64		<0.68		0.1	J
Benzo[b]fluoranthene	0.66	mg/kg	<0.83		<0.8		<0.96		<1.0		<0.9		<0.9		<0.97		0.19	JX
Benzo[k]fluoranthene	0.66	mg/kg	<0.67		<064		<0.78		<0.82		<0.73		<0.73		<0.78		0.2	JX
Indeno[1,2,3-cd]pyrene	1.2	mg/kg	<0.49		<0.98		<0.58		<0.6		<0.54		<0.54		<0.58		0.064	J
Benzo[g,h,i]perylene	0.66	mg/kg	<0.67		<0.64		<0.78		<0.82		<0.73		<0.73		<0.78		0.065	J
Antimony	31	mg/kg	<9.7		<9.4		0.65	BN	0.92	BN	2.2	BN	1.9	BN	0.7	BN	0.34	BN
Arsenic	0.97	mg/kg	<16.1		<15.7		***10.4***		***11.9***		***2.6***		***9.3***		***8.7***		***3.2***	
Barium	5500	mg/kg	37.1	BC	36.2	BC	***10300***	C	2710	C	722	C	1610	C	250	C	***7940***	C
Beryllium	0.4	mg/kg	<1.6		<1.6		***0.710***		***0.900***		***0.560***	B	***0.460***	B	***0.600***	B	***0.920***	
Cadmium	39	mg/kg	<1.1		<1.0		<0.02		<0.03		<0.52	BN	5.8	N	0.11	BN	0.23	BN
Chromium	940	mg/kg	7.6	BC	6.1	BC	13.7	C	10.8	C	9.5	C	10.6	C	8.8	C	10.8	C
Cobalt	0.1	mg/kg	<2.7		<2.6		***7.4***		***12.7***		***5.4***	B	***5.4***	B	***9***		***8.4***	
Copper	2900	mg/kg	10.3	BC	10.5	BC	25.7	C	20.8	C	47	C	76.6	C	16.6	C	27.5	C
Mercury	23	mg/kg	<0.1		<0.1		<0.11		<0.13		0.15		0.12		<0.12		<0.12	
Nickel	1600	mg/kg	17.7	B	19.9	B	22.7		33.4		15.7		27.9		23.2		29.3	
Lead	500	mg/kg	<8.6		<8.4		132	NC	26.2	NC	321	NC	***656***	NC	25.5	NC	69.9	NC
Selenium	390	mg/kg	<14		<13.6		0.87	N	0.61	BN	0.65	N	0.51	BN	0.9	N	0.33	BN
Silver	390	mg/kg	<3.8		<3.7		<0.09		<0.09		<0.08		<0.08		<0.09		<0.09	
Vanadium	550	mg/kg	7.6	B	5.6	B	7.2		12.8		5.1	B	9.3		11.9		6.8	
Zinc	23000	mg/kg	28.3	BNC	48.6	BNC	190	NC	126	NC	128	NC	315	NC	77.9	NC	78.9	NC
Tin	47000	mg/kg	<22.6		<22.0		11.3	C	2.7	BC	125000	C	24.2	C	1.4	BC	5.2	BC
2,4-D	390	mg/kg	<0.11		<0.1		0.0022	J	0.0027	JP	<0.12		<0.12		<0.13		<0.12	
2,4,5-TP	0.11	mg/kg	<0.028		<0.026		0.00011	JP	<0.033		<0.029		0.00088	JP	0.00036	JP	<0.31	
2,4,5-T	390	mg/kg	0.00087	JB	0.00045	JPB	0.00087	JPB	0.001	JPB	<0.029		0.0012	JPB	0.0033	JPB	0.00075	JPB
gamma-BHC	0.00268	mg/kg	0.00004	J	<0.001		<0.0012		<0.0013		<0.0012		0.00021	JP	<0.0013		0.000059	JP
Heptachlor	0.19	mg/kg	0.00016	J	<0.001		0.000041	JP	<0.0013		0.00005	JP	0.00064	J	0.00042	JP	<0.0012	
Aldrin	0.05	mg/kg	<0.0011		<0.001		0.00016	JP	0.00015	JP	0.00015	JP	0.00027	JP	0.00011	JP	0.000087	JP
Endosulfan I	2	mg/kg	<0.0016		<0.0016		0.000072	JP	<0.0014		0.000071	JP	0.000081	JP	0.00019	JP	0.00042	JP
Dieldrin	0.053	mg/kg	0.00006	JP	<0.0016		0.000086	JP	<0.0019		<0.0017		0.00016	JP	0.00011	J	0.000082	JP
Endosulfan II	2	mg/kg	0.000062	JP	<0.0036		0.00011	JP	<0.0045		<0.0041		<0.0041		0.00013	JP	0.00036	JP
4,4'-DDT	0.008	mg/kg	0.00022	JP	<0.0036		0.00045	JP	0.00019	JP	0.00017	JP	<0.0041		0.00012	JP	***0.016***	
Methoxychlor	200	mg/kg	0.00034	JPB	0.00017	JPB	0.0021	JPB	0.0006	JPB	0.0002	JPB	0.00094	JPB	0.0004	JPB	0.0081	PB
alpha-BHC	0.00201	mg/kg	<0.0011		<0.001		<0.0012		<0.000042		<0.0012		<0.0012		<0.0013		0.00011	JPB
beta-BHC	0.00402	mg/kg	<0.0011		<0.001		<0.0012		<0.0013		0.00013	JP	0.00048	JP	<0.0013		0.00031	JP
delta-BHC	0.00603	mg/kg	0.000086	JPB	0.00011	JPB	0.00089	JPB	0.00062	JPB	0.00011	JPB	0.000077	JPB	0.00027	JPB	0.00016	JPB
Heptachlor epoxide	0.094	mg/kg	<0.0011		<0.001		0.00005	JPB	0.000063	JPB	<0.0012		0.000064	JPB	0.000066	JPB	0.000091	JB
4,4'-DDE	2.5	mg/kg	0.00034	J	0.00039	JP	<0.0043		<0.0045		<0.0041		0.00013	JP	0.000079	JP	0.0022	JP
Endrin	12	mg/kg	<0.0027		<0.0026		0.000071	JPB	<0.0032		<0.0029		<0.0029		0.00021	JPB	0.0026	JPB

