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DEPARTMENT OF THE NAVY

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

2-1-1998

IN REPLY REFER TO
5090
Ser 095/8028

09 FEB 1998

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
Attn: Ms. Carol Witt-Smith (DRP-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Ms. Witt-Smith:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits for review and approval two copies of the Final Full Scale Operational Plan for the Bioremediation Project as enclosure (1). The Morrison Knudsen Corporation will forward to your office an electronic copy of the plan. Enclosure (2) is the required certification statement.

NAVSURFWARCENDIV Crane point of contact is
Ms. Christine D. Freeman, Code 09511, telephone 812-854-4423.

Sincerely,

James M. Hensler

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

Encl:
(1) Final Full Scale Operational Plan
(2) Certification Statement

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

SIGNATURE

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

TITLE

09 FEB 1996

DATE

Full-Scale
Operational Plan
For
Soils Bioremediation Facility

NSWC CRANE
CRANE, INDIANA

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Contract #N62467-93-D-1106
Delivery Order #0009
Statement of Work #007

February 1998

Revision 0

Full-Scale Operational Plan For Soils Bioremediation Facility

NSWC CRANE
CRANE, INDIANA

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Contract #N62467-93-D-1106
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February 1998

Revision 0

FULL-SCALE
OPERATIONAL PLAN

INTERIM MEASURES CLEANUP
AT
SOILS BIOREMEDIATION FACILITY

NSWC CRANE
Crane, Indiana

Revision 0

February 09, 1998

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

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U. S. Navy Responsible Authority — Date

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U.S. EPA Region 5 RCRA Project Coordinator — Date

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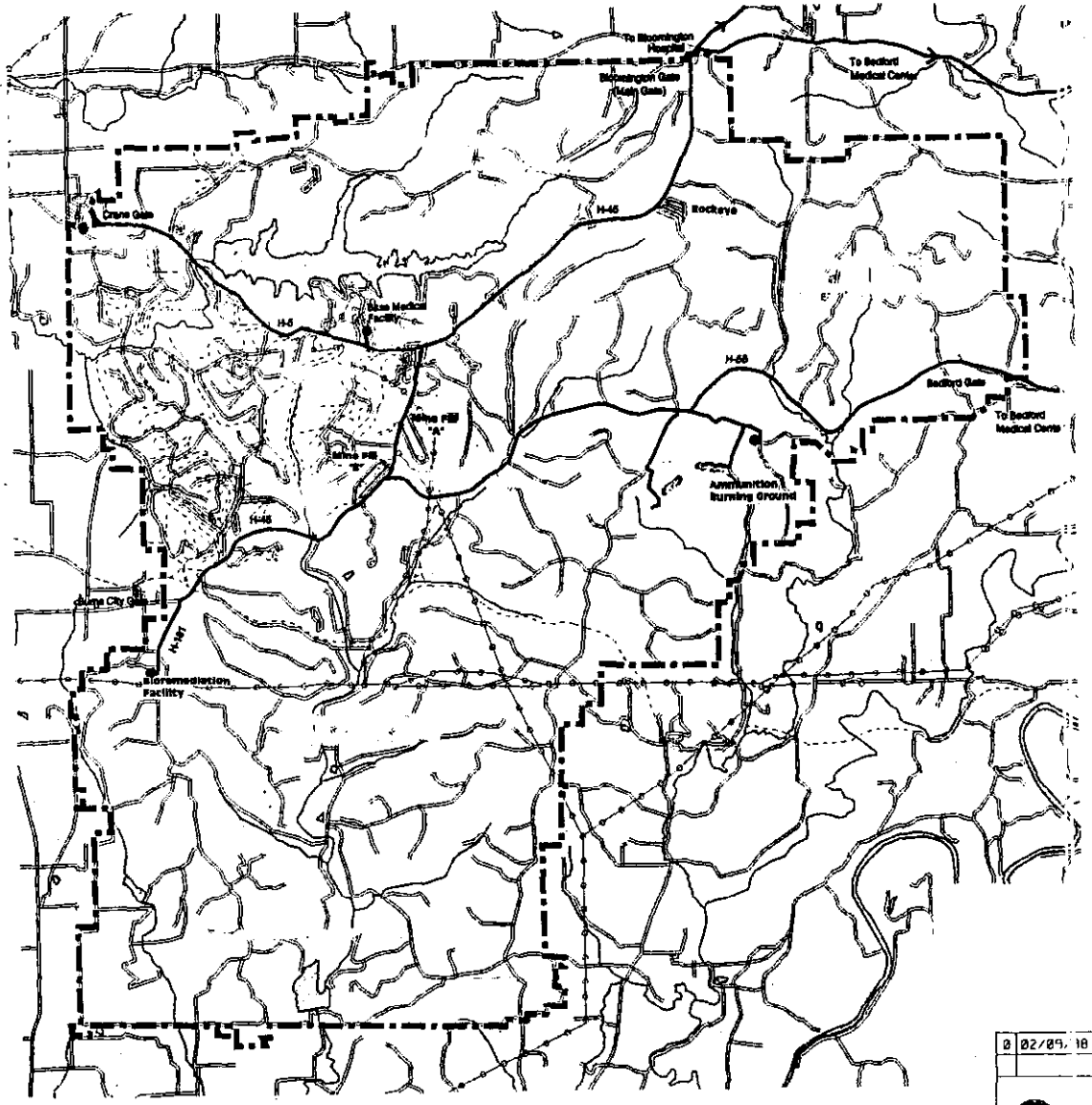
1.0
INTRODUCTION

The Naval Surface Warfare Center (NSWC) Crane, located in southwestern Indiana, provides support for equipment, shipboard weapons systems, and ordnance. In addition, NSWC supports the Crane Army Ammunition Activity (CAAA) including production and renovation of conventional ammunition, storage, shipment, and demilitarization and treatment of conventional ammunition. Explosive-contaminated soils resulting from these operations have been identified at four Solid Waste Management Units (SWMUs): Ammunition Burning Ground (ABG) - SWMU-03/10; Rockeye Munitions Facility (Rockeye) - SWMU-10/15; Mine Fill A - SWMU-12/14; and Mine Fill B - SWMU-13/14. Figure 1-1 shows the locations of these SWMUs. A brief description of each of these SWMUs and the on-site Bioremediation Facility, identified as SWMU-33/00, is provided in Section 1.4 of this Plan. The constituents of concern for each of the SWMUs are discussed in Section 1.2 of this Plan. Approximately 60,000 cubic yards of soil from ABG; approximately 18,000 cubic yards of soil from Rockeye; approximately 11,000 cubic yards of soil from Mine Fill A; and approximately 22,000 cubic yards of soil from Mine Fill B are expected to be treated using on-site bioremediation.

The Department of Defense (DOD) has successfully utilized bioremediation, or composting, to treat explosives-contaminated soil since 1982. Bioremediation has proven to be successful at other sites having explosive-contaminated materials [Weston, 1993]. Explosive contaminants in soils and sludges that have been successfully degraded by composting include: 2,4,6-trinitrotoluene (TNT); hexahydro-1,3,5,-trinitro-1,3,5,-triazine (RDX); octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX); methyl-2,4,6-trinitropheylnitramine (Tetryl); and nitrocellulose [U.S. EPA, 1993a, 1993b]. Based on this success, on-site bioremediation was selected as the preferred treatment alternative for the Interim Measures (IM) at ABG, Rockeye, Mine Fill A, and Mine Fill B. In addition to its effectiveness in treating explosives, on-site bioremediation involves limited transportation of contaminated soil and is less expensive than the other treatment alternatives evaluated.

The first phase of the IM process consisted of a pilot-scale bioremediation operation which evaluated several mix recipes, and provided lessons learned, a final recipe for full-scale operation, and cleanup goals for treated soil. Results and discussions on the pilot-scale operations are provided in the Pilot-Scale Completion Report [MK, 1998a]. The second phase of the IM process is the full-scale operation of the Bioremediation Facility for treatment of the explosives-contaminated soil. This Plan discusses the second phase of operation, the full-scale operation.



SWMU 03/10: AMMUNITION BURNING GROUND
SWMU 10/15: ROCKEYE
SWMU 12/16: MINE FILL A
SWMU 13/16: MINE FILL B
SWMU 33/00: BIOREMEDIATION FACILITY

—·—·—·— NSWC CRANE BOUNDARY

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FULL-SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

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			APPROVE

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FIGURE 1-1
LOCATION OF SWMUs

DWG DATE: 1/26/98 | FILE NAME: FIG1-1.DGN

Soil from Mine Fill A (SWMU-12/14) has been selected for the start-up of full-scale operation. This area was selected due to its high concentrations of RDX, TNT, and other explosives as described in Section 1.4.3. In addition, Mine Fill A was used in the Pilot-Scale Operations and continued excavation in this area will not impact on-going facility operations.

1.1 PURPOSE

The purpose of this Plan is to provide operational guidance and parameters, cleanup goals, and safety considerations for full-scale operation of the Bioremediation Facility. This Plan may be modified, amended, or revised, with the approval of the United States (U.S.) Navy and the United States Environmental Protection Agency (U.S. EPA), to optimize system performance throughout the full-scale operation. This Plan and the following documents will be used to implement actions at the Bioremediation Facility:

- The approved *Work Plan for the Soils Bioremediation Facility* - addresses the design and construction requirements of the Bioremediation Facility [MK, 1997a].

- The approved *Quality Assurance Project Plan (QAPP) For Full-Scale Operations at the Soils Bioremediation Facility* - addresses the quality assurance, sampling and analytical requirements of the bioremediation full-scale operation [MK, 1998b].

- The approved *Soil Erosion Control Plan for Bioremediation Facility* - addresses the erosion and sediment control measures for the Bioremediation Facility construction [MK, 1996].

1.2 DOCUMENT ORGANIZATION

This Plan is organized into fifteen sections and includes six appendices. Section 2.0 provides a summary of the regulatory framework which governs the IM work actions described in this Plan. Section 3.0 provides description of the Bioremediation Facility. Details of soil excavation, screening, transportation, and site restoration is presented in Section 4.0. Description of the composting process operation is provided in Section 5.0. Section 6.0 provides requirements for process control monitoring and sampling. Requirements for decontamination, fluid collection, and disposal of generated wastes from both the excavation sites and the Bioremediation Facility are provided in Section 7.0. Quality Control requirements are presented in Section 8.0. Description of the various operating equipment and requirements for maintenance of the Bioremediation Facility are provided in Section 9.0. Section 10.0 provides requirements for demobilization activities. Emergency response, contingency, and spill prevention plan implementation methods are specified in Section 11.0. Requirements for records maintenance, report generation, and recording are described in Section 12.0. The organization and responsibilities of project team involved with the IM work actions

covered by this Plan are presented in Section 13.0. A proposed IM work implementation schedule is presented in Section 14.0. A list of reference documents is provided in Section 15.0.

Additional details required to implement the IM work actions described in this Plan are provided in the following appendices:

- Appendix A: The Site Safety and Health Plan (SSHP) describes safety and health requirements for the IM work actions described in this Plan. A separate SSHP is included for each of the SWMUs. Currently, only the SSHP associated with Mine Fill A is included in this Plan. The other SSHPs will be developed at a later date and issued for approval prior to excavation.

- Appendix B: Contains selected photographs of the Bioremediation Facility, equipment, and the SWMUs where soil will be excavated for treatment at the Bioremediation Facility.

- Appendix C: Contains drawings of the Bioremediation Facility and process flow diagrams.

- Appendix D: General guidelines for field operations are provided in Standard Operating Procedures (SOPs).

- Appendix E: Soil Excavation Plans provide methods and controls for excavation, screening, transportation, and storage of explosive-contaminated soils. A separate soil excavation plan is included for each of the SWMUs. Currently, only the soil excavation plan associated with Mine Fill A is included in this Plan. The other excavation plans will be developed at a later date and issued for approval prior to excavation.

- Appendix F: Quality Control Documentation, which includes Testing Plan and Log and Field Inspection Checklists, required for successful implementation of IM work actions described in this Plan.

- Appendix G: Procedures and methodology for performing the toxicity test. This appendix is under development and will be issued at a later date for approval prior to performing the toxicity test. Toxicity testing will be performed on each recipe for each IM SWMU prior to disposal of treated soil, in any location other than the on-site solid waste landfill, for that SWMU.

1.3 CONSTITUENTS OF CONCERN AND REMEDIAL OBJECTIVES

1.3.1 Constituents of Concern

The constituents of concern for Mine Fill A (SWMU-12/14) are listed below. They are derived from the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Phase I Environmental Monitoring Report for Mine Fill A [Halliburton NUS, 1992].

Explosives: Penta erylthritol tetranitrate (PETN); TNT; RDX; HMX; Tetryl; trinitrobenzene (TNB); 1,3-dinitrobenzene (DNB); nitrobenzene (NB); 4-amino-2,6-dinitrotoluene (4-Am-DNT); 2-Am-DNT; 2,4-dinitrotoluene (DNT); 2,6-DNT; 2-nitrotoluene (NT); 3-NT; and 4-NT.

Metals: Aluminum; barium; cadmium; chromium (total); and lead.

Volatile Organic Compounds (VOCs): Dichloromethane (methylene chloride); acetone; methyl ethyl ketone (2-butanone); methyl isobutyl ketone; toluene; and xylene (total).

The constituents of concern for Mine Fill B (SWMU-13/14)are listed below. They are derived from the RFI Phase I Environmental Monitoring Report for Mine Fill B [Halliburton NUS, 1992].

Explosives: PETN; TNT; RDX; HMX; Tetryl; TNB; 1,3-DNB; NB; 4-Am-DNT; 2-Am-DNT; 2,4-DNT; 2,6-DNT; 2-NT; 3-NT; and 4-NT.

Metals: Aluminum; barium; cadmium; chromium (total); and lead.

VOCs: Dichloromethane (methylene chloride); acetone; methyl ethyl ketone (2-butanone); methyl isobutyl ketone; toluene; and xylene (total).

Polychlorinated Biphenyls (PCBs): Aroclor 1242; Aroclor 1254; and Aroclor 1260.

The constituents of concern for ABG (SWMU-03/10) are listed below. They are derived from the Part 2 RFI Phase III Soils Report for ABG [ACOE, 1995] and Current Contamination Conditions Risk Assessment [BRE, 1997].

Explosives: PETN; TNT; RDX; HMX; Tetryl; TNB; 1,3-DNB; NB; 4-Am-DNT; 2-Am-DNT; 2,4-DNT; 2,6-DNT; 2-NT; 3-NT; and 4-NT.

Metals: Aluminum; antimony; arsenic; barium; cadmium; chromium (total); cobalt; copper; lead; manganese; mercury; nickel; silver; thallium; vanadium; and zinc.

VOCs: Acetone, 1,1-dichloroethylene; 1,2-dichloroethylene, trichloethylene; 1,1,2,2-tetrachloroethane; trans-1,2-dichloroethylene; vinyl chloride; chloroethane; chloroform; and tetrachloroethylene.

Semivolatile organic compounds (SVOCs): Bis(2-ethylhexyl) phthalate; di-n-butyl phthalate; N-nitroso-di-n-phenylamine; 4-nitrophenol; benzo(a)anthracene; and benzo(b)fluoranthene.

Dioxins: 2,3,7,8-TCDD

The constituents of concern for Rockeye (SWMU-10/15) are listed below. They are derived from the RFI Phase III Soils Report for Rockeye [ACOE, 1992].

Explosives: PETN; TNT; RDX; HMX; Tetryl; TNB; 1,3-DNB; NB; 4-Am-DNT; 2-Am-DNT; 2,4-DNT; 2,6-DNT; 2-NT; 3-NT; and 4-NT.

Metals: Aluminum; antimony; arsenic; barium; beryllium; cadmium; chromium (total); cobalt; copper; iron; lead; magnesium; nickel; and zinc.

VOCs: trans-1,3,dichloropropene; xylene (total); 1,1,1-trichloroethane; 1,1,2-trichloroethane.

SVOCs: Phenanthrene; fluoranthene; and pyrene.

Based on generator knowledge and process operations at a particular SWMU additional analytical testing of constituents may be required to ensure that solvent-contaminated soil or other characteristic wastes are not transported to the Bioremediation Facility for composting. If metals and/or VOCs are present in soil at a particular SWMU, the soil will be analyzed for toxicity characteristic leaching procedure (TCLP) metals and/or VOCs. However, metals will be analyzed for total metals and the results based on the correction factor of 20 will be used to check if the values are below the TCLP metals regulatory limits as specified in Tables 1-1 through 1-3. If the total metals results with the correction factor indicate values are higher than the regulatory limits, then TCLP analysis will be requested to verify the total metals results.

1.3.2 Remedial Goals

The primary objective of full-scale operation at the Bioremediation Facility is to reduce, through composting, the explosive contaminant levels of affected soils to meet the National Contingency Plan (NCP) criteria of 90% to 99% reduction of toxicity and

mobility (leachability), and to achieve human health (residential or industrial) and/or ecological risk-based remedial goals based on disposition of soil.

The NCP Preamble indicates 90% to 99% reduction of toxicity and mobility (leachability) as a guide for effective treatment. Previous studies have indicated that reductions in parent compounds and first series intermediate compounds were providing parallel reductions in toxicity and leachability based on combined chemical, toxicology and leachability data [U.S. EPA, 1996b]. Therefore, a 90% to 99% reduction in concentrations of contaminant compounds corresponds to a 90% to 99% reduction in toxicity and leachability and meets the NCP treatment performance guideline for composting of TNT, RDX, HMX, and other explosives.

A performance goal of 30 mg/kg for TNT and RDX was used during the pilot-scale as opposed to the industrial soil PRGs (64 mg/kg and 17 mg/kg, respectively) and the residential soil PRGs (15 mg/kg and 4 mg/kg, respectively). The U.S. EPA has applied the 30 mg/kg performance goal at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites to minimize the phytotoxicity effects of munitions compounds on plant species [U.S. EPA, 1996b]. This criteria is especially applicable to areas which may be backfilled with treated soil and revegetated. In particular, the PRG established for soil cleanup at the Bangor facility was set at 30 mg/kg for TNT, as this level corresponded to "lifetime excess cancer risks between 10^{-5} and 10^{-6} under CERCLA and is protective for non-carcinogenic effects" [U.S. EPA, 1993c]. Other constituents' performance goals have been reduced from the PRG level such as 2,4 and 2,6 DNT based on previous studies [U.S. EPA, 1996c].

Human health (residential and industrial) and ecological risk-based remedial goals have been established using preliminary remedial goals and data quality levels by U.S. EPA Region 5 [U.S. EPA, 1998]. Cumulative risk, other risk scenarios, and toxicity testing results are not considered in the U.S. EPA evaluation. These remedial goals are presented in Tables 1-1 through 1-3. The analytical methods and analytical reporting limits are also shown in these Tables. Method reporting limits for each of the target constituents are provided by Southwest Laboratory of Oklahoma and have been evaluated by Morrison Knudsen Corporation (MK) for acceptability for data quality.

Tables 1-4a and 1-4b provides the cleanup goals for rinse water generated after washing the rocks at the excavation site. If the rinse water meets these cleanup levels or non-detect levels the rocks are determined to be acceptable for use as backfill material; or the rocks may be triple rinsed, crushed, and sent to the Bioremediation Facility for composting.

Table 1-5 provides the allowable discharge limits without pretreatment, analytical methods, and analytical reporting limits for water generated in the storm-water retention ponds at the Bioremediation Facility.

Since the remedial goals tables do not reflect a full risk-assessment evaluation or leachability analysis, disposal options are restricted to certain land use options. Data must be recorded and maintained in the DOD Master Plan for this facility (NSWC Crane), in any lease agreement, and in a notice in deed upon any land transfers. The location of all treated soil disposal with a coordinating final analysis file for that soil shall be maintained for the land use record.

1.3.3 Performance Objectives

Figures 1-2 and 1-3 are flowcharts describing the process flow path for decision-making of the excavation site soil and the treated soil respectively. Similarly, Figure 1-4 is a flowchart describing the process flow path for decision-making of decontamination of rocks.

Toxicity tests of the treated soil will be performed, as specified in Appendix G of this Plan, at a later date to determine if treated soil meeting the remedial goals listed in Tables 1-1 through 1-3 can be used as soil amendment for revegetation at the excavation sites or other NSWC Crane Environmental Protection Department (EPD)-approved areas.

1.3.4 Process Goals

The process parameters and their operating goals essential to successful biodegradation of the explosive contaminants are listed in Table 1-6. It is essential that these goals be met to provide optimal conditions for successful degradation of the explosive contaminants and, therefore, meeting the performance goals of this Plan. The process parameters and their operating goals are discussed in more detail in Section 6.0.

1.4 RECIPE SELECTION

The mix for use in the full-scale operation is: 25% soil; 15% chicken manure; and 60% straw. This recipe was identified as Mix No. 7b and has been selected based on successful results from the pilot-scale testing [MK, 1998a]. Once the initial batch of soil treated under full-scale operation is shown to meet the performance goals, the mix will be tested at a 30% soil loading in a pilot-scale size windrow, as agreed upon by the U.S. Navy and the U.S. EPA.

Since the results of the toxicity tests are not available at the time of this Plan approval, other recipes (such as Mix No. 3 or Mix No. 7a) used in the pilot-scale testing will be used at one or more SWMUs to achieve the desired process and remedial performance goals. Additionally, based on results of 30% soil loading, other recipes (such as Mix No. 3 or Mix No. 7a) may be used at one or more SWMUs to achieve the desired process and remedial performance goals. These other recipes will be used after

INSERT

TABLE 1-1
REMEDIAL GOALS (RESIDENTIAL LEVELS), ANALYTICAL METHODS, AND ACCEPTABLE REPORTING LIMITS

INSERT

TABLE 1-2
REMEDIAL GOALS (INDUSTRIAL LEVELS), ANALYTICAL METHODS, AND ACCEPTABLE REPORTING LIMITS

INSERT

TABLE 1-3
REMEDIAL GOALS (ECOLOGICAL LEVELS), ANALYTICAL METHODS, AND ACCEPTABLE REPORTING LIMITS

INSERT

TABLE 1-4a
CLEANUP LEVELS FOR RINSE WATER FROM ROCK WASHING (DRINKING WATER LEVELS), ANALYTICAL METHODS, AND ACCEPTABLE REPORTING LIMITS

INSERT

TABLE 1-4b
CLEANUP LEVELS FOR RINSE WATER FROM ROCK WASHING (ECOLOGICAL LEVELS), ANALYTICAL METHODS, AND ACCEPTABLE REPORTING LIMITS

TABLE 1-5
DISCHARGE LIMITS FOR POND WATER WITHOUT PRETREATMENT

Parameter	Method of Analysis[1]	Discharge To WWTP Acceptance[2] Level (lbs/day)	Discharge To Surface Acceptance Level (NPDES monthly limit - mg/L)	Acceptable Reporting Limit (ug/L)
Explosives				
TNT	8330	HMX+RDX+TNT = 0.17 lbs/day Max. HMX+RDX+TNT = 2.0 mg/l Max.	-	6.4 (high) 0.12 (low)
RDX	8330	as above	-	14.0 (high) 0.84 (low)
HMX	8330	as above	-	13.0 (high) 1.0 (low)
Nitrates	300.0	-	90 Max.	1,000
Other parameters				
BOD	EPA 405.1	4.6	10 Ave/15 Max	5,000
COD	EPA 410.4	-	10 Ave/15 Max	10,000
TSS	EPA 160.2	4.6	10 Ave/15 Max	10,000
Ammonia-N (May 1 to Nov. 30)	EPA 350.2	0.9	3 Ave/ 6 Max	1,000
Ammonia-N (Dec. 1 to Apr. 30)	EPA 350.2	1.8	3 Ave/ 6 Max	1,000
Oil & Grease	EPA 413.1		26 Ave/ 52 Max	500
pH	Field Measure-ment	-	5.0 to 11.0 units	n/a
Cadmium	6010	0.0009	-	4.0
Chromium	6010	0.18	-	5.0
Copper	6010	0.006	-	10.0
Lead	6010	0.004	-	40.0
Nickel	6010	0.05	-	10.0
Zinc	6010	0.09	-	10.0

TABLE 1-5 (Continued) DISCHARGE LIMITS FOR POND WATER WITHOUT PRETREATMENT				
Parameter	**Method of Analysis[1]**	**Discharge To WWTP Acceptance[2] Level (lbs/day)**	**Discharge To Surface Acceptance Level (NPDES monthly limit - mg/L)**	**Acceptable Reporting Limit (ug/L)**
Silver	6010	0.004	-	5.0
Mercury	7470	0.00003	-	0.15
Total Cyanide	9010	0.003	-	10,000

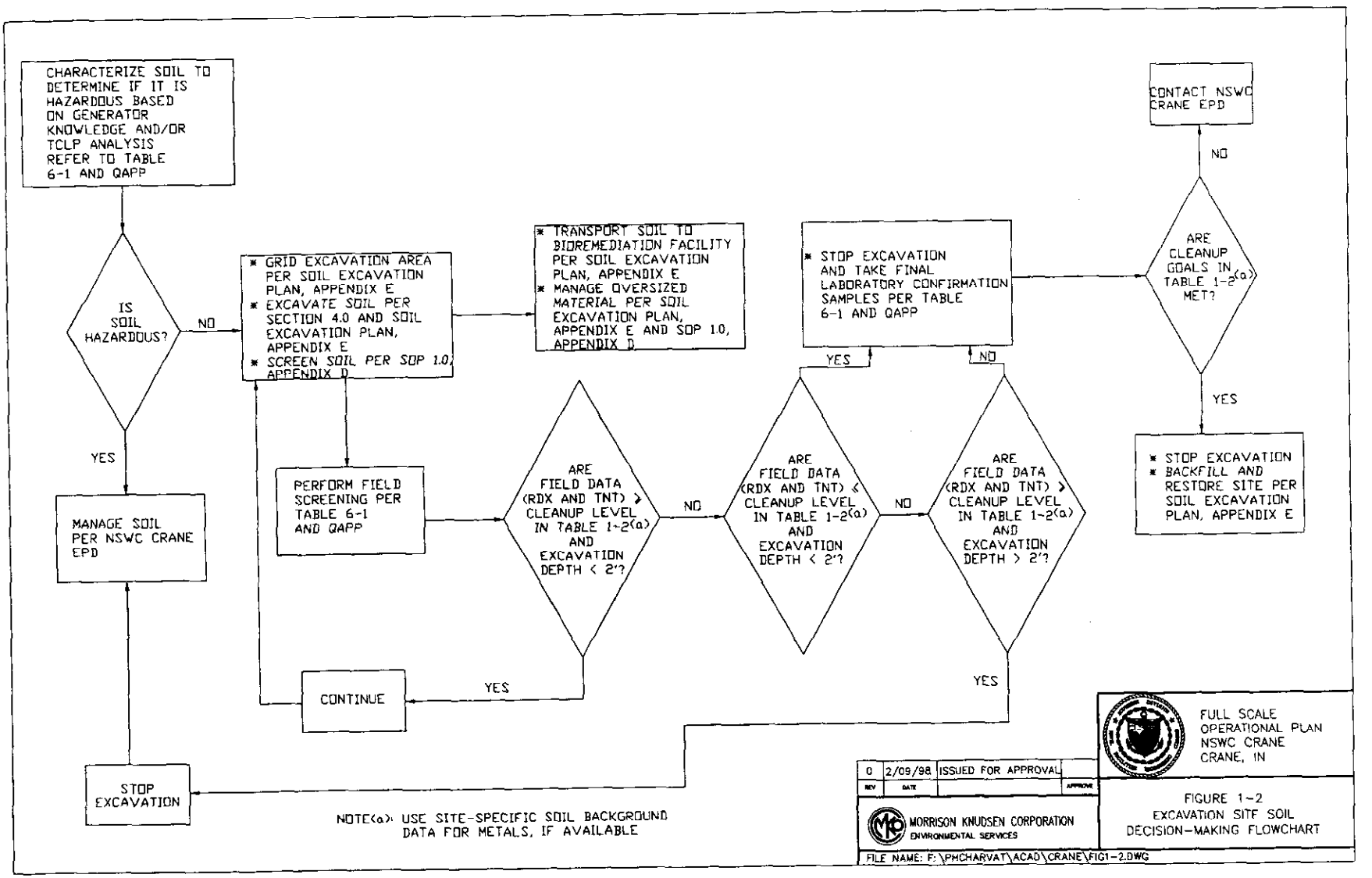
Notes:

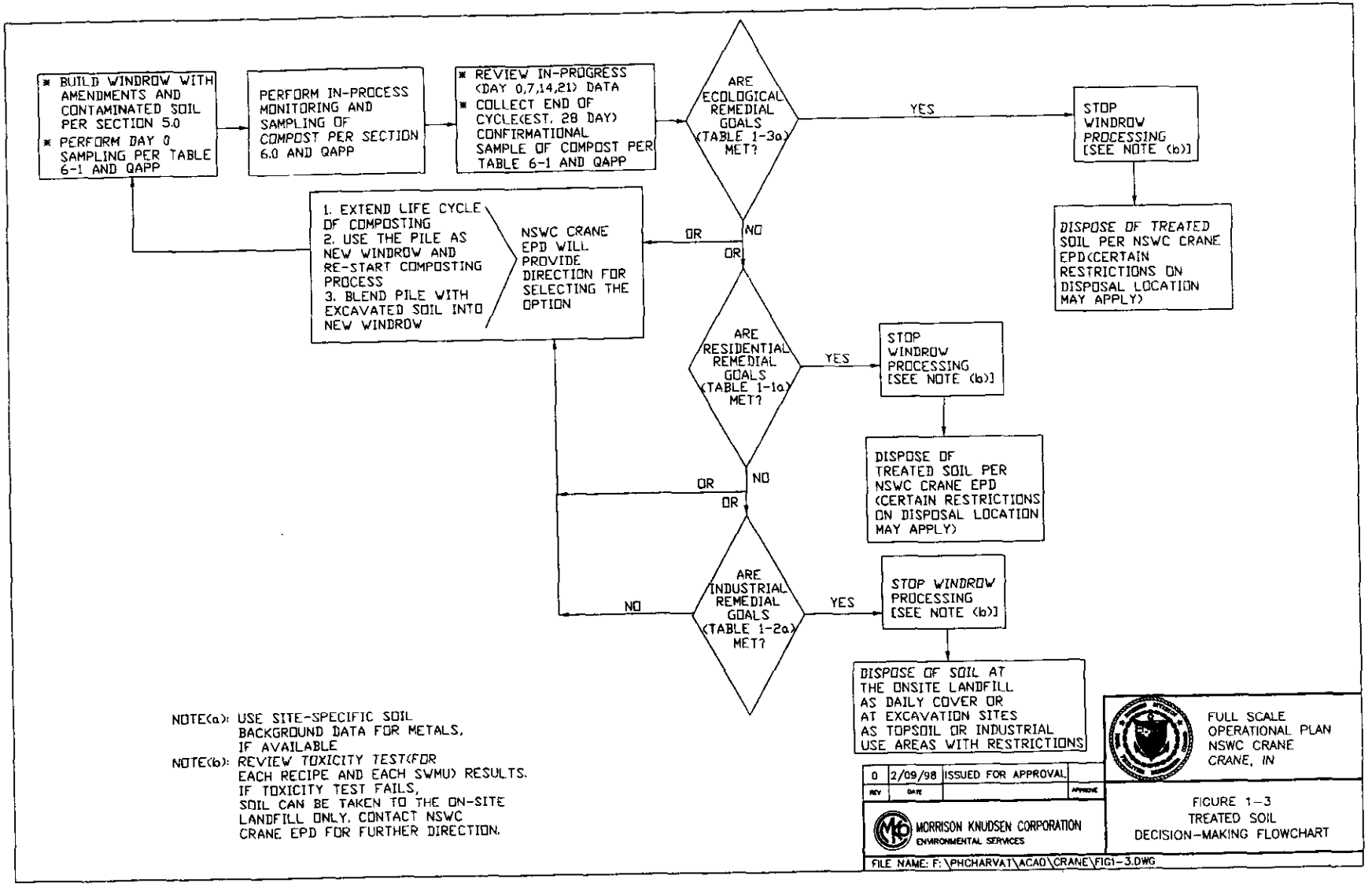
1. Analytical methods listed above are SW-846 methods, unless otherwise indicated.
2. Based on NSWC Crane Memorandum dated September 26, 1997 "Current Waste Water Dumping Guidelines" NSWC Crane Code 0957 to Code 09511 [NSWC Crane, 1997a]

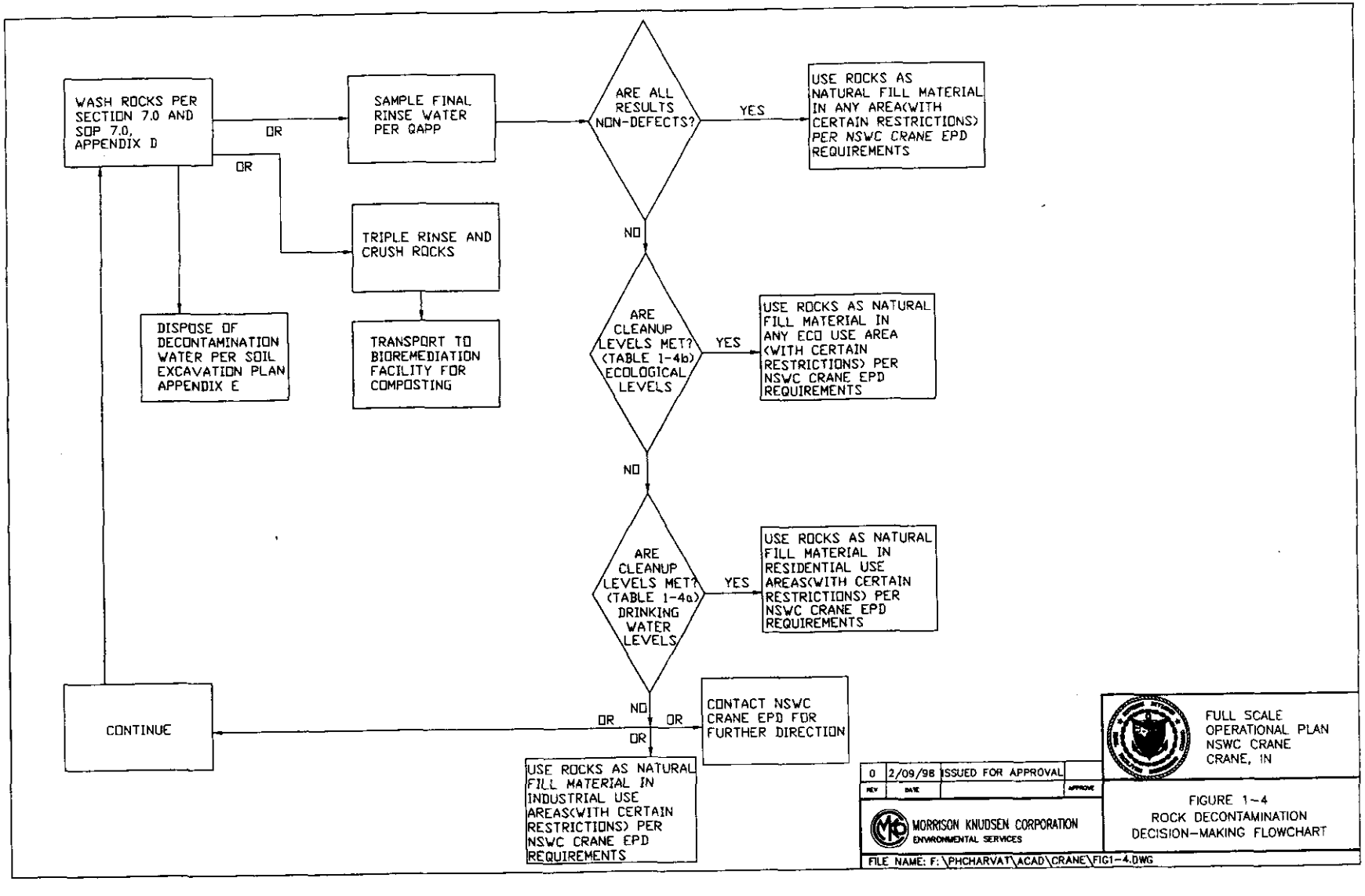
n/a: not applicable

TABLE 1-6 PROCESS PARAMETERS AND OPERATING GOALS	
Process Parameter	Operating Goal
Temperature	25 to 60 °C
Moisture	40 to 60 % (WHC)[1]
Oxygen	5 to 20 %

[1] Water Holding Capacity


CHARACTERIZE SOIL TO DETERMINE IF IT IS HAZARDOUS BASED ON GENERATOR KNOWLEDGE AND/OR TCLP ANALYSIS REFER TO TABLE 6-1 AND QAPP
IS SOIL HAZARDOUS?
NO
YES
MANAGE SOIL PER NSWC CRANE EPD
* GRID EXCAVATION AREA PER SOIL EXCAVATION PLAN, APPENDIX E
* EXCAVATE SOIL PER SECTION 4.0 AND SOIL EXCAVATION PLAN, APPENDIX E
* SCREEN SOIL PER SOP 1.0, APPENDIX D
* TRANSPORT SOIL TO BIOREMEDIATION FACILITY PER SOIL EXCAVATION PLAN, APPENDIX E
* MANAGE OVERSIZED MATERIAL PER SOIL EXCAVATION PLAN, APPENDIX E AND SOP 1.0, APPENDIX D
PERFORM FIELD SCREENING PER TABLE 6-1 AND QAPP
ARE FIELD DATA (RDX AND TNT) > CLEANUP LEVEL IN TABLE 1-2(a) AND EXCAVATION DEPTH < 2'?
NO
YES
CONTINUE
ARE FIELD DATA (RDX AND TNT) < CLEANUP LEVEL IN TABLE 1-2(a) AND EXCAVATION DEPTH < 2'?
YES
NO
* STOP EXCAVATION AND TAKE FINAL LABORATORY CONFIRMATION SAMPLES PER TABLE 6-1 AND QAPP
ARE FIELD DATA (RDX AND TNT) > CLEANUP LEVEL IN TABLE 1-2(a) AND EXCAVATION DEPTH > 2'?
NO
YES
STOP EXCAVATION
ARE CLEANUP GOALS IN TABLE 1-2(a) MET?
NO
YES
CONTACT NSWC CRANE EPD
* STOP EXCAVATION
* BACKFILL AND RESTORE SITE PER SOIL EXCAVATION PLAN, APPENDIX E
NOTE(a): USE SITE-SPECIFIC SOIL BACKGROUND DATA FOR METALS, IF AVAILABLE
FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN
0 | 2/09/98 | ISSUED FOR APPROVAL
REV | DATE | APPROVE
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES
FIGURE 1-2
EXCAVATION SITE SOIL
DECISION-MAKING FLOWCHART
FILE NAME: F:\PHCHARVAT\ACAD\CRANE\FIG1-2.DWG


* BUILD WINDROW WITH AMENDMENTS AND CONTAMINATED SOIL PER SECTION 5.0
* PERFORM DAY 0 SAMPLING PER TABLE 6-1 AND QAPP
PERFORM IN-PROCESS MONITORING AND SAMPLING OF COMPOST PER SECTION 6.0 AND QAPP
* REVIEW IN-PROGRESS (DAY 0,7,14,21) DATA
* COLLECT END OF CYCLE(EST. 28 DAY) CONFIRMATIONAL SAMPLE OF COMPOST PER TABLE 6-1 AND QAPP
ARE ECOLOGICAL REMEDIAL GOALS (TABLE 1-3a) MET?
YES
STOP WINDROW PROCESSING [SEE NOTE (b)]
DISPOSE OF TREATED SOIL PER NSWC CRANE EPD(CERTAIN RESTRICTIONS ON DISPOSAL LOCATION MAY APPLY)
NO
OR
OR
1. EXTEND LIFE CYCLE OF COMPOSTING
2. USE THE PILE AS NEW WINDROW AND RE-START COMPOSTING PROCESS
3. BLEND PILE WITH EXCAVATED SOIL INTO NEW WINDROW
NSWC CRANE EPD WILL PROVIDE DIRECTION FOR SELECTING THE OPTION
ARE RESIDENTIAL REMEDIAL GOALS (TABLE 1-1a) MET?
YES
STOP WINDROW PROCESSING [SEE NOTE (b)]
DISPOSE OF TREATED SOIL PER NSWC CRANE EPD (CERTAIN RESTRICTIONS ON DISPOSAL LOCATION MAY APPLY)
NO
OR
OR
ARE INDUSTRIAL REMEDIAL GOALS (TABLE 1-2a) MET?
NO
YES
STOP WINDROW PROCESSING [SEE NOTE (b)]
DISPOSE OF SOIL AT THE ONSITE LANDFILL AS DAILY COVER OR AT EXCAVATION SITES AS TOPSOIL OR INDUSTRIAL USE AREAS WITH RESTRICTIONS
NOTE(a): USE SITE-SPECIFIC SOIL BACKGROUND DATA FOR METALS, IF AVAILABLE
NOTE(b): REVIEW TOXICITY TEST(FOR EACH RECIPE AND EACH SWMU) RESULTS. IF TOXICITY TEST FAILS, SOIL CAN BE TAKEN TO THE ON-SITE LANDFILL ONLY. CONTACT NSWC CRANE EPD FOR FURTHER DIRECTION.
0 2/09/98 ISSUED FOR APPROVAL
REV DATE APPROVE
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES
FULL SCALE OPERATIONAL PLAN NSWC CRANE CRANE, IN
FIGURE 1-3
TREATED SOIL
DECISION-MAKING FLOWCHART
FILE NAME: F:\PHCHARVAT\ACAO\CRANE\FIG1-3.DWG


WASH ROCKS PER SECTION 7.0 AND SOP 7.0, APPENDIX D
OR
OR
SAMPLE FINAL RINSE WATER PER QAPP
TRIPLE RINSE AND CRUSH ROCKS
TRANSPORT TO BIOREMEDIATION FACILITY FOR COMPOSTING
DISPOSE OF DECONTAMINATION WATER PER SOIL EXCAVATION PLAN APPENDIX E
ARE ALL RESULTS NON-DEFECTS?
YES
USE ROCKS AS NATURAL FILL MATERIAL IN ANY AREA(WITH CERTAIN RESTRICTIONS) PER NSWC CRANE EPD REQUIREMENTS
NO
ARE CLEANUP LEVELS MET? (TABLE 1-4b) ECOLOGICAL LEVELS
YES
USE ROCKS AS NATURAL FILL MATERIAL IN ANY ECO USE AREA (WITH CERTAIN RESTRICTIONS) PER NSWC CRANE EPD REQUIREMENTS
NO
ARE CLEANUP LEVELS MET? (TABLE 1-4a) DRINKING WATER LEVELS
YES
USE ROCKS AS NATURAL FILL MATERIAL IN RESIDENTIAL USE AREAS(WITH CERTAIN RESTRICTIONS) PER NSWC CRANE EPD REQUIREMENTS
NO
OR
OR
OR
CONTACT NSWC CRANE EPD FOR FURTHER DIRECTION
USE ROCKS AS NATURAL FILL MATERIAL IN INDUSTRIAL USE AREAS(WITH CERTAIN RESTRICTIONS) PER NSWC CRANE EPD REQUIREMENTS
CONTINUE
0 2/09/98 ISSUED FOR APPROVAL
REV DATE APPROVE
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES
FILE NAME: F:\PHCHARVAT\ACAD\CRANE\FIG1-4.DWG
FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN
FIGURE 1-4
ROCK DECONTAMINATION
DECISION-MAKING FLOWCHART

approval by the U.S. Navy and the U.S. EPA. Mix No. 3 consisted of 25% alfalfa; 25% turkey manure; 25% wood chips; and 25% soil. Mix No. 7a consisted of 25% soil; 3.5% chicken manure; and 71.5% straw. A discussion on the amendment supply and storage is provided in Section 5.1 of this Plan.

1.5 BACKGROUND

In 1993, the U.S. Navy shifted emphasis from site investigations to actual cleanup activities. As a result of this decision, and to reduce or eliminate the potential for contaminant migration, NSWC Crane evaluated its 31 SWMUs to determine which ones would be amenable to accelerated cleanup actions, otherwise known as IMs. NSWC Crane submitted a proposal to the U.S. EPA to conduct IM cleanup actions at selected SWMUs. Four of those SWMUs have been identified for IM cleanup due to explosive contaminants in the soils and a fifth SWMU identified as the facility for treatment of the affected soil. Those SWMUs are:

- SWMU-03/10, Ammunition Burning Grounds
- SWMU-10/15, Rockeye Munitions Facility
- SWMU-12/14, Mine Fill A
- SWMU-13/14, Mine Fill B
- SWMU-33/00, Bioremediation Facility

A brief description of these SWMUs is provided in the following sections. Selected photographs of these SWMUs are included in Appendix B of this Plan.

1.5.1 SWMU-03/10, Ammunition Burning Ground

The ABG area is located in the eastern portion of the NSWC as shown in Figure 1-1, and occupies approximately 50 acres. Access is by Highway H-462 via H-58, H-274 and H-463. The ABG has been used extensively since the 1940s to treat materials contaminated with explosives, bare explosives, candles, flares, solvents, red phosphorus, small detonators, and fuse materials. The largest quantities were destroyed between 1956 and 1960, when 15,000 pounds per day of smokeless powder and 48,000 pounds per day of high explosives were burned directly on the soil surface. Ammunition burning is now performed in clay-lined steel pans [ACOE, 1992a]. The area is also used for flashing the residue from bombs and projectiles after they have been melted or drilled out to remove the bulk of the explosives. Close coordination between NSWC operations personnel and the remediation personnel will be required to minimize any impact to ongoing operations.

