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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

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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
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

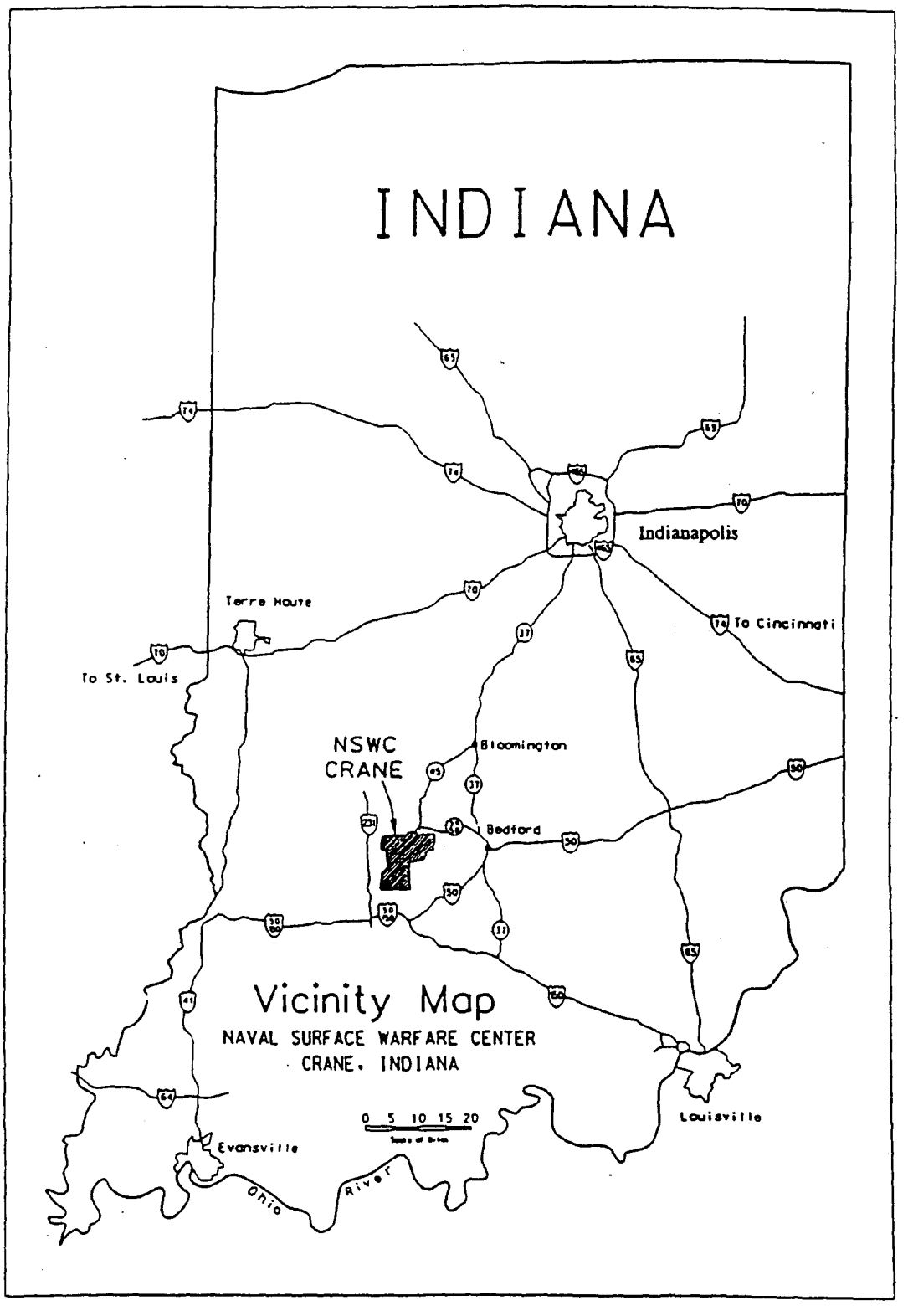

FIGURE 1
NSWC CRANE VICINITY MAP

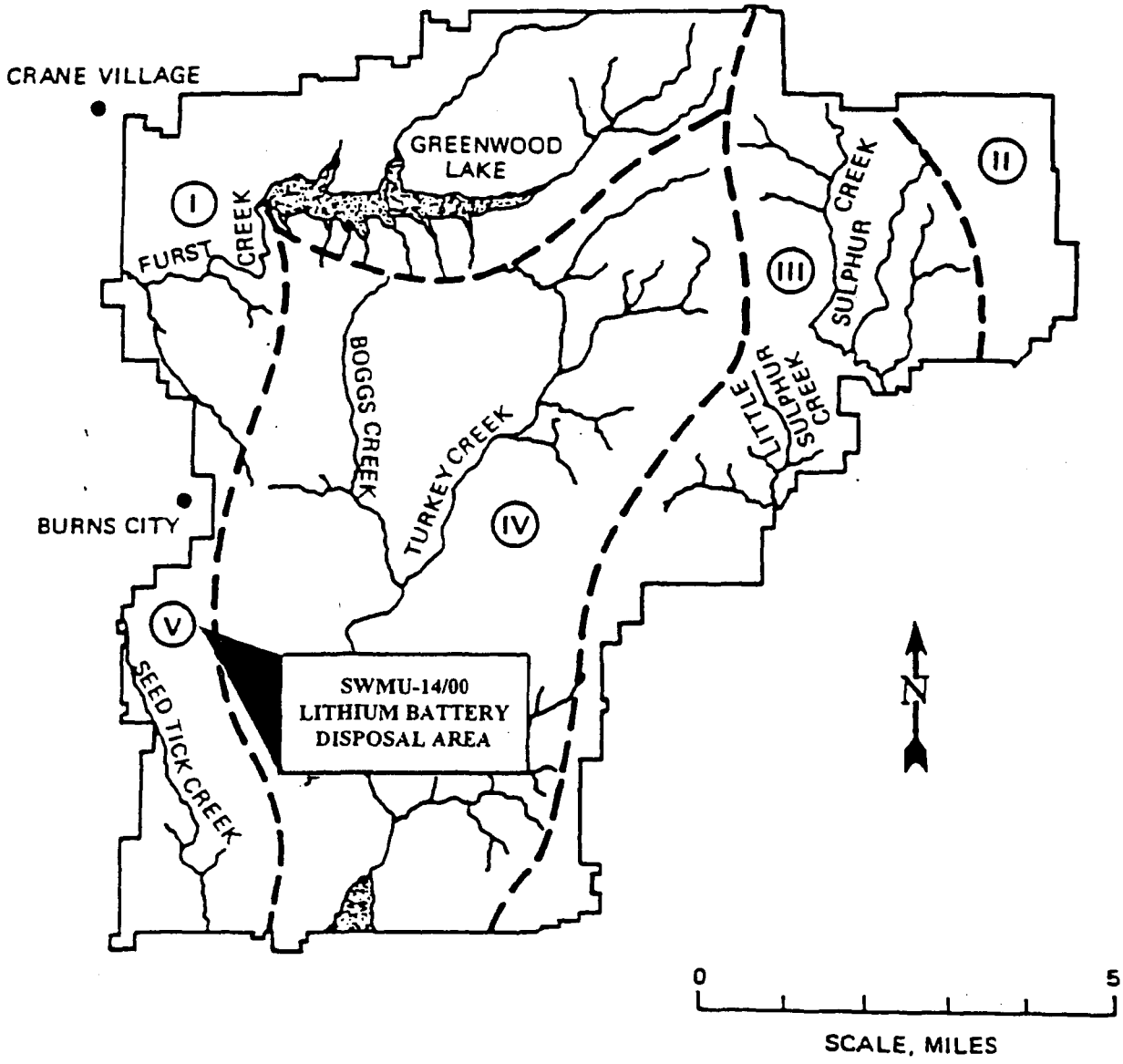