TABLE 2
SWMU 26/08D PROGRESS SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-007 3/12/96 SOIL		26/08D-008 3/12/96 SOIL		26/08D-009 3/12/96 SOIL		26/08D-010 3/12/96 SOIL		26/08D-011 3/12/96 SOIL		26/08D-012 3/12/96 SOIL		26/08D-013 3/12/96 SOIL		26/08D-014 3/12/96 SOIL	
TOTALS RESULTS																		
4,4'-DDD	3.5	mg/kg	0.00012	JPB	<0.0036		<0.0043		<0.0045		0.000076	JPB	0.00034	JPB	0.000077	JPB	0.026	JPB
Endrin aldehyde	0.0154	mg/kg	<0.0011		0.00013	JB	0.00018	JPB	<0.0013		0.00013	JPB	0.0006	JPB	0.00031	JPB	0.0008	JPB
Endosulfan sulfate	0.0442	mg/kg	0.000087	JB	0.00019	JPB	<0.0024		0.0002	JPB	<0.0023		0.00011	JPB	0.00034	JB	0.00044	JPB
Aroclor-1254	0.11	mg/kg	<0.021		<0.021		<0.0024		<0.026		<0.023		<0.024		<0.025		<0.025	
Dimethoate	7.8	mg/kg	0.016	PB	0.006	JPB	<0.012		<0.013		<0.012		<0.012		<0.013		<0.012	
Methyl-Parathion	0.02	mg/kg	<0.011		0.0062	JP	<0.012		0.0086	JP	<0.012		<0.012		<0.013		<0.012	
Famphur	Not Established	mg/kg	<0.011		<0.01		<0.012		0.022	P	<0.012		<0.012		<0.013		<0.012	
Phorate	7.8	mg/kg	<0.011		<0.01		<0.62		<0.013		<0.012		<0.012		<0.013		<0.012	
Cyanide	1600	mg/kg	<0.54		<0.52		<0.62		<0.66		<0.59		<0.59		<0.63		<0.63	
TCLP RESULTS																		
Barium	100	mg/L	N/A		N/A		13.04		8.11		10.7		2.5		2.37		***412***	
Cadmium	1	mg/L	N/A		N/A		0.0019	B	ND		0.0131		0.0453		0.00074	B	0.0049	B
Chromium	5	mg/L	N/A		N/A		0.0015	B	ND		0.00099	B	ND		0.00099	B	0.0023	B
Lead	5	mg/L	N/A		N/A		0.0573		0.0025	B	0.0727		0.0494		0.003		0.0101	
Selenium	1	mg/L	N/A		N/A		0.005		0.0053		0.0079		0.0105		0.0062		0.0055	
ASBESTOS RESULTS																		
Total Asbestos	any detection		ND		ND		ND		ND		ND		ND		ND		ND	

Notes:

1. Centered and bold italic sample results indicate a sample level above the Interim Measures Cleanup Level.
2. Flagcode explanations:
   - J: Estimated concentration below reporting limit.
   - B: (for Organic Analytes): Analyte also found in corresponding Blank sample(s).
   - P: Value from quantitation and confirmation columns differed by more than 25%. Data flagged and lower of two values reported.
   - C: (for metals): indicates laboratory duplicate analysis not within control limits.
   - B: (for metals): indicates a concentration below reporting limit.
   - E: (for metals): indicates an estimated value because of the presence of an interference.
   - N: (for metals): indicates spike sample recovery not within control limits.
3. N/A: indicates Not Analyzed
4. ND indicates asbestos was not detected.
5. A trip blank (26/08D-TB8) was taken with samples 003A through 005A on 12/15/95. No volatile organics were detected in the trip blank.