The results of the RFI Part 2, Phase III Soils Study for the ABG, SWMU #03/10 indicated total xylene, ethylbenzene and toluene were detected in surface soil at concentrations ranging from 0.00061 to 0.0091 mg/kg. Trichloroethylene (TCE) was detected at a maximum concentration of 0.017 mg/kg. This TCE value falls below the

risk-based concentration (RBC) of 3 mg/kg, for a soil to air inhalation scenario [USEPA, 1994a] and does did not exceed residential values for soil ingestion (58 mg/kg). Polynuclear aromatic hydrocarbons (PAHs) were detected in 9 of 33 samples collected. The highest PAH concentration detected was 0.37 ppm [benzo(b)fluoranthene]. All detected concentrations were below RBCs [ACOE, 1995].

In addition, eight explosives (HMX; RDX; TNT; TNB; 2,4-DNT; 2,6-DNT; 2A-DNT; and 4A-DNT) were detected in surface soils collected during the August, 1993 study. The maximum detected concentrations for HMX, RDX and TNT were 223 mg/kg, 1820 mg/kg and 136 mg/kg, respectively. Concentrations of metals detected during the study were compared to background levels for the site. Calcium, cadmium, copper, lead and zinc were found in surface soils at 100 times background levels. Magnesium, silver, tin and phosphorus were detected at concentrations 10 times above background levels [ACOE, 1995].

Aerial photographs are provided in Appendix B for additional detail of the site. Based on the previous sampling data, an estimated 60,000 bank cubic yards of explosives-contaminated soil will be excavated at the ABG area. Additional site characterization and details of the excavation activities are provided in Appendix E of this Plan.

1.5.2 SWMU-10/15, Rockeye

The Rockeye Munitions area is located in the northeastern portion of the NSWC at the intersection of Highways H-161 and H-45 as shown in Figure 1-1. This area, an NSWC operating unit, is a production facility that was formerly a press-loading operation for 3-inch projectiles. It was later converted to a case-filling operation for cluster bombs. A large volume of wastewater is produced by the operation and is collected in sumps. Prior to 1978, explosives-contaminated waters from full sumps were discharged directly to a branch of Sulfur Creek on the north side of the facility and to Turkey Creek, a tributary to Boggs Creek, on the south. Residues from the sumps are now pre-treated, pumped, and transported to an on-site treatment facility [ACOE 1992b].

The subsurface soil explosive concentrations range up to 42.7 mg/kg for individual constituents. Surface soil samples contained explosive concentrations ranging from non-detects to as high as 10,400 mg/kg (HMX). DNB, DNT, and TNB were found at concentrations below quantitation limits (the concentration reported was estimated) and tetryl was not detected at all. TNT was found in surface samples at a maximum concentration of 295 mg/kg and at a maximum level of 1.40 mg/kg in subsurface samples. An RDX concentration of 3,350 mg/kg was found in surface samples. HMX was found in more samples and at higher concentration than any other explosive compound analyzed. Subsurface soil samples contained HMX at concentrations above quantitation limits. HMX concentrations of 1,960 and 10,400 mg/kg were found in surface soil samples from two areas. The surface soils beneath the exhaust of a Rockeye Building 2734 ventilator contained concentrations of TNT, RDX, and HMX at

295, 3,350, and 10,400 mg/kg, respectively. These concentrations were the maximums for these compounds in the Rockeye soil samples [ACOE 1992b].

Comparison of the maximum metals concentrations of Rockeye subsurface soils to background subsurface soils does not appear to yield conclusive evidence as to whether or not a release of metals has occurred at Rockeye. Comparison of metals analyses of Rockeye surface soils with background samples indicates that maximum concentrations in Rockeye surface soils were higher than the background, except for nickel and antimony [ACOE 1992b].

Based on the previous sampling data and locations, the areas below the ventilator exhausts at Buildings 2731 and 2734 have been selected as excavation sites for the IM cleanup discussed in this Plan. In addition, the sumps, drainage ways, and drainage way outfalls will be excavated and treated during this IM cleanup. Aerial photographs are provided in Appendix B for additional detail of the site. An estimated 18,000 bank (in-place) cubic yards of explosives-contaminated soil will be excavated at the Rockeye Munitions area and transported to the Bioremediation Facility for compost treatment. Additional site characterization and details of the excavation activities are provided in Appendix E of this Plan.

1.5.3 SWMU-12/14, Mine Fill A

Mine Fill A is located in the west-central portion of NSWC situated along Highway H-17 as shown in Figure 1-1. Mine Fill A consists of 29 buildings which have been used to assemble mines, depth charges, rocket heads, aerial bombs, and projectiles. Currently, Mine Fill A is used to produce 2,000-pound aerial bombs. Demilitarization activities also take place in this area. The major sources of contamination were wash down operations and the exhaust ventilation system.

Soil contaminants include TNT, RDX, and HMX. Concentrations of individual constituents in the soil range from non-detect to 15,300 mg/kg (RDX). TNT and HMX were reported as high as 3,790 mg/kg and 1,340 mg/kg respectively. Soil samples were collected in 1985 around Buildings 153 and 158 with the highest concentrations of contaminants detected near Building 153 [Halliburton, 1992]. Aerial and ground photographs are provided in Appendix B for additional detail of the SWMU. Approximately 210 cubic yards of an estimated 11,000 cubic yards soil of was excavated and transported to the Bioremediation Facility for use in the pilot-scale testing, performed from June, 1997 through November, 1997 [MK, 1998a]. The remaining soil will be excavated and transported to the Bioremediation Facility for composting as part of the full-scale operations. Additional site characterization and details of the excavation activities are provided in Appendix E of this Plan.

1.5.4 SWMU-12/14, Mine Fill B

Mine Fill B is located in the west-central portion of NSWC as shown in Figure 1-1. Mine Fill B consists of 39 buildings and is situated along Highway H-18. Historically, its operations were similar to Mine Fill A. It is currently used for the renovation and rework of munitions. Activities include the application of enamel and bituminous solvent coatings, rotary grit blasting, spray painting, propellant removal, and fuse and configuration changes. Explosive particulate matter was exhausted through the ventilation system. Rinse and wastewater containing Composition B, HBX-1, HBX-3, H6 (all combinations of TNT, RDX, HMX, with additives) and TNT are potential contaminants. Concentrations of individual explosives in soils ranged from undetected to 24,000 mg/kg (RDX). TNT and HMX were reported as high as 2410 mg/kg and 2020 mg/kg respectively. Based on operational history, physical condition, location, waste characteristics, visual evidence, and analytical data, releases to ground water, surface water, soil, and air have occurred [Halliburton, 1992].

Based on the previous sampling data and locations, the areas around Buildings 166, 167, 168, 171, 172, and 173 have been selected as excavation sites for soil interim measures cleanup. Aerial photographs are provided in Appendix B for additional detail of the site. An estimated 18,000 cubic yards of explosives-contaminated soil will be excavated at the Mine Fill B area and transported to the Bioremediation Facility for composting. Additional site characterization and details of the excavation activities are provided in Appendix E of this Plan.

1.5.5 SWMU-33/00, Bioremediation Facility

The Bioremediation Facility is a 5.5 acre complex located in the southwest quadrant of NSWC Crane near the Crane Landfill as shown on Figure 1-1. The facility was constructed from March of 1996, to June of 1997 by the Navy Remedial Action Contractor (RAC), Morrison Knudsen Corporation (MK) with funding provided from the Defense Environmental Restoration Account managed by Southern Division, Naval Facilities Engineering Command. The Bioremediation Facility is comprised of three compost buildings each measuring 300 feet long by 70 feet wide by 18 feet tall, a vehicle decontamination facility, two lined storm-water collection ponds, a diesel storage tank, amendment storage area, and a field laboratory and administration facility. A description of the facility is provided in Section 3.0 of this Plan.

2.0
REGULATORY COMPLIANCE

2.1 CONTAMINATED MEDIA CLASSIFICATION

On-site bio-treatment of contaminated media must comply with all relevant permitting and reporting requirements of RCRA (1976 *et seq.*).

Data obtained from *in-situ* soil samples of all excavation areas indicate that the contaminated soil does not contain 40 CFR 261 Appendix VIII hazardous constituents above the characteristic reactivity threshold as determined in 40 CFR 261.23. Contaminated soil containing reactive nitrated aromatics has been evaluated and indicated that reactivity was not observable if the reactive constituents are present below concentrations of 10% (100,000 mg/kg) [Kristoff et al, 1987]. The site soil concentrations of nitrated aromatic compounds are below this concentration.

Wash-out water from ammunition processing has previously been released to soil at Rockeye, Mine Fill A, and Mine Fill B. This wastewater was classified as KO47 (pink/red water from TNT operations). Per the regulations, KO47 waste becomes delisted upon deactivation. The reactive level for TNT has been determined to be 10 percent as discussed above. If the soils do not contain TNT concentrations greater than 10%, then the soil is acceptable for treatment at the Bioremediation Facility.

Records indicate that pyrotechnics, explosives, and propelants (PEP)-contaminated waste had been burned on the ground at the ABG. The Bioremediation Facility can only accept soil contaminated with solvents if the soil is segregated and approved for treatment at the Bioremediation Facility by the NSWC Crane EPD and the U.S. EPA.

It is anticipated that none of the soil will be considered a listed RCRA hazardous waste. Review of in-situ soil analyses indicate that all soils will be non-reactive and considered non-hazardous waste. After treatment at the Bioremediation Facility, the hazardous constituents will have been removed, and the resulting soil will be suitable for use as daily cover material at the on-site landfill; for use as topsoil at the excavation sites; or for use at other areas as determined by NSWC Crane EPD. If the generation of hazardous waste is expected from excavation in an area, activities in that area will stop until a decision is reached by the NSWC Crane EPD as to the ultimate disposition of the material. PCB-contaminated soil greater than 50 ppm at Mine Fill B will not be transported to the Bioremediation Facility for treatment. Treated soil between 10 and 50 ppm of PCBs will be covered with a minimum of ten inches of clean soil (i.e., less than one ppm PCB)

Based on the classification of the soil to be treated as non-hazardous waste, the Bioremediation Facility and buildings have been designed and approved as a solid

waste and contaminated media treatment facility meeting the applicable codes, standards, and regulations.

2.2 WASTE MANAGEMENT

The NSWC Crane EPD representative will coordinate all waste management and disposal. The contractors will comply with all NSWC Crane EPD requirements for management of any solid wastes, hazardous wastes, or contaminated wastes. A waste management handbook is available in the Bioremediation Facility Office for handling of wastes based on NSWC Crane EPD requirements.

The bioremediation process will generate water from decontamination of sampling and operating equipment. Decontamination water will be sampled and analyzed as required by this Plan and the approved QAPP for Full-Scale Operations [MK, 1998b]. Requirements for disposal of decontamination water is specified in Section 7.2.

Specific waste containers (e.g., acetone, field screening kits, etc.,) will be generated at times in response to operational needs. These materials may be characterized by generator knowledge, Material Safety Data Sheets (MSDS), or sampling. All sampling and analysis will conform to this Plan and the approved QAPP for Full-Scale Operations [MK, 1998b]. All waste storage containers will be properly stored, labeled, and disposed of in accordance with the regulations listed above and NSWC Crane directives. Specifically, waste such as acetone from the field test kits and some of the waste which is explosive-contaminated combustible material can be transported for treatment at ABG. A *Contaminated Scrap Manifest - NSWCC 6280/4, Rev. 6-84* will be filled out and submitted for approval by the NSWC Crane EPD. Upon approval, these specific wastes will be transported to the ABG for treatment.

Experience has shown that Personnel Protective Equipment (PPE) is contaminated with minimal amounts of material it comes in contact with. Therefore, PPE is classified as a solid waste and will be disposed of at the on-site landfill.

2.3 STORM-WATER DISCHARGE

The NSWC Crane has obtained a Storm-water Discharge Permit, [NSWC Crane, 1997b] under 327 IAC 15; National Pollution Discharge Elimination System (NPDES) General Permit Rule Program. This permit will be amended to include discharge levels for the Bioremediation Facility storm-water collection system. Operations will be in compliance with the specifications in this Plan, which is consistent with the permit. The storm-water diversion and retention controls for the Bioremediation Facility are described in Sections 3.6 and 7.2.4 of this Plan. Additional details on sampling procedures and analytical methodologies for storm-water discharge are provided in the approved QAPP for Full-Scale Operations, Section 4.3 [MK, 1998b].

2.4 LANDFILL PERMITTING

An application for a Minor Modification, if required, to the existing landfill permit will be submitted by NSWC Crane EPD personnel to the Indiana Department of Environmental Management (IDEM). If treated soil will meet the remedial goals specified in Tables 1-1 through 1-3, no permit modification is required. However, a letter indicating that the treated soil will meet the remedial goals is required. This letter will be submitted by NSWC Crane EPD to IDEM prior to disposal of treated soil at the on-site landfill.

2.5 EXCAVATION PERMITTING

A Digging Permit is required for soil excavation in the SWMUs. This permit will be obtained from the Public Works Officer and is valid for the duration of work unless physical conditions change, at which time it will be revised. Additional details on excavation permitting is provided in Section 4.0 and Appendix E of this Plan. In addition, statement of the removal or absence of unexploded ordnance (UXO) in the work zone has been obtained for all SWMUs addressed in this Plan and is provided in Attachment A to the Soil Excavation Plan (Appendix E).

2.6 SPECIFICATIONS, CODES, AND STANDARDS

Compliance in the material, examination, testing, inspection, and documentation will include, but not be limited to, the applicable portions of the specifications, codes, and standards listed below. References to codes, specifications, and standards will be to the latest edition, complete with all addenda and revisions applicable on the date of approval of this Plan.

- U.S. Navy or NSWC Crane guidance

- U.S. Occupational Safety and Health Administration
  29 CFR 1910, Occupational Safety and Health Standards
  29 CFR 1926, Safety and Health Regulations for Construction

- U.S. Army Corps of Engineers
  EM-385-1-1, Safety and Health Manual

- U.S. Environmental Protection Agency
  40 CFR 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices
  40 CFR 261, Identification and Listing of Hazardous Waste
  40 CFR 262, Standards Applicable To Generators Of Hazardous Waste
  40 CFR 264, Subpart S Corrective Action
  40 CFR 300, National Oil and Hazardous Substance Contingency Plan

- U. S. Department of Transportation
  49 CFR 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements. This part describes requirements for completing shipping papers; marking, labeling, and placarding; training; and emergency response.
  49 CFR 173, General Requirements for Shipments and Packaging. This part describes classification and packaging of hazardous materials.

- Indiana Department of Environmental Management
  327 IAC 15, NPDES General Permit Rule Program
  329 IAC 2, Solid Waste Management
  329 IAC 3.1, Hazardous Waste Management Permit Program And Related Hazardous Waste Management

- Department of Defense Explosives Safety Board explosive safety standard for construction equipment.

- National Codes and Standards
  ASTM, American Society for Testing and Materials
  ANSI, American National Standards Institute
  NEMA, National Electrical Manufactures Association
  NEC, National Electric Code
  NFPA, National Fire Protection Association

2.7 ENVIRONMENTAL PROTECTION

All work will be conducted in a way that minimizes pollution of the air, water, and land. Noise and the disposal of solid waste materials will be controlled to protect human health and the environment.

2.7.1 Dust Control

All excavations, stockpiles, access roads, and other work areas will be maintained free from excess dust to avoid causing a hazard. Dust at the excavation sites and Bioremediation Facility will be controlled with a wetting spray from a potable water source.

2.7.2. Erosion and Sediment Control

Temporary erosion control will be used in excavation areas until permanent surface drainage is reestablished. The amount of bare soil exposed at any time is not expected to exceed three acres, and the excavations will be protected when work is not in

progress.

All erosion control structures in excavation areas are to be built to conform to SWMU-specific conditions. Generally, erosion control structures will consist of berms, ditches, sumps or straw bale dikes. These structures will be maintained as often as required to ensure that sediment is minimally permitted to migrate into or out of exclusion zones. Water contained and collected within the exclusion zones, except water protected from cross-contamination, will be pumped to on-site storage tanks and handled as stated in Appendix E. If excavation area exceeds three acres in any one location, an erosion control plan will be prepared and submitted to the NSWC Crane EPD for approval.

3.0
BIOREMEDIATION FACILITY DESCRIPTION

The following descriptions are supported by design drawings and technical specifications provided in the Work Plan for Soils Bioremediation Facility and Task-Specific SSHP [MK, 1997a].

The Bioremediation Facility is shown on drawing G-100, located in Appendix C, and consists of the following structures and service elements:

- Three 70-foot wide by 300-foot long compost buildings
- Amendment storage area
- Amendment haul road area
- Equipment and personnel decontamination areas
- Office and laboratory trailer area
- Storm-water diversion and retention controls
- Basic services and utilities, including a water supply source for dust suppression and compost moisture additions

Selected photographs of the various structures of the Bioremediation Facility are included in Appendix B of this Plan.

3.1 COMPOST BUILDING AREA

The Compost Building Area is located in the south central and western portions of the Bioremediation Facility as shown on drawing G-100 of Appendix C and as amended in the approved plans. The compost building structures consist of a metal structural frame with a light-weight roof designed to accommodate both local climatological conditions and the height of equipment selected for composting operations. The compost building side walls are constructed of six-inch thick concrete to a height of four feet with metal siding extending to the roof line. The entrance/exit ends of the buildings are open with six-inch high entrance/exit ramps to prevent run-on or run-off conditions. The floors of the compost structures are concrete, designed to slope to an epoxy-coated fluid collection sump. Each compost building is provided with a one and one-half inch diameter underground water line. Ventilation is provided for each of the three compost buildings.

The area surrounding the compost buildings is provided with asphalt paving coated with an approved sealant to limit infiltration of contaminated water into the soil. Where required, the outer perimeter of the paved surface has a six-inch high asphalt curb for run-on and run-off control. The paved surface at the Compost Building Area slopes to the southwestern edge of this area where a storm-water storage/retention pond is located.

3.2 AMENDMENT STORAGE AREA

The Amendment Storage Area is located in the southeast section of the Bioremediation Facility as shown on drawing G-100 in Appendix C, and is used to store bulking agents and manure amendments. This area is surfaced with asphalt paving and coated with an approved sealant to limit infiltration of contaminants. The outer perimeter of the paved surface has a six-inch high asphalt curb for run-on and run-off control. The paved surface of the Amendment Storage Area slopes to the southern edge of this area where a second storm-water storage/retention pond is located.

The Amendment Storage Area has multiple temporary bins for storing the amendment materials used in the composting operation. The bin side walls are constructed of precast concrete blocks which can be adjusted as required to accommodate different storage configurations. All stockpiles of amendments will be covered for protection from wind and rain at the end of every day.

A 500-gallon capacity above-ground diesel fuel storage tank and containment pad is located on the north-central edge of the Amendment Storage Area. The containment pad is cast concrete with eight-inch CMU block walls two courses high, coated with an epoxy paint and provided with a two-inch diameter drain pipe and a lockable valve for storm-water discharge. The fuel dispenser also has a locking device.

3.3 AMENDMENT HAUL ROAD AREA

The Amendment Haul Road area is located in the southeastern portion of the Bioremediation Facility as shown on drawing G-100 in Appendix C. The amendment haul road is constructed of compacted limestone. Drainage swales on both sides of the haul road and corrugated steel culverts at each end of the haul road maintain proper drainage.

3.4 EQUIPMENT AND PERSONNEL DECONTAMINATION AREAS

An Equipment Decontamination Facility is constructed for cleaning trucks and equipment that have come into contact with contaminated soil within the Bioremediation Facility. Trucks and equipment will be cleaned using a high-pressure, low-volume water spray system. The equipment decontamination area consist of a vehicle wash area, a 4,000-gallon capacity epoxy coated fluid collection and storage sump, a toilet facility, and equipment room. A boot wash area is located on the east side of the truck wash to allow personnel to cleanse their boots prior to moving to the shower/change trailer. A sanitary sewer line from the decontamination facility toilet room is routed to a pump/lift station located in the office/laboratory area.

The Personnel Decontamination Area consists of a shower/locker room trailer with change room area, lockers, lavatory, toilets and showers. The sanitary sewer line is

routed to the pump/lift station in the office/laboratory area.

3.5 OFFICE AND LABORATORY TRAILER AREA

The Office and On-Site Laboratory Trailers are located north of the Compost Building Area as shown on drawing G-100 in Appendix C. They are provided with a compacted limestone, 24-vehicle capacity, parking area. Sanitary sewer service is provided by way of a grinder pump/lift station as specified in the technical specifications and drawings. The existing roadside drainage swales are sloped to obtain proper drainage.

The On-Site Laboratory Trailer contains the necessary equipment and supplies to support the process monitoring requirements as described in Section 6.0.

3.6 STORM-WATER DIVERSION AND RETENTION CONTROLS

The facility utilizes both the existing topography and site drainage controls to control storm-water run-off and run-on as shown on drawing G-100 in Appendix C. Two lined storm-water retention ponds sized to store rainfall from a 10-year, 24-hour storm are constructed inside the Bioremediation Facility. Each pond has a 10-foot high chain link perimeter fence with access gates for protection against wildlife intrusion. The access gates will also be fenced to provide protection against wildlife intrusion. The discharge pipes for both ponds are controlled with a locking device which allows for controlled on-site storm-water storage/retention and off-site storm-water discharge.

Water collected in the retention basin will be sampled following a storm to determine whether the water meets off-site discharge or sanitary sewer influent requirements. Water not meeting off-site discharge requirements will either be recycled in the soil treatment area for compost moisture adjustment, pumped into the sanitary sewer system, or transported to one of the water treatment facilities located at Mine Fill A and Rockeye. Evaporation will be the preferred method of decreasing retention pond volumes, but analyses of retained water will be kept current so that water may be discharged when needed.

NSWC Crane EPD will implement the NPDES discharge permit [NSWC Crane, 1997b] and obtain another modification for discharge of the pond water to the local drainage swales.

4.0
SOIL EXCAVATION, SCREENING, TRANSPORTATION, AND SITE RESTORATION

Prior to initiating any excavating, a Digging Permit will be required and will be obtained through the Public Works Department, Building 2516. Prior to mobilization of excavation equipment, all areas of excavation, work configuration, the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), Support Zone (SZ), soil screener location, stockpile area, etc. will be established in the field and clearly identified as specified in the Soil Excavation Plan in Appendix E. A complete description of the excavation area, screening, and sampling of soil as well as the equipment decontamination and SWMU restoration is described in the Soils Excavation Plan in Appendix E. A brief summary of each major activity is provided in the following sections.

4.1 SOIL EXCAVATION

Soil excavation will be performed by a backhoe/loader, and/or a steer skid loader (Bobcat) and hand digging. A detailed soil excavation plan is provided in Appendix E for each SWMU.

4.2 SOIL SCREENING

Screening is required to ensure that the soil to be treated is homogenous so that the composting operation is effective. Contaminated soil will be screened to remove oversized material (1.5-inch or larger) from the excavated soil prior to use for composting. Smaller screen sizes may be used when screening for metal removal is required. The screening will be performed using a screen with a minimum 50 ton/hr capacity. The screen will be of a standard design, portable, road legal for towing, self-powered, and will have a feed hopper with grizzly bars, fines stacking conveyor and a reject (oversized material) discharge conveyor. A step-by-step procedure for soil screening is provided in the Field Standard Operating Procedure (SOP) 1.0 in Appendix D.

After screening at the excavation SWMU, the material that passes through the screen will be dropped from the fines stacking conveyor into a lined stockpile area, or directly into a conveyor for direct loading in the live-bottom semi-tractor trailers for transport to the Bioremediation Facility. Stockpiled material, that does not pass through the screen (i.e., coarse fractions determined to be rejected materials) at the excavation site, will be segregated and placed in separate lined and bermed areas and will be covered during periods of precipitation. Screened soil may be stockpiled in one of the three compost buildings.

Post-excavation in-situ confirmatory soil samples will be collected and their locations recorded. Confirmatory soil samples will meet the cleanup levels specified in Table 1-2 (industrial levels) prior to backfilling the area. This sampling is further described in Section 4.5 of the approved QAPP for Full-Scale Operations [MK, 1998b].

4.3 TRANSPORTATION

The transport route may vary depending upon NSWC Crane operations during the periods of soil transport. SWMU-specific transportation routes are described in the Soil Excavation Plan in Appendix E of this Plan.

Each truck load of screened soil will be weighed to determine and record the quantity and weight of soil entering the Bioremediation Facility. The trucks will be weighed at the truck scale at the entrance to the Bioremediation Facility access road as described in Field SOP 2.0 in Appendix D of this Plan.

4.4 BACKFILLING AND SITE RESTORATION

As equipment is no longer required in the EZ it will be decontaminated and moved to the SZ. After all contaminated materials are containerized, the remaining equipment will be decontaminated and moved to the SZ. The decontamination equipment will then be cleaned and the work zone barriers removed. All decontamination fluids will be collected and disposed of at the Mine Fill A or Rockeye treatment facility, pumped into the on-site sanitary sewer system, transported off-site for treatment, or disposed of using a method approved by the NSWC Crane EPD Representative.

The excavation will be surveyed to determine the volume of the excavation, to record the extent of the excavation, and to record the location of the post-excavation samples. The excavation may be backfilled to grade with non-contaminated fill from an on-site borrow source and/or with approved compost material at the end of the excavation period.

The structural backfill material may be placed in 12-inch lifts and compacted. Backfilled areas may be covered with a minimum of three inches of topsoil (which may include the clean or approved treated soil compost material), seeded with native grasses, fertilized, and watered or covered with other materials. Erosion control measures will be maintained in seeded areas until the growth of grasses is sufficient to prevent erosion.

5.0
COMPOSTING PROCESS DESCRIPTION

The composting operation process flows are illustrated on drawing 4324-0009-02-A in Appendix C. The full-scale composting operation consists of the following major steps to be performed for each windrow:

- Amendment Supply and Storage
- Load Amendments into Grinder/Mixer
- Load Amendment Blend into Windrow
- Load Soil into Windrow
- Turn/Mix Windrow
- Unload Windrow and Transport Soil for Disposal

5.1 AMENDMENT SUPPLY AND STORAGE

All amendment trucks will be weighed in an off-site certified scale and records maintained at the Bioremediation Facility Office. Prior to off-loading of amendments, the delivery trucks will be weighed (randomly at the rate of 20 percent of trucks by amendment type) on the truck scale at the entrance to the Bioremediation Facility access road as described in Field SOP 2.0 in Appendix D of this Plan. Trucks that have been weighed off-site and are too large to travel on the Bioremediation Facility truck scale are not required to be re-weighed on-site. The amendments will be brought on-site by way of the amendment haul road and stored in the asphalt-paved amendment storage area as illustrated on drawing P-100 in Appendix C. All amendment suppliers will be identified on the Record of Recipe form, Field SOP 3.0 in Appendix D. The suppliers may change during the course of this IM cleanup.

5.1.1 Chicken and Turkey Manure

The chicken manure comes from laying hens up to 80 weeks old. The chickens diet consists of grain, grain by-products, and calcium. The manure contains no bedding, and contains approximately 1% feathers, eggs or other natural impurities.

The turkeys are hens, 6-14 weeks old. Their diet consists of grain, grain by-products, meat by-products, fish by-products, calcium, phosphorus, salt, trace minerals, animal and vegetable fat, anti-oxidants, metholnine, and lysine. The manure contains a bedding material that is a mixture of approximately 30% by volume rice hulls, approximately 60% by volume sawdust, and approximately 10% by volume wood chips, and contains approximately 1% feathers, eggs or other natural impurities.

Both the chicken and turkey manures will be delivered in bulk to the amendment storage area. Due to potential odor and leaching concerns, the manures will be delivered within one week of the time they will be incorporated into the windrows to

ensure quality and freshness of the amendment.

5.1.2 Alfalfa and Straw

The alfalfa hay and straw will be provided in bales bound with hemp or a plastic mesh baling material which will be removed prior to amendment blending. The supplier will deliver the alfalfa and straw within two weeks of windrow construction.

5.1.3 Wood Chips

Wood chips will be delivered in bulk to the amendment storage area, within two weeks of windrow formation. Wood chips will be ground to 1.5 inch minus size.

5.1.4 Amendment Storage

The amendments will be stockpiled in bins separated by movable concrete dividers. The amendments will be stored within the amendment storage bins and will not flow outside the diked areas. Bales of alfalfa and straw may be stored along the northern edge of the amendment storage area as shown in Figure P-100 in Appendix C. Available amendment storage capacity has been allocated for more than 1,200 cubic yards, thus allowing more than sufficient storage capacity of amendments for one building of full-scale operation. Any ponding of water on the asphalt pavement will be manually removed within 24 hours, except during periods of precipitation.

All stockpiles are to be covered when not in use for protection from precipitation and wind. The covers are to be placed in a manner that directs clean storm-water away from the storage area. The covers are to be made of plastic of sufficient strength to withstand typical weather conditions and frequent handling. The covers are to be held in position with a sufficient number of weighted items to keep them in place during a strong wind. Efforts will be made to avoid puncturing the covers when placing the weighted items. If amendments are showing signs of excess fluid, straw bales will be placed along the edges of the dividers to minimize nutrient water run-off from one section to another. When not in use the cover will remain inside the amendment storage area.

5.2 LOAD AMENDMENTS INTO GRINDER/MIXER

Amendments will be loaded in the proper proportions into the farm tractor-powered grinder/mixer unit using a center-pivot loader located in the Amendment Storage Area. Once mixed, the amendments will be unloaded in the Compost Buildings as illustrated on drawing P-100, in Appendix C. The nearly 26 cubic yard capacity unit will be loaded with amendments based on the selected recipe per the volume ratios given in Figure 1 provided in Field SOP 3.0 in Appendix D. Field SOP 3.0 in Appendix D also provides a step-by-step procedure for loading and blending of amendments.

5.3 LOAD AMENDMENT BLEND INTO WINDROW

Windrow formation will begin by unloading the amendment blend as shown on drawing P-100, in Appendix C. The amendments will be unloaded from the grinder/mixer unit through a side-mounted discharge conveyor, forming a windrow approximately 6-foot high and 12-foot wide. The windrow will begin to be formed at approximately column line 2, i.e., the column numbers along the length of the building. The grinder/mixer will return to the amendments storage for reloading once the blending hopper is emptied. This process will continue until a windrow is formed approximately 250 to 270 feet long (approximately column line 2 through column line 12).

A second windrow, adjacent to and partially overlapping the first windrow, will then be loaded into the building. This will form a single, larger windrow approximately 20-foot wide with two peaks six feet high. Figure 1 of Field SOP 4.0 in Appendix D shows the amendment and soil loading windrow dimensions. As the amendment windrow is completed, the amendment grinder/mixer will be loaded with materials in the proper proportions to repeat the process for loading another amendment windrow. This process will continue until the amendment windrows have been formed as shown on drawing P-101 in Appendix C.

Once the amendment blends have been loaded into a windrow, the windrow turner will turn and shape each of the piles into approximately 20-foot wide and 4-foot, 6-inch tall windrow. Field SOP 4.0 in Appendix D provides a step-by-step procedure for loading the amendment blends into windrows.

5.4 LOAD SOIL INTO WINDROW

Once the amendment blend has been loaded and shaped into a windrow, screened soil will be transported to the windrow being created. The trucks will be inspected in the facility work area, and the quantity of soil recorded, prior to the delivery truck entering the building.

The soil will be loaded onto the amendment windrow using a self-powered, tow-behind hopper/conveyor unit as shown on drawings P-102 and P-103 in Appendix C. Once the truck has entered into the building, the hopper/conveyor unit will be attached to the rear of the trailer. As the trailer begins to unload the soil into the tow-behind hopper, the discharge conveyor will place the soil on top of the existing amendment blend windrow. The truck unloading conveyor and the tow-behind conveyor are both equipped with a variable-speed drive for optimum discharge control based on varying soil conditions. As the soil reaches the proper height, the truck will slowly move forward continuing to place soil over the amendment blend windrow until the trailer empties its load.

The empty truck will disconnect from the conveyor unit, leave the building, and may proceed to get another load of soil. A truck of soil will enter the building where the

hopper/conveyor unit will be reconnected to continue soil unloading. This process will continue until amendment blend windrow is covered with soil to the proper height and length as shown on drawing P-102 in Appendix C. Field SOP 5.0 in Appendix D provides a step-by-step procedure for transporting and loading soil into the windrows.

If an empty truck is to return to the excavation site for a load of soil, it must proceed to the vehicle decontamination facility (as illustrated on drawing P-102 in Appendix C) where the wheels and exterior will be washed with a high-pressure, low-volume spray prior to exiting the facility per Field SOP 7.0 in Appendix D. Incidental sediments and soils removed from the water collection sumps or ponds may be added to the windrows during initial pile formation.

5.5 TURN/MIX WINDROW

Once the soil has been loaded into the windrow to the specified level, the windrow/compost turning machine will commence mixing and forming the windrow. The travel speed of the windrow turner is adjusted automatically based on the density of the material being turned to maintain a constant load on the drum. The windrow turner may make multiple passes during initial windrow construction to assure thorough mixing which are recorded on the daily report. The final shape and size of the homogeneous windrow is shown on Figure 1 of Field SOP 5.0 in Appendix D.

Upon completion of turning a windrow, the equipment will be locked out and brushed or scraped to remove loose or caked material. Material which has fallen off the sides or been thrown beyond the ends of the windrow will be cleaned up and placed back onto the windrow maintaining the original configuration. Flyout material will be minimized by the rubber flap at the rear of the windrow turner. The windrow turning frequency and monitoring is expected to be daily, but will be adjusted as necessary to maintain proper aeration, temperature, and moisture as described in Section 6.0. A detailed procedure for windrow turning and moisture addition is provided in Field SOP 6.0 in Appendix D.

5.6 UNLOAD WINDROW AND TRANSPORT SOIL FOR DISPOSAL

If the cleanup goals have not been achieved based evaluation of sample results, the following options are available to ensure that the pile meets the cleanup goals: (1) extend life cycle of composting (i.e., another 15, 30, 60 days or as needed); (2) use the pile as new windrow and re-start the composting process; or (3) blend the pile with excavated soil into a new windrow. The NSWC Crane EPD will provide direction for selecting the option.

Once the treatment goals have been met, as determined by sampling results, the building will be emptied. The loader will transfer successfully treated material, directly from the windrows to the semi-tractor live-bottom trailers. The trailers will be free of contaminated soil prior to loading the treated soil/compost mix. Once the truck is

loaded, tarp covered and decontaminated, each truckload of finished compost (treated soil) will be weighed to determine weight of compost exiting the Bioremediation Facility. The trucks will be weighed on the truck scale at the entrance to the Bioremediation Facility access road as described in Field SOP 2.0 in Appendix D of this Plan. After weighing, the treated soil will be transported to the on-site landfill for use as daily cover; used as a soil amendment for revegetation at the excavation site; or disposed of at other NSWC Crane EPD-approved areas. The flowchart provided in Figure 1-3 presents the logical steps for disposal of treated soil.

6.0
PROCESS CONTROL MONITORING AND SAMPLING

Process control monitoring and sampling will be performed during Bioremediation Facility operational activities to ensure compost operations are proceeding at optimum conditions to achieve the specified performance goals. In addition, sampling and analysis of soil at excavation sites will be performed to ensure soil meets the specified remedial goals. Sampling and analysis of generated water will be performed to ensure proper disposal. The following sections identify the requirements for the parameters to be monitored and sampled. All sampling and analysis will be performed as described in the approved QAPP for Full-Scale Operations [MK, 1998b]. Table 6-1 summarizes the parameters to be monitored, the sample frequencies, and the analytical methods (field or laboratory).

6.1 COMPOST WINDROW MONITORING AND SAMPLING

The process parameters essential to successful biodegradation of the explosive contaminants are listed in Table 1-6 in Section 1.0 of this Plan. Additional parameters will be monitored such as explosives compounds and pH.

All in-situ process parameters such as temperature and oxygen, will be measured prior to sample extraction so as to obtain representative levels of the monitored parameter. Adjustments to the process for temperature, oxygen, and moisture will be performed pending the monitored results. These adjustments are described in Field SOP 6.0 in Appendix D of this Plan. Detailed procedures of process monitoring and sampling methods are described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b].

The three composting structures at the facility will be numbered Buildings 1 through 3 as shown on drawing G-100 in Appendix C. Within the buildings, the full-scale windrows will be numbered 1 (the north windrow) and 2 (the south windrow).

For sampling and monitoring purposes, cross-sections numbered 3, 5, 7, 9, and 11 (corresponding to column numbers) will be established along each windrow. The cross-sections will be located at building column lines on 50-foot intervals for consistency. The last cross-section (i.e., number 11) will be located at column line number 11 initially; however, due to volume reduction during the composting process, the location of this cross-section may vary and may be deleted by the end of the windrow cycle. Six sampling or monitoring positions will be established at each cross-section. Detailed procedures for establishing the sampling cross-sections, locations, numbering, and lettering are described in Field SOP QAPP-3.0 of the approved QAPP for Full-Scale Operations [MK, 1998b].

TABLE 6-1 PROCESS MONITORING AND SAMPLING SCHEDULE			
Matrix	**Parameter**	**Frequency**	**Method**
1. Pre-excavation in-situ soil (characterization)	SWMU-specific parameters per Section 1.3.1	Two composites per grid block[1] and one grab sample (VOCs)	Laboratory (various per QAPP and Table 1-2)
2. In-process excavation in-situ soil (during excavation)	Explosives RDX and TNT	**Base:** One composite and one grab (VOCs) per grid block[1] **Sidewalls:** One composite and one grab (VOCs) per 20'	Field screening kits per SOP QAPP-5.0 (SW846-8510 & 8515)
3. Post-excavation in-situ soil (confirmation)	SWMU-specific parameters per Section 1.3.1	**Base:** One composite and one grab (VOCs) per grid block[1] **Sidewalls:** One composite and one grab (VOCs) per 20'	Laboratory (various per QAPP and Table 1-2)
4. Windrow compost	Explosives RDX and TNT	One composite sample per cross-section from location 1, 2, & 3 on Day 7, 14, and 21	Field screening kits per SOP QAPP-5.0 (SW846- 8510, & 8515)
5. Windrow compost	Explosives Per Table 6-2	One sample per location 1, 2, & 3 per cross-section on Day 0 and at end of cycle	Laboratory (SW846-8330)
6. Windrow compost	SWMU-specific parameters per Section 1.3.1. [Required only if present in the characterization samples.]	One sample per location per cross-section on Day 0 and at end of cycle	Laboratory (various per QAPP and Tables 1-1 through 1-3)
7. Windrow compost	Temperature	Daily: before & after turning	Field SOP QAPP- 4.0
8. Windrow compost	Moisture	Three times per week and directly after moisture addition	Field SOP QAPP-3.0 and 4.0
9. Windrow compost	pH	One time per week	Field SOP QAPP-3.0 and 4.0
10. Windrow compost	Oxygen	Daily: before & after turning	Field SOP QAPP-4.0
11. Storm-water	Per NPDES	After heavy rainfall or per the NPDES Permit	Laboratory (various per QAPP)
12a. Decon/wash water from Bioremediation Facility and Excavation Sites 12b. Building sump water	Per Table 1-5	If required for disposal to on-site sewer treatment system. [No testing is required if disposal to one of the on-site waste treatment facilities or used for composting moisture addition.]	Laboratory (various per QAPP and Table 1-5)
13. Building sump sediments	NONE	NONE	NONE

NOTE 1 indicates that the grid block size will vary depending on the excavation site and will be specified in the Soil Excavation Plan in Appendix E.

6.1.1 Temperature Monitoring

Temperature is one of the most important monitoring parameters since it is a primary indicator of successful achievement of conventional thermophilic composting operations in the windrows. The process goal is to maintain average windrow temperatures near 55°C for at least two weeks. The average pile temperature rises to the temperature range of 25 to 40°C within the first few days of formation, continues rising to within the temperature range of 40 to 60°C, and maintains that temperature range for at least two weeks. Based on conventional composting practice, such temperatures indicate a healthy, metabolically active windrow. Temperature decrease over time to below 50°C is viewed as an indicator of a pile that is nearing the end of its operation [Weston, 1993].

The temperature of each windrow will be monitored daily. Temperature readings at the core and near the surface will be taken before and after each turning event of the windrow. Temperature readings will be taken at six sampling/monitoring locations at each of the cross-sections using a hand-held compost temperature probe and indicator as described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b]. These locations are selected to provide representative temperature profiles of each cross-section in the windrow.

Ambient air temperature and humidity inside the buildings will be monitored daily during any composting activities using a certified thermometer and a hygrometer.

6.1.2 Moisture Level Monitoring

The operating goal for composting moisture content is 40 to 60% of the maximum Water Holding Capacity (WHC). If moisture levels are excessively low or high (beyond the typical ranges), proper composting and explosives degradation may be affected. Too little moisture will inhibit microbial movement and nutrient availability. Excess moisture will cause the moisture to fill the void spaces needed for proper aeration, thus reducing the oxygen level and aerobic microbial growth.

Moisture level monitoring will be performed a minimum of three times per week. Water will be added to maintain the desired moisture range. If moisture is added to the windrows at any time, moisture content will be checked again after windrow turning. One composite sample per cross-section, composed of three discrete samples, will be collected for moisture level determination. Moisture level sampling procedures are described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b]. The following moisture data will be determined:

- Percent moisture
- WHC (i.e., percent moisture at saturation)
- Percent saturation

- Percent WHC

Sources of water for moisture addition are described in SOP 6.0 in Appendix D of this Plan. Moisture levels will be adjusted to the proper levels by water addition from any of three available methods:

- Through a spray system integral to the windrow turner machine
- By direct spray from a low-pressure water supply hose
- By direct spray of recycled water (decontamination water from truck washing at the Bioremediation Facility only, building sump water, and storm-water in the retention ponds) from a collection tank supply hose. Decontamination water will be free of any soaps, antibacterial detergents, or materials detrimental to bacterial growth.

6.1.3 pH Level Monitoring

It is anticipated, based on pilot-scale experience, that the pH will steadily increase from near neutral to a level as high as 9.1 within weeks of operation and then decrease to a level between 7 and 8.5. Levels of pH are not intended to be adjusted during treatment. Acidic pH values below 5.5 will be alleviated by the aeration and increasing oxygenation to avoid anaerobic conditions and acid formation. Reintroduction or alterations of amendments for the purpose of pH adjustment may be performed with the approval of the NSWC Crane EPD and U.S. EPA representatives. Samples for pH level monitoring will be collected at one location for each of the cross-sections, once per week as described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b].

6.1.4 Oxygen Level Monitoring

Typical compost oxygen levels for rapid degradation are greater than 5%; however, the preferred level is as high as 20%. If sufficient oxygen levels are not maintained, proper microbial degradation may not occur and thermophilic temperatures would not be maintained. Oxygen levels decline rapidly to very low levels (less than 5%) in a short time after mixing. Oxygen levels of less than 1% indicate the process is approaching anaerobic conditions, and aeration is required.

Oxygen level monitoring will be performed at the same locations and frequency as the temperature monitoring activity using a hand-held probe and indicator as described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b].

6.1.5 Explosives Concentration Monitoring

Explosives to be monitored are listed in Table 6-2. Samples for laboratory analysis (U.S. EPA SW846 Method 8330) will be collected from each of the sampling/monitoring cross-sections, at three locations on days 0 and at the end of cycle (expected to be 28 days) of the windrow life cycle. Composite samples for field screening of TNT and RDX will be collected from each of the sampling/monitoring cross-sections, consisting of samples from three locations on days 7, 14, and 21 of the windrow life cycle. Once the field screening samples indicate concentrations of RDX and TNT below the cleanup level, confirmation samples will be collected for laboratory analysis. Detailed sampling and analysis procedures for explosives level monitoring will be performed as described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b].

TABLE 6-2
EXPLOSIVES PROCESS PARAMETERS

Compound	Compound
PETN	4-Am-DNT
TNT	2-Am-DNT
RDX	2,4-DNT
HMX	2,6-DNT
Tetryl	2-NT
TNB	3-NT
1,3-DNB	4-NT
NB	

All analytical results will be reviewed and compared to the performance goals as established in Section 1.3.3 of this Plan. Once the performance goals have been achieved, the windrow life cycle will be considered complete and the process stopped. If the cleanup goals have not been achieved based evaluation of sample results, NSWC Crane EPD will provide direction for selecting one of the options described in Section 5.6 of this Plan.

6.1.6 Other Contaminant Concentration Monitoring

If excavation soil characterization samples indicate contaminants (e.g., metals, VOC, SVOC, PCBs, etc.,) present above the cleanup goals specified in Tables 1-1 through 1-3, sampling of the compost will be performed for those specific contaminants. Samples for laboratory analysis will be collected from each of the sampling/monitoring cross-

sections at three locations on days 0 and at the end of cycle (expected to be 28 days) of the windrow life cycle. Sampling and analysis requirements for these chemicals of concern will be performed as described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b]. The analytical results will be reviewed to determine the before and after effects of composting on these contaminants and the leachability of certain metals.

