

**MISCELLANEOUS MILITARY/CIVIL HTW PROJECTS
FOR
U. S. ARMY CORPS OF ENGINEERS
OMAHA DISTRICT**

**FINAL
ENGINEERING EVALUATION/COST ANALYSIS
FOR THE
EXPLOSIVE-CONTAMINATED SUMPS
AT
IOWA ARMY AMMUNITION PLANT
MIDDLETOWN, IOWA**

**CONTRACT NO. DACW45-93-D-0004
Delivery Order No. 012**

Prepared by:

**CDM Federal Programs Corporation
8215 Melrose Drive, Suite 100
Lenexa, Kansas 66214**

October 11, 1994

**PCDR \ PCDR3 \ IOWA AAP \
091307 \ IWA070210**

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**ENGINEERING EVALUATION/COST ANALYSIS DOCUMENT
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LIST OF ACRONYMS

ARAR	Applicable Relevant and Appropriate Requirements
BDAT	Best Demonstrated Available Technology
CERCLA	Comprehensive Environmental Response Compensation Liability Act
CFR	Code of Federal Regulations
DNT	1,3-Dinitrotoluene
DOD	Department of Defense
DOT	Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
HMX	Cyclotetramethylenetetranitramine
IAAP	Iowa Army Ammunition Plant
NCP	National Contingency Plan
OSHA	Occupational Safety and Health Administration
PRG	Preliminary Remediation Goal
RDX	Cyclotrimethyleretinitramine
TCLP	Toxicity Characteristics Leaching Procedure
TETRYL	2,4,6-Trinitrophenylmethlynitramine
TNB	1,3,5-Trinitrobenzene
TNT	2,4,6-Trinitrotoluene
USGS	United States Geological Survey
USACE	United States Army Corps of Engineers
VISITT	Vendor Information System for Innovative Treatment Technologies

1.0 SITE CHARACTERIZATION

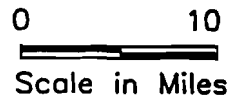
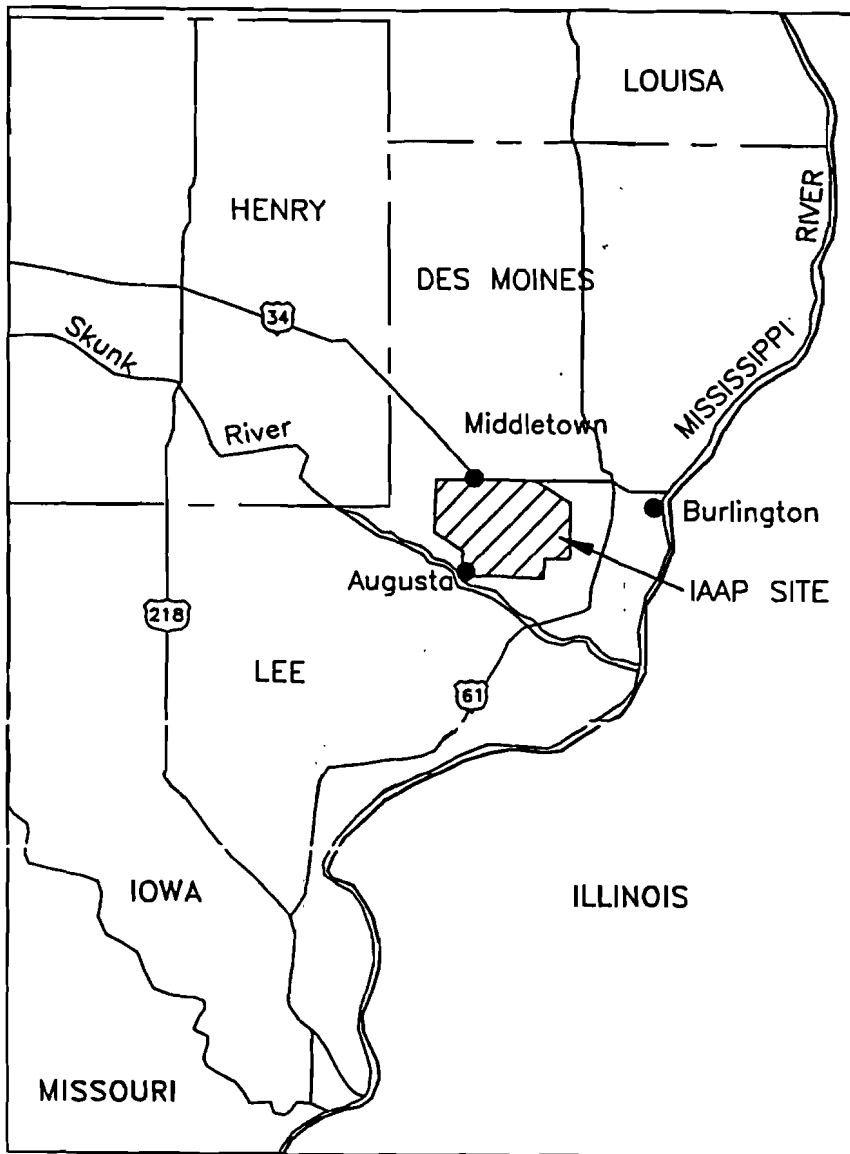
1.1 INTRODUCTION

The purpose of this Engineering Evaluation/Cost Analysis (EE/CA) is to document the alternative selection process for the removal action at the pesticide pit. Upon completion of the EE/CA, it is submitted for public comment on the removal action (30 days). Once comments are received and addressed, an Action Memorandum/Decision Document is developed documenting how public comments were addressed and the selected alternative. The removal is initiated after the Action Memorandum/Decision Document is published.

1.2 SITE DESCRIPTION AND BACKGROUND

The Iowa Army Ammunition Plant in Middletown, Iowa, (IAAP) began production in 1941 and is still operating at the present time. IAAP is currently operating to load, assemble and pack ammunition items, including projectiles, mortar rounds, warheads, demolition charges, anti-tank mines, anti-personnel mines and the components of these munitions, including primers, detonators, fuses and boosters. The loading, assembling, and packaging operations use explosive materials and lead-based initiating compounds (Jaycor 1993). The location and topography of the site is shown on Figure 1-1 and Figure 1-2).

A total of 28 concrete sumps were identified during the initial survey of sumps on 28 July 1992 with the aid of base personnel at IAAP. In addition, 3 concrete sumps and 5 stainless steel sumps were included for a total of 31 concrete and 5 stainless steel sump to be addressed in this removal. The sumps are generally placed adjacent to buildings located throughout IAAP and are of various sizes. The sumps scheduled for removal are inactive. Access to some of the sumps will not be possible with large equipments because of the presence of utilities and ground level piping systems. Sumps 1 through 4, 8 and 37 are located at Line 1, Sumps 9 through 16-Line 2, Sumps 17 and 19-Line 3, Sumps 19 through 21-Line 3A, Sumps 22 through 27 and 41-Line 5B, Sumps 28 through 30-Line 5A, Sumps 31 and 32-Line 6, and sumps 34 through 36 and 38 through 40-Line 7 (Figures 1-3 through 1-9). Table 1-1 shows the sump size, number of samples, and depth



Source: Dames & Moore


Project No. 7150-100	Iowa Army Ammunition Plant Middletown, Iowa	Site Location Map	Figure No. 1-1
	 CDM FEDERAL PROGRAMS CORPORATION <small>a subsidiary of Comp Dresser & McKee Inc.</small>		4/94

TABLE 1-1
Sump Sample Summary
Iowa Army Ammunition Plant
Middletown, Iowa

<i>Sump No.</i>	<i>Line-Bldg. No.</i>	<i>Size (Ft.)</i>	<i>No. Surf. Samples</i>	<i>No. at Depth</i>	<i>Depth BGS (In)</i>
1	1-50	6 X 9 X 3	3	3	34
2	1-50	6 X 9 X 3	3	3	19
3	1-08-1	6 X 9 X 3	2	2	28
4	1-05-1	7.25 X 7.25 X 6	2	2	25 & 33
8	1-40	14 X 20 X 2-4.5	5	5	19-43
9	2-06-1	6 X 9 X 3	2	2	30
10	2-50	6 X 9 X 3	2	2	31
11	2-05-2	7.25 X 7.25 X 6	3	1	12
13	2-05-1	9 X 9 X 3	3	3	35
14	2-05-1	7.25 X 7.25 X 6	4	4	37
15	2-05-1	9 X 9 X 3	3	3	33
16	2-05-1	3 X 6 X 3.5	2	2	37
17	3-05-1	4 X 7 X 3	2	2	32
19	3-05-1	7.25 X 7.25 X 6	3	3	37
22	5B-55	2 X 2 X 2	2	1	16
23	5B-55	2 X 2 X 2	2	2	19
24	5B-21	2 X 2 X 2	2	2	24
25	5B-56	2 X 2 X 2	2	2	22
26	5B-25	2 X 2 X 2	2	2	24
27	5B-27	2 X 2 X 2	2	2	24
28	5A-21	2 X 2 X 2	2	2	24
29	5A-56	2 X 2 X 2	2	2	26
30	5A-25	2 X 2 X 2	2	2	23
31	6-19	2 X 2 X 2	2	2	24
32	6-98	2 X 2 X 2	2	2	28
34	7-18	2 X 2 X 2	2	2	24
35	7-67	2 X 2 X 2	2	2	33
36	7-54-1	2 X 2 X 2	2	2	28
37	1-12	5 Dia X 5 ft Deep	---	---	---
38	7-64	2 X 2 X 2	---	---	---
39	7-66	2 X 2 X 2	---	---	---
40	7-18	2 X 2 X 2	---	---	---
41	5B-140-1	5 Dia X 5 ft Deep	---	---	---
42	5B-140-2	5 Dia X 5 ft Deep	---	---	---
43	5B-140-3	4 X 10 X 3	---	---	---
44	5B-140-3	4 X 10 X 3	---	---	---

samples were collected in association with the respective buildings. The sumps were generally used to collect weekly wash down of floors, walls, and equipments. All sumps were reported to be constructed of concrete and appeared structurally sound at the time of the survey, with no obvious evidence that the base had been breached (Jaycor 93).

Thirteen former sumps removed by the installation contractor will need to be backfilled to existing grade. Prior to being backfilled confirmatory sampling for explosives and metals will be conducted.

The IAAP is located in the Dissected Till Plain section of the Central Lowland Province of the southern Iowa Drift Plain region. The site is immediately underlain by fill material consisting of silty clay and deposits of wind blown non-stratified silts and clays (loess), are located beneath the fill material. Underlying the loess is the Kellersville Till member of the Glasford formation, a glacial till consisting of clay and silt with discontinuous sand and gravel seams. The generalized groundwater flow at the IAAP is to the south and southeast. However, due to the presence of sand seams and clay lenses in the glacial layers and dissection by surface drainage ways, the localized groundwater flow direction in the unconsolidated material varies across the site, often resulting in perched water conditions. Depth to groundwater at IAAP is approximately 5 - 40 feet bgs (Jaycor 1993).

1.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The sumps are associated with load lines at the facility. There is industrial or commercial land use in the immediate area. The possible pathways of exposure to the population include:

- Ingestion of wind blown surface soil that are contaminated, by onsite workers or visitors of the site.
- Inhalation of wind blown surface soil that are contaminated, by onsite workers or visitors of the site.
- Eventual leaching of contaminants to groundwater which may be a source of drinking water offsite.

The data to be used in this Engineering Evaluation/Cost Analysis (EE/CA) is from the contamination assessment of concrete sumps at IAAP final report June 10, 1993. The assessment on the extent of contamination at the sump areas was not fully investigated and defined for the purposes of this (EE/CA). The data obtained from the Contamination Assessment report was reviewed and compared to the Preliminary Remediation Goals (PRGs) calculated for the site. For contaminants found at the sump without the calculated PRGs, action levels are obtained from the Risk-Based Concentration Table published by EPA Region III for a commercial scenario. Action levels (clean up goals) used for explosives and metals found at IAAP are shown in Table 1-2.

For the purpose of volume estimation of contaminated soil, 4 different scenarios were investigated, they are:

- (1) excavating 6 inches around the sump and 1 foot at bottom of sump.
- (2) excavating 1 foot around the sump and 1 foot at bottom of sump.
- (3) excavating 2 feet around the sump and 2 feet at bottom of sump.
- (4) excavating with regards to degree of contaminant concentrations at each sump.

The total volume of contaminated soil to be removed for the 36 sumps using scenario 1 (6 inches) is estimated at 91 cubic yards, scenario 2 (1 foot) is estimated at 139 cubic yards, scenario 3 (2 feet) is estimated at 358 cubic yards. The recommended volume of contaminated soil removal is derived based on the degree of contamination around the sump. The criteria used for the recommended volume is:

- sumps with concentrations less than 100 $\mu\text{g/g}$ of explosive or metals contaminants at the surface soil or 6 inches below the sump than scenario 1 applies,
- the scenario 2 excavation depths are used for concentration between 100-200 $\mu\text{g/g}$,
- for concentrations greater than 200 $\mu\text{g/g}$ of explosive or metals contaminants at the surface soil or 6 inches below the sump, the scenario 3 excavation depths are used.
- for the purpose of cost estimating, the recommended scenario for each sump was used.

TABLE 1-2 Action Levels Iowa Army Ammunition Plant Middletown, Iowa		
<i>Contaminants</i>	<i>Soil (mg/kg)</i>	<i>Water (mg/L)</i>
HMX	51,000**	5.1*
RDX	53*	0.002*
2,4,6-TNT	196*	0.0095*
1,3,5-TNB	102*	0.005*
2,6-DNT	8.7	0.00042*
2,4-DNT	8.7*	0.00042*
Nitrobenzene	510**	0.05*
Cadmium	510**	0.05*
Copper	38,000**	1,400**
Lead	500	0.005
Chromium	5,100**	0.005*
Silver	5,100**	0.5*
Antimony	816*	0.04*
Mercury	310**	0.031*
Barium	72,000**	7.1*
Nickel	20,000**	2*
Tetryl	10,000**	1*
Arsenic	3.4*	0.00016*

* PRGs calculated at IAAP.

** From Risk-Based Concentration Table, Region III.

Table 1-3 shows volumes for each sump for the 4 scenarios and Table 1-4 shows the average concentrations of explosives and metals contaminants at each sump. Volume calculations are included in Appendix A. The average concentrations that exceed the action levels in Table 1-2 are bolded. Contaminant concentrations were averaged for the two samples taken due to their close proximity to each other.

During the sampling effort, Sump 12, 13, 15, and 16 were found full of water. If these sumps are full, during remedial action, an estimated 4,070 gallons of contaminated water need to be treated before discharge. The explosive- and metal-contaminated water will be treated using activated carbon for explosives and precipitation or ion exchange for metals via a temporary facility to be set up by the removal contractor. Table 1-5 shows volume and average concentrations of contaminants in the sump water and discharge limits that will be used for treated water.

All 31 concrete and 5 stainless steel sumps removed from site will be disposed by macro-encapsulating at a permitted landfill. The contaminated water will be collected in a sump adjacent to the decontamination pad and disposed of at a temporary wastewater treatment facility (activated carbon) constructed by the removal contractor.

Sumps 22 through 36 do not contain any explosive contaminants above the Preliminary Remediation Goals or the Risk-Based Concentrations (Table 1-4) and no sampling analysis results are available for sumps 37 through 44. It is assumed that sumps 37 through 44 contain explosive contaminants. Therefore, a total of 43 yd³ of metal-contaminated (explosive free) soil from these 14 sumps will be hauled and macro encapsulated at a permitted landfill.

TABLE 1-3
Sump Excavation Volumes
Volumes in yd³
Iowa Army Ammunition Plant
Middletown, Iowa

<i>Sump No.</i>	<i>6" Perimeter</i>	<i>1' Perimeter</i>	<i>2' Perimeter</i>	<i>Recommended Volume</i>
1	4.4	7.0	9.4	4.4
2	3.0	4.0	10.0	3.0
3	4.0	6.1	16.0	16.0
4	6.0	10.5	21.2	6.0
8	16.0	18.1	43.0	18.1
9	3.5	5.1	13.8	13.8
10	3.5	5.2	14.0	14.0
11	5.0	3.2	4.7	4.7
13	5.4	7.3	19.0	19.0
14	3.7	5.7	10.4	10.4
15	4.0	7.1	18.0	18.0
16	2.0	3.7	10.5	2.0
17	2.0	4.3	11.7	2.0
19	3.7	5.7	10.4	3.7
22	.42	0.81	3.3	0.42
23	.47	0.93	3.6	0.47
24	.55	1.1	4.1	0.55
25	.52	1.0	3.8	0.52
26	.55	1.1	4.1	0.55
27	.55	1.1	4.1	0.55
28	.55	1.1	4.1	4.1
29	.58	1.2	4.3	0.58
30	.58	1.2	4.3	1.2
31	.50	1.0	3.8	0.5
32	.61	1.3	4.5	4.5
34	.55	1.1	4.1	0.55
35	.69	1.4	5.0	0.69
36	.61	1.3	4.5	0.61
37	2.65	4.9	12.9	2.7
38	0.55	1.1	4.1	0.55
39	0.55	1.1	4.1	0.55
40	0.55	1.1	4.1	0.55
41	2.65	4.9	12.9	2.7
42	2.65	4.9	12.9	2.7
43	3.7	6.2	16.3	3.7
44	3.7	6.2	16.3	3.7
TOTALS	91 yd³	139 yd³	358 yd³	168 yd³

TABLE 1-4
Average Concentration of Contaminants in Soil
Iowa Army Ammunition Plant
Middletown, Iowa

Sump No.	Average Concentration of Contaminants (µg/g)*																	
	HMX	RDX	2,4,6-TNT	1,3,5-TNB	2,6-DNT	2,4-DNT	Nitrobenzene	Cadmium	Copper	Lead	Chromium	Silver	Antimony	Mercury	Barium	Nickel	Tetryl	Arsenic
1	—	—	—	—	—	—	—	2.3	72.2	447	57	—	—	—	—	—	—	—
2	—	—	2	—	—	—	—	—	—	65	—	—	—	—	—	—	—	—
3	525	1,323	5.4	—	—	—	—	2.1	284	354	65	0.8	23	—	—	—	—	—
4	—	—	—	—	—	—	—	2.1	—	92	—	—	—	—	—	—	—	—
8	112	92.3	10.4	106	0.6	7.5	68	1.2	—	—	—	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—	1.6	—	1,061	—	—	—	—	—	—	—	—
10	—	—	268	—	—	—	—	—	—	—	—	—	—	—	—	—	3,981	—
11	688	1,400	515	348	2.6	2.8	—	1.3	—	253	—	—	16	—	—	—	—	—
13	104	288	105	18.5	—	—	—	2.3	—	329	61	—	—	94	—	—	—	—
14	560	1,526	1,743	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	80	313	14.1	1.4	—	—	—	11	83.3	618	155	—	—	3.9	—	—	—	—
16	—	7.2	1.6	—	—	—	—	6.3	39	—	—	—	—	—	—	—	—	—
17	3.5	3.2	4.3	—	—	—	—	1.6	—	255	—	—	—	—	—	—	—	—
19	12	64	32	1.1	—	—	—	—	—	76.2	—	—	—	—	—	—	—	—
22	—	—	—	—	—	—	—	1.7	—	111	—	—	—	—	—	—	—	—
23	—	—	—	—	—	—	—	11.5	—	277	—	—	—	—	—	—	—	—
24	—	—	—	—	—	—	—	4.0	57.3	395	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	2.1	—	233	—	—	—	—	—	—	—	—
26	—	—	—	—	—	—	—	3.0	—	139	—	—	—	—	—	—	—	—
27	—	—	—	—	—	—	—	1.6	—	164	—	—	—	—	—	—	—	—
28	—	—	—	—	—	—	—	2.9	35.2	753	—	—	—	—	—	—	—	92
29	—	—	2.0	—	—	—	—	2.3	—	171	—	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	1.6	—	137	—	—	9	—	—	—	—	—
31	—	1.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	1.4	526	749	73	—	57	727	—	—	—	—
34	—	—	4.1	—	—	—	—	—	—	76	—	1	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	922	167	—	1.3	11.2	—	—	—	—	—
36	—	1	—	—	—	—	—	1.8	—	122	—	1.1	—	—	—	—	—	—
40	—	—	4.1	—	—	—	—	—	—	76	—	1.0	—	—	—	—	—	—

* Values exceeding action levels listed in Table 1-2.

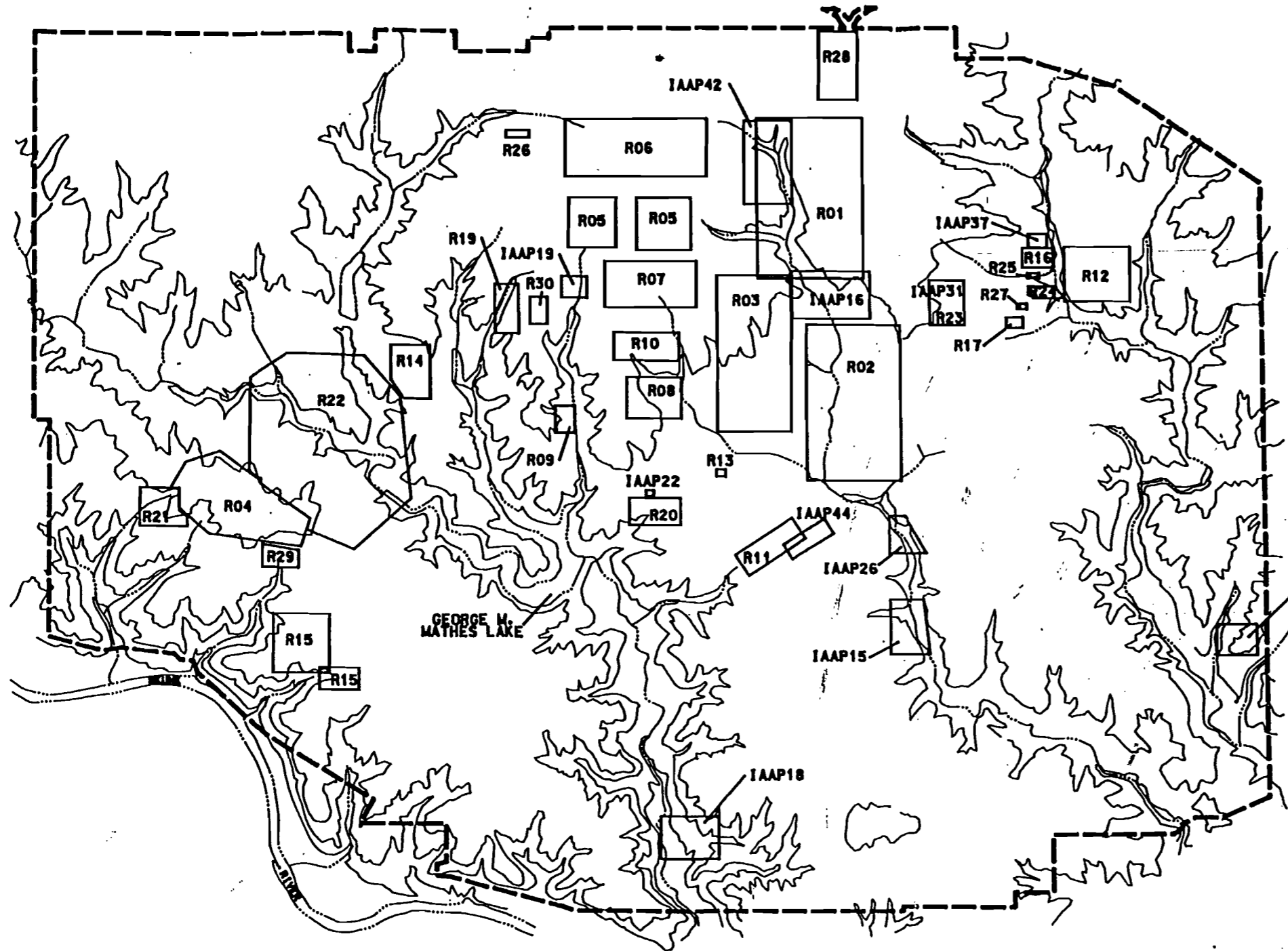
TABLE 1-5
Volume and Average Concentration of Contaminated Sump Water
Iowa Army Ammunition Plant
Middletown, Iowa

Sump No.	Volume of Contaminated Water (Gal.)	Average Concentration of Contaminants (µg/L)									
		HMX	RDX	2,4,6-TNT	2,4-DNT	1,3-DNB	1,3,5-TNB	Lead	Nitrobenzene	Copper	Chromium
12	1272	496	2240	0.7	82	47.3	0.5	7	—	—	—
13	1197	223	1100	5650	--	--	51.2	--	4.6	--	--
15	1197	168	285	0.6	--	--	1.0	86.3	--	111	13
16	404	542	2370	4270	--	--	7.1	80.5	--	244	--
*Discharge Limit		**400.0	**2.0	2.2	73.0	3.7	1.8	***50.0	3.4	1400	180

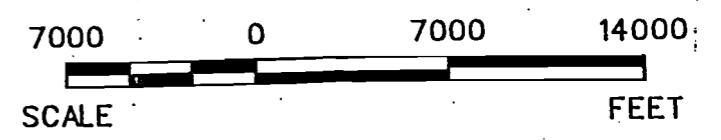
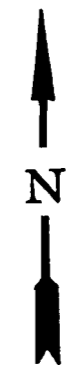
* Based on EPA Region III Risk-Based Concentration

