

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**

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**NSWC CRANE
CRANE, INDIANA**

June 2000

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Prepared for

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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.

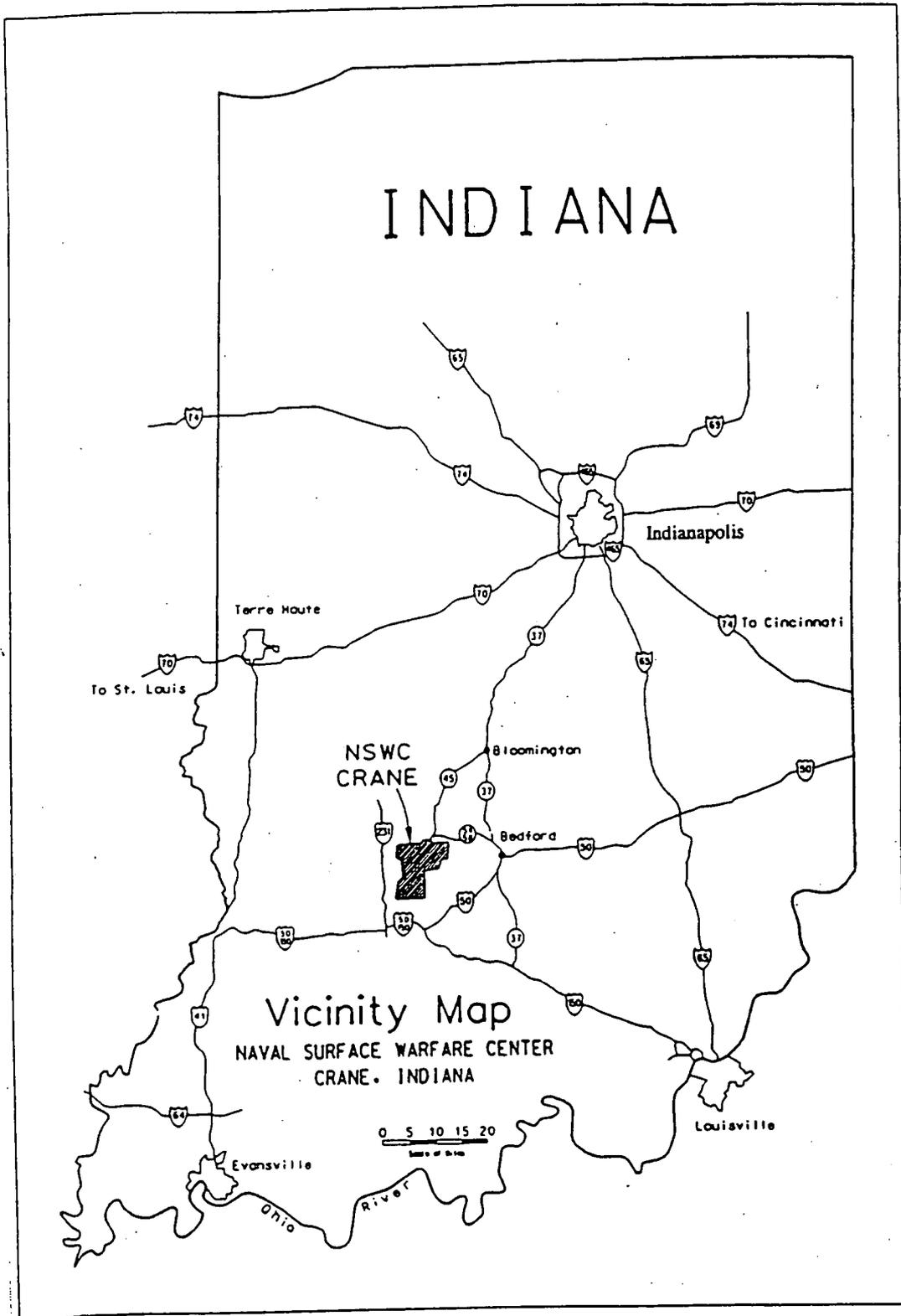
NSWC Crane is underlain by unconsolidated deposits of Quaternary (Pleistocene) age and residual soil derived from Pennsylvanian and Mississippian bedrock. The unconsolidated deposits are limited to the small floodplains and are composed of alluvial, colluvial and paludal (marshland) silt, sand, and gravel; 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**