6.2 FLUID COLLECTION SYSTEM MONITORING AND SAMPLING

Various liquids may be collected throughout the facility including compost process leachate (i.e., the water collected in the building sumps), storm-water, and decontamination water. Some of these liquids are expected to be used as sources of process water for the compost moisture addition as described in Section 6.1.2 of this Plan and SOP 6.0 in Appendix D. Additional quantities of waste water generated during the project will be sampled per Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b] for disposal characterization. The frequency of liquid sample collection will depend on the quantities generated or collected.

6.3 EXCAVATION SOIL SAMPLING

Primary excavation sampling areas are described in the Soil Excavation Plan, Appendix E of this Plan. These areas, which are contaminated with explosives, are based on previous sampling results. Additional sampling areas will be grid based on SWMU-specific requirements addressed in Appendix E of this Plan.

Grid layout and boundaries will be affected by the presence of buildings, utilities, etc. Grid borders will be flagged in the field, and areas will be chosen which will be accessible by heavy equipment (i.e. individual grid blocks will not be placed in the midst of heavy utilities or surface structures). Grid blocks are not expected to be perfectly square (i.e. those in the berm and around structures).

6.3.1 Soil Sampling Prior To Excavation

This task has three specific objectives:

1. To identify areas for full-scale excavation based on explosives contaminant concentrations.
2. To determine if SWMU-specific waste products are present such as VOCs, SVOCs, PAHs, PCBs, and/or metals.
3. To determine if soil is hazardous with respect to TCLP metals and TCLP VOCs. Soil will not be accepted into the Bioremediation Facility for treatment if it is considered a RCRA hazardous waste.

These three objectives will be met by collecting soil samples in a general area where

high levels of explosives have been previously detected. Soil samples will be collected and analyzed for explosives; SWMU-specific VOCs, SVOCs, PAHs, PCBs, metals, and other parameters; TCLP metals; and TCLP VOCs as presented in Section 1.3.1 of this Plan and described in the approved QAPP for Full-Scale Operations [MK, 1998b].

6.3.2 Soil Sampling During and After Excavation

Based on results of TNT and RDX field screening grids (as specified in the Soil Excavation Plans included in Appendix E) will be established for soil sampling of the excavation sidewalls and bases at each SWMU to assess horizontal and vertical extent of contamination. As the contaminated areas are excavated and delineated by horizontal field screening, additional field screening will be used to determine the vertical extent of contamination. Once TNT/RDX field screening results indicate concentrations in the excavation area soil are below the established cleanup levels, confirmation soil samples will be collected at SWMU-specific designated intervals. Procedures for field screening and confirmation sampling are provided in the approved QAPP for Full-Scale Operations [MK, 1998b].

7.0
DECONTAMINATION, FLUID COLLECTION, AND DISPOSAL

7.1 DECONTAMINATION, FLUID COLLECTION, AND DISPOSAL AT THE EXCAVATION SITE

During interim measures activities, all personnel will minimize contact with contaminated materials. All personnel will minimize kneeling, splashing, and inadvertent physical contact with contaminated materials. Field procedures, to control over spray and run-off as well as to ensure that unprotected personnel working nearby are not affected, are provided in Field SOP 7.0 in Appendix D.

Decontamination will be required for excavation equipment, gravel and rocks, trucks, operating equipment, and personnel. A brief summary describing these activities is presented in the following sections. Refer to SSHP in Appendix A for additional details.

7.1.1 Excavation Site Rock Washing

Periodically, the need for washing of gravel and/or rocks will occur when excavating in roadway areas, near building foundations, or rocky terrain. The rocks and boulders in the oversized material pile rejected from the soil screening process will be sorted out from the soil clumps and vegetation (logs, stumps, roots, brush, rotten wood, and other refuse) as described in the Soil Excavation Plan provided in Appendix E. The separated rocks or gravel will be loaded into a front-end loader bucket or a collection bin and taken to the decontamination pad. The rocks and/or gravel will be thoroughly washed and triple-rinsed to remove all visible signs of soil using the high-pressure, low-volume spray wash unit as described in Field SOP 7.0 in Appendix D of this Plan.

Wash and rinse water will be collected and stored for disposal as approved by NSWC Crane EPD. Final rinse samples will be collected and analyzed to determine the cleanliness of the washed rocks as described in Section 4.0 of the approved QAPP for Full-Scale Operations [MK, 1998b]. Figure 1-4 provides the decision-making flowchart for the rock decontamination.

7.1.2 Excavation Truck and Equipment Decontamination

Prior to exiting the excavation site, loaded trucks will be inspected for exterior cleanliness. Exterior of the trucks may be covered with plastic lining prior to soil loading to minimize contamination of the truck from spillage. In case of accidental spillage of contaminated soil onto the truck exterior or if the truck has driven over a contaminated area, the decontamination process will take place. The equipment decontamination procedure is described in detail in Field SOP 7.0 provided in Appendix D. The excavation site decontamination facility is described in the Soils Excavation Plan

provided in Appendix E.

All wash fluids collected in the excavation site equipment wash area will be collected and stored in dedicated polyethylene (poly) tanks until disposal. The method of disposal for the excavation decontamination water will be primarily at the on-site water treatment facilities (i.e., Mine Fill A or Rockeye). See Process Flow drawings 4324-0009-02-B and 02-C in Appendix C. A secondary disposal method will be to use the on-site sewer treatment system or an off-site disposal facility, as approved by the NSWC Crane EPD.

7.2 DECONTAMINATION, FLUID COLLECTION, AND DISPOSAL AT THE BIOREMEDIATION FACILITY

7.2.1 Truck and Equipment Washing

In order to minimize the tracking of potentially contaminated materials, trucks and other heavy equipment operating inside the compost buildings will be decontaminated prior to exiting the Bioremediation Facility as described in Field SOP 7.0 found in Appendix D. The trucks or heavy equipment will be inspected for exterior cleanliness. All loose dirt will be swept or brushed off the vehicle exterior. The vehicles will enter the covered vehicle decontamination area where the wheels, wheel wells and other visibly contaminated areas will be washed with a high-pressure, low-volume water spray using a hand held wand connected to an overhead high-pressure supply line. This design enables the operator to clean all sides of the vehicle. Operators will avoid potential over spray out of the building or over the walls.

If equipment is to be used for any other purpose than the Bioremediation Facility operations, the equipment will be entirely decontaminated at the vehicle wash area located at the facility exit. In addition to the typical washing requirements specified above, all other areas exposed to potentially contaminated materials will be washed and inspected. This includes truck beds, loader and backhoe buckets, etc.

All wash fluids will be collected in the vehicle wash area sump. The wash water will be collected and stored in dedicated poly tanks as necessary prior to disposal. The truck wash water will be transported to the compost buildings for use as process water during the first seven days of windrow formation only. This will prevent potentially high levels of explosives from being added to the windrows once the explosives degradation has significantly progressed. Water will be transferred to tanker trailers and transported to the on-site water treatment facilities at Mine Fill A or Rockeye; on-site sewer treatment system; or as approved by NSWC Crane EPD. Disposal of water at the on-site water treatment facilities (i.e., Mine Fill A or Rockeye) will not require sampling. However, sampling and analysis of water will be required for disposal at the on-site sewer treatment system. Sampling frequencies, procedures, and analytical methodologies are contained in Table 6-1 of this Plan and the approved QAPP for Full-Scale Operations [MK, 1998b]. Sump sediments will be collected and added to the windrows

at the beginning of a compost cycle during initial windrow formation only.

7.2.2 Personnel Decontamination

A personnel decontamination trailer is located next to the equipment decontamination facility and consists of a change room area, lockers, lavatory, toilets and showers. The trailer sanitary sewer line is routed to the pump/lift station in the office/laboratory area.

Any personnel exiting the work area must first pass through the contamination reduction zone which includes a boot wash station, cleaning and wipe station, etc. Personnel will avoid over spraying at the boot wash area. Follow decontamination procedures specified in the SSHP in Appendix A.

7.2.3 Compost Building Sumps

Each of the three structures is equipped with an epoxy-coated sump for collection of any excess water in the building. The building sump water will be collected, stored in poly storage tanks, if necessary, and recycled in the treatment process for compost moisture control in the same building. Drawings 4324-0009-02-A and 02-C in Appendix C provide a schematic of the process flow. Any sediments collected in the building sumps will be removed and added to the windrows at the beginning of the compost cycle. If excess building sump water is present, it will be disposed of at the on-site water treatment facilities at Mine Fill A or Rockeye; on-site sewer treatment system; or as approved by NSWC Crane EPD. Disposal of water at the on-site water treatment facilities (i.e., Mine Fill A or Rockeye) will not require sampling. However, sampling and analysis of water will be required for disposal at the on-site sewer treatment system. Sampling frequencies, procedures, and analytical methodologies are contained in Table 6-1 of this Plan and the approved QAPP for Full-Scale Operations [MK, 1998b].

7.2.4 Storm-Water Diversion and Retention Ponds

The facility will utilize both the existing topography and site drainage controls to control storm-water run-off and run-on.

Two lined storm-water retention basins sized to store rainfall from a 10-year, 24-hour storm are constructed inside the Bioremediation Facility boundary. These retention basins will retain and store storm-water from the area paved with asphalt inside the facility. Pond #1 will retain a maximum of 428,000 gallons of storm-water and Pond #2 will retain a maximum of 407,000 gallons. A peak discharge flow to the local drainage swales will vary from 315 gallons per minute (gpm) at full level to 160 gpm at low level, allowing for controlled off-site storm-water discharge. Water collected in the retention basin will be sampled within 24 hours following a major storm event to determine whether the water meets off-site discharge requirements. The discharge pipes from the ponds will remain closed and locked until discharge is approved. The operators of the

facility will maintain the level of the ponds with a minimum of two-foot freeboard. If the water level approaches the freeboard limit and a storm event is anticipated, the NSWC Crane EPD Representative will be immediately notified. NSWC Crane EPD will provide disposition which may include sampling and discharging pond water to the waste water treatment sewer system. Sampling frequencies, procedures, and analytical methodologies are contained in Table 6-1 and the approved QAPP for Full-Scale Operations [MK, 1998b].

Water not meeting off-site discharge requirements will either be recycled in the Bioremediation Facility for windrow compost moisture control or transported to one of the water treatment facilities. Sampling frequencies, procedures, and analytical methodologies are contained in Table 6-1 and the approved QAPP for Full-Scale Operations [MK, 1998b]. Storm-water collected in the retention ponds may be used for windrow moisture addition at anytime during the composting process if the retention pond level is in excess of 18-inches. Retention pond fluid less than 18-inches deep may only be used during the first seven days of windrow formation. This will prevent potentially high levels of explosives contaminated sediment from being added to the windrows once the explosives degradation has significantly progressed.

8.0
QUALITY CONTROL

The prime Contractor will implement and manage all matters involving Quality Control performed in the execution of SOUTHNAVFACENGCOM Delivery Orders. This approach provides the U.S. Navy with a quality management system having clear lines of authority and responsibility, and a consistent approach and application of quality requirements.

A Testing Plan and Log has been prepared and is included in Appendix F of this Plan. The Testing Plan and Log delineates the required tests and inspections applicable to the work executed, as well as the inspection checklist to be used in the performance of the inspection. Appendix F of this Plan provides Field Inspection Checklists for performing inspections of the excavation activities, composting activities, and facility and equipment maintenance. The analytical and sampling quality control is discussed in the approved QAPP for Full-Scale Operations [MK, 1998b].

A field audit plan will be developed that will establish frequencies of audits of the bioremediation process. These frequencies may be daily, weekly, or monthly and appropriate to the activities being audited.

In addition, the NSWC Crane EPD personnel will perform quality checks and inspections of the Contractors work and operation based on this Plan. The U.S. EPA and IDEM also retain the authority to perform quality checks and inspections.

9.0
OPERATING EQUIPMENT DESCRIPTIONS AND BIOREMEDIATION FACILITY MAINTENANCE

9.1 OPERATING EQUIPMENT

Table 9-1 below provides a list of the major operating equipment that will be used at the excavation sites and composting facility. Selected photographs of the major operating equipment are included in Appendix B of this Plan.

TABLE 9-1
OPERATING EQUIPMENT

Equipment	Qty.	Specifications	Description/Use
Portable Soil Screener	1	Minimum 50 ton/hr capacity; screen material to 1-1/2 inches with feed hopper and discharge conveyor (smaller screen sizes may used pending SWMU-specific requirements.	Screening of contaminated soil.
Semi-tractor Truck and Live-Bottom Trailer	2	Minimum 48 cu. yd. capacity, conveyor rear discharge trailer. 0 to 450 cu. ft./hr.	Hauling contaminated soil from the excavation site to the composting facility. Hauling treated material to the disposal site and hauling backfill material.
Hopper/Conveyor System	1	150 ton/hr capacity.	Self powered side discharge conveyor for loading soil onto windrow; towed by Live Bottom Trailer.
Soil Yard Conveyor	1	200 ton/hr capacity	Self powered end discharge for conveying screened soil from screener to stockpile or live-bottom trailers.
Backhoe/Loader	1	3 - 4 cu. yd. bucket loader	Excavating material, loading screen, and loading trucks at the excavation sites. May also be used at the Bioremediation Facility for reforming windrows.
Steer Skid Loader	1	½ to 1/3 cu. yd excavator	Excavating material in areas of limited access and cleaning aisles between windrows.
Grinder/Mixer	1	700 cu.ft. capacity tractor power takeoff (PTO) driven, Grinder/Mixer with side discharge conveyor	Grinding and mixing of amendments prior to forming windrow
Tractor	1	Agricultural farm tractor with loader, bale handler and spear attachments	Moving and unloading bales, towing grinder/mixer unit, cleaning aisles and forming windrows in compost buildings.

TABLE 9-1 (continued) OPERATING EQUIPMENT			
Equipment	Qty.	Specifications	Description/Use
Center Pivot Wheel Loader	1	6-7 cu. yd. bucket center pivot loader with claw attachment	Loading amendments into grinder/mixer, and unloading windrows into trucks and adjusting shape of windrows. Also may be used at the excavation site for loading the screener or trucks.
Water Tank Trailer	3	1000 gallon (minimum)poly tank, trailer mounted with valve and pump	For collecting and transporting decontamination liquids to site treatment facility or to compost buildings and clean water for dust suppression and compost moisture addition.
Water Tank - Stationary	6	500 to 1100 gallon poly storage tanks with discharge valve	For storage of decontamination and sump fluids awaiting analytical results.
Portable High Press Spray Wash Unit	1	1500 to 2400 psi portable gas powered spray wash unit.	For decontamination of trucks, equip., and rocks at the excavation site.
Portable Suction Pumps	3	50 gpm self priming suction pump	For pumping out building, decontamination facility, and storm-water retention pond sumps.
Windrow Turner	1	Self-propelled, 20 foot windrow straddle type composting machine	Forming and turning windrows.
Explosives-contaminated Water Pumper Truck	1	Truck mounted 1000-gallon minimum steel tank with pump.	Transporting accumulated liquids to on-site treatment facilities

Additional equipment will be leased as needed for short-term assignments. To minimize downtime of equipment, the program will include a schedule of important preventative maintenance tasks and lists of any critical spare parts. Daily, weekly, monthly, and periodic maintenance requirements for the major pieces of equipment are provided in Appendix F. Each major equipment operation and maintenance manual will be consulted for details. Equipment maintenance support is provided by the NSWC Crane Transportation Department.

In the event of mechanical downtime (due to routine maintenance or otherwise) experienced by the windrow turner, the center pivot loader will be used to perform windrow turning. All other heavy equipment which may experience mechanical downtime will be temporarily replaced with an alternate piece of existing heavy equipment, such as, the center pivot loader may be replaced by the backhoe loader, and the skid steer loader replaced by the tractor. Additional equipment may also be leased or obtained from the NSWC Crane Transportation Department if needed.

During long periods of non-use, equipment will be operated for a sufficient time to thoroughly warm up the engine and rotating equipment. Hydraulic systems will be

operated to assure proper function.

9.2 BIOREMEDIATION FACILITY MAINTENANCE

General building cleanliness will be maintained by using a front end loader and/or a skid steer loader to collect stray compost materials and reform the piles, if necessary. Brooms and shovels will be used in inaccessible areas. Any ponded liquid inside the buildings will be manually moved to the sump within 24 hours. The windrows will be kept segregated, well-formed, and identified with signs containing the windrow number and date formed. Any ponded liquid on the asphalt surfaces will be manually moved to the retention ponds within 24 hours.

Inspections and maintenance of Bioremediation Facility buildings and associated structures will be performed on a quarterly basis. Items found to be deficient will be repaired or scheduled for repair at the earliest available period. These repairs will be performed based on "level of urgency". Those items determined to be non-essential or have no impact on the environment or human health, will be scheduled for repair based on convenience of operations.

Special attention will be paid to specific items such as potential settlement cracks in the Bioremediation Facility building floors and potential leaks in either storm-water retention pond liners or compost buildings. The Bioremediation Facility building floors and sumps will be inspected for new cracks between building compost cycles and on a quarterly basis. Any new cracks will be scheduled for repair and will be performed by saw cutting the crack as necessary to allow installation of Silkaflex 1a Polyurethane sealant or equivalent sealant. All facility repairs will be in accordance with the facility construction specifications [MK, 1997a and MK, 1998c]. Building and pond liner inspection checklists are provided in Appendix F.

10.0
DEMOBILIZATION

Demobilization of the materials, equipment, and facilities associated with the bioremediation operation will occur at the conclusion of the project (full-scale operation). It is assumed that the elements of demobilization described in this section may change by the time the project is concluded in order to be consistent with the needs of NSWC Crane for continued full-scale soil bioremediation or reuse of the facility for other purposes. For the purpose of this Plan, it will be assumed NSWC Crane will continue to use the facility for soil treatment.

In the unlikely event that the bioremediation treatment process is abandoned or if the facility is shut down for an extended period of time, the following demobilization activities will be performed.

10.1 MATERIALS AND EQUIPMENT

All remaining composting amendment materials not in contact with contaminated soil will be used as topsoil amendments for revegetation. All equipment used in the Bioremediation Facility or at the excavation sites will be thoroughly decontaminated prior to leaving the Bioremediation Facility. Each piece of equipment will be brushed clean of any loose dirt or compost material prior to entering the truck wash area at the Bioremediation Facility exit. Once inside the truck wash station, the equipment will undergo a thorough cleaning with a high-pressure, low-volume water spray. All wheels, wheel wells, vehicle undercarriages, truck beds, loader buckets, etc., will be pressure washed. Decontamination procedures are provided in Field SOP 7.0 in Appendix D of this Plan.

10.2 PROJECT BUILDINGS AND STRUCTURES

The office trailers, laboratory and shower trailers, and supplies will be removed from the Bioremediation Facility. All hand tools, sampling equipment, and instrumentation which has come in contact with contaminated soil or compost will be decontaminated prior to leaving the Bioremediation Facility, as described in Field SOP 7.0 in Appendix D.

Once all equipment and vehicles have been decontaminated, the truck wash facility itself will be pressure washed and decontaminated. All decontamination fluids will be collected in the truck wash facility sump and sampled for analysis and disposal. Final rinsate samples and a field blank will be collected and submitted to the analytical laboratory for analysis per the approved QAPP for Full-Scale Operations [MK, 1998b]. Additional cleaning of the wash facility will be implemented as required based on results of the rinsate sample analysis. The same procedure will be followed for the cleaning and sampling of the truck wash sump.

The interior surfaces of each building will be pressure-spray washed and final rinse samples collected and tested for parameters specified in the approved QAPP for Full-Scale Operations [MK, 1998b]. Decontamination fluids will be collected and sampled for analysis and disposal. Additional wall and floor final rinse samples will be analyzed to evaluate facility cleanliness. Additional cleaning of the buildings will be implemented as required based on rinsate sample results.

The asphalt surface will be washed using low-pressure water and final rinsed in the same manner as the truck wash and compost buildings. All wash fluids will be collected in the storm-water retention ponds and sampled to determine appropriate disposal. Final rinsate samples will be collected and submitted for parameters specified in the approved QAPP for Full-Scale Operations [MK, 1998b]. The storm-water retention ponds will be cleaned utilizing the same cleaning and sampling process.

All generated decontamination and wash water from demobilization activities will be disposed of at the on-site water treatment facilities at Mine Fill A or Rockeye; on-site sewer treatment system; or as approved by NSWC Crane EPD.

The asphalt pad, buildings, truck wash facility, storm-water retention ponds, utilities and sumps will be left intact for NSWC Crane use.

11.0
EMERGENCY RESPONSE, CONTINGENCY, AND SPILL PREVENTION PLAN

A Site-Specific Safety and Health Plan (SSHP), included as Appendix A, describes safety and health requirements for the interim measures actions described in this Plan. The SSHP is consistent with requirements of the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Site Regulations, 29 CFR 1910.120 and 29 CFR 1926.65, and the U.S. Army Corps of Engineers' *Safety and Health Requirements Manual* EM 385-1-1 [ACOE, 1996].

This section describes an emergency response, contingency, and spill prevention plan to be implemented in the event of injuries, illnesses, accidents, and fires; and to prevent spills. The contingency plan provides guidelines for the proper response to emergency situations; however, the actual response will depend on the situation.

In the event of an emergency, the Contractor Site Safety and Health Officer (SSHO), Project Manager (PM) or Operations Manager (OM) will direct all personnel to take appropriate action which could include any or all of the following:

- Evacuate all personnel involved to a safe place of refuge.
- Notify emergency services using phone numbers identified in Table A-3 in Appendix A.
- Initiate emergency response action.

All operations will be performed to minimize spills and releases throughout the full-scale operations. The Contractor PM will assure that effective spill response plans and resources are in-place prior to full-scale operations. Spill and release accident scenarios during remediation could occur and involve residue process material and rinsates from decontamination activities. The following information will be used by project personnel to respond to and mitigate any spills and releases on the project site.

In the event of a spill or release, the Contractor SSHO, PM or OM will direct all personnel to take appropriate action which could include any one or all of the following:

- Initiate spill response action and notify emergency services.
- Notify emergency services as identified in Table A-3 in Appendix A immediately.
- Evacuate the work zone to a safe place of refuge.

11.1 PRE-PLANNING

Prior to start-up of full-scale operations, the Contractor PM, OM, and SSHO will check

that all steps necessary to assure effective emergency response requirements and resources are established for this project. They will review the NSWC Crane Oil and Hazardous Substances Spill Contingency Plan [NSWC Crane, 1994] prior to facility start-up. After review, they shall execute the steps necessary to assure effective spill response planning requirements and resources are established for this project.

Remedial construction activities will be reviewed for release potential and the capability of on-site personnel to adequately respond. Base personnel will be contacted to determine their capability to respond to various releases.

The person identifying a release will record the date, time, type of incident, name and quantity of material(s) involved, extent of injuries (if any), an assessment of actual or potential hazard to the environment and human health, and the estimated quantity and disposition of the recovered material. A written report will be supplied to the ROICC and NSWC Crane EPD within 48 hours.

The Contractor will cooperate with the base; other site contractors; and federal, state and local directors of emergency preparedness and response to ensure a coordinated effort in preparing for a spill emergency, with response plans that are compatible and integrated. The NSWC Crane EPD and Base Fire Department will be notified of any spills classified above incidental and will assist in spill containment. The NSWC Crane Response Team will provide overall command and control of the clean-up activity for spills classified above incidental until relieved by a higher authority.

In addition to the guidance provided in this document, all safety meetings and pre-entry briefs will include emergency response preplanning specific to each task and work site as a topic area. This training will include:

- Assembly Points. If the work activity may result in a release of hazardous substances, more than one assembly point will be specified to ensure that at least one upwind assembly point is accessible. This also pertains to fires and sites subjected to adverse weather conditions.

- Emergency Response Coordinator. The Contractor SSHO, as the onsite emergency response coordinator, will contact the emergency response providers, account for individuals at the assembly point, and plan the appropriate response.

- Means of Evacuation. The number of personnel that may be evacuated from the work site by various routes will be evaluated by the Contractor SSHO.

- Means of Communication. This will include the means of alerting personnel to an emergency at all points in the work site and should consider the sound - screening potential of hearing protection, distance and noisy equipment when

specifying the use of alarms, horns and sirens. The means of communication with emergency response providers will be considered.

- Designation of a location for first aid services, fire extinguisher(s) and spill control equipment.

- Procedures to be followed by on-site personnel who remain to manage critical operations to insure safe shutdown.

11.2 RESPONSIBILITIES

The following is a description of personnel roles, lines of authority, and the emergency response communication/notification responsibilities for Contractor personnel.

11.2.1 Contractor Project Personnel

It is the responsibility of all project personnel to recognize conditions that have the potential for resulting in a personal injury or damage to property, and to report the condition immediately to their supervisor or the Contractor SSHO.

11.2.2 Contractor Project Manager

The Contractor PM is responsible for assuring adherence to the administrative elements and implementation of the Emergency Response Plan, evaluate the site's preparedness for emergency responses, and identify special conditions which may require additional preparations. He will ensure that necessary equipment and facilities are provided to support this Plan.

11.2.3 Contractor Site Safety and Health Officer

The Contractor SSHO is responsible for directing response actions to emergency situations. He will coordinate with project management to ensure the availability of response equipment and supplies, and initiate drills. Emergency response plans will be evaluated over the course of the project by the Contractor SSHO to keep them up-to-date and to ensure that they are applicable and relevant to emergency response organizations.

11.3 EMERGENCY RECOGNITION AND PREVENTION

Any personnel on-site will be apprised of hazards and potential life-threatening emergency situations during site-specific training including the project kickoff site-specific training, safety meetings and briefs. Means to control hazards and mitigate emergency situations will be addressed at that time.

11.4 SAFETY ZONES

Suitable assembly points will be established at the start of the project for each work site. These assembly points will provide a safe point of refuge for all personnel on-site. Additional information will be provided in the site briefing concerning other hazards that may arise at the site.

11.5 SITE SECURITY AND CONTROL

At all times, personnel on-site in an area in the near vicinity of an emergency situation will be apprised of the emergency as soon as possible. Only authorized personnel will be allowed into the emergency area. As necessary, the emergency area may be cordoned off and access restricted by Contractor.

11.6 EVACUATION ROUTES

Evacuation routes will be established based on scope of work, location of work and atmospheric conditions. All personnel on-site will be made aware of evacuation procedures during site-specific training especially pre-entry briefings. Topography, layout and prevailing wind conditions will be considered in establishing evacuations routes and assembly points.

11.7 EMERGENCY DECONTAMINATION

In the event an any on-site person is injured or becomes ill and requires hospital treatment, the extent of decontamination to be performed will be assessed based on severity of the injury or illness and time delay that decontamination may cause. If the on-site person has any signs of contamination, the ambulance and hospital staff will be notified of this and the nature of the contamination. Reasonable effort will be expended to decontaminate the victim prior to removal from the site. The medical facilities will be notified of the intended scope of work and the potential for contaminated personnel. The medical facilities will receive copies of all the Material Safety Data Sheets (MSDSs) and/or NIOSH Pocket Guides where available and applicable to this project. The Contractor SSHO will contact the medical facility to establish a contact person for the necessary information.

11.8 EMERGENCY MEDICAL TREATMENT AND FIRST AID

Emergency medical treatment and first aid is discussed in detail in the Section 11.0 of the SSHP.

11.9 COMMUNICATIONS

The Contractor SSHO, PM, and OM will be equipped with two-way radios for

communications on-site as warranted. Two-way radios will be allowed only at the Bioremediation Facility. Emergency Communications equipment will be provided by Contractor. Additional communications with outside emergency services will be accomplished through the use of cellular telephones at excavation sites with permission from CAAA.

11.10 CRITIQUE OF RESPONSE AND FOLLOW-UP

All actual emergencies will be critiqued and follow-up corrective actions will be implemented as needed. Drills and exercises if completed will also be critiqued. The critique will be conducted as part of a safety meeting first by supervisory personnel and second with all Contractor personnel.

11.11 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number 854-1333, the Environmental Department (854-1132, 854-3114, or 854-4423), and to the Contractor SSHO at 854-6941 or portable radio Unit 0004. The Contractor SSHO will assure that the Navy designated authority is notified promptly and directing initial emergency response actions until the arrival of the NSWC Crane designated authority. The designated authority can include the Chief Duty Officer (CDO), resident officer in charge of security, fire department and/or ambulance services, and the NSWC Crane EPD Manager.

The following contains the initial response actions to be taken by Contractor personnel at the work site for the type of incident incurred.

11.11.1 Incident Type: Fires in Vehicles and Mobile Equipment, Process Equipment, and Support Structures.

Response Actions:

1. Notify the NSWC Crane Security Desk at 854-1333, and provide the following information:
    a. The name and phone number of the person making the call.
    b. The location of incident.
    c. The type of incident.
    d. Injured or trapped personnel and any potential material release.

2. Contractor SSHO or Contractor OM designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. Contractor SSHO or Contractor OM assumes initial command of the situation

and directs personnel to do one of the following:

a. Emergency shutdown of process equipment or mobile equipment, evacuate the work zone or immediate area to a safe place of refuge, meet the incoming response units and provide all available information.
b. As appropriate, initiate first fire attack and knockdown using available fire extinguishing equipment followed by evacuating the work zone or immediate area.

11.11.2. Incident Type: Preparation for Adverse Weather Condition to Include High Winds, Tornado, Heavy Rains, Snow and Ice Conditions

Response Actions:

1. Contractor SSHO or Contractor OM notifies the NSWC Crane Security Desk at 854-1333 and provides the following information:
   a. The name and phone number of the person making the call.
   b. The location of the work site(s).
   c. Preparation for adverse weather condition has begun.
   d. Permanent structure location where personnel will be relocating to on Base.

2. Contractor SSHO or Contractor OM will direct personnel to shutdown operations, secure loose materials, and park and secure mobile equipment. Personnel will be directed to report to a permanent building after completing decontamination procedures.

3. Contractor SSHO or Contractor OM will complete accountability and await clearance from Base Security to resume operations or other action.

11.11.3 Incident Type: Medical and Rescue Emergencies

Response Actions:

1. Notify the NSWC Crane Security Desk at 854-1333 and provide the following information:
   a. The name and phone number of the person making the call.
   b. The location of incident.
   c. The type of incident.
   d. Injured or trapped personnel and any exposure to hazardous material.

2. Contractor SSHO or Contractor OM designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. Contractor SSHO or Contractor OM assumes initial command of the situation and completes or directs personnel to do one or both of the following:

   a. Emergency shutdown of process equipment or mobile equipment and any other necessary action to mitigate or control the incident.
   b. Initiate emergency first aid actions until arrival of emergency units.

11.11.4 Incident Type: Mobile vehicle accident or incident during transport of contaminated soil from work area to Bioremediation Facility

Response Actions:

1. Notify the NSWC Crane Security Desk at 854-1333 and provide the following information:
   a. The name and phone number of the person making the call.
   b. The location of incident.
   c. The type of incident.
   d. Injured or trapped personnel and estimate of material released.

2. Contractor SSHO or Contractor OM designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. Contractor SSHO or Contractor OM assumes initial command of the situation and directs personnel to do the following:
   a. Cordon off the accident/spill area.
   b. Cover the spilled contaminated soils with canvas tarps or visqueen.
   c. Install temporary environmental protection and/or erosion control measures to contain potential surface run-off contamination.

11.12 SPILL AND FIRE CONTROL MATERIALS AND EQUIPMENT

When planning to move or handle drums (or other containers) containing hazardous or special waste materials, the following shall be kept available in areas where spills, leaks or ruptures may occur: 1) salvage drums or containers (approved by the U.S. Department of Transportation); 2) suitable quantities of proper absorbent materials; 3) portable containing material; 4) neutralizing agents; and 5) fire extinguisher(s).

Drums and containers used during a clean-up will be appropriate to the hazardous substances they are meant to contain, and will meet the regulations promulgated by DOT, 49 CFR Parts 171-179, OSHA, 29 CFR 1910.120, and EPA 40 CFR 262. Drums and containers will be inspected for defects and their integrity assured prior to being filled with any non-solid hazardous or special waste substance.

A spill of material can be contained with porous or absorbent barriers. Absorbent materials can take several configurations (pillows, sheets, booms, loose chips, particle beads, and fibers) that may be set in place, or scattered by hand. Preferred sorbents are inert nonreactive clay minerals (neutralizing agents may be added), or specific formulations which provide automatic neutralization or vapor control.

Spill response equipment is located in the small emergency vehicle (pickup truck) provided by NSWC Crane. This pickup truck is located at the Bioremediation Facility administration area parking lot. The equipment present in the vehicle is a fire extinguisher and one spill kit containing:

- One 85-gallon overpack drum
- Three 50-pound bags of absorbent
- One shovel
- 25-feet of nylon rope
- One roll of duct tape
- Two pair of safety goggles
- Two pair of nitrile gloves and two pairs of butyl rubber gloves
- Two pair of Tyvek suits
- 50-feet of absorbent tubes(socks)
- Clean rags

All items are stored in the 85-gallon drum. This material is held for spill response and will not be used in day to day activities. The spill kit is provided for responding to a spill of no more than ten gallons of fluid. The spill response equipment will be inspected weekly and items will be replaced if in need of repair or missing.

11.13 SPILL CONTROL MEASURES

Stopping the leak or spill at its source may involve turning off pumps or closing valves. Returning a container to an upright position, transferring wastes to other containers, or moving containers to less dangerous locations may, in some circumstances, be possible, but should not be attempted if the identification of the substance is not known unless Level B PPE Protection is worn and decontamination stations have been established. Similarly, the patching of an active leak is not advised until an initial "Assessment" of the situation is made and guidance established in Section 16.6 has been followed.

Some materials are used frequently at the facility. Vehicle related fluids such as fuel, oil, and hydraulic fluid are of special interest due to there continuous presence. The compounds can be released during filling, draining, and rupture events. Frequently, the amount released will be minimal (i.e., less than 8 ounces). A spill of larger quantities will be handled as described above with particular attention to fire hazards.

To the extent possible, the small quantity of the oil, fuel, and hydraulic fluid should be wiped up using a oil absorbent rag, etc. Material produced in the exclusion zone of the Bioremediation Facility or the excavation sites will be classified as explosives-contaminated waste. A disposal manifest will be initiated and NSWC Crane EPD will be contacted for approval to dispose of the material. If the material is from an area other than within an exclusion zone, it will be handled as waste oil.

11.14 DRUM, CONTAINER, AND TANK HANDLING AND MOVING PROCEDURES

Drums, containers, and/or tanks of hazardous or special waste substances will not be moved until the requirements for preparations described in a task work plan and SSHP have been completed (i.e., all required equipment and materials are at the work site ready for use, and the on-site personnel have been familiarized with their responsibilities, the emergency response procedures, and the potential hazards associated with the contents of the drums and containers).

Work site operations will be organized to minimize the amount of drum or container movement. Each drum or container will be inspected before it is moved to ensure that it can be handled without suffering a rupture or puncture, and relocated without having the contents spill or leak.

Unlabeled or unmarked drums and containers will be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Drums and containers under pressure, as evidenced by bulging or swelling, will not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect on-site personnel from explosion.

Equipment used to handle the drums and containers will be selected, positioned, operated, and maintained to minimize any contact that could rupture, puncture, dent, or drop drums and containers holding hazardous or special waste substances, and the potential for equipment ignition sources to ignite vapors released from ruptured drums or containers shall be controlled.

Drums and containers that cannot be moved without rupture, leakage or spillage will be transferred to a sound container using a device specified for the material being transferred. During liquid transfer of flammable or combustible liquids, bonding and grounding equipment shall be utilized.

11.15 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All spill emergencies classified above incidental shall be promptly reported to the Emergency Response Number 854-1333, the Environmental Department (854-1132, 854-3114, or 854-4423), and to the Contractor SSHO at 854-6941 or portable radio Unit

0004. The SSHO will assure that the NSWC Crane EPD and Navy Technical Representative (NTR) or ROICC is notified promptly.

Incidental Release (defined): An incidental release is defined as a release of hazardous material where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by on-site personnel in the immediate release area, or by maintenance personnel. In addition, the quantity of released material does not exceed any EPA Reportable Quantities.

The Contractor SSHO, PM, or OM is responsible for directing initial emergency response actions until the arrival of the NSWC Crane designated authority. The designated authority can include the CDO, resident officer in charge of security, fire department and/or ambulance services, and the NSWC Crane EPD Manager. The following contains the initial response actions to be taken by Contractor personnel and Subcontractors at the work site for spill and release emergencies:

Response Actions:

1. Classify spill as Incidental or an Emergency.

2. If Incidental (as defined above): 1) notify immediate supervisor; 2) assess hazard potential, establish precautions and PPE requirements; 3) begin clean-up of spill.

3. If Emergency, initiate response action in accordance with the following steps:
   a. Quickly assess probability of safely stopping spill. If physical, chemical, or biological health hazards exist, immediate evacuate the area to a safe distance upwind and upgrade from the spill.
   b. Notify the NSWC Crane Security Desk at 854-3300 and provide the following information:
      i. Name and phone number of person calling;
      ii. Location of incident;
      iii. Type of incident;
      iv. If anyone is injured or trapped and the estimated volume of material released.
   c. SSHO, PM, or OM designates one person to meet the emergency response units at the nearest road where the units will be approaching.
   d. SSHO, PM, or OM assumes initial command of the situation and directs personnel to do one of the following:
      i. Emergency shutdown of process equipment or mobile equipment, evacuate the work zone or immediate area to a safe place of refuge and meet the incoming response units and provide all available information.
      ii. Initiate initial spill response using available spill response equipment only for small emergency spill events where personnel are trained to

mitigate. Evacuate the work zone or immediate area if there are any health threats or risks to personnel.

iii. PM or designee shall immediately notify the Navy's Designated Authority. The Navy's Designated Authority is the ROICC assigned to this project.

11.16 SPILL PREVENTION PLAN

Requirements and guidelines for spill prevention will be in accordance with the NSWC Crane Oil and Hazardous Substances Spill Contingency Plan [NSWC Crane, 1994] which has been prepared in accordance with 40 CFR 112, Oil Pollution Prevention.

12.0
RECORDS AND RECORDING

Field personnel will generate and maintain detailed records of all IM activities beginning with equipment and material receipt. A daily project logbook will be maintained on-site to document all relevant activities. General narrative descriptions of field activities will be included in the logbook along with any sketches needed to document field decisions. Field personnel will be responsible for ensuring that the log is current and thoroughly accounts for work accomplished.

In addition to the project log, pertinent data forms are prepared for accumulation of operating and monitoring data associated with both the composting and excavation portions of the project. The data forms will be used primarily to record monitoring information. The forms will be maintained in an operational file in the office trailer at the Bioremedation Facility. Examples of the reporting forms are provided in the various Field SOPs in Appendix D and in the approved QAPP for Full-Scale Operations [MK, 1998b].

The general information recorded for each windrow will include: soil source, amendment quantities and types, moisture added, windrow dimensions, etc. Complete monitoring and sampling data will also be recorded for each windrow. Dates, locations, and results will be recorded for laboratory analyses and process parameter monitoring. The windrow turning schedule and ambient temperature and humidity will also be recorded.

Reports will be generated as required by the U.S. Navy and regulatory agencies such as:

- Initial Full-Scale Batch Report - This report will include the analytical and process data, operation summary and conclusions for the completion of the first batch of soil composting from each SWMU (Mine Fill A, Mine Fill B, Rockeye, and ABG).

- Interim Progress Reports - These reports will include a summary of operations, compost and excavation confirmation analytical results, cubic yards of soil processed, process adjustments, etc., and will be submitted to the NSWC Crane EPD every 90 days for transmittal to the regulators for information.

- Interim Measures Reports - These reports will include a summary of operations and analytical results, cubic yards of soil processed, process adjustments, disposal of wastes and treated soil, photographs, etc., and will be submitted upon completion of interim measures and restoration activities at each SWMU (Mine Fill A, Mine Fill B, Rockeye, and ABG). Two separate reports will be developed for each SWMU - excavation completion report and compost

completion report. The excavation completion report will be submitted to the regulators within 180 days of completion of final excavation, confirmatory sampling and backfilling actions, and acceptance of work. The compost completion report will be submitted to the regulators within 180 days of completion of treatment, confirmation sampling, treated soil disposal, and final acceptance of work.

- Daily Reports - These reports will include a summary of daily operations; monitoring logs; temperature, moisture, oxygen, and any other process parameter results; and analytical results upon receipt from the laboratory. The Daily Reports will be legible and faxed by 10:00 am the following business day to the NSWC Crane EPD for the first thirty days of operation for each SWMU (Mine Fill A, Mine Fill B, Rockeye, and ABG). NSWC Crane EPD will transmit these reports to the regulators if required.

- Photographic Documentation - Documentation will include color photographs and videos of the various stages of excavation, transportation, windrow formation (particularly the initial batch of each SWMU), monitoring, windrow completion, and excavation site restoration. These documentation will be maintained at the Bioremediation Facility Office.

- Inspection Records - These include documentation of all periodic inspections performed during the course of IM remedial actions described in this Plan. Records includes field inspection checklists, calibration records, field logbooks, field data forms, etc. All these records will be maintained at the Bioremediation Facility Office.

13.0
PROJECT ORGANIZATION

The project team organization for this remedial action is shown in Figure 13-1. The responsibilities of each team member are listed in Table 13-1.

The team is structured to provide the necessary operations personnel and oversight for the execution of this work.

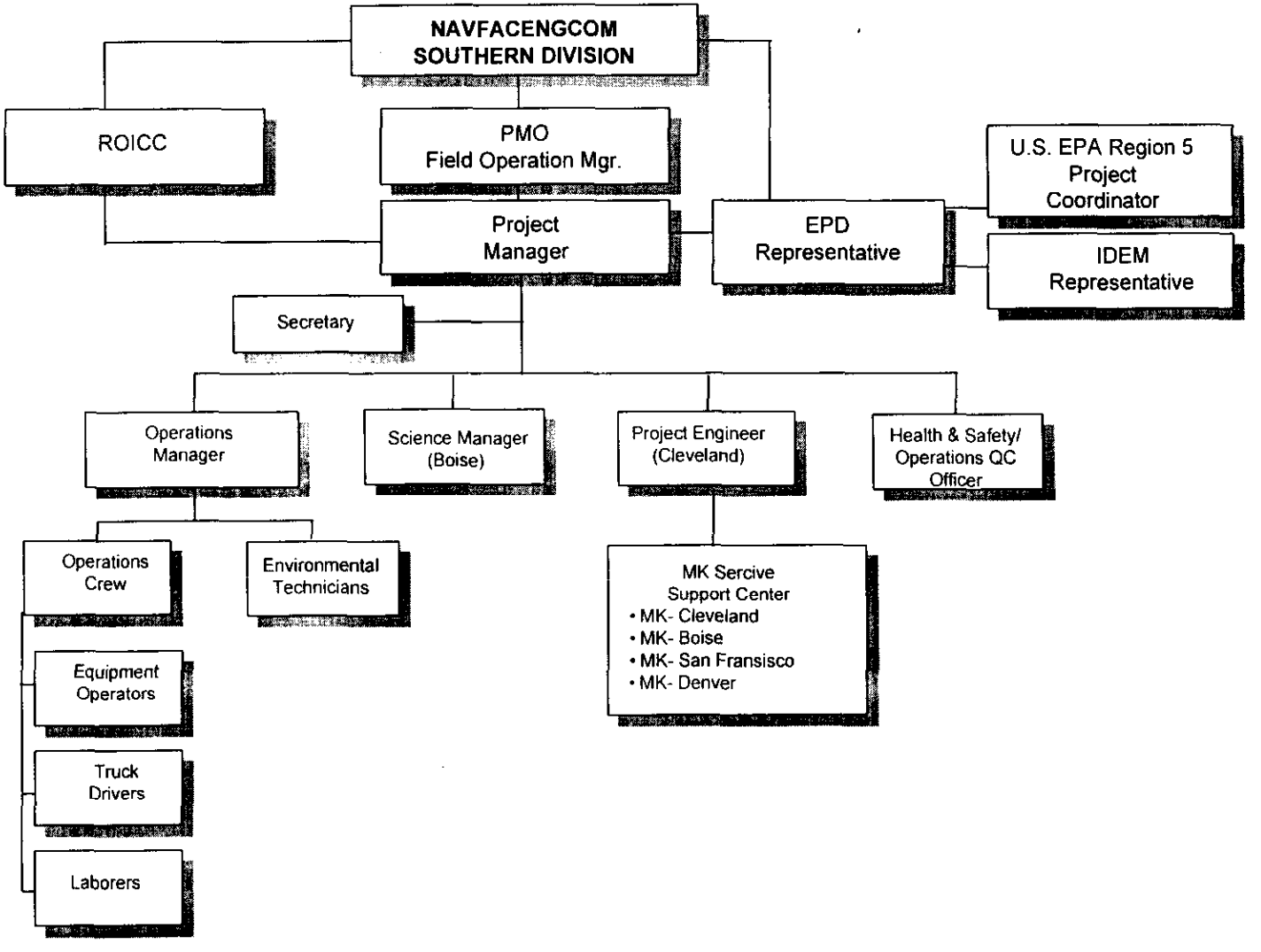


FIGURE 13-1
ORGANIZATION CHART

TABLE 13-1 PROJECT RESPONSIBILITIES	
TEAM MEMBERS	**RESPONSIBILITIES**
NAVFACENGCOM Southern Division Restoration Project Manager (RPM)	Overview of project execution and coordination between Contractor, NSWC Crane, U.S. EPA, and other agencies.
Program Management Office (PMO)	Overall responsibility for all cleanup measures at all sites in the Southern Division of the Naval Facilities Engineering Command under Contract No. N62467-93-D-1106. The PMO is the point of contact for Southern Division.
U.S. EPA Region 5 RCRA Project Coordinator (RPC)	Responsible for overview of all site activities to assure compliance with RCRA. RPC will review and approve all phases of remedial activities including work plans, construction design, equipment, analytical results, etc..
NSWC Crane Environmental Protection Department (EPD) Assistant Navy Technical Representative (ANTR)	Responsible for monitoring contractor performance for compliance with RCRA, the RCRA Corrective Action Part B Permit, and other environmental regulations as they apply to the approved Interim Measures Work Plans. In absence of Navy Technical Representative (NTR) and in an environmental emergency, the ANTR will provide direction to Contractor and provide notification to appropriate parties.
NSWC Resident Officer In Charge of Construction (ROICC)	Southern Division's on-site representative (NTR) and is the liaison between NSWC Crane officials, the U.S. EPA, and the Contractor Project Manager for all work described in this Plan at NSWC Crane.
Project Manager (PM)	Reports to the Field Operations Manager from the PMO. Overall responsibility for implementing this Operational Plan and all other project activities. The PM will control all on-site forces to ensure completion of project tasks. • Single point of contact for U.S. Navy and U.S. EPA liaison. • Coordinates the project resources to ensure compliance with the appropriate plans, procedures, and regulatory requirements. • Oversees all personnel on-site and coordinates with the PMO. • Overall responsibility for cost, schedule control, safety, and quality.
Operations Manager (OM)	Reports to the PM and has primary responsibility for the coordination and control of all field activities to ensure that all tasks included in this Operational Plan are completed. • Coordinates the activities of all field operations personnel. • Provides daily reports to the PM on the status of field operation activities. • Responsible for equipment maintenance, procurement of amendments, and miscellaneous equipment rental. • Primary responsibility for production of the Bioremediation Facility and direct supervision of operators, drivers, laborers, and the Environmental Technicians. • Responsible for control and elimination of existing and potential industrial hazards.