FIGURE 2
SURFACE DRAINAGE OF NSWC CRANE

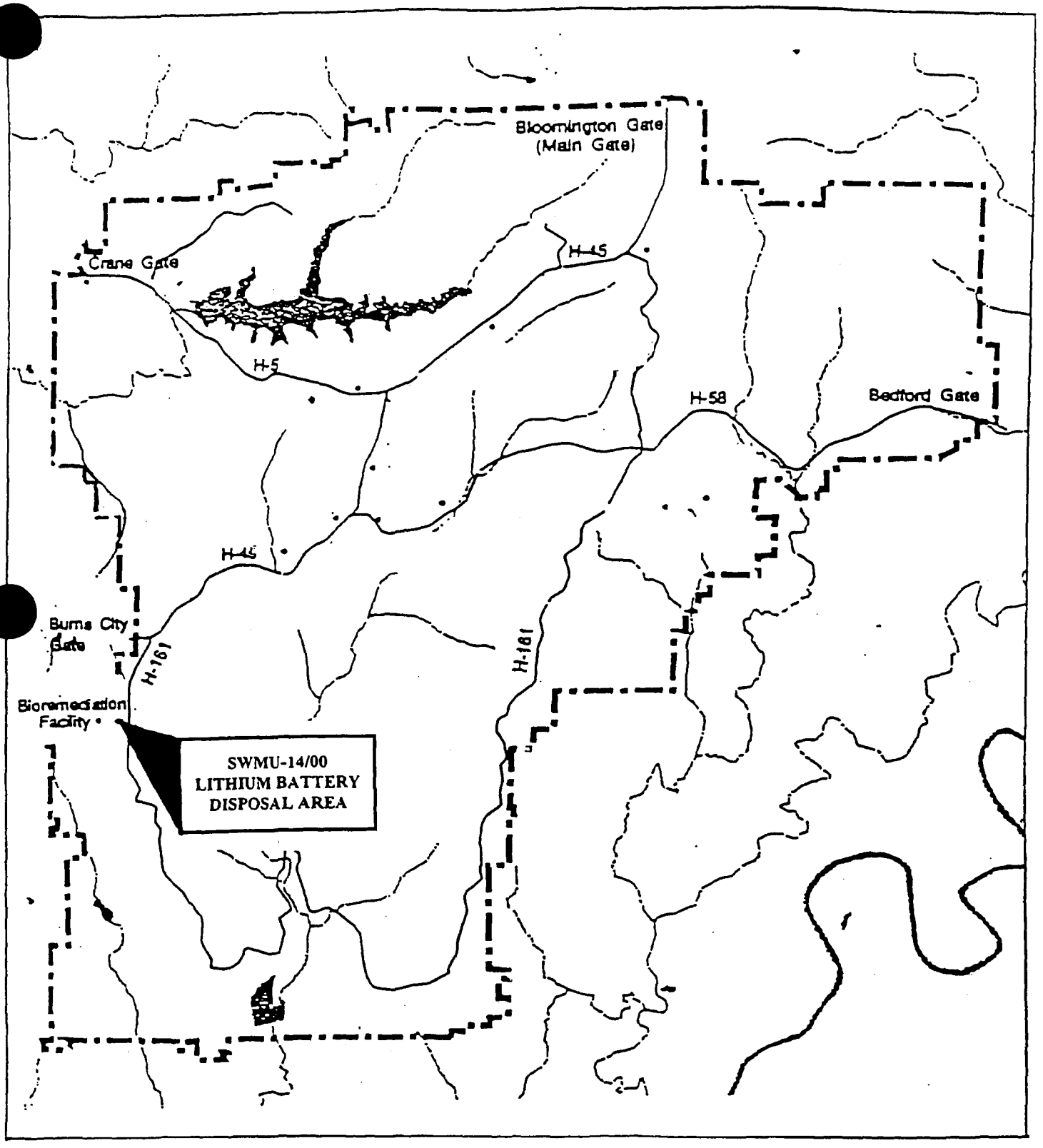

FIGURE 3
NSWC CRANE SWMU 14 LOCATION

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.