** Based on Health Advisory Level

*** Water Pollution Standard Proposed (EPA)



LEGEND:
 ~~~~~ INTERMITTENT STREAM  
 690 TOPOGRAPHIC CONTOUR  
 CONTOUR INTERVAL - 50 FEET



  
 CDM FEDERAL PROGRAMS CORPORATION  
 a subsidiary of Camp Dresser & McKee Inc.

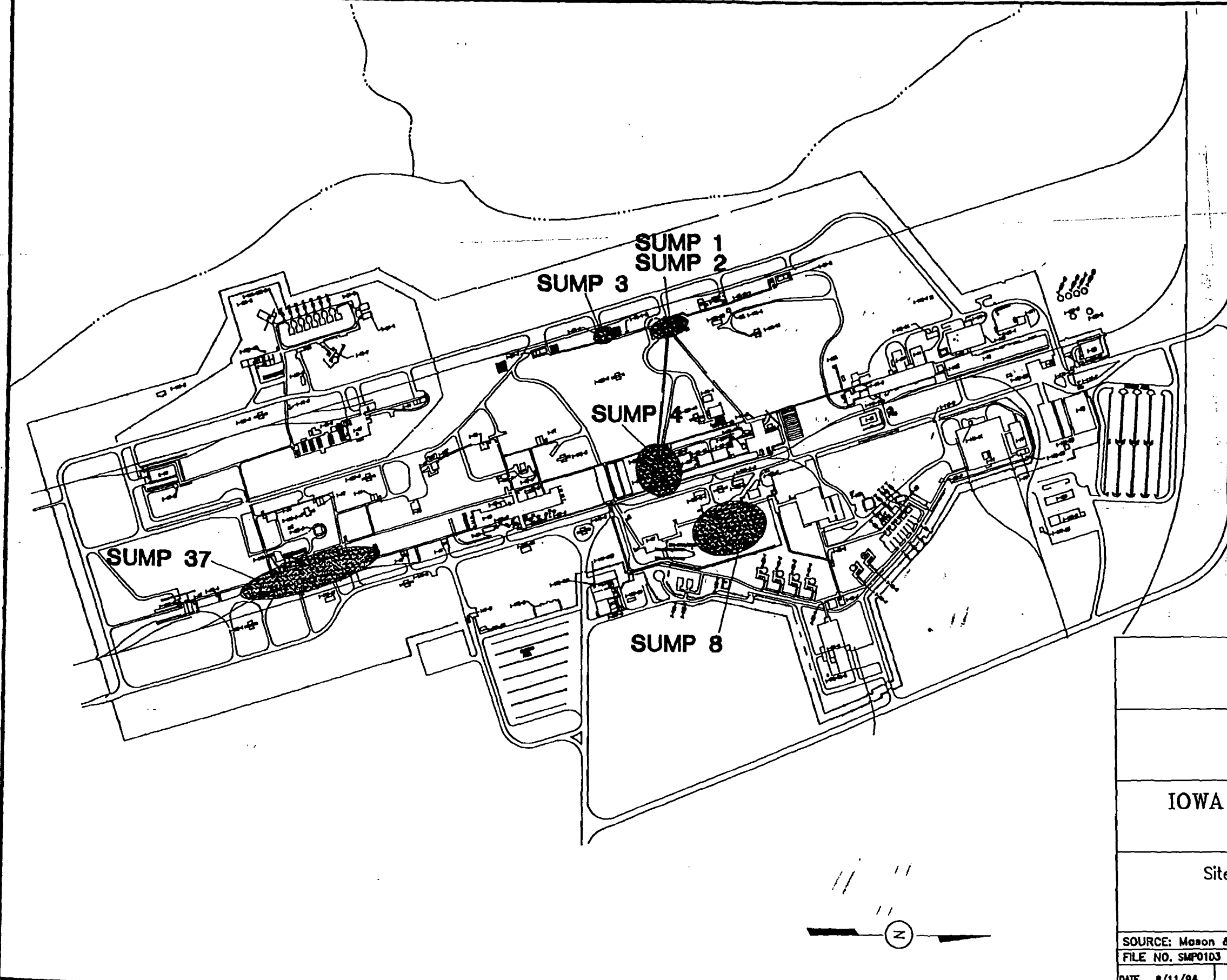
**JAYCOR**  
 Environmental

IOWA ARMY AMMUNITION PLANT  
 MIDDLETOWN, IOWA

IAAP Facility Showing Basewide  
 Site Locations

|                                              |              |                     |                 |
|----------------------------------------------|--------------|---------------------|-----------------|
| SOURCE: Mason & Hanger-Siles Mason Co., Inc. |              |                     |                 |
| FILE NO. IAAPMSTR                            | DRWN BY: DOS | PROJECT #: 7150-100 | SHT. 1 OF 1     |
| DATE 4/94                                    |              |                     | FIGURE: Plate 2 |





- LEGEND**
- ROAD
  - WALKWAY
  - FENCE
  - 7-12-1 BUILDING #
  - BERM (EXPLOSION PROTECTION)
  - TOPOGRAPHIC CONTOUR
  - CONTOUR INTERVAL = 5 FEET
  - INTERMITTENT STREAM
  - SUMP AREA



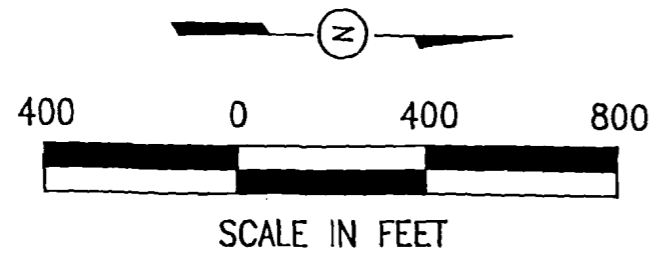
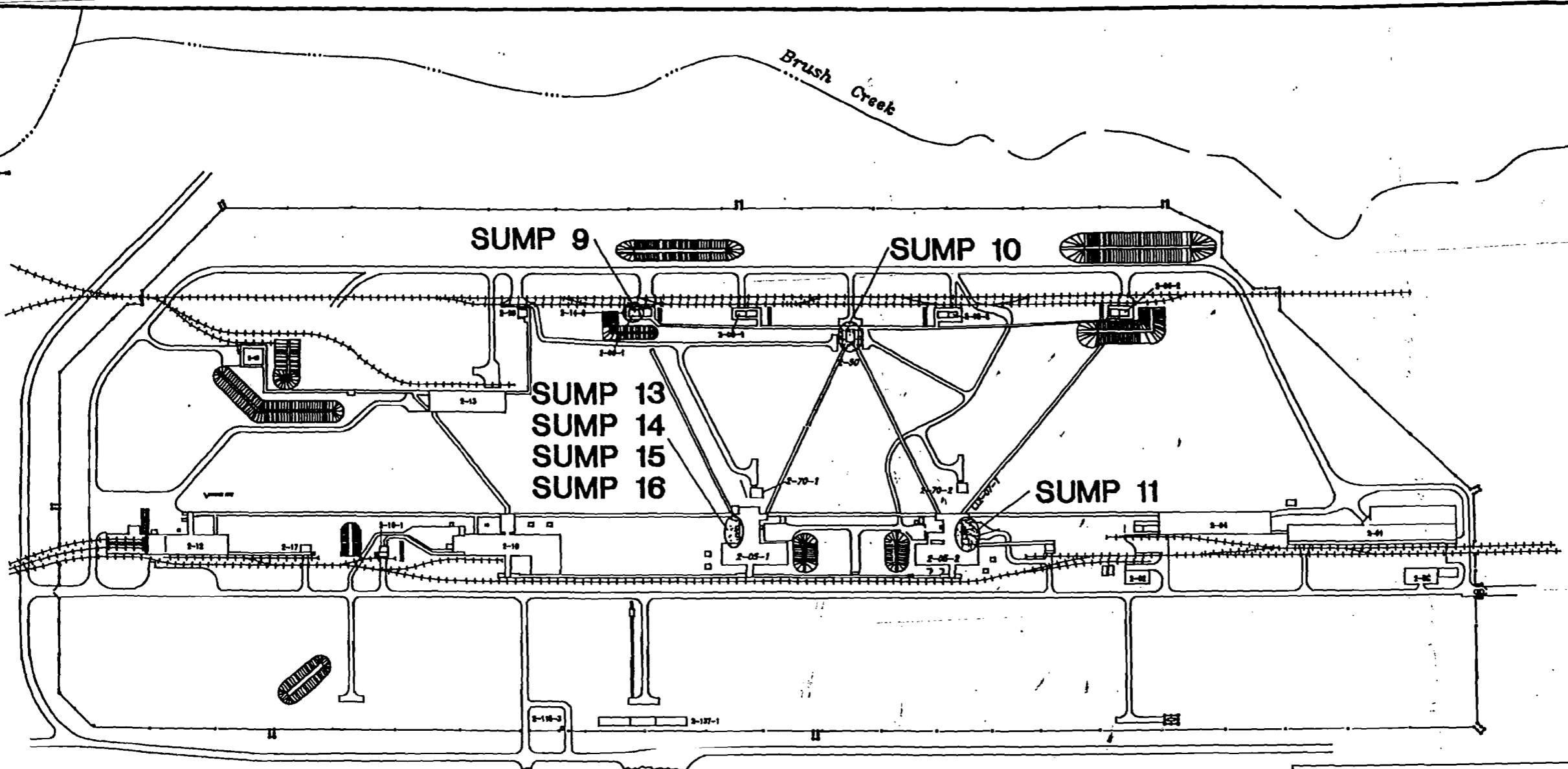
**CDM FEDERAL PROGRAMS CORPORATION**  
 a subsidiary of Camp Dresser & McKee Inc.

**JAYCOR**  
 Environmental

**IOWA ARMY AMMUNITION PLANT**  
 MIDDLETOWN, IOWA

Site Map of IAAP R01 Sump Locations  
 Line 1  
 (Formerly IAAP 1)

SOURCE: Mason & Hanger-Silas Mason Co., Inc.  
 FILE NO. SMP0103 | DRWN BY: D. ALLEN | PROJECT #: 7150-100 | SHT. 1 OF 1  
 DATE 8/11/94 | FIGURE: 1-3



LEGEND

- ROAD
- WALKWAY
- FENCE
- 7-18-1 BUILDING #
- BERM (EXPLOSION PROTECTION)
- TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL = 5 FEET
- INTERMITTENT STREAM
- SUMP AREA

SAMPLE KEY

- MONITORING WELL
- SOIL SAMPLE
- SUBSURFACE SOIL SAMPLE
- SUBSURFACE & SURFACE SOIL SAMPLE
- SURFACE WATER SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER & SEDIMENT SAMPLE
- GEOPROBE SAMPLE
- PIEZOMETER SAMPLE
- GEOPROBE & PIEZOMETER SAMPLE

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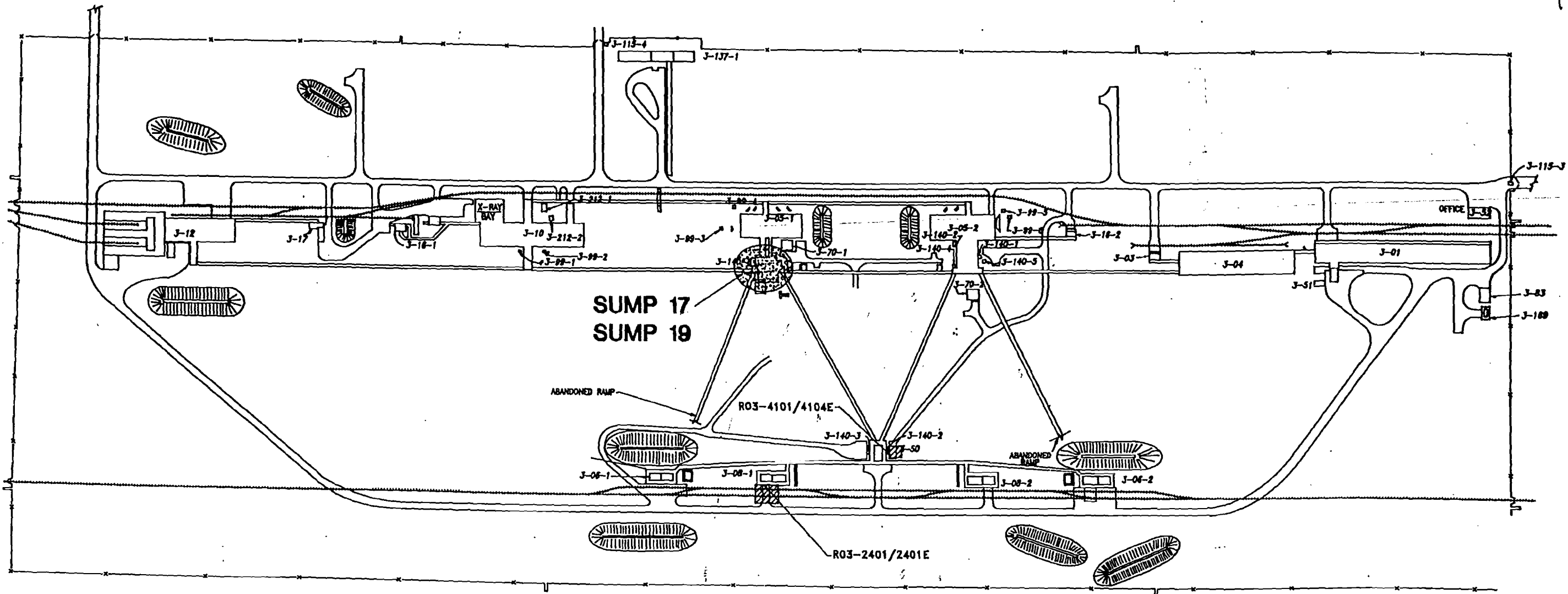


IOWA ARMY AMMUNITION PLANT

MIDDLETOWN, IOWA

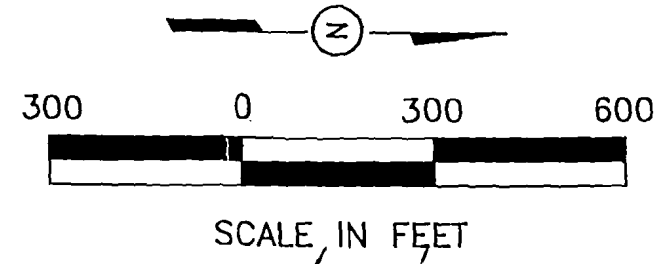
Site Map of IAAP R02  
 Line 2  
 (Formerly IAAP 2)

|                                              |                   |                     |
|----------------------------------------------|-------------------|---------------------|
| SOURCE: Mason & Hanger-Silas Mason Co., Inc. |                   |                     |
| FILE NO. IA02.D1                             | DRWN BY: D. ALLEN | PROJECT #: 7150-100 |
| DATE 8/15/94                                 | SHT. 1 OF 1       |                     |
| FIGURE: 1-4                                  |                   |                     |



**LEGEND**

- ROAD
- WALKWAY
- FENCE
- BUILDING #
- BERM (EXPLOSION PROTECTION)
- TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL = 5 FEET
- INTERMITTENT STREAM
- MONITORING WELL
- SUMP AREA



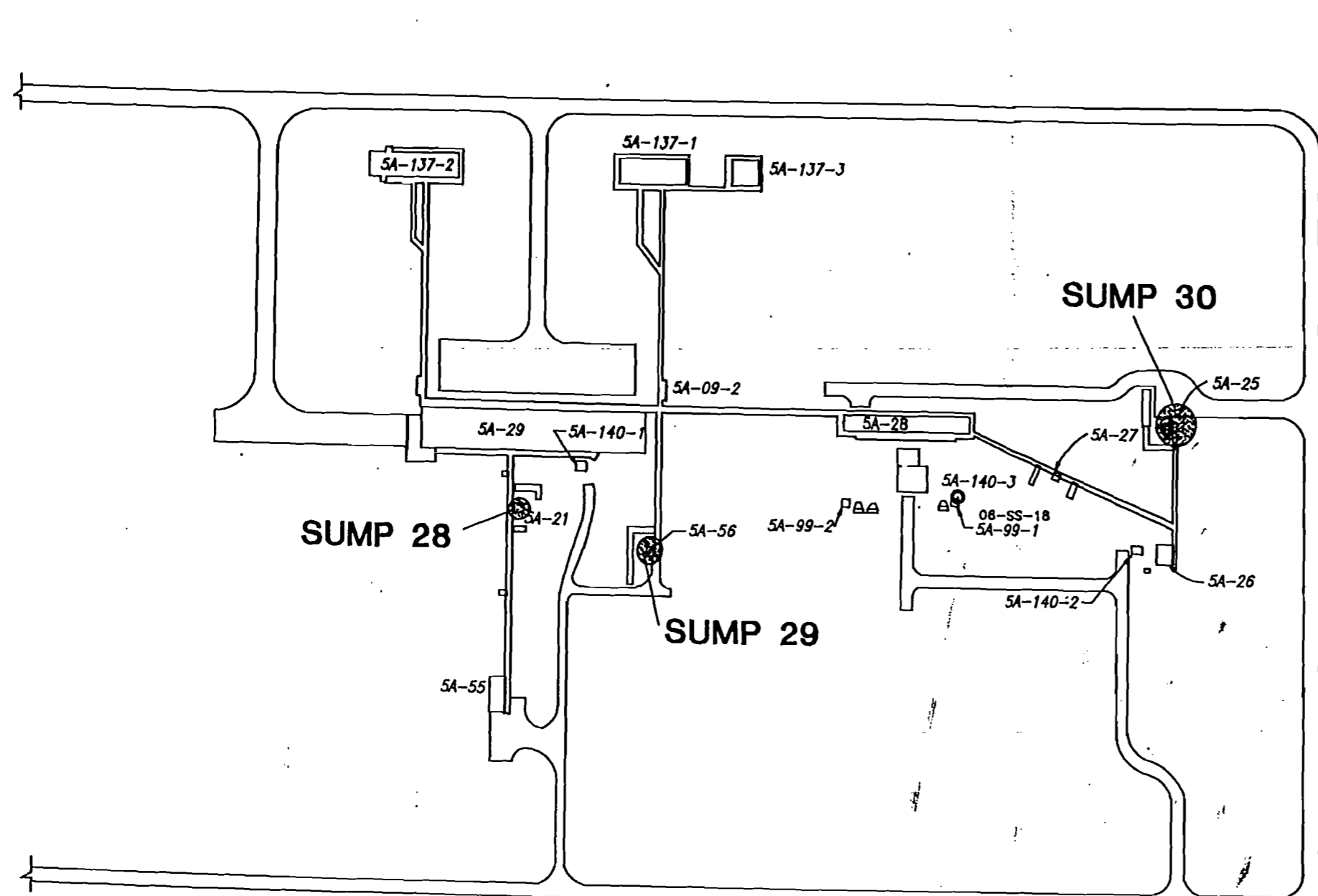
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Environmental

**IOWA ARMY AMMUNITION PLANT**  
MIDDLETOWN, IOWA

Site Map of IAP R03 Sump Locations  
Line 3  
(Formerly IAP 3)

|                                              |                   |                     |             |
|----------------------------------------------|-------------------|---------------------|-------------|
| SOURCE: Mason & Hanger-Silas Mason Co., Inc. |                   |                     |             |
| FILE NO. SMP03D1                             | DRWN BY: D. ALLEN | PROJECT #: 7150-100 | SHT. 1 OF 1 |
| DATE 8/11/94                                 |                   |                     | FIGURE: 1-5 |



**LEGEND**

- ROAD
- WALKWAY
- FENCE
- BUILDING #
- BERM (EXPLOSION PROTECTION)
- TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL = 5 FEET
- INTERMITTENT STREAM
- SUMP AREA

N

SCALE IN FEET

**CDM FEDERAL PROGRAMS CORPORATION**  
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**JAYCOR**  
Environmental

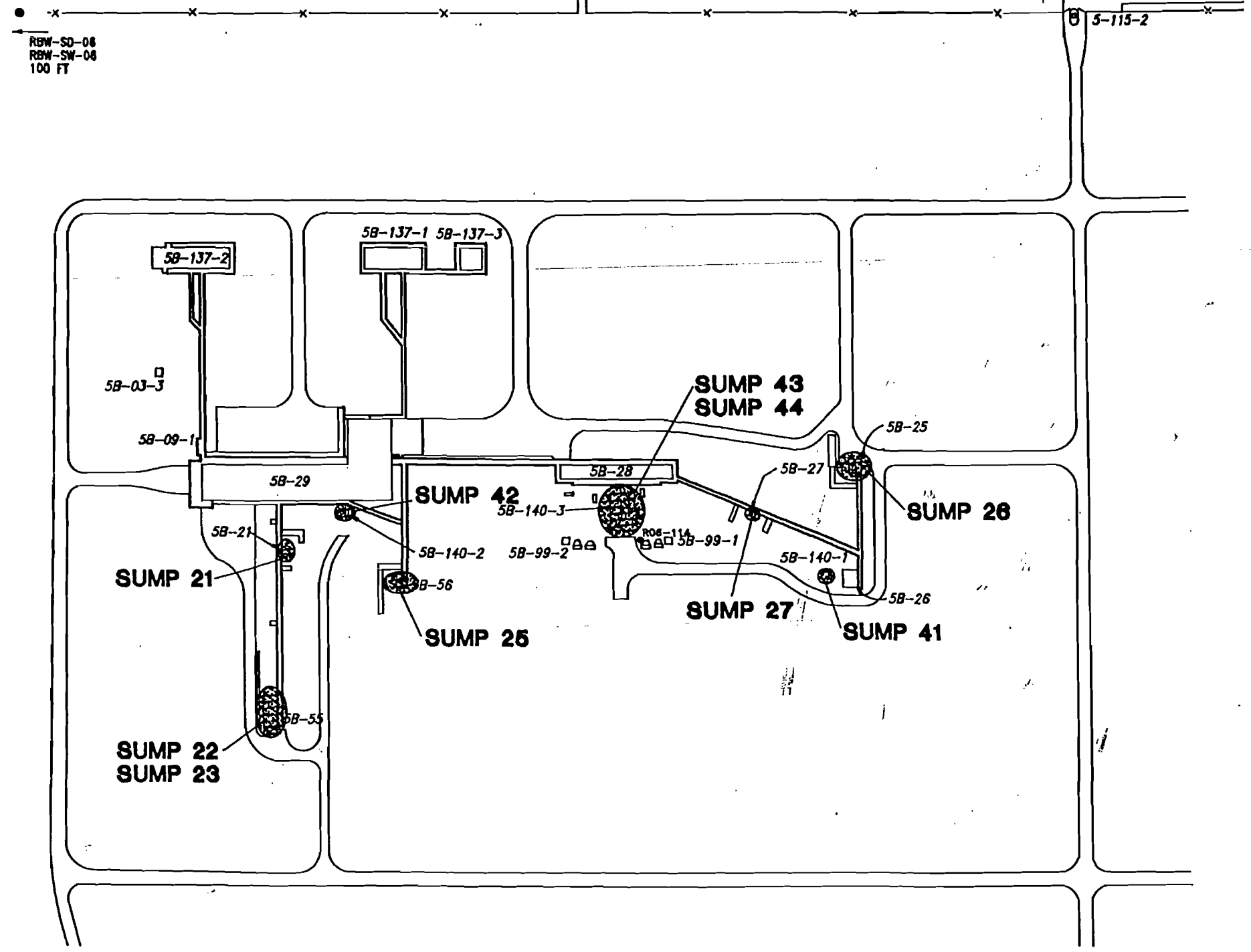
**IOWA ARMY AMMUNITION PLANT**  
MIDDLETOWN, IOWA

Site Map of IAAP R06 Sump Locations  
(Line 5)  
(Formerly IAAP 6)

|                                              |                                       |
|----------------------------------------------|---------------------------------------|
| SOURCE: Mason & Hanger-Silas Mason Co., Inc. |                                       |
| FILE NO. SMPO6AC                             | DRWN BY: D. ALLEN PROJECT #: 7150-100 |
| DATE 8/11/94                                 | SHT. 1 OF 1                           |
| FIGURE: 1-6                                  |                                       |

SU30SS01

5-145

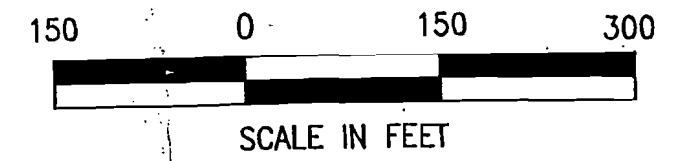


RBW-SO-08  
 RBW-SW-08  
 100 FT



**LEGEND**

- ROAD
- WALKWAY
- FENCE
- BUILDING
- BERM (EXPLOSION PROTECTION)
- TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL = 5 FEET
- INTERMITTENT STREAM
- SUMP AREA



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**IOWA ARMY AMMUNITION PLANT**  
 MIDDLETOWN, IOWA

Site Map of IAAP R06 Sump Locations  
 (Line 5b)  
 (Formerly IAAP 6)

|                                              |                   |                     |             |
|----------------------------------------------|-------------------|---------------------|-------------|
| SOURCE: Mason & Hanger-Silas Mason Co., Inc. |                   |                     |             |
| FILE NO. SMP08BC                             | DRWN BY: D. ALLEN | PROJECT #: 7150-100 | SHT. 1 OF 1 |
| DATE 8/11/94                                 |                   |                     | FIGURE: 1-7 |

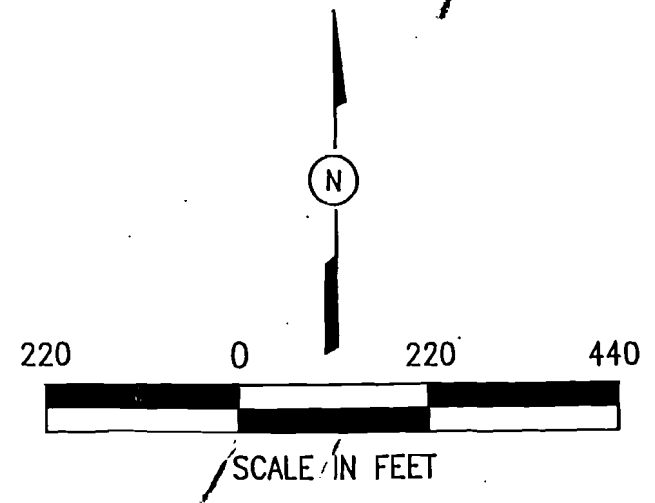
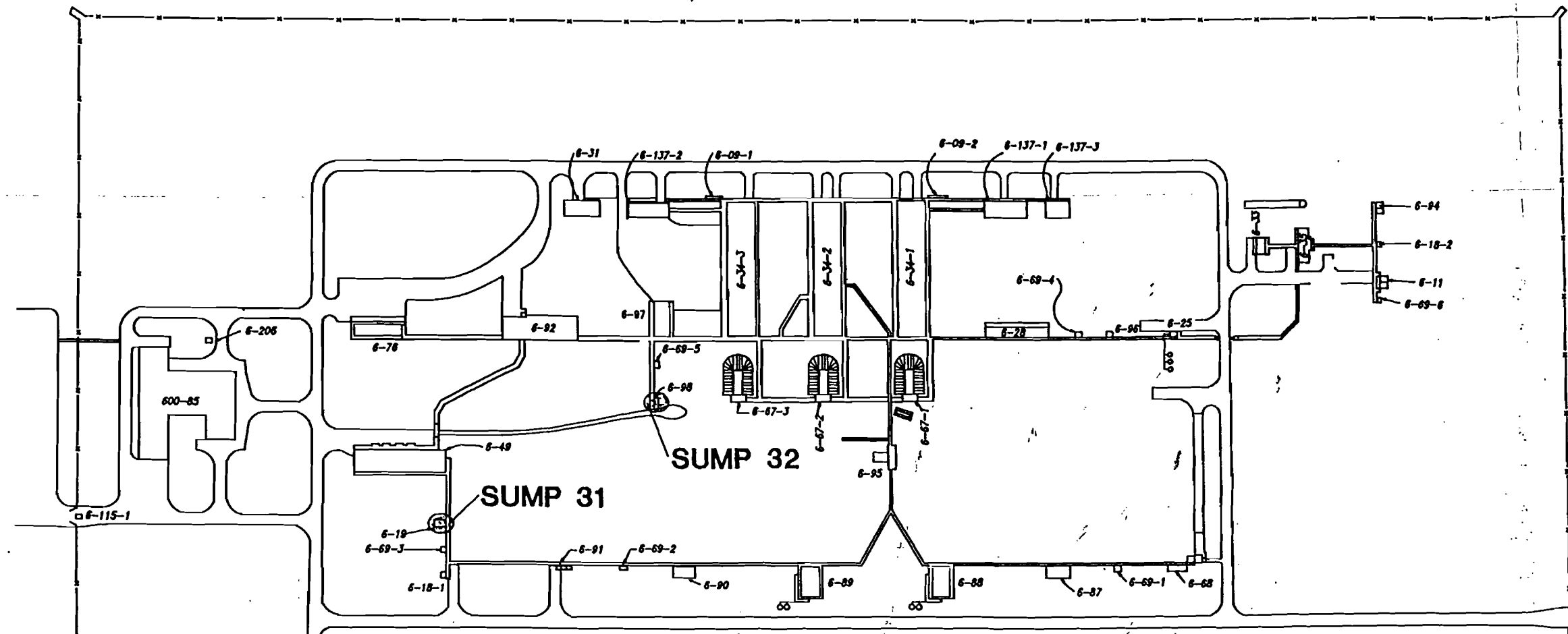
# LEGEND

22

- ROAD
- WALKWAY
- FENCE
- BUILDING #
- BERM (EXPLOSION PROTECTION)
- TOPOGRAPHIC CONTOUR  
CONTOUR INTERVAL = 5 FEET
- INTERMITTENT STREAM
- SUMP AREA

# SAMPLE KEY

- MONITORING WELL
- SOIL SAMPLE
- SUBSURFACE SOIL SAMPLE
- SUBSURFACE & SURFACE SOIL SAMPLE
- SURFACE WATER SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER & SEDIMENT SAMPLE
- SCREENING SAMPLE
- GEOPROBE SAMPLE
- PIEZOMETER SAMPLE
- GEOPROBE & PIEZOMETER SAMPLE



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IOWA ARMY AMMUNITION PLANT  
MIDDLETOWN, IOWA

Site Map of laap R07 Sump Locations  
Line 6  
(Formerly IAAP 7)

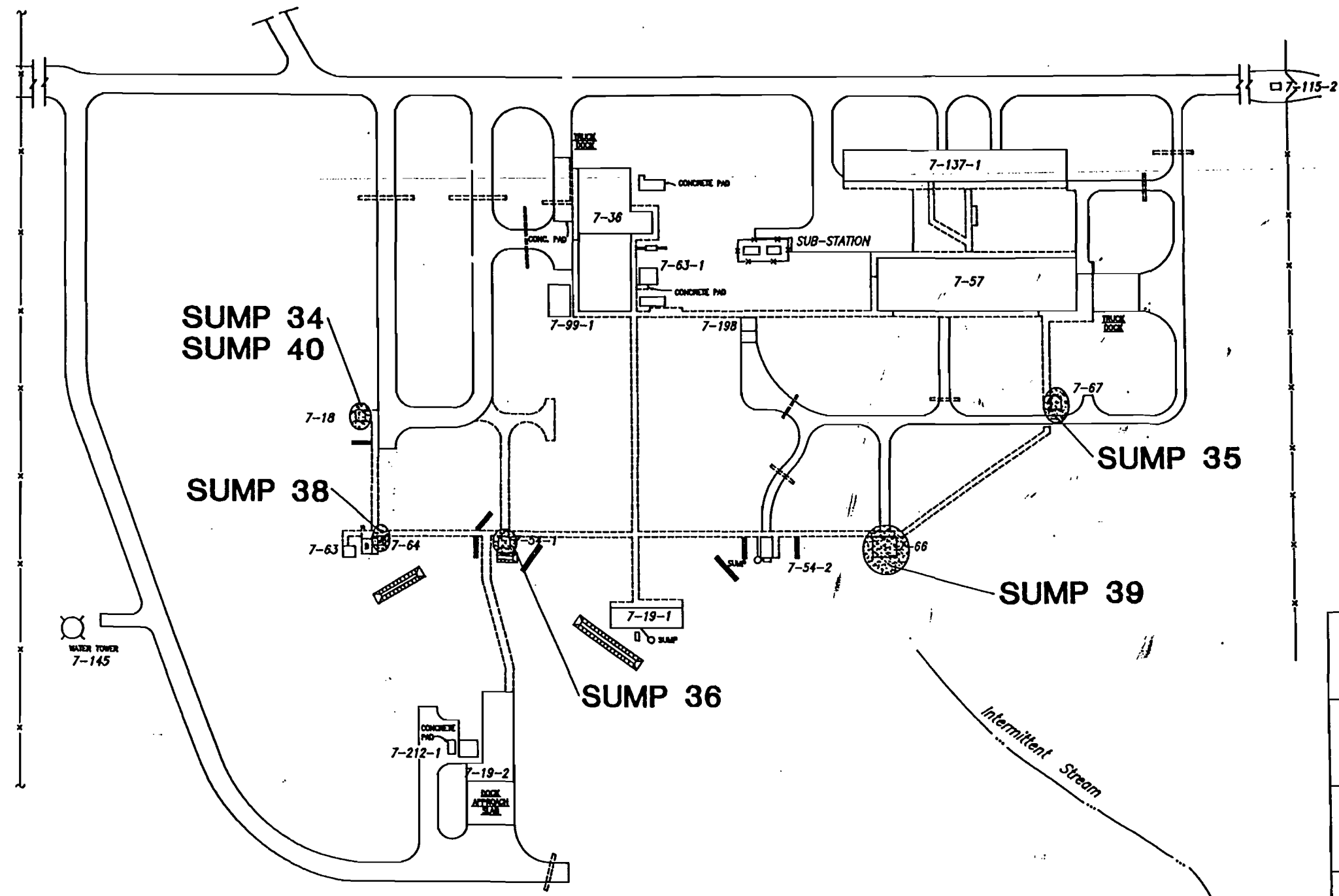
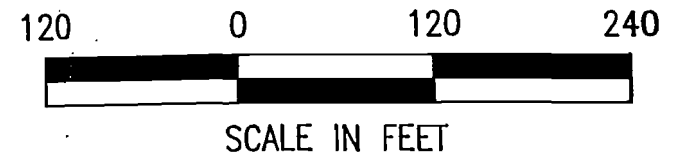
|                                              |                   |                     |             |
|----------------------------------------------|-------------------|---------------------|-------------|
| SOURCE: Mason & Hanger-Silas Mason Co., Inc. |                   |                     |             |
| FILE NO. SMP07B                              | DRWN BY: D. ALLEN | PROJECT #: 7150-100 | SHT. 1 OF 1 |
| DATE 8/11/94                                 |                   |                     | FIGURE: 1-8 |

### LEGEND

- ROAD
- WALKWAY
- FENCE
- 7-19-1 BUILDING #
- BERM (EXPLOSION PROTECTION)
- TOPOGRAPHIC CONTOUR
- CONTOUR INTERVAL = 5 FEET
- INTERMITTENT STREAM
- SUMP AREA

### SAMPLE KEY

- MONITORING WELL
- SOIL SAMPLE
- SUBSURFACE SOIL SAMPLE
- SUBSURFACE & SURFACE SOIL SAMPLE
- SURFACE WATER SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER & SEDIMENT SAMPLE
- SCREENING SAMPLE
- GEOPROBE SAMPLE
- PIEZOMETER SAMPLE
- GEOPROBE & PIEZOMETER SAMPLE



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IOWA ARMY AMMUNITION PLANT  
 MIDDLETOWN, IOWA

Site Map of IAAP R08 Sump Locations  
 Line 7  
 (Formerly IAAP 8)

|                                              |                   |                     |             |
|----------------------------------------------|-------------------|---------------------|-------------|
| SOURCE: Mason & Hanger-Silas Mason Co., Inc. |                   |                     |             |
| FILE NO. BIA_08-C                            | DRWN BY: D. ALLEN | PROJECT #: 7150-100 | SHT. 1 OF 1 |
| DATE 8/15/94                                 |                   |                     | FIGURE: 1-9 |

## 2.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

### 2.1 STATUTORY LIMITS ON REMOVAL ACTIONS

The National Contingency Plan (NCP) section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) places a statutory limit of 2 million dollars and 12-month duration on fund-financed (Superfund) removal actions. However, this removal will be funded by the Defense Environmental Restoration Account (DERA), which does not have the \$2 million dollar statutory funding limit, but does have an approval process for actions exceeding \$2 million dollars.

### 2.2 DETERMINATION OF REMOVAL SCOPE

The overall goal of the removal action is to eliminate the sumps and their contaminants from further consideration or concern for human health and the environment. To accomplish this goal physical removal of the sumps and associated contamination is necessary. To assure that the goal is met the specific objective of the removal action is to eliminate the possible pathways identified in Section 1 of this EE/CA. This will be accomplished by removing soils to the risk-based remediation goals discussed earlier.

To assure protection of human health, contaminated soil shall be removed to a risk based concentration. Risk-based numbers were calculated for chemicals of concern as part of the ongoing site-wide RI/FS, if a number was not calculated for a chemical found at the sumps than the number was obtained from EPA Region III risk-based concentration levels.

Preliminary remediation goals (PRGs) were calculated for an estimated excess cancer risk of greater than  $1E-06$  and/or the hazard index (HI) is greater than  $1E+00$ . PRGs were calculated by rearranging the equations used for the risk calculations at the site:



and 
$$\text{Cancer Risk} = C \times \text{HIF} \times \text{SF}$$

and 
$$\text{HQ} = C \times \text{HIF}/\text{RfD}$$

where:

C = concentration of a chemical in a medium  
 HIF = human intake factor  
 SF = slope factor  
 RfD = reference dose  
 HQ = hazard quotient

To calculate the concentration of each chemical in each medium associated with a particular risk level or HQ, the following equations were used:

and 
$$C = \text{Target Cancer Risk}/(\text{HIF} \times \text{SF})$$

and 
$$C = \text{Target Hazard Quotient} \times \text{RfD}/\text{HIF}$$

EPA Region III numbers are based on similar equations and parameters.

Once the contaminated soil is removed the objective would be to treat and/or dispose of the material in a manner that would achieve the overall goal of the removal. The explosives and metals of concern at this site may require some form of treatment prior to land disposal.

### 2.3 REMOVAL SCHEDULE

The magnitude of removal at this site should allow completion well within one year. The removal contract is anticipated to be administered September 15, 1994. The removal should be able to be completed prior to less desirable construction weather (mid-December). The following is a schedule of events that are necessary prior to remediation:

|                   |                                           |
|-------------------|-------------------------------------------|
| 31 August 1994    | Start of Public Comment Period            |
| 30 September 1994 | End of Public Comment Period              |
| 31 October 1994   | Final Action Memorandum/Decision Document |
| 01 November 1994  | Construction Start                        |

### 3.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

A no-action alternative was not considered viable as concentrations of contaminants existed above action levels specified earlier. As identified in Section 2.0, removal of contaminated soils and treatment are necessary to achieve the overall goal of the removal action. Removal can be accomplished using standard excavation methods. There are several treatment technologies available for the treatment of explosive-contaminated soil. The Vendor Information System for Innovative Treatment Technologies (VISITT) database operated by the Technology Information Office lists the following technologies that have been demonstrated:

- Bioremediation (slurry and solid phase)
- Chemical Treatment
- Soil Washing

All are listed as demonstrated either full or pilot scale. The technologies listed above would all have an associated mobilization cost for onsite treatment. Performance information is not available in the VISITT database supporting the ability of the technologies to reduce concentrations in contaminated soil to land disposal treatment standards; therefore treatability studies may be necessary prior to full scale operation. The volume of soil requiring treatment (125 cubic yards) at the site does not justify the expense of either mobilization (\$300,000 - \$500,000) or treatability studies (\$50,000 - \$100,000); however, composting listed under solid phase has successfully demonstrated the ability to treat explosive contaminated soil. Treatability studies and construction of a facility for composting would not be cost effective for this volume of soil. Composting treatability studies done on this soil would benefit future sites that are in the current feasibility study for Iowa AAP.

The best demonstrated available technology (BDAT) for the treatment of the explosives-contaminated soil found at this site is incineration.

Based on discussions to this point, the recommended alternative for the removal action is excavation (decontamination by steam cleaning of concrete sumps), hauling, offsite incineration and disposal (incineration ash in a landfill, concrete in a solid waste landfill). The offsite facility

selected should have capabilities to both incinerate and dispose of the material to avoid excess transportation thus reducing cost of remediation. Incineration ash may have to be stabilized prior to land disposal due to the metals content.

### **3.1 EFFECTIVENESS**

#### **3.1.1 OVERALL PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT**

The physical removal of the sumps and associated contaminated soil at the site would eliminate the possible exposure pathways mentioned in Section 1. Incineration would reduce concentrations below risk-based levels developed for the IAAP and discussed earlier in the report. The intent of the removal is to remove all explosive-contaminated soil below the calculated risk-based numbers mentioned in Section 1, thus leaving no residual contamination that would pose a risk to human health and the environment.

#### **3.1.2 COMPLIANCE WITH ARAR'S AND OTHER CRITERIA, ADVISORIES, AND GUIDANCE**

The complete list of ARARs that may be required for any type removals at the Iowa AAP is included in Appendix B. Specific ARARs that need to be considered for this removal action are discussed below.

The Iowa Responsible Parties Cleanup Regulations are applicable to the removal action. The regulations assure that the goals of the state for protection of groundwater are achieved. A physical removal of explosive-contaminated soil at the site would achieve the State goal of groundwater protection.

The waste at the site is sufficiently similar to explosive waste considered hazardous under 40 CFR 261, therefore, the waste shall be handled as such.

Transporting material similar to hazardous waste offsite makes 40 CFR 262 and 263 applicable to the site. When acquiring the transportation services under the removal contract the contract language shall require the hauler to meet the requirements of the two regulations cited.

The requirements of 40 CFR 264 Subpart O are applicable when a hazardous material is to be treated by incineration by an offsite source. Removal contract language should assure that the facility selected for incineration meets the requirements of this regulation. The accepting facility shall also dispose of the residual material from the incinerator in a landfill that meets the requirements of 40 CFR 264.

Incineration will assure that the requirements of 40 CFR 268 are met.

The selected facility shall be in compliance with the requirements of the National Ambient Air Quality Standards 40 CFR 50 for emission standards for incinerators.

The selected hauler shall be required to comply with the Iowa Hazardous Substances and Waste regulations. A submittal shall be required of the hauler listing requirements and how they are addressed.

The selected hauler will be subject to the Iowa Hazardous Waste Disposal Penalty Law if the above requirements are not met and it is determined that unlawful transportation of hazardous waste is occurring.

Dust suppression shall be a requirement of the removal contract to assure the requirements of the Iowa Air Pollution Control Regulations are met during excavation activities. An air monitoring plan for explosives and/or metals contaminated particulates will be a required submittal of the removal contractor.

### **3.1.3 LONG-TERM EFFECTIVENESS AND PERMANENCE**

This evaluation assesses the extent and effectiveness of the controls necessary to manage the risk posed by treatment residuals and/or untreated wastes left onsite. The alternative being evaluated removes the waste from the site. The method used to estimate volume is intended to eliminate any residual contamination that may pose a risk. Controls will not be needed for any residual waste and no waste will be left onsite. The removal will achieve long-term effectiveness with little or no monitoring. Confirmatory sampling after removal should support the effectiveness of the remedy. For estimating purposes we have assumed 1 composite sample per sump. The removal is also a permanent solution and should fit well into to the remedial scheme for the entire site. The commercial scenario accepted for this site is based on the foreseeable future land use. The Army will discuss a contingency if the property is exscessed and a possible residential scenario may be realized in the FS and ROD to be developed for the installation.

### **3.1.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT**

The alternative being evaluated includes incineration. Incineration should reduce concentrations of explosives below risk based levels discussed earlier; therefore reducing their hazard. Physical removal of explosive-contaminated soil at the site will reduce or eliminate mobility of the explosive assuring that groundwater will not be impacted in the future. The volume of contaminated material will be reduced by incineration. The residual waste will be put in a landfill thus reducing its mobility.

### **3.1.5 SHORT-TERM EFFECTIVENESS**

The nearest community (Middletown, Iowa) is located far enough away that impacts from the removal should be unlikely. Fugitive dust should be controlled if the ARAR cited earlier is to be met. Trucks hired to haul the material will be in compliance with applicable DOT regulations which are intended to protect the public during transportation of hazardous material.

Construction workers that will be working on the removal should be required to wear the proper protective clothing to reduce the risk of handling the material. The alternative is relatively simple in that common safety practices employed during any excavation activity should reduce the possibility of harm.

Environmental impacts should be minimal since the site is not located in a environmentally sensitive area (surrounded by agricultural fields).

### **3.2 IMPLEMENTABILITY**

#### **3.2.1 TECHNICAL FEASIBILITY**

The excavation portion of the alternative is a relatively simple technology and should not be difficult to implement. The most difficult requirement of the excavation will be that the workers have the OSHA 40 hour health and safety training for hazardous waste sites (29 CFR 1910.120 (e) (8) and 29CFR 1926). Confirmatory sampling if done by the remediation contractor will require trained personnel and an USACE validated laboratory. The removal is being done under a USACE rapid response contract, thus trained personnel are available.

The hauling portion of the alternative will be done by a licensed hazardous waste hauler. The availability of hazardous waste haulers was evaluated by contacting different haulers and determining their availability. There seems to be no difficulty in finding a hauler for hire.

The incineration and disposal portions of the alternative will be done by a licensed facility that handles hazardous waste daily. The personnel employed at these facilities are trained in running incinerators and landfills. The availability of a facility to accept the waste is dependant on the DOT classification, several were contacted (Appendix C) and were willing to accept explosive-contaminated soil depending on its DOT classification.

There is no operation and maintenance associated with this alternative.

The removal action will be a long-term remedy.

In-situ treatment is not a proven or recommended treatment option for explosive-contaminated soil. Containment options (capping) for this project would not be technically feasible with the sumps being located in different locations across the site.

### **3.2.2 ADMINISTRATIVE FEASIBILITY**

Permits required for offsite transportation (manifest) will be completed by the licensed hauler and signed by installation personnel. The manifest records are relatively straight forward and are readily implementable administratively.

The accepting facility will be required to submit proof of a current permit to accept the type of waste being discussed. The submittal should be routine for an active facility. The facility will also be required to submit the current permit allowing the operation of a hazardous waste incinerator, per NCP Section 300.400 as amended in Federal Register, Volume 58, No. 182, September 22, 1993.

### **3.2.3 STATE ACCEPTANCE**

Reserved for State comment.

### **3.2.4 COMMUNITY ACCEPTANCE**

Reserved for public comment.

## **3.3 COST**

The direct and indirect capital costs are shown in Table 3-1. There are no operation and maintenance costs. The price for incineration varied from \$0.70 per pound for the material if deemed nonexplosive/nonhazardous to \$5.00 per pound if the DOT classification represents a

Class 1 explosive. It is assumed for the purposes of this EE/CA that the material will be deemed the prior. It is assumed that incineration ash will not require stabilization or encapsulation prior to landfilling.

Onsite treatment options (incineration, biological, and soil washing) would not be cost effective with the volume of soil being addressed. Mobilization costs and treatability study costs do not justify this form of treatment.



**TABLE 3-1**  
**Summary of Costs for Contaminated Soil Handling and Sump Removal**

|                                                                                                                          |   |                     |
|--------------------------------------------------------------------------------------------------------------------------|---|---------------------|
| <b><u>Contaminated Soil Handling and Sump Removal</u></b>                                                                |   |                     |
| Remove Concrete Sumps by Jackhammer & Machine                                                                            | = | \$ 6,960.00         |
| Add 40% for Hazardous Site Work                                                                                          | = | 2,785.00            |
| <b>SUBTOTAL</b>                                                                                                          | = | <b>9,745.00</b>     |
| Excavate Contaminated Soil                                                                                               | = | 671.70              |
| Add 40% for Hazardous Site Work                                                                                          | = | 268.70              |
| <b>SUBTOTAL</b>                                                                                                          | = | <b>\$ 940.40</b>    |
| <b><u>Decontamination &amp; Decon Pad</u></b>                                                                            |   |                     |
| Decontaminate Concrete/Steel                                                                                             | = | \$ 4,150.00         |
| Decontamination Pad                                                                                                      | = | 6,700.00            |
| <b>SUBTOTAL</b>                                                                                                          | = | <b>\$ 10,850.00</b> |
| <b><u>Transport to TSD Facility</u></b>                                                                                  |   |                     |
| 10 Loads @ \$3.70/Loaded Mile X 700 Miles                                                                                | = | \$ 25,900.00        |
| <b><u>Incineration and Disposal of Ash</u></b>                                                                           |   |                     |
| 337,900 lbs. @ \$0.70/lb.                                                                                                | = | \$236,530.00        |
| Macro Encapsulation of Metal-Contaminated Soil<br>60 yd <sup>3</sup> - 20 yd <sup>3</sup> /Rolloff Box @ \$5,700/Box X 3 | = | 17,100.00           |
| <b><u>Disposal of Concrete Sumps</u></b>                                                                                 |   |                     |
| 70 Tons @ \$22.60/Ton                                                                                                    | = | \$ 1,582.00         |
| <b><u>Confirmatory Sampling</u></b>                                                                                      |   |                     |
| 2 Samples/Sump X 49 @ \$270.00                                                                                           | = | \$ 26,460.00        |
| <b><u>Site Preparation</u></b>                                                                                           |   |                     |
| Trailer Rental and Site Recon                                                                                            | = | \$ 810.00           |
| <b><u>Backfill</u></b>                                                                                                   |   |                     |
| Backfill with Clean Soil                                                                                                 | = | \$ 4,950.00         |