TABLE 13-1 (continued) PROJECT RESPONSIBILITIES	
TEAM MEMBERS	**RESPONSIBILITIES**
Science Manager (SM)	Reports to the PM and has primary responsibility for oversight of the science activities on site including regulatory support, data collection, analysis, and reporting. • Provides technical support to the Environmental Technicians, • Provides technical support to the OM.
Environmental Technicians (ET)	Report to the OM. Specific responsibilities include: • Perform duties relative to data collection, sampling, and process control. • Maintain project records of all monitoring and analysis and prepare technical reports presenting the results of the monitoring, analysis, and facility operational performance. • Responsible for sample collection, field screening analysis, and preparation of samples for shipment to off-site laboratories. • Operates and maintains process instrumentation such as temperature/oxygen probe and data logger, pH analyzer, etc.. • Performs calculations for moisture content analysis, volume and weight conversions, averages, and standard deviations.
Project Engineer (PE) (Cleveland)	Reports to the PM with primary responsibilities of coordinating the engineering effort in support of field activities. • Assign Cleveland based resources as required for the completion of all project plans and documents. • Provide engineering support for field activities as required.
MK Engineering Service Support Center	Technical staff reporting to the Project Engineer with specific task responsibilities as necessary to allow the Project Engineer to fulfill his responsibilities.
Site Safety and Health Officer (SSHO)	Reports to the PM and implements and ensures compliance with the Task-Specific Site Safety and Health Plan (SSHP). Tracks and reports on safety-related matters. • Implements and executes personnel surveillance program to ensure proper monitoring of internal and external exposures. • Provides site-specific training to personnel as required by the SSHP. • Tracks all personnel training requirements for heavy and light equipment operation, survey data, certifications, and records to ensure compliance with plans and regulations. • Assists in developing and implementing the SSHP. • Conducts audits as appropriate to ensure compliance. • Reviews and approves work permits for appropriate industrial hygiene and safety controls. • Provides monitoring to ensure the protection of project personnel, the public, and the environment. • Maintains an inventory of industrial hygiene and safety supplies as appropriate. • Maintains monitoring equipment and calibration records. • Stops work when necessary to ensure the safety of personnel and to prevent damage to the environment. • Collects air quality samples, records results, and prepares monitoring reports presenting the air quality results to the U.S. Navy.

TABLE 13-1 (continued) PROJECT RESPONSIBILITIES	
TEAM MEMBERS	**RESPONSIBILITIES**
Operations Quality Control Officer (OQCO)	Reports to the PMO Program QC Manager. Interfaces with the PM and has the primary responsibility for verifying a consistently high level of quality for the operations. • Reviews and checks documents, reports, and testing results. • Coordinates with the PM and OM on all facility operations. • Provides surveillance of field operation activities to ensure compliance with this Plan and the QAPP and completes Field Inspection Checklists. • Keeps minutes of the periodic quality meetings. • Implements the three phases of quality control by conducting preparatory meetings prior to beginning a new feature of work, performing surveillance and audits during the implementation phase and finally performing follow-up inspections to verify work was completed in accordance with all associated plans and procedures. • Ensures tracking and resolution of nonconformance/rework items.
Secretary	Reports to PM and is responsible for receiving in-coming telephone calls and correspondence, maintaining project files, and general clerical duties.
Equipment Operators Center-Pivot Loader/Tractor/Backhoe/loader/ Skid Steer Loader/Screener Operators	Reports to the OM and is responsible for operation of equipment for excavation of contaminated material to be processed, placement of backfill, screening, loading and mixing of amendments etc.. • Loading operations of the amendment grinder-mixer, • Cleanup and windrow forming during loading and windrow turning operations, • Assist in loading finished compost into the live-bottom trailers, • Operate the windrow turner machine as required. • Loading operations of the amendment grinder-mixer. • Operate excavation site soil screener.
Truck Driver	Reports to the OM and is responsible for operating the tractor/trailer rigs to deliver contaminated soil to the Bioremediation Facility and deliver finished compost material to the NSWC Crane landfill.
Laborer	Reports to the OM and is responsible for; • Decontamination of equipment at the excavation site. • Segregation of reject materials from screener (i.e., rocks, metal, wood, etc.). • Operation of the vehicle decontamination facility at the Bioremediation Facility. • General site cleanup and maintenance of Bioremediation Facility area, sumps, and ponds.
Note: See Table A-3 of the SSHP in Appendix A contact numbers.	

14.0
SCHEDULE

Figures 14-1 and 14-2 show the proposed milestone activity schedule for full-scale soil excavation and compost operations, respectively for the first year of operation. The quantities and time periods may be altered slightly during the full-scale operation based on the optimization of amendments and soil conditions. The schedule is presented with activity bars which will show progress once the program begins. The schedule also shows a target bar for establishing the original schedule target milestones. This allows for progress against the original target dates to be observed at a glance.

Excavation will be in accordance with the Soil Excavation Plan and will continue as weather and other conditions allow. It is anticipated that winter weather for the period between January 1, 1998, and March 31, 1998 will be unfavorable and result in little or no excavation activities during this period. Excavated soil may be screened and stockpiled in one of the compost buildings for use during the winter months. Unseasonably good weather during the winter months may allow additional excavation activities to proceed.

The compost operations, shown on Figure 14-2, are for a typical building with two cycles of composting. Multiple buildings will be used and cycles will continue throughout the full-scale period. It is anticipated that compost activities will commence in mid-February 1998. A master schedule, showing the progress of field activities, will be available at the Bioremediation Facility Office and updated on a monthly basis.

The order of excavation activities will be as follows: Mine Fill A, Mine Fill B, ABG, and Rockeye. Based on the estimated quantities of soil to be excavated at each of these SWMUs (see Section 1.0), and assuming use of only two buildings for composting and a 25% soil loading, it is estimated that it will take ten years to accomplish the IM remedial actions described in this Plan. However, the actual schedule will be less than the estimated schedule if 30% soil loading is used and all three buildings are used for composting.

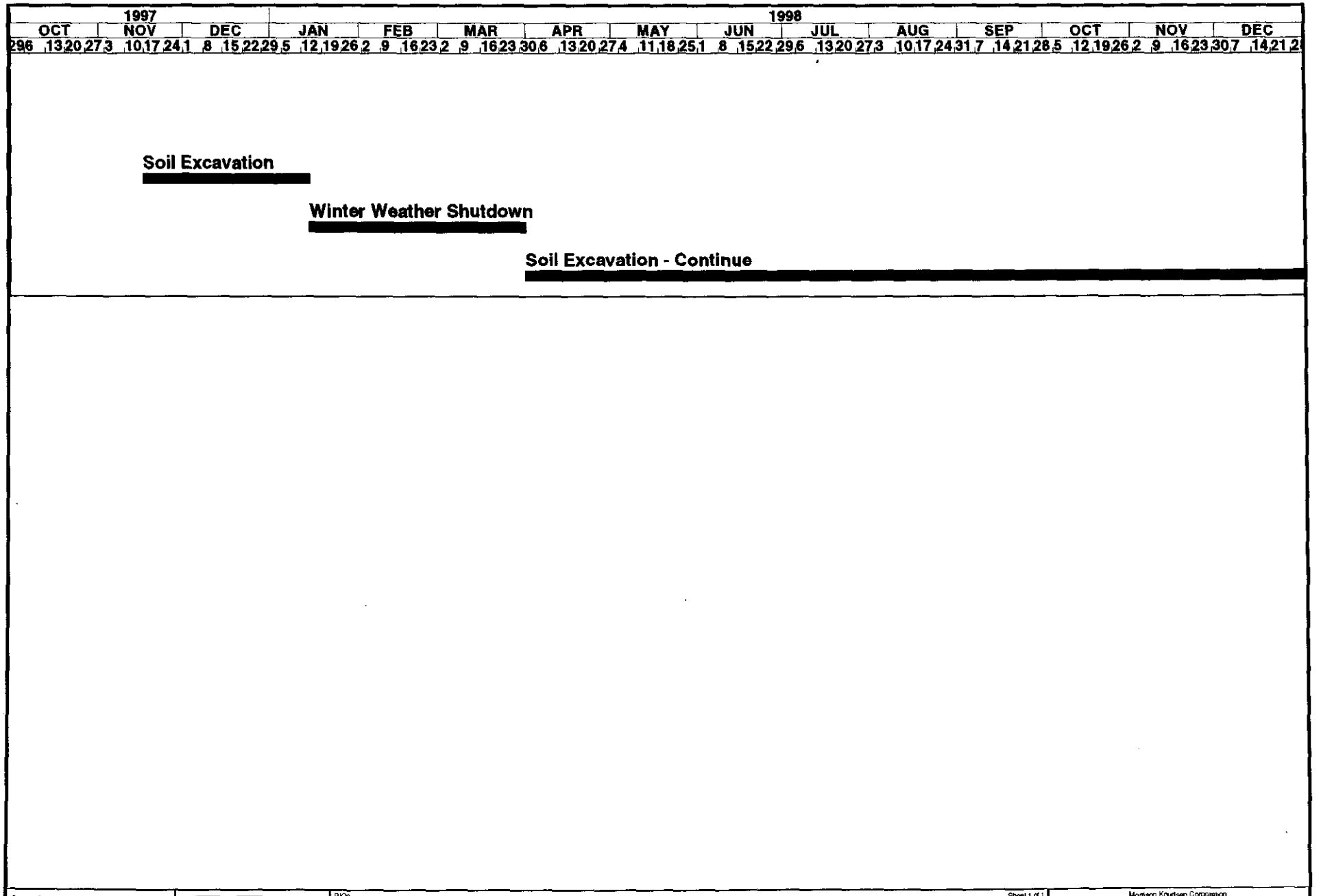
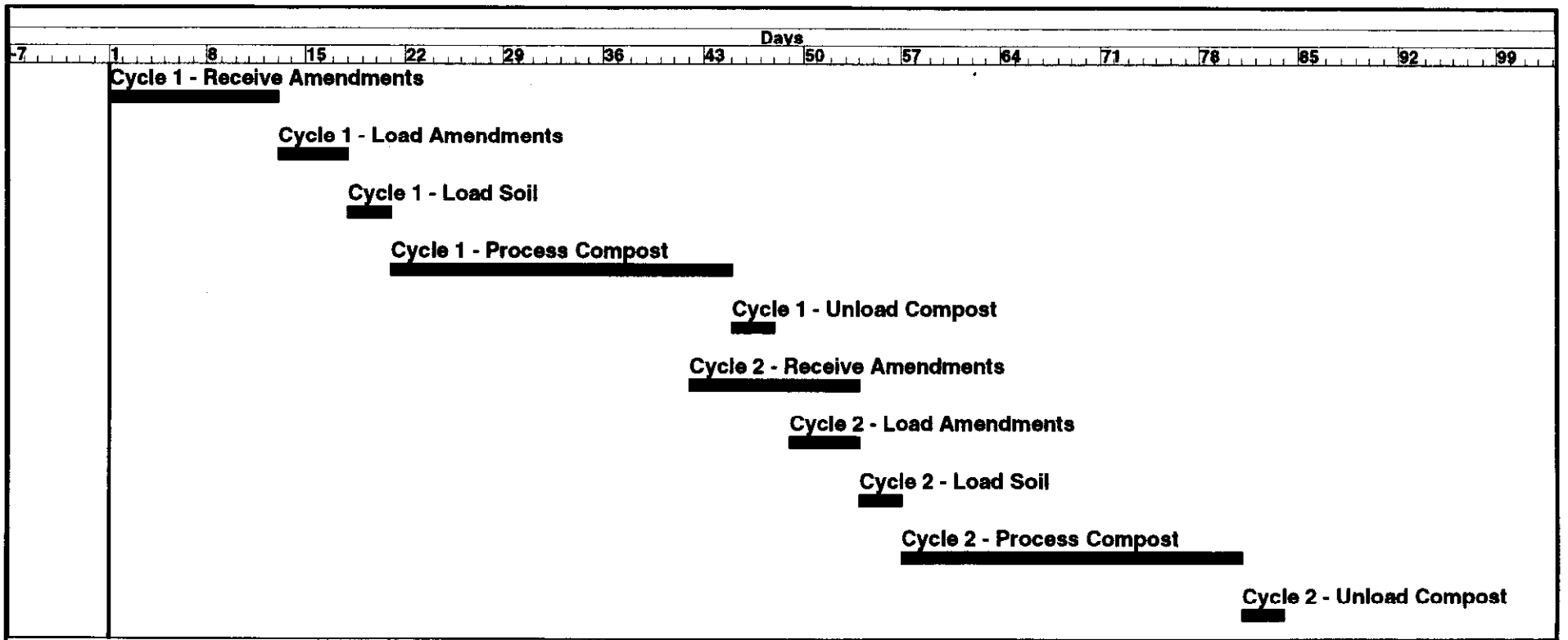


Figure 14-1

Full Scale Biofacility Excavations



Project Start	04NOV96	Non-Critical	
Project Finish	25JAN97	Progress Bar	
Data Date	04NOV96	Critical Activity	
Plot Date	21NOV97		

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BK03

Sheet 1 of 1

Figure 14-2
Full Scale Biofacility Operations
Typical Building - Two Cycles

Morrison Knudsen Corporation

Date	Revision	Checked	Approved

15.0
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APPENDIX A
FULL-SCALE SITE SAFETY AND HEALTH PLAN

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MK PMO Health and Safety Manager

APPENDIX A1
SWMU-12/14, MINE FILL A SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP) FOR FULL-SCALE OPERATIONS

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1.0
INTRODUCTION

This Task-Specific Site Safety and Health Plan (SSHP) describes safety and health requirements for interim cleanup measures at NSWC Crane, specifically for full-scale operations conducted at Solid Waste Management Unit (SWMU)-12/14, Mine Fill A and the Soils Bioremediation Facility. This SSHP is consistent with requirements of the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Site Regulations; 29 CFR 1910.120 and 29 CFR 1926.65; and the U.S. Army Corps of Engineers (ACOE) *Safety and Health Requirements Manual* EM 385-1-1, dated September 1996. This SSHP is applicable to all personnel who enter work areas described in this SSHP and who are under the control of Morrison Knudsen Corporation (MK) or MK's Subcontractors.

1.1 WORK TASK SUMMARY

SWMU-12/14, Mine Fill A - Excavation, removal, and screening (includes rock washing) of approximately 2,400 cubic yards of explosives-residual contaminated soil, transport to the Bioremediation Facility, soil sampling, decontamination, and site restoration. Table A-1 provides a summary on site description and contaminants.

Soils Bioremediation Facility - Explosives contaminated soil will be received at this facility from SWMU-12/14. The contaminated soil will be processed by mixing with amendments and composting in covered structures. Support subsystems include decontamination facilities; storm water diversion and retention controls; and office and laboratory trailers. Amendments that will be mixed with the contaminated soils include alfalfa and animal manures, sawdust, wood chips, straw, and potato waste in various recipes. Amendments will be loaded into a grinder/mixer and discharged into the composting building for formation of the windrows (refer to the Full Scale Operational Plan).

1.2 CONTAMINANT CHARACTERISTICS

The potential contaminants are summarized below. Material Safety Data Sheets (MSDSs) or National Institute for Occupational Safety and Health (NIOSH) Pocket Guides will be used as a source of information for each contaminant. MSDS and NIOSH information for each of the potential contaminants, process chemicals, or other chemical substances encountered during the interim cleanup process will be organized into a separate binder, commonly called the "MSDS Binder." These binders will be available to all personnel, at anytime, and will be at appropriate on-site locations including the MK job-site trailer. Additional information concerning potential contaminants is presented in Table A-2. The

potential contaminants contained in the soils to be received at the Soils Bioremediation Facility are summarized below.

SWMU-12/14, Mine Fill A - Soil containing residues of TNT, HMX and RDX, and explosive-contaminated wastewater are present at the excavation site. Concentrations of individual constituents in the soil ranged from undetected to 15,300 mg/kg (Halliburton NUS, 1992). Halliburton NUS 1992 also reports other chemicals of concern to include, bituminous asphalt, micro-crystalline wax, toluene, naphtha, coal-tar naphtha, methylethylketone, and aluminum. In the same report, they report hazardous waste potentially generated at Mine Fill A to include Sludge containing explosives, pink water (TNT containing), grit blast residue (cadmium, chromium, lead, barium), paint waste (metals and hydrocarbons to include halogenated, aromatic, ketone and alcohol), and spent carbon. Follow-on soil sampling and subsequent analysis for soils representing the initial 2,400 cubic yards to be composted confirmed HMX, TNT, and RDX contamination. Total metals reported include barium, cadmium, chromium and lead in low mg/kg concentrations. TCLP metals were undetected in the majority of the sampling runs. Volatile organics were undetected or estimated to be in the low microgram/kilogram levels.

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2.0
SAFETY AND HEALTH HAZARDS SUMMARY

2.1 OVERVIEW

Hazards at this site include construction safety hazards associated with heavy equipment operation; soil excavation, potential contact with underground utilities and undermining of structural supports in Mine Fill A; inclined walking and working surfaces; traffic control including haul road layout; energy control (electrical and other kinetic energy sources) or other utility lines; site restoration including backfilling and compaction; eye/head/feet physical hazards; and heat and cold stress.

During full-scale operations, the potential risk of acute exposure to the chemical contaminants listed in Table A-2 is considered low if the engineering controls, administrative controls, and personal protective equipment (PPE) requirements are strictly adhered to. The highest health risk chemical contaminant is Ammonia (NH_3) generated from animal manures. Potential health hazards involving hydrocarbons, *other* inorganics, and other gases and vapors are also considered low. Potential biological hazards may include airborne bioaerosols such as bacteria and fungi (molds and yeast). The health hazard potential is considered moderate based on published results of air sampling campaigns at sewage sludge, leaf, and municipal waste composting facilities. The Soils Bioremediation Facility processing equipment has been designed and will be operated to minimize dust releases, and safeguarded to prevent employee contact with rotating equipment. A Chemical Hygiene Plan (CHP) has been prepared to establish safe laboratory practices and procedures, refer to Attachment B of this document.

2.2 ACTIVITY HAZARD ANALYSES

AHA have been prepared for each anticipated task in accordance with EM 385-1-1, September 1996 (ACOE, 1996). These hazard analyses are in the form of worksheets contained in Attachment A of this SSHP. Each site activity shall be reviewed by field supervision, namely the MK Site Safety and Health Officer (SSHO) and MK General Superintendent prior to starting work to determine if the prepared AHA adequately addresses the planned activity. If the prepared AHA requires revision or a new task is identified, additional hazard analysis will be prepared as needed. A new AHA worksheet shall be field prepared by the MK SSHO before the activity takes place. The Pre-Entry Briefing meeting is utilized to review the AHA and is conducted with all affected workers by the Superintendent.

2.3 CHEMICAL HAZARDS

The potential chemical contaminants, their exposure limits, sign and symptoms of overexposure, and first aid requirements are presented in Table A-2.

2.4 BIOLOGICAL HAZARDS

Each work area will be approached with caution and assessed for insect, snake and biohazard plant life. Potential biological bioaerosol hazards includes bacteria, molds, yeast and fungi which may be present in airborne concentrations greater than background at the Bioremediation Facilities during the composting process.

2.5 CONSTRUCTION SAFETY HAZARDS

2.5.1 Physical Hazards

Physical hazards on this project include the use of heavy equipment including haul trucks, backhoe and loader, screener, grinder, windrow turner and other process equipments; and tripping and slipping from walking and working surfaces. Project personnel will receive site-specific and safety training, discussed later, to orient them to these potential hazards.

2.5.2 Noise

Operations may generate noise levels that exceed allowable limits. Hearing protection shall be provided for all field personnel, and its use is required when noise levels exceed 85 decibels A weighted network {dB(A)} steady state or 140 dB(A) impulse, regardless of the duration of exposure. Hearing protection will be provided to all field personnel. A comprehensive Hearing Conservation Program will be implemented when noise levels equal or exceed 85 dBA on an 8-hour time weighted average. Exposure assessments will be conducted by the MK SSHO throughout the work campaign.

2.5.3 Adverse Weather Stress

All employees are to be alert to the signs and symptoms of heat stress. Should extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating, rapid pulse, or pale clammy skin occur, the employee is to immediately leave the work area, rest, cool off, and drink plenty of cool water. If the symptoms do not subside after a reasonable rest period, the employee shall notify the supervisor, who in turn will notify the MK SSHO and seek medical assistance. The MK SSHO and the site supervisor will be alert to signs of heat stress in site personnel and increase the frequency of breaks and fluid consumption as necessary.

Cold injury is classified as either localized, as in frostbite, frost nip or chilblain, or generalized, as hypothermia. In judging the cold hazard, both air temperature and wind chill factor must be considered. The first symptoms of hypothermia are uncontrolled shivering, the sensation of being cold; the heartbeat slows and sometimes becomes irregular; the pulse weakens and blood pressure changes. Severe shaking or rigid muscles caused by bursts of energy change the body chemistry. Vague or slowed speech

occurs; memory lapses, incoherence and drowsiness then occur. As core temperature continues to drop, listlessness, confusion and little attempt to keep warm commences. Pain in the extremities is felt. As exhaustion sets in, the body's ability to contract blood vessels is diminished, and rapid loss of heat and cooling begins.

Frostbite can occur without hypothermia when the extremities do not receive sufficient heat from central body stores. This can occur because of inadequate circulation and/or insulation. This condition results in damage to and loss of tissue. The most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes. Damage from frostbite can affect the outer layer of skin only, or it can include the tissue beneath the outer layer. Damage from frostbite can be serious; scarring, tissue death and amputation are all possibilities. The symptoms of frostbite include: 1) The skin changes color to white or grayish-yellow, progresses to reddish-violet and turns black as tissue dies; 2) Pain may be felt at first, but subsides; 3) Blisters may appear; 4) The affected part is cold and numb; and 5) The skin has a waxy appearance.

To prevent cold stress, proper clothing must be worn. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat. Refer to Section 7.2.6 for more guidance on heat and cold stress management.

2.5.4 Excavations

Open excavations and trenches present a hazard from falling into the excavation and/or side wall collapse while personnel are near or inside the excavation. To minimize exposure risk, the excavation work site will be barricaded. The deepest excavation on this project may approach slightly more than 3 feet. OSHA 1926.650 Subpart P - Excavations and Corps of Engineers requirements (EM 385-1-1, Section 25) for sloping or shoring are not anticipated as necessary. When excavations are completed near building sidewalls and foundations, a competent excavation person will assess potential collapse scenarios and specify any control requirements (e.g. shoring).

Positive identification of underground utilities and services is required at least 24 hours prior to any excavation, trenching or penetrations. An Excavation and Trenching Permit application must be submitted at least seven days prior to any excavation activities. The MK Project Manager (PM) will be responsible for obtaining this permit through the NSWC Crane Public Works Department (PWD). Part of this permit process will include a UXO survey by the NSWC representative. MK will have a designated competent person who will evaluate all excavations and trenches on a daily basis. Inspections shall be recorded in a log book or field inspection checklists.

2.5.5 Hazardous Energy Control (Lockout/Tagout)

Ground Fault Circuit Interrupters (GFCIs) will be installed on all temporary portable electrical equipment in accordance with EM 385-1-1 Section 11.C.05. All extension cords shall have GFCI protection and shall be inspected and determined to be free of cracks or frays.

Any system where the potential exists for unexpected energizing, start-up, or release of kinetic or stored energy during servicing and maintenance resulting in injury or damage shall be energy isolated in accordance with EM 385-1-1 Section 12, 29 CFR 1910.147. The MK Site Superintendent shall be responsible for verifying adequacy of all lockout/tagout installations and notifying all affected personnel. The MK Site Superintendent has the responsibility for implementing energy control measures. The PWD will provide energy control services on Mine Fill A utilities and process equipment if necessary. MK will provide their own energy control services on Bioremediation facility equipment and processes.

In addition, energy controls apply to motorized heavy equipment and process equipments and the following requirement applies. At a minimum, during service and maintenance of motorized equipment, the key shall be removed and in possession of the service or maintenance person and a "Do Not Operate" tag signed by this person shall be displayed near the start-up controls. Pre-operational checks and maintenance requirements on process equipments, including energy control will be incorporated into checklists.

2.5.6 Fire and Explosion

An Unexploded Ordnance Survey (UXO) will be required prior to excavation site mobilization and may continue throughout the excavation process. The UXO Survey will be conducted by NSWC personnel.

No hot work or open flames will be allowed in the work area without a Hot Work Permit obtained through the NSWC Fire Services. Hot Work Permitting will be coordinated through the base Fire Department. Flammable and combustible fuels for heavy equipment shall be stored and dispensed in accordance with NFPA 30, the Flammable and Combustible Liquids Code. Fire extinguishers will be located at the diesel fuel storage location and in each of the Composting Buildings. All mobile heavy equipment must be fitted with a minimum 5 lb "ABC" fire extinguisher. Any temporary trailers or structures must have fire extinguishers installed in accordance with NFPA 10. Depending on the fire loading, in most cases a 5 lb "ABC" is sufficient in each office trailer. This extinguisher must be mounted approximately four feet from the floor next to a egress door. The MK SSHO is responsible for completing monthly checks on the fire extinguishers and recording appropriately. Use of any tool that can be considered an ignition hazard where fire and explosion hazards may exist is strictly prohibited.

Smoking is permitted only in designated areas, this applies to excavation sites and the Bioremediation Facility.

Explosives Hazard Analysis was completed for process equipment by Comarco (1997). Implementation of the recommendations by Comarco (1997) were summarized in a memo by Beall (1997). Controls include the following:

1. Employee awareness training on the potential for burning and explosion.

2. Monitor Screener output for lumps greater than 1.5 inches in diameter and insure these lumps are not transported to the Bioremediation Facility for composting.

3. Monitoring for dust and use of water sprays to minimize dust generation.

4. Establish decontamination procedures for all equipment.

5. Only rubber-tired equipment is permitted in areas where explosive contamination is present.

6. Use only non-sparking bristles on the power brush.

7. Conduct personal training on the safe use on the laboratory bench oven installation.

2.5.7 General Motor Vehicle, Hand and Power Equipment Safety

The following traffic rules will apply to all motorized vehicles and equipment while on site:

- Equipment carrying waste shall always have the right-of-way within the Work Zones.

- The speed limit is 10 mph, or as posted. Exceeding the speed limit is cause for disciplinary action, including removal from the site.

- Personnel shall not ride equipment that has not been specifically designed for the transport of personnel.

- Seatbelts shall be worn at all times when operating any motorized equipment or vehicle.

- All motor vehicles and equipment including hand and power tools shall be subject to safety inspections by the MK SSHO. The MK SSHO reserves the right to reject any equipment. A "DO NOT USE" or "DEFECTIVE" tag will be placed on the

equipment and documented in the MK SSHO Logbook. Corrective action will be pursued with the Superintendent.

- Daily safety checklists shall be completed by heavy equipment operators and delivered to the MK Site Project Office on a daily basis. The checklist is based on the equipment manufacturers recommended guidelines for daily checks.

2.5.8 Vehicular Traffic and Work-Site Control Hazards

Potential hazards from vehicular traffic around work areas including the Soils Bioremediation Facility will be controlled by using traffic control items such as traffic cones, flagging, barricades, and signs. Types and placement of traffic control items will be in accordance with EM 385-1-1, Section 8 and 29 CFR 1926.201 and 202. Workers required to work in active traffic paths or roadways will be required to wear high visibility reflective vests.

2.5.9 Access and Haul Roads

If special access and haul roads are required and constructed for this project, they will be constructed in accordance with EM 385-1-1 Section 21.I.

3.0
RESPONSIBILITIES AND AUTHORITIES SUMMARY

This section describes the roles and responsibilities of project personnel with regard to safety and health. Ultimately, responsibility for the safety and health lies with the individual. All personnel must be cognizant of the hazards and the methods of reducing the risk of injury and illness. All personnel will comply with the rules and procedures set forth in this plan and will make project management aware of any conditions which may jeopardize the welfare of project workers and/or the general public. The specific personnel names and telephone numbers of responsible persons are presented in Table A-3. Figure A-1 is the route map to the nearest medical facilities which also shows the NSWC Base layout.

3.1 MK PROJECT MANAGER (PM)

The PM is responsible for the management of all aspects of the project, including safety and health. The PM is responsible for ensuring that all project tasks receive appropriate safety and health review before commencement of field activities and that the necessary equipment and facilities are available to implement the SSHP.

3.2 MK GENERAL SUPERINTENDENT AND JOB SUPERVISORS

The MK General Superintendent and the Job Supervisor(s) are responsible for ensuring that the safety and health aspects for their particular task are addressed. They are responsible for the implementation of the SSHP in the field and for ensuring that all project personnel comply with provisions of the plan. The MK General Superintendent and Job Supervisor(s) are also responsible for notifying the MK SSHO of any changes in work conditions which may affect the safety and health aspects of the task. The MK General Superintendent is responsible for conducting Plan of the Day (POD) meetings. The Job Supervisor(s) are responsible for conducting Pre-Entry Briefings when required.

The Job Supervisor(s) must notify the MK SSHO and MK General Superintendent of all accidents and incidents as soon as possible. The Job Supervisor(s) shall conduct an accident investigation and record the results of the investigation on a Supervisor Accident Investigation Report form or equivalent form. The initial investigation report shall be formally transmitted to the MK Project Manager within four hours after critical management of the incident is complete. The MK Project Manager shall follow the reporting requirements described in PHSP 04.1. The MK General Superintendent shall conduct a critique of the incident with selected MK and Subcontractor personnel as soon as possible after critical management of the incident is complete. Lessons learned will then be developed by the MK General Superintendent and Job Supervisor(s) and communicated to all affected personnel.

3.3 MK SITE SAFETY AND HEALTH OFFICER (SSHO)

The MK SSHO is responsible for the day-to-day implementation of the SSHP, and verification of compliance with the SSHP and all applicable occupational safety and health rules and regulations. The SSHO has the authority to suspend work at any time if there is an imminent threat to the health and safety of project workers or the general public. The SSHO shall assure the Navy's designated authority at the site is notified immediately of any accident including spills. The SSHO shall assist in the accident investigation effort and shall have final approval authority for accident reports. The MK Work Plan document describes in detail the role and responsibilities of the SSHO on this project. The SSHO is responsible for making modifications to the plans and recommending changes to the work tasks if they affect safety and health. The SSHO is responsible for ensuring that all required sampling/monitoring is performed and that all required safety and health documentation is maintained.

3.4 NEAREST EMERGENCY MEDICAL FACILITY

Directions to the On-Site NSWC Medical Department:

The NSWC Fire Department coordinates the on-site ambulance service. The Medical Department is located in Building 12, off of road H-2, just north of H-5. See Figure A-1.

Directions to Bedford Medical Center:

From the Bloomington Gate, head east on Highway 58 to the city of Bedford, turn left onto 16th. This Gate is open 24 hours. The approximate distance to hospital is 22 miles.

From the Bedford Gate, head east on Highway 158 to the city of Bedford, 158 turns left onto 16th Street. The distance to hospital is approximately 22 miles. This gate is open during the hours of 6 AM to 8 AM and 3 PM to 6 PM on Mondays through Fridays exclusive of holidays.

Directions to Bloomington Hospital:

Exit NSWC on road H5-45 through the Bloomington Gate, then follow Highway 45 North to Bloomington. At the intersection of Highway 45 and Highway 37, continue straight ahead and follow Bloomfield Road north until it becomes 2nd Street. Continue on 2nd Street; the hospital will be on right-hand side of the road.

4.0
TRAINING REQUIREMENTS SUMMARY

This section summarizes training requirements for project personnel. A training requirements summary is provided as Table A-4.

4.1 HAZARDOUS WASTE OPERATIONS TRAINING

All personnel entering a contamination reduction zone or exclusion zone shall have completed the initial 40-Hour Hazardous Waste Operations Safety and Health Training and three days of supervised experience pursuant to 29 CFR 1910.120(e)(3). All personnel shall receive eight hours of refresher training annually, pursuant to 29 CFR 1910.120(e)(8), as necessary. All on-site supervisors and managers shall receive an additional eight hours of specialized training pursuant to 29 CFR 1910.120(e)(4).

4.2 SITE SPECIFIC TRAINING

All personnel shall receive site-specific safety and health training prior to entering the site or commencement of work. All site employees and subcontractors entering the contamination reduction zone (CRZ) and the Exclusion Zone (EZ) shall receive this training. The Job Supervisor(s) are responsible for identifying personnel requiring this training and coordinated with the MK SSHO regarding scheduling of this training. The MK SSHO or designated alternate will conduct the training. Site visitors shall receive site-specific training prior to entering an exclusion zone. The format and content will be left up to the discretion of the MK SSHO. This training will cover the SSHP, but not necessarily be limited to, the following topics:

- Names of site safety and health personnel.
- Safety and health hazards present on the site and anticipated during the work campaign.
- Hazard Communication.
- PPE requirements.
- Safe work practices.
- Engineering controls.
- Medical surveillance requirements, including recognition or symptoms and signs which might indicate overexposure to hazards.
- Decontamination procedures.
- Emergency procedures.
- Spill containment plan.
- Energy Control.
- All other requirements of this SSHP.

4.3 RESPIRATORY PROTECTION TRAINING

All personnel required to use respiratory protection shall have certified training in respirator use, care and maintenance pursuant to 29 CFR 1926.103 and 29 CFR 1910.134. Each individual shall be medically qualified to wear a respiratory device and have documented evidence of completing respiratory training and fit testing. Personnel required to use disposable dust masks shall be trained only on the use and limitations of these units.

4.4 HAZARD COMMUNICATION TRAINING

All personnel shall complete hazard communication training pursuant to 29 CFR 1910.1200 and 29 CFR 1926.59 regarding all potentially hazardous chemicals to which they may be exposed. MSDSs and/or NIOSH Pocket Guides for the contaminants suspected to be in the various work sites will be placed in a site MSDS Right-To-Know Binder. Copies will be maintained at the site. Hazard Communication training will be included as part of the Site-Specific Training required in Section 4.2. When new chemicals are brought onto the work site or new chemical contaminants are identified, an MSDS and/or NIOSH Pocket Guide will be added to the MSDS Right-To-Know Binder(s) with a corresponding review by the MK SSHO and Job Supervisor(s) and if necessary, training shall be conducted with affected individuals. The MK SSHO has overall responsibility for maintenance of the MSDS database. Job Supervisor(s) are responsible for reviewing the MSDS, identifying training needs for affected workers and transmitting a copy of the MSDS to the MK SSHO.

4.5 CPR/FIRST AID AND BLOOD BORNE PATHOGENS

At least one employee on each shift shall be qualified to administer First Aid and CPR. At a minimum, the MK SSHO shall be First Aid/CPR qualified. This person is also required to be trained to 29 CFR 1910.1030 (Blood Borne Pathogens).

4.6 SAFETY MEETINGS

Safety meetings for all MK employees shall be conducted on a weekly basis. This is a group meeting intended to be a self assessment of safety performance and a chance to review any lessons learned as a group, plus an opportunity to introduce specialized training topics. The meeting shall be chaired by the MK General Superintendent with assistance by the MK SSHO. This safety meeting can also be used to describe any changes in the Site Specific Training described in Section 4.4. Safety Meetings are documented using Figure A-2 from this plan or equivalent.

4.7 PLAN OF THE DAY (POD) MEETINGS

Plan Of The Day (POD) Meetings shall be held at the beginning of each shift to review the planned work of the day as well as any safety and quality concerns. The meeting is

chaired by the MK General Superintendent or MK PM. The attendee's include Job Supervisor, the MK Quality Control representative, the MK SSHO and other selected personnel. The date, time, personnel attending and meeting minutes shall be documented in field log-books.

4.8 PRE- ENTRY BRIEFINGS (MEETING)

Pre-entry briefings shall be held for employees prior to their initiating any new or differing site activity in an exclusion zone and at such other times as necessary to ensure employees are knowledgeable of the work plan activity, the Activity Hazards Analysis (AHA), and that the plan and analyses are being followed. Pre Entry Briefs are the responsibility of the Job Supervisor. Attendance shall be documented using Figure A-3 from this Plan.

In addition, all incidents will be promptly evaluated and the evaluation results will be communicated to personnel in POD meetings. Lessons-learned from these evaluations shall be communicated to all affected personnel.

4.9 QUALITY CONTROL PREPARATORY PHASE INSPECTION MEETING

The MK SSHO shall attend all Quality Control Preparatory Phase Inspection Meetings to discuss any safety and health concerns requiring special attention and to review anticipated safety requirements for a specific definable feature of work, and to review specific air monitoring required.

4.10 RECORDKEEPING

Written records of all required training and meetings shall be maintained on site by the MK SSHO. These records shall be made available to U.S. Navy personnel upon request.

5.0
MEDICAL SURVEILLANCE PROGRAM REQUIREMENTS

5.1 SUMMARY

All project personnel who work within the exclusion zone for more than three days per month, or are required to use respiratory protection regardless of the time within the exclusion zone, will participate in a medical surveillance program in accordance with OSHA 1910.120 and 1926.65, Section 16 from the MK Safety and Health Program Description for Hazardous Waste Site Operations (MK employees only), and as described in this section.

The medical surveillance program consists of a baseline or initial examination, an annual medical examination, a termination examination, and episodic medical examinations as necessary. Termination exams specific to this job have been determined to not be necessary unless specific criteria is met as discussed in the MK Safety and Health Program for Hazardous Waste Site Operations, Section 16. At a minimum, the content of the initial, annual and termination examinations shall consist of the following medical tests and procedures (or as determined by the examining physician):

- Medical and occupation history.
- Complete physical examination.
- Pulmonary function test (FVC and FEV_1).
- Complete blood count, generally SMAC-22 or 24 biochemical profile.
- Audiometry.
- Complete urinalysis.
- Resting electrocardiogram at the direction of examinng physician).
- Vision screen.
- Chest X-ray (PA) (every three years or at the direction of the examining physician).

An episodic examination will be required if any employee develops signs or symptoms related to the possible overexposure to hazardous substances or other health hazards, if the employee has been injured, or if the employee has been exposed above the permissible exposure limits or published exposure levels in an emergency. The scope of any episodic examination will be left to the discretion of the examining physician.

A copy of the examining physician's written opinion about the employee's ability to perform work on this hazardous waste site and use respiratory protection, and a statement that the physician has informed the employee of the results of the examination shall be kept on site.

5.2 DRUG ABUSE PREVENTION PROGRAM

MK is committed to the establishment and maintenance of a safe and efficient work environment for all employees free from the effects of alcohol, illegal drugs, other controlled substances, and prohibited items. MK has implemented a Substance Abuse Prevention Program, which includes pre-employment testing, periodic testing, post-accident testing, for cause testing, and random testing.

5.3 RECORDKEEPING

The MK SSHO will arrange medical surveillance for MK employee's. The statements by the examining physician(s) attesting to the medical qualification of individual workers shall be maintained at the project site and will remain a part of the project files. Medical records will be kept by the examining physician. One copy of all forms and lab results will be sent to the MK corporate record retention office in Boise, ID.

6.0
PERSONAL PROTECTIVE EQUIPMENT

In addition to engineering controls and administrative controls (e.g. work practices), Personal Protective Equipment (PPE) (a.k.a. Chemical Protective Clothing) shall be used to protect personnel from exposure to contaminants which may be encountered during activities on site as warranted. The following guidelines will be followed:

- Respirators and other PPE necessary to protect the health of employees shall be provided by their employer.

- Only NIOSH/MSHA-approved respirators and cartridges shall be used.

- The respirator user's medical status shall be verified by the MK SSHO before work is performed requiring respirator use.

- MK IH Procedure 14.0 shall serve as the written standard operating procedure governing the use of respirators at the job site. Section 10 from MK Safety and Health Program Description for Hazardous Waste Operations shall serve as the written standard operating procedure governing the use of PPE at the job site. Safe Work Practice (SWP) 4.0, found in Section 17 of the MK Safety and Health Program Description shall serve as guidance in chemical protective clothing selection and donning/doffing procedures.

- Respirators will be assigned to individual employees for their exclusive use and marked to indicate to whom it was assigned, for the duration of this project.

Table A-5 presents the basic levels (Level B, C, Modified D, and D) of PPE. Table A-6 lists the minimum PPE level required for each task or operation. If air sampling/monitoring indicates that modification to the levels of protection are warranted, the MK SSHO is empowered with the authority to authorize the modification based on the guidance provided in Table A-7, Airborne Contaminant Response Criteria or by professional judgement.

The PPE has been selected based on what is known or anticipated about the site specific hazards. If conditions change, PPE selection and use shall be reviewed by the MK SSHO and the General Superintendent and upgraded or downgraded per their assessment. The MK SSHO shall record the rationale for the modification as a log book entry. Personnel will be trained if necessary on the use and limitations of specific pieces of PPE prior to initiation of work by their designated Supervisors during the Pre-Entry Briefs with assistance when necessary from the MK SSHO or General Superintendent.

PPE will be maintained and stored in accordance with the manufacturer's recommendation and good industrial hygiene practices. Personnel will inspect PPE prior to each use to assure the PPE is clean and good working order. Training will be provided to personnel concerning PPE inspection criteria by their supervisors with assistance when necessary from the MK SSHO. The MK SSHO shall conduct evaluations of effectiveness and useability of PPE. Logbook entries are sufficient but the data should be readily transferable to the safety and health project completion report (see Section 13.5).

7.0
MONITORING AND SAMPLING

Air monitoring refers to direct real time reading of airborne concentrations and air sampling refers to time integrated air sampling, either personal or area samples. The MK SSHO will maintain a supply of colormetric indicator tubes and handpump, and one multi-gas combustible gas indicator (CGI)/ Oxygen (O_2)/ Hydrogen Sulfide (H_2S)/ Carbon Monoxide (CO) meter. In addition, the MK SSHO will maintain a sound level meter and dust aerosol meter plus all time integrated air sampling equipment. Execution of real time air monitoring will be coordinated by the MK SSHO in accordance with the requirements for air monitoring depicted in Table A-9. Time integrated air sampling will be completed by the MK SSHO.

7.1 GENERAL

This section describes the air sampling and air monitoring program performed to evaluate project worker exposure to potentially hazardous airborne materials and to evaluate off-site impacts. The air sampling/monitoring results will be used to:

- Assess worker exposure to potentially hazardous materials with respect to the Permissible Exposure Limit (PEL) for Air Contaminants (Title 29 Code of Federal Regulations, Part 1910.1000) or other published exposure levels.
- Assess the adequacy of engineering controls and respiratory protection.
- Delineate areas where controls or respiratory protection is needed.
- Establish work control zones.

7.2 MONITORING

7.2.1 Volatile Organic Compounds

Colorimetric indicator tubes (e.g., MSA tubes) for ammonia and organic vapors shall be used at the MK SSHO's discretion. Colorimetric tubes are used to characterize potential exposure. Based on volatile concentrations reported in the soil sampling results, VOC's are not expected to be a problem. Additional compounds that may be measured using colorimetric indicator tubes include the following: carbon dioxide, carbon monoxide, and ammonia. If levels are detected above action levels, an immediate assessment of job controls will be made, and appropriate modifications incorporated if necessary. See Section 7.2.6 on measurement location and frequency.

7.2.2 Airborne Dust

A direct-reading, real-time instrument capable of detecting airborne dust will be used, based on visible observations of excessive dust. Readings will be taken at locations that reflect approximate concentrations of airborne dust in the breathing zone of project personnel. Results of the airborne dust monitoring will be documented. If necessary, the level of PPE used by personnel will be modified or engineering controls enhanced. The direct-reading, real-time monitoring equipment will be "response checked" according to the manufacturer's instructions before use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance, and annual calibration will be maintained on-site. When such monitoring is conducted and the results are greater than approximately 1.0 mg/m^3 total dust concentrations, immediate steps will be taken to determine the cause and modify site operations.