TABLE 2
SWMU 26/08D PROGRESS SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-015 3/12/96 SOIL		26/08D-016 3/12/96 SOIL		26/08D-017 3/12/96 SOIL		26/08D-018 3/12/96 SOIL		26/08D-019 3/12/96 SOIL		26/08D-020 3/12/96 SOIL		26/08D-009A 4/11/96 SOIL	26/08D-014A 4/11/96 SOIL	26/08D-015A 4/11/96 SOIL
TOTALS RESULTS																	
Methylene Chloride	22	mg/kg	0.011	B	0.014	B	0.01	BJ	0.01	JB	0.008	JB	0.015	B	N/A	N/A	N/A
Acetone	230	mg/kg	0.01	JB	<0.012		<0.011		0.012	B	0.007	JB	0.012	B	N/A	N/A	N/A
1,1,1-Trichloroethane	300	mg/kg	<0.11		<0.012		<0.011		0.002	J	<0.012		<0.012		N/A	N/A	N/A
Phenanthrene	0.66	mg/kg	0.17	J	<0.73		<0.69		<0.73		<0.74		<0.73		N/A	N/A	N/A
Benzo[a]anthracene	0.66	mg/kg	0.08	J	0.048	J	<0.73		<0.78		<0.78		<0.78		N/A	N/A	N/A
Di-n-butylphthalate	3900	mg/kg	0.36	J	0.66	J	0.38	J	0.47	J	0.51	J	0.83	J	N/A	N/A	N/A
Fluoranthene	1600	mg/kg	0.18	J	0.075	J	<1.0		<1.1		<1.1		<1.1		N/A	N/A	N/A
Pyrene	1200	mg/kg	0.18	J	0.083	J	<0.81		<0.86		<0.87		<0.86		N/A	N/A	N/A
bis(2-ethylhexyl)Phthalate	61	mg/kg	<0.85		0.34	J	0.038	J	<0.88		0.56	J	<0.88		N/A	N/A	N/A
Chrysene	0.8	mg/kg	0.089	J	0.049	J	<0.6		<0.64		<0.64		<0.64		N/A	N/A	N/A
Benzo[b]fluoranthene	0.66	mg/kg	0.14	JX	0.11	JX	0.04	XJ	<0.90		<0.92		<0.9		N/A	N/A	N/A
Benzo[k]fluoranthene	0.66	mg/kg	0.15	JX	0.12	JX	0.036	JX	<0.73		<0.74		<0.73		N/A	N/A	N/A
Indeno[1,2,3-cd]pyrene	1.2	mg/kg	0.041	J	<0.54		<0.51		<0.54		<0.55		<0.54		N/A	N/A	N/A
Benzo[g,h,i]perylene	0.66	mg/kg	0.045	J	<0.73		<0.64		<0.73		<0.74		<0.73		N/A	N/A	N/A
Antimony	31	mg/kg	7.4	N	***41.5***	N	6.9	N	<0.21		1.1	BN	<0.21		N/A	N/A	N/A
Arsenic	0.97	mg/kg	***9.7***		***1.40***		***6.5***		***6.1***		***10.1***		***3.9***		N/A	N/A	N/A
Barium	5500	mg/kg	***14000***	C	***10100***	C	2300	C	1310	C	***7350***	C	1320	C	N/A	N/A	N/A
Beryllium	0.4	mg/kg	***0.440***	B	***0.410***	B	***0.410***	B	0.35	B	***0.660***		***0.470***	B	N/A	N/A	N/A
Cadmium	39	mg/kg	5	N	4.6	N	2.6	N	<0.02		1.3	N	<0.02		N/A	N/A	N/A
Chromium	940	mg/kg	18.8	C	21.5	C	13.4	C	5.3	C	12	C	8.1	C	N/A	N/A	N/A
Cobalt	0.1	mg/kg	***4.9***	B	***3.8***	B	***4.4***	B	***10.6***		***5.3***	B	***4.6***	B	N/A	N/A	N/A
Copper	2900	mg/kg	156	C	284	C	124	C	8.4	C	28.5	C	9	C	N/A	N/A	N/A
Mercury	23	mg/kg	0.19		0.21		<0.09		<0.11		0.11		<0.12		N/A	N/A	N/A
Nickel	1600	mg/kg	2.7		32.6		22.7		28		25.1		20.8		N/A	N/A	N/A
Lead	500	mg/kg	***987***	NC	***2740***	NC	***680***	NC	12.5	NC	49.5	NC	15.9	NC	N/A	N/A	N/A
Selenium	390	mg/kg	0.5	BN	0.34	BN	0.43	BN	0.54	BN	0.38	BN	<0.31		N/A	N/A	N/A
Silver	390	mg/kg	0.6	B	1.9		0.44	B	<0.08		<0.08		<0.08		N/A	N/A	N/A
Vanadium	550	mg/kg	8		8.3		6.9		5.9		17.4		6.8		N/A	N/A	N/A
Zinc	23000	mg/kg	724	NC	962	NC	303	NC	15.5	NC	99.1	NC	38.1	NC	N/A	N/A	N/A
Tin	47000	mg/kg	232	C	532	C	482	C	<0.49		4.3	BC	4	BC	N/A	N/A	N/A
2,4-D	390	mg/kg	<0.11		<0.12		<0.11		<0.12		<0.12		<0.12		N/A	N/A	N/A
2,4,5-TP	0.11	mg/kg	<0.028		0.00039	JP	0.00035	JP	0.000098	JP	<0.03		0.00054	JP	N/A	N/A	N/A
2,4,5-T	390	mg/kg	0.00093	JB	<0.029		0.00057	JPB	0.00093	JPB	0.00052	JPB	<0.029		N/A	N/A	N/A
gamma-BHC	0.00268	mg/kg	<0.0011		0.00014	JP	0.000033	JP	0.000059	JP	<0.0012		<0.0011		N/A	N/A	N/A
Heptachlor	0.19	mg/kg	<0.0011		0.00029	JP	0.00008	JP	0.00012	J	<0.0012		<0.0011		N/A	N/A	N/A
Aldrin	0.05	mg/kg	0.000051	J	0.00029	J	0.00023	JP	0.000045	JP	<0.0012		<0.0011		N/A	N/A	N/A
Endosulfan I	2	mg/kg	0.000052	JP	0.0011	J	0.000078	JP	<0.0017		<0.0018		<0.0012		N/A	N/A	N/A
Dieldrin	0.053	mg/kg	0.00015	JP	<0.0018		0.00016	JP	<0.0017		0.000055	JP	0.00016	JP	N/A	N/A	N/A
Endosulfan II	2	mg/kg	<0.004		0.00027	JP	0.00026	JP	<0.0041		0.00012	JP	<0.004		N/A	N/A	N/A
4,4'-DDT	0.008	mg/kg	0.003	J	0.00023	JP	0.0026	JP	<0.0041		0.00027	JP	0.00067	JP	N/A	N/A	N/A
Methoxychlor	200	mg/kg	0.0044	PB	0.00071	JPB	0.0094	B	0.0014	JPB	0.00059	JPB	<0.004		N/A	N/A	N/A
alpha-BHC	0.00201	mg/kg	0.00017	JB	0.000074	JPB	0.00018	JB	0.000041	JPB	<0.0012		<0.0011		N/A	N/A	N/A
beta-BHC	0.00402	mg/kg	0.00016	JP	0.00017	JP	0.00087	JP	<0.0012		<0.0012		<0.0011		N/A	N/A	N/A
delta-BHC	0.00603	mg/kg	0.00058	JPB	0.00012	JPB	0.00071	JPB	0.000078	JPB	<0.0012		<0.0011		N/A	N/A	N/A
Heptachlor epoxide	0.094	mg/kg	0.000072	JPB	0.000086	JPB	0.00015	JPB	<0.0012		0.000072	JPB	0.0002	JB	N/A	N/A	N/A
4,4'-DDE	2.5	mg/kg	0.00031	JP	0.000066	JP	0.000099	JP	<0.0041		0.000075	JP	<0.004		N/A	N/A	N/A
Endrin	12	mg/kg	<0.0028		<0.0029		0.00013	JPB	<0.0029		0.00019	JPB	<0.0029		N/A	N/A	N/A