| <b><u>Granular Activated Carbon</u></b>                                                                                  |   |                     |
| Sump water treatment                                                                                                     | = | \$ 2,880.00         |
| <b><u>Oversight</u></b>                                                                                                  |   |                     |
| 8hrs/Day X 5 Day/Wk X 4 Wks X \$70.00                                                                                    | = | \$ 11,200.00        |
| <b><u>Travel</u></b>                                                                                                     |   |                     |
| 0.25 X 600 Miles X 4 Trips                                                                                               | = | \$ 600.00           |
| <b><u>Per Diem</u></b>                                                                                                   |   |                     |
| \$26.00 X 24 Day                                                                                                         | = | \$ 624.00           |
| <b>SUBTOTAL</b>                                                                                                          | = | <b>\$350,171.00</b> |
| <b><u>Work Plan &amp; Final Report</u></b>                                                                               |   |                     |
| 10%                                                                                                                      | = | \$ 35,017.00        |
| <b>SUBTOTAL</b>                                                                                                          | = | <b>\$385,189.00</b> |
| Contingencies (30%)                                                                                                      | = | \$ 115,557.00       |
| <b>TOTAL</b>                                                                                                             | = | <b>\$500,745.00</b> |

#### **4.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE**

The alternative recommended for this site after the evaluation in Section 3.0 is Excavation, Confirmatory Sampling, Hauling, Incineration, and Landfill Disposal (incineration ash in a landfill, concrete in a construction debris landfill). Operation and maintenance will not be necessary since the intent is complete removal. It has been determined that this alternative is the simplest, most cost-effective way to address the contamination.

## 5.0 REFERENCES

Chemical Waste Management. July 11, 1994. Telephone Conversation with Patrick Shea.

Jaycor. 1993. Final Report Contamination Assessment of Concrete Sumps.

Means. 1994. Site Work and Landscape Cost Data.

Risk-Based Concentration Table. U. S. EPA Region III.

Ross Incineration. July 12, 1994. Telephone Conversation with Dwight Askew.

U. S. Geological Survey. 1962, 1964. West Burlington Quadrangle 7.5 Minute Series  
Topographic Maps Revised 1976.

VISITT. User Manual. Version 2.0.

**APPENDIX A**

**Results of Chemical Analysis for Sumps to be Removed**

SUMPS TO BE REMOVED

37

SUMP SPECIFIC CONTAMINANT ANALYSIS

All concentrations in ppb

16-May-94

SUMP 1 Located at Building 1-50, Approximately 20 Ft East of  
1-50 (1) the North/ South Runway  
6 x 9 x 3 ft

| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-01-SS-01-01<br>(outfall)          | Cadmium     | 2.28          | 0.899    |
|                                      | Chromium    | 57            | 48       |
|                                      | Copper      | 72.2          | 30.9     |
|                                      | Lead        | 749           | 53       |
|                                      | Zinc        | 531           | 133      |
| SU-01-SS-02-01<br>(southeast corner) | Lead        | 144           | 53       |

SUMP 2 Located Directly North of Sump 1 Along the North Side of  
1-50 (2) 1-50  
6 x 9 x 3 ft

| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-02-SS-01-01<br>(outfall)          | Lead        | 64.6          | 53       |
| SU-02-SS-02-01<br>(northeast corner) | 2,4,6-TNT   | 1.99          | 0.456    |

SUMP 3 Located Adjacent to the West Side of Building 1-08-1.  
1-08-1 6 x 9 x 3 ft

| Sample No.                           | Contaminant                 | Concentration | Criteria |
|--------------------------------------|-----------------------------|---------------|----------|
| SU-03-SS-02-01<br>(outfall)          | HMX                         | 1580          | 0.666    |
|                                      | RDX                         | 3740          | 0.587    |
|                                      | 2,4,6-TNT                   | 9.18          | 0.456    |
|                                      | Antimony                    | 22.8          | 3.57     |
|                                      | Cadmium                     | 2.98          | 0.899    |
|                                      | Chromium                    | 65.4          | 65.4     |
|                                      | Copper                      | 441           | 30.9     |
|                                      | Lead                        | 977           | 53       |
|                                      | Silver                      | 0.767         | 0.294    |
|                                      | Zinc                        | 765           | 133      |
|                                      | SU-03-SS-02-01<br>(outfall) | 2,4-DNT       | 0.678    |
| HMX                                  |                             | 390           | 0.666    |
| RDX                                  |                             | 108           | 0.587    |
| 2,4,6-TNT                            |                             | 1.67          | 0.456    |
| Cadmium                              |                             | 1.24          | 0.899    |
| Copper                               |                             | 126           | 30.9     |
| Lead                                 |                             | 232           | 53       |
| SU-03-SS-02-01<br>(southeast corner) | HMX                         | 33            | 0.666    |
|                                      | Cadmium                     | 2.17          | 0.587    |
|                                      | Lead                        | 77.9          | 53       |
| SU-03-SA-02-02<br>(southeast corner) | HMX                         | 98.8          | 0.666    |
|                                      | RDX                         | 122           | 0.587    |
|                                      | Lead                        | 127           | 53       |

SUMP 4  
1-05-1

Located at Building 1-05-1.  
7.25 X 7.25 X 6 ft

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| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-04-SS-01-01<br>(southeast corner) | Cadmium     | 2.06          | 0.899    |
|                                      | Lead        | 110           | 53       |
| SU-04-SS-02-01<br>(northwest corner) | Lead        | 74.5          | 53       |

SUMP 8  
1-40

Located on the North Side of Building 1-40.  
14 x 20 x 2-4.5 ft

| Sample No.                       | Contaminant  | Concentration | Criteria |
|----------------------------------|--------------|---------------|----------|
| SU-08-SA-01-02<br>(west side)    | HMX          | 4.98          | 0.666    |
| SU-08-SA-01-02                   | HMX          | 19.2          | 0.666    |
|                                  | RDX          | 4.32          | 0.587    |
| SU-08-SA-05-02<br>(north side)   | HMX          | 115           | 0.666    |
|                                  | RDX          | 3.18          | 0.587    |
| SU-08-SA-02-02                   | HMX          | 11.9          | 0.666    |
|                                  | RDX          | 107           | 0.587    |
| SU-08-SA-04-01<br>(east side)    | HMX          | 62.9          | 0.666    |
|                                  | RDX          | 2.2           | 0.587    |
| SU-08-SA-04-02                   | HMX          | 4.62          | 0.666    |
|                                  | RDX          | 12.1          | 0.587    |
| SU-08-SS-05-01<br>(downgradient) | 1,3-DNT      | 0.572         | 0.496    |
|                                  | 2,4-TNT      | 7.49          | 0.424    |
|                                  | HMX          | 664           | 0.666    |
|                                  | Nitrobenzene | 67.6          | 2.41     |
|                                  | RDX          | 509           | 0.587    |
|                                  | 1,3,5-TNB    | 106           | 0.488    |
|                                  | 2,4,6-TNT    | 10.4          | 0.456    |
| SU-08-SA-05-02                   | HMX          | 10.6          | 0.666    |
|                                  | RDX          | 8.5           | 0.587    |

6) SUMP 9  
2-6-1

Located on the South Side of Building 2-06-1, Within  
shed 2-140-6  
6 x 9 x 3 ft

| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-09-SS-01-01<br>(outfall)          | Cadmium     | 1.31          | 0.899    |
|                                      | Lead        | 1360          | 53       |
| SU-09-SS-02-01<br>(southwest corner) | Cadmium     | 1.89          | 0.899    |
|                                      | Lead        | 533           | 53       |
| SU-09-SD-01-01<br>(sediment)         | Lead        | 1290          | 53       |

7) SUMP 10  
2-50

Located on the South Side of Building 2-50 in shed 2-140-5  
6 x 9 x 3 ft

| Sample No.     | Contaminant | Concentration | Criteria |
|----------------|-------------|---------------|----------|
| SU-10-SS-01-01 | Tetryl      | 7690          | 0.731    |

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|                               |           |      |       |
|-------------------------------|-----------|------|-------|
| (outfall)                     | 2,4,6-TNT | 795  | 0.456 |
| SU-10-SA-01-02                | Tetryl    | 2.31 | 0.731 |
| SU-10-SS-02-01<br>(east side) | 2,4,6-TNT | 8.3  | 0.456 |
| SU-10-SA-02-02                | 2,4,6-TNT | 1.49 | 0.456 |

SUMP 11  
2-05-2

Located on the East Side of Building 2-05-2.  
7.25 X 7.25 X 6 ft

| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-11-SS-01-01<br>(northwest corner) | HMX         | 1250          | 0.666    |
|                                      | RDX         | 5.87          | 0.587    |
|                                      | Antimony    | 15.4          | 357      |
|                                      | Lead        | 55.8          | 53       |
| SU-11-SS-02-01<br>(southeast corner) | HMX         | 711           | 0.666    |
|                                      | RDX         | 56.4          | 0.587    |
|                                      | 2,4,6-TNT   | 77.6          | 0.456    |
|                                      | Antimony    | 16.5          | 357      |
|                                      | Lead        | 55.8          | 53       |
| SU-11-SS-03-01<br>(drainage)         | HMX         | 7.17          | 0.666    |
|                                      | RDX         | 58.7          | 0.587    |
|                                      | 2,4,6-TNT   | 8.31          | 0.456    |
|                                      | Cadmium     | 1.12          | 0.899    |
|                                      | Lead        | 648           | 53       |
| SU-11-SS-04-01<br>(downgradient)     | 1,3-DNT     | 2.55          | 0.496    |
|                                      | 2,4-DNT     | 2.82          | 0.424    |
|                                      | HMX         | 784           | 0.666    |
|                                      | RDX         | 5480          | 0.587    |
| SU-11-SS-04-01                       | 1,3,5-TNB   | 348           | 0.488    |
|                                      | 2,4,6-TNT   | 1460          | 0.456    |
|                                      | Cadmium     | 1.33          | 0.899    |

) SUMP 13

Sump 13 is located in shed 2-140-2 on the north side of the building.  
9 x 9 x 3 ft

| Sample No.                  | Contaminant    | Concentration | Criteria |
|-----------------------------|----------------|---------------|----------|
| SU-13-SS-01-01<br>(Outfall) | HMX            | 388           | 0.666    |
|                             | RDX            | 921           | 0.587    |
|                             | 1,3,5-TNB      | 48.8          | 0.488    |
|                             | 2,4,6-TNT      | 165           | 0.456    |
|                             | Cadmium        | 2.82          | 0.899    |
|                             | Chromium       | 96.1          | 48       |
|                             | Lead           | 462           | 53       |
|                             | Mercury        | 158           | 0.155    |
|                             | Zinc           | 647           | 133      |
|                             | SU-13-SA-01-02 | HMX           | 16       |
| RDX                         |                | 9             | 0.587    |
| 1,3,5-TNB                   |                | 1.15          | 0.488    |
| 2,4,6-TNT                   |                | 15.7          | 0.456    |
| Lead                        |                | 123           | 53       |
| Mercury                     |                | 230           | 0.155    |
| SU-13-SS-02-01              | HMX            | 84.4          | 0.666    |
|                             | RDX            | 8.73          | 0.587    |
|                             | 1,3,5-TNB      | 5.51          | 0.488    |
|                             | 2,4,6-TNT      | 71.2          | 0.456    |

|                                |              |      |       |
|--------------------------------|--------------|------|-------|
|                                | Cadmium      | 1.73 | 0.899 |
|                                | Lead         | 673  | 53    |
|                                | Mercury      | 10.4 | 0.155 |
|                                | Zinc         | 383  | 133   |
| SU-13-SA-02-02                 | HMX          | 2.67 | 0.66  |
|                                | RDX          | 2.7  | 0.587 |
|                                | 2,4,6-TNT    | 6.51 | 0.456 |
|                                | Mercury      | 1.08 | 0.155 |
| SU-13-SS-03-01<br>(West side)  | HMX          | 123  | 0.66  |
|                                | RDX          | 774  | 0.587 |
|                                | 2,4,6-TNT    | 286  | 0.456 |
|                                | Chromium     | 25.2 | 48    |
|                                | Lead         | 56.8 | 53    |
|                                | Mercury      | 35.2 | 0.155 |
| SU-13-SA-03-02                 | HMX          | 2680 | 0.666 |
|                                | RDX          | 15   | 0.587 |
|                                | 2,4,6-TNT    | 88   | 0.456 |
|                                | Mercury      | 130  | 0.155 |
| SU-13-SW-01-01<br>(Sump water) | HMX          | 223  | 0.66  |
|                                | Nitrobenzene | 4.64 | 2.41  |
|                                | RDX          | 1100 | 0.587 |
|                                | 1,3,5-TNB    | 51.2 | 0.488 |
|                                | 2,4,6-TNT    | 5650 | 0.456 |

- 0) SUMP 14 Located Under the East Side of the Building 2-05-1.  
7.25 x 7.25 x 6 ft

| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-14-SS-01-01<br>(outfall)          | HMX         | 2680          | 0.666    |
|                                      | RDX         | 7240          | 0.587    |
|                                      | 1,3,5-TNB   | 21.2          | 0.488    |
|                                      | 2,4,6-TNT   | 6900          | 0.456    |
| SU-14-SA-01-02                       | HMX         | 11.3          | 0.666    |
|                                      | RDX         | 53.1          | 0.587    |
|                                      | 1,3,5-TNB   | 4.87          | 0.488    |
|                                      | 2,4,6-TNT   | 23.7          | 0.456    |
| SU-14-SS-02-01<br>(southwest corner) | HMX         | 10.8          | 0.666    |
|                                      | RDX         | 63.2          | 0.587    |
|                                      | 2,4,6-TNT   | 27.5          | 0.456    |
| SU-14-SS-02-01                       | HMX         | 90.6          | 0.666    |
|                                      | RDX         | 275           | 0.587    |
|                                      | 2,4,6-TNT   | 20.1          | 0.456    |
| SU-14-SA-02-02<br>(northeast corner) | HMX         | 2.47          | 0.666    |
|                                      | RDX         | 1.2           | 0.587    |

- 1) SUMP 15 Located on the South Side of Building 2-140-1.  
2-140-1  
2-05-1  
9 x 9 x 3 ft

| Sample No.                  | Contaminant | Concentration | Criteria |
|-----------------------------|-------------|---------------|----------|
| SU-15-SS-01-01<br>(outfall) | HMX         | 1.29          | 0.666    |
|                             | 2,4,6-TNT   | 2.45          | 0.456    |
|                             | Cadmium     | 15.3          | 0.899    |
|                             | Chromium    | 204           | 48       |
|                             | Copper      | 114           | 30.9     |
|                             | Lead        | 1390          | 53       |



|                                      |           |       |       |
|--------------------------------------|-----------|-------|-------|
|                                      | Mercury   | 4.58  | 0.155 |
| SU-15-SA-01-02                       | HMX       | 5.46  | 0.666 |
|                                      | RDX       | 4.72  | 0.587 |
|                                      | 1,3,5-TNB | 1.26  | 0.488 |
|                                      | 2,4,6-TNT | 22.9  | 0.456 |
| SU-15-SS-02-01<br>(west side)        | HMX       | 99.2  | 0.666 |
|                                      | RDX       | 65.8  | 0.587 |
|                                      | 1,3,5-TNB | 1.43  | 0.488 |
|                                      | 2,4,6-TNT | 15.3  | 0.456 |
|                                      | Cadmium   | 5.98  | 0.899 |
|                                      | Chromium  | 162   | 48    |
|                                      | Copper    | 82.9  | 30.9  |
|                                      | Lead      | 1260  | 53    |
|                                      | Mercury   | 3.22  | 0.155 |
| SU-15-SA-02-02                       | HMX       | 2.55  | 0.666 |
|                                      | RDX       | 1.39  | 0.587 |
|                                      | 1,3,5-TNB | 1.44  | 0.488 |
|                                      | 2,4,6-TNT | 3.81  | 0.456 |
|                                      | Lead      | 86.6  | 53    |
| SU-15-SS-03-01<br>(southeast corner) | HMX       | 352   | 0.666 |
|                                      | RDX       | 1450  | 0.587 |
|                                      | 2,4,6-TNT | 36.9  | 0.456 |
|                                      | Chromium  | 99.3  | 48    |
|                                      | Copper    | 53.9  | 30.9  |
|                                      | Lead      | 182   | 53    |
| SU-15-SA-03-02                       | HMX       | 14.7  | 0.666 |
|                                      | RDX       | 43.7  | 0.587 |
|                                      | 2,4,6-TNT | 3.05  | 0.456 |
|                                      | Lead      | 170   | 53    |
| SU-15-SW-01-01<br>(water)            | HMX       | 168   | 0.66  |
|                                      | RDX       | 235   | 0.58  |
|                                      | 1,3,5-TNB | 1.03  | 0.448 |
|                                      | 2,4,6-TNT | 0.635 | 0.456 |
| SU-15-SW-01-01                       | Chromium  | 13.3  | 6.02  |
|                                      | Copper    | 111   | 8.09  |
|                                      | Lead      | 86.3  | 4.8   |

2) SUMP 16 Located on the West Side of Building 2-05-1.  
2-05-1(2) 3 x 6 x 3.5 ft

| Sample No.                     | Contaminant | Concentration | Criteria |
|--------------------------------|-------------|---------------|----------|
| SU-16-SS-01-01<br>(north side) | Cadmium     | 6.32          | 0.899    |
|                                | Copper      | 38.6          | 30.9     |
| SU-16-SA-01-02                 | 2,4,6-TNT   | 1.55          | 0.456    |
|                                | Copper      | 49.6          | 30.9     |
| SU-16-SS-02-01<br>(south side) | RDX         | 7.14          | 0.587    |
|                                | Cadmium     | 1.09          | 0.899    |
| SU-16-SW-01-01<br>(sump water) | HMX         | 542           | 0.66     |
|                                | RDX         | 2370          | 0.587    |
|                                | 1,3,5-TNB   | 7.14          | 0.488    |
|                                | 2,4,6-TNT   | 4270          | 0.456    |
|                                | Copper      | 244           | 8.09     |
|                                | Lead        | 80.5          | 4.8      |

- 3) SUMP 17 Located on the North Side of Building 3-05-1 (NE)  
3-05-1 (1) 4 x 7 x 3 ft

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| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-17-SS-01-01<br>(northeast corner) | HMX         | 3.52          | 0.666    |
|                                      | RDX         | 1.99          | 0.587    |
|                                      | 2,4,6-TNT   | 8.6           | 0.456    |
|                                      | Cadmium     | 1.57          | 0.899    |
| SU-17-SA-01-02                       | RDX         | 6.57          | 0.587    |
|                                      | 2,4,6-TNT   | 4.51          | 0.456    |
| SU-17-SS-02-01<br>(southwest corner) | 2,4,6-TNT   | 1.48          | 0.456    |
|                                      | Cadmium     | 1.53          | 0.899    |
|                                      | Lead        | 255           | 53       |
| SU-17-SA-02-02                       | RDX         | 2.6           | 0.587    |
|                                      | 2,4,6-TNT   | 2.73          | 0.456    |

- 4) SUMP 19 Located Under the West Wall of Building 3-05-1.  
3-05-1 (3) 7.25 X 7.25 X 6 ft

| Sample No.                    | Contaminant | Concentration | Criteria |
|-------------------------------|-------------|---------------|----------|
| SU-19-SS-01-01<br>(west side) | HMX         | 1.5           | 0.666    |
|                               | RDX         | 18.2          | 0.587    |
|                               | 2,4,6-TNT   | 4.42          | 0.456    |
| SU-19-SA-01-02                | HMX         | 6.46          | 0.666    |
|                               | RDX         | 6.1           | 0.587    |
|                               | 2,4,6-TNT   | 1.23          | 0.456    |
| SU-19-SS-02-01<br>(east side) | HMX         | 10.2          | 0.666    |
|                               | RDX         | 13.4          | 0.587    |
|                               | 2,4,6-TNT   | 9.82          | 0.456    |
| SU-19-SA-02-02                | HMX         | 3.66          | 0.666    |
|                               | RDX         | 12.3          | 0.587    |
|                               | 1,3,5-TNB   | 1.11          | 0.488    |
|                               | 2,4,6-TNT   | 6.51          | 0.456    |
| SU-19-SS-03-01<br>(low spot)  | HMX         | 44.7          | 0.666    |
|                               | RDX         | 315           | 0.587    |
|                               | 2,4,6-TNT   | 161           | 0.456    |
|                               | Lead        | 76.2          | 53       |
| SU-19-SA-03-02                | HMX         | 4.69          | 0.666    |
|                               | RDX         | 16.3          | 0.587    |
|                               | 2,4,6-TNT   | 4.3           | 0.456    |

- 15) SUMP 22 Located on the southwest corner of Building 5B-55.  
5B-55 (1) 2 x 2 x 2 ft

| Sample No.                           | Contaminant | Concentration | Criteria |
|--------------------------------------|-------------|---------------|----------|
| SU-22-SS-01-01<br>(outfall/west corn | Cadmium     | 1.68          | 0.899    |
|                                      | Lead        | 111           | 53       |
|                                      | Zinc        | 449           | 133      |

- ) SUMP 23 Located on the Northwest Side of Building 5B-55.  
5B-55 (2) 2 x 2 x 2 ft

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| Sample No.                  | Contaminant | Concentration | Criteria |
|-----------------------------|-------------|---------------|----------|
| SU-23-SS-01-01<br>(outfall) | Cadmium     | 29.8          | 0.899    |
|                             | Lead        | 277           | 53       |
|                             | Zinc        | 721           | 133      |
| SU-23-SA-01-02              | Cadmium     | 3.11          | 0.899    |
| SU-23-SS-02-01<br>(ditch)   | Cadmium     | 1.5           | 0.899    |

- 7) SUMP 24 Located on the East Side of Building 5B-21.  
5B-21 2 x 2 x 2 ft

| Sample No.                            | Contaminant | Concentration | Criteria |
|---------------------------------------|-------------|---------------|----------|
| SU-24-SS-01-01<br>(outfall/east side) | Cadmium     | 6.06          | 0.899    |
|                                       | Copper      | 57.3          | 30.9     |
|                                       | Lead        | 448           | 53       |
|                                       | Zinc        | 1440          | 133      |
| SU-24-SS-02-01<br>(west side)         | Cadmium     | 1.99          | 0.899    |
|                                       | Lead        | 341           | 53       |
|                                       | Zinc        | 430           | 133      |

- 8) SUMP 25 Located on the North Side of Building 5B-56.  
5B-56 2 x 2 x 2 ft

| Sample No.                            | Contaminant | Concentration | Criteria |
|---------------------------------------|-------------|---------------|----------|
| SU-25-SS-01-01                        | Cadmium     | 1.4           | 0.899    |
|                                       | Lead        | 137           | 53       |
|                                       | Zinc        | 290           | 133      |
| SU-25-SS-02-01<br>(outfall/west side) | Cadmium     | 2.89          | 0.899    |
|                                       | Lead        | 329           | 53       |
|                                       | Zinc        | 913           | 133      |