7.2.3 Perimeter Monitoring

Perimeter monitoring to evaluate emissions of airborne dust in the Support Zone will be performed periodically during soil excavation, as warranted. When such monitoring is conducted and results are greater than 1.0 mg/m^3, immediate steps will be taken to determine the cause and modify site operations.

7.2.4 Noise Monitoring

Noise monitoring will be performed, as warranted, at the initiation of each new task or new operation to determine the sound levels. Basic sound levels from operational equipments were monitored during pilot scale and appropriate controls established. Where determined to be necessary, detailed sound level surveys and noise dosimetry will be completed at locations that best approximate the sound levels at the ear of potentially affected personnel. Noise monitoring equipment will be "response checked" according to the manufacturer's instructions prior to use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance, and annual calibration will be maintained on-site.

7.2.5 Heat Stress and Cold Stress Monitoring

When temperatures at the site are above 65°F work/rest periods will be adjusted according to the guidelines stated in the current edition of *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents*. When the clothing worn differs from the ACGIH standard ensemble such as in the case of workers wearing semipermeable or impermeable clothing, guidelines established in the NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Section 8 should be consulted. The following is a summary from that document.

When employees are required to wear impermeable chemical protective clothing in temperatures exceeding 70°F, employees should monitor their pulse rate or use the "buddy system" to monitor each other's pulse rate at the start of each rest period. Table A-9 can be used to establish work/rest periods and the frequency of monitoring pulse rates.

Guidelines for the prevention of cold stress and cold stress TLVs shall follow the guidelines stated in EM-381-1-1 Section 06.J and the current edition of *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents*. At air temperatures below 50°F, the air temperature and wind speed shall be monitored by the MK SSHO qualitative assessment of cold stress risk shall be made by comparing wind speed and actual temperature to the assigned equivalent chill temperature depicted on Table 2 in the Cold Stress section of the ACGIH booklet. Unless there are unusual or extenuating circumstances, cold injury to other than the hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. These symptoms are described in Section 2.5.3. The use of extra insulating clothing and/or reduction of the exposure period are among the special precautions which should be considered.

Cold weather clothing requirements shall follow the guidance listed in Section 06.J.09 of EM-385-1-1. If work is performed continuously in the cold at an equivalent chill temperature or below 20 °F, heated warming shelters shall be made available nearby the work area and the workers encouraged to use these shelters at regular intervals. A cold weather work/warm-up regimen shall be established when outside ambient temperature is less than a -15 °F in accordance with Table 3 of the ACGIH booklet in the Cold Stress section.

7.2.6 Other Chemical Monitoring

At the Bioremediation Facilities during active composting, real-time monitoring using colorimetric indicator tubes for carbon dioxide, carbon monoxide and ammonia will be performed periodically by the MK SSHO in the buildings housing the windrows. If carbon dioxide levels exceed 4,000 ppm inside of the structure, the structure will be evacuated and action taken to vent the structure and maintain a level below 3,000 ppm.

Also during active composting, real-time monitoring will be conducted periodically to determine if any detectable levels of methane, carbon monoxide, and ammonia are present. Monitoring will be completed using colorimetric indicator tubes, except for methane and carbon monoxide where the multi-gas meter will be used. If levels are detected above action levels, an immediate assessment of job controls will be made, and appropriate modifications incorporated where necessary.

7.3 AIR SAMPLING

7.3.1 Explosives Residues

Time-integrated air sampling for explosive residues as airborne aerosols using personal air sampling pumps will be performed by the MK SSHO during composting when the windrows are mixed and composting process parameters are monitored. Sample collection will be based on OSHA Method 44 and sample analysis will be conducted in accordance with EPA Method 8330 using High-Pressure Liquid Chromatography (HPLC) Analysis. Refer to the detailed operating procedure found in Attachment C.

7.3.1.1 Material and Method

OSHA 44 - collect on sorbent and filter tube, 270/140 XAD-2 and glass fiber filter, OSHA Versatile Sampler (OVS) Tube. Volume = 240 Liter (L), rate = 1.0 Liter per minute (L/min), time = approximately 4 hours. Analysis by HPLC in accordance with EPA Method 8330 providing a scan for specific analytes and isomers. Specific analytes include HMX; RDX; 1,3,5-TNB; 1,3-DNB; Tetryl; Nitrobenzene; 2,4,6-TNT; 4-Amino-2,6-DNT; 2-Amino-4,6-DNT; 2,4-DNT; 2,6-DNT; 2-Nitrotoluene; 3-Nitrotoluene; and 4-Nitrotoluene.

7.3.1.2 Sampling Strategy

Every calender quarter during composting, four personal samples and three area samples of full shift duration, or if necessary, split shift duration will be obtained from the maximally exposed individuals. Area samples will be obtained inside of the composting structure near the work area during active composting. The sample pump and media will be positioned at approximately 1.5 meter (m) above the floor. Area samples should be biased by representing the worst-case exposure.

7.3.2 Biological Hazards

Two time-integrated air sampling campaigns (one in late spring, another in the summer) for bioaerosols will be obtained by the MK SSHO inside of the Composting Building during active composting and compared to background samples taken at a location outside of the perimeter of the Bioremediation site. Refer to Attachment C.

7.3.2.1 Material and Method

a. Collect airborne aerosols by impaction on pre-selected growth media plates using a high volume sampling pump with single stage Andersen Impactor calibrated using 4-L glass calibration jar with calibration specific culture

plates. The sampling flowrate is 28.3 L/min and sampling time will be set at 5 minutes. Samples will be obtained for the total fraction. Standard Method Agar (SGA) will be the growth media selected for bacteria, and acidified Potato Dextrose Agar (PDA) for fungi (yeasts and molds) unless changed based on recommendations from microbiology laboratory.

A separate growth media will be used for each of the following constituents and analyzed accordingly:

1. Total bacteria (total plate count), subculture from bacteria plate for pathogenic species looking especially for *E.coli* as a marker from manure.

2. Total plate count for Fungi (molds and yeast), looking especially for the fungus *Aspergillus fumigatus*.

7.3.2.2 Sampling Strategy

For each sampling campaign, ten area samples will be obtained inside of the composting structure and ten area samples outside of the structure approximately 100 m upwind from the composting structure. The samples will be obtained approximately two and three days into the composting process. Samples inside of the structure will be taken during turning and immediately after the windrows are turned.

One sample set consists of the following:

Bacteria - 1 culture plate
Fungi - 1 culture plate

Therefore one sample set inside of the structure for bacteria will require 10 culture plates and one sample sets for Fungi inside of the structure will require 10 culture plates for a total of 20 culture plates. Subsequent bacterial pathogen isolations are to be performed by streaking for isolation, using morphologically distinct representative colonies, onto SMA from the inoculated plates. The initial SMA Plates are to be incubated and single consistent colonies inoculated onto selective and differential agars to culture for the following species of bacteria or as modified by the microbiology laboratory: *Pseudomonas aeruginosa*; *Pseudomonas fluorescens*; *Pseudomonas putida*; *Pseudomonas cepacia* (approximately 50% of strains); *Pseudomonas pseudoalcagenes* (approximately 50% of strains); *Pseudomonas species VE-2* (approximately 50% of strains); *Staphylococcus aureus*; *Staphylococcus epidermis*; *Escherichia coli (E.coli)*; *Salmonella typhi*;

Salmonella enteritidis; *Salmonella choleraesuis*; *Citrobacter freundii*; *Citrobacter diversus*; *Citrobacter amalonnaticus*; *Enterobacter cloacae*; *Enterobacter aerogenes*; *Enterobacter agglomerans*; *Enterbacter gergoviae*; *Proteus vulgaris*; and *Morganella morganii*. An estimated 4 field culture blanks (2 SMA plates and 2 acidified PDA plates) will be obtained in the field.

7.3.3 Wipe Sampling for Explosives Residues

Wipe samples will be obtained by the MK SSHO to assess the effectiveness of PPE controls and decontamination every calendar quarter. Samples will be analyzed for explosive residues.

7.3.3.1 Material and Method

Collect wipe samples using glass fiber filters pre-wetted with acetonitrile. Obtain random surface samples from the personnel decontamination shower trailer, specifically the change room area and the lunch/conference room. Samples are obtained by wiping through a 100 square centimeter (cm^2) template moving in concentric squares from the outside to the inside of the sampling area. After wipe sampling, the media is folded with the exposed side in, placed in a sampling vial, and sent to the laboratory for analysis. Clean latex gloves are required for each sample.

7.3.3.2 Sampling Strategy

Samples are obtained randomly and unannounced. Estimate 5 samples for explosive residues.

7.4 AIR MONITORING AND SAMPLING REQUIREMENTS

Air monitoring and sampling requirements are shown in Table A-9.

7.5 RECORDKEEPING AND CHAIN OF CUSTODY

Written records of all monitoring will be maintained on site and affected employees will be notified of monitoring results representative of their exposure. For industrial hygiene sampling requiring collection and shipment of a sample to an approved analytical laboratory, Chain-of-Custody forms will be properly completed and accompany all collected samples in accordance with MK Industrial Hygiene Procedures Manual, Procedure 7.0, titled Analytical Laboratory Procedures. The selected AIHA accredited industrial hygiene lab will be **To Be Determined.** Turn-around time will be set at 10 working days.

8.0
GENERAL SAFETY RULES AND PROCEDURES

8.1 GENERAL

Operations shall be conducted in a safe manner consistent with the policies and procedures outlined in this SSHP. The number of personnel shall be restricted to the minimum necessary to complete the required work as an administrative control to limit personnel exposures to potential site chemical, physical and biological hazards. All project personnel assigned to this project are responsible for following this SSHP and for using safe work practices including wearing the PPE specified by the MK SSHO. Project personnel shall report hazards and unsafe conditions and practices to the MK SSHO. All federal, state and local occupational health and safety regulations must be complied with by project personnel. Violations of project procedures may include disciplinary measures up to and including termination.

8.2 RULES AND PROCEDURES

- MK shall have available first aid kit including CPR kit (Pocket Mask) and biohazards control kit; emergency eyewash (where necessary); and spill response equipment (where necessary) available at each controlled work location. MK shall complete the Soil Excavation Maps and post it at each work site including emergency phone numbers. Work zone signs shall be posted in accordance with the requirements of Section 9.1.4 of this SSHP.

- Do not eat, smoke, take medications, chew gum or tobacco, or put objects in mouth while in the exclusion zone and contamination reduction zone or when handling samples. Drinking fluids for heat stress is allowed in the CRZ as established by the SSHO.

- After handling samples, thoroughly wash hands and, if necessary, face, before eating or putting anything in mouth (i.e., avoid hand-to-mouth contamination).

- At a minimum, wear safety glasses and sturdy work boots when inside the work boundaries.

- Remain a safe distance from the excavation equipment when not involved in operation or monitoring activities.

- Do not <u>under any circumstances</u> enter or ride in or on any backhoe/excavator bucket, materials hoist or any other device not specifically designed for carrying human passengers.

- Remain aware of your own and other's positions with regard to rotating equipment and be extremely careful when assembling, lifting and carrying items that may cause pinch point injuries and collisions.

- Be alert to the symptoms of fatigue, heat stress and cold stress and their effect on the normal caution and judgment of personnel.

- Use ground fault circuit interrupters (GFCI) with all portable electrical tools and equipment.

- Stand clear of trenches during excavation. Always approach the excavation from upwind.

- Stand upwind, whenever possible, of excavations and other sites where the soil has been disturbed.

- Be alert to potentially changing exposure conditions as evidenced by perceptible odors, unusual appearance of excavated soils, oily sheen on water, or other evidence of possible contamination.

- Do not enter any excavation or trench greater than five feet in depth unless authorized by the MK SSHO.

- Use good housekeeping practices with regard to tools and material whenever possible to avoid tripping hazards and the spread of contamination.

- Use the buddy system at all times while working at the site in controlled work zones. No one is to work alone in the Exclusion Zone or Contamination Reduction Zone without permission from the MK SSHO and MK General Superintendent.

- Minimize truck tire disturbance of all stabilized sites and areas beyond the work area boundaries.

- Cease all work operations on the site at sunset unless the control zone is adequately illuminated.

- Job Supervisors shall attend the POD meeting prior to the start of the work and conduct pre- entry briefs with all affected workers.

- Avoid direct contact with contaminated materials unless necessary for sample collection or required observation. PPE shall be worn at all times, as required.

- Remove disposable clothing and follow decontamination procedures.

- Always use an appropriate level of personal protection as assigned in this SSHP. Lesser levels of protection can result in otherwise preventable exposure.

- Maintain a high level of awareness of the limitations in mobility, dexterity and visual impairment inherent in the use of Level B and Level C PPE.

- Establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment, since this equipment impairs speech communication.

- Wear hearing protection if you have to shout to communicate at a distance of three feet in steady-state (continuous) noise or when you expect loud impact noise from certain activities. The MK SSHO will assess potential noise exposure and provide recommendations on correct hearing protection devices.

9.0
WORK ZONES

Where a potential for worker exposure to potentially hazardous substances and physical hazards, work zones will be established and the flow of personnel and equipment will be controlled. The establishment of work zones will ensure that personnel are properly protected against hazards present in the work area, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

Prior to the commencement of remedial field activities, work zones shall be established by MK. These work zones are depicted on Soil Excavation Figures contained in Appendix E of the Operational Plan. In addition to the zones, data will be added in the field to show assembly points and emergency communications equipment. Posted with the Soil Excavation Map shall be the list of emergency phone numbers.

9.1 EXCLUSION ZONE (EZ)

The EZ is the area where hazardous substances are present or expected to occur, or health and safety hazards are present. Entry into this area is limited to personnel required to perform the work who are wearing the specified PPE and have attended a Pre-Entry Briefing. Everyone entering the EZ shall have completed the required health and safety training and will participate in the medical surveillance program as necessary. The boundary of the EZ will be determined for each activity and may change depending on activities and conditions.

An EZ will be established to encompass the contaminated area. The EZ will be clearly delineated with signs, barricade tape, fences, or other suitable means. Access control points will be established to regulate the flow of personnel and equipment in an out of the zone and to help verify that proper procedures for entry and exit are followed. PPE levels in the EZ are initially scoped as Level C, depending on the task listed in Table A-6. Decontamination will follow guidelines established in Section 10. Gross contamination will be removed in the EZ followed by additional decontamination in the CRZ. The MK SSHO will monitor activities in the EZ from his position in the CRZ.

9.2 CONTAMINATION REDUCTION ZONE (CRZ)

The CRZ is the transition area between the contaminated area, the EZ and the clean area, the SZ. While designed primarily to reduce the possibility of the support zone becoming contaminated or affected by EZ activities, the CRZ is also used for decontamination of personnel and equipment. No personnel or equipment will be allowed to exit the contamination reduction and exclusion zones without being properly decontaminated except in emergency situations. The immediate area around the EZ

extending outward as much as necessary to accommodate the complete length of the longest piece of heavy equipment will be designated the CRZ. Used PPE will be removed and stored in properly marked containers.

9.3 SUPPORT ZONE (SZ)

The SZ consists of all areas outside the exclusion and contamination reduction zones. These areas are used for all site activities which are not limited to the EZ or CRZ equipment and material storage, offices, parking, etc. The SZ will also serve as the staging area for all activities to be conducted.

9.4 WORK ZONE CONTROLS

Before site operations begin, the SZ MK site office shall be identified with signs identifying as such. MK shall post signs at entrances to the CRZ and EZ stating the following or equivalent:

HAZARDOUS AREA KEEP OUT
AUTHORIZED PERSONNEL ONLY
PERSONAL PROTECTIVE EQUIPMENT IS REQUIRED IN THIS AREA

MK shall post signs at the entrance to the CRZ before operations begin, stating:

NO SMOKING, DRINKING OR EATING BEYOND THIS POINT

10.0 PERSONNEL AND EQUIPMENT DECONTAMINATION AND HYGIENE PROCEDURES

All personnel, clothing and equipment leaving an exclusion zone (contaminated or potentially contaminated area) shall be inspected and, if necessary, decontaminated to remove any potentially harmful substances that may have adhered to them. Some equipment/clothing may be disposed of rather than decontaminated. In this case, the used PPE and/or equipment (e.g. disposable sampling equipment) will be stored in properly marked containers in the CRZ. A temporary decontamination station will be constructed at the excavation site and a permanent decontamination facility has been constructed at the Bioremediation Facility. This section gives guidelines regarding the decontamination procedures to be implemented. Final details will be described during the site-specific safety and health briefing prior to commencing field operations.

10.1 EMERGENCY PERSONNEL DECONTAMINATION

Based on the type of emergency that is postulated, the following types of response actions are anticipated for personnel emergencies within the exclusion zone.

A. Critical Triage Condition (life threatening) - Emergency evacuation or extrication from the exclusion zone to contamination reduction zone where emergency medical treatment and stabilization will be attempted until arrival of first responding medical unit. Or, emergency medical treatment and stabilization will be completed in the exclusion zone till arrival of first responding medical unit. In either case, gross decontamination will be completed to the extent possible by removal PPE, wiping patient down to remove contamination and/or wrapping patient to prevent spread of contamination.

B. Marginal Triage Condition (non life threatening) - patient will be evacuated from exclusion zone and treated in the contamination reduction zone followed by decontamination and patient preparation for transport to emergency medical facility. Decontamination could occur first followed by medical treatment in selected scenarios.

10.2 PERSONNEL DECONTAMINATION

Decontamination (decon) stations will be established in the contamination reduction zone. The decon stations will consist of the following, as appropriate:

- Equipment drop.
- Boot wash station.

- Disposable clothing drop. All contaminated or potentially contaminated disposable clothing shall be placed into labeled 6-mil plastic bags within an appropriate container.

- Personal showers and washing facilities consisting of water, towels and soap. Street clothing shall be stored in lockers provided at the shower facility. Note: this facility is located at the Bioremediation Facility.

10.3 EQUIPMENT DECONTAMINATION

All equipment/tools used in the exclusion zone will be inspected for contamination prior to removal from the site. Any equipment/tools with visible contamination will be cleaned prior to removal from the site. All water used during decontamination will be contained for disposal. Construction and field equipment will be decontaminated at each temporary decontamination facility. If contamination can not be removed on-site, the affected surfaces of the equipment will be wrapped in plastic and transported to the Bioremediation Facility where more thorough decontamination can be performed prior to release.

10.4 WASHING FACILITIES

A hand and face washing facility shall be made available in each CRZ.

10.5 DECONTAMINATION WASH WATER

Equipment and personnel decontamination areas will be designed to allow for collection of all wash/rinse waters.

10.6 SANITATION AND PERSONAL HYGIENE

Personnel exiting the CRZ are required to thoroughly wash their hands and face prior to eating, drinking, smoking, or using toilet facilities. Adequate toilet, hand washing and lunchroom facilities free of contaminants shall be designated by MK.

11.0
ON-SITE FIRST AID AND EQUIPMENT

11.1 FIRST-AID AND MEDICAL FACILITIES REQUIREMENTS

At a minimum, 16-unit first aid kits shall be maintained by MK in their office trailer and at each work site. The location of the first aid kit shall be communicated to project personnel as part of the site-specific and pre-entry brief training. Included with the first aid kit shall be a CPR Pocket Mask and a biohazards control kit (universal precautions and clean up kit). The MK SSHO can require upgrades to the first aid equipment requirements as deemed necessary for this job (e.g. insect repellants and sunscreen)

An emergency eyewash and spill control kit (as appropriate) will be stationed at each controlled work area. The Bioremediation Facilities will have stationary eyewash/drench equipment. The emergency phone number list and route map to medical facilities shall be posted at each office trailer and at each controlled work zone as part of the MK prepared Soil Excavation Figures.

11.2 REPORT OF FIRST AID CASES

All first aid cases, accidents and incidents shall be promptly reported to the MK SSHO. The MK SSHO shall immediately notify the Navy Technical Representative (NTR) or the Navy Resident Engineer in Charge of Construction (REICC) of all accidents and incidents even if preliminary information is available. The MK SSHO and MK PM shall follow the guidance presented in Program Procedure PHSP-04.1. The MK Charleston Project Management Office (PMO) should be notified shortly after notification to the Navy's designated authority. If an on-site official cannot be reached, the MK Charleston PMO still should be promptly notified at (803) 554-0100.

A written report of the accident/incident must be provided to the ROICC or REICC and MK Charleston PMO within 24 hours of the incident via memo form. The report in memo form should include as attachments the following:

a. Employer's First Report of Injury (Workman's Comp Insurance Form)
b. Contractor Significant Incident Report (CSIR) forms
c. Any records provided by the Medical Service Provider such as 1) Hospital Emergency room Report, 2) Examining Physician's designation of work restriction, and 3) Examining Physician's Work Release.

12.0
EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

This section has been moved to Section 11.0 of the Operations Plan.

13.0
LOGS, REPORTS, AND RECORDKEEPING

13.1 SAFETY AND HEALTH LOGBOOK

The MK SSHO shall maintain a Project Safety and Health Logbook for the duration of work activities at the site. The logbook will contain specific information recorded on a daily basis. The logbook will contain specific information on safety and health activities. Records of training and site orientations and briefings including pre-entry briefs shall also be maintained in file folders by the MK SSHO.

13.2 REPORTS

A weekly site safety and health inspection report shall be prepared by the MK SSHO. This report shall identify work activities, safety and health-related deficiencies, and corrective measures. As a minimum, the checklist shown in Figure A-4 shall be completed by the MK SSHO. All near miss incidents and incidents that result in property damage, personnel injuries or illness will be investigated and notification/reporting requirements shall be followed in accordance with PHSP 04.1.

13.3 FIELD MASTER COPY OF SSHP

The MK SSHO shall maintain a field master copy of this SSHP document to include all redlines. This copy shall be properly filed with project records at the completion of the project and sent to MK PMO office in Charleston.

13.4 RECORDKEEPING

The MK SSHO shall maintain records of all injuries and illnesses for MK employees only incidental to the work in accordance with 29 CFR 1904, including copies of the Worker's Compensation First Report of Injury. Accidents and Incidents data reporting requirements shall be managed in accordance with Program Procedure PHSP-04.1 for both MK and Subcontractor personnel as stated in Section 11.3. A record of all first aid treatments not otherwise recordable shall be maintained and furnished to the Navy's designated authority upon request.

13.5 SAFETY AND HEALTH PROJECT COMPLETION REPORT

The MK SSHO shall complete a safety and health project completion report at the conclusion of the field work associated with the first year of full-scale operations. The purpose of the report is to a self assessment summarizing effectiveness of the safety and health program implemented in the field; lessons learned and suggestions for program improvement; accident and incidents; air monitoring and sampling results including ratings on instrument useability; and how well the original prepared AHA worksheets reflected field conditions. The report shall be directed to the MK SouthDiv Program Health and Safety Manager.

14.0
ON-SITE WORK PLANS

A Full-Scale Operational Plan has been prepared of which this SSHP document is designated Appendix A.

15.0
COMMUNICATION PROCEDURES

15.1 RADIO COMMUNICATION, TELEPHONE, ALARMS AND DRILLS/EXERCISES

Two-way radios in coordination with office telephones will be the primary choice of emergency communication. An emergency alarm, such as an air horn, shall be available if necessary at each major work site to warn personnel of an emergency. Personnel shall be trained on what actions they are to take if the alarm is sounded to include evacuation routes and assembly points. Drills and exercises shall be conducted to ensure that communication methods are adequate. The MK SSHO will test the two-way communication system for confirmation of emergency communication using NSWC Crane protocols.

16.0
SPILL CONTAINMENT PLAN

This section has been moved to Section 11.0 of the Operations Plan.

17.0
CONFINED SPACES

Permit-required confined space entry is not anticipated on this project. If any confined space entries are necessary on this project, MK Procedure 9.0 found in the Industrial Hygiene Procedures Manual (MK 1994a) will be followed.

TABLES

Table A-1
Site Description and Contaminants

Identifier	Location/Description	Scope of Work	Contaminants
SWMU 12/14	Mine Fill A, west central portion of NSWC, H-17 off of H-45.	Soil excavation and transport to Bioremediation Facility, site restoration, and soil sampling.	Major contaminants include TNT, HMX and RDX in soils are the most significant.
Bioremediation Facility	Located south of Burns City Gate off of H-161.	Soil excavated from SWMU 12/14 will be processed at this facility using composting technology.	Contaminants in Soil to be processed and mixed with amendments are described in Section 1.2.

Table A-2
Potential Contaminants

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Acetone (may occur in very low levels if any at all)	Colorless liquid with a fragrant, mint-like odor.	OSHA PEL of 1000 ppm as 8 hr TWA.	Irritant to eyes, nose, and respiratory system. May cause dermatitis upon skin contact.	Irrigate eyes immediately with water. Soap wash skin promptly. Seek medical attention immediately.
Ammonia (varying levels, offgas component from manures) (considered highest chemical hazard on this job)	Colorless gas with a pungent, suffocating odor.	OSHA STEL of 50 ppm. NIOSH REL of 25 ppm, STEL of 35 ppm. ACGIH TLV-TWA of 25 ppm and STEL of 35 ppm.	Irritant to eyes, nose and throat.	Remove to fresh air. Irrigate eyes immediately with water. Provide respiratory support. Seek medical attention immediately.
Carbon Dioxide, off-gas component of aerobic composting.	Colorless, odorless gas. Normal constituent of air, about 3,000 ppm.	OSHA PEL of 5,000 ppm.	Cause headache, dizziness, restlessness; dyspnea, increased heart rate, pulse and blood pressure; convulsions and asphyxia at high concentrations	Provide respiratory support. Seek medical attention immediately.
Hydrogen Sulfide (May be off gas component of composting)	Colorless gas with a strong odor of rotten eggs.	OSHA Ceiling of 20 ppm, NIOSH Ceiling of 10 ppm.	Irritant to eyes and respiratory system. Causes dizziness, headache and eye pain. CNS depressant. Asphyxiant.	Irrigate eyes immediately with water. Provide respiratory support. Seek medical attention immediately.
Diesel exhaust including oxides of nitrogen.	Appearance and odor vary depending upon the specific diesel exhaust component.	Use STEL of 1 ppm.	Irritant to eyes and respiratory system, may cause pulmonary function changes.	Remove to fresh air, provide respiratory support. Seek medical attention immediately.
DNT (Dinitrotoluene) (Majority of amino DNTs undetected in soil samples, can exist as metabolite during composting)	Orange-yellow crystalline solid with a characteristic odor. Note: skin designation.	OSHA PEL 1.5 mg/m^3 as 8 hr. ACGIH 8 hr TWA of 0.15 mg/m^3	Causes anoxia; cyanosis; anemia; jaundice; reproductive effects; suspected human carcinogen.	Irrigate eyes immediately with water. Water flush promptly. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

Table A-2
Potential Contaminants

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
HMX (Cyclotetramethylenetetranitramine)	White-crystalline solid.	No exposure limits listed.	May cause Irritation to eyes, skin and respiratory system.	Irrigate eyes immediately with water. Water flush promptly. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
RDX (Cyclonite)	White crystalline powder, combustible solid.	OSHA PEL 1.5 mg/m^3 as 8 hr. ACGIH 8 hr TWA of 1.5 mg/m^3 *Note: skin designation*	Skin, eye and respiratory irritations. Very similar to TNT.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
TNT (Trinitrotoluene)	Colorless to pale yellow, odorless solid or crushed flakes. Combustible solid.	OSHA PEL 1.5 mg/m^3 as 8 hr. TWA, ACGIH 8 hr TWA of 0.5 mg/m^3. Note: skin designation.	Causes liver damage, jaundice; cyanosis; sneezing; cough; sore throat; peripheral neuropathy; muscle pain, kidney damage; cataract; sensitive dermatitis; leukocytosis; anemia and cardiac irregularities.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

Table A-2
Potential Contaminants

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Biological constituents to include bacteria and fungi (yeasts and molds). Constituents will be present in amendments and may become airborne during composting operations.	Microbiological organisms	None established, will compare to background levels or other data from current literature. Bacterial or fungal concentrations above 10,000 colony forming units per meter cubed (cfu/m^3) in total or above 500 cfu/m^3 for each specific group of organisms or species of a potentially pathogenic nature should be considered a threat to the worker's health. For gram-negative bacteria, a TLV of 1000 cfu/m^3 has been proposed, since a number of species of this group are able to release pathogenic endotoxins, which may cause an additional health hazard.	Varies, depending on sensitivity. Can include respiratory system irritation, distress and infections.	Remove from source, seek medical attention.

Note: Data is Table derived from NIOSH 1994, OSHA 1997 and ACGIH 1996-1997.

Table A-3 Personnel Contacts and Telephone Numbers

Person or Agency	Telephone
NSWC Crane Fire Department (Base)	**1333 emergency** **(812) 854-1235**
NSWC Crane Ambulance (Base)	**1333 emergency** **(812) 854-1100**
NSWC Crane Security (Base)	**(812) 854-3318**
NSWC Crane Environmental Protection Department	(812) 854-4423
Chief Duty Officer (CDO)	(812) 854-1225
Crane Army Ammunition Activity (CAAA) Security	(812) 854 3960
ROICC (NTR)	(812) 854-3318
SOUTHNAVFACENGCOM	(803) 743-0582
NSWC Crane E.O.D. (Base)	(812) 854-3456
NSWC Crane Safety Director	(812) 854-3601
Poison Control Center	(800) 942-5969
NSWC Base Medical Facility	(812) 854-1220, 4319
Bedford Medical Center, 2900 West 16th Street, Bedford, IN 47432	(812) 275-1200
Bloomington Hospital, 601 West Second Street, Bloomington, IN	(812) 336-9515
NSWC Crane Public Works Department (Base)	(812) 854-1834
MK Program Manager	(803) 554-9367
MK Field Operations Manager	(803) 554-6003
MK NSWC Site Project Manager	Office (812) 854-6941 Home (812) 824-2594
MK NSWC Site Superintendent	Office (812) 854-6941 Home (812) 824-6728
MK NSWC Site Safety and Health Officer (SSHO) Supervisor	Cellular: (812) 639-8356 (812) 847-7690
MK Project Engineer (Cleveland, OH office)	216-523-5541
MK Site Quality Assurance/Quality Control Supervisor	Office: (812) 854-6941
MK Health and Safety Program Manager (Boise, ID office)	(208) 386-5930
NSWC Crane PWD/Eng. Dept	(812) 854-1834
NSWC Base Commander	(812) 854-1210
USEPA (Region 5) Emergency	(312) 353-2318
IDEM, State of Indiana Emergency	(317) 233-7745
National Response Center	(800) 424-8802

Directions to NSWC Medical Department On-site:

The NSWC Fire Department coordinates the on-site ambulance service. The Medical Department is located in Building 12, off of H-2 just north of H-5.

Directions to Bedford Medical Center:

From the Bloomington Gate, head east on Highway 58 to the city of Bedford, turn left onto 16th. This Gate is open 24 hours. The approximate distance to hospital is 22 miles.

From the Bedford Gate, head east on Highway 158 to the city of Bedford, 158 turns left onto 16th Street. The distance to hospital is approximately 22 miles. This gate is open during the hours of 6 AM to 8 AM and 3 PM to 6 PM on Mondays through Fridays exclusive of holidays.

Directions to Bloomington Hospital:

Exit NSWC Crane on H5-45 through the Bloomington Gate, then follow Highway 45 North to Bloomington. At the intersection of Highway 45 and Highway 37, continue straight ahead over the bypass (Bloomfield Road), and follow Bloomfield Road north until it becomes 2nd Street. Continue on 2nd Street and the hospital will be on right-hand side of the road.

Note: MK SSHO is to ensure this Table and Figure A-1 are included with the Soil Excavation Maps posted at the job site. In addition, the Table and Figure must be posted at each office location.

Notify the MK SSHO of any changes in work conditions which may affect the health and safety aspects of the task. The Superintendents or designated supervisors are responsible for conducting Plan-of-the-Day meetings and Pre-Entry were necessary, weekly safety meetings, and conducting or ensuring that other training is completed.

Table A-4
Training Requirements

Identifier	Location	40-Hr. Haz. Waste	Haz. Waste Annual Ref.	Haz. Waste Super-visor	Weekly Safety Mtg.	Haz. Com.	CPR/ First Aid	Respira-tory Protec-tion	Site-Speci fic	POD, Pre-Entry Brief	Other
SWMU 12/14	Mine Fill A	Y	Y	Y	Y	Y	Y	Y	Y	Y	N[2]
Full Scale operation of facility	Bioremediation Facility	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y[1,2,3]

Y = Yes, N = No, 0 = Optional

Notes:

1 - 49 CFR Part 172 Subpart H for personnel required to classify, mark, select packaging, inspect, load and transport hazardous materials.
2 - Fire Extinguishers
3 - Chemical Hygiene Plan for Laboratory Workers

Table A-5 Selection of Personal Protective Equipment

PPE	Level D	Modified Level D	Level C	Level B
Coveralls or other approved working apparel	Yes	Yes	Yes	na
Chemical-resistant clothing (coveralls; hooded, one- or two-piece chemical-resistant coveralls)		Yes	Yes	na
Boots, chemical resistant	Yes	Yes	Yes	na
Boot covers (outer), chemical resistant (disposable)		Optional	Optional	na
Safety glasses or chemical splash goggles, meeting ANSI Z87.1-1979 for "Industrial Safety Glasses"	Yes	Yes	Yes	na
Face shield	Optional	Optional	Optional	na
Gloves (cotton/leather)	Optional	Optional	Optional	na
Gloves (inner), chemical resistant or liners		Yes	Yes	na
Gloves (outer), chemical resistant		Yes	Yes	na
Approved Disposable Dust Mask		Optional		na
Air-purifying respirator, half-face or full face with suitable cartridge (MSHA or NIOSH approved)			Yes	na

Note: Optional requirements to be determined by the MK SSHO based on additional evaluation of site conditions and hazards analysis. Note: safety glasses not required when wearing full-face APR.

Na - not applicable

Table A-6 Minimum Personal Protective Equipment Requirements by Task		
Site	Activity	PPE
Soil excavation at SWMU #12/14	1. Excavate, screen, and load soils for Composting 2. Site restoration 3. Decontamination and rock washing 4. Transporting contaminated soil (driving trucks)	1. Modified Level D, modify based on air monitoring/sampling results. 2. Level D 3. Modified Level D, use rain suit 4. Level D
SWMU Sampling	1. Obtain soil and/or groundwater samples	1. Modified Level D
Full Scale Operations of Bioremediation Facility	1. Offload and grind amendments	1. Level C, modify where necessary.
	2. Load amendment blend in windrows	2. Level C, modify where necessary.
	3. Offload contaminated soil into windrows	3. Modified Level D.
	4. Turn and mix windrows	4. Level C, modify where necessary.
	5. Monitor windrow parameters and field screening/confirmation sampling	5. Level C if working in building during windrow turning. Modify when necessary.
	6. Load and transport treated soils	6. Level D
	7. Decontamination water management	7. Modified Level D.
	8. Composting building housekeeping	8. Level C, modify where necessary.
	9. Maintenance and Upkeep of Equipment	9. Level D, modify per task based on manufacturer's recommendation.

Level C respiratory protection includes full-face air purifying respirator (APR) with Ammonia/Methylamine Cartridge/P100 Filters. Existing inventory of HEPA/ammonia cartridges may be used until supply is exhausted.

Clothing includes dedicated coveralls; 16 inch PVC boots; Tyvek ™ ; double nitrile gloves; safety glasses.

Modified Level D includes same protective clothing as Level C except for Dust Masks instead of APR. Where specified, Dust Masks should be 3 M Brand 8210 (N95) or Brand 8511 (N95). Dust Masks must be replaced at minimum of daily per manufacturers instructions. Existing inventory of 3M Brand 8710 Dust/Mist Respirator may be used until supply is exhausted.

In some cases leather work gloves can be substituted for chemical protective gloves (e.g. handling amendments, off-loading amendments and building maintenance).

Table A-7
Airborne Contaminant Response Criteria

Contaminant	Level	PPE	Monitoring Frequency	Actions Taken
Explosives Residues	Less than action level for the explosive compound having the lowest AL (DNB, 0.5 mg/m^3) and/or no visible observation of excessive dusts	Modified Level D	Periodic per plan	Continue monitoring and/or sampling and observations
	Greater than action level or visible observation of excessive dusts.	Level C	To be determined by SSHO	To be determined by SSHO
	Greater than OSHA PEL or greater than 10 mg/m^3 total dust.	To be determined by SSHO	To be determined by SSHO	To be determined by SSHO
Hydrogen Sulfide	Greater than 10 ppm	To be determined by SSHO	Periodic per plan inside of Composting Facility	Stop work, shut off equipment and evacuate Composting Facility. Notify SSHO; ventilate structure
Carbon Dioxide (CO_2)	Greater than 4,000 ppm	To be determined by SSHO	Periodic per plan inside of Composting Facility	Stop work, shut off equipment and evacuate Composting Facility. Notify SSHO; ventilate structure
Ammonia Off-gas from Compost Piles	Greater than 25 ppm and < 300 ppm	Level C	Periodic per plan inside of Composting Facility	Level C PPE to be used.
	> 300 ppm	Supplied Air respiratory protection	To be determined by SSHO	Stop work, shut off equipment and evacuate Composting Facility. Notify SSHO; ventilate structure, and upgrade respirator protection if entry required.

Table A-7
Airborne Contaminant Response Criteria

Contaminant	Level	PPE	Monitoring Frequency	Actions Taken
% LEL	Equal to or greater than 10%.	To be determined by SSHO	To be determined by SSHO	Stop work, shut off equipment, remove ignition sources if safe to do so; notify SSHO

Table A-8
Frequency of Physiological Monitoring for Fit and Acclimatized Workers[1]

ADJUSTED TEMPERATURE[2]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 120 minutes of work

[1]For work levels of 250 kilocalories/hour.

[2]Calculate the adjusted air temperature (ta adj) by using this equation:

ta adj °F = ta°F + (13 x % sunshine).

Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow.

(100 percent sunshine = no cloud cover and a sharp, distinct shadow: 0 percent sunshine = no shadows.)

Note: Reprinted from *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (1985).

Table A-9
Monitoring and Sampling Requirements

Site	Activity	Monitor				Sample	
		Dust	Perimeter (Dust)	Noise	Heat Stress	Biological	Explosives
SWMU 12/14	1. Excavate, screen, and load soils for Composting	Y	Y	Y	O	N	Y
Start-up and Operations of Bioremediation Facility	1. Offload and grind amendments.	Y	Y	Y	O	O	N
	2. Load amendment blend in windrows.	Y	N	Y	O	Y	N
	3. Offload contaminated soil into windrows.	Y	N	Y	O	N	N
	4. Turn and mix windrows.	Y	Y	Y	O	Y	Y

Y = Yes, O = Optional at discretion of SSHO, N = Not required

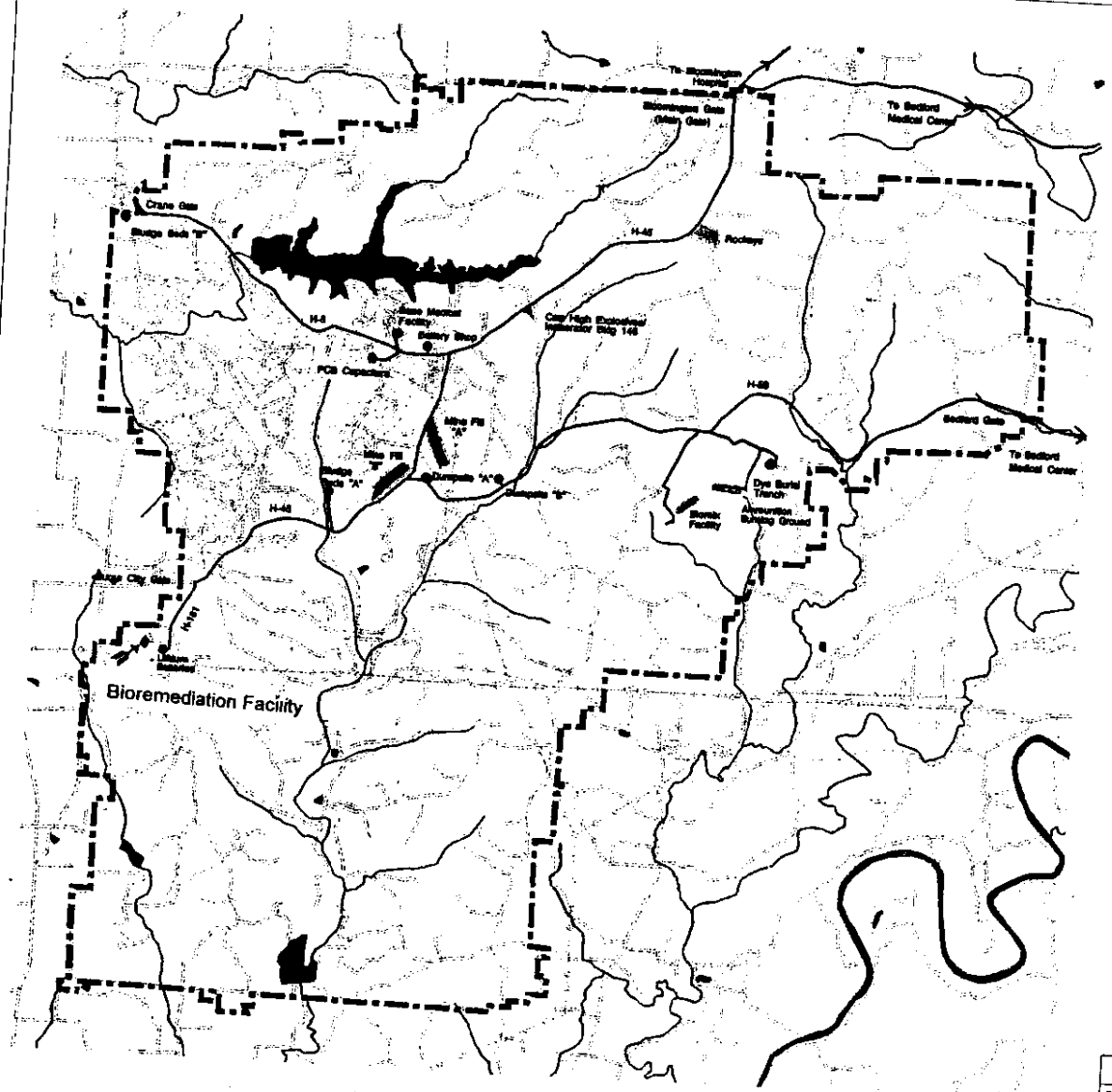
Notes:

1 = See Section 7 for additional monitoring using colorimetric indicator tubes.

FIGURES

Figure A-1 Directions to Nearest Emergency Medical Facilities

See Following Page for 11" X 17" foldout



DIRECTIONS:

1. DIRECTIONS TO NSWC MEDICAL DEPARTMENT ON SITE:

   THE NSWC MEDICAL DEPARTMENT MANAGES AND COORDINATES THE ON-SITE AMBULANCE SERVICE. LOCATED IN BUILDING 12 OFF H-2 JUST NORTH OF H-5.

2. DIRECTIONS TO BEDFORD MEDICAL CENTER:

   FROM THE BLOOMINGTON GATE, HEAD EAST ON HIGHWAY 58 TO THE CITY OF BEDFORD, TURN LEFT ONTO 16TH. THIS GATE IS OPEN 24 HOURS. THE APPROXIMATE DISTANCE TO HOSPITAL IS 22 MILES.

   FROM THE BEDFORD GATE, HEAD EAST ON HIGHWAY 158 TO THE CITY OF BEDFORD. 158 TURNS LEFT ONTO 16TH STREET. THE DISTANCE TO HOSPITAL IS APPROXIMATELY 22 MILES. THIS GATE IS OPEN DURING THE HOURS OF 6 AM TO 8 AM AND 3 PM TO 6 PM ON MONDAYS THROUGH FRIDAYS EXCLUSIVE OF HOLIDAYS.

3. DIRECTIONS TO BLOOMINGTON HOSPITAL:

   EXIT BASE ON H5-45 THROUGH THE BLOOMINGTON GATE. FOLLOW HIGHWAY 45 NORTH TO BLOOMINGTON. AT HIGHWAY 45 AND HIGHWAY 37, CONTINUE GOING STRAIGHT OVER THE BYPASS (BLOOMFIELD ROAD). FOLLOW BLOOMFIELD ROAD NORTH WHICH TURNS INTO 2ND STREET. FOLLOW 2ND STREET AND HOSPITAL IS ON YOUR RIGHT.

LEGEND:

PRIMARY ROUTE

NSWC BOUNDARY

1 inch = 1.5 miles

REV	DATE		APPROVE
0	02/19/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

FIGURE A-1
DIRECTIONS TO THE NEAREST MEDICAL FACILITY

DWG DATE: 1/26/98 | FILE NAME

Figure A-2 Safety Meeting Report

Type of Meeting:_____.

Topic:_____.

The following personnel were present for meeting conducted at _____ (time) on _____ (date) at _____ (location).

NAME	SIGNATURE	ORGANIZATION

_____

Printed Name of Meeting Chairman Signature Date

Figure A-3 Pre-Entry Briefing Signature Sheet

Work area(s) to be entered _____

The following personnel have had a pre-site entry briefing conducted at _____ __ (time) on _____ (date) at _____ (location), and are familiar with this plan's provisions, and are willing to meet the requirements of this plan.