TABLE 2
SWMU 26/08D PROGRESS SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-015 3/12/96 SOIL		26/08D-016 3/12/96 SOIL		26/08D-017 3/12/96 SOIL		26/08D-018 3/12/96 SOIL		26/08D-019 3/12/96 SOIL		26/08D-020 3/12/96 SOIL		26/08D-009A 4/11/96 SOIL		26/08D-014A 4/11/96 SOIL		26/08D-015A 4/11/96 SOIL	
TOTALS RESULTS																				
4,4'-DDD	3.5	mg/kg	0.00052	JP	<0.0041		0.0017	JPB	<0.0041		<0.0041		0.00037	JPB	N/A		N/A		N/A	
Endrin aldehyde	0.0154	mg/kg	0.00088	JPB	0.0004	JPB	0.0013	PB	<0.0012		0.00033	JPB	0.0029	B	N/A		N/A		N/A	
Endosulfan sulfate	0.0442	mg/kg	0.000084	JPB	0.00023	JPB	0.00067	JPB	<0.0023		<0.0023		<0.0023		N/A		N/A		N/A	
Aroclor-1254	0.11	mg/kg	<0.0023		0.069	P	<0.022		<0.023		<0.023		<0.023		N/A		N/A		N/A	
Dimethoate	7.8	mg/kg	0.018	PB	<0.012		<0.011		0.036	PB	0.039	PB	0.02	PB	N/A		N/A		N/A	
Methyl-Parathion	0.02	mg/kg	<0.011		<0.012		<0.011		0.014	P	***0.026***	PB	<0.012		N/A		N/A		N/A	
Famphur	Not Established	mg/kg	0.022	PB	<0.012		<0.011		0.028	P	<0.012		<0.012		N/A		N/A		N/A	
Phorate	7.8	mg/kg	<0.011		<0.012		<0.011		<0.012		<0.012		0.024	P	N/A		N/A		N/A	
Cyanide	1600	mg/kg	<0.57		0.61		<0.56		<0.59		<0.59		<0.59		N/A		N/A		N/A	
TCLP RESULTS																				
Barium	100	mg/L	****137***		****102***		19.9		51.1		****115.1***		<50		0.663		0.104	B	0.0807	B
Cadmium	1	mg/L	0.0073		0.0079		0.0055		<0.5		<0.5		<0.5		<0.0005		<0.0005		<0.0005	
Chromium	5	mg/L	0.0012	B	<0.90		0.0014	B	<2.5		<2.5		<2.5		0.0019	B	0.003	B	0.0044	B
Lead	5	mg/L	0.692		0.101		0.378		<2.5		<2.5		<2.5		0.0115		0.113		0.0045	
Selenium	1	mg/L	0.0032	B	0.0036	B	ND		<0.5		<0.5		<0.5		0.0068		<0.0029		0.0037	B
ASBESTOS RESULTS																				
Total Asbestos	any detection		ND		ND		ND		ND		ND		ND		N/A		N/A		N/A	