- 9) SUMP 26 Located on the West Side of Building 5B-25.  
5B-25 2 x 2 x 2 ft

| Sample No.                    | Contaminant | Concentration | Criteria |
|-------------------------------|-------------|---------------|----------|
| SU-26-SS-01-01<br>(west side) | Cadmium     | 3.89          | 0.899    |
|                               | Lead        | 181           | 53       |
|                               | Zinc        | 1190          | 133      |
| SU-26-SA-01-02                | Cadmium     | 2.06          | 0.899    |
|                               | Lead        | 98.6          | 53       |
|                               | Zinc        | 264           | 133      |

- 10) SUMP 27 Located on the West Side of Building 5B-27.  
5B-27 2 x 2 x 2 ft

| Sample No.                     | Contaminant | Concentration | Criteria |
|--------------------------------|-------------|---------------|----------|
| SU-27-SS-01-01<br>(north side) | Cadmium     | 1.65          | 0.899    |
|                                | Lead        | 70.7          | 53       |
|                                | Zinc        | 232           | 133      |
| SU-27-SS-02-01<br>(south side) | Cadmium     | 1.48          | 0.899    |
|                                | Lead        | 258           | 53       |
|                                | Zinc        | 396           | 133      |

- 11) SUMP 28 Located on the South Side of Building 5A-21.  
5A-21 2 x 2 x 2 ft

| Sample No.     | Contaminant | Concentration | Criteria |
|----------------|-------------|---------------|----------|
| SU-28-SS-01-01 | Cadmium     | 3.42          | 0.899    |

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|                                        |         |      |       |
|----------------------------------------|---------|------|-------|
| (north side)                           | Copper  | 35.2 | 30.9  |
|                                        | Lead    | 494  | 53    |
|                                        | Zinc    | 1130 | 133   |
| SU-28-SA-01-02                         | Arsenic | 92   | 30    |
| SU-28-SS-02-01<br>(outfall/south side) | Cadmium | 2.44 | 0.899 |
|                                        | Lead    | 1050 | 53    |
|                                        | Zinc    | 634  | 133   |
| SU-28-SA-02-02                         | Lead    | 716  | 53    |

- 2) SUMP 29 5A-56 Located on the North Side of Building 5A-56.  
2 x 2 x 2 ft

| Sample No.                            | Contaminant | Concentration | Criteria |
|---------------------------------------|-------------|---------------|----------|
| SU-29-SS-01-01<br>(east side)         | 2,4,6-TNT   | 0.929         | 0.456    |
|                                       | Cadmium     | 3.35          | 0.899    |
| SU-29-SS-01-01                        | Lead        | 188           | 53       |
|                                       | Zinc        | 808           | 133      |
| SU-29-SA-01-02                        | 2,4,6-TNT   | 1.88          | 0.456    |
|                                       | Cadmium     | 1.33          | 0.899    |
| SU-29-SS-02-01<br>(outfall/west side) | 2,4,6-TNT   | 4.32          | 0.456    |
|                                       | Cadmium     | 2.25          | 0.899    |
|                                       | Lead        | 155           | 53       |
|                                       | Zinc        | 684           | 133      |
| SU-29-SA-02-02                        | 2,4,6-TNT   | 0.75          | 0.456    |

- 3) SUMP 30 5A-25 Located on the West Side of Building 5A-25.  
2 x 2 x 2 ft

| Sample No.                            | Contaminant | Concentration | Criteria |
|---------------------------------------|-------------|---------------|----------|
| SU-30-SS-01-01<br>(east side)         | Cadmium     | 1.51          | 0.899    |
|                                       | Lead        | 138           | 53       |
|                                       | Zinc        | 277           | 133      |
| SU-30-SS-02-01<br>(outfall/west side) | Antimony    | 8.97          | 3.57     |
|                                       | Cadmium     | 1.64          | 0.899    |
|                                       | Lead        | 137           | 53       |
|                                       | Zinc        | 384           | 133      |
| SU-30-SA-02-02                        | Cadmium     | 1.53          | 0.899    |
|                                       | Copper      | 83.3          | 30.9     |
|                                       | Zinc        | 254           | 133      |

- 4) SUMP 31 6-19 Located at Building 6-19, which is a Black Powder Dry House  
2 x 2 x 2 ft

| Sample No.                            | Contaminant | Concentration | Criteria |
|---------------------------------------|-------------|---------------|----------|
| SU-31-SS-01-01<br>(outfall/west side) | RDX         | 1.68          | 0.587    |
| SU-31-SA-01-02                        | RDX         | 1.28          | 0.587    |
| SU-31-SS-02-01<br>(low area)          | RDX         | 1.81          | 0.587    |

- 5) SUMP 32 Located on the East Side of Building 6-98.

| Sample No.                    | Contaminant | Concentration | Criteria |
|-------------------------------|-------------|---------------|----------|
| SU-32-SS-01-01<br>(outfall)   | Antimony    | 14.1          | 3.57     |
|                               | Cadmium     | 1.81          | 0.899    |
|                               | Chromium    | 70.7          | 48       |
|                               | Copper      | 117           | 30.9     |
|                               | Lead        | 612           | 53       |
|                               | Mercury     | 131           | 0.155    |
|                               | Zinc        | 623           | 133      |
| SU-32-SA-01-02                | Antimony    | 99            | 3.57     |
|                               | Copper      | 1790          | 30.9     |
|                               | Mercury     | 1920          | 0.155    |
| SU-32-SA-01-02                | Zinc        | 286           | 133      |
| SU-32-SS-02-01<br>(northwest) | Cadmium     | 0.957         | 0.899    |
|                               | Chromium    | 74.7          | 48       |
|                               | Copper      | 53            | 30.9     |
|                               | Lead        | 886           | 53       |
|                               | Mercury     | 5.66          | 0.155    |
|                               | Zinc        | 210           | 133      |
| SU-32-SA-02-02                | Copper      | 143           | 30.9     |
|                               | Mercury     | 852           | 0.155    |

- 5) SUMP 34 Located on the North Side of Building 7-18.  
7-18 2 x 2 x 2 ft

| Sample No.                    | Contaminant | Concentration | Criteria |
|-------------------------------|-------------|---------------|----------|
| SU-34-SS-01-01<br>(outfall)   | Lead        | 61.1          | 53       |
| SU-34-SA-01-02                | Silver      | 1.02          | 0.294    |
| SU-34-SS-02-01<br>(east side) | 2,4,6-TNT   | 4.13          | 0.456    |
|                               | Lead        | 90.5          | 53       |
|                               | Zinc        | 465           | 133      |

- 7) SUMP 35 Located South of Building 7-67.  
7-67 2 x 2 x 2 ft

| Sample No.                     | Contaminant | Concentration | Criteria |
|--------------------------------|-------------|---------------|----------|
| SU-35-SS-01-01<br>(north side) | Copper      | 922           | 30.9     |
|                                | Lead        | 69.4          | 53       |
| SU-35-SA-01-02                 | Silver      | 1.34          | 0.294    |
| SU-35-SS-02-01<br>(south side) | Antimony    | 11.2          | 3.57     |
|                                | Lead        | 264           | 53       |

- 8) SUMP 36 Located on the South Side of Building 7-54-1.  
7-54-1 2 x 2 x 2 ft

| Sample No.                    | Contaminant | Concentration | Criteria |
|-------------------------------|-------------|---------------|----------|
| SU-36-SA-01-02<br>(east side) | Cadmium     | 1.6           | 0.899    |
|                               | Silver      | 1.11          | 0.294    |
| SU-36-SS-02-01                | RDX         | 0.889         | 0.587    |

|                |         |       |       |
|----------------|---------|-------|-------|
| (west side)    | Cadmium | 1.99  | 0.899 |
|                | Lead    | 122   | 53    |
|                | Zinc    | 472   | 133   |
| SU-36-SA-02-02 | RDX     | 0.843 | 0.587 |

46

- SUMP 37 Stainless Steel Tank  
1-12 5 Dia x 5 ft deep
- ) SUMP 38 Located west of Building 7-64  
2 x 2 x 2 ft
- ) SUMP 39 Located south of Building 7-66  
2 x 2 x 2 ft
- ) SUMP 40 Located north of Building 7-18  
2 x 2 x 2 ft, 10 inches above grade

| Sample No.                    | Contaminant | Concentration | Criteria |
|-------------------------------|-------------|---------------|----------|
| SU-34-SS-01-01<br>(outfall)   | Lead        | 61.1          | 53       |
| SU-34-SA-01-02                | Silver      | 1.02          | 0.294    |
| SU-34-SS-02-01<br>(east side) | 2,4,6-TNT   | 4.13          | 0.456    |
|                               | Lead        | 90.5          | 53       |
|                               | Zinc        | 465           | 133      |

- 3) SUMP 41 Aluminum Sump located south of Building 5B-140-1  
5 diam x 5 feet deep
- 4) SUMP 42 Aluminum Sump located south of Building 5B-140-2  
5' diam x 5' deep
- 5) SUMP 43 Aluminum Sump located east of Building 5B-140-3  
4 wide x 10 long x 3 deep in ft
- 6) SUMP 44 Aluminum Sump located west of Building 5B-140-3  
4 wide x 10 long x 3 deep in ft

FORMER SUMPS

47

The following sumps have been already removed, and the pits have been backfilled. Screening samples for 4 of the pits were obtained by Jaycor, and the results are presented below. The remaining 9 have been sampled by Mason and Hanger and those results will be included as soon as they are received.

- 1 Excavation site north of building 5A-28, where a 4' x 10' x 3' sump was removed. One sample was collected from the bottom of the sump pit. No contaminants were reported above detection in the sample.
- 2 Excavation site east of building 5A-140-3, where a 4' x 10' x 3' sump was removed. No contaminants were reported above detection.
- 3 Excavation site west of building 5A-140-3, where a 4' x 10' x 3' sump was removed. Screening samples contained 2,4,6 -TNT at 3.8 ppb.
- 4 Excavation site south of building 5A-140-1, where a 5' diam x 5' deep sump was removed.
- 5 Excavation site south of building 5A-140-2, where a 5' diam x 5' deep sump was removed. Screening samples contained 2,4,6 -TNT at 3.0 ppb. No metals were reported.
- 6 Excavation site west of building 7-19-2, where a 3' diam x 5' deep sump was removed.
- 7 Excavation site south of building 7-64, where a 5' diam x 5' deep sump was removed.
- 8 Excavation site south of building 7-63, where a 5' diam x 5' deep sump was removed.
- 9 Excavation site south of building 7-54-2, where a 5' diam x 5' deep sump was removed.
- 10 Two excavation sites east of building 9-14, where two 3' diam x 5' deep sump was removed.
- 11 Excavation site east of building 9-57, where a 5' diam x 5' deep sump was removed.
- 12 Excavation site east of building 9-58, where a 5' diam x 5' deep sump was removed.
- 13 Two excavation sites east of building 9-58, where a 5' diam x 5' deep sump was removed.

5/12/94

Maria,

We have enclosed the results of soil samples taken from the excavations of tanks removed from Lines 6, 7 and 9 for your use during this sample removal action.

R. Durbin



Mason & Hanger-Silas Mason Co., Inc.  
 Iowa Army Ammunition Plant  
 Middletown, IA 52638

December 16, 1991  
 PACE Project Number: 31102450

Attn: Mr. Ron Durbin

Client Reference: Soil Samples

|                     |                   |                  |                |
|---------------------|-------------------|------------------|----------------|
| PACE Sample Number: | 80 0071281        | 80 0071290       | 80 0071303     |
| Date Collected:     | 06/12/91          | 06/12/91         | 06/07/91       |
| Date Received:      | 10/24/91          | 10/24/91         | 10/24/91       |
| Client Sample ID:   | 1 SE of<br>7-54-2 | 2 W of<br>7-19-2 | 3 E of<br>9-57 |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>W of 7-66</u> | <u>S Tank</u> |
|------------------|--------------|------------|------------------|---------------|
|------------------|--------------|------------|------------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |      |        |          |          |          |
|-------------------|------|--------|----------|----------|----------|
| Lead              | mg/L | 0.005  | 1.91     | 1.03     | -        |
| Lead              | mg/L | 0.0050 | -        | -        | 0.64     |
| Mercury Digestion |      |        | 10/25/91 | 10/25/91 | 10/25/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | ND    | 0.340 | ND    |
| Cadmium  | mg/L | 0.01  | ND    | ND    | ND    |
| Chromium | mg/L | 0.01  | ND    | ND    | ND    |
| Mercury  | mg/L | 0.001 | ND    | ND    | 0.006 |
| Lead     | mg/L | 0.01  | 0.034 | -     | -     |
| Lead     | mg/L | 0.05  | -     | 0.129 | -     |
| Lead     | mg/L | 0.1   | -     | -     | ND    |
| Selenium | mg/L | 0.1   | ND    | ND    | ND    |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 10/28/91 | 10/28/91 | 10/28/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.

Mr. Ron Durbin  
 Page 2

December 16, 1991  
 PACE Project Number: 31102450

Client Reference: Soil Samples

|                     |            |            |            |
|---------------------|------------|------------|------------|
| PACE Sample Number: | 80 0071311 | 80 0071320 | 80 0071338 |
| Date Collected:     | 06/12/91   | 06/12/91   | 06/12/91   |
| Date Received:      | 10/24/91   | 10/24/91   | 10/24/91   |
| Client Sample ID:   | 4 E of     | 5 S of     | 6 E of     |
|                     | 9-14       | 7-19-1     | 9-14       |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>N Tank</u> | <u>S Tank</u> |
|------------------|--------------|------------|---------------|---------------|
|------------------|--------------|------------|---------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |      |        |          |          |          |
|-------------------|------|--------|----------|----------|----------|
| Lead              | mg/L | 0.005  | -        | 1.40     | 2.92     |
| Lead              | mg/L | 0.0050 | 0.094    | -        | -        |
| Mercury Digestion |      |        | 10/25/91 | 10/25/91 | 10/25/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | ND    | ND    | ND    |
| Cadmium  | mg/L | 0.01  | ND    | ND    | ND    |
| Chromium | mg/L | 0.01  | ND    | ND    | ND    |
| Mercury  | mg/L | 0.001 | 0.001 | 0.005 | 0.005 |
| Lead     | mg/L | 0.01  | -     | 0.01  | -     |
| Lead     | mg/L | 0.1   | ND    | -     | ND    |
| Selenium | mg/L | 0.1   | 0.035 | ND    | ND    |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 10/28/91 | 10/28/91 | 10/28/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
PACE Project Number: 3110245

Client Reference: Soil Samples

|                     |              |            |                                         |
|---------------------|--------------|------------|-----------------------------------------|
| PACE Sample Number: | 80 0071346   | 80 0071354 | 80 0071366                              |
| Date Collected:     | 06/12/91     | 06/12/91   | 06/07/91                                |
| Date Received:      | 10/24/91     | 10/24/91   | 10/24/91                                |
| Client Sample ID:   | 7 S of       | 8 S of     | 9 S of                                  |
| Parameter           | <u>Units</u> | <u>MDL</u> | <u>9-64</u> <u>6-35</u> <u>600-86-2</u> |

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |       |        |          |          |          |
|-------------------|-------|--------|----------|----------|----------|
| Lead              | mg/L  | 0.0050 | 0.071    | 0.315    | -        |
| Lead              | mg/kg | 1.000  | -        | -        | 1.2      |
| Mercury Digestion |       |        | 10/25/91 | 10/25/91 | 10/29/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | 0.363 | ND    | ND    |
| Barium   | mg/L | 0.1   | 1.12  | ND    | 0.475 |
| Cadmium  | mg/L | 0.01  | 0.039 | ND    | 0.013 |
| Chromium | mg/L | 0.01  | ND    | ND    | ND    |
| Mercury  | mg/L | 0.001 | ND    | 0.005 | ND    |
| Lead     | mg/L | 0.05  | -     | -     | 0.126 |
| Lead     | mg/L | 0.1   | 0.179 | 0.14  | -     |
| Selenium | mg/L | 0.02  | -     | -     | 0.045 |
| Selenium | mg/L | 0.1   | ND    | ND    | -     |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 10/28/91 | 10/28/91 | 10/25/91 |
|------------------------|----------|----------|----------|

MDL        Method Detection Limit  
ND        Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
PACE Project Number: 31102450

Client Reference: Soil Samples

|                     |                 |                 |                 |
|---------------------|-----------------|-----------------|-----------------|
| PACE Sample Number: | 80 0071370      | 80 0071389      | 80 0071397      |
| Date Collected:     | 06/07/91        | 06/07/91        | 06/12/91        |
| Date Received:      | 10/24/91        | 10/24/91        | 10/24/91        |
| Client Sample ID:   | 10 W of<br>9-58 | 11 E of<br>9-57 | 12 E of<br>7-36 |

|                  |              |            |                             |               |                             |
|------------------|--------------|------------|-----------------------------|---------------|-----------------------------|
| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>                    </u> | <u>N Tank</u> | <u>                    </u> |
|------------------|--------------|------------|-----------------------------|---------------|-----------------------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |      |       |          |          |          |
|-------------------|------|-------|----------|----------|----------|
| Lead              | mg/L | 0.005 | 1.35     | ND       | 0.094    |
| Mercury Digestion |      |       | 10/29/91 | 10/29/91 | 12/04/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | 2.08  | ND    |
| Barium   | mg/L | 0.1   | 0.220 | ND    | 1.27  |
| Cadmium  | mg/L | 0.005 | -     | ND    | -     |
| Cadmium  | mg/L | 0.008 | -     | -     | ND    |
| Cadmium  | mg/L | 0.01  | 0.041 | -     | -     |
| Chromium | mg/L | 0.003 | -     | 0.016 | 0.007 |
| Chromium | mg/L | 0.01  | 0.01  | -     | -     |
| Mercury  | mg/L | 0.001 | 0.004 | ND    | ND    |
| Lead     | mg/L | 0.03  | 0.041 | -     | -     |
| Lead     | mg/L | 0.05  | -     | -     | ND    |
| Lead     | mg/L | 0.100 | -     | 0.873 | -     |
| Selenium | mg/L | 0.01  | -     | 0.043 | 0.038 |
| Selenium | mg/L | 0.1   | ND    | -     | -     |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |  |          |          |          |
|------------------------|--|----------|----------|----------|
| Date Extracted, Metals |  | 10/28/91 | 10/28/91 | 11/04/91 |
|------------------------|--|----------|----------|----------|

MDL Method Detection Limit  
ND Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
 PACE Project Number: 31102450

Client Reference: Soil Samples

|                     |                 |            |                 |
|---------------------|-----------------|------------|-----------------|
| PACE Sample Number: | 80 0071400      | 80 0071419 | 80 0071427      |
| Date Collected:     | 06/12/91        | 05/30/91   | 05/30/91        |
| Date Received:      | 10/24/91        | 10/24/91   | 10/24/91        |
| Client Sample ID:   | 13 N of<br>6-35 | 14 S Side  | 15 E of<br>7-36 |

|                  |              |            |  |  |               |
|------------------|--------------|------------|--|--|---------------|
| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> |  |  | <u>N Side</u> |
|------------------|--------------|------------|--|--|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |      |       |          |          |          |
|-------------------|------|-------|----------|----------|----------|
| Lead              | mg/L | 0.005 | 0.20     | 0.84     | -        |
| Lead              | mg/L | 0.50  | -        | -        | 1.52     |
| Mercury Digestion |      |       | 12/04/91 | 12/04/91 | 12/04/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | 7.48  | 0.909 | 2.17  |
| Cadmium  | mg/L | 0.008 | 0.011 | -     | ND    |
| Cadmium  | mg/L | 0.40  | -     | 0.449 | -     |
| Chromium | mg/L | 0.003 | 0.055 | -     | -     |
| Chromium | mg/L | 0.01  | -     | -     | 0.012 |
| Chromium | mg/L | 0.080 | -     | 0.085 | -     |
| Mercury  | mg/L | 0.001 | ND    | ND    | ND    |
| Lead     | mg/L | 0.050 | 0.475 | -     | -     |
| Lead     | mg/L | 0.1   | -     | 0.506 | -     |
| Lead     | mg/L | 0.10  | -     | -     | 0.204 |
| Selenium | mg/L | 0.01  | 0.034 | 0.029 | 0.059 |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 11/04/91 | 11/07/91 | 11/04/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
 PACE Project Number: 311024509

Client Reference: Soil Samples

|                     |            |            |            |
|---------------------|------------|------------|------------|
| PACE Sample Number: | 80 0071435 | 80 0071443 | 80 0071451 |
| Date Collected:     | 05/30/91   | 05/30/91   | 05/30/91   |
| Date Received:      | 10/24/91   | 10/24/91   | 10/24/91   |
| Client Sample ID:   | 16 E of    | 17 W of    | 18         |
|                     | 7-36       | 7-19-2     | 600-86-2   |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>S Side</u> | <u>N Side</u> | <u>N Side</u> |
|------------------|--------------|------------|---------------|---------------|---------------|
|------------------|--------------|------------|---------------|---------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |      |       |          |          |          |
|-------------------|------|-------|----------|----------|----------|
| Lead              | mg/L | 0.005 | ND       | 0.184    | 0.32     |
| Mercury Digestion |      |       | 12/04/91 | 12/04/91 | 12/04/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | 1.34  | 1.35  | 0.167 |
| Cadmium  | mg/L | 0.008 | 0.013 | 0.019 | ND    |
| Chromium | mg/L | 0.002 | -     | -     | 0.006 |
| Chromium | mg/L | 0.003 | -     | 0.008 | -     |
| Chromium | mg/L | 0.01  | 0.010 | -     | -     |
| Mercury  | mg/L | 0.001 | 0.001 | 0.004 | ND    |
| Lead     | mg/L | 0.05  | -     | ND    | ND    |
| Lead     | mg/L | 0.1   | 0.351 | -     | -     |
| Selenium | mg/L | 0.02  | -     | 0.032 | 0.074 |
| Selenium | mg/L | 0.05  | 0.093 | -     | -     |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 11/04/91 | 11/04/91 | 11/04/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
 PACE Project Number: 311024505

Client Reference: Soil Samples

|                     |            |            |            |
|---------------------|------------|------------|------------|
| PACE Sample Number: | 80 0071460 | 80 0071478 | 80 0071486 |
| Date Collected:     | 05/30/91   | 05/30/91   | 05/30/91   |
| Date Received:      | 10/24/91   | 10/24/91   | 10/24/91   |
| Client Sample ID:   | 19         | 20 E of    | 21 Near    |
|                     | 600-86     | 7-63       | Bldg 6-35  |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>S Side</u> | <u>S Side</u> | <u>N Side</u> |
|------------------|--------------|------------|---------------|---------------|---------------|
|------------------|--------------|------------|---------------|---------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |       |       |          |          |          |
|-------------------|-------|-------|----------|----------|----------|
| Lead              | mg/L  | 0.005 | 0.155    | -        | -        |
| Lead              | mg/L  | 0.125 | -        | 0.174    | -        |
| Lead              | mg/kg | 2.5   | -        | -        | 9.1      |
| Mercury Digestion |       |       | 12/04/91 | 12/04/91 | 12/04/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | 0.146 | 1.98  | 4.25  |
| Cadmium  | mg/L | 0.008 | 0.009 | ND    | ND    |
| Chromium | mg/L | 0.002 | -     | -     | 0.032 |
| Chromium | mg/L | 0.003 | ND    | 0.014 | -     |
| Mercury  | mg/L | 0.001 | ND    | ND    | ND    |
| Lead     | mg/L | 0.05  | 0.077 | ND    | -     |
| Lead     | mg/L | 0.100 | -     | -     | 1.34  |
| Selenium | mg/L | 0.02  | 0.053 | 0.08  | 0.077 |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 11/04/91 | 11/04/91 | 11/04/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
 PACE Project Number: 3110245

Client Reference: Soil Samples

|                     |            |            |           |
|---------------------|------------|------------|-----------|
| PACE Sample Number: | 80 0071583 | 80 0071591 | 80 007160 |
| Date Collected:     | 05/30/91   | 05/30/91   | 05/30/91  |
| Date Received:      | 10/24/91   | 10/24/91   | 10/24/91  |
| Client Sample ID:   | 32 S of    | 33 S of    | 34 W of   |
|                     | 7-19-1     | 7-54-2     | 9-58      |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>S Side</u> | <u>N Side</u> | <u>S Side</u> |
|------------------|--------------|------------|---------------|---------------|---------------|
|------------------|--------------|------------|---------------|---------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |       |       |          |          |          |
|-------------------|-------|-------|----------|----------|----------|
| Lead              | mg/L  | 0.005 | 0.89     | ND       | -        |
| Lead              | mg/kg | 2.5   | -        | -        | 54.9     |
| Mercury Digestion |       |       | 12/04/91 | 12/04/91 | 12/04/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.1   | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | 0.200 | 0.612 | 0.133 |
| Cadmium  | mg/L | 0.005 | ND    | 0.012 | -     |
| Cadmium  | mg/L | 0.008 | -     | -     | ND    |
| Chromium | mg/L | 0.003 | 0.004 | -     | -     |
| Chromium | mg/L | 0.01  | -     | -     | 0.014 |
| Chromium | mg/L | 0.080 | -     | 0.065 | -     |
| Mercury  | mg/L | 0.001 | ND    | 0.001 | ND    |
| Lead     | mg/L | 0.05  | ND    | ND    | -     |
| Lead     | mg/L | 0.050 | -     | -     | 0.224 |
| Selenium | mg/L | 0.01  | -     | 0.037 | -     |
| Selenium | mg/L | 0.02  | 0.074 | -     | 0.046 |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 11/07/91 | 11/07/91 | 11/07/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.