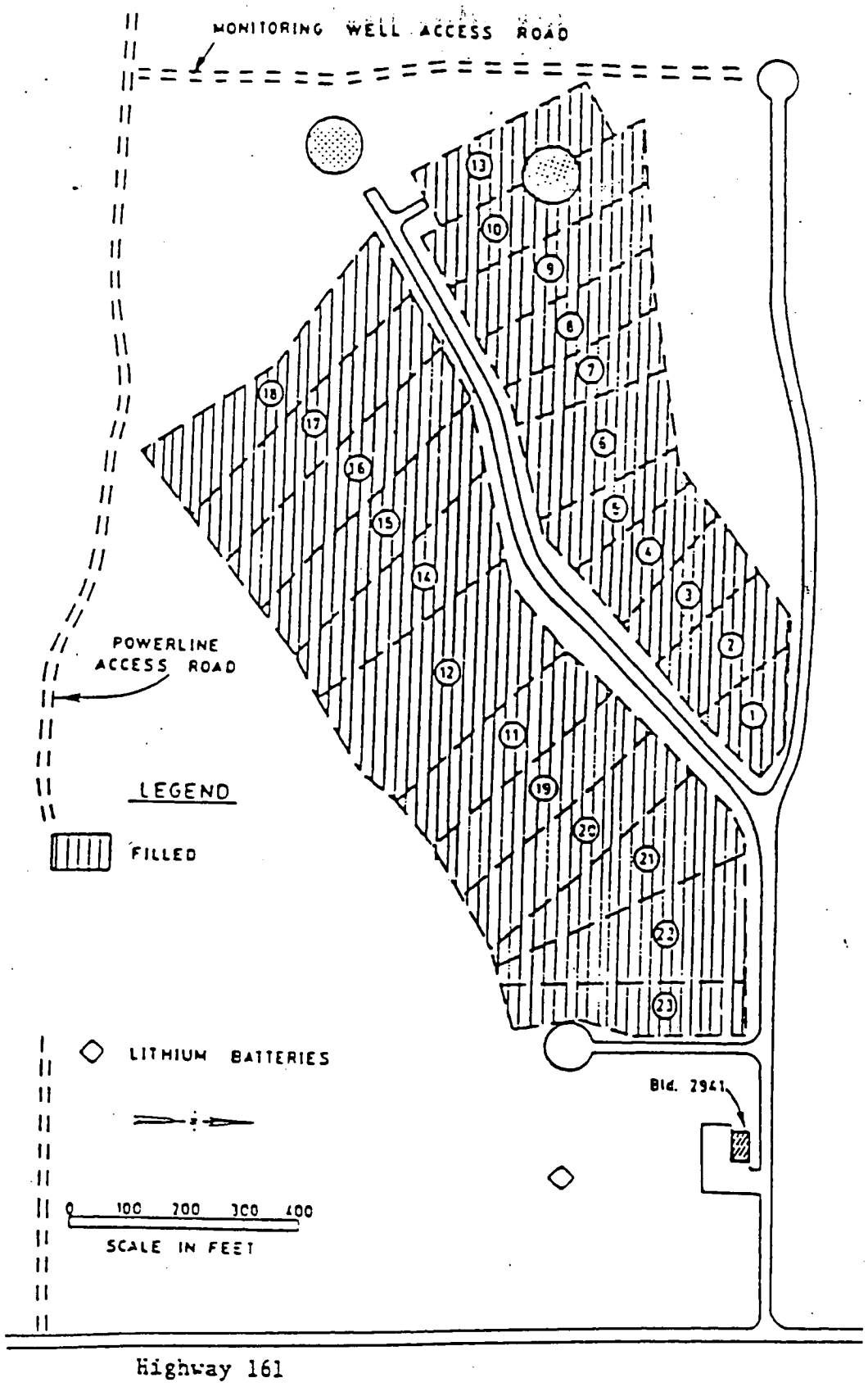

FIGURE 4
SANITARY LANDFILL AND LITHIUM BATTERY DISPOSAL AREA ACCESS ROADS

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.

TAB

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
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.

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

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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-CI
4324-00
PROJECT MEMBER
PROJECT MANAGER
PROJECT ENGINEER
GNL SUPT
SAFETY AND HEALTH
QA/QC SUPERVISOR
PROJECT CONTROLS
FIELD ENGINEERING
PMO-CHARLESTON
FILE: 13.050.
FILE: 10.021
FILE: 11.012

C-4324
ST I A R
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