Notes:

1. Centered and bold italic sample results indicate a sample level above the Interim Measures Cleanup Level.
2. Flagcode explanations:
   - J: Estimated concentration below reporting limit.
   - B: (for Organic Analytes): Analyte also found in corresponding Blank sample(s).
   - P: Value from quantitation and confirmation columns differed by more than 25%. Data flagged and lower of two values reported.
   - *: (for metals): indicates laboratory duplicate analysis not within control limits.
   - B: (for metals): indicates a concentration below reporting limit.
   - E: (for metals): indicates an estimated value because of the presence of an interference.
   - N: (for metals): indicates spike sample recovery not within control limits.
3. N/A: indicates Not Analyzed
4. ND indicates asbestos was not detected.
5. A trip blank (26/08D-TB8) was taken with samples 003A through 005A on 12/15/95. No volatile organics were detected in the trip blank.

TABLE 2
SWMU 26/08D PROGRESS SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-016A 4/11/96 SOIL	26/08D-017A 4/11/96 SOIL
TOTALS RESULTS				
Methylene Chloride	22	mg/kg	N/A	N/A
Acetone	230	mg/kg	N/A	N/A
1,1,1-Trichloroethane	300	mg/kg	N/A	N/A
Phenanthrene	0.66	mg/kg	N/A	N/A
Benzo[a]anthracene	0.66	mg/kg	N/A	N/A
Di-n-butylphthalate	3900	mg/kg	N/A	N/A
Fluoranthene	1600	mg/kg	N/A	N/A
Pyrene	1200	mg/kg	N/A	N/A
bis(2-ethylhexyl)Phthalate	61	mg/kg	N/A	N/A
Chrysene	0.8	mg/kg	N/A	N/A
Benzo[b]fluoranthene	0.66	mg/kg	N/A	N/A
Benzo[k]fluoranthene	0.66	mg/kg	N/A	N/A
Indeno[1,2,3-cd]pyrene	1.2	mg/kg	N/A	N/A
Benzo[g,h,i]perylene	0.66	mg/kg	N/A	N/A
Antimony	31	mg/kg	N/A	N/A
Arsenic	0.97	mg/kg	N/A	N/A
Barium	5500	mg/kg	N/A	N/A
Beryllium	0.4	mg/kg	N/A	N/A
Cadmium	39	mg/kg	N/A	N/A
Chromium	940	mg/kg	N/A	N/A
Cobalt	0.1	mg/kg	N/A	N/A
Copper	2900	mg/kg	N/A	N/A
Mercury	23	mg/kg	N/A	N/A
Nickel	1600	mg/kg	N/A	N/A
Lead	500	mg/kg	N/A	N/A
Selenium	390	mg/kg	N/A	N/A
Silver	390	mg/kg	N/A	N/A
Vanadium	550	mg/kg	N/A	N/A
Zinc	23000	mg/kg	N/A	N/A
Tin	47000	mg/kg	N/A	N/A
2,4-D	390	mg/kg	N/A	N/A
2,4,5-TP	0.11	mg/kg	N/A	N/A
2,4,5-T	390	mg/kg	N/A	N/A
gamma-BHC	0.00268	mg/kg	N/A	N/A
Heptachlor	0.19	mg/kg	N/A	N/A
Aldrin	0.05	mg/kg	N/A	N/A
Endosulfan I	2	mg/kg	N/A	N/A
Dieldrin	0.053	mg/kg	N/A	N/A
Endosulfan II	2	mg/kg	N/A	N/A
4,4'-DDT	0.008	mg/kg	N/A	N/A
Methoxychlor	200	mg/kg	N/A	N/A
alpha-BHC	0.00201	mg/kg	N/A	N/A
beta-BHC	0.00402	mg/kg	N/A	N/A
delta-BHC	0.00603	mg/kg	N/A	N/A
Heptachlor epoxide	0.094	mg/kg	N/A	N/A
4,4'-DDE	2.5	mg/kg	N/A	N/A
Endrin	12	mg/kg	N/A	N/A

TABLE 2
SWMU 26/08D PROGRESS SAMPLE ANALYTICAL RESULTS SUMMARY

Compound	Interim Measures Cleanup Level mg/kg	Sample ID Sample Date Medium	26/08D-016A 4/11/96 SOIL		26/08D-017A 4/11/96 SOIL	
TOTALS RESULTS						
4,4'-DDD	3.5	mg/kg	N/A		N/A	
Endrin aldehyde	0.0154	mg/kg	N/A		N/A	
Endosulfan sulfate	0.0442	mg/kg	N/A		N/A	
Aroclor-1254	0.11	mg/kg	N/A		N/A	
Dimethoate	7.8	mg/kg	N/A		N/A	
Methyl-Parathion	0.02	mg/kg	N/A		N/A	
Famphur	Not Established	mg/kg	N/A		N/A	
Phorate	7.8	mg/kg	N/A		N/A	
Cyanide	1600	mg/kg	N/A		N/A	
TCLP RESULTS						
Barium	100	mg/L	0.0173	B	0.0783	B
Cadmium	1	mg/L	<0.0005		0.0007	B
Chromium	5	mg/L	0.0052	B	0.004	B
Lead	5	mg/L	0.0147		0.12	
Selenium	1	mg/L	0.0042	B	0.0095	
ASBESTOS RESULTS						
Total Asbestos	any detection		N/A		N/A	