Mr. Ron Durbin  
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December 16, 1991  
PACE Project Number: 311024505

Client Reference: Soil Samples

|                     |                       |                       |                       |
|---------------------|-----------------------|-----------------------|-----------------------|
| PACE Sample Number: | 80 0071648            | 80 0071656            | 80 0071664            |
| Date Collected:     | 05/30/91              | 05/30/91              | 05/30/91              |
| Date Received:      | 10/24/91              | 10/24/91              | 10/24/91              |
| Client Sample ID:   | 38 W of<br>9-58N Tank | 39 E of<br>9-57S Tank | 40 E of<br>9-57N Tank |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>N Side</u> | <u>N Side</u> | <u>S Side</u> |
|------------------|--------------|------------|---------------|---------------|---------------|
|------------------|--------------|------------|---------------|---------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |       |        |          |          |          |
|-------------------|-------|--------|----------|----------|----------|
| Lead              | mg/L  | 0.0050 | -        | -        | 2.07     |
| Lead              | mg/kg | 1.25   | -        | 13.5     | -        |
| Lead              | mg/kg | 2.5    | 18.5     | -        | -        |
| Mercury Digestion |       |        | 12/04/91 | 12/04/91 | 12/09/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.005 | -     | -     | ND    |
| Arsenic  | mg/L | 0.1   | ND    | ND    | -     |
| Barium   | mg/L | 0.1   | 0.396 | 0.101 | 0.241 |
| Cadmium  | mg/L | 0.005 | -     | -     | ND    |
| Cadmium  | mg/L | 0.008 | ND    | ND    | -     |
| Chromium | mg/L | 0.003 | 0.010 | 0.018 | -     |
| Chromium | mg/L | 0.008 | -     | -     | 0.011 |
| Mercury  | mg/L | 0.001 | ND    | 0.005 | ND    |
| Lead     | mg/L | 0.03  | 0.091 | -     | -     |
| Lead     | mg/L | 0.05  | -     | ND    | ND    |
| Selenium | mg/L | 0.02  | -     | -     | 0.08  |
| Selenium | mg/L | 0.020 | 0.046 | -     | -     |
| Selenium | mg/L | 0.05  | -     | 0.166 | -     |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 11/08/91 | 11/07/91 | 11/07/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
ND Not detected at or above the MDL.

Mr. Ron Durbin  
 Page 14

December 16, 1991  
 PACE Project Number: 31102450

Client Reference: Soil Samples

|                     |                       |                       |                       |
|---------------------|-----------------------|-----------------------|-----------------------|
| PACE Sample Number: | 80 0071672            | 80 0071680            | 80 0071699            |
| Date Collected:     | 05/30/91              | 05/30/91              | 05/30/91              |
| Date Received:      | 10/24/91              | 10/24/91              | 10/24/91              |
| Client Sample ID:   | 41 E of<br>9-57N Tank | 42 E of<br>9-57S Tank | 26 E of<br>9-14S Tank |

| <u>Parameter</u> | <u>Units</u> | <u>MDL</u> | <u>N Side</u> | <u>S Side</u> | <u>S Side</u> |
|------------------|--------------|------------|---------------|---------------|---------------|
|------------------|--------------|------------|---------------|---------------|---------------|

INORGANIC ANALYSIS

INDIVIDUAL PARAMETERS

|                   |       |        |          |          |          |
|-------------------|-------|--------|----------|----------|----------|
| Lead              | mg/L  | 0.0050 | -        | 2.37     | -        |
| Lead              | mg/L  | 0.2500 | -        | -        | 0.863    |
| Lead              | mg/kg | 2.5    | 32.8     | -        | -        |
| Mercury Digestion |       |        | 10/29/91 | 10/29/91 | 12/06/91 |

TCLP METALS

|          |      |       |       |       |       |
|----------|------|-------|-------|-------|-------|
| Arsenic  | mg/L | 0.005 | ND    | ND    | ND    |
| Barium   | mg/L | 0.1   | 0.382 | -     | -     |
| Barium   | mg/L | 0.5   | -     | 0.957 | 1.5   |
| Cadmium  | mg/L | 0.008 | ND    | ND    | -     |
| Cadmium  | mg/L | 0.05  | -     | -     | 0.090 |
| Chromium | mg/L | 0.003 | 0.020 | -     | -     |
| Chromium | mg/L | 0.01  | -     | ND    | 0.013 |
| Mercury  | mg/L | 0.001 | ND    | ND    | ND    |
| Lead     | mg/L | 0.002 | ND    | -     | -     |
| Lead     | mg/L | 0.03  | -     | 0.036 | -     |
| Lead     | mg/L | 0.050 | -     | -     | 0.069 |
| Selenium | mg/L | 0.01  | 0.034 | -     | -     |
| Selenium | mg/L | 0.02  | -     | 0.073 | 0.09  |
| Silver   | mg/L | 0.01  | ND    | ND    | ND    |

ORGANIC ANALYSIS

TCLP METALS

|                        |          |          |          |
|------------------------|----------|----------|----------|
| Date Extracted, Metals | 11/07/91 | 11/07/91 | 11/07/91 |
|------------------------|----------|----------|----------|

MDL Method Detection Limit  
 ND Not detected at or above the MDL.

Mr. Ron Durbin  
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December 16, 1991  
PACE Project Number: 311024505

Client Reference: Soil Samples

These data have been reviewed and are approved for release.



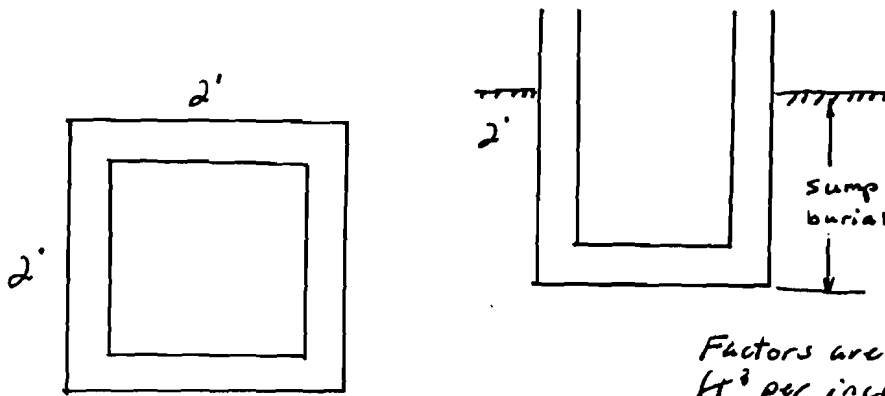
Michael D. Saeugling  
Regional Director

**APPENDIX B**  
**Volume Calculations**

61

DM FEDERAL PROGRAMS CORPORATION  
 Subsidiary of Camp Dresser & McKee Inc.

### Increased excavation factors for 2x2x2 sump



Factors are expressed in  
 $\text{ft}^3$  per inch of sump burial.

Factor for 1' perimeter excavation.

Area of 4' x 4' used.

$$4' \times 4' \times \frac{1''}{12} - 2' \times 2' \times \frac{1''}{12} = 1 \text{ ft}^3/\text{inch}$$

Excavate 1' below sump bottom.

$$4' \times 4' \times 1' = 16 \text{ ft}^3$$

for 1' offset excavation use following equation:

$$V(\text{ft}^3) = \underline{16 \text{ ft}^3 + \frac{1 \text{ ft}^3}{\text{in}} (\text{sump burial})}$$

Factor for 2' perimeter excavation.

Area of 6' x 6' used.

$$6' \times 6' \times \frac{1''}{12} - 2' \times 2' \times \frac{1''}{12} = 2.7 \text{ ft}^3/\text{inch}$$

Excavate 2' below sump bottom.

$$6' \times 6' \times 2' = 72 \text{ ft}^3$$

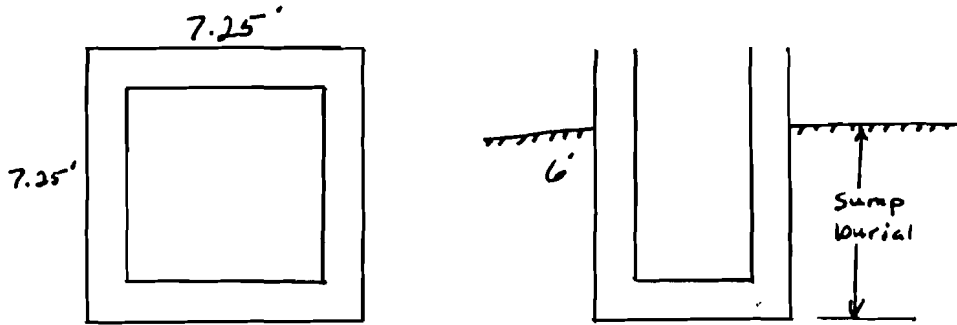
for 2' offset excavation use following equation:

$$V(\text{ft}^3) = \underline{72 \text{ ft}^3 + 2.7 \frac{\text{ft}^3}{\text{in}} (\text{sump burial})}$$



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Increased excavation factors for 7.25' x 7.25' x 6' sump.



Factor for 1' perimeter excavation.

Area of 9.25' x 9.25' used.

$$9.25' \times 9.25' \times \frac{1}{12} - 7.25' \times 7.25' \times \frac{1}{12} = 2.75 \text{ ft}^3/\text{inch}$$

Excavate 1' below sump bottom.

$$9.25 \times 9.25 \times 1 = 86 \text{ ft}^3$$

for 1' offset excavation use following equation:

$$V(\text{ft}^3) = \underline{86 \text{ ft}^3 + 2.75 \frac{\text{ft}^3}{\text{in}} (\text{sump burial})}$$

Factor for 2' perimeter excavation.

Area of 11.25' x 11.25' used.

$$11.25' \times 11.25' \times \frac{1}{12} - 7.25' \times 7.25' \times \frac{1}{12} = 6.2 \text{ ft}^3/\text{inch}$$

Excavate 2' below sump bottom

$$11.25' \times 11.25' \times 2 = 127 \text{ ft}^3$$

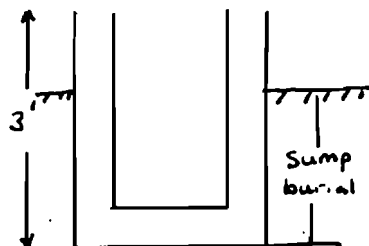
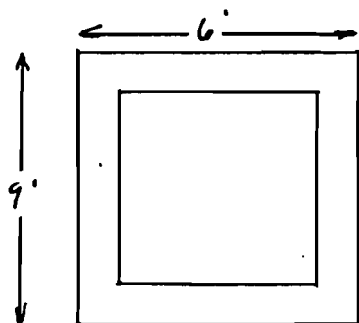
for 2' offset excavation use following equation

$$V(\text{ft}^3) = \underline{127 \text{ ft}^3 + 6.2 \frac{\text{ft}^3}{\text{in}} (\text{sump burial})}$$

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DM FEDERAL PROGRAMS CORPORATION  
subsidiary of Camp Dresser & McKee Inc.PROJECT Iowa MAP JOB NO. \_\_\_\_\_ DATE 1-8-77  
COMPUTED BY OGE CHECKED BY TM DATE CHECKED 7-8-77  
CLIENT \_\_\_\_\_ PAGE NO. \_\_\_\_\_

Increased excavation factors 6' x 9' x 3' sump.

Factors are expressed in  
ft<sup>3</sup> per inch of sump burial

Factor for 1' perimeter excavation.

Area of 8' x 11' used.

$$8' \times 11' \times \frac{1''}{12} - 6' \times 9' \times \frac{1''}{12} = 2.8 \text{ ft}^3/\text{inch}$$

Excavate 1' below sump bottom

$$8' \times 11' \times 1' = 88 \text{ ft}^3$$

For 1' offset excavation use following equation:

$$\underline{88 \text{ ft}^3 + 2.8 \frac{\text{ft}^3}{\text{in}} (\text{sump burial})}$$

Factor for 2' perimeter excavation.

Area of 10' x 13' used.

$$10' \times 13' \times \frac{1''}{12} - 6' \times 9' \times \frac{1''}{12} = 6.3 \text{ ft}^3/\text{inch}$$

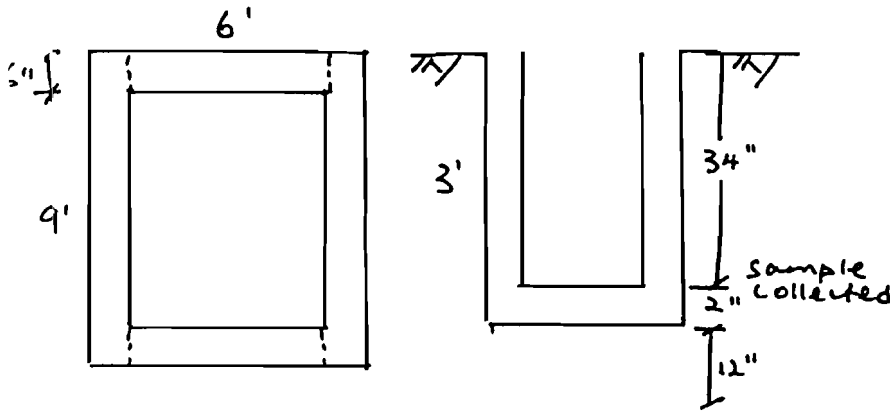
Excavate 2' below sump bottom

$$10' \times 13' \times 2 = 260 \text{ ft}^3$$

For 2' offset excavation use following equation:  $\underline{260 \text{ ft}^3 + 6.3 \frac{\text{ft}^3}{\text{in}} (\text{sump burial})}$



Sump # 1



Volume of soil to be removed  
 by 1ft from bottom of sump

An area of 10'x7'x4' is  
 used for contaminated soil  
 calculation.

Volume of contaminated soil: (Assume sump below ground)

$$10' \times 7' \times 4' - 9' \times 6' \times 3' = 118 \text{ ft}^3 = \textcircled{4.4 \text{ yd}^3}$$

Volume of concrete to be removed:

$$9' \times 3' \times 0.5' \times 2 + 5' \times 3' \times 0.5' \times 2 + 8' \times 5' \times 0.5' = 62 \text{ ft}^3 \approx 2.3 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 1

Cadmium - 2.28 ug/g      Copper - 72.2 ug/g      Lead - 447 ug/g.  
 Chromium - 57 ug/g      Zinc - 531 ug/g

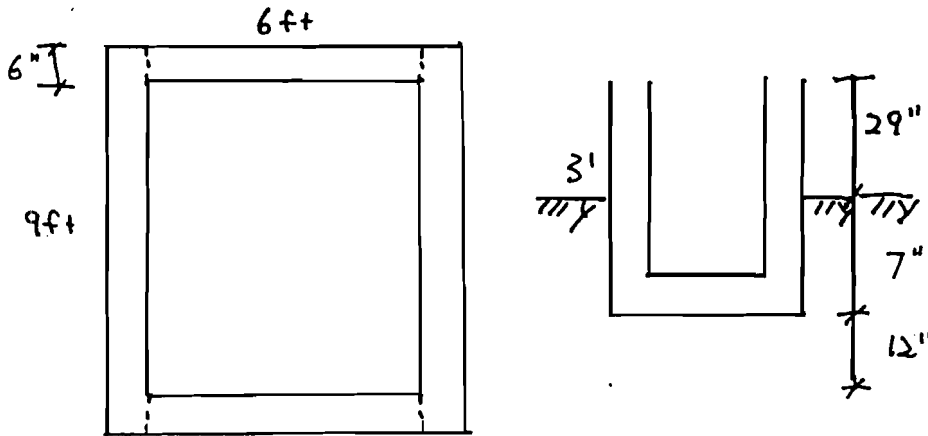
Volume for 1' perimeter excavation =  $189 \text{ ft}^3 = 7 \text{ yd}^3$

Volume for 2' perimeter excavation =  $253 \text{ ft}^3 = 9.4 \text{ yd}^3$





Sump # 2



Volume of soil to be removed offset by 1 ft. from bottom of sump

An area 10'x7'x19" is used for contaminate soil calculation.

Volume of contaminated soil:

$$10' \times 7' \times 19'' - 9' \times 6' \times 7'' = 80 \text{ ft}^3 \approx \boxed{3 \text{ yd}^3}$$

Volume of concrete to be removed:

$$9' \times 3' \times 0.5' \times 2 + 5' \times 3' \times 0.5' \times 2 + 8' \times 5' \times 0.5' = 62 \text{ ft}^3 = \boxed{2.3 \text{ yd}^3}$$

Average conc. of contaminants above Evaluation Criteria at Sump

Lead - 64.6 ug/g.

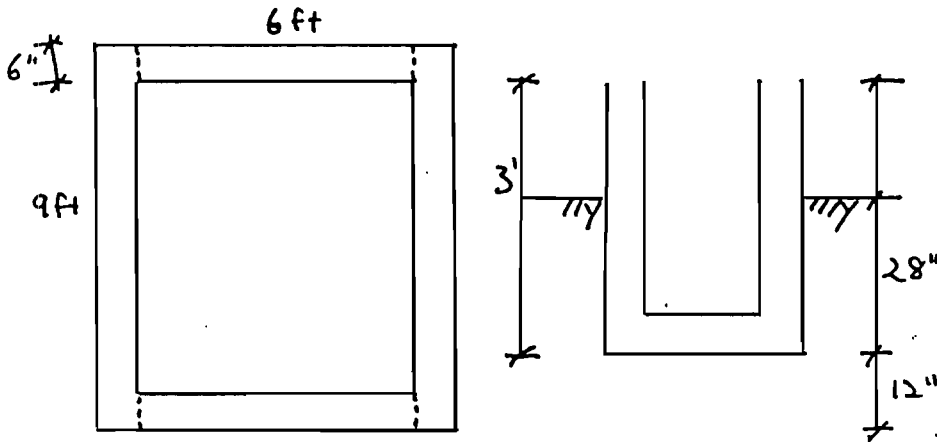
2,4,6-TNT - 1.99 ug/g.

Volume for 1' perimeter excavation =  $108 \text{ ft}^3 = 4 \text{ yd}^3$

Volume for 2' perimeter excavation =  $273 \text{ ft}^3 = 10 \text{ yd}^3$



Sump # 3



Volume of soil to be removed offset by 1 ft from bottom of sump

An area of 10' x 7' x 40" is used for contaminant soil calculations.

Volume of contaminated soil:

$$10' \times 7' \times 40'' - 9' \times 6' \times 2.3' = 109 \text{ ft}^3 \approx 4 \text{ yd}^3$$

Volume of concrete to be removed:

$$9' \times 3' \times 0.5' \times 2 + 5' \times 3' \times 0.5' \times 2 + 8' \times 5' \times 0.5' = 62 \text{ ft}^3 \approx 2.3 \text{ yd}^3$$

Average conc. of contaminants above Evaluation Criteria at Sump 3

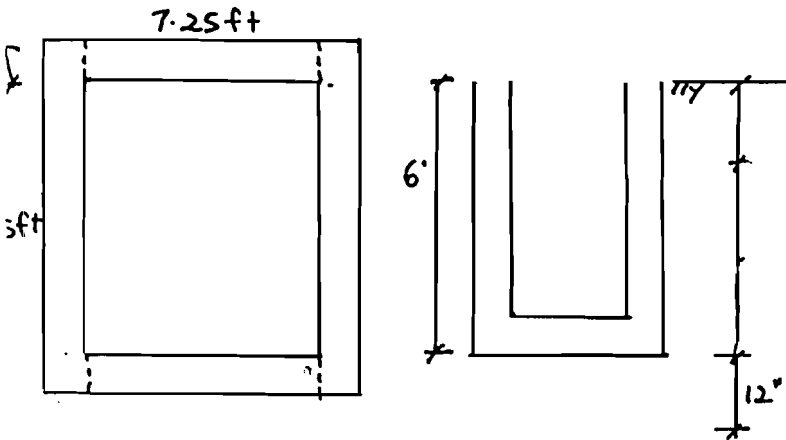
|                     |                      |                      |
|---------------------|----------------------|----------------------|
| HMX - 525 ug/g      | 2,4,6-TNT - 5.4 ug/g | Cadmium - 2.13 ug/g  |
| RDX - 1323 ug/g     | Antimony - 22.8 ug/g | Chromium - 65.4 ug/g |
| Copper - 283.5 ug/g | Lead - 354 ug/g      | Silver - 0.77 ug/g   |
| Zinc - 765 ug/g     |                      |                      |

Volume for 1' perimeter excavation =  $166 \text{ ft}^3 = 6.1 \text{ yd}^3$

Volume for 2' perimeter excavation =  $436 \text{ ft}^3 = 16 \text{ yd}^3$



Sump # 4



Volume of soil to be removed  
 offset by 1 ft from  
 bottom of sump

An area of 8.25' x 8.25' x 84"  
 is used for contaminated  
 soil calculations.

Volume of contaminated soil:

$$8.25' \times 8.25' \times 84" - 7.25' \times 7.25' \times 72" = 161 \text{ ft}^3 \approx \textcircled{6 \text{ yd}^3}$$

Volume of concrete to be removed:

$$7.25' \times 6' \times 0.67' \times 2 + 5.92' \times 6' \times 0.67' \times 2 + 5.92' \times 5.92' \times 0.67' = 129.4 \text{ ft}^3 \approx \boxed{4.8 \text{ yd}^3}$$

ave. conc. of contaminants above Evaluation Criteria at Sump #4

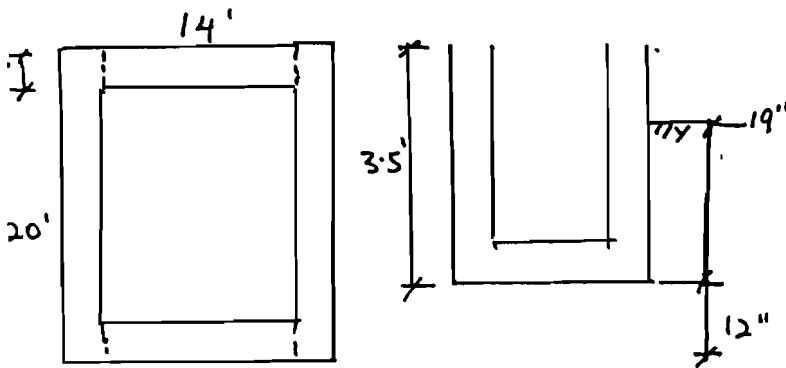
Cadmium - 2.06 ug/g      Lead - 92.3 ug/g.

Volume for 1' perimeter excavation =  $284 \text{ ft}^3 = 10.5 \text{ yd}^3$

Volume for 2' perimeter excavation =  $573 \text{ ft}^3 = 21.2 \text{ yd}^3$



Sump #8



Volume of soil to be removed offset by 1ft from bottom of sump.

An area of 15' x 21' x 31" is used for contaminated soil calculation.

Volume of contaminated soil: (Assume sump is below ground)

$$15' \times 21' \times 2.6' - 14' \times 20' \times 1.6' = 371 \text{ ft}^3 \approx 14 \text{ yd}^3$$

Volume of concrete to be removed:

$$20' \times 3.5' \times 0.5' \times 2 + 13' \times 3.5' \times 0.5' \times 2 + 13' \times 19' \times 0.5' = 239 \text{ ft}^3 \approx \boxed{9 \text{ yd}^3}$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 8

|                       |                      |                          |
|-----------------------|----------------------|--------------------------|
| HMX - 112 ug/g        | 1,3-DNT - 0.572 ug/g | Nitrobenzene - 67.6 ug/g |
| RDX - 92.3 ug/g       | 2,4,-TNT - 7.49 ug/g | 1,3,5-TNB - 106 ug/g     |
| 2,4,6-TNT - 10.4 ug/g | Cadmium - 1.17 ug/g  |                          |

Volume for 1' perimeter excavation

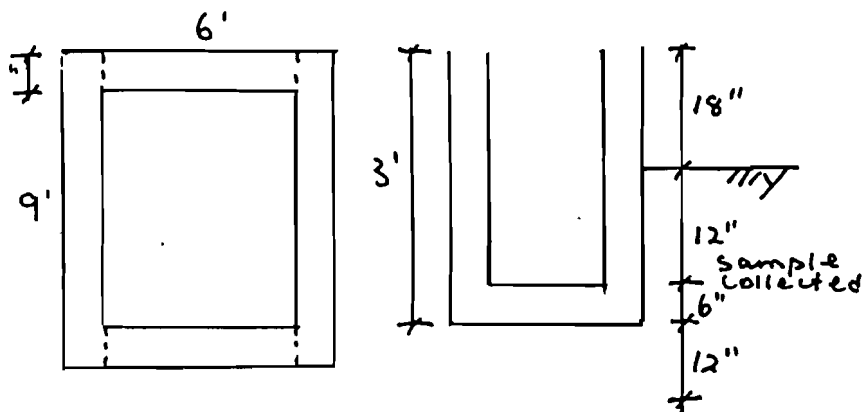
$$16' \times 22' \times \frac{35''}{12} - 14' \times 20' \times \frac{23''}{12} = 490 \text{ ft}^3 = \boxed{18.1 \text{ yd}^3}$$

Volume for 2' perimeter excavation

$$18' \times 24' \times \frac{47''}{12} - 14' \times 20' \times \frac{23''}{12} = 1155 \text{ ft}^3 = 43 \text{ yd}^3$$



Sump # 9



Volume of soil to be removed offset by 1ft from bottom of sump.

An area of 7'x10'x2.5' is used for contaminated soil calculation.

Volume of contaminated soil:

$$7' \times 10' \times 2.5' - 6' \times 9' \times 1.5' = 94 \text{ ft}^3 \approx 3.5 \text{ yd}^3$$

Volume of concrete to be removed:

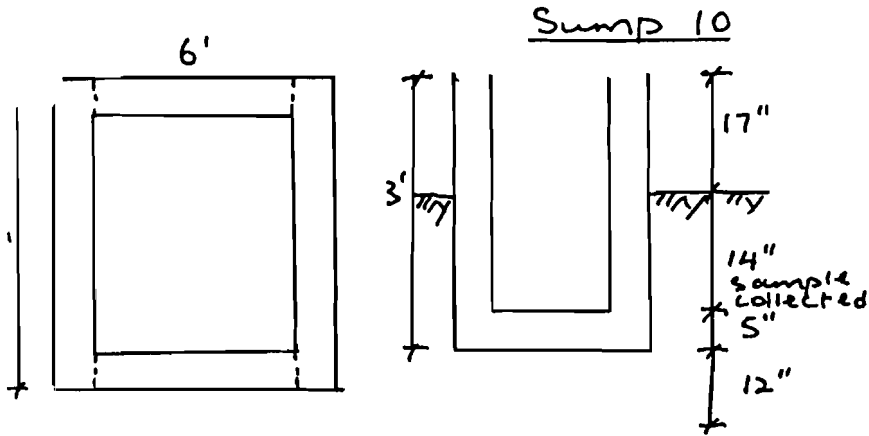
$$9' \times 3' \times 0.5' \times 2 + 5' \times 3' \times 0.5' \times 2 + 8' \times 5' \times 0.5' = 62 \text{ ft}^3 = \boxed{2.3 \text{ yd}^3}$$

ave. conc. of contaminants above Evaluation Criteria at Sump 9

Cadmium - 1.6 ug/g      Lead - 1061 ug/g.

Volume for 1' perimeter excavation =  $138 \text{ ft}^3 = 5.1 \text{ yd}^3$

Volume for 2' perimeter excavation =  $373 \text{ ft}^3 = \textcircled{13.8 \text{ yd}^3}$



Volume of soil to be removed offset by 1ft from bottom of sump.

An area of 7'x10'x 31" is used for contaminated soil calculation.

Volume of contaminated soil:

$$7' \times 10' \times 2.6' - 9' \times 6' \times 1.6' = 95.6 \text{ ft}^3 \approx 3.5 \text{ yd}^3$$

Volume of concrete to be removed:

$$9' \times 3' \times 0.5' \times 2 + 5' \times 3' \times 0.5' \times 2 + 8' \times 5' \times 0.5 = 62 \text{ ft}^3 \approx 2.3 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 10

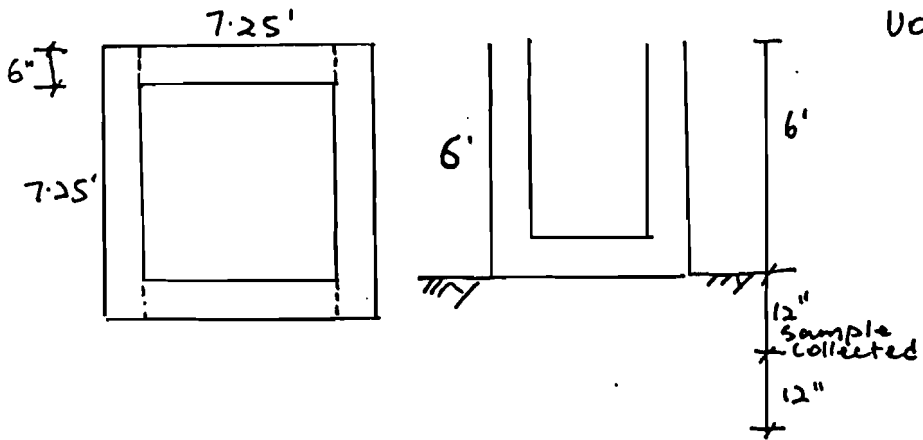
etryl - 3981 ug/g      2,4,6-TNT - 268 ug/g.

Volume for 1' perimeter excavation =  $141 \text{ ft}^3 = 5.2 \text{ yd}^3$

Volume for 2' perimeter excavation =  $380 \text{ ft}^3 = 14 \text{ yd}^3$



Sump # 11



Volume of soil to be removed offset by 1ft from sample collected.

An area of 8.25' x 8.25' x 2' is used for contaminated soil calculation.

Volume of contaminated soil:

$$8.25' \times 8.25' \times 2' = 136 \text{ ft}^3 \approx 5 \text{ yd}^3$$

Volume of concrete to be removed:

$$7.25' \times 6' \times 0.5' \times 2 + 6.25' \times 6' \times 0.5' \times 2 + 6.25' \times 6.25' \times 0.5' = 101 \text{ ft}^3 \approx \boxed{3.7 \text{ yd}^3}$$

re. conc. of contaminants above Evaluation Criteria at Sump 11

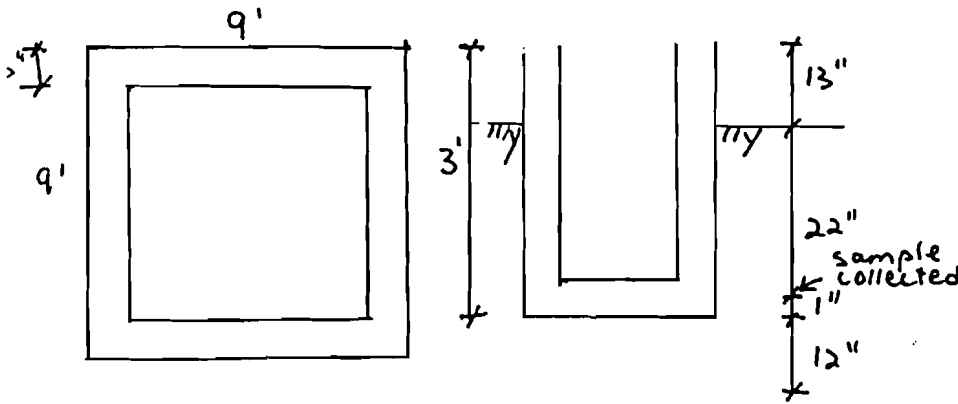
|                     |                     |                      |
|---------------------|---------------------|----------------------|
| Hmx - 688 ug/g      | Antimony - 16 ug/g  | 2,4,6-TNT - 515 ug/g |
| RAX - 1400 ug/g     | Lead - 253 ug/g     | Cadmium - 1.3 ug/g   |
| 1,3-DNT - 2.55 ug/g | 2,4-DNT - 2.82 ug/g | 1,3,5-TNB - 348 ug/g |

Volume for 1' perimeter excavation =  $86 \text{ ft}^3 = 3.2 \text{ yd}^3$

Volume for 2' perimeter excavation =  $127 \text{ ft}^3 = \textcircled{4.7 \text{ yd}^3}$



Sump # 13



Volume of soil to be removed offset by 1ft from bottom of sump.

An area of 10'x10'x3' is used for contaminate soil calculation.

Volume of contaminated soil:

$$10' \times 10' \times 3' - 9' \times 9' \times 1.9' = 146.1 \text{ ft}^3 \approx 5.4 \text{ yd}^3$$

Volume of concrete to be removed:

$$9' \times 9' \times 3' - 8' \times 8' \times 2.5' = 83 \text{ ft}^3 = \boxed{3.1 \text{ yd}^3}$$

e. conc. of contaminants above Evaluation Criteria at Sump 13 (soil)

|                  |                       |                    |
|------------------|-----------------------|--------------------|
| HMX - 103.3 ug/g | 1,3,5-TNB - 18.5 ug/g | Cadmium - 2.3 ug/g |
| RDX - 288 ug/g   | 2,4,6-TNT - 105 ug/g  | Chromium - 61 ug/g |
| Lead - 329 ug/g  | Mercury - 94 ug/g     | Zinc - 515 ug/g    |

Assume sump to be filled with water.

$$\therefore \text{Volume of water in sump} - 8' \times 8' \times 2.5' = 160 \text{ ft}^3 \approx 1197 \text{ gals.}$$

|                          |                       |                       |
|--------------------------|-----------------------|-----------------------|
| HMX - 223 ug/L           | RDX - 1100 ug/L       | 2,4,6-TNT - 5650 ug/L |
| Vitrobenzene - 4.64 ug/L | 1,3,5-TNB - 51.2 ug/L |                       |

Volume for 1' perimeter excavation

$$11' \times 11' \times \frac{35}{12} - 9' \times 9' \times \frac{23}{12} = 198 \text{ ft}^3 = 7.3 \text{ yd}^3$$

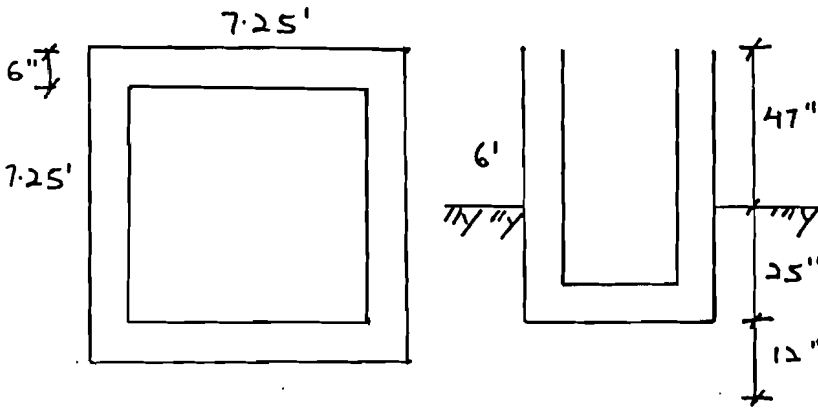
Volume for 2' perimeter excavation

$$13' \times 13' \times \frac{47}{12} - 9' \times 9' \times \frac{23}{12} = 507 \text{ ft}^3 = \boxed{19 \text{ yd}^3}$$





Sump # 14



Volume of soil to be removed offset by 1 ft from bottom of sump.

An area of 8.25' x 8.25' x 37" is used for contaminated soil calculation.

Volume of contaminated soil:

$$8.25' \times 8.25' \times 37" - 7.25' \times 7.25' \times 25" = 100.6 \text{ ft}^3 \approx 3.7 \text{ yd}^3$$

Volume of concrete to be removed:

$$7.25' \times 7.25' \times 6' - 6.25' \times 6.25' \times 5.5' = 100.5 \text{ ft}^3 = 3.7 \text{ yd}^3$$

Conc. of contaminants above Evaluation Criteria at Sump 14

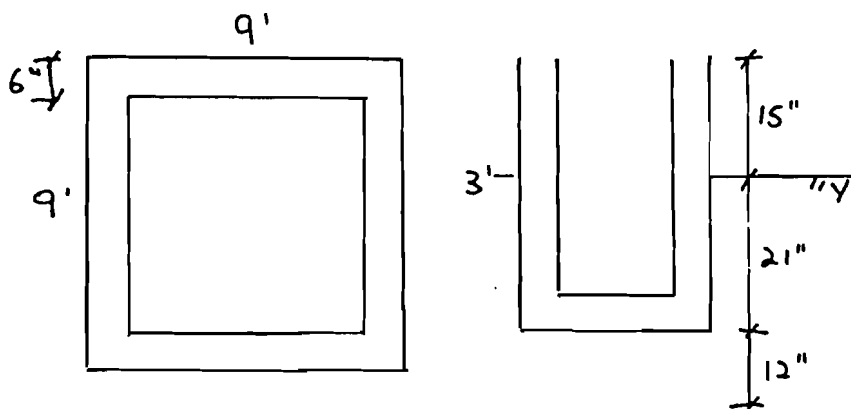
|                 |                       |
|-----------------|-----------------------|
| HMX - 560 ug/g  | 1,3,5-TNB - 13 ug/g   |
| ROX - 1526 ug/g | 2,4,6-TNT - 1743 ug/g |

Volume for 1' perimeter excavation =  $155 \text{ ft}^3 = 5.7 \text{ yd}^3$

Volume for 2' perimeter excavation =  $282 \text{ ft}^3 = 10.4 \text{ yd}^3$



Sump # 15



Volume of soil to be removed offset by 1ft from bottom of sump

An area of 10'x10'x33" is used for contaminated soil calculation.

Volume of contaminated soil:

$$10' \times 10' \times 2.75' - 9' \times 9' \times 1.75' = 133.3 \text{ ft}^3 \approx 4.9 \text{ yd}^3$$

Volume of concrete to be removed:

$$9' \times 9' \times 3' - 8' \times 8' \times 2.5' = 83 \text{ ft}^3 \approx \boxed{3.1 \text{ yd}^3}$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 15 (soil)

|                       |                      |                     |
|-----------------------|----------------------|---------------------|
| HMX - 79.2 ug/g       | RDX - 313 ug/g       | Cadmium - 10.6 ug/g |
| 2,4,6-TNT - 14.1 ug/g | 1,3,5-TNB - 1.4 ug/g | Chromium - 155 ug/g |
| Copper - 83.3 ug/g    | Lead - 618 ug/g      | Mercury - 3.9 ug/g  |

Assume sump to be filled with water

$$\therefore \text{Vol. of water in sump} = 8' \times 8' \times 2.5' = 160 \text{ ft}^3 \approx \boxed{1197 \text{ gals}}$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 15 (SI)

|                  |                        |                      |
|------------------|------------------------|----------------------|
| HMX - 168 ug/L   | 1,3,5-TNB - 1.03 ug/L  | Chromium - 13.3 ug/L |
| RDX - 285 ug/L   | 2,4,6-TNT - 0.635 ug/L | Copper - 111 ug/L    |
| Lead - 86.3 ug/L |                        |                      |

Volume for 1' perimeter excavation

$$11' \times 11' \times \frac{33}{12} - 9 \times 9 \times \frac{21}{12} = 191 \text{ ft}^3 = 7.1 \text{ yd}^3$$

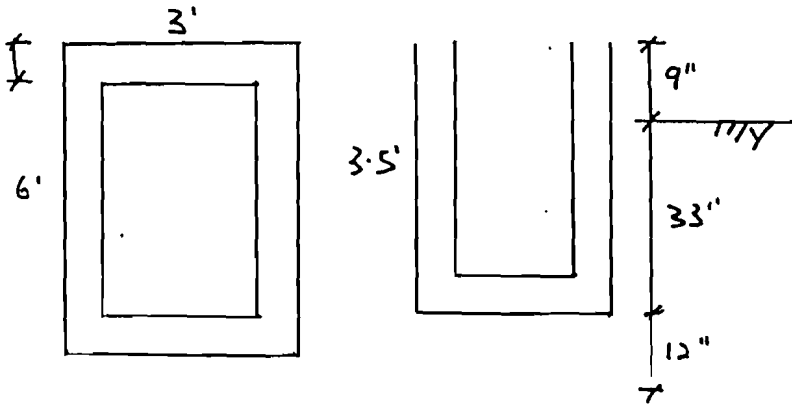
Volume for 2' perimeter excavation

$$13 \times 13 \times \frac{45}{12} - 9 \times 9 \times \frac{21}{12} = 492 \text{ ft}^3 = \boxed{18 \text{ yd}^3}$$



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Sump #16



Volume of soil to be removed offset by 1ft from bottom of sump

An area of 7'x4'x3.75' is used for contaminated soil calculation.

Volume of contaminated soil:

$$7' \times 4' \times 3.75' - 6' \times 3' \times 2.75' = 55.5 \text{ ft}^3 \approx \textcircled{2 \text{ yd}^3}$$

Volume of concrete to be removed:

$$6' \times 3' \times 3.5' - 5' \times 2' \times 3' = 33 \text{ ft}^3 \approx 2.3 \text{ yd}^3$$

conc. of contaminants above Evaluation Criteria at Sump 16 (soil)

RDX - 7.14 ug/g      Cadmium - 6.32 ug/g

2,4,6-TNT - 1.55 ug/g      Copper - 38.6 ug/g

Assume sump filled with water.

Volume of water in sump -  $6' \times 3' \times 3' = 54 \text{ ft}^3 = 404 \text{ gals}$

ve. conc. of contaminants above Evaluation Criteria at Sump 16 (SW)

RDX - 2370 ug/L      1,3,5-TNB - 7.14 ug/L      Copper - 244 ug/L

HMX - 542 ug/L      2,4,6-TNT - 4270 ug/L      Lead - 80.5 ug/L

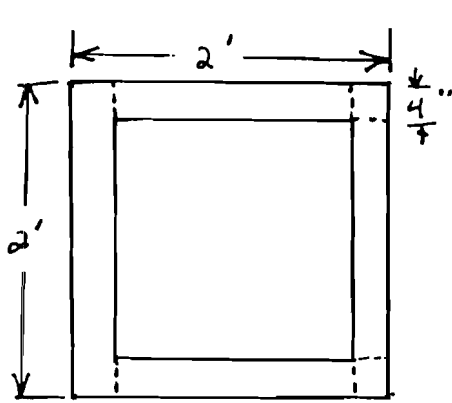
Volume for 1' perimeter excavation

$$5' \times 8' \times \frac{45''}{12} - 6' \times 3' \times \frac{33''}{12} = 100 \text{ ft}^3 = 3.7 \text{ yd}^3$$

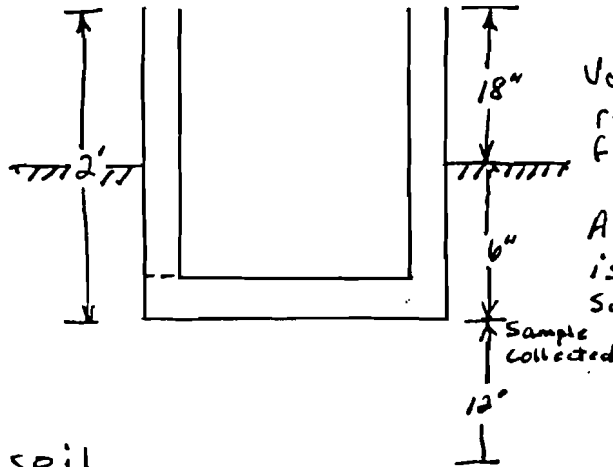
Volume for 2' perimeter excavation

$$7' \times 10' \times \frac{57''}{12} - 6' \times 3' \times \frac{33''}{12} = 283 \text{ ft}^3$$

$$10.5 \text{ yd}^3$$



SUMP 22



Volume of soil to be removed offset by 1ft from Sump Bottom.

A Volume of 3' x 3' x 12" is used for contaminated soil calculation.

Volume of contaminated soil

$$3' \times 3' \times 18'' - 2' \times 2' \times 6'' = 11.5 \text{ ft}^3 = \textcircled{0.42 \text{ yd}^3}$$

Volume of concrete to be removed

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3.$$

Ave. Conc. of contaminants above Evaluation Criteria at Sump 22

Cadmium 1.68 mg/g

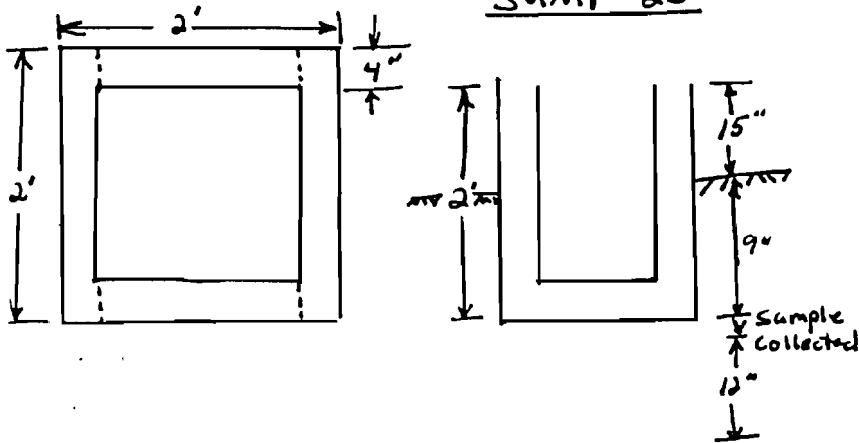
Lead 111 mg/g

Zinc 449 mg/g

Volume for 1' perimeter excavation = 22 ft<sup>3</sup> = 0.81 yd<sup>3</sup>

Volume for 2' perimeter excavation = 88 ft<sup>3</sup> = 3.3 yd<sup>3</sup>

SUMP 23



Volume of soil to be removed  
 offset by 1ft from Sump  
 Bottom.

A volume of 3 x 3 x 21" is  
 used for contaminated soil  
 calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{21}{12} - 2' \times 2' \times \frac{9}{12} = 12.75 \text{ ft}^3 \approx \textcircled{0.47 \text{ yd}^3}$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. Conc. of contaminants above Evaluation Criteria at sump 23

Cadmium 11.47  $\mu\text{g/g}$

Lead 277  $\mu\text{g/g}$

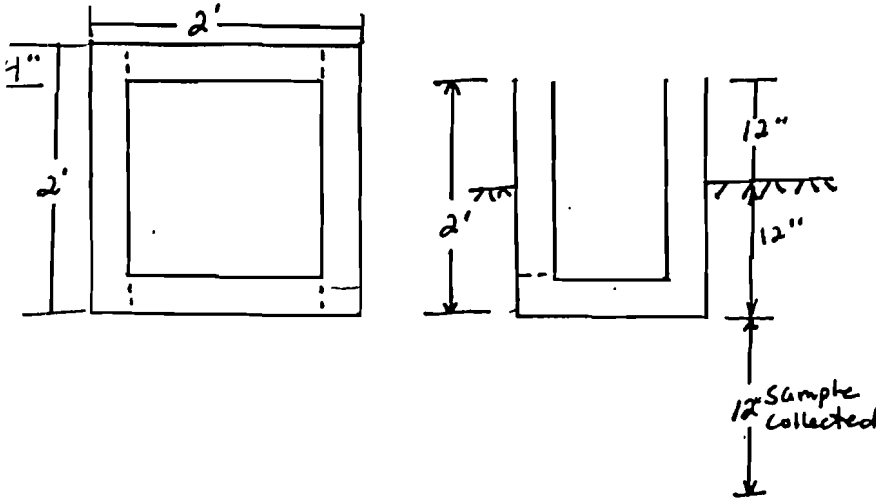
Zinc 721  $\mu\text{g/g}$

Volume for 1' perimeter excavation =  $25 \text{ ft}^3 = 0.93 \text{ yd}^3$

Volume for 2' perimeter excavation =  $96 \text{ ft}^3 = 3.6 \text{ yd}^3$



Sump 25



Volume of soil to be removed  
 offset by 1ft from Sump  
 Bottom.

A volume of  $3 \times 3 \times 24$  is  
 used for contaminated soil  
 calculation.

Volume of contaminated soil:

$$3 \times 3 \times \frac{24}{12} - 2 \times 2 \times \frac{12}{12} = 14 \text{ ft}^3 \approx \text{0.52 yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 25

Cadmium 2.1  $\mu\text{g/g}$

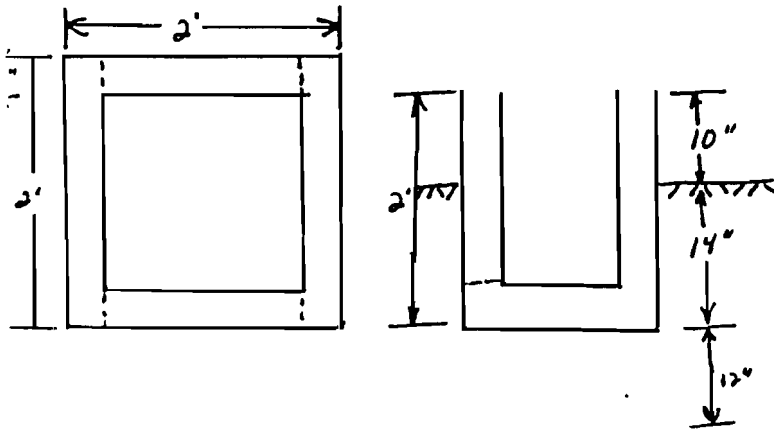
Lead 233  $\mu\text{g/g}$

Zinc 602  $\mu\text{g/g}$

Volume for 1' perimeter excavation =  $28 \text{ ft}^3 = 1 \text{ yd}^3$

Volume for 2' perimeter excavation =  $104 \text{ ft}^3 = 3.8 \text{ yd}^3$

Sump 27



Volume of soil to be removed offset by 1ft from sump bottom.

A volume of 3 x 3 x 26" is used for contaminated soil calculation

Volume of contaminated soil:

$$3' \times 3' \times \frac{26''}{12} - 2' \times 2' \times \frac{14''}{12} = 14.8 \text{ ft}^3 \approx \textcircled{0.55 \text{ yd}^3}$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

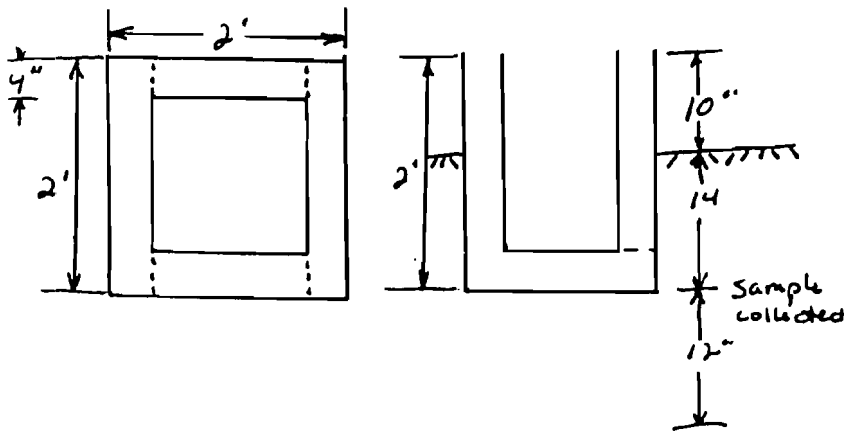
Ave. conc. of contaminants above Evaluation criteria at sump 27

|         |                      |
|---------|----------------------|
| Cadmium | 1.56 $\mu\text{g/g}$ |
| Lead    | 164 $\mu\text{g/g}$  |
| Zinc    | 314 $\mu\text{g/g}$  |

Volume for 1' perimeter excavation = 30 ft<sup>3</sup> = 1.1 yd<sup>3</sup>

Volume for 2' perimeter excavation = 110 ft<sup>3</sup> = 4.1 yd<sup>3</sup>

Sump 28



Volume of soil to be removed  
 offset by 1ft from Sump  
 Bottom.

A volume of 3 x 3 x 26 is  
 used for contaminated  
 soil calculation.

Volume of contaminated Soil:

$$3 \times 3 \times \frac{26}{12} - 2 \times 2 \times \frac{14}{12} = 14.8 \text{ ft}^3 \approx 0.55 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. Conc. of contaminants above Evaluation Criteria at sump 28

|         |           |
|---------|-----------|
| Cadmium | 2.93 mg/g |
| Copper  | 35.2 mg/g |
| Lead    | 753 mg/g  |
| Zinc    | 882 mg/g  |
| Arsenic | 92 mg/g   |

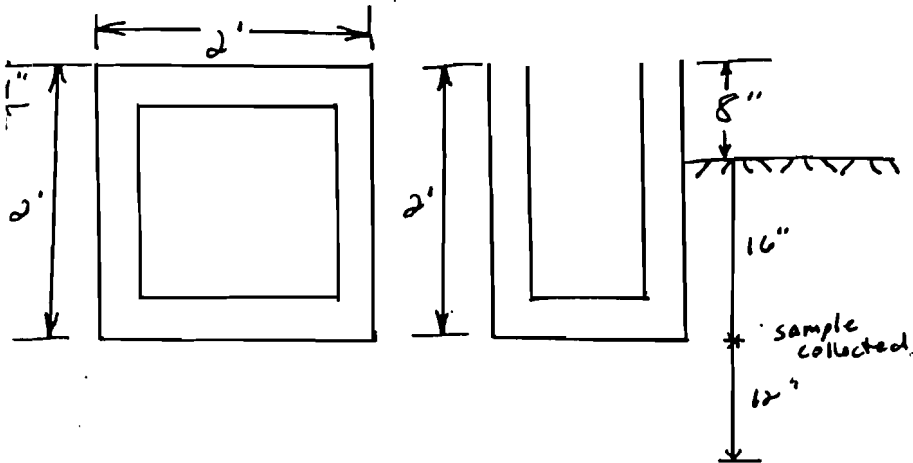
Volume for 1' perimeter excavation = 30 ft<sup>3</sup> = 1.1 yd<sup>3</sup>

Volume for 2' perimeter excavation = 110 ft<sup>3</sup> = 4.1 yd<sup>3</sup>





Sump 29



Volume of soil to be removed  
 offset by 1ft from Sump  
 Bottom.

A volume of 3'x3' x 28" is  
 used for contaminated soil  
 calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{28''}{12} - 2' \times 2' \times \frac{16''}{12} = 15.7 \text{ ft}^3 \approx 0.58 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 29

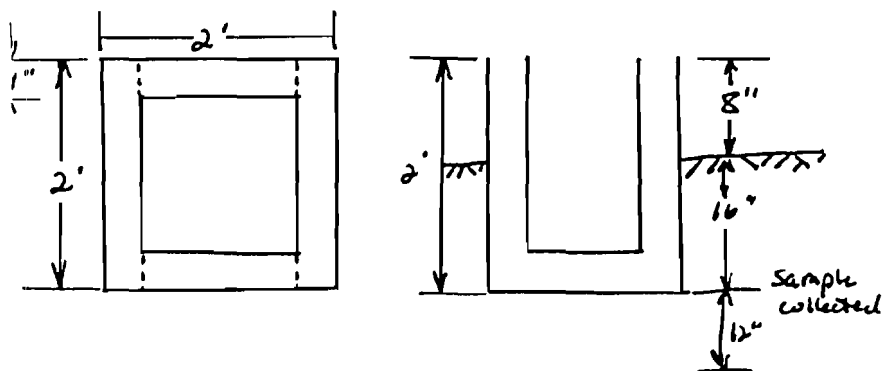
|           |           |
|-----------|-----------|
| 2,4,6-TNT | 1.97 mg/g |
| Cadmium   | 2.31 mg/g |
| Lead      | 171 mg/g  |
| Zinc      | 746 mg/g  |

Volume for 1' perimeter excavation = 32 ft<sup>3</sup> = 1.2 yd<sup>3</sup>

Volume for 2' perimeter excavation = 115 ft<sup>3</sup> = 4.3 yd<sup>3</sup>



Sump 30



Volume of soil to be removed  
offset by 1 ft from Sump  
Bottom.

A volume of  $3' \times 3' \times 28''$   
used for contaminated soil  
calculation

Volume of contaminated Soil:

$$3' \times 3' \times \frac{28''}{12} - 2' \times 2' \times \frac{16''}{12} = 15.7 \text{ Ft}^3 \approx 0.58 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67 = 0.19 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at sump 30

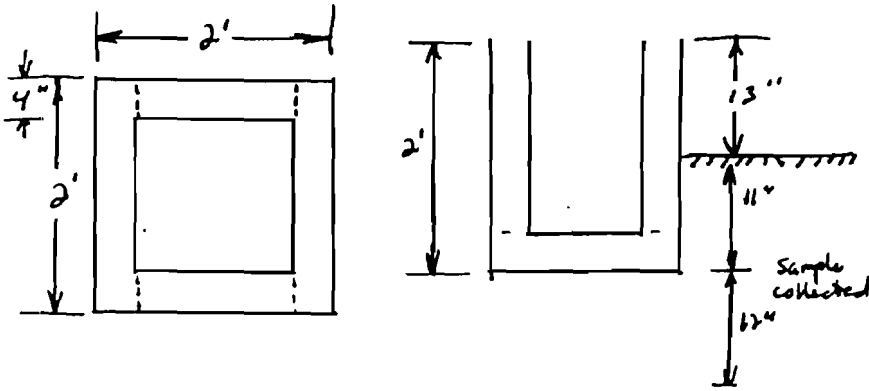
|          |           |
|----------|-----------|
| Antimony | 8.97 mg/g |
| Cadmium  | 1.56 mg/g |
| Lead     | 137 mg/g  |
| Zinc     | 305 mg/g  |

Volume for 1' perimeter excavation =  $32 \text{ ft}^3 = 1.2 \text{ yd}^3$

Volume for 2' perimeter excavation =  $115 \text{ ft}^3 = 4.3 \text{ yd}^3$



Sump 31



Volume of soil to be removed  
 offset by 1ft from Sump  
 Bottom