NAME	SIGNATURE	ORGANIZATION

_____

Printed Name of Supervisor Signature Date

Figure A-4 SSHP Weekly Inspection Checklist

Surveillance No. _____

SURVEILLANCE NO:	ACTIVITY:		PROJECT NO:
DATE:	LOCATION:		SURVEYED ORGANIZATION: PRIME:
	SITE/AREA CONTACT:	RESPONSIBLE MANAGER:	SUBTIER:

ITEM NO.	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
1	Activity hazard analysis prepared for each major work phase? (EM 385-1-1, Section 01.A.09)						
2	All hazards including chemical/biological and physical adequately described?						
4	All site personnel completed required training?						
5	All site personnel medically qualified?						
6	PPE available and in good condition?						
7	PPE work per SSHP and/or SSHO direction?						
8	PPE donning/doffing procedures in place?						
9	Written SOP available describing respirator selection and use?						
10	Air monitoring conducted per SSHP?						
11	Monitoring equipment properly maintained and calibrated?						
12	Employees notified of monitoring results?						
13	Chain of custody prepared and maintained for all samples?						
14	Weekly safety meeting held?						
15	Pre entry briefs held?						
16	Haz Com programs in place?						
17	Competent person evaluates excavation?						
18	Personnel responsible for work maintains control of area and general safety requirements are being followed ? Note: fire extinguishers, eyewash, first aid kits and spill response equipment.						
19	Soil Excavation Maps prepared and updated?						
20	All personnel materials decontaminated prior to exiting contamination reduction zone?						

ITEM NO.	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	' ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
21	Decon stations properly established?						
22	Proper personal hygiene practices observed?						
23	Decon solutions collected and properly disposed of?						
24	At least one employee on each shift trained in CPR and first aid and BLOOD BORNE pathogens?						
25	First aid kit at each work site?						
26	All first aid and medical cases promptly reported to MK SSHO?						
27	List of emergency services/contact is up to date and posted?						
28	Assembly points identified and communicated to employees?						
29	Communication methods are adequate						
30	Records of all injuries and illnesses maintained by MK SSHO?						
31	Equipment operational checklists developed as needed?						
32	Two-way radios available per SSHP?						
33	Cellular telephone available as needed?						
34	Emergency alarms available?						
35	Drills and exercises conducted to test communication methods?						
36	Suitable quantities of spill supplies available?						
37	Operations arranged to minimize spills?						

Inspection Performed By: _____ Date: _____

Abatement Accepted By: _____ Date: _____

ATTACHMENT A

ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS (AHA)

Activity: Soil Excavation, Screening, Transport and Decontamination.	Analyzed By/Date: Richard Spurgeon 11/19/97	Reviewed By/Date: Frank J. Petrik 11/19/97
1.0 Principal Steps	**Potential Hazards**	**Recommended Controls**
1.1 Soil excavation, screening, transport and decontamination (general categories of work).	1. Struck by equipment or reject conveyor material while sorting and during start-up.	1. Keep clear of grizzly dump area during dumping. Ensure all personnel are clear prior to start-up. Ensure backup alarms working or use continuous spotter: - operator physically acknowledges presence of other personnel and equipment during operation. - personnel keep clear of equipment operational path. - use handtools to sort through reject material.
	2. Noise.	2. Hearing protection required outside cab within 15 feet of operating equipment.
	3. Dust.	3. Dust suppression immediately available. Use based on monitoring and visual inspection. Safety glasses and dust mask required.
	4. Explosives contaminants.	4. Work area demarcated, PPE as listed above; decontamination of all equipment/material and personnel.
PPE Required: dedicated coveralls; 16 inch PVC boots; Tyvek; double nitrile gloves; dust mask; safety glasses. Note: dust mask use is determined by SSHO and is based on soil conditions and air monitoring results. Dust masks if required can be removed while operating equipment inside enclosed cabs provided clean storage and handling is maintained.	5. Eye/skin contact with high pressure wash.	5. Rainsuit, faceshield, heavy nitrile gloves required for use of high pressure wash.
	6. Slips do to wet surfaces.	6. Provide adequate drainage without excessive slope.
	7. Heat/cold stress.	7. PPE/Breaks/Fluids provided based on SSHO guidance.
	8. Caught in moving parts.	8. Ensure all guards are in place prior to operation. Keep clear of all moving parts. Lockout/tagout of equipment prior to any access/maintenance of moving parts.
	9. Severing an unidentified utility.	9. Excavation permit required; all utilities identified and marked; hand dig within 2 feet of utility.
1.2 Equipment to be Used	Inspection Requirements	Training Requirements
1.3 Heavy equipment for excavation and hauling. Screener and hand tools.	Daily, prior to use per manufacturer's recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre-Entry Briefs, and OSHA Hazard Communication.

ACTIVITY HAZARD ANALYSIS (AHA)

Activity: Receive Mix and Load Building with Amendments to Soil.	Analyzed By/Date: Richard Spurgeon 11/19/97	Reviewed By/Date: Frank J. Petrik 11/19/97

2.0. Principal Steps	Potential Hazards	Recommended Controls
2.1. Receive Mix and Load Building with Amendments to Soil (general categories of work)	1. Struck by equipment.	1. Ensure backup alarms are working or continuous spotter provided: - operator physically acknowledges presence of other personnel and equipment during operation. - personnel keep clear of equipment operational path. - use handtools to sort through reject material.
	2. Noise.	2. Hearing protection required outside of cab within 15 feet of equipment.
PPE Required: dedicated coveralls; 16 inch PVC boots; Tyvek; double nitrile gloves; dust mask; safety glasses. Dust Mask unless ammonia monitoring results indicate F.F. APR w/HEPA/NH3 cartridge necessary. Note: dust mask can be removed while operating equipment inside enclosed cabs provided clean storage and handling is maintained.	3. Dust/Ammonia. Biological by direct contact.	3. Dust suppression immediately available. Use based on monitoring and visual inspection. Safety glasses and dust mask required unless ammonia monitoring dictates F.F. APR w/HEPA/NH_3 cartridges.
	4. Heat/Cold Stress.	4. PPE/Breaks/Fluids provided based on SSHO guidance.
	5. Caught in Moving Parts.	5. Ensure all guards are in place prior to operation. Keep clear of all moving parts. Lockout/tagout of equipment prior to any access/maintenance of moving parts.

2.2 Equipment to be Used	Inspection Requirements	Training Requirements
2.3. Grinder, heavy equipment for material handling.	Before use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre-Entry Briefs, and OSHA Hazard Communication.

ACTIVITY HAZARD ANALYSIS (AHA)

Activity: Turning, Sampling and Water Addition to Compost Piles.	Analyzed By/Date: Richard Spurgeon 11/19/97	Reviewed By/Date: Frank J. Petrik 11/19/97

3.0. Principal Steps	Potential Hazards	Recommended Controls
3.1.Turning, Sampling and Water *Addition to Compost Piles* (general categories of work).	1. Struck by equipment. 2. Struck by flying debris from Scarab. 3. Noise 4. Explosives contamination. 5. Dust/ammonia. 6. Heat/Cold Stress 7. Caught in moving parts.	1. Ensure backup alarms are working or continuous spotter provided: - *operator physically acknowledges presence of other personnel* and equipment during operation. - personnel keep clear of equipment operational path. 2. No personnel allowed in building during turning unless protected by equipment cab. 3. Hearing protection required outside cab within 15 feet of equipment. 4. Work area demarcated, PPE levels established and decontamination. 5. Dust suppression immediately available. Use based on monitoring and visual inspection. Safety glasses and dust mask required unless ammonia monitoring dictates F.F. APR w/HEPA/NH_3 cartridges. 6. PPE/Breaks/Fluids provided based on SSHO guidance. 7. Ensure all guards are in place prior to operation. Keep clear of all moving parts. Lockout/tagout of equipment prior to any access/maintenance of moving parts.
PPE Required: dedicated coveralls; 16 inch PVC boots; Tyvek; double nitrile gloves; dust mask; safety glasses. Dust Mask unless ammonia monitoring results indicate F.F. APR w/HEPA/NH3 cartridge necessary. Note: dust mask can be removed while operating equipment inside enclosed cabs provided clean storage and handling is maintained.		

3.3 Equipment to be Used	Inspection Requirements	Training Requirements
3.4. Scarab, skid loader, sampling and monitoring equipment.	Before use per manufacturers recommendation.	*OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory.* 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre-Entry Briefs, and OSHA Hazard Communication.

ACTIVITY HAZARD ANALYSIS (AHA)

Activity: Compost Removal from Buildings.		Analyzed By/Date: Richard Spurgeon 11/19/97	Reviewed By/Date: Frank J. Petrik 11/19/97
4.0 Principal Steps	**Potential Hazards**	**Recommended Controls**	
4.1 Compost removal from buildings.	1. Struck by moving equipment. 2. Noise. 3. Heat/Cold Stress. 4. Caught in moving parts.	1. Ensure backup alarms are working or continuous spotter provided: - operator physically acknowledges presence of other personnel and equipment during operation. - personnel keep clear of equipment operational path. 2. Hearing protection required outside cab within 15 feet of equipment. 3. PPE/Breaks/Fluids provided based on SSHO guidance. 4. Ensure all guards are in place prior to operation. Keep clear of all moving parts. Lockout/tagout of equipment prior to any access/maintenance of moving parts.	
PPE required: Dedicated coveralls, 16 inch PVC Boots, and Safety Glasses.			
4.2 Equipment to be Used	**Inspection Requirements**	**Training Requirements**	
4.3 Heavy equipment.	Daily, prior to use per manufacturer's recommendation in accordance with Operational Plan.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre-Entry Briefs, and OSHA Hazard Communication.	

ACTIVITY HAZARD ANALYSIS (AHA)

Activity: Pond/Sump Dewatering.		Analyzed By/Date: Richard Spurgeon 11/19/97	Reviewed By/Date: Frank J. Petrik 11/19/97
5.0 Principal Steps	**Potential Hazards**	**Recommended Controls**	
5.1 Pond/Sump Dewatering.	1. Water hazards (drowning).	1. Buddy system required inside locked impound area. Life jackets required when inside impound area.	
	2. Fire during refueling operations.	2. Use only flash arrested approved safety can. Fuel gasoline powered pumps with engine "off" and cool to touch.	
PPE required: Nitrile gloves if outside exclusion zone; dedicated coveralls; 16 " PVC boots; single nitrile gloves and safety glasses as a minimum.	3. Leaks or spills of water.	3. Inspect all hoses and connections prior to use and periodically thereafter.	
5.2 Equipment to be Used	**Inspection Requirements**	**Training Requirements**	
5.3 Portable pumps and holding tanks, handtools.	Daily, prior to use per manufacturer's recommendation in accordance with Operational Plan.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre-Entry Briefs, and OSHA Hazard Communication.	

ATTACHMENT B

CHEMICAL HYGIENE PLAN

ATTACHMENT B

CHEMICAL HYGIENE PLAN (CHP)

FOR

ONSITE LABORATORY OPERATIONS

1.0
CHEMICAL HYGIENE PLAN (CHP)

1.1 Introduction

The following Chemical Hygiene Plan (CHP) has been prepared for laboratory activities at the Bioremediation Facility Laboratory Trailer and is based on pertinent requirements established by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.1450 including Appendix A of the regulation. This CHP forms the basis of the chemical hygiene program used by MK personnel which sets forth procedures, equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in the Laboratory Trailer. This CHP is Appendix B to the Site Safety and Health Plan (SSHP) for Full Scale Soils Bioremediation Operations.

1.2 General Principles

In addition to the more detailed requirements listed in Section 1.5, the following general principles are established for all work in the laboratory setting on this project.

A. It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals will be adopted, rather than specific guidelines for particular chemicals. Skin contact with chemicals should be avoided as a cardinal rule.

B. Avoid underestimation of risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken. One should assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are toxic.

C. Provide adequate ventilation. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices.

D. Institute a chemical hygiene program as described in this CHP. A mandatory chemical hygiene program designed to minimize exposures will be utilized; it will be a regular, continuing effort, not merely a standby or short-term activity. Its requirements shall be followed by full-time

Environmental Technicians and others serving as laboratory workers.

E. Observe the PELs, TLVs. The Permissible Exposure Limits (PELs) of OSHA and the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) should not be exceeded.

1.3 Chemical Hygiene Responsibilities

1.3.1. Program Manager

The Program Manager has ultimate responsibility for chemical hygiene within the laboratory and must, with other managers, provide continuing support for laboratory chemical hygiene.

1.3.2. Environmental Specialist

The Environmental Specialist serves as supervisor of the laboratory and is responsible for chemical hygiene. May serve as the Chemical Hygiene Officer (described below) and has the following responsibilities for chemical hygiene in the laboratory:

(1) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided;

(2) Provide regular, formal chemical hygiene and housekeeping inspections including routine inspections of emergency equipment and spill control materials;

(3) Know the current legal requirements concerning regulated substances;

(4) Determine the required levels of protective apparel and equipment; and

(5) Ensure that facilities and training for use of any material being ordered are adequate.

1.3.3. Chemical Hygiene Officer (CHO)

The Chemical Hygiene Officer (CHO) must be identified by the Project

Manager and in this position is responsible for the following:

(1) Work with managers and other employees to develop and implement appropriate chemical hygiene policies and practices

(2) Monitor procurement, use, storage, and disposal of chemicals used in the lab;

(3) Maintain audits of equipment and operations;

(4) Help the Project Manager develop operating procedures for the laboratory facilities;

(5) Know the current legal requirements concerning regulated Chemicals; and

(6) Seek ways to improve the chemical hygiene program.

1.3.4. Site Safety and Health Supervisor (Officer)

The Site Safety and Health Supervisor (Officer) (SSHO) provides technical and administrative support as needed to the Chemical Hygiene Officer (CHO). The SSHO is responsible for conducting random inspections and surveillance of the laboratory to determine compliance with this CHP.

1.3.5. Environmental Technicians

The Environmental Technicians are responsible for:

(1) Planning and conducting each operation in accordance with the laboratory chemical hygiene procedures;

(2) *Maintaining good personal chemical hygiene habits; and*

(3) Reviewing this CHP and providing recommendations for improvement to the CHO.

1.4 Laboratory Facility

The Lab Trailer is located adjacent to the Administration Trailers at the Bioremediation

Facility. The Laboratory is approximately 30-ft by 20-ft in dimension. The Laboratory is equipped with an equalization damper adjacent to the door. The Laboratory consists of various cabinets and counter space, a Labconco Basic 47 fume hood (375 cfm), a sample drying oven, a sink and a sample refrigerator. The fume hood requires possible tension adjustment and adjustment of vent draft plate.

1.5 General Procedures for Working With Chemicals

1.5.1 Chemical Procurement, Distribution and Storage

(1) Procurement. Before a substance is received, information on proper handling, storage, and disposal will be reviewed by the SSHO. Material Safety Data Sheets (MSDSs) will be managed per SSHP Section 4.4.

(2) No container will be accepted without an adequate identifying label. Preferably, all substances should be received in a central location, that being the Laboratory Trailer.

(3) Stockrooms/storerooms. Toxic substances will be segregated in a well-identified area with local exhaust ventilation or in approved cabinets. Chemicals which are highly toxic or other chemicals whose containers have been opened will be in unbreakable secondary containers. Stored chemicals will be examined periodically (at least annually) for replacement, deterioration, and container integrity. Do not store heavy items above shoulder height. Use a stop stool for overhead access.

(4) Distribution. When chemicals are hand carried, the container will placed in an outside container or bucket. Solvents and acids should use container materials compatible with the material being transported.

(5) Laboratory storage. Amounts permitted should will be as small as practical. Storage on bench tops and in hoods is not permitted except in direct use containers. Exposure to heat or direct sunlight will be avoided. Periodic inventories will be conducted, with unneeded items being discarded or returned to the storeroom/stockroom and flammable storage cabinets.

Note: Maximum storage of acetone in the Laboratory Trailer is 3-Gallons and the containers are to be stored in a

flammable storage cabinet. Additional storage of acetone is limited to the capacities of the outside flammable storage cabinet.

6. Flammables must never be stored with oxidizers.

7. If carcinogenic or teratogenic materials are in use or storage, warning signs must be displayed.

1.5.2 General Rules for all Laboratory Work With Chemicals

The following will be used for essentially all laboratory work with chemicals:

(1) Accidents and spills-Eye Contact: Promptly flush eyes with water for a prolonged period (minimum of 15 minutes) and seek medical attention.

Note: Contact lenses are not permitted when working with hazardous chemicals.

Ingestion: Encourage the victim to drink large amounts of water. Read medical emergency instructions on MSDS. Seek medical attention. Do not induce vomiting unless instructed.

Skin Contact: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention.

Clean-up: Promptly clean up spills, using appropriate protective apparel and equipment (See MSDS for material).

(2) Avoidance of "routine"' exposure: Develop and encourage safe habits; avoid unnecessary exposure to chemicals by any route ; Do not smell or taste chemicals. Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices. Do not allow release of toxic substances into rooms which have recirculated atmospheres. Avoid entrainment of exhaust into other work area air intakes.

(3) Choice of chemicals: Use only those chemicals for which the design of the available ventilation system is appropriate for the material. Acids and flammables should not discharged into unapproved ventilation systems.

Note: Maximum quantity of Acetone for in process use within the ventilation hood is limited to 250 milliliters (mL).

(4) Avoid all eating, drinking, smoking, gum and tobacco chewing, or application of cosmetics in areas where laboratory chemicals are present; wash hands before conducting these activities. Avoid storage, handling or consumption of food or beverages in chemical storage areas. Do not use refrigerators, glassware or utensils which are also used for laboratory operations to handle or store food.

(5) Equipment and glassware: Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus; use secondary containment. Use equipment only for its designed purpose.

(6) Exiting Laboratory: Wash areas of exposed skin well before leaving the laboratory.

(7) Horseplay: Avoid practical jokes or other behavior which might confuse, startle or distract another worker.

(8) Mouth suction: Do not use mouth suction for pipetting or starting a siphon.

(9) Personal apparel: Confine long hair and loose clothing. Wear work shoes or shoe covers at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers.

(10) Personal housekeeping: Keep the work area clean and uncluttered. Chemicals and equipment should be properly labeled and stored. Clean up the work area on completion of an operation or at the end of each day.

(11) Personal protection: Assure that appropriate eye protection is worn by all persons, including visitors, where chemicals are stored or handled. Wear appropriate gloves when the potential for contact

with toxic materials exists; inspect the gloves before each use, wash them before removal where applicable, and replace them periodically. Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls. Inspect the respirator before each use. Use any other protective and emergency apparel and equipment as appropriate. Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken. Remove laboratory coats and/or aprons immediately on significant contamination. Use hot gloves or tongs to handle hot glassware or crucibles. Hot pods should be used to cool items.

(12) Planning: Seek information and advice about hazards from the CHO and/or the SSHO, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation. Critical or hazardous operations require a Standard Operating Procedure (SOP).

(13) Labconco Basic 47 Fume Hood: Use the hood for operations which might result in release of toxic and irritant chemical vapors or dust. As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm. Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made; keep materials stored in hoods to a minimum and do not allow them to block vents or air flow. Maximum quantity of Acetone for in process use within the ventilation hood is limited to 250 mL.

Note: "hood on" operation should be verified by visual indicator to worker outside the hood area.

(14) ELE International Electric Drying Oven: do not place combustible, flammable or explosive material into the oven. Follow manufacturers recommendation for service checks including the operational check of the temperature limit switch.

(15) Refrigerators used for the storage of potentially flammable materials must be approved for the hazard class.

(16) Vigilance: Be alert to unsafe conditions and see that they are

corrected when detected.

(17) Waste disposal: Assure that the plan for each laboratory operation includes plans and training for waste disposal. Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the CHP and the Quality Assurance Project Plan (QAPP).

Do not discharge to the sewer concentrated acids or bases; highly toxic, malodorous, or lachrymatory substances; or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow.

(17) Working alone: Avoid working alone in the Lab Trailer; do not work alone in the Lab if the procedures being conducted are hazardous.

(18) In the case of power failure, leave the lab trailer immediately. Open windows if possible.

1.5.3 Environmental Monitoring and Sampling

No environmental monitoring in the form of time integrated industrial hygiene monitoring and sampling has been determined to be necessary. The SSHO may complete monitoring and sampling to test ventilation systems or when new substances are stored or used regularly. The SSHO may require wipe sampling for explosive residues and metals to verify cleanliness of work surfaces.

1.5.4 Housekeeping, Maintenance, and Inspection

(1) Cleaning. Excessive soil dust must be controlled at all times by wet wiping or mopping. Avoid dry sweeping of surfaces. Floors will be cleaned regularly by wet method. Use wipe mats at entrance to control soil tracking.

(2) Inspections. Formal housekeeping and chemical hygiene inspections will be held at least semiannually; informal inspections will be continual. The formal inspection will be conducted by the SSHO and documented using a memo to the CHO and file.

(3) Maintenance. Eye wash fountains will be inspected at intervals of

not less than 3 months and change out of self-contained units will occur per manufacturers recommendation. Respirators for routine use should be inspected periodically by the CHO. Other safety equipment should be inspected regularly.

(4) Passageways. Access to exits, emergency equipment, and utility controls shall never be blocked. Shutoffs shall be clearly identified for emergency use. Fire extinguishers shall be wall mounted with identifying signs.

(5) Ergonomic. Maintain adequate lighting for operations. Use antifatigue mats for extended standing operations.

1.5.5 Medical Program

(1) Surveillance. Lab personnel will follow medical surveillance program requirements from Section 5 of the SSHP.

1.5.6 Protective Apparel and Equipment

The following items will be included for use in the Laboratory Trailer:

(1) Protective apparel compatible with the required degree of protection for substances being handled. This includes safety glasses, chemical goggles, chemical resistant gloves, chemical resistant aprons, and face shields;

(2) An easily accessible emergency eye-wash;

(3) A fire extinguisher suitable for the level of hazard;

(4) Easily accessible telephone or communication system for emergency use; and

(5) Tools and material handling equipment as necessary for safe movement and transfer of chemical materials.

1.5.7 Records

(1) Accident records will be written and retained in accordance with the SSHP Section 11.2.

(2) CHP records will document that the facilities and precautions were compatible with current knowledge and regulations as specified in the SSHP Section 13.3.

(4) Medical records will be kept per SSHP Section 5.3.

1.5.8 Signs and Labels

Prominent signs and labels of the following types will be posted accordingly:

(1) Emergency telephone numbers of emergency personnel/facilities and managers (Table A-3 and Figure 1 from the SSHP);

(2) Identity labels, showing contents of containers (including waste receptacles) and associated hazards;

Note: temporary use container including rinse water must have identity labels and name of user.

(3) Location signs for eyewash stations, other safety and first aid equipment, exits and areas where food and beverage consumption and storage are permitted; and

(4) Warnings at areas or equipment where special or unusual hazards exist.

1.5.9 Spills and Accidents

Emergency preparedness and spill containment will follow the guidelines and requirements established in the SSHP Section 12.0 and 16.0 respectively.

1.5.10 Information and Training Program

The training program will follow the requirements specified in the SSHP Section 4.0. In addition, laboratory personnel are required to review this CHP. Additional training will be conducted by the CHO and/or SSHO on protective apparel and equipment as determined to be necessary during the weekly safety meeting (SSHP Section 4.7).

1.5.11 Waste Disposal Program

(1) Aim: To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals. Requirements from the Waste Management Plan (WMP) will be implemented where applicable.

(2) Discarding Chemical Stocks: Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened. Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage.

List each chemical stock that is a candidate for waste disposal:

A) Used Acetone - Navy will dispose of at Ammunition Burning Ground.

B) Used deionized water and distilled water- rinsate will be disposed of to sanitary sewer system.

C) Used Explosives Screening Test Kits - inert, will be disposed off at onsite Landfill.

D) Waste Compost Samples - samples will be returned to compost piles.

(3) Frequency of Disposal: Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals.

A) Used Acetone - weekly disposal, stored in flammable cabinet.

B) Used deionized water and distilled water- daily to sanitary sewer.

C) Used Explosives Screening Test Kits - daily to landfill.

D) Waste Compost Samples - daily returned to piles.

(4) Method of Disposal: Indiscriminate disposal by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable. Hoods should not be used as a means of disposal for volatile chemicals. Disposal by recycling or chemical decontamination should be used when possible.

A) Used Acetone - Navy will dispose of at Ammunition Burning Ground.

B) Used deionized water and distilled water- rinsate will be disposed of to sewer system via the sink at Laboratory..

C) Used Explosives Screening Test Kits - inert, will be disposed off at onsite Landfill as non hazardous waste..

D) Waste Compost Samples - samples will be returned to compost piles for biodegradation.

ATTACHMENT C

FIELD STANDARD OPERATING PROCEDURE SSHP-01

1.0 PURPOSE

This procedure describes the material and methods in detail which will be used for time integrated industrial hygiene air sampling of bioaerosols and explosive residues.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full scale operations. This procedure only includes time integrated air sampling as described in Section 7.3 of the Task-Specific Site Safety and Health Plan (SSHP) (MK, 1998).

3.0 PREREQUISITES

Prior to calibration of sampling pumps, the temperature, barometric pressure, and relative humidity data will be obtained from the Bloomington Airport Tower or equivalent source and recorded on Attachment 1. The phone number for the Tower is 812-825-7421. The following conversion formulae are applicable:

Degree Celsius (°C) = 5/9(°F - 32)
Degrees Kelvin (°K) = °C + 273
millimeters mercury (mm Hg) = inches Hg x 25.40

4.0 MATERIAL

The following material (equipment) will be used for air sampling.

4.1 Bioaerosols

Included will be a high volume sampling pump with Single-Stage Andersen Impactor calibrated using 4 liter (L) glass calibration jar or equivalent with calibration specific petri dishes. All sampling and calibration equipment will be supplied by laboratory on a rental agreement. Seventy percent ethanol or greater will be supplied by the laboratory. Miscellaneous consumables such as disposable gloves, freezer bags, spray bottle, and pans will be purchased prior to start-up by the Site Safety and Health Officer (SSHO).

Samples will be collected by impaction on pre-selected growth media plates

using a high volume sampling pump with Single-Stage Andersen Impactor. The growth media will be Standard Method Agar (SMA) for bacteria and acidified Potato Dextrose Agar (PDA) for fungi (molds and yeast). The choice of growth media may change depending on additional expert advice from microbiology laboratory. The Andersen Single-Stage Impactor uses plastic petri dishes containing 20 mil-liter (mL) of the appropriate growth media prepared by the analytical laboratory and shipped to the field.

Both the SMA and acidified PDA are supplied to the analytical laboratory by Becton Dickinson and Company or equivalent. The approximate formula for SMA per liter (L) purified water is: 5.0 gram (g) pancreatic digest of casein; 2.5 g yeast extract; 1.0 g dextrose; and 15.0 g agar. The approximate formula for acidified PDA per L purified water is: 4.0 g potato, infusion from (solids); 20.0 g dextrose; and 15.0 g agar.

The calibration specific petri dishes are extra sampling petri dishes filled with either SMA or acidified PDA. They are used only for determining the pre- and post-sampling flow rates of the sampling pump.

4.2 Explosive Residues

Included will be Gillian multi-flow sampling pumps, Gillabrator calibrator, and tygon tubing. An OSHA Versatile Sampler (OVS) Tube Holder from SKC Corporation will be used to hold the OVS Tube in place and fastened to the worker, or for area samples, fastened to a step ladder or stanchions inside of the composting structure. Refer to SKC 1997 Comprehensive Catalog and Air Sampling Guide on page 34 (SKC, 1997) for this holder.

Samples will be collected on sorbent and filter tube, 270/140 XAD-2 and glass fiber filter, OVS Tubes. OSHA Method 44 (OSHA, 1983) recommends collection of 2,4-DNT and 2,4,6-TNT on modified Tenax-GC Tubes (100 milligram (mg) /50 mg sections). The modification includes placing an 8 millimeter (mm) glass fiber filter inside of the tube ahead of the first resin bed. OSHA's Chemical Sampling Information (CSI, 1996) database available through the OSHA Computerized Information System (OCIS) recommends 37 mm glass fiber filter for collection of RDX and HMX.

By design, the OSHA OVS tube satisfies requirements for both an adsorbent bed and a filter media. During pilot scale testing, the analytical laboratory

recommended using the XAD-2 tube instead of Tenax, and stated the XAD-2 tube will provide equivalent if not better collection efficiency than Tenax and costs less per OVS tube. This was confirmed by an SKC Corporation representative by telephone. The Tenax tubes are mainly designed where thermal desorption techniques are used in the analysis of the sample media. A description of the XAD-2 tube is provided in the SKC 1997 Comprehensive Catalog and Air Sampling Guide on page 29 (SKC, 1997).

5.0 METHODS

The following methods will be used for air sampling.

5.1 Bioaerosols

During active composting, ten area samples will be obtained inside of the composting structure and ten area samples outside of the structure approximately 100 m away from and upwind from the composting structures. Two sampling campaigns are anticipated, one in late spring and one during the summer. The samples will be obtained approximately two and three days into the composting process. Samples inside of the structure will be taken during windrow turning and immediately thereafter. One sample set consists of the following:

1. Bacteria - 1 petri dish containing SMA
2. Fungi (molds and yeast) - 1 petri dish containing acidified PDA

Therefore ten sample sets inside of the structure for bacteria will require 10 petri dishes and ten sample sets for Fungi (molds and yeast) inside of the structure will require 10 petri dishes for a total of 20 petri dishes. Subsequent bacterial pathogen isolation will be performed on all of the SMA petri dishes by the laboratory.

The outside samples will total 20 the same as the inside samples. Bacterial isolation will be performed on the SMA petri dishes. Eight field culture blanks will be obtained in the field consisting of two sets of petri dishes, four inside and four outside. Of the four inside, two will be SMA containing petri dishes and two will be acidified PDA containing petri dishes. The same breakdown applies to the outside field culture blanks.

5.1.1 Procedure

Bioaerosol samples will be collected in accordance with the guidance presented in the American Industrial Hygiene Association (AIHA), Field Guide for the Determination of Biological Contaminants in Environmental Samples (AIHA, 1996).

The airflow for the sampling unit will be adjusted to 28.3 liters per minute (L/min) and verified using a factory calibrated electronic bubble-tube calibrator with a capacity to 30 L/min. Prior to calibration, the temperature, pressure, and relative humidity will be recorded on a Calibration Data Form. During calibration, a designated calibration only plastic petri dish will be inserted into the impactor stage. The impactor will be placed in a 4 L calibration jar or equivalent as described in Bisesi and Kohn, (1995). The pre-sampling flowrate (Q_{pre}) will be determined using the electronic bubble-tube calibrator based on the average result of three measurement trials and recorded on the Calibration Data Form.

Prior to sampling, each petri dish will be removed from storage and allowed to warm to ambient temperature for approximately 1 hour. Each petri dish will be labeled specifying sample number, type of sample, location, and date. After calibration, the impactor will be disassembled and sprayed and swabbed with seventy percent ethanol (or equivalent) and air dried on disposable pans pre-wiped with ethanol. Disposable latex gloves will be worn when disinfecting and handling the impactor and petri dishes.

After air drying, the impactor will be loaded with a sample petri dish. The petri dish sample lid will be placed concave surface down on disposable pans pre-wiped with ethanol and inserted into a large freezer bag pre-wiped with ethanol.

At the sampling site, the sampling pump and impactor will be placed on a folding table at approximately 1.0 m above the floor or ground. The sampling pump will be turned "ON" and start time recorded using an electronic timer. After a specified time, the pump will be turned "OFF" and stop time recorded. Sampling time will be set at 5 minutes and may be modified based upon discussion with microbiology laboratory.

After completing sampling, the impactor will be disassembled and the covers of the petri dish installed and taped. The petri dish will be placed in a cooler filled with blue ice right-side-up. The blue ice will maintain storage temperatures of

about 4 °C during shipment to the laboratory for incubation by Federal Express (FED EX) overnight delivery. One set of negative controls (two field sample blanks) for every ten collected samples will be prepared. A set of negative controls will be prepared by loading the sampling impactor with a filled petri dish, followed by removal of the petri dish without activating the sampling pump. Shipment and storage of negative control plates coincides with the field samples.

In addition to the field blanks, two travel control blanks will be sent by the analytical laboratory with the shipment of petri dishes. The travel control blanks are not opened in the field and are returned to the laboratory with the field samples for analysis to determine if contamination could have occurred. A Field Monitoring Data Form (Attachment 2) and Chain-of-Custody form (Attachment 3) will be completed and attached to the cooler along with the Calibration Data Form. As part of the analytical laboratory quality control program, two sets of positive and two sets of negative control blanks will be prepared and analyzed by the laboratory.

After completing the field samples, the "calibration only" petri dish will again inserted into the impactor stage and post-sample calibration flow rate (Q_{post}) data will be obtained based on the average result of three measurement trials and recorded on the Calibration Data Form. Q_{post} will be checked to make sure its value is within 10% of Q_{pre} . If not, the difference will be noted on the Calibration Data Form under Calibration Notes and the samples treated as suspect. Percent error in the calibration check is calculated using the following equation:

$$\% \text{ error} = \frac{Q_{pre} - Q_{post}}{Q_{pre}} \times 100$$

The average flow rate (Q_{avg}) will be calculated based on the average of the pre- and post-sampling flow rates and recorded on the calibration log sheet using the following equation:

$$Q_{avg} = \frac{Q_{pre} + Q_{post}}{2}$$

Q_{avg} becomes the actual flow rate in the field and is corrected in the field to standard flow rate (Q_{std}), where standard temperature and pressure equal 25 °C (298 °K) and 760 mm Hg , respectively.

$Q_{std} = Q_{avg} \times (298/T) \times (P/760)$, where T = ambient temperature in °K and P = ambient barometric pressure in mm Hg.

5.1.2 Sample Analysis

A separate growth media as described in the Material section was used for each of the following constituents and analyzed accordingly:

1. SMA for total bacteria (total plate count), subculture for additional bacterial pathogens including *E.coli* as a marker from manure.

2. Acidified PDA for fungi (molds and yeast), looking especially for *Aspergillus* species including *Aspergillus fumigatus.*

At the laboratory, as soon as possible and before 24 hr, the sample plates will be placed right-side-up for fungi and upside down for bacteria in an incubator set at an appropriate temperature for incubation. For bacteria, the incubation temperature will be 35 ± 1 °C for 48 hours ± 2 hr. For fungi (molds and yeast), the incubation temperature will be 22.5 ± 2.5 °C for 120-168 hours.

Analysis for bacteria (total plate count) will be completed by laboratory using a Quebec colony counter, dark-field, with suitable light source and grid plate in accordance with Food and Drug Administration (FDA) Bacteriological Analytical Manual or equivalent method. Subsequent bacterial pathogen isolations will be performed by streaking for isolation, using morphologically distinct representative colonies, onto SMA from the inoculated plates. Plates will be incubated and single consistent colonies will then be inoculated onto selective and differential agars to culture for the following species of bacteria or as modified by laboratory: *Pseudomonas aeruginosa*; *Pseudomonas fluorescens*; *Pseudomonas putida*; *Pseudomonas cepacia* (approximately 50% of strains); *Pseudomonas pseudoalcagenes* (approximately 50% of strains); *Pseudomonas species VE-2* (approximately 50% of strains); *Staphylococcus aureus*; *Staphylococcus epidermis*; *Escherichia coli (E.coli)*; *Salmonella typhi*; *Salmonella enteritidis*; *Salmonella choleraesuis*; *Citrobacter freundii*; *Citrobacter diversus*; *Citrobacter amalonnaticus*; *Enterobacter cloacae*; *Enterobacter aerogenes*; *Enterobacter agglomerans*; *Enterbacter gergoviae*; *Proteus vulgaris*; and *Morganella morganii.*

Analysis for fungi (molds and yeast) will be completed by laboratory using a Quebec colony counter, dark-field, with suitable light source and grid plate in

based on procedures for determining plate count developed by the Association of Official Analytical Chemists (AOAC), and by the American Public Health Association (APHA) or equivalent method.

The concentration of microorganisms will be determined based on the number of colonies counted divided by the volume of air sampled. The concentration is expressed in units of colony forming units per cubic meter of air (cfu/m^3) as calculated in the following equation:

$$\text{Bioaerosol concentration (cfu/m}^3\text{)} = \frac{\text{Number of colonies counted}}{\text{Vol. of air sampled in m}^3}$$

5.1.3 Data Analysis

The laboratory will report quantitative laboratory analysis for each sample in raw data (as total count) and cfu/m^3. The laboratory will also report qualitative laboratory analysis results for each sample by identifying the type of microorganism found. *Aspergillus* species and bacterial pathogenic species including *E.coli* will be reported as detected or non-detect.

5.2 Explosives Residues

Every calender quarter during composting operations, four personal samples of full shift duration, or if necessary, split shift duration will be obtained from the maximally exposed individuals. The personal samples are compliance samples.

Three area samples will be obtained inside of the composting structure near the work area during active composting. The sample pump and media will be secured to a stepladder or stanchions at approximately 1.5 m height above the floor. Area samples should be biased by representing the worst-case exposure.

5.2.1 *Procedure*

To obtain a full shift sample of eight hours (hr) of approximately 240 L air volume, the flow rate of the pump will be adjusted to 0.5 L/min and verified using a factory calibrated electronic bubble-tube calibrator with a capacity to 4 L/min. If split shift samples of four hour duration are obtained, the pump will be adjusted to 1.0 L/min. Prior to calibration, the temperature, pressure, and relative humidity will be recorded on a Calibration Data Form. Both ends of a labeled OVS tube will be broken open and inserted into the tygon tubing for calibration. An OVS tube holder is not used during calibration. For calibration, the sampling train will consist of a multi-flow pump with tygon tubing connected to an OVS tube and a moisture trap. The sampling pump will be adjusted to approximately 0.5 L/min or 1.0 L/min. The OVS tube holder will be inserted into the sampling train after calibration.

The pre-sampling flowrate (Q_{pre}) will be determined using the electronic bubble-tube calibrator based on the average result of three measurement trials and recorded on the Calibration Data Form.

The OVS tube holder containing a labeled sampling tube will be positioned vertically and attached to the worker within the breathing zone, and the air sampling pump will be secured to a sampling belt worn over-top of the workers disposable Tyvek® coveralls. The sampling train will be positioned and secured approximately 1.5 m above the floor for area sampling.

At the sampling site, the sampling pump will be turned "ON" and start time recorded. After a specified time (approximately 4 or 8 hours), the pump will be turned "OFF" and stop time recorded. The sample train will be removed from the

worker and the post-sample calibration flow rate (Q_{post}) data will be obtained based on the average result of three measurement trials and recorded on the Calibration Data Form. Q_{post} will be checked to make sure its value is within 10% of Q_{pre} . If not, the difference will be noted on the Calibration Data Form under Calibration Notes and the samples treated as suspect. Percent error in the calibration check is calculated using the following equation:

$$\% \text{ error} = \frac{Q_{pre} - Q_{post}}{Q_{pre}} \times 100$$

The average flow rate (Q_{avg}) will be calculated based on the average of the pre- and post-sampling flow rates and recorded on the calibration log sheet using the following equation:

$$Q_{avg} = \frac{Q_{pre} + Q_{post}}{2}$$

Q_{avg} becomes the actual flow rate in the field and is corrected in the field to standard flow rate (Q_{std}), where standard temperature and pressure equal 25 °C (298 °K) and 760 mm Hg , respectively.

$Q_{std} = Q_{avg} \times (298/T) \times (P/760)$, where T = ambient temperature in °K and P = ambient barometric pressure in mm Hg.

After post-calibration, the OVS tube will be removed from the holder, the OVS tube label will be checked and the end caps secured in place. The OVS tube end caps will be custody sealed, wrapped in protective covering, and placed in a cooler filled with blue ice. The blue ice will maintain storage temperatures at approximately 4°C during shipment to the laboratory by Federal Express (FED EX) overnight delivery. A Field Monitoring Data Form (Attachment 2) and Chain-Of-Custody form (Attachment 3) will be completed and attached to the cooler along with the Calibration Data Form.

One negative control (field blank) will be obtained for every ten collected samples. The negative control will be prepared by assembling the sample train with an opened OVS tube inserted into the tube holder, followed by removal of the OVS tube without activating the sampling pump.

5.2.2 Sample Analysis

At the laboratory, the samples will be analyzed per USEPA Method 8330 (USEPA SW846, 1994) using a Hewlet Packard 1040A UV-VIS Diode Array High Pressure Liquid Chromatography (HPLC) detector system or equivalent providing a scan for specific analytes and isomers including HMX; RDX; 1,3,5-TNB; 1,3-DNB; Tetryl; Nitrobenzene; 2,4,6-TNT; 4-Amino-2,6-DNT; 2-Amino-4,6-DNT; 2,4-DNT; 2,6-DNT; 2-Nitrotoluene; 3-Nitrotoluene; and 4-Nitrotoluene.

Samples will be extracted with acetonitrile and analyzed by HPLC. The area of the peaks of the unknown sample will be compared to standard injections. Desorption efficiency (DE), expressed in percent, will be calculated by the analytical laboratory and factored in to determine the mass of analyte on the OVS Tube sections. The concentration (C), of analyte in the air volume sampled (V) in L will be calculated from the following equation:

$$C\ (mg/m^3) = \frac{[W_p + W_f + W_b - (B_p + B_f + B_b)] \times 10^3}{V\ (L)}$$

where:

C = concentration of analyte in air, in mg/m^3.
W_p = mass of analyte found in sample prefilter, in mg.
W_f = mass of analyte found in the sample front, in mg.
W_b = mass of analyte found in the sample back, in mg.
B_p = mass of analyte found in the blank prefilter, in mg.
B_f = mass of analyte found in the blank front, in mg.
B_b = mass of analyte found in the blank back, in mg.
V = volume of air sampled, in L.

During sample analysis, if $W_b > W_f/10$, the analytical laboratory will report breakthrough and possible sample loss. The OSHA Method 44 uses gas chromatography with thermal energy analyzer and explosives analysis package (GC/TEA/EAP), but lists HPLC as one of several very adequate analytical techniques for DNT and TNT. The OSHA OCIS CSI (CSI, 1996) lists HPLC-UV for RDX and HMX analysis. By using EPA Method 8330, an analysis of the key analytes can be conducted from a single media using one method.

5.2.3 Data Analysis

The laboratory will report analysis results in mg/m^3 for each detected constituent. The laboratory will calculate desorption efficiency and the results of at least one matrix control blank per sample batch.

6.0 COMPLETION REPORT

The Safety Supervisor is responsible for preparing a summary report on results of all time-integrated industrial hygiene sampling results for the first year of full scale operations. Refer to the SSHP document section 13.5.

7.0 REFERENCES

American Industrial Hygiene Association (AIHA) 1996 Andersen multi-hole impactor samplers. In: Dillion, H.K.; Heinsohn, P.A.; and Miller, J.D., eds., Field Guide for the Determination of Biological Contaminants in Environmental Samples: Section 4. Viable air sampling instruments: description and operating procedures. AIHA, Fairfax, Virginia, pp. 82-85.

Bisesi, M.S. and Kohn, J.P. 1995 Industrial Hygiene Evaluation Methods. Lewis Publishers (CRC Press, Inc.), Boca Raton, FL., pp 15-1-15-5.

Occupational Safety and Health Administration (OSHA) 1983 Method number 44 for 2,4-Dinitrotoluene (DNT) and 2,4,6-Trinitrotoluene. In: OSHA Computerized Information System (OCIS), Analytical Methods, http:// 198.17.175.40/ SLTC/ methods.html

OSHA Chemical Sampling Information (CSI) 1996 Chemical sampling information for Cyclonite, HMX, and 2,4,6-Trinitrotoluene. In: OSHA Computerized Information System (OCIS), Chemical Sampling Information, http:// 198.17.175.40/ OCIS/ toc.chemsamp.html

Site Safety and Health Plan (MK) 1998 Task-specific site safety and health plan, pilot scale, soils bioremediation facility. North Charleston, South Carolina, Morrison Knudsen Corporation, Rev 1.

SKC Inc. 1997 Comprehensive catalog and air sampling guide. Eighty Four, PA., SKC Inc., p. 29.

USEPA SW846. 1994 Test methods for the evaluation of solid waste. Washington DC. United States Environmental Protection Agency, Volume 1, Section B, Method 8330.

8.0 ATTACHMENTS

1. Calibration Data Form: Low, High, and Multi-Flow Sampling Pumps.
2. Field Monitoring Data Form: Integrated Monitoring for Particulates, Gases, Vapors, or Bioaerosols.
3. Chain Of Custody Record.