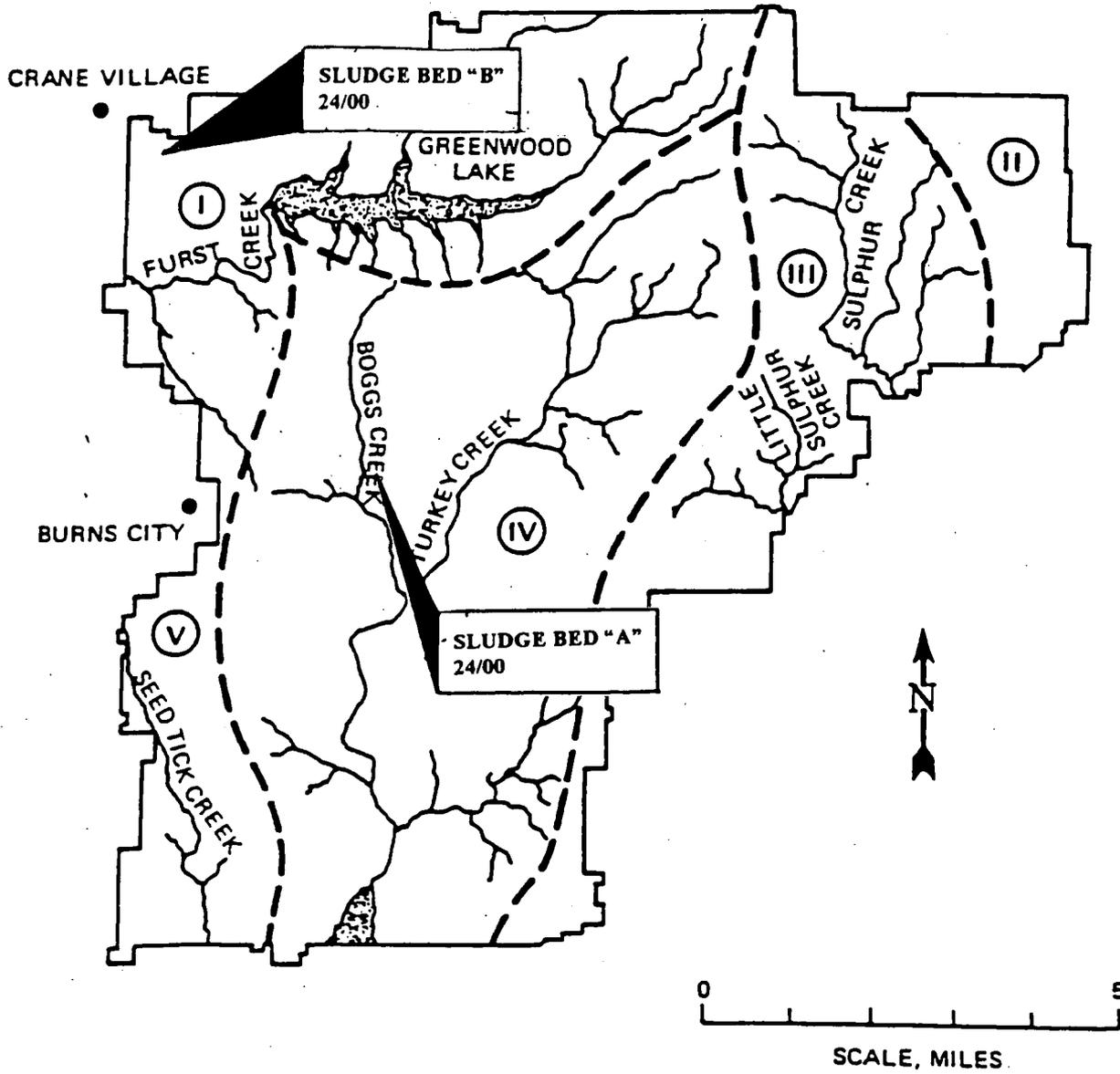
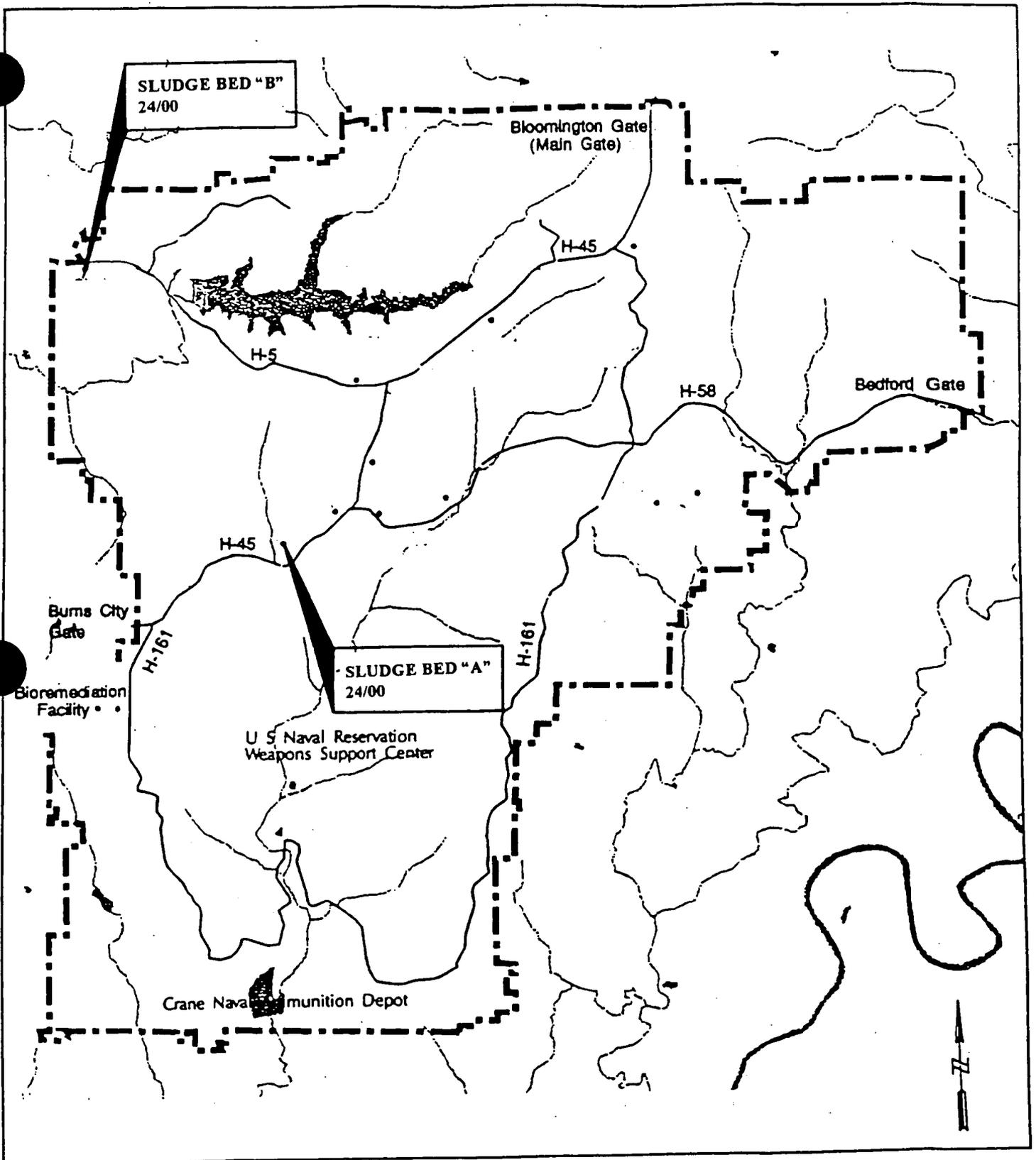


FIGURE 2
SURFACE DRAINAGE OF NSW CRANE



**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

COMPOUND	SAMPLE # DATE TYPE CLEANUP LEVEL mg/kg	SLUDGE BED A					SLUDGE BED B						
		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	
		7/12/95 SOIL	7/12/95 SOIL	7/12/95 SOIL	7/12/95 SOIL	7/12/95 SOIL	7/12/95 SOIL	7/12/95 SOIL	7/12/95 SOIL	9/18/95 SOIL	9/18/95 SOIL	9/18/95 SOIL	9/18/95 SOIL
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	
Beryllium	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	<i>*0.0085 (P)</i>	<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 excess 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:

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. 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

COMPOUND	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
	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)	0.00089 (J,P)	<0.0015	<0.00082 (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	0.00018(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.
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- 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.