Notes:

1. Centered and bold italic sample results indicate a sample level above the Interim Measures Cleanup Level.
2. Flagcode explanations:
   - J: Estimated concentration below reporting limit.
   - B: (for Organic Analytes): Analyte also found in corresponding Blank sample(s).
   - P: Value from quantitation and confirmation columns differed by more than 25%. Data flagged and lower of two values reported.
   - *: (for metals): indicates laboratory duplicate analysis not within control limits.
   - B: (for metals): indicates a concentration below reporting limit.
   - E: (for metals): indicates an estimated value because of the presence of an interference.
   - N: (for metals): indicates spike sample recovery not within control limits.
3. N/A: indicates Not Analyzed
4. ND indicates asbestos was not detected.
5. A trip blank (26/08D-TB8) was taken with samples 003A through 005A on 12/15/95. No volatile organics were detected in the trip blank.

TABLE 3
SWMU 26/08D CONFIRMATION SAMPLE ANALYTICAL RESULTS SUMMARY

			CONFIRMATION SAMPLES											
Compound	Interim Measures Cleanup Level ug/kg	Sample ID Sample Date Medium	26/08D-018 9/3/96 SOIL		26/08D-019 9/3/96 SOIL		26/08D-020 9/3/96 SOIL		26/08D-021 9/3/96 SOIL		26/08D-022 9/3/96 SOIL		26/08D-023 9/3/96 SOIL	
TOTALS RESULTS														
Barium	5500	mg/kg	201		679		82.9		273		4510		3310	
Lead	500	mg/kg	12.8	E	280	E	9.4	E	4.2	E	12.6	E	253	E

Note:

E: (for metals): indicates an estimated value because of the presence of an interference.

TABLE 4
BACKGROUND AND BORROW PIT ANALYTICAL RESULTS

Interim Measures			Antimony		Arsenic		Barium	Beryllium		Chromium		Cobalt		Copper		Lead		Lithium		Nickel	Selenium		Tin		Vanadium	Zinc	
Cleanup Level (mg/kg)	Date		31		0.97		5500	0.4		940		0.1		2900		500		1600		1600	390		47000		550	23000	
NSWC-BP/BF-001	3/16/95	mg/kg	<2.6		***9.4***		62.4	***0.570***		15.8		***3.9***		15.3		13.8		12.8		10	<0.65		<32.4		31.2	39.5	
NSWC-BP/BF-002	3/16/95	mg/kg	<2.4		***9***		65.1	***0.560***		16.9		***4.6***		16.1		14.9		11.7		10.8	<0.60		<30.0		30.8	41.9	
NSWC-BP/BF-003	10/12/95	mg/kg	<2.3		***7.8***	NC	92.1	***0.740***		22.1		***8.6***		15.1		14.2	NC	14.9		14.5	<0.57		<22.7		39	40.8	
NSWC-BP/BF-004	10/12/95	mg/kg	<2.2		***6.3***	NC	83.9	***0.810***		22.8		***7***		13.9		13.7	NC	14.7		13.5	<0.53		<22.2		38.2	40.1	
NSWC-BP/BF-005	10/27/95	mg/kg	<2.1		***1.9***	N	20.6	<0.21		4.6	N	***2.4***		4.3	E	3.5	E	NR		6.2	<0.53		<21.2		7.3	16	EN
NSWC-BP/BF-006	10/27/95	mg/kg	<2.2		***1.8***	N	26.7	<0.22		5.6	N	***3.2***		4.8	E	3.9	E	NR		6.6	<0.56		<21.5		8.6	17.7	EN
NSWC-BIOF001	3/7/96	mg/kg	0.410	BN	***9.2***		86.3	***0.627***	B	17.7		***9.2***		14.6		15.9		7.44	B	11.1	1.06	N	1.73	B	30.2	34	
NSWC-BIOF002	3/7/96	mg/kg	0.303	BN	***6.21***		82	***0.557***	B	11.1		***10.7***		9.19		16.2		4.69	B	8.54	1.21	N	1.39	B	20.1	24.3	
NSWC-BIOF003	3/7/96	mg/kg	0.363	BN	***8.2***		61.2	***0.417***	B	15.9		***10.8***		9.91		13.5		6.96	B	9.5	1.06	N	1.31	B	27.1	27	
NSWC-BIOF004	3/7/96	mg/kg	0.335	BN	***4.95***		123	***0.729***	B	10.4		***9.89***		10.3		16.7		4.73	B	9.86	0.733	BN	1.06	B	18.3	27	
NSWC-BIOF005	3/7/96	mg/kg	0.346	BN	***7.43***		105	***0.602***	B	12.1		***8.69***		10.9		16.3		5.82	B	9.05	0.985	N	0.888	B	24.1	29.7	
NSWC-BIOF006	3/7/96	mg/kg	<0.248		***5.88***		89.2	***0.642***	B	11.3		***10.3***		10.4		16.5		5.1	B	9.41	0.816	N	1.41	B	20.9	25.8	
NSWC-BIOF007	3/7/96	mg/kg	0.448	BN	***11.4***		58.3	***0.546***	B	17.7		***6.37***	B	15.4		16.4		8.73	B	10.9	1.31	N	1.45	B	32	35.7	
NSWC-BIOF008	3/7/96	mg/kg	<0.239		***6.13***		91.9	***0.648***	B	11.4		***11.1***		10.4		17		6.22	B	10.5	0.943	N	1.35	B	22.3	29.9	
NSWC-BIOF009	3/7/96	mg/kg	<0.267		***2.96***		83.5	***0.540***	B	9.49		***4.86***	B	10.5		13.2		6.03	B	8.99	<0.386		2.14	B	17.2	39.7	
NSWC-BIOF010	3/7/96	mg/kg	0.233	BN	***5.26***		46.7	***0.478***	B	12.4		***8.08***		7.12		13.7		4.43	B	7.24	0.855	N	1.25	B	20.9	20.6	
NSWC-BIOF011	3/7/96	mg/kg	0.610	BN	***6.87***		73	***0.542***	B	38.3		***9.18***		16		15.2		45.2		193	1.43	N	1.83	B	24.2	38.7	
NSWC-BIOF012	3/7/96	mg/kg	0.491	BN	***6.73***		54.6	***0.459***	B	17.6		***12.6***		11.2		14.5		7.94	B	21.1	0.938	N	1.51	B	23.5	31.3	
NSWC-BIOF013	3/7/96	mg/kg	0.383	BN	***2.88***		51.6	***0.454***	B	9.36		***7.82***		8.51		7.38		5.58	B	10.6	0.572	BN	0.897	B	14.2	25.3	
NSWC-BIOF014	3/7/96	mg/kg	<0.228		***2.58***		62.7	***0.623***	B	9.48		***12.1***		10.4		7.72		6.52	B	17.9	0.554	BN	1.19	B	13.2	36.1	