Attachment 1. Calibration Data Form: Low, High, and Multi-Flow Sampling Pumps

Name and Location of Calibration: _____

Calibration Conducted By: _____ Date Calibration Conducted: _____

Calibration Instrument (Type/Manufacturer/Model): _____

Air Sampling Pump (Type/Manufacturer/Model): _____

Collection Medium In Line: _____ Calibrator Volume: _____

Air Temperature: °C Air Pressure: _____ mm Hg Relative Humidity: %

Pump No.	Pre-Sampling Calibration Flow Rate (Q_{pre})					Post-Sampling Calibration Flow Rate (Q_{post})					Avg. Flow Rate	Std. Flow Rate
	Q (L/min)				Q_{pre}	Q (units)				Q_{post}	Q_{avg}	Q_{Std}
	Q_1	Q_2	Q_3	Avg	L/min	Q_1	Q_2	Q_3	Avg	L/min	L/min	L/min

Calibration Notes:

Attachment 2. Field Monitoring Data Form: Integrated Monitoring for Particulates, Gases, Vapors, or Bioaerosols

Facility Name and Location: _____ Contaminant Sampled: _____

Monitoring Conducted By and Date: _____ Collection Media: _____

Monitoring Instrument (Type/Manufacturer/Model): _____

Air Temperature: _____ °C Air Pressure: _____ mm Hg Relative Humidity: _____ %

Identification of Personnel or Area	Field Sample ID No.	Pump No.	Q_{pre} L/min	Q_{post} L/min	Q_{avg} L/min	Sample Start-Time	Sample Stop Time	Total Sample Time (T)	Volume Sampled (Vol)

Field Notes:

APPENDIX A2
SWMU-13/14, MINE FILL B SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP) FOR FULL-SCALE OPERATIONS

Appendix A2 will be issued for approval as an addendum to this Operations Plan prior to beginning excavation at SWMU-13/14, Mine Fill B.

APPENDIX A3
SWMU-03/10, AMMUNITION BURNING GROUND SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP) FOR FULL-SCALE OPERATIONS

Appendix A3 will be issued for approval as an addendum to this Operations Plan prior to beginning excavation at SWMU-03-10, Ammunition Burning Ground.

APPENDIX A4
SWMU-10/15, ROCKEYE SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP) FOR FULL-SCALE OPERATIONS

Appendix A4 will be issued for approval as an addendum to this Operations Plan prior to beginning excavation at SWMU-10/15, Rockeye

APPENDIX B
PHOTOGRAPHS

APPENDIX B

LIST OF PHOTOS

PHOTO	DESCRIPTION
BIOREMEDIATION FACILITY PHOTOGRAPHS:	
1	COMPOST BUILDINGS - #1, #2, AND #3
2	AMENDMENT STORAGE AREA
3	AMENDMENT HAUL ROAD AREA
4	EQUIPMENT AND PERSONNEL DECONTAMINATION AREA
5	OFFICE AND LABORATORY TRAILER AREA
6	STORM-WATER RETENTION BASIN #1
7	STORM-WATER RETENTION BASIN #2
BIOREMEDIATION EQUIPMENT PHOTOGRAPHS:	
8	KNIGHT SOIL SCREENER - MODEL PRO-SCREEN 1605 (LEFT SIDE VIEW)
9	KNIGHT SOIL SCREENER - MODEL PRO-SCREEN 1605 (REAR RIGHT SIDE VIEW)
10	SEMI-TRACTOR TRUCK AND LIVE-BOTTOM TRAILER
11	HOPPER/SOIL DUMP CONVEYOR SYSTEM
12	BACKHOE/LOADER - CATERPILLAR MODEL 416B
13	SKID STEER LOADER - JOHN DEERE MODEL 6675
14	AMENDMENT GRINDER/MIXER - SUPREME MODEL 700
15	AMENDMENT GRINDER/MIXER SCALE OPERATORS PANEL WITH DIGITAL DISPLAY
16	FARM TRACTOR WITH LOADER ATTACHMENTS - JOHN DEERE MODEL 7710
17	CENTER-PIVOT WHEEL LOADER - CATERPILLAR MODEL 966F
18	WINDROW COMPOST TURNER - SCARAB MODEL 20HYD450 (REAR VIEW)

LIST OF PHOTOS (Continued)

PHOTO	DESCRIPTION
19	WINDROW COMPOST TURNER - SCARAB MODEL 20HYD450 (FRONT RIGHT SIDE VIEW)
SWMU 03/10, AMMUNITION BURNING GROUND PHOTOGRAPHS:	
20	SWMU 03/10, AMMUNITION BURNING GROUND AERIAL VIEW (AS OF NOVEMBER 1993)
21	INCENDIARY CAGE, FLARES AND OTHER DEVICES
22	INCENDIARY CAGE AND GROUNDS
23	INCENDIARY AREA
24	PRIMER PITS
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SWMU 10/15, ROCKEYE PHOTOGRAPHS:	
28	SWMU 10/15, ROCKEYE AERIAL VIEW (AS OF NOVEMBER 1993)
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31	LOOKING AT THE SOUTH SIDE OF BLDG. 2734
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32	SWMU 12/14, MINE FILL A AERIAL VIEW (AS OF NOVEMBER 1993)
33	LOOKING SOUTHWEST TOWARD BLDG. 153
34	LOOKING DOWN FROM BLDG. 153 AT VEHICLE TURNAROUND
35	LOOKING EAST TOWARD BLDG. 153 (VEHICLE TURNAROUND AT LEFT)
36	LOOKING NORTH TOWARD BLDG. 158 (SECONDARY EXCAVATION SITE)
37	LOOKING SOUTH TOWARD BLDG. 158 (SECONDARY EXCAVATION SITE)

LIST OF PHOTOS (Continued)

PHOTO	DESCRIPTION
38	LOOKING WEST AT FILLING STATION BLDG. 157
39	LOOKING EAST AT SUPPLY BLDG. 159
40	LOOKING WEST AT BLDG. 152
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SWMU 13/14, MINE FILL B PHOTOGRAPHS:	
42	SWMU 13/14, MINE FILL B AERIAL VIEW (AS OF NOVEMBER 1993)
43	LOOKING SOUTH AT SUPPLY BLDG. 172 AND OTHER STRUCTURES
44	LOOKING EAST AT SUPPLY BLDG. 173 AND OTHER STRUCTURES
45	LOOKING EAST AT SUPPLY BLDG. 2501 AND OTHER STRUCTURES
46	LOOKING NORTH TOWARD MINE FILL B RECEIVING STATION FOR BLDG. 171
47	LOOKING WEST AT BLDG. 166 AND OTHER STRUCTURES
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49	LOOKING SOUTH AT SUPPLY BLDG. 168 AND OTHER STRUCTURES
50	LOOKING SOUTH AT SUPPLY BLDG. 168 AND OTHER STRUCTURES

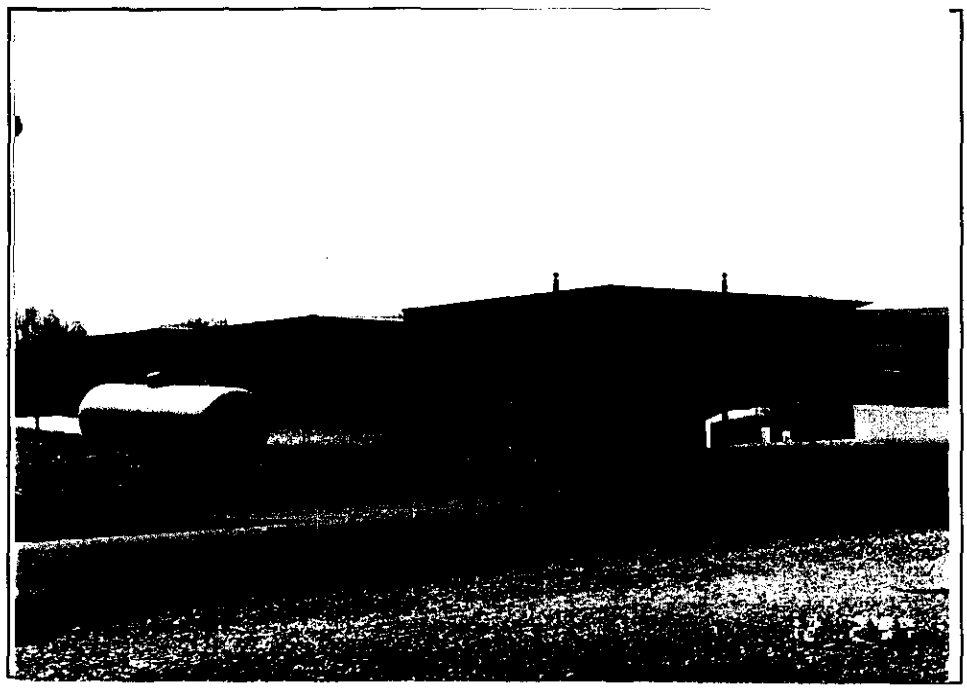


PHOTO 1
COMPOST BUILDINGS - #1, #2, AND #3

PHOTO 2
AMENDMENT STORAGE AREA

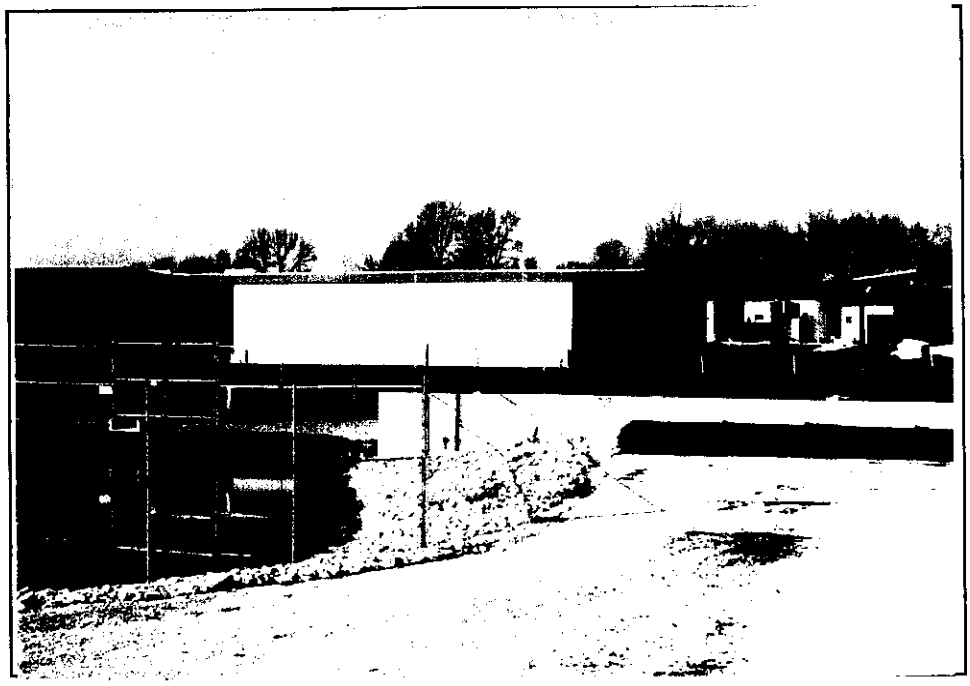


PHOTO 3
AMENDMENT HAUL ROAD AREA

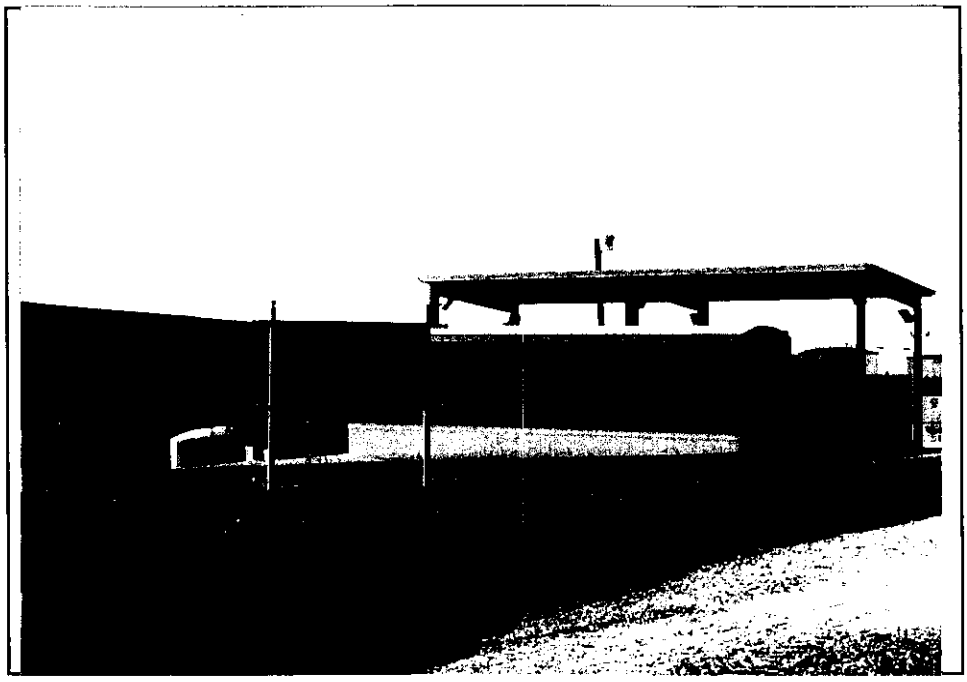


PHOTO 4
EQUIPMENT AND PERSONNEL DECONTAMINATION AREA

PHOTO 5
OFFICE AND LABORATORY TRAILER AREA

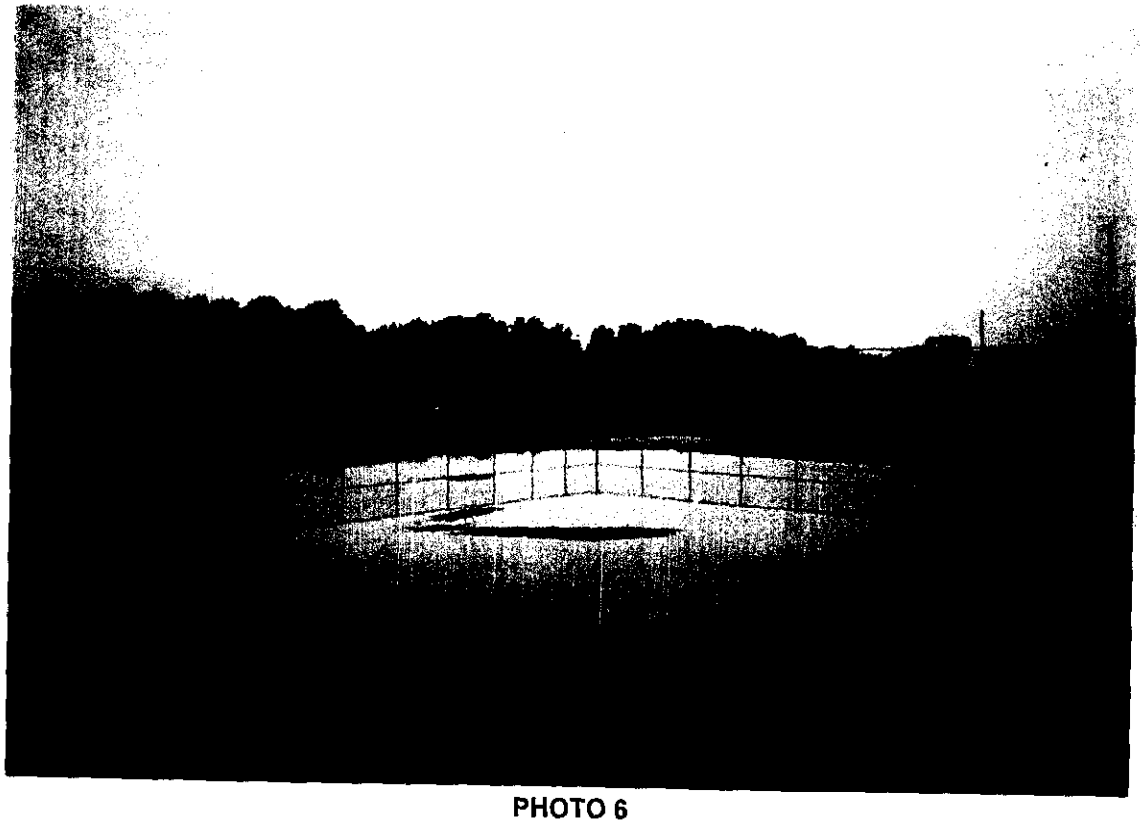


PHOTO 6
STORM-WATER RETENTION BASIN #1

PHOTO 7
STORM-WATER RETENTION BASIN #2

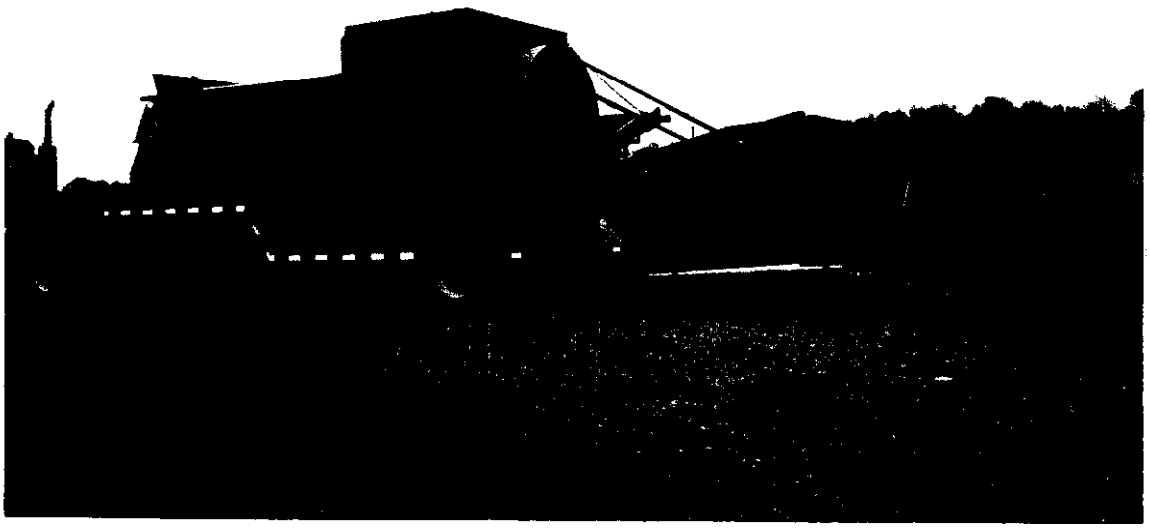


PHOTO 8
KNIGHT SOIL SCREENER - MODEL PRO-SCREEN 1605 (LEFT SIDE VIEW)

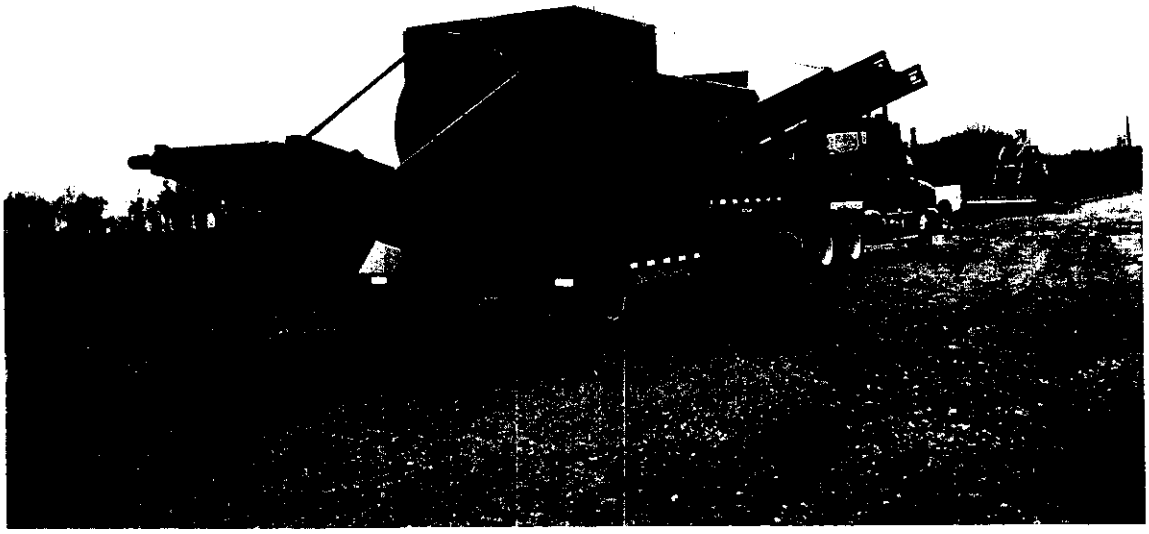


PHOTO 9
KNIGHT SOIL SCREENER - MODEL PRO-SCREEN 1605 (REAR RIGHT SIDE VIEW)

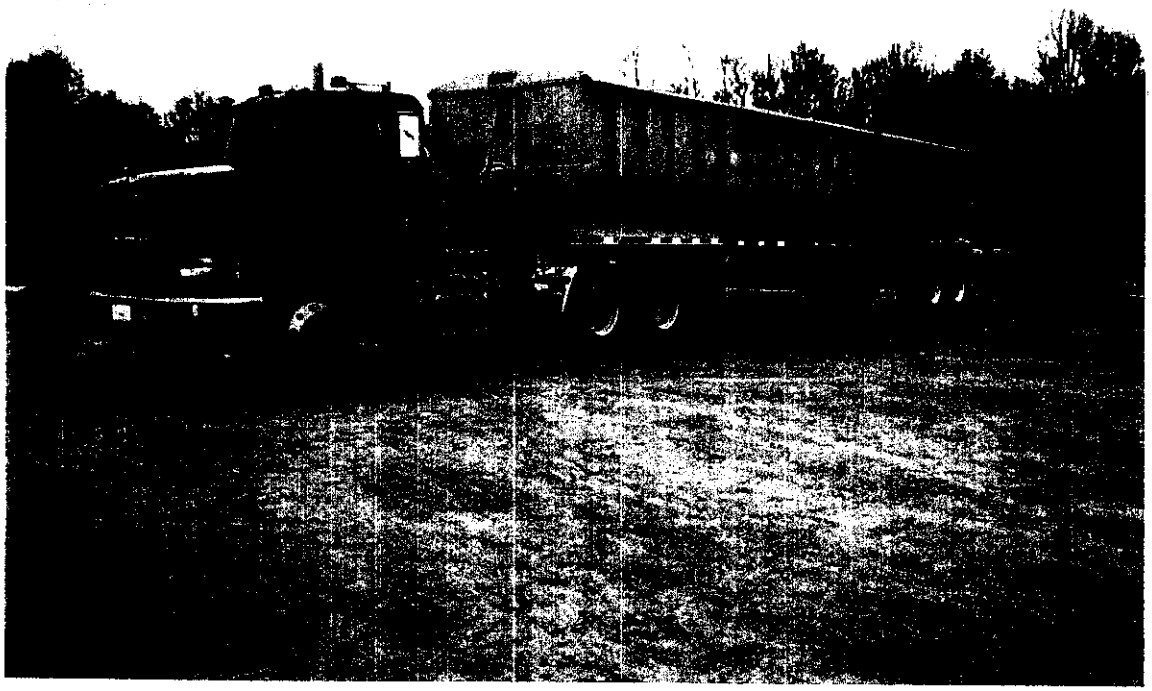


PHOTO 10
SEMI-TRACTOR TRUCK AND LIVE-BOTTOM TRAILER

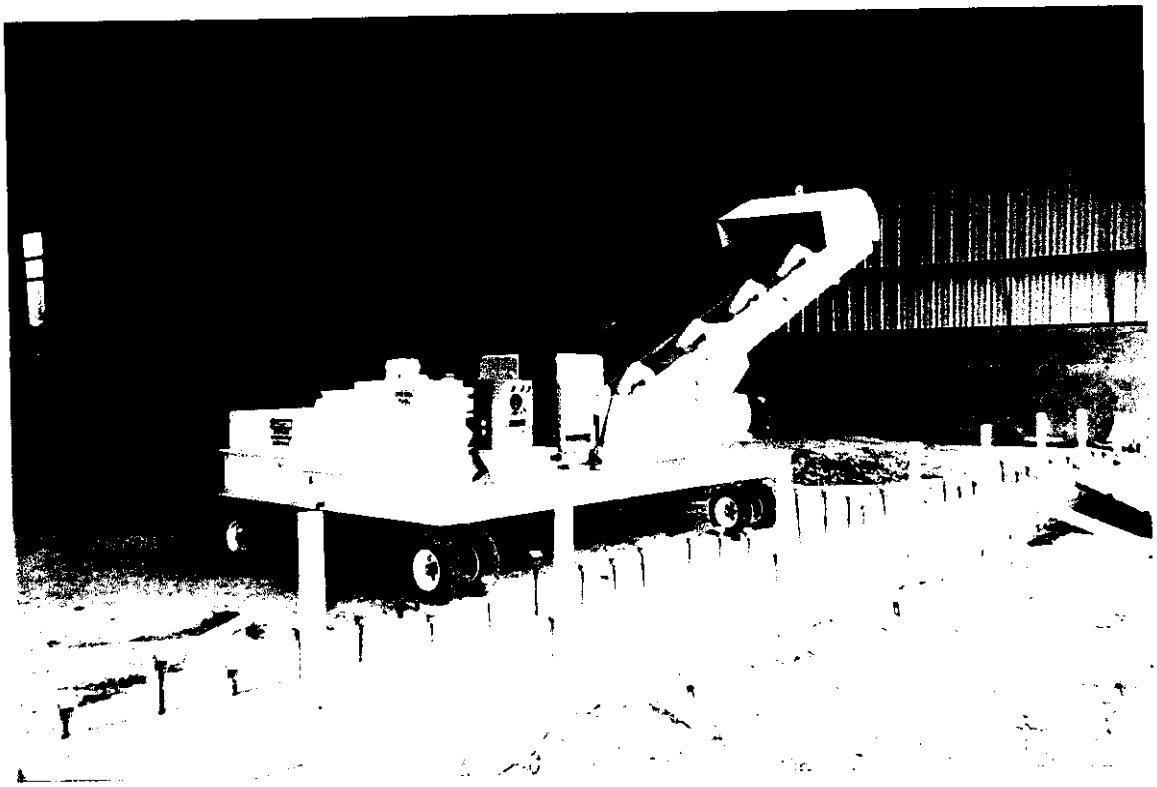


PHOTO 11
HOPPER/SOIL DUMP CONVEYOR SYSTEM

PHOTO 12
BACKHOE/LOADER - CATERPILLAR MODEL 416B

PHOTO 13
SKID STEER LOADER - JOHN DEERE MODEL 6675

PHOTO 14
AMENDMENT GRINDER/MIXER - SUPREME MODEL 700

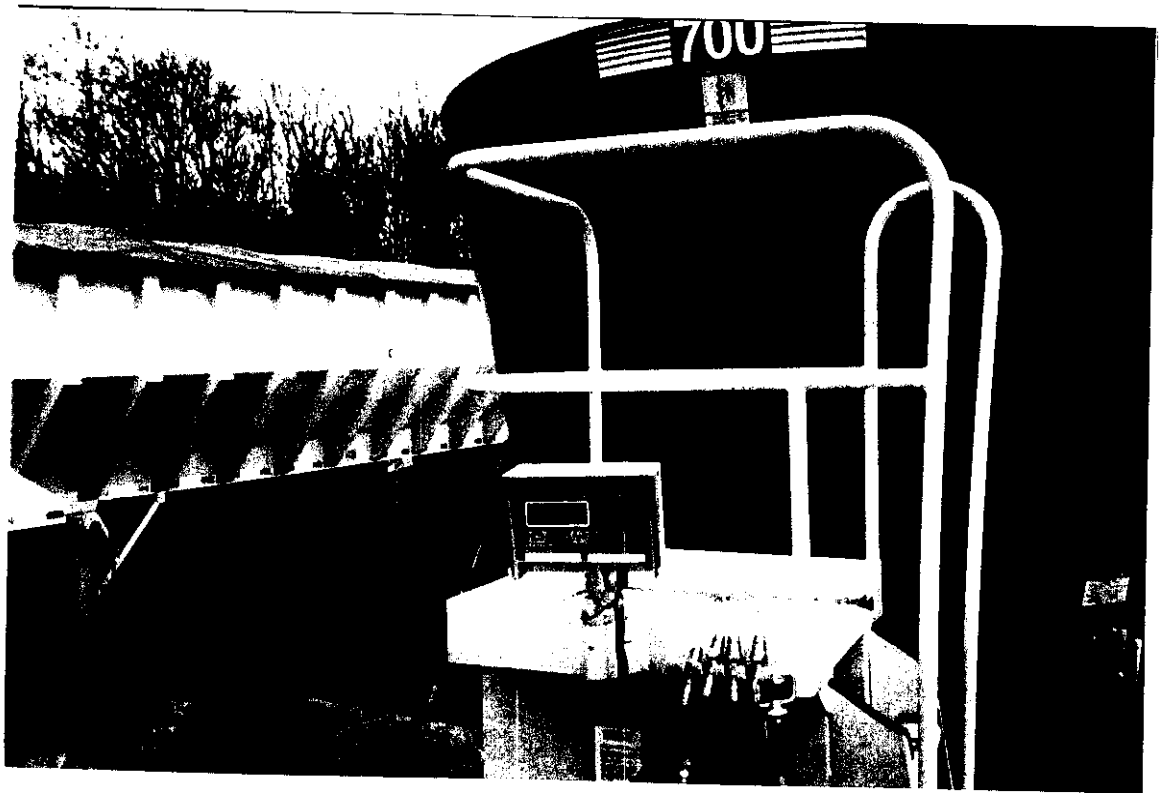


PHOTO 15
AMENDMENT GRINDER/MIXER SCALE OPERATORS PANEL WITH DIGITAL DISPLAY

PHOTO 16
FARM TRACTOR WITH LOADER ATTACHMENTS - JOHN DEERE MODEL 7710

PHOTO 17
CENTER-PIVOT WHEEL LOADER - CATERPILLAR MODEL 966F

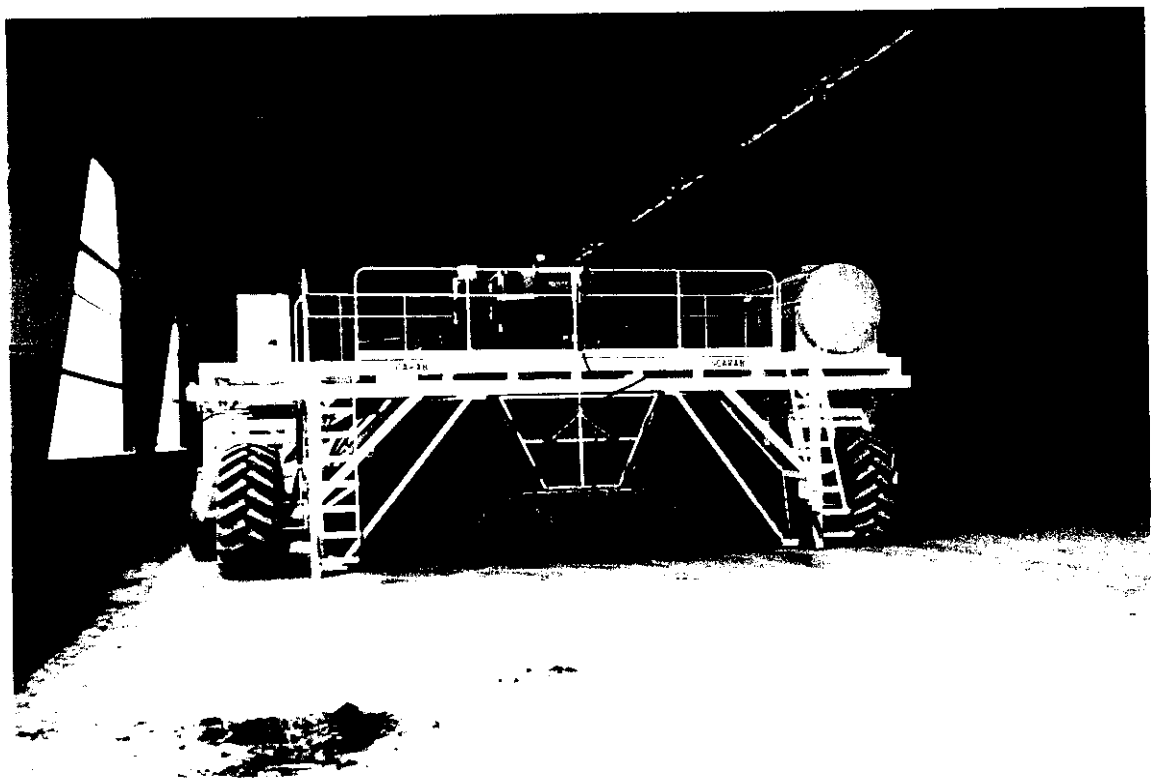


PHOTO 18
WINDROW COMPOST TURNER - SCARAB MODEL 20HYD450 (REAR VIEW)

PHOTO 19
WINDROW COMPOST TURNER - SCARAB MODEL 20HYD450 (FRONT RIGHT SIDE VIEW)

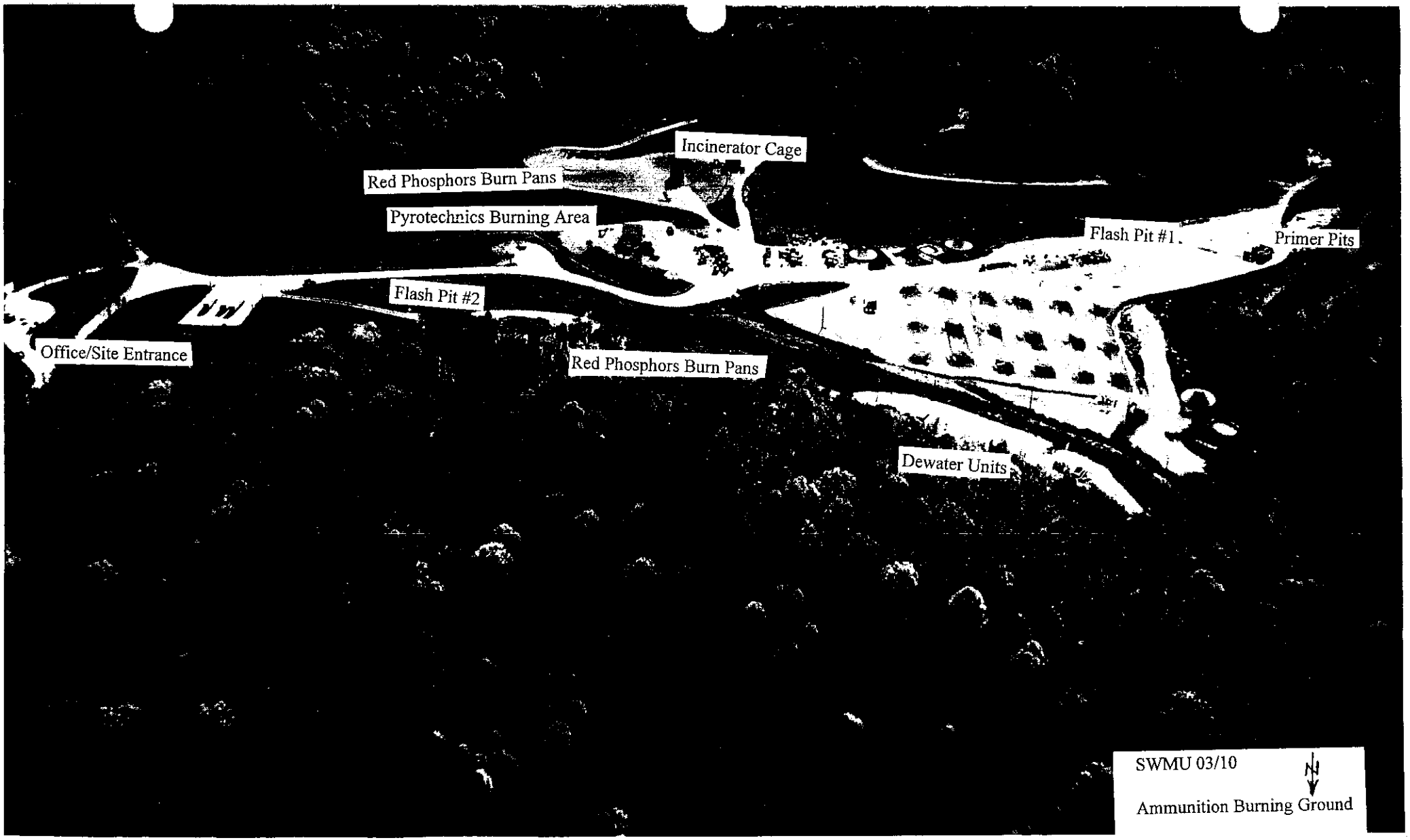


PHOTO 20
SWMU 03/10, AMMUNITION BURNING GROUND AERIAL VIEW (AS OF NOVEMBER 1993)

PHOTO 21
INCENDIARY CAGE, FLARES AND OTHER DEVICES

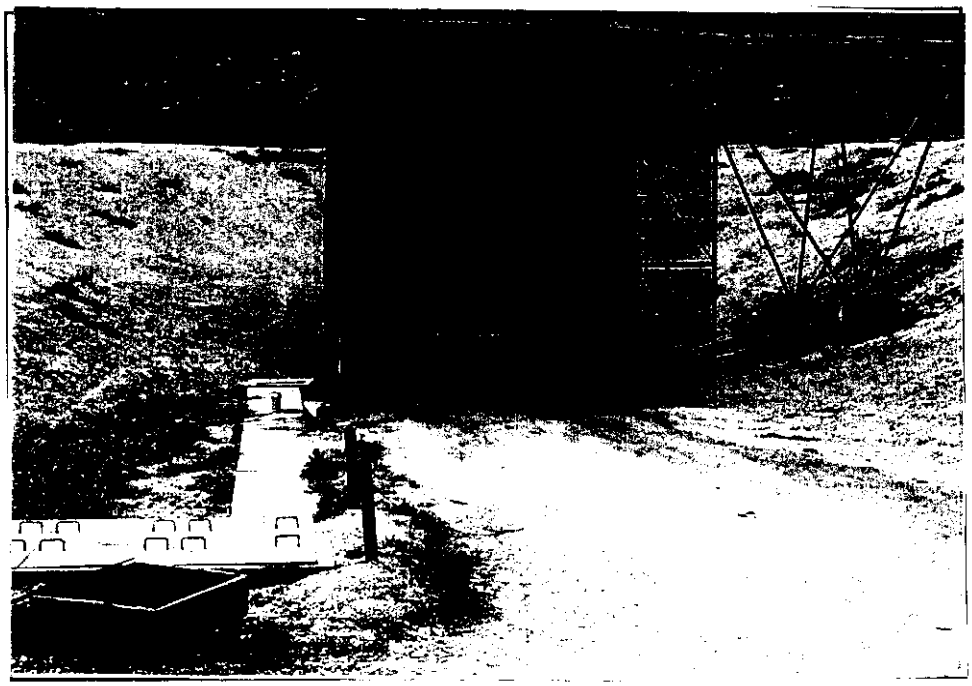


PHOTO 22
INCENDIARY CAGE AND GROUNDS

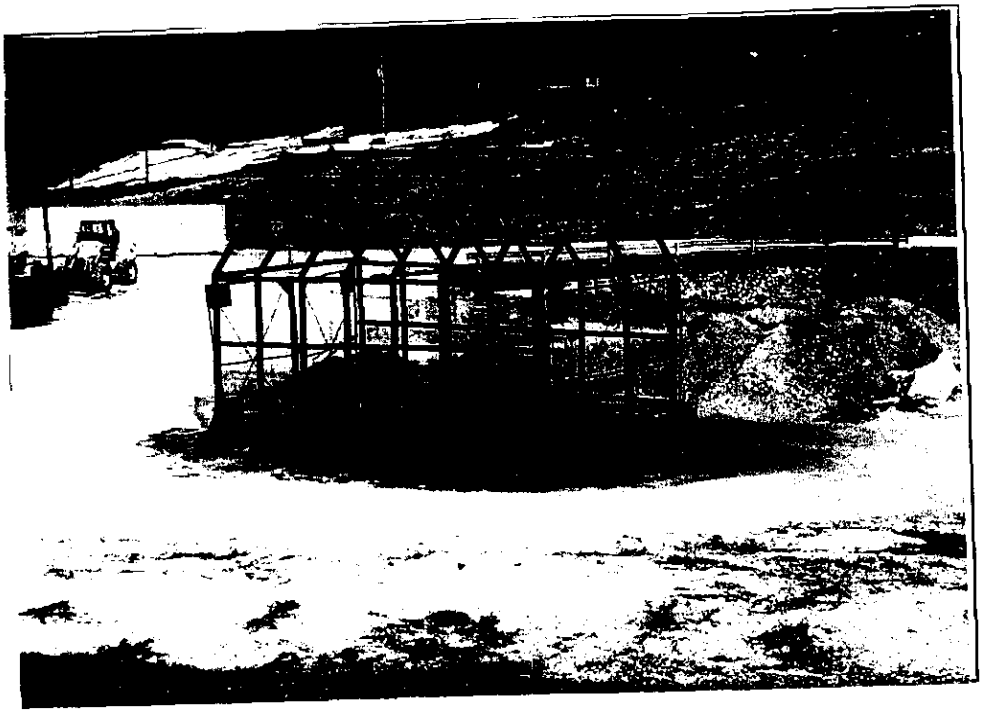


PHOTO 23
INCENDIARY AREA

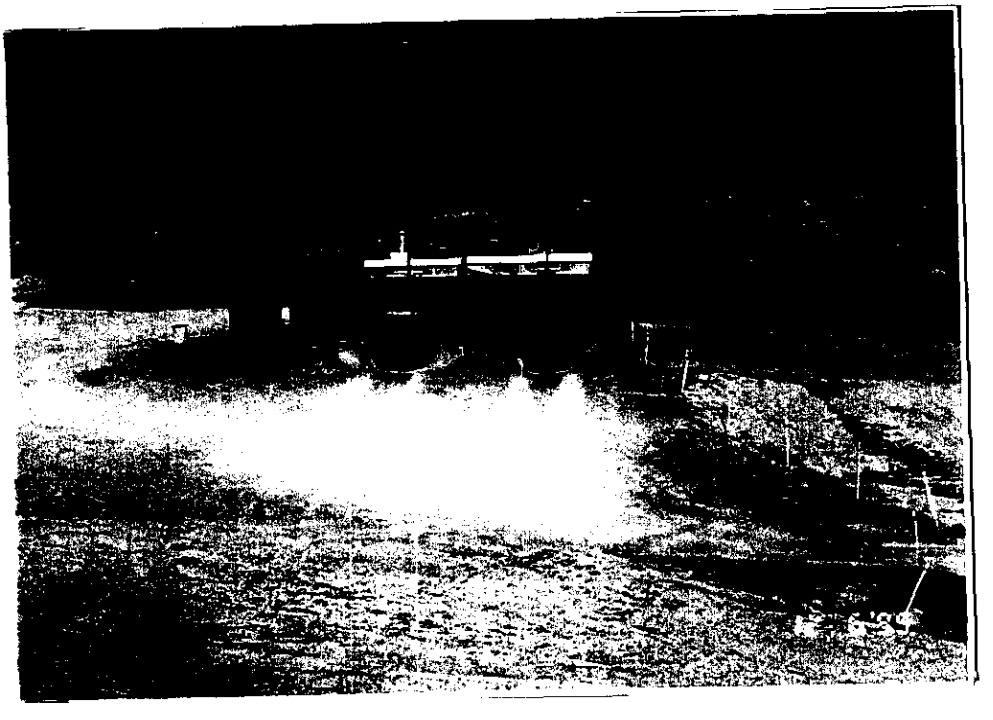


PHOTO 24
PRIMER PITS

PHOTO 25
BURNING PAN AREA

PHOTO 26
FLASH PIT #1

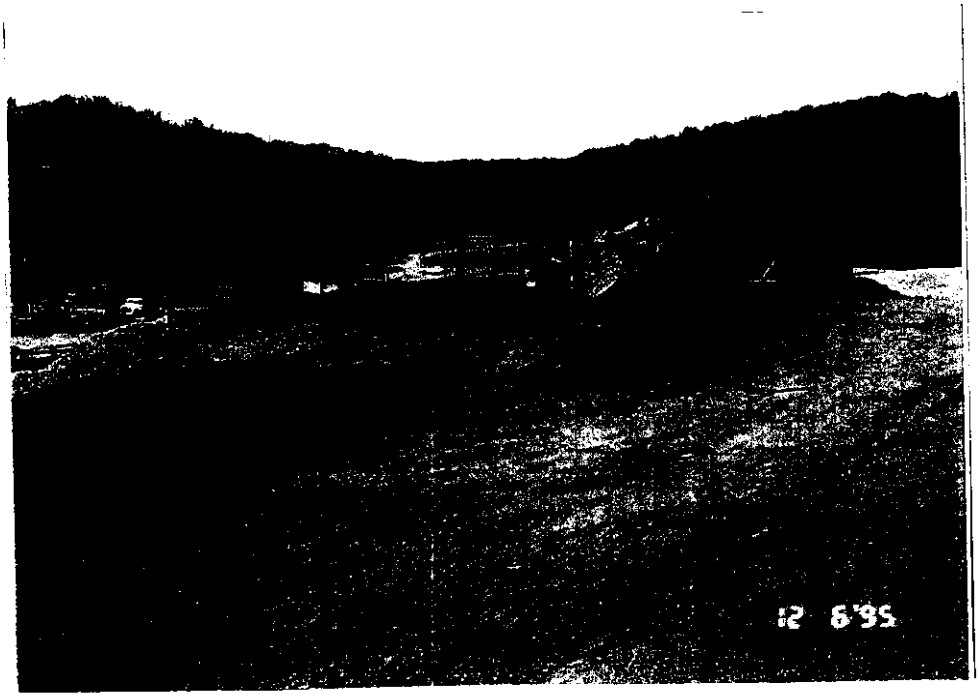


PHOTO 27
FLASH PIT #2

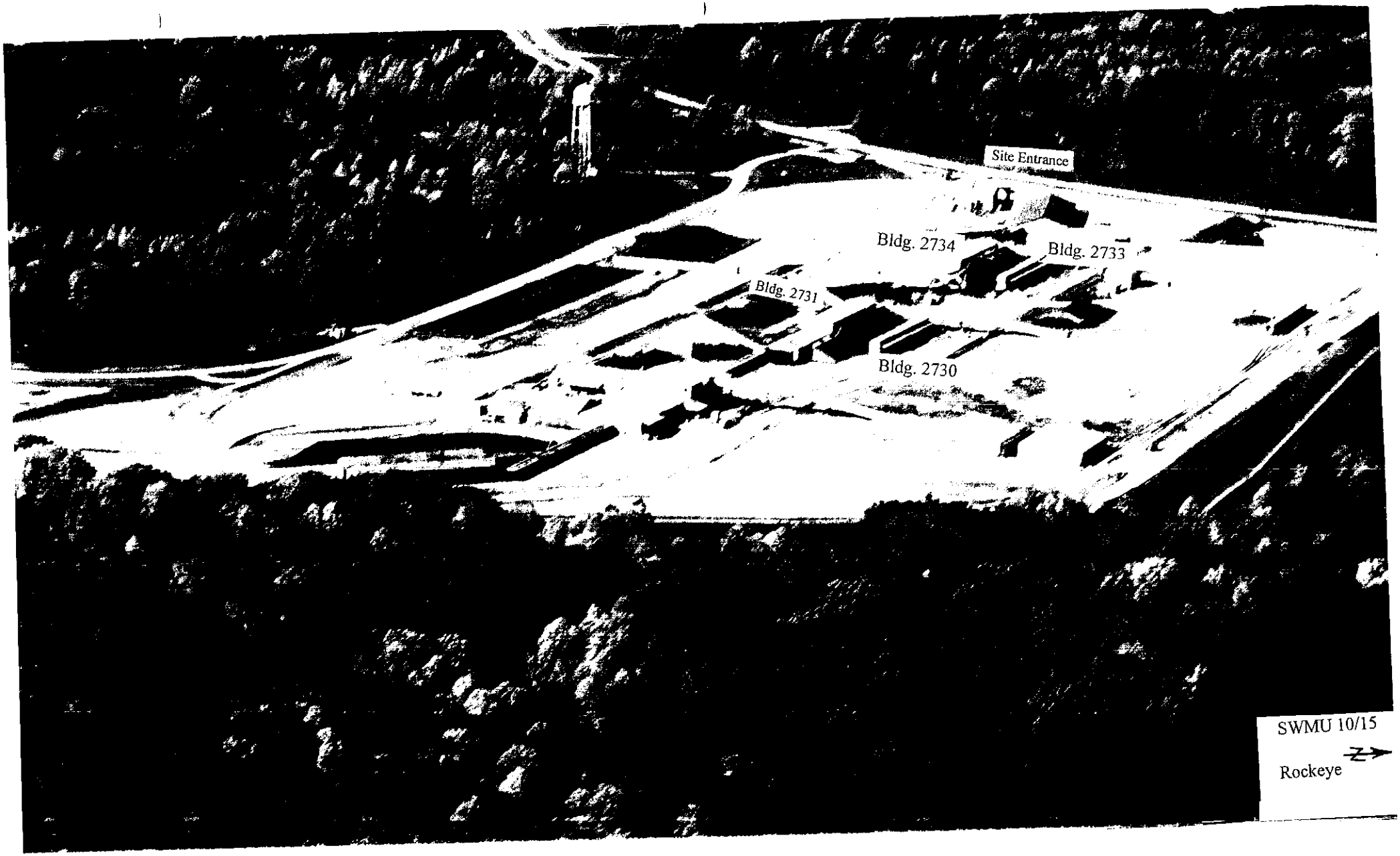


PHOTO 28
SWMU 10/15, ROCKEYE AERIAL VIEW (AS OF NOVEMBER 1993)