A volume of  $3' \times 3' \times 23''$  is  
 used for contaminated soil  
 calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{23''}{12} - 2' \times 2' \times \frac{11''}{12} = 13.6 \text{ ft}^3 \approx \textcircled{0.5 \text{ yd}^3}$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at sump 31

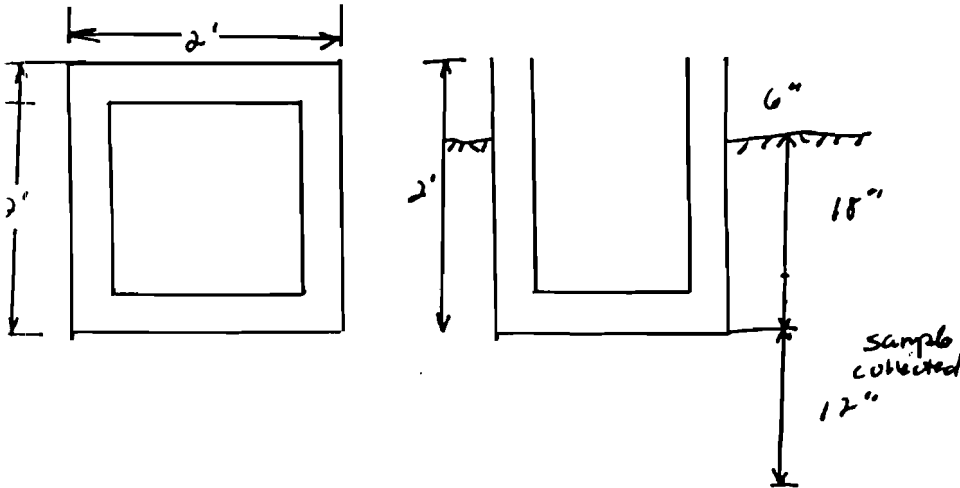
RDX  $1.59 \mu\text{g/g}$

Volume for 1' perimeter excavation =  $27 \text{ ft}^3 = 1 \text{ yd}^3$

Volume for 2' perimeter excavation =  $102 \text{ ft}^3 = 3.8 \text{ yd}^3$



Sump 32



Volume of soil to be removed offset by 1ft from Sump Bottom.

A volume of 3' x 3' x 30" is used for contaminated soil calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{30''}{12} - 2' \times 2' \times \frac{18''}{12} = 16.5 \text{ Ft}^3 \approx 0.61 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

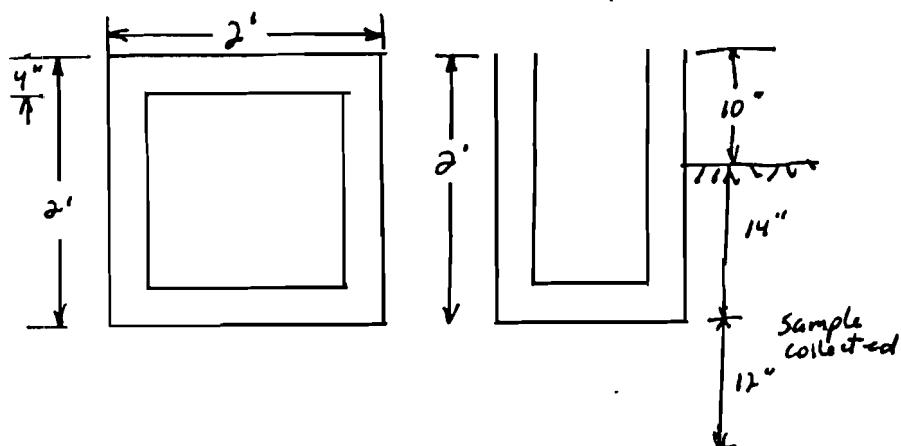
Ave. conc. of contaminants above Evaluation Criteria at sump 32

|          |           |         |          |
|----------|-----------|---------|----------|
| Antimony | 56.8 mg/l | Mercury | 727 mg/l |
| Cadmium  | 1.38 mg/l | Zinc    | 373 mg/l |
| Chromium | 72.7 mg/l |         |          |
| Copper   | 526 mg/l  |         |          |
| Lead     | 749 mg/l  |         |          |

Volume for 1' perimeter excavation:  $346 \text{ ft}^3 = 1.3 \text{ yd}^3$

Volume for 2' perimeter excavation:  $121 \text{ ft}^3 = 4.5 \text{ yd}^3$

## Sump 34



Volume of Soil to be removed  
offset by 1ft from sump  
Bottom

A volume of 3' x 3' x 26" is  
used for contaminated soil  
calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{26''}{12} - 2' \times 2' \times \frac{14''}{12} = 14.8 \text{ FT}^3 \approx 0.55 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at Sump 34

2,4,6-TNT 4.13  $\mu\text{g/g}$

Lead 75.8  $\mu\text{g/g}$

Silver 1.02  $\mu\text{g/g}$

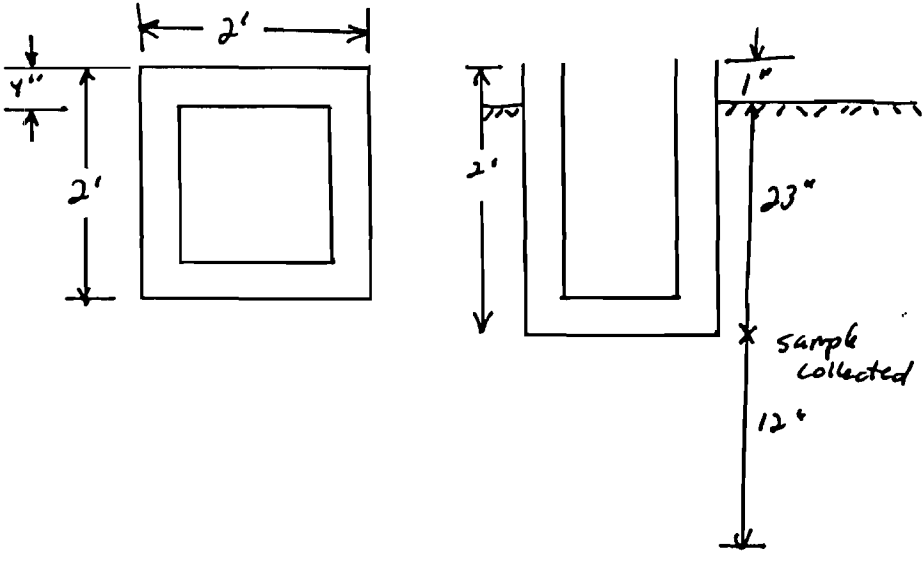
Zinc 465  $\mu\text{g/g}$

Volume for 1' perimeter excavation = 30  $\text{ft}^3 = 1.1 \text{ yd}^3$

Volume for 2' perimeter excavation = 110  $\text{ft}^3 = 4.1 \text{ yd}^3$



Sump 35



Volume of soil to be removed offset by 1 ft from Sump Bottom.

A volume of 3' x 3' x 35" is used for contaminated soil calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{35''}{12} - 2' \times 2' \times \frac{23''}{12} = 18.6 \text{ Ft}^3 \approx 0.69 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. conc. of contaminants above Evaluation Criteria at Sump.

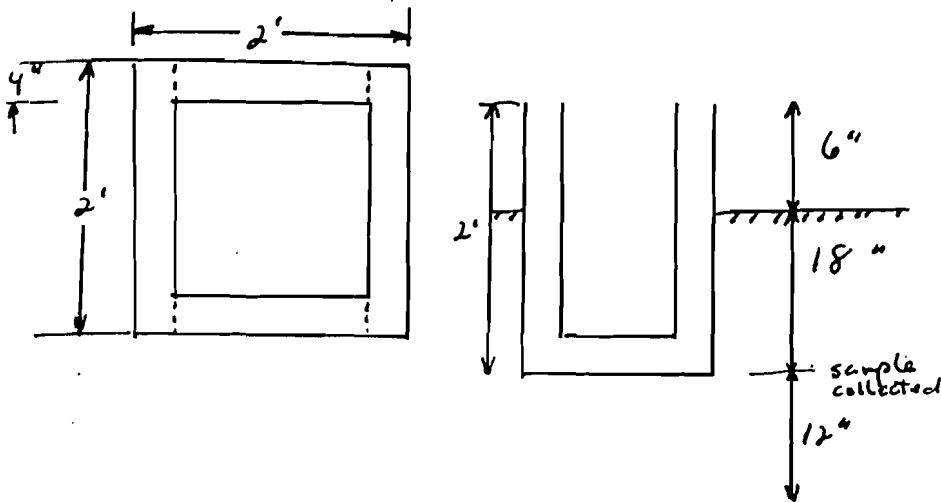
|          |                      |
|----------|----------------------|
| Antimony | 11.2 $\mu\text{g/g}$ |
| Copper   | 422 $\mu\text{g/g}$  |
| Lead     | 167 $\mu\text{g/g}$  |
| Silver   | 1.34 $\mu\text{g/g}$ |

Volume for 1' perimeter excavation =  $39 \text{ ft}^3 = 1.4 \text{ yd}^3$

Volume for 2' perimeter excavation =  $134 \text{ ft}^3 = 5 \text{ yd}^3$



Sump 36



Volume of soil to be removed offset by 1ft from sump bottom.

A volume of 3' x 3' x 30" is used for contaminated soil calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{30''}{12} - 2' \times 2' \times \frac{18''}{12} = 16.5 \text{ Ft}^3 \approx 0.61 \text{ yd}^3$$

Volume of concrete to be removed:

$$2' \times 2' \times 2' - 1.33' \times 1.35' \times 1.67' = 0.19 \text{ yd}^3$$

Ave. Conc. of Contaminants above Evaluation Criteria at sump 36

|         |                       |
|---------|-----------------------|
| Cadmium | 1.79 $\mu\text{g/l}$  |
| Lead    | 122 $\mu\text{g/l}$   |
| RDX     | 0.866 $\mu\text{g/l}$ |
| Silver  | 1.11 $\mu\text{g/l}$  |
| Zinc    | 472 $\mu\text{g/l}$   |

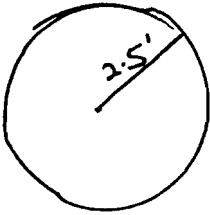
Volume for 1' perimeter excavation =  $34 \text{ Ft}^3 = 1.3 \text{ yd}^3$

Volume for 2' perimeter excavation =  $121 \text{ Ft}^3 = 4.5 \text{ yd}^3$



Sump 37

Stainless Steel Tank  
 5 Dia x 5 ft Deep.



Volume of soil to be removed offset by  
 1 ft from sump bottom.

A volume of 6 dia x 6 ft deep is used for  
 contaminated soil calculation.

Volume of contaminated soil

$$\pi 3^2 \times 6 - \pi 2.5^2 \times 5 = 71.5 \text{ ft}^3 \approx 2.65 \text{ yd}^3$$

Volume of steel to be removed.

Assume tank is 1/2" thick.

$$\pi 2.5^2 \times 5 - \pi \left( \frac{29}{12} \right)^2 \times 4'11.5" = 7.2 \text{ ft}^3 = 0.27 \text{ yd}^3$$

No sampling analysis is available.

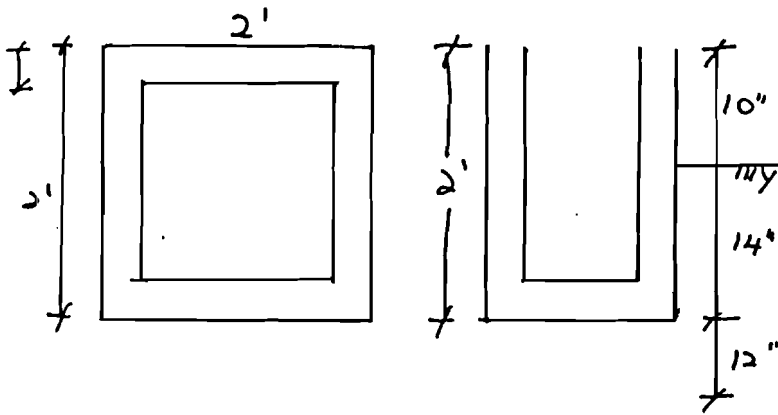
$$\text{Volume for 1' perimeter excavation} = 133 \text{ ft}^3 = 4.9 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 347 \text{ ft}^3 = 12.9 \text{ yd}^3$$





Sump 38



Volume of soil to be removed offset by 1ft from sump bottom. Assume sump is 10' above grade.

A volume of 3'x3'x26" is used for contaminated soil calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{26}{12} - 2' \times 2' \times \frac{14}{12} = 14.8 \text{ ft}^3 \approx \textcircled{0.55 \text{ yd}^3}$$

Volume of concrete to be removed

$$2' \times 2' \times 2' = 7.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3.$$

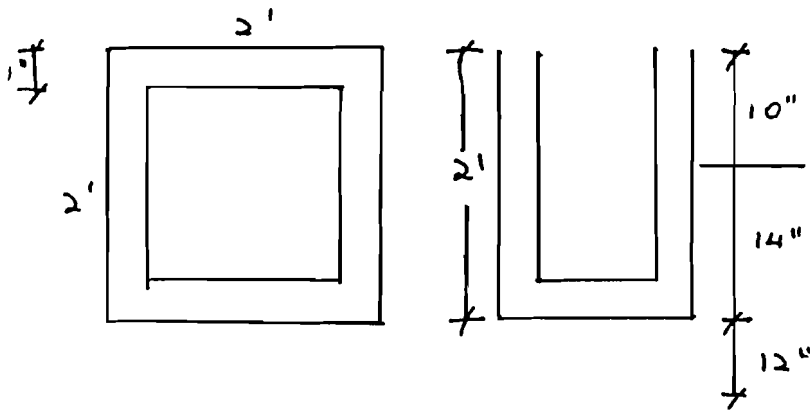
No sampling analysis is available

$$\text{Volume for 1' perimeter excavation} = 30 \text{ ft}^3 = 1.1 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 110 \text{ ft}^3 = 4.1 \text{ yd}^3$$



Sump 39



Volume of soil to be removed offset by 1 ft from sump bottom. Assume sump is 10" above grade.

A volume of 3' x 3' x 26" is used for contaminated soil calculation

Volume of contaminated soil:

$$3' \times 3' \times \frac{26}{12}' - 2' \times 2' \times \frac{14}{12}' = 14.8 \text{ ft}^3 \approx \textcircled{0.55 \text{ yd}^3}$$

Volume of concrete to be removed

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

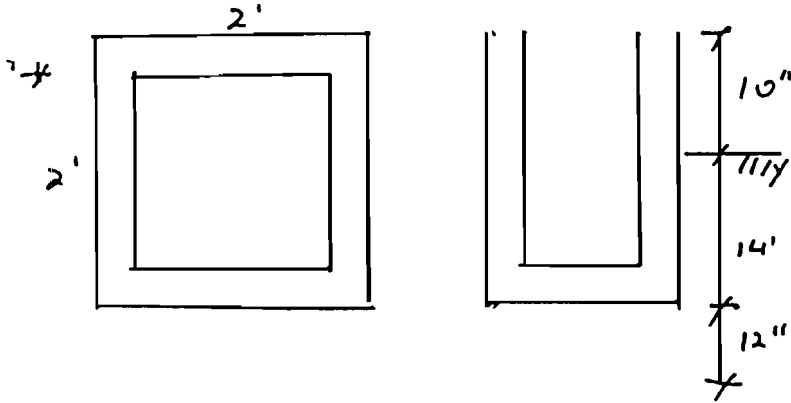
No sampling analysis is available

$$\text{Volume for 1' perimeter excavation} = 30 \text{ ft}^3 = 1.1 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 110 \text{ ft}^3 = 4.1 \text{ yd}^3$$



Sump 40



Volume of soil to be removed offset by 1 ft from sump bottom.

A volume of 3' x 3' x 26" is used for contaminated soil calculation.

Volume of contaminated soil:

$$3' \times 3' \times \frac{26}{12} - 2' \times 2' \times \frac{14}{12} = 14.8 \text{ ft}^3 = \textcircled{0.55 \text{ yd}^3}$$

Volume of concrete to be removed

$$2' \times 2' \times 2' - 1.33' \times 1.33' \times 1.67' = 0.19 \text{ yd}^3$$

Av. conc. of contaminants at Sump 40.

Lead - 75.8      2,4,6-TNT - 4.13

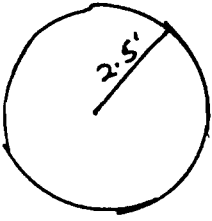
Silver - 1.02      Zinc - 465

Volume for 1' perimeter excavation = 30 ft<sup>3</sup> = 1.1 yd<sup>3</sup>

Volume for 2' perimeter excavation = 110 ft<sup>3</sup> = 4.1 yd<sup>3</sup>



Sump 41



Stainless Steel Tank  
 5 Dia x 5ft Deep

Volume of soil to be removed offset by 1 ft  
 from sump bottom.

A volume of 6' dia x 6 ft deep is used for  
 contaminated soil calculation.

Volume of contaminated soil

$$\pi 3^2 \times 6 - \pi 2.5^2 \times 5 = 71.5 \text{ ft}^3 = 2.65 \text{ yd}^3$$

Volume of steel to be removed

Assume tank is 1/2" thick.

$$\pi 2.5^2 \times 5' - \pi \left(\frac{29''}{12}\right)^2 \times 4' 11.5'' = 7.2 \text{ ft}^3 = 0.27 \text{ yd}^3$$

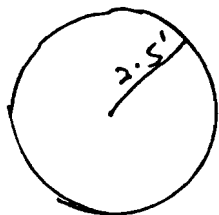
No sampling analysis is available.

$$\text{Volume for 1' perimeter excavation} = 133 \text{ ft}^3 = 4.9 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 347 \text{ ft}^3 = 12.9 \text{ yd}^3$$



Sump 42



Stainless steel Tank  
 5' dia x 5ft deep

Volume of soil to be removed offset by 1ft  
 from sump bottom.

A volume of 6' dia x 6ft deep is used for  
 contaminated soil calculation.

Volume of contaminated soil

$$\pi 3^2 \times 6 - \pi 2.5^2 \times 5 = 71.5 \text{ ft}^3 = 2.65 \text{ yd}^3$$

Volume of steel to be removed

Assume tank is 1/2" thick

$$\pi 2.5^2 \times 5' - \pi \left(\frac{29''}{12}\right)^2 \times 4' 11.5'' = 7.2 \text{ ft}^3 = 0.27 \text{ yd}^3$$

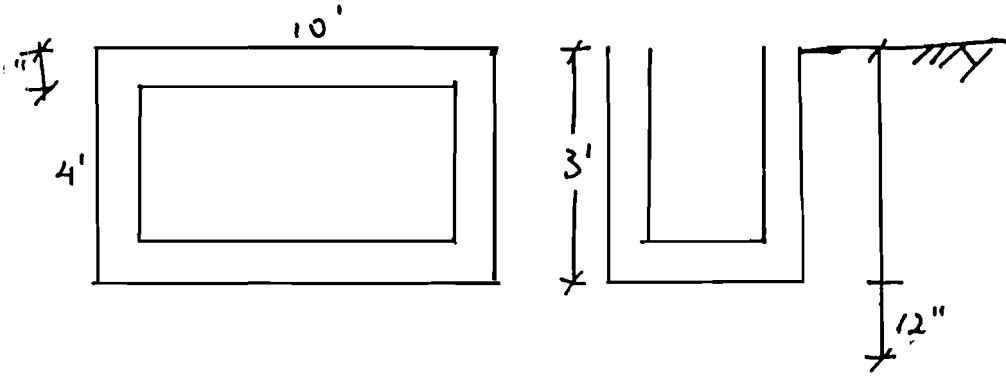
No sampling analysis is available.

$$\text{Volume for 1' perimeter excavation} = 133 \text{ ft}^3 = 4.9 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 347 \text{ ft}^3 = 12.9 \text{ yd}^3$$



Sump 43



Volume of soil to be removed offset by 1 ft from bottom of sump  
 A volume of 5'x11'x4' is used for contaminate soil calculation.

Volume of contaminated soil: (Assume sump is bgs)

$$5' \times 11' \times 4' - 4' \times 10' \times 3' = 100 \text{ ft}^3 = \textcircled{3.7 \text{ yd}^3}$$

Volume of steel to be removed.

$$4' \times 10' \times 3' - 3'10'' \times 9'10'' \times 2'11'' = 0.37 \text{ yd}^3$$

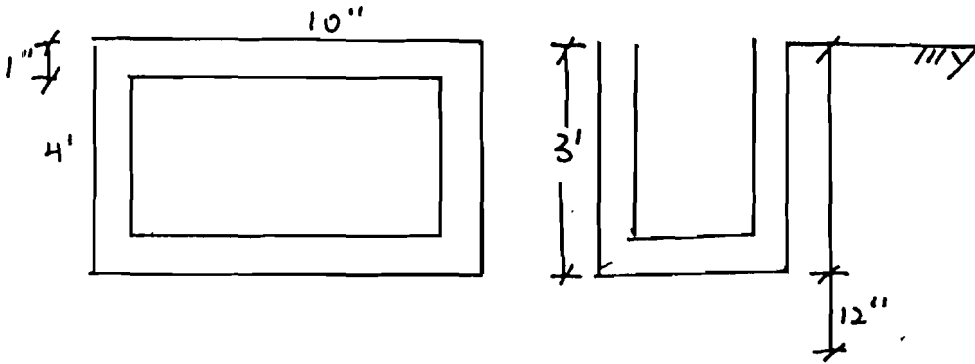
No sampling analysis available.

$$\text{Volume for 1' perimeter excavation} = 168 \text{ ft}^3 = 6.2 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 440 \text{ ft}^3 = 16.3 \text{ yd}^3$$



Sump 44



Volume of soil to be removed offset by 1ft from bottom of sump.

A volume of 5' x 11' x 4' is used for contaminated soil calculation.

Volume of contaminated soil: (Assume sump is 6'5').

$$5' \times 11' \times 4' - 4' \times 10' \times 3' = 100 \text{ ft}^3 = \textcircled{3.7 \text{ yd}^3}$$

Volume of steel to be removed (Assume sump is 1" thick)

$$4' \times 10' \times 3' - 3'10" \times 9'10" \times 2'11" = 0.37 \text{ yd}^3$$

No sampling analysis is available.

$$\text{Volume for 1' perimeter excavation} = 168 \text{ ft}^3 = 6.2 \text{ yd}^3$$

$$\text{Volume for 2' perimeter excavation} = 440 \text{ ft}^3 = 16.3 \text{ yd}^3$$

**APPENDIX C**

**Complete List of ARARs for IAAP**



**TABLE 2-2  
Potential Chemical-Specific ARARs**

| <i>Standard, Requirement, Criterion, or Limitation</i>                      | <i>Citation</i>                                                                           | <i>Description</i>                                                                                                                                                                                                                                                                                                                                                                                                                                              | <i>Comment</i>                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FEDERAL</b>                                                              |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                            |
| <b>Safe Drinking Water Act</b><br>National Primary Drinking Water Standards | 40 USC Section 300<br>40 CFR Part 141                                                     | Established maximum contaminant levels (MCLs) which are health-based standards for public water systems.                                                                                                                                                                                                                                                                                                                                                        | The MCLs for organic and inorganic contaminants are relevant and appropriate to the groundwater contaminants, including MCLs for volatile organics and metals.                                                                             |
| National Secondary Drinking Water Standards                                 | 40 CFR Part 143                                                                           | Establishes secondary maximum contaminant levels (SMCLs) which are nonenforceable guidelines for public water systems to ensure the aesthetic quality of the water.                                                                                                                                                                                                                                                                                             | SMCLs may be relevant and appropriate if treated groundwater is used as a source of water.                                                                                                                                                 |
| Maximum Contaminant Level Goals (MCLGs)                                     | PL No. 99-339 100 Statute 642 (1986)                                                      | Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects with an adequate margin of safety.                                                                                                                                                                                                                                                                                                                     | MCLGs for organic and inorganic contaminants may be relevant and appropriate if a more stringent standard is required to protect human health or the environment.                                                                          |
| <b>Clean Water Act</b><br>Ambient Water Quality Criteria                    | 33 USC Section 1251-1376<br>40 CFR Part 131, Quality Criteria for Water, 1976, 1980, 1986 | Requires the states to set ambient water quality criteria (AWQC) for water quality based on use classifications and the criteria developed under Section 304(a) of the Clean Water Act.                                                                                                                                                                                                                                                                         | AWQC for some of the organic and inorganic contaminants in the groundwater at the site have been developed. May be relevant and appropriate if contaminated or treated groundwater is discharged to surface water during a removal action. |
| <b>STATE</b>                                                                |                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                            |
| Iowa Air Pollution Control Regulations                                      | Chapter 567-28                                                                            | Ambient Air Quality Standards (Adopts 40 CFR 40).                                                                                                                                                                                                                                                                                                                                                                                                               | See national Primary and Secondary Ambient Air Quality Standards.                                                                                                                                                                          |
| Iowa Air Pollution Control Regulations (Continued)                          | Chapter 567-30                                                                            | This chapter is not yet promulgated, but it will govern emissions from an onsite treatment process. Development of a permit will be on a case-by-case basis under the general authority of the IDNR to protect human health and the environment.                                                                                                                                                                                                                | None                                                                                                                                                                                                                                       |
| Iowa Water Pollution Control Regulation                                     | Chapter 576-60 to 64                                                                      | Chapter 60 provides general definitions applicable in this title and rules of practice. Chapter 61 contains the water quality standards of the State including classification of surface waters. Chapter 62 contains the standards relevant to the discharge of pollutants to the water of the state. Chapters 63 and 64 identify monitoring, analytical and reporting requirements pertaining to specific permits for the operation of water disposal systems. | None                                                                                                                                                                                                                                       |
| Iowa Responsible Parties Cleanup Regulations                                | Title X, Chapter 133                                                                      | These rules establish the procedures and criteria the IDNR will use to determine the parties responsible and cleanup actions necessary to meet the goals of the State pertaining to the protection of groundwater. These rules pertain to the cleanup of groundwater, soils, and surface water where groundwater may be impacted.                                                                                                                               | None                                                                                                                                                                                                                                       |

**TABLE 2-3  
Potential Action-Specific ARARs**

| <i>Standard, Requirement, Criterion, or Limitation</i>                                                           | <i>Citation</i>                           | <i>Description</i>                                                                                                                                                                                                                                                                           | <i>Comment</i>                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FEDERAL</b>                                                                                                   |                                           |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                    |
| <b>Solid Waste Disposal Act (SWDA)</b>                                                                           | 42 USC Section 6901-6987                  |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                    |
| Criteria for Classification of Solid Waste Disposal Facilities and Practices                                     | 40 CFR Part 257                           | Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health and thereby constitute prohibited open dumps.                                                                                     | If an alternative developed would involve the land disposal of solid waste, this part would be applicable.                                                                                                                                                                                         |
| Hazardous Waste Management Systems General                                                                       | 40 CFR Part 260                           | Establishes procedures and criteria for modification or revocation of any provision in 40 CFR Parts 260-265.                                                                                                                                                                                 | May be applicable if a substance at the site was to be excluded from the list of hazardous wastes.                                                                                                                                                                                                 |
| Identification and Listing of Hazardous Wastes                                                                   | 40 CFR Part 261                           | Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 263-265 and Parts 124, 270, and 271.                                                                                                                                                       | Identifies those wastes considered to be hazardous wastes at the site. Any wastes considered as hazardous would be required to be handled as such.                                                                                                                                                 |
| Standards Applicable to Transporters of Hazardous Waste                                                          | 40 CFR Part 263                           | Establishes standards which apply to persons transporting hazardous waste within the U. S. If the transportation requires a manifest under 40 CFR Part 262.                                                                                                                                  | If an alternative developed would involve offsite transportation of hazardous wastes, these standards would be applicable.                                                                                                                                                                         |
| Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities                | 40 CFR Part 264                           | Establishes minimum national standards which define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose hazardous waste.                                                                                                      | Subparts B through X may be applicable or relevant and appropriate to onsite and offsite remedial actions.                                                                                                                                                                                         |
| Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities | 40 CFR Part 265                           | Establishes minimum national standards which define the acceptable management of hazardous waste during the period of interim status and until certification of final closure or if the facility is subject to post-closure requirements, until post-closure responsibilities are fulfilled. | Remedies should be consistent with the more stringent Part 264 standards since these represent the ultimate RCRA compliance standards and are consistent with CERCLA's goal of long-term protection of public health and welfare and the environment.                                              |
| Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities                       | 40 CFR Part 267                           | Establishes minimum national standards which define the acceptable management of hazardous waste for new land disposal facilities.                                                                                                                                                           | Remedies should be consistent with the more stringent Part 264 standards since these represent the ultimate RCRA compliance standards and are consistent with CERCLA's goal of long-term protection of public health and welfare and the environment.                                              |
| Land Disposal Restrictions                                                                                       | 40 CFR Part 268                           | Establishes a timetable for restriction of land disposal of wastes and other hazardous materials.                                                                                                                                                                                            | If an alternative involves land disposal of any restricted waste, this part may be applicable.                                                                                                                                                                                                     |
| Hazardous Waste Permit Program                                                                                   | 40 CFR Part 270                           | Establishes provisions covering basic EPA permitting requirements.                                                                                                                                                                                                                           | A permit is not required for onsite CERCLA response actions; however, a permit is required for offsite actions. Substantive requirements are addressed in 40 CFR Part 264. Under 40 CFR Section 300.38, requirements of the Act apply to all response activities under the NCP.                    |
| <b>Clean Water Act</b>                                                                                           | 33 USC Section 1251-1378                  |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                    |
| National Pollutant Discharge Elimination System Permit Regulations                                               | 40 CFR Parts 122, 125                     | Requires permits for the discharge of pollutants from any point source into water of the United States.                                                                                                                                                                                      | A permit is not required for onsite CERCLA response actions, but the substantive requirements would apply if an alternative developed would discharge into a creek or other surface water on the site. A permit would be required if the discharge is to a creek or surface water located offsite. |
| National Pretreatment Standards                                                                                  | 40 CFR Part 403                           | Sets standards to control pollutants which pass through or interfere with treatment processes in publicly-owned treatment works or which may contaminate sewage sludge.                                                                                                                      | If an alternative developed involves discharge to publicly-owned treatment works, these standards would be applicable.                                                                                                                                                                             |
| <b>Occupational Safety and Health Act (OSHA)</b>                                                                 | 20 USC Section 651-678<br>29 CFR 1910.120 | Regulates worker health and safety.                                                                                                                                                                                                                                                          | None.                                                                                                                                                                                                                                                                                              |