Notes:

1. Bold italic sample results with asterisk indicate a sample level above the Interim Measures Cleanup Level.
2. Analytical results are for metals only. No other analytes were present at levels near or above interim Cleanup Levels Criteria.

Flagging codes:

C: (for metals): indicates laboratory duplicate analysis not within control limits.
B: (for metals): indicates a concentration below reporting limit.
E: (for metals): indicates an estimated value because of the presence of an interference.
N: (for metals): indicates spike sample recovery not within control limits.

contamination exists in this area as the contaminated soils have been removed from the site. The results of confirmation sampling, and backfill sampling are provided in Tables 3 and 4.

5.0 CURRENT AND FUTURE LAND USES

The area surrounding the SWMU is heavily forested. The excavated area is not forested, and is exposed bedrock. The site is currently being used as a habitat for the local wildlife. It is not currently being used by the NSWC Crane Facility, and there are no plans for the facility to use this site in the future.

6.0 DESCRIPTION OF EXPOSURE PATHWAYS

6.1 HUMAN RECEPTOR EXPOSURE PATHWAYS

All soil with chemical concentrations above the cleanup goals has been removed from the Dump Site B area. The excavation was not backfilled and the bedrock is currently exposed. Humans are potentially exposed to several routes of exposure. The following routes of exposure are considered for human receptors:

Soil — The soil contaminants remaining around the SWMU are below the clean-up goals for this site. Soil with contaminant concentrations above the clean-up goals has been removed from the site and not replaced. The site currently consists of exposed bedrock. Human exposure to contaminated soil has been eliminated by removing the contaminated soil and transporting it to an approved disposal area.

Groundwater — Groundwater is not currently being used in the vicinity of the site. Leaching of contaminants from the soil to the groundwater has been eliminated by removing soils above the clean-up levels from the site. Prior to remediation, hazardous waste was present on top of bedrock and the possibility exists that contaminants leached into the groundwater prior to remediation. The groundwater will need to be evaluated at a later date.

Surface water — Surface water is not present at SWMU 26/08D.

Air — Wind erosion and atmospheric dispersion of contaminants at the site has been eliminated by removing soil from the site. The site currently consists of exposed bedrock.

6.2 ECOLOGICAL EXPOSURE PATHWAYS

All soil with chemical concentrations above the cleanup goals has been removed from the Dump Site B area. The excavation was not backfilled and bedrock is currently exposed. Ecological receptors are potentially exposed to several routes of exposure. The following routes of exposure are considered for ecological receptors:

Soil — The soil contaminants remaining around the SWMU are below the clean-up goals for this site. Soil with contaminant concentrations above the clean-up goals has been removed from the site and not replaced. The site currently consists of exposed bedrock. Ecological receptor exposure to contaminated soil has been eliminated by removing the contaminated soil and transporting it to an approved disposal area.

Groundwater — Groundwater is not currently being used in the vicinity of the site. Leaching of contaminants from the soil to the groundwater has been eliminated by removing soils above the clean-up levels from the site. Prior to remediation, hazardous waste was present on top of bedrock and the possibility exists that contaminants leached into the groundwater prior to remediation. The groundwater will need to be evaluated at a later date.

Surface water — Surface water is not present at SWMU 26/08D.

Air — Wind erosion and atmospheric dispersion of contaminants at the site has been eliminated by removing soil from the site. The site currently consists of exposed bedrock.