| <b>Clear Air Act</b>                                                                                             | 42 USC Section 7401-7642                  |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                    |
| National Ambient Air Quality Standards                                                                           | 40 CFR Part 50                            | Treatment technology standards for emissions to air; incinerators, surface impoundments, waste piles, landfills, fugitive emissions.                                                                                                                                                         | If an alternative developed would involve emissions governed by these standards, then the requirements are applicable.                                                                                                                                                                             |
| <b>Toxic Substance Control Act</b>                                                                               | 15 USC 2601<br>40 CFR Part 781            | Establishes management standards for PCB disposal.                                                                                                                                                                                                                                           | May be applicable for offsite treatment.                                                                                                                                                                                                                                                           |

**TABLE 2-3 (Continued)  
Potential Action-Specific ARARs**

| <i>Standard, Requirement, Citation, or Limitation</i>        | <i>Citation</i>                      | <i>Description</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <i>Comment</i>                                                              |
|--------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>STATE</b>                                                 |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                             |
| Iowa Environmental Quality Act                               | Chapter 455B                         | Defines the jurisdiction of the IDNR, defines powers and duties of the commission and the director, civil, or criminal proceedings to be undertaken by the State Attorney General.                                                                                                                                                                                                                                                                                                                                | None.                                                                       |
| Iowa Hazardous Substances and Waste Regulations              | Chapters 131, 140, 141, 149          | Chapter 131 requires reporting of hazardous conditions. Chapter 140 provides general definitions applicable in this title. Chapter 141 contains specific regulations identifying and listing hazardous wastes, the standards applicable to generators and transporters of hazardous wastes and standards applicable to treatment, storage, and disposal facilities. Chapter 149 contains the procedures for the assessment and collection of fees for transportation, treatment, and disposal of hazardous waste. | Considered in an alternative involving offsite transportation and disposal. |
| Iowa Solid Waste Disposal Regulations                        | Chapters 567-100, 101, 102, 103, 110 | Establishes standards for sanitary disposal projects and by regulating the dumping of solid waste through a system of general rules and specific permits. Deals with excavation of closed landfills or dumps, operation, cover, and monitoring of landfills.                                                                                                                                                                                                                                                      | Considered in an alternative involving onsite landfill disposal.            |
| Iowa Hazardous Waste Disposal Penalty Law                    | Chapter 716B                         | Establishes penalties for unlawful transportation and disposal of hazardous waste.                                                                                                                                                                                                                                                                                                                                                                                                                                | Offsite disposal.                                                           |
| Iowa Air Pollution Control Regulation                        | Chapter 567-23                       | Governs the release of fugitive dust in quantities creating a nuisance during site activities and emissions from a treatment system.                                                                                                                                                                                                                                                                                                                                                                              | Considered for excavation activities.                                       |
|                                                              | Chapter 567-24                       | Applies to emissions from a permit emission point. Could be applied to excess emissions of fugitive dust.                                                                                                                                                                                                                                                                                                                                                                                                         | None.                                                                       |
|                                                              | Chapter 567-25                       | State could require measurement of emissions from an air stripper.                                                                                                                                                                                                                                                                                                                                                                                                                                                | None.                                                                       |
|                                                              | Chapter 567-28                       | Ambient Air Quality Standards (Adopts 40 CFR 50).                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | None.                                                                       |
| Iowa Water Pollution Control Regulations                     | Chapter 567-37                       | Registration of water well contractors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Considered if wells installed for future monitoring.                        |
|                                                              | Chapter 567-38                       | Private water well construction permits.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                             |
|                                                              | Chapter 567-39                       | Well abandonment requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                             |
|                                                              | Chapter 567-40                       | Water supply definitions. Defines MCLs that Chapter 133 refers to.                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                             |
|                                                              | Chapter 567-49                       | These rules refer to nonpublic water wells, contains well construction standards, materials standards and abandonment guidelines.                                                                                                                                                                                                                                                                                                                                                                                 |                                                                             |
| Iowa Responsible Parties Cleanup Regulations                 | Chapter 133                          | These rules establish the procedures and criteria the IDNR will use to determine the parties responsible and cleanup actions necessary to meet the goals of the State pertaining to the protection of groundwater. These rules pertain to the cleanup of groundwater itself and soils and surface water where groundwater may be impacted.                                                                                                                                                                        | None.                                                                       |
| Iowa Hazardous Waste Facilities Siting and Land Disposal Act | 455B.441 to 455B.470, Iowa Code      | Provides procedures for establishing appropriate sites and properly designed facilities for the treatment, storage, and disposal of hazardous waste and to limit land disposal of hazardous waste.                                                                                                                                                                                                                                                                                                                | Considered for onsite treatment or disposal.                                |

**TABLE 2-4  
Potential Location-Specific ARARs**

| <i>Standard, Requirement, Criteria, or Limitation</i> | <i>Citation</i>                        | <i>Description</i>                                                                                                                                                                                                                                                            | <i>Comment</i>                                |
|-------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <b>FEDERAL</b>                                        |                                        |                                                                                                                                                                                                                                                                               |                                               |
| Clean Water Act                                       | 40 CFR 230 Section 404                 | Establishes a permit program administered by the U. S. Army Corps of Engineers to regulate the nonpoint source discharges of dredged or fill material into waters of the U. S.                                                                                                | Potentially applicable in watersheds at IAAP. |
| RCRA                                                  | 40 CFR 270.14(b)(11) (iii) and (iv)    | Establishes building criteria for TSD facilities located in floodplain.                                                                                                                                                                                                       | Potentially applicable in watersheds at IAAP. |
| Fish and Wildlife                                     | 40 CFR 6.302(a)                        | Requires federally-funded projects ensure that any modification of any stream or other water body affected be provided adequate protection of fish and wildlife resources.                                                                                                    | Potentially applicable in watersheds at IAAP. |
| Floodplain Management Order                           | 40 CFR Part 6                          | Mandates that federally-funded projects within 10-year floodplain avoid adverse impacts associated with development of a floodplain.                                                                                                                                          | Potentially applicable in watersheds at IAAP. |
| Endangered Species Act                                | 50 CFR 402                             | Requires that any federal activity may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.                                                                                                      | Potentially applicable in watersheds at IAAP. |
| <b>STATE</b>                                          |                                        |                                                                                                                                                                                                                                                                               |                                               |
| Clean Water Act                                       | Section 401                            | State Section 401 water quality certification is mandatory for all projects requiring Federal Section 404 permit. Section 401 certification is State's concurrence that a project is consistent with state's water quality standards. Also establishes criteria for wetlands. | Potentially applicable in watersheds at IAAP. |
| Floodplain Development                                | Iowa Code Section 455B, Chapters 70-76 | The State has authority to regulate construction on all floodplains and floodways in the State. Chapters 70-76 explain how and when a permit must be obtained for various types of development.                                                                               | Potentially applicable in watersheds at IAAP. |

**APPENDIX D**

**Cost Calculations and Record of Communications**



### Sump Remedial costs

tasks:

1. Remove concrete.
2. Excavate contaminated soil.
3. Decontaminate concrete.
4. Transport soil to TSD Facility, Incinerate and Disposal.
5. Backfill sumps.

. Remove concrete

Assume that the 2'x2'x2' sumps will have to be removed by hand due to space restraints. The remaining sumps should be accessible by machine.

Removal of concrete by hand (Ref means crew A-2) (016-420-0990, 1000)  
 Assume 2 sumps per day for removal, 17, 2'x2'x2' sumps.

Crew A-2 2 laborers, 1 truck driver, 1 truck: \$37.28/hr  
 Jack hammer rental per week: \$45.00  
 Air equipment rental per week: \$160.00

rental for 2 weeks: \$410.00  
 Crew 68hrs @ \$37.28: \$2535.00

Removal of concrete by machine

Assume 4 sumps per day for removal, 19 sumps,  
 (Ref Means crew B-3)

Laborers and operator: \$64.35/hr  
 Equipment:

mob costs: Track mounted backhoe: 1 @ \$239.00

Rental costs: Track mounted backhoe: \$1175/week

Concrete removal: 40 hours ≈ 1 week

Labor:  $64.35 \times 40 = \$2600.00$   
 Equipment:  $= \$1415.00$

Subtotal concrete removal = \$6960.00  
 add 40% for haz. site work = 2785.00

TOTAL ≈ \$9750.00

2. Excavate contaminated soil

Assume 2'x2'x2' sumps will be hand excavated and larger sumps will be excavated by machine.

Hand excavation: 9.5 yd<sup>3</sup>  
 (Ref. 021-404-0300)

$$9.5 \text{ yd}^3 @ \$34.00/\text{yd}^3 = \$323.00$$

Machine excavation: 158.5 yd<sup>3</sup>  
 (Ref. 022-238-0200)

add 15% for loading onto trucks

$$\text{yd}^3 @ \$2.20/\text{yd}^3 = \$348.70$$

Subtotal for excavation = \$671.70

add 40% for haz.

site work = \$268.70

Total = \$940.40

3. Decontaminate concrete & steel sumps.

(Ref. means crew A-1A)

$$3 \text{ weeks} @ 40 \text{ hrs/week} = 120 \text{ hrs} @ \$34.58/\text{hr} = \$4150.00$$

4. Transport soil to TSD Facility.

Ave. transportation cost per loaded mile to an incineration facility is at \$3.70. x 700 = \$2590 x 10 trips = \$25900.00  
 Quotes from Rollins Environmental & Ensco.

5. Incineration cost.

Based on the assumption that the waste is characterized non-hazardous.

Quote from Chemical Waste Management (Patrick Shea) x \$0.70/lb

$$\text{Contaminated soil volume } 108 \text{ yd}^3 \times 1.35 = 146 \text{ tons} \approx 292000 \text{ lbs.} @ \\ \$0.70/\text{lbs} = \$204400.00$$

$$6. \text{ Steam cleaned concrete, } ^{+ \text{ steel}} \approx 52 \text{ yd}^3 \times 1.35 = 70 \text{ ton} @ \$22.60/\text{ton} \\ = \$1582.00.$$

$$7. \text{ Confirmatory sampling at 2 per sump} \times 49 = 98 \times \$270 = \$26460$$

$$8. \text{ Macro Encapsulation of metal contaminated soil @ } \$5700/\text{roll} \\ \text{off box } 20 \text{ yd}^3 \text{ capacity (60 yd}^3) \\ 5700 \times 3 \text{ box} = \$17100.$$



9) Site preparation + reconnaissance  
 with contractor (including trailer rental)

8 x \$70.00 Field Engineer  
 = 560.00 \$ 560.00

Trailer rental / month =  $\frac{\$250.00}{\$810.00}$

10) Backfill with clean soil at the  
 excavated sumps  $\approx 240 \text{ yd}^3$ , assume on site source available

5 mile roundtrip @ \$6.95/yd<sup>3</sup> Hauling (Means 022-200-0540)  
 Rental cost - track mounted backhoe \$1175/wk  
 Laborers + operators = \$64.35/hr. (Means B - 3 crew)

240 x 6.95/yd<sup>3</sup> = \$1668.00  
 Backhoe rental = \$1175.00/wk.  
 Laborers \$64.35 x 24 = \$1544.00  
 Compaction \$2.34/yd<sup>3</sup>  
 $\frac{\$2.34 \times 240 \text{ yd}^3}{(022-200-8000)} = \frac{\$561.60}{4948.60} \approx \$4950.00$

11) Work Plan + Final Report (10%) = \$ 31804.60

12) Contingencies (15%) = \$ 52477.60

13) Field Engineer (Oversight) = \$70.00 x 160 = \$11200.00  
 8 hrs/day x 5 day/wk x 4 wks

14) Travel 0.25 x 600 miles x 4 trips = \$600.00

15) Per Diem \$26.00 x 24 days = \$624.00

Total = 402327.60



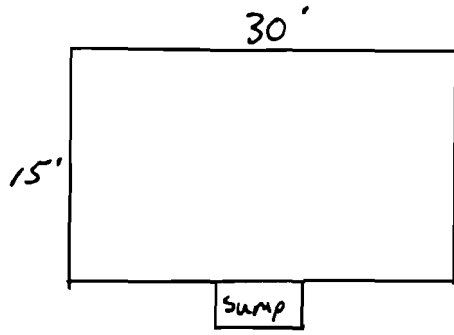


Granular Activated Carbon Unit for sump water treatment

|                                                                       |   |            |
|-----------------------------------------------------------------------|---|------------|
| Cansorts C-15XP, flow rate 5gpm, 2 units<br>in parallel @ \$635.00    | - | \$ 1270.00 |
| Equilization tank                                                     | - | \$ 400.00  |
| Pump rental \$50/day x 3 days                                         | - | \$ 150.00  |
| Piping and installation for discharge<br>and connecting carbon units. | - | \$ 500.00  |
| Oversight / 3 days x 8hrs/day x \$70.00                               | - | \$ 560.00  |
|                                                                       |   | <hr/>      |
|                                                                       |   | \$ 2880.00 |



DECON FACILITY



30' x 15' x 8" concrete pad with attached  
 5' x 4' x 3.5' concrete sump.

Concrete volume needed:

pad:  $30' \times 15' \times \frac{8''}{12} = 300 \text{ ft}^3 = 11.1 \text{ yd}^3$

Sump:  $4' \times 3.5' \times \frac{6''}{12} \times 2 + 4' \times 3.5' \times \frac{6''}{12} + 4' \times 3' \times \frac{6''}{12}$   
 $+ 4' \times 5' \times \frac{6''}{12} = 37 \text{ ft}^3 = 1.37 \text{ yd}^3$

Total concrete volume needed =  $12.5 \text{ yd}^3$

COSTS.

Site grading and sump excavation

Front end loader with backhoe 3 hours @  $20.5 \text{ \$/hr} = 61.50$   
 ref. (Crew B-10R)

Concrete installation

Slab (ref 031-170-2000)  $450 \text{ ft}^2 \times \$7.15/\text{ft}^2 = \$3200.00$   
 Sump (ref 031-182-2000)  $92 \text{ ft}^2 \times \$6.95/\text{ft}^2 = \$640.00$

Fence for Decon area.

Chain link with polyethylene lining, gate on both ends.

90 lf including 2 x 12' wide gates. (ref 015-306-0300)  
 6' high (ref 028-312-0100)  
 (ref 028-308-5010)  
 Fence  $90 - 24 = 66 \text{ LF} @ \$8.70/\text{LF} = \$570.00$   
 gate  $2 @ \$680.00 = \$1360.00$   
 polyethylene  $516 \text{ ft}^2 @ \$0.50/\text{ft}^2 = \$260.00$

Steam cleaner rental for 1 month (ref 016-420-6300)

1 @ \$405 per month \$ 405.00

Pump rental for 1 month (ref 016-420-5500)

1 @ \$246 per month \$ 246.00

Total

\$ 6700.00

TELEPHONE CONVERSATION

DATE: 7-11-94

INCOMING  OUTGOING

TIME: \_\_\_\_\_ AM/PM

MEETING

RECORDED BY: Thomas Mathew

PROJECT: Iowa AAP CONTRACT NO. 6102-012-ECA-SUMP

SUBJECT: Incineration cost for Explosive Contaminated Soil.

| PARTICIPANTS         | ORGANIZATION/DEPARTMENT  | TELEPHONE/EXT.      |
|----------------------|--------------------------|---------------------|
| <u>Thomas Mathew</u> | <u>CDM Federal</u>       | <u>913-492-2181</u> |
| <u>Dwight Askew</u>  | <u>Ross Incineration</u> | <u>216-748-2171</u> |
| _____                | _____                    | _____               |
| _____                | _____                    | _____               |
| _____                | _____                    | _____               |

SUMMARY: They can handle the explosives contaminated soil if it is not classified class 1 by DOT. The cost for incineration is estimated at 50-70¢/lb.

DISTRIBUTION:  PARTICIPANTS  FILE  INFORMATION  ACTION

OTHER: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TELEPHONE CONVERSATION

DATE: 7/11/94

INCOMING  OUTGOING

TIME: 6:00 PM AMPM

MEETING

RECORDED BY: Stephen Birchmeier

PROJECT: Iowa AAP CONTRACT NO. \_\_\_\_\_

SUBJECT: Disposal facility acceptance of Explosive Contaminated Soil

| PARTICIPANTS              | ORGANIZATION/DEPARTMENT | TELEPHONE/EXT. |
|---------------------------|-------------------------|----------------|
| <u>Stephen Birchmeier</u> | <u>CDM Federal</u>      | _____          |
| <u>Patrick Shea</u>       | <u>Chem Waste Mgt.</u>  | _____          |
| _____                     | _____                   | _____          |
| _____                     | _____                   | _____          |
| _____                     | _____                   | _____          |

SUMMARY: Patrick informed me that the price for incineration and disposal of explosive contaminated soil would vary from 0.70 - 5.00 \$ / lb depending on DOT classification. He said DOD (AMC Com) could determine DOT classification. He also would require a 3000<sup>00</sup> trial burn prior to setting a firm price for disposal. The trial burn would determine the flow rate and retention time need to properly incinerate material. He also said he could "macroencapsulate the metals contaminated soil for 5700<sup>00</sup> / 20 yds.

| DISTRIBUTION: | <input type="checkbox"/> PARTICIPANTS | <input type="checkbox"/> FILE | INFORMATION              | ACTION                   |
|---------------|---------------------------------------|-------------------------------|--------------------------|--------------------------|
| OTHER: _____  |                                       |                               | <input type="checkbox"/> | <input type="checkbox"/> |
| _____         |                                       |                               | <input type="checkbox"/> | <input type="checkbox"/> |
| _____         |                                       |                               | <input type="checkbox"/> | <input type="checkbox"/> |



**Chemical Waste Management, Inc.**

# Debris Management

## The Issues And Answers

**As of May 8, 1994, all the variances involving treatment of debris expire.**

**As a result, every generator of hazardous debris is required to obtain treatment for wastes like construction rubble, old piping and structural materials, tools and equipment, personal protective gear, filters and similar debris contaminated with hazardous materials.**

**But one thing hasn't changed. The burden of finding a treatment facility for your debris—one with the technology and capacity to handle the job safely, efficiently and in compliance—is still on you. Where do you turn?**

**As of March 1, Chemical Waste Management is on-line with a full range of debris treatment services, strategically located at facilities in Emelle, Alabama; Kettleman Hills, California; Lake Charles, Louisiana; and Model City, New York. All this increases CWM's ability to help you meet your hazardous debris treatment requirements. And we'll do it with professional treatment systems custom-tailored to your specific needs.**

**So what *are* your debris treatment options?**

# Chemical Waste Management

|                             |                 |                                     |  |
|-----------------------------|-----------------|-------------------------------------|--|
| To: Steve Birchmeier        |                 | From : Patrick O'Shea               |  |
| Fax Number : 1-913-492-5619 |                 | Company : Chemical Waste Management |  |
| Date : 7/11/94              | Time : 18:46:06 | For Information Call: 708-218-1619  |  |
| Subject : Marco Info        |                 | Fax Number : 708-572-1260           |  |

Steve

CWM Macroencapsulation for the concrete. Meets the K047 treatment standards.

Pat

## With Chemical Waste Management, You Get More Choices & Options.

Additional technologies you can choose from the *CWM Service Network* include:

- **Solid Fuels Substitution/Blending** to manage your high Btu debris streams, such as rags, filters and personal protective equipment. CWM is one of North America's most experienced providers of fuels blending services.
- **Incineration** for destruction of debris. As part of CWM's complete package of debris treatment technologies, our incineration services provide you with another option for certain types of debris.

## Want To Know More? Call CWM Toll-Free At 1-800-843-3604.

Explore the debris treatment options and services available through CWM. In debris management, as in every aspect of your hazardous waste and environmental services needs, Chemical Waste Management has solutions tailored to your unique, specific needs.

For more information on how we can help you comply with the debris management regulations, contact your local CWM sales representative or call our toll-free *CWM Customer Service Connection* telephone number at 1-800-843-3604.

## With CWM, we've got you covered.



### Chemical Waste Management, Inc.

*A WMX Technologies Company*

3003 Butterfield Road

Oak Brook, IL 60521

Toll-Free Customer Service: 1-800-843-3604

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# With CWM's ENCAP\*SECURE Services, Your Micro-Encapsulation Needs Are Completely, Permanently Covered.

ENCAP\*SECURE<sup>SM</sup> is CWM's micro-encapsulation technology for treating the majority of all types and mixtures of coatable debris. ENCAP\*SECURE is the preferred treatment for debris that can be successfully coated on all surface areas, interior and exterior.

With ENCAP\*SECURE, debris is coated with custom-tailored, proprietary encapsulation agents. CWM's encapsulation recipes are proven to meet or exceed all performance standards required by debris treatment regulations.

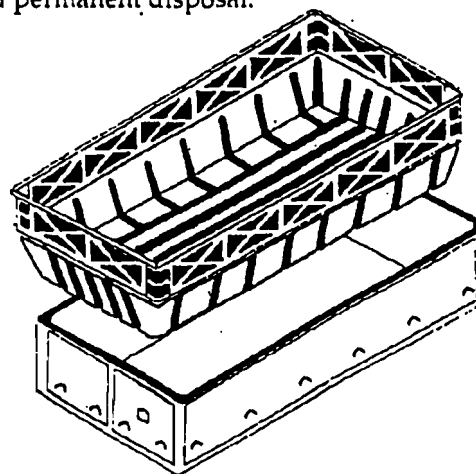
## Introducing MACRO\*SECURE: A Unique Macro-Encapsulation Service Available Only Through CWM.

MACRO\*SECURE<sup>SM</sup> is our patent-pending macro-encapsulation technology capable of handling any type or mixture of debris that fits in a 20 cu. yd. roll-off box. CWM's MACRO\*SECURE is ideal for mixed debris, as well as for items too large for ENCAP\*SECURE treatment. MACRO\*SECURE is especially valuable in treating debris like piping, pumps, ductwork or similar materials where coating of interior surfaces is impossible using micro-encapsulation methods.

With MACRO\*SECURE, debris is placed in a special, one-piece containment unit made from a high-strength HDPE barrier specially formulated to resist contaminants and leachate. A pozzolanic, flowable solid material such as fly ash or cement kiln dust seals the debris and fills any remaining voids inside the unit. After the lid is welded shut, the treated debris may be placed, permanently and safely, in a Subtitle C landfill.

With MACRO\*SECURE, you can prefill the units on-site or ship your debris to a CWM facility in bulk, drums or other DOT-approved method. And of course, CWM's MACRO\*SECURE meets or exceeds all applicable regulations for macro-encapsulation treatment and permanent disposal.

*CWM's MACRO\*SECURE unit fits inside a 20-cu. yd. roll-off container. With dimensions of 22' x 8' x 3.5', MACRO\*SECURE units offer both ease of handling on-site, as well as the volume needed to manage almost any type and size of debris. After treatment, the unit's lid is welded on, completely immobilizing the treated debris.*





## Q & A:

**Q: What is 'hazardous debris'?**

A: Hazardous debris can be any single debris type or mixture primarily composed of debris that is larger than 60 millimeters in diameter and which either contains or is contaminated with materials classified by governmental regulation as RCRA hazardous wastes or —when analyzed— displays characteristics of such materials.

**Q: What cannot be classified as debris?**

A: By law, debris is not:

- Debris-like process wastes; an example is lead smelter slag
- Debris-like wastes that have a specific LDR treatment standard, such as lead-acid batteries
- Intact containers that retain 75 percent or more of their contents.

**Q: Can mixtures of debris and non-debris wastes be classified as debris?**

A: Such mixtures can be classified as debris if, based on visual inspection, a load consists of "primarily debris" (>50%). The entire load can be managed as debris. Non-debris waste cannot intentionally be added to debris waste.

**Q: What are the allowable debris treatment methods?**

A: There are 17 specific allowable treatment technologies for debris, broken into three distinct categories: destruction, extraction and immobilization. CWM can help you choose the most cost-effective option to manage your debris in full compliance.

**Q: How do I choose a debris treatment method?**

A: Review the table below. Regulations provide Performance and/or Design and Operating Standards that must be met for each method of treatment. Specific restrictions apply to debris type and size, treatment technology, and handling and disposal of treatment residues. Most debris is mixed, limiting the effectiveness of any one treatment technology — except for immobilization, which can be used to effectively and efficiently treat virtually the entire range of debris types.

| Application of Debris Technologies |             |            |                                                                            |
|------------------------------------|-------------|------------|----------------------------------------------------------------------------|
| DEBRIS TYPE                        | DESTRUCTION | EXTRACTION | IMMOBILIZATION<br>MACRO*SECURE <sup>SM</sup><br>ENCAP*SECURE <sup>SM</sup> |
| Metal/Tanks                        |             | ✓          | ✓                                                                          |
| Brick/Concrete/Stone               |             | ✓          | ✓                                                                          |
| Glass                              |             | ✓          | ✓                                                                          |
| PPE/ Paper/Cloth/Rags              | ✓           |            | ✓                                                                          |
| Rubber/Plastic Gloves              | ✓           |            | ✓                                                                          |
| Wood                               | ✓           |            | ✓                                                                          |
| Mixtures                           |             |            | ✓                                                                          |

**APPENDIX E**

**EPA Comments to Draft EE/CA and Comment Responses**

**CDM FEDERAL RESPONSES TO COMMENTS**

**Responses to EPA Region VII comments to the Explosive Contaminated Sumps EE/CA**

**NO. RESPONSE**

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**General Comments**

1. **Comment:** "The EE/CA should contain an introductory section to briefly explain the non time-critical removal process to the public. This should describe, at a minimum, the Federal Facility Agreement (FFA) between EPA and the Army for the IAAP, the purpose of the EE/CA, the non-time critical removal action process (EE/CA, public comment, Action Memorandum/Decision Document, removal implementation), and the authority by which the Army is executing the non-time critical removal. An example of such an introduction was included with our comments regarding the Pesticide Pit EE/CA."

**Response:** An introductory paragraph will be added explaining the non time-critical removal process to the public.

2. **Comment:** "EPA requests the opportunity to review and provide input to any work plans which may be prepared by the Army to execute the proposed removal action."

**Response:** Shop drawings or other required submittals of the construction contractor could be provided to EPA for review, however, a review schedule will be necessary to avoid delay claims from the construction contractor.

3. **Comment:** "Please note, that for any proposed interim response actions, the ultimate remedial action(s) are determined only after appropriate consideration through the Feasibility Study, Proposed Plan, and Record of Decision (ROD). It is feasible that, if a comprehensive interim action is performed, no further action may be required by the ROD."

**Response:** Comment noted.

4. **Comment:** "The Army should consider evaluating the scope of response actions which may be required for the comprehensive 'soils' operable unit at IAAP. It may be cost-effective for the Army to consider consolidating the proposed excavation and disposal associated with the sump removal with additional areas at the site which will eventually require remediation. Under such an approach, the Army could consider excavation of all soils which exceed RGs

in a single mobilization effort, the possible storage of these soils (with similar contamination) in a manner which would minimize the potential for further releases, and the eventual treatment of the contaminated soils - likely via incineration or biotreatment. This may offer economies relative to the excavation and may provide for more cost-effective treatment options, as the treatment costs per unit volume should decrease as larger volumes of contaminated soil are treated."

**Response:** This may be a viable option. The proposed excavation and storage would involve the and disposed of in within the earthen berms and covered with a clay cap. A well or wells could than be placed in the area in an effort to control (pump and treat) any leachate that may be of concern from the soils in the lagoon. As suggested the soils could be remove and treated when the remedial action for the entire site is selected.

5. **Comment:** "The source of the sump/soils data referenced in the EE/CA should be clarified. It appears that in some instances field screening methods utilized in the RI for metals and explosives analyses have been used for characterizing sump contaminant levels. The usability of this data is questionable, as noted in EPA's dispute of the RI report."

**Response:** The source of the data for the sump EE/CA was the 10 June 1993 "Contamination Assessment of Concrete Sumps at the IAAP," prepared by Jaycor. Data from the IAAP contractor (Mason and Hanger) was used for sumps that were not included in the above referenced report.

### Specific Comments

1. **Comment:** "**Page 1-1, section 1.1.** The locations of the 36 sumps referenced in this section should be identified on a figure.

"As part of the Remedial Investigation / Feasibility Study (RI/FS) for the IAAP, EPA will require that the Army identify all waste sumps - both active and inactive. The Army should provide some assurances that all such sumps at the installation have been identified so that potential response/interim response actions may be appropriately scoped. The process by which the sumps were identified should be discussed. Active sumps should be identified since these units are subject to RCRA Corrective Action requirements. It is not necessary that the active sumps be included as part of the proposed removal action. Please clarify how the additional 3 concrete and 5 stainless steel sumps were identified subsequent to the July 28, 1992 survey. The location and nature of the 13 former sumps removed by the installation contractor should be discussed. Discuss the authority by which these sumps were removed and how contaminated media associated with the removal was disposed.

“Any discharge routes leading away from the sumps should be identified to assure that appropriate confirmatory sampling is performed in the areas of preferential migration.”

**Response:** Figures will be provided identifying sumps on each line.

The sumps were identified for removal because they were no longer needed or in use at the facility. Sumps that were identified for removal and not included in the Jaycor report have been identified as not being needed.

The 13 former sumps were all stainless steel and were removed without removing any associated soil. The sumps are still on site.

2. **Comment:** “**Page 1-4, paragraph 1.** The text states that depth to groundwater at the IAAP is 20-40 feet bgs. Please clarify as our references indicate that groundwater is as shallow as 5-10 feet bgs in some locations at the installation.”

**Response:** Correct, there are areas where the groundwater level is as shallow 5-10 feet BGS, the text will be corrected.

3. **Comment:** “**Page 1-4, section 1.2.** It is significant that the ‘...assessment on the extent of contamination at the sump areas was not fully defined for the purposes of this EE/CA...’ This suggests that comprehensive confirmatory sampling may be required to show that removal action objectives (RAOs) have been met. It would be appropriate to include an outline of the plan for collecting confirmatory samples at some point in the EE/CA. The Army should plan to analyze such samples for explosives and metals.”

**Response:** Comprehensive confirmation sampling (sampling all sides of the excavation) is planned to verify adequate removal. The samples for the sump excavations will be sampled for both explosives and metals. A brief description of the proposed confirmation sampling will be included in the report as an appendix.

4. **Comment:** “**Page 1-5, Table 1-2.** It would be most appropriate to include site-specific remediation goals (RGs) based on the agreed upon scenarios from the Baseline Risk Assessment (BLRA) for all contaminants of concern associated with the sump removals. Documentation of the procedures used to determine the RGs should be included in an appendix.”

**Response:** PRG calculations have not been completed for every chemical of concern at the IAAP but only for those that posed a significant risk as depicted in the risk assessment; therefore when a site specific PRG was not available a value

was obtained from the risk-based concentration tables developed by Region III. These value are based on a 10E-6 carcinogenic risk and 1E+00 hazard quotient for a commercial use scenario.

5. **Comment:** **“Page 1-6, items #1-4, bullets 1-4.** The rationale for the various combinations of contaminant concentrations/volume estimates is not apparent. Please note any contingencies which have been considered should the actual waste volume encountered to satisfy the RAOs exceed that which is anticipated.”

**Response:** The various combinations of contaminant concentration/volume estimates is a result of the sumps being of similar configurations and contamination nature varying for each sump. For instance there are five 6 X 9 X 3 foot sumps, a volume was calculated for each excavation scenario and then based on contaminate nature the a recommended volume was presented. This also allowed the reviewers to see the variation of volume with each excavation scenario. Only he recommended volume will be presented in the final document to avoid confusion.

6. **Comment:** **“Page 1-6, last paragraph.** Please clarify, if the sumps are inactive, why sumps 12, 13, 15, and 16 were filled with washdown water. Details of the temporary treatment facility, discharge limits for metals and explosive constituents, confirmatory testing methods, and the discharge location of the treated wastewater should be discussed.”

**Response:** The sentence should read that when sampling was performed the sumps were discover with water in them. The temporary treatment facility would consist of a small carbon unit (Carbtrol markets a 55-gal drum of carbon) for explosives and a small precipitation basin or ion exchange resin for metals. Discharge limits would be those RGs that have been calculated for the site. Once treated to these levels it would be discharged to the ground. Confirmatory testing, analyzing samples for contaminants identified in the report would verify that the limits were met.

7. **Comment:** **“Page 1-7, Table 1-3.** It appears that there are inconsistencies in estimated waste volumes associated with numerous sumps relative to the data presented in Table 1-4. Please clarify.”

**Response:** Table 1-3 presents volumes while Table 1-4 presents average concentrations it is not understood where the inconsistencies are present, please provide more explanation.

8. **Comment:** “**Page 1-8, Table 1-4.** A table should be included providing specific sample results for each sump.”

**Response:** Summary tables of the sample results for each sump will be included as an appendix to avoid bulking the main body of the report.

9. **Comment:** “**Page 1-10.** It may be inappropriate to dispose the concrete sumps in a sanitary landfill, as proposed. The contaminated concrete sumps may well have retained significant metals and explosives contamination within the semi-porous concrete matrix. TCLP testing is required to characterize whether metal wastes entrained in the concrete may cause the sump material to be considered characteristic hazardous waste with accompanying disposal requirements. The explosive levels in the concrete sump material should be determined to evaluate whether the wastes may be sufficiently similar to hazardous wastes to be managed as such. Verification testing of the metal sumps should be performed following decontamination to assure that the sumps are free of contamination.

“It is inappropriate to assume, in the absence of sampling data, that no explosive contaminants are present at sumps 37-44. Analytical data should be obtained to characterize these soils for disposal purposes. Further, since metals contamination is present in the samples obtained in proximity to the 17 sumps in question, TCLP testing should be performed to assure appropriate disposal if the presence of characteristic hazardous wastes is indicated.”

**Response:** The statement that explosive contaminated soil does not exist will be removed. The volume of contaminated soil to be removed can be estimated based on other similar sumps that have contamination data. The soils from sumps (37-44) could be assumed contaminated with explosives and treated as such and confirmatory sample taken after excavation would be analyzed for explosive. Characterization prior to removal would cost \$350 per sample. The volume anticipated for each sump (between 1 and 3 cubic yards per sump) is a relatively small cost increase for disposal when compared to a re-mobilization effort and addition sampling.

10. **Comment:** “**Page 2-1, section 2.1.** Please discuss applicability of the 2-million dollar funding limit relative to DERA financed removal actions.”

**Response:** There is no statutory funding limit of the DERA fund for removal actions, however there is an approval process necessary when 2 million dollars is exceeded.

11. **Comment:** **“Page 2-1, section 2.2.** The objective of the removal action is to eliminate unacceptable risks due to potential exposures to site soils, to reduce the potential for additional contaminant migration from soil to groundwater, to maintain consistency with a final site remedy, and to attain ARARs. The report should state that the Army will achieve these goals by remediating all soils in proximity to the sumps which exceed risk-based RGs defined by the commercial/industrial land use scenario in the BLRA.”
- Response:** Agree with the objective stated in the comment. As discussed in the report it is the intent of the removal action to remove soils to a risk-based number. The RGs were not calculated for every chemical found at IAAP. The Region III risk-based number was used when a calculated RG was not available.
12. **Comment:** **“Page 2-2, section 2.3.** It would be appropriate to include details of the removal schedule so that the public may be informed. This may include the anticipated date for the public comment period regarding the EE/CA, any associated public meetings which are planned, the date by which the Action Memorandum/Decision Document will be issued, and the approximate date that construction activities would begin.”
- Response:** A schedule will be provided in the text.
13. **Comment:** **“Page 3-1, paragraphs 1 and 3.** The text erroneously references the ‘...treatment of pesticide contaminated soil...’ Please correct.
- “The text references ‘composing’ and ‘compositing’ as a treatment technology for explosive contaminated soils. Please correct to ‘composting.’”
- Response:** Corrections will be made to the text.
14. **Comment:** **“Page 3-1, section 3.0.** The removal action alternatives should be more fully discussed here. Alternatives should include in-situ treatment, ex-situ treatment, and containment. As part of the comparative analysis of alternatives, containment options could be eliminated since they do not offer a permanent solution and do not reduce contaminant toxicity or volume. In-situ treatment options could be eliminated based on implementability considerations. Therefore, it is reasonable to conclude that ex-situ treatment is appropriate. Ex-situ treatment options would include on-site and off-site treatment, using each of the treatment technologies referenced in the text. Since CERCLA states a preference for on-site actions, the proposed off-site incineration should be discussed. For off-site actions, the requirements described at section 300.440 of the NCP as amended in Federal Register, Vol. 58, No. 182, September 22, 1993, must be satisfied. Therefore, the



Army must specify the facility to be receiving wastes associated with any off-site response actions so that it can be verified that such facilities are acceptable.

We suggest that the Army consider the concept presented in General Comment #4 when evaluating removal action alternatives.”

Response: There will be mention of containment, onsite and in-situ options through the comparative analysis.

15. Comment: “**Page 3-1, last paragraph.** The removal action should be presented as a ‘proposal’ or ‘recommendation’ rather than as the ‘selected alternative,’ to allow for meaningful public comment. Such a recommendation should be presented following the comparative analysis of alternatives.”

Response: The verbiage suggesting selected alternative will be changed to recommended alternative.

16. Comment: “**Page 3-2, section 3.1.2.** EPA does not consider the proposed response action at the contaminated sumps to address potential groundwater concerns at the site. Significant groundwater contamination, primarily metals and explosives, has been found in various areas of the site. The sump/soil contamination is a likely source of at least a portion of this contamination. We will require that any risk factors associated with such sources, including soils and groundwater, which are unaddressed by the proposed interim action, be addressed in a Feasibility Study (or multiple Feasibility Studies - if an operable unit approach is defined).

“OSHA requirements should be specified as an ARAR for hazardous waste management activities at the site.

“The presence of metals residues in incinerator ash may require that the ash be disposed as a hazardous waste subject to RCRA LDRs.

“The applicability/relevance of elements of the Clean Air Act - such as the National Ambient Air Quality Standards and the National Emission Standards for Hazardous Air Pollutants should be discussed. Such ARARs may be subsumed by the requirements of the Iowa Air Pollution control Regulations.”

Response: It was not intended to address groundwater contamination in this removal action. As suggested the groundwater will be addressed in the groundwater operable unit for the entire site.

Regarding the Historic Preservation Act, see response to Specific Comment No. 2.

The OSHA requirements will be added as an ARAR to be complied with.

The reference to 40 CFR 50 for emission standards for hazardous waste incinerators is part of the National Ambient Air Quality Standards, this will be clarified in the text.

17. Comment: **“Page 3-3, section 3.1.3.** If the removal achieves the goal of remediating all contaminated soils to levels below commercial/industrial land use RGs, it is possible that no further remedial activities associated with the contaminated soils from the sumps would be required as part of the FS or ROD for the site. The proposed interim response does not address groundwater contamination at the site, and would not necessarily achieve protective levels for soils for a possible future residential setting. Determinations regarding the need for additional clean-up activities, future monitoring, or institutional controls are appropriately addressed in the FS and ROD for the site.”

Response: Comment noted. The commercial scenario accepted for this site is based on the foreseeable future land use. The Army will discuss a contingency if the property is exceeded and a possible residential scenario may be realized. This is appropriately addressed in the FS and ROD.

18. Comment: **“Page 3-4, section 3.1.5.** It would be appropriate to identify the nearest community to the areas proposed for excavation and note that impacts are ‘unlikely.’

“It should be stated that fugitive dust will be controlled in order to comply with ARARs.

“If the Army intends to divert truck traffic around communities in route to a proposed disposal facility, this should be stated. If not, the reference should be removed from the text.

“It should be stated that site workers will be appropriately trained in hazardous waste management activities, as required by OSHA.”

Response: Agree, the nearest community will be identified and the impacts to that community described as unlikely.

The Army intends to transport the contaminated soil in an acceptable manner according to DOT regulations. If truck traffic hauling pesticide contaminated soil does not have to be diverted around communities this statement is not necessary. The intent is to put the burden of DOT compliance on the

licensed hauler, this sentence will be changed to state that the waste will be hauled in accordance with DOT regulations which are intended to protect the public.

19. Comment: **“Page 3-4, section 3.2.1.** The EE/CA previously states that some sumps to be included in the proposed removal action may be inaccessible to large equipment. Please discuss how you intend to excavate such inaccessible sumps.”

Response: The sumps that are inaccessible are mainly the 2 X 2 X 2 sumps. It was assumed that these sumps and associated soil would be removed by hand using jackhammers and shovels. Small excavation equipment is available that may be able to be hoisted into the sump area and be utilized; however, for cost estimating purposes hand excavation was assumed.

20. Comment: **“Page 3-5, paragraph 2.** The determination of the explosive waste classification for transportation purposes may impact overall project costs. It would be appropriate to resolve this issue in the planning stage of the removal to assure that adequate funding is available to satisfy the RAOs.”

Response: The AMC command is being contacted to make this determination, it is anticipated that the contaminated soil will be classed as a non-explosive hazard.

21. Comment: **“Page 3-5, section 3.2.2, paragraph 2.** Note that the off-site facility must be in compliance with EPA’s CERCLA ‘Off-site Policy’ - NCP section 300.440.”

Response: Comment noted.

22. Comment: **“Page 4-1, section 4.0.** It is known that groundwater at the site is contaminated with significant levels of metals and explosives in some areas. The sumps may be acting as a source contributing to this groundwater contamination. The statement that ‘...no impacts to groundwater have occurred...’ is not supported and should be removed from the text.”

Response: This statement in reference to “no impacts to groundwater” will be removed.