7.0 CURRENT RISKS VS. REMEDIATION GOALS

A quality assurance program, in accordance with the procedures set forth in the *General Project Plans for Interim Measures Cleanup* [MK, 1995], was followed for the IM at SWMU 26/08. A complete description of the quality assurance program and its relationship to the remediation goals for the IM at SWMU 26/08 is contained in the IMR, and is summarized as follows:

- All samples collected from SWMU 26/08 were transported from the field to the laboratory using proper chain-of-custody procedures.
- Field quality control samples were collected to identify potential sources of error or cross contamination that may have occurred during collection, storage, or shipment of samples to the laboratory. Field quality control samples included trip blanks, field duplicates, and an equipment rinsate sample.
- The laboratory performed method blank, sample matrix spike, sample matrix spike duplicate, surrogate, and standard matrix spike analyses in order to evaluate laboratory accuracy, precision, representativeness, comparability, and completeness.

Overall, data quality objectives for accuracy, precision, representativeness, comparability, and completeness were met, and the data was considered acceptable.

The landfill and associated contaminated soil above the cleanup goals have been removed from the site. The target cleanup levels for these interim measures were taken from the *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects*, June 18, 1994 [U.S. EPA, 1994]. Since the sources of contamination have been removed, there are no longer any exposure pathways by which human and ecological receptors can be exposed. Therefore, there is currently little or no risk to human and ecological receptors.

Table 5 presents comparison of the confirmation, background, and borrow pit sample concentrations, cleanup levels, and human and ecological receptor Ecological Data Quality Limit (EDQL) and Soil Screening Levels (SSL) values for barium and lead. A comparison of the values in Table 5 are summarized as follows:

- Barium and lead concentrations in the confirmation and background samples are below the SSL's for human receptors.
- Lead concentrations in the confirmation and background samples are below the EDQL's for ecological receptors.

TABLE 5
SWMU 26 CONTAMINANTS OF CONCERN
SUMMARY OF SOIL ANALYTICAL DATA, CLEANUP GOALS, AND RISK LEVELS
NSWC CRANE, INDIANA

Element	Cleanup Goal	Range		Ecological Risk	Human Risk	
		Confirmation Samples	Backfill Samples	EDQL	Ingestion	Inhalation
Barium	5,500	82.9 - 4,510	20.6 - 123	1.04	5,500	690,000
Lead	500	4.2 - 280	3.5 - 17	0.45	400	--

Notes:
1) All levels in mg/kg
2) Ranges of confirmation samples obtained from Table 3
3) Ranges of Backfill and Background samples obtained from Table 4
4) Ecological Risk levels obtained from Region 5 Model QAP Appendix C
5) EDQL = Ecological Data Quality Limit
6) Human Risk levels obtained from Region 5 Model QAP Appendix D
7) "-- = Not Established

- Barium concentrations in the confirmation and background samples are above the EDQL's for ecological receptors.

Groundwater quality has not been determined at this site and will be evaluated at a later date.

8.0 RISK SCREENING EVALUATION SUMMARY

Considering the work performed at SWMU-26/08D, the confirmation sample results and the acceptance of the physical work by the Navy, the requirements and objectives of the Interim Measures Cleanup Activities have been met. All contaminated soil above the clean-up goals for this site have been excavated to bedrock and removed from the site. It is recommended that no further action be taken for soil remediation at NSWC Crane SWMU-26/08D. The need for further action concerning groundwater quality will be evaluated at a later date.

9.0 REFERENCES

Morrison Knudsen Corporation, (MK) 1995a. *Work Plan for Interim Measures Cleanup at Solid Waste Management Units #23/00, #25/07D, and #26/08D*, Revision B, as amended, dated August 25, 1995.

Morrison Knudsen Corporation, (MK) 1995b. *Task-Specific Site Safety and Health Plan, Supplement to Work Plan for Solid Waste Management Units #23/00, #25/07D, and #26/08D*, Revision B, dated August 25, 1995.

Morrison Knudsen Corporation, (MK) 1995c. *Quality Control Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana,* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995d. *Quality Assurance Project Plan for RCRA Corrective Action Interim Measures Cleanup, NSWC Crane, Crane, Indiana,* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995e. *Waste Management Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana,* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995f. *Sampling and Analysis Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana,* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1995g. *Environmental Protection Plan for Interim Measures Cleanup, NSWC Crane, Crane, Indiana* Revision C, August 1995.

Morrison Knudsen Corporation, (MK) 1997. *Draft Interim Measures Report, SWMU-26/08D, Highway 58 Dump Site B, NSWC Crane, Indiana.* January 1997.

Naval Energy and Environmental Support Activity. (NEESA) 1983. *Initial Assessment Study of Naval Weapons Support Center Crane, Indiana.* NEESA 13-003, May.

U.S. Environmental Protection Agency (U.S. EPA) 1994. *RCRA Corrective Action Guidance Human Data Quality Levels for RFI Projects.* June 18, 1994.

U.S. Environmental Protection Agency (U.S. EPA) 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846).* U.S. EPA OSWER, Third Edition, revised December 1996.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James M. Hunsicker

SIGNATURE

James M. Hunsicker
Environmental Protection Department Manager
TITLE

7/12/00
DATE