PHOTO 29
LOOKING WEST, DOWN EXPLOSION WALL

PHOTO 30
LOOKING AT THE CATCH BASIN WEST OF BLDG. 2739

PHOTO 31
LOOKING AT THE SOUTH SIDE OF BLDG. 2734

PHOTO 32
SWMU 12/14, MINE FILL A AERIAL VIEW (AS OF NOVEMBER 1993)

PHOTO 33
LOOKING SOUTHWEST TOWARD BLDG. 153

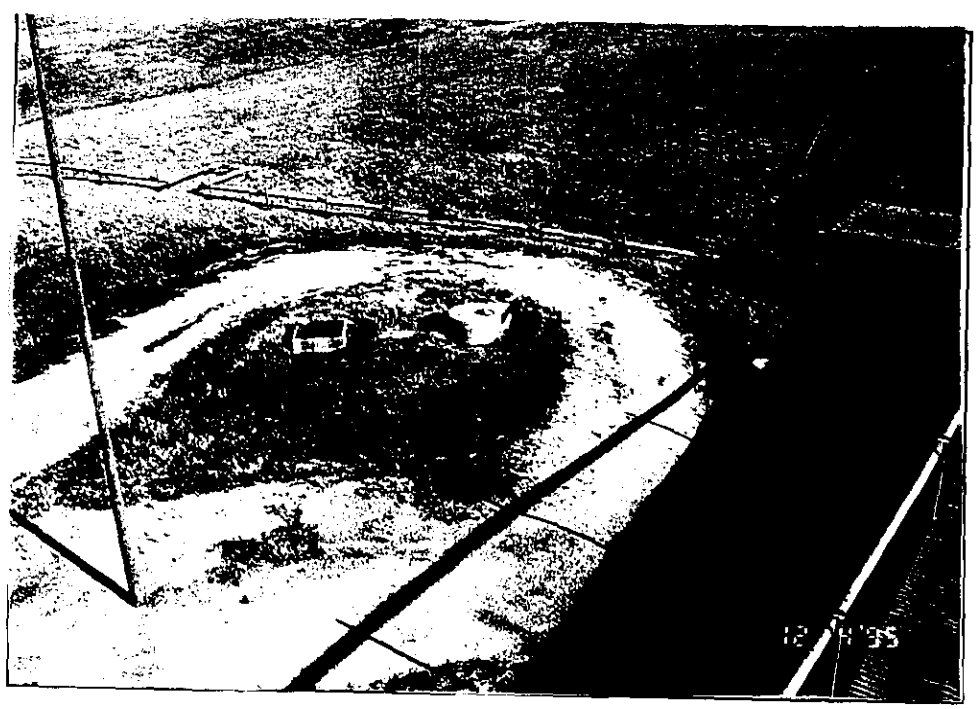


PHOTO 34
LOOKING DOWN FROM BLDG. 153 AT VEHICLE TURNAROUND

PHOTO 37
LOOKING SOUTH TOWARD BLDG. 158 (SECONDARY EXCAVATION SITE)

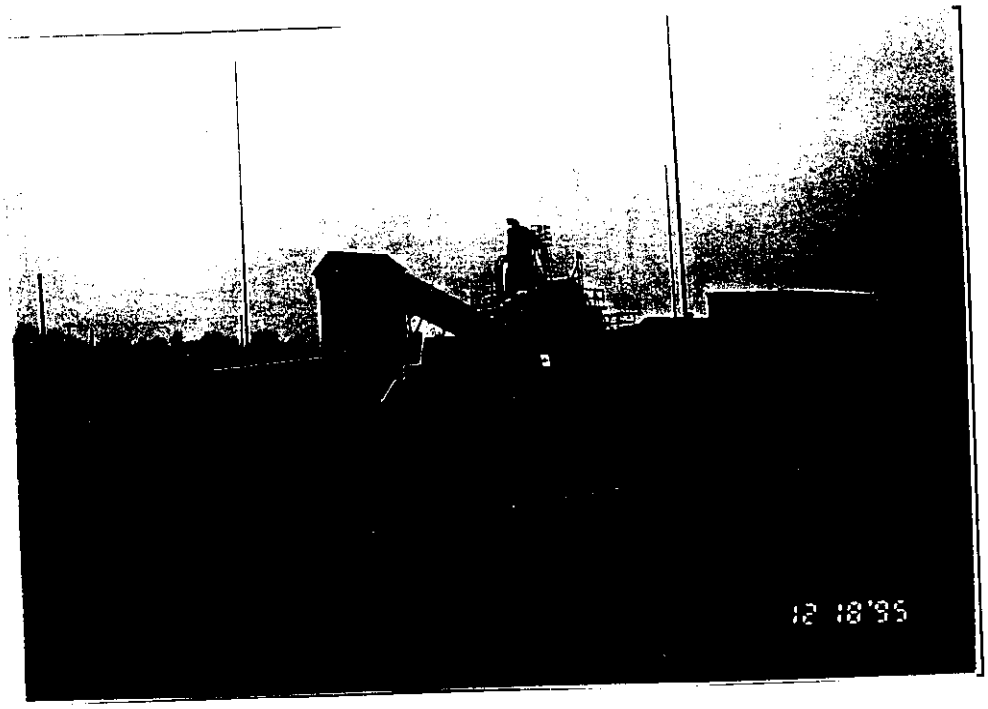


PHOTO 35
LOOKING EAST TOWARD BLDG. 153 (VEHICLE TURNAROUND AT LEFT)

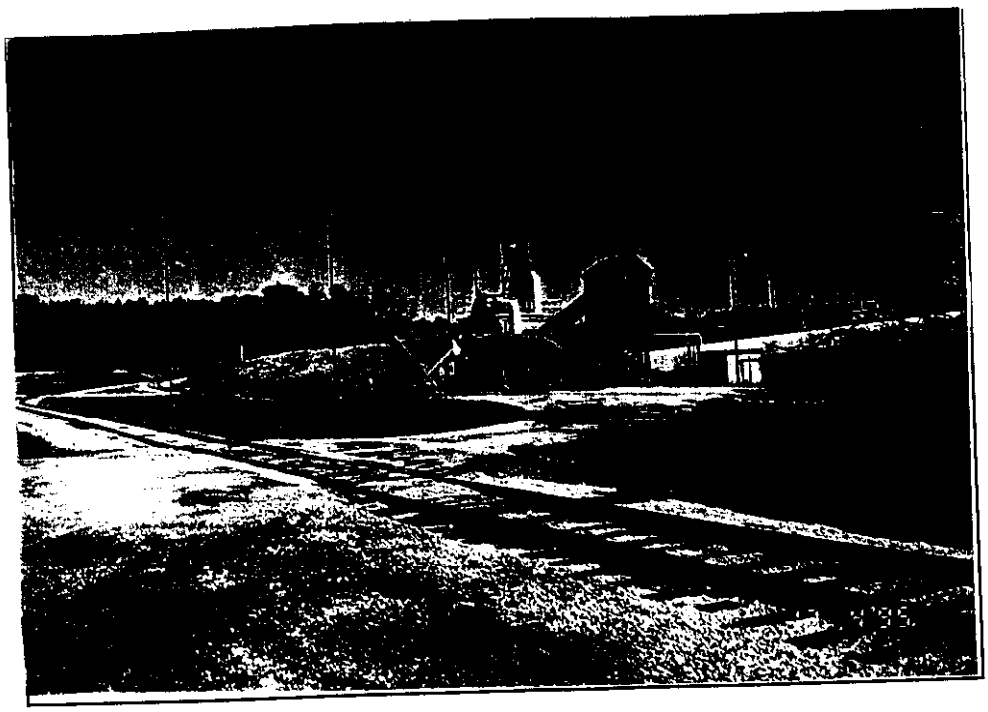


PHOTO 36
LOOKING NORTH TOWARD BLDG. 158 (SECONDARY EXCAVATION SITE)

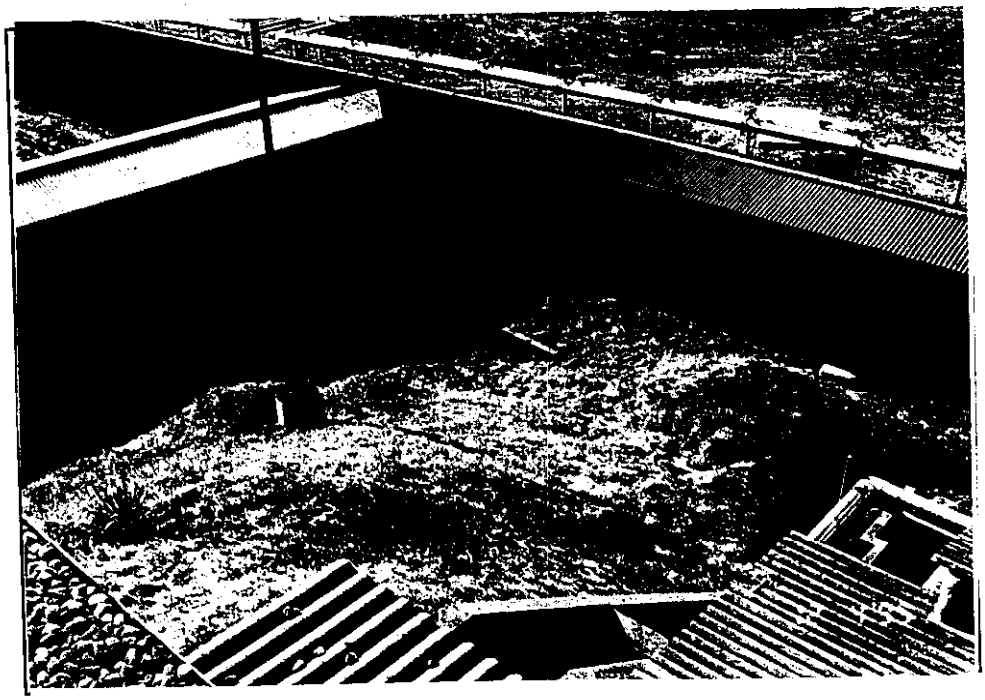


PHOTO 38
LOOKING WEST AT FILLING STATION BLDG. 157

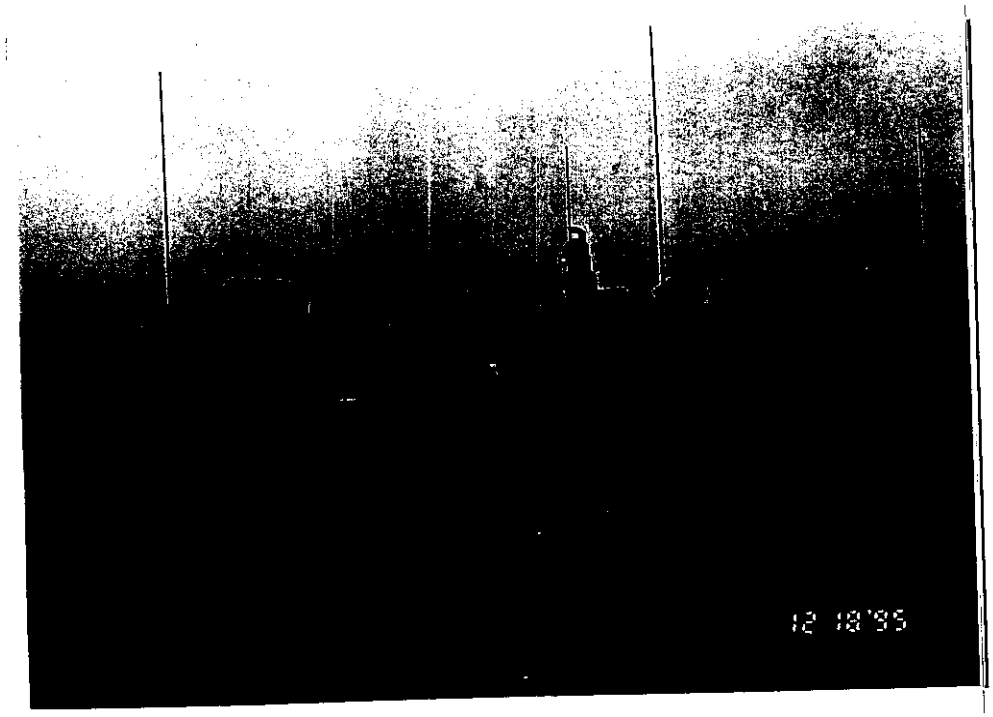


PHOTO 39
LOOKING EAST AT SUPPLY BLDG. 159

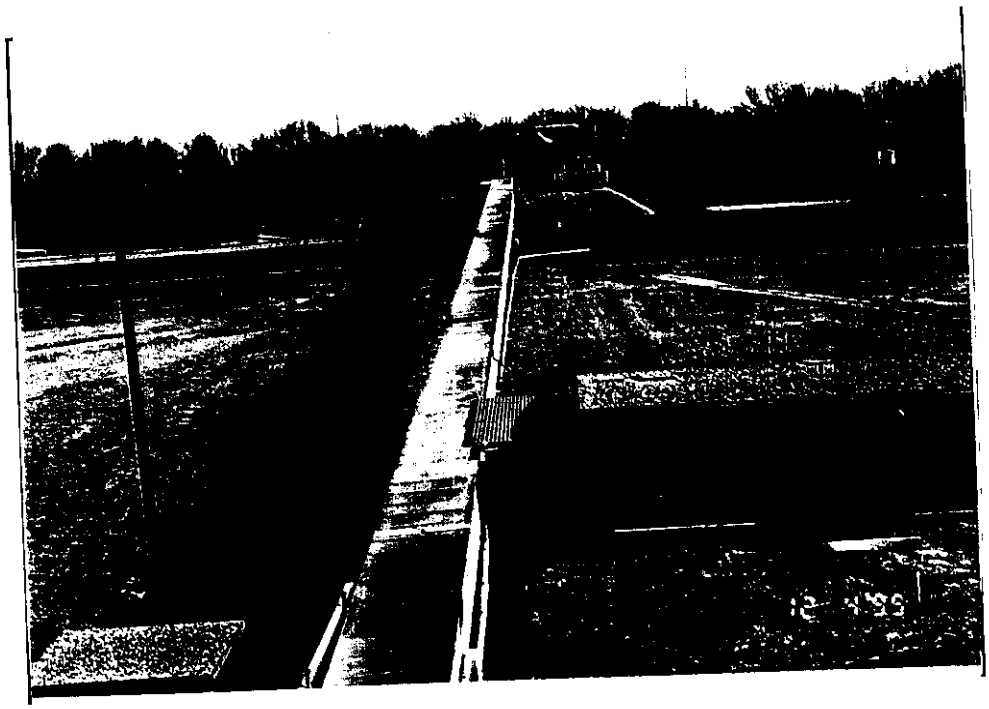


PHOTO 40
LOOKING WEST AT BLDG. 152

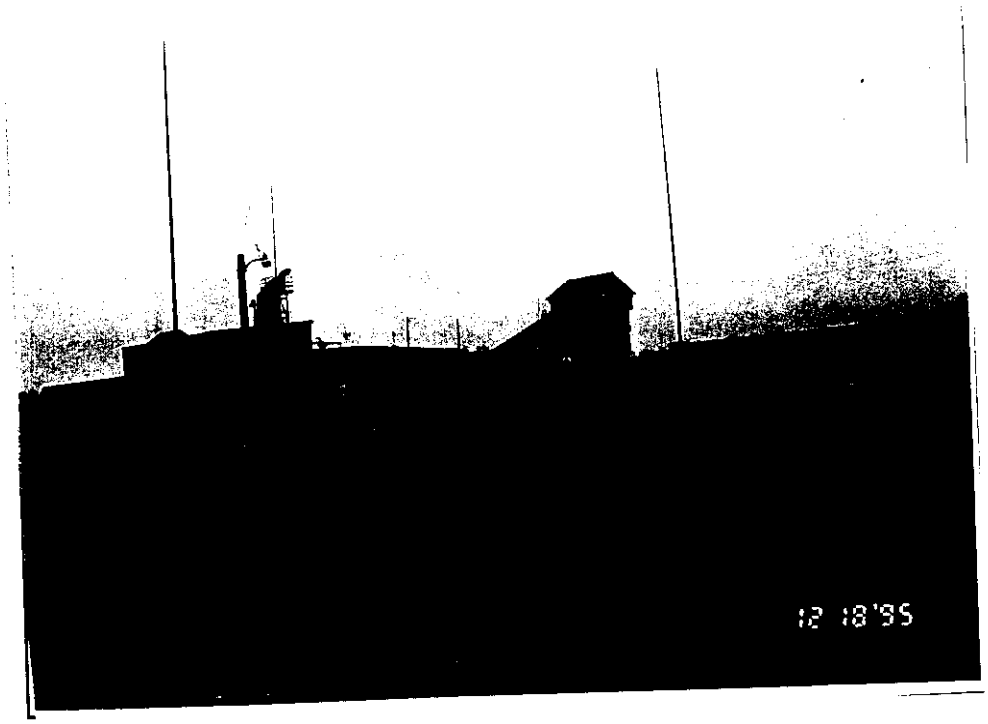


PHOTO 41
LOOKING NORTH AT SUPPLY BLDG. 154 AND OTHER STRUCTURES

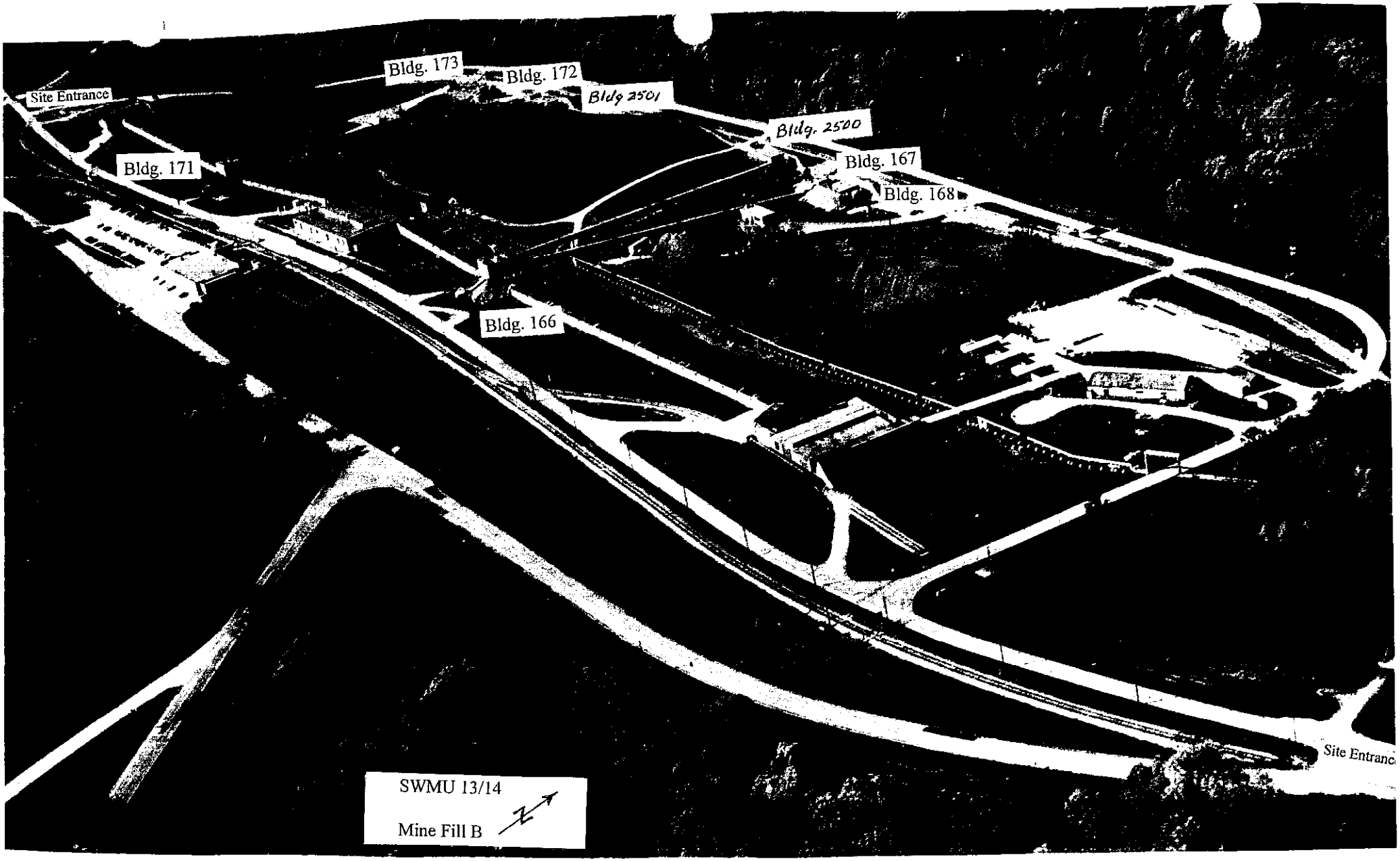


PHOTO 42
SWMU 13/14, MINE FILL B AERIAL VIEW (AS OF NOVEMBER 1993)

PHOTO 43
LOOKING SOUTH AT SUPPLY BLDG. 172 AND OTHER STRUCTURES

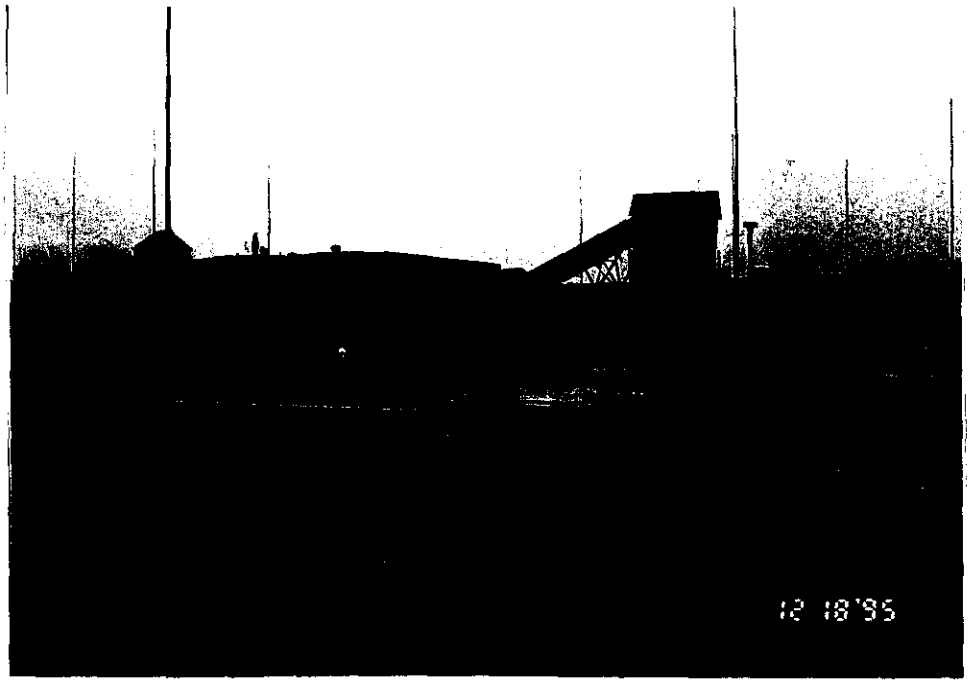


PHOTO 44
LOOKING EAST AT SUPPLY BLDG. 173 AND OTHER STRUCTURES

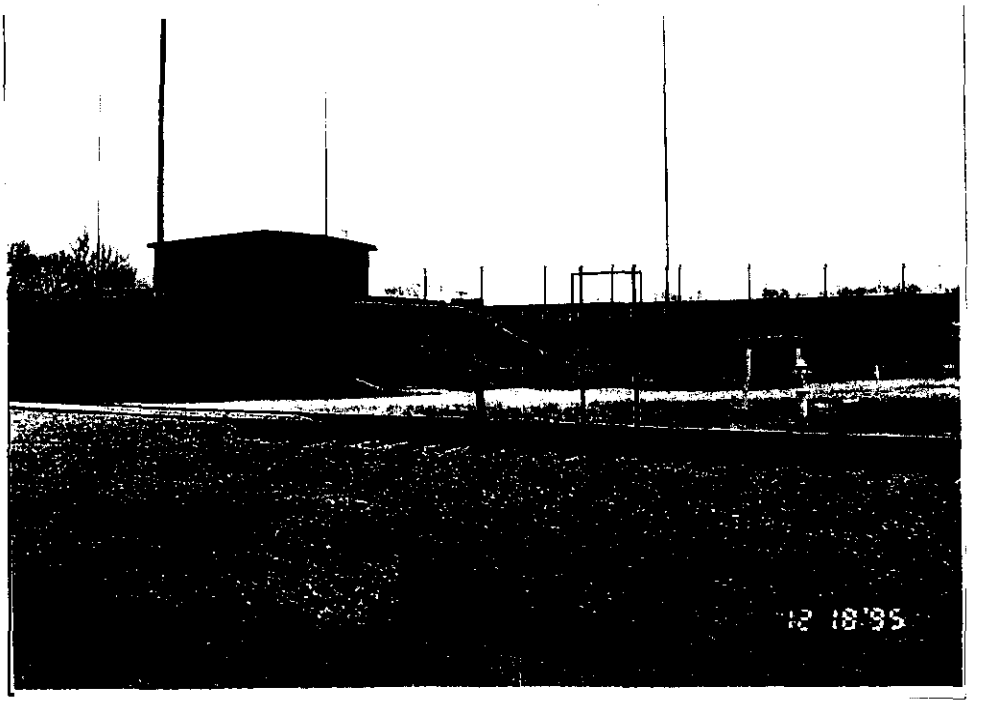


PHOTO 45
LOOKING EAST AT SUPPLY BLDG. 2501 AND OTHER STRUCTURES

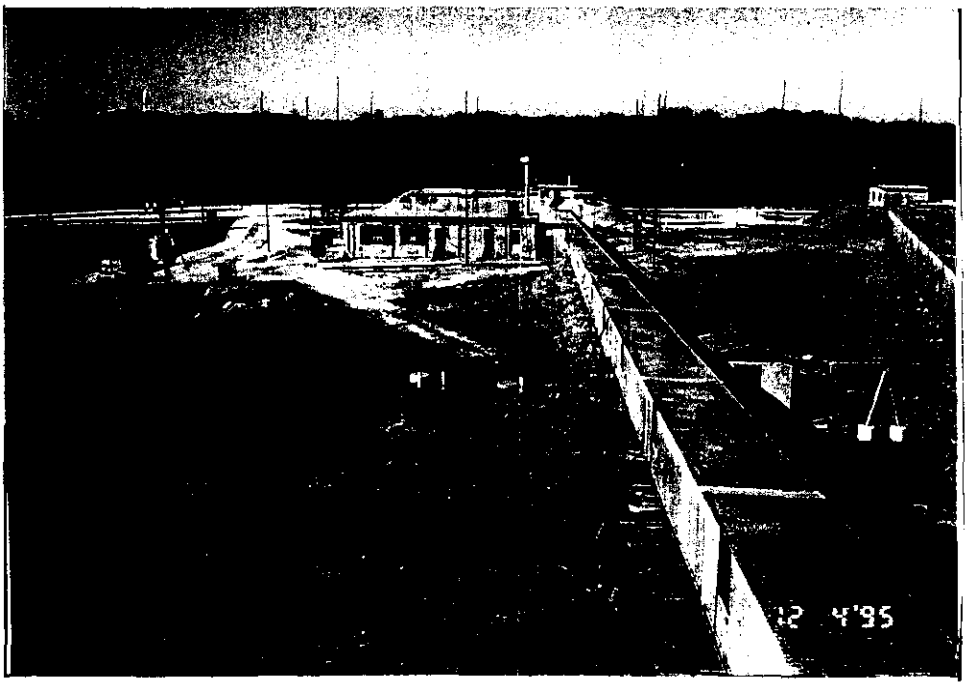


PHOTO 46
LOOKING NORTH TOWARD MINE FILL B RECEIVING STATION FOR BLDG. 171

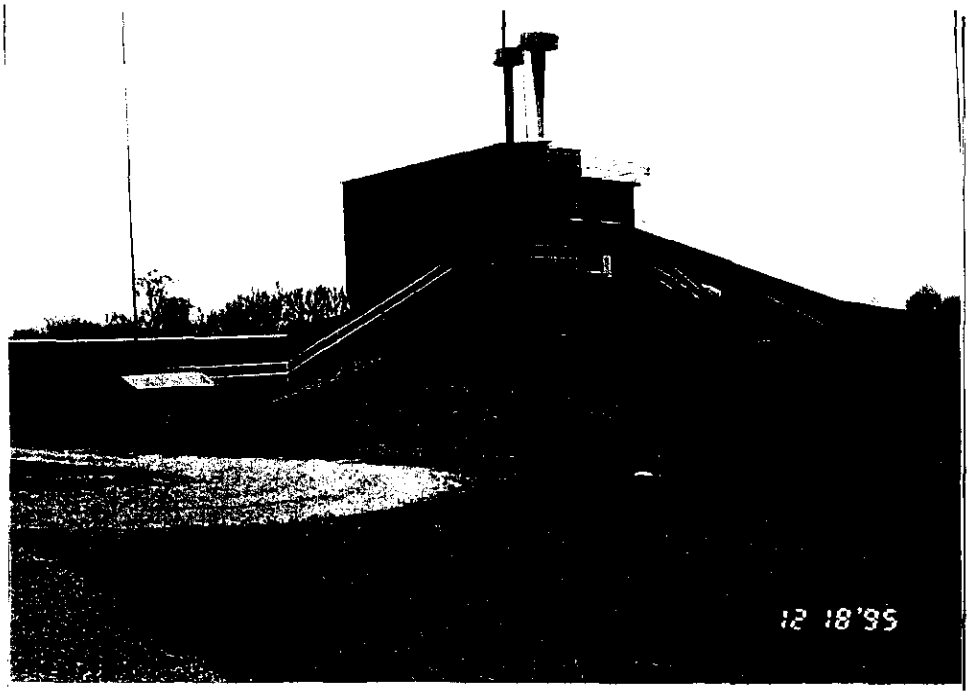


PHOTO 47
LOOKING WEST AT BLDG. 166 AND OTHER STRUCTURES

PHOTO 48
LOOKING AT SOUTHWEST CORNER OF RECEIVING BLDG. 167

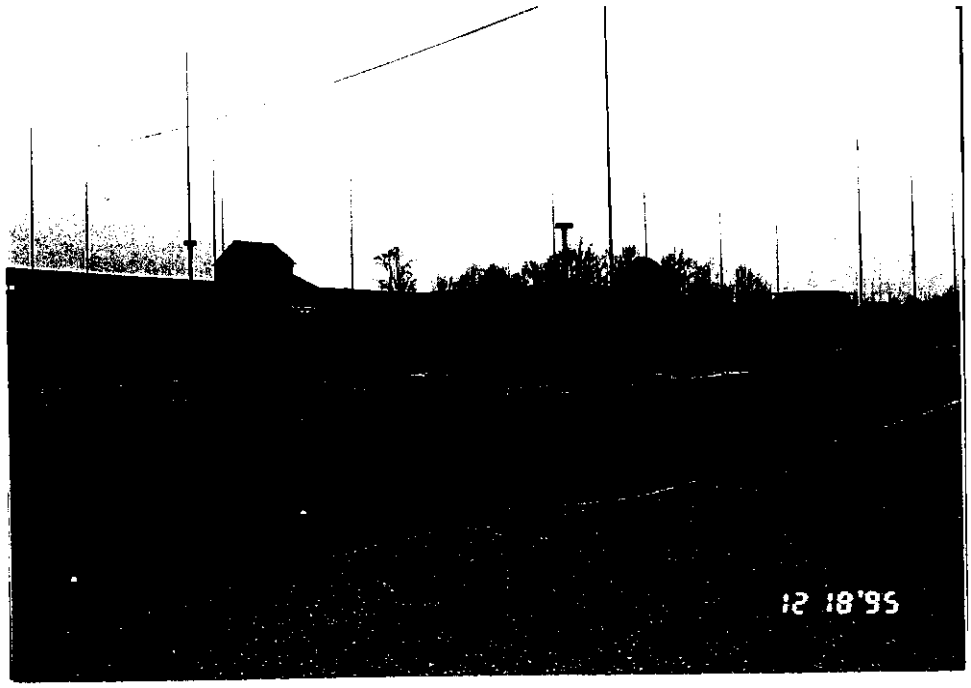


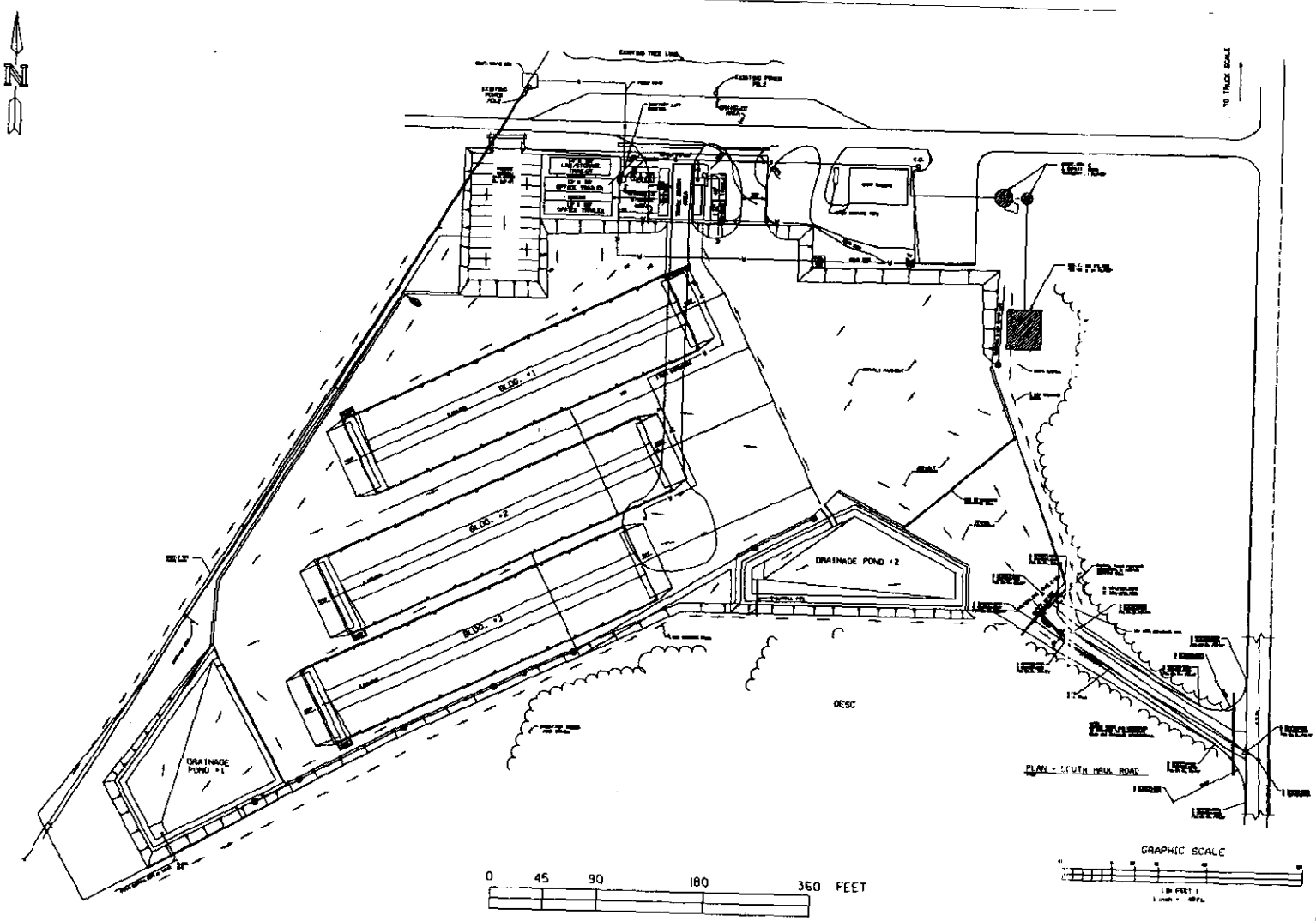
PHOTO 49
LOOKING SOUTH AT SUPPLY BLDG. 168 AND OTHER STRUCTURES

PHOTO 50
LOOKING SOUTH AT SUPPLY BLDG. 168 AND OTHER STRUCTURES

APPENDIX C
BIOREMEDIATION FACILITY DRAWINGS

LIST OF DRAWINGS

Drawing Number	Description
G-100	Bioremediation Facility, Crane NSWC, Master Site Plan
4324-0009-02-A	NSWC Crane, Soil Remediation Facility Process Flow
4324-0009-02-B	NSWC Crane, Wastewater Collection Process Flow
4324-0009-02-C	NSWC Crane, Soil Excavation Site Process Flow
P-100	Bioremediation Facility, Amendment Loading - Windrows #1-1, 2-1, & 3-1
P-101	Bioremediation Facility, Amendment Loading - Windrows #1-2, 2-2, & 3-2
P-102	Bioremediation Facility Soil Loading - Windrows #1-1, 2-1, & 3-1
P-103	Bioremediation Facility Soil Loading - Windrows #1-2, 2-2, & 3-2



LEGEND

- DENOTES DRAINAGE FLOW
- DENOTES ASPHALT BERM
- DENOTES EXISTING POWER POLE
- DENOTES EXISTING SANITARY SEWER MANHOLE
- DENOTES NEW WATER LINE (INSTALL 3' BELOW GRADE)
- SANITARY SEWER LINE

REV	DATE		APPROVE
0	02/19/98	ISSUED FOR APPROVAL	

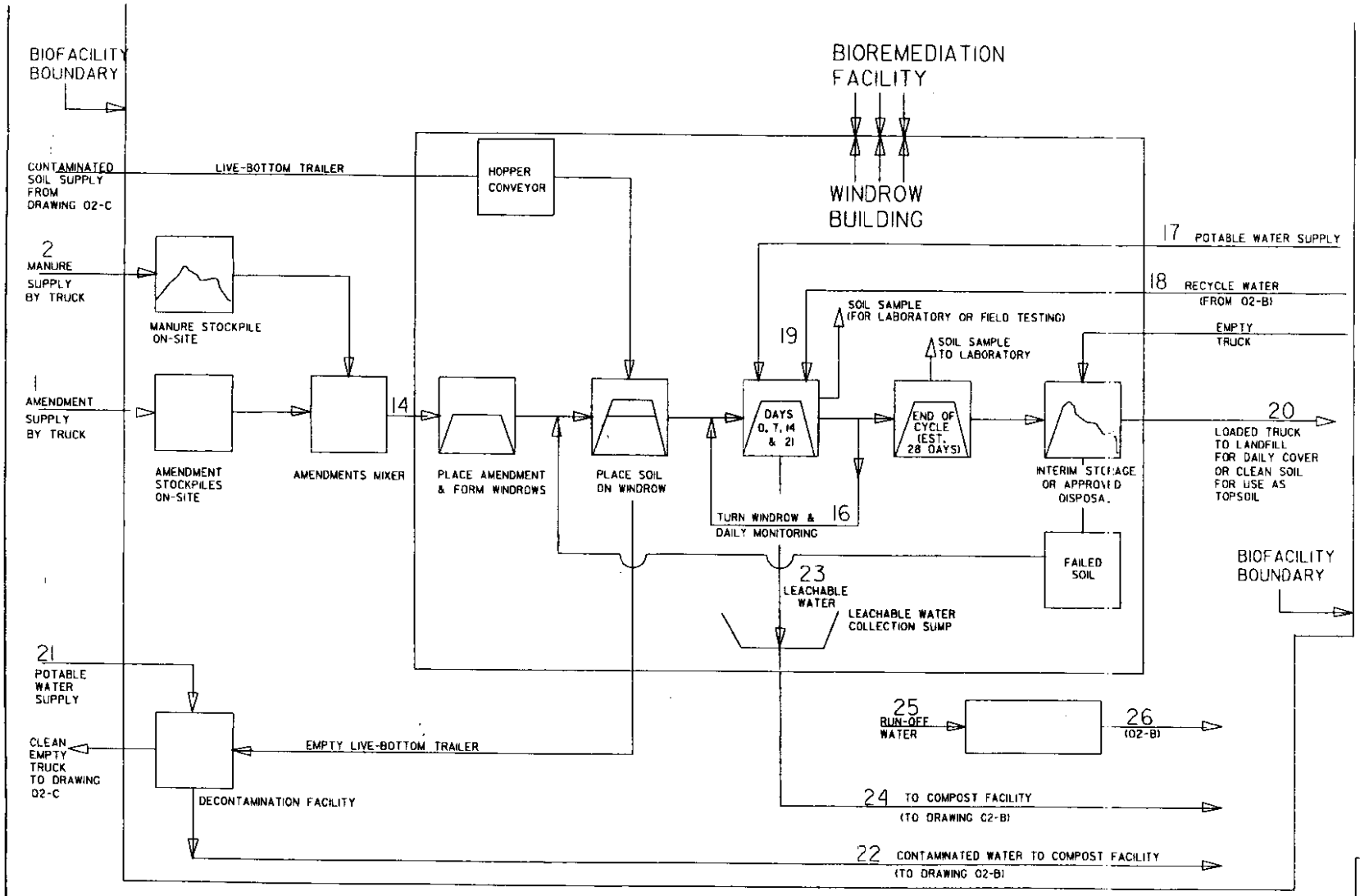
ENVIRONMENTAL SERVICES

SOURCE: JACOBS ENGINEERING GROUP

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. G-100
BIOREMEDIATION FACILITY
MASTER SITE PLAN

DWG DATE: 01/27/98 | FILE NAME: G-100.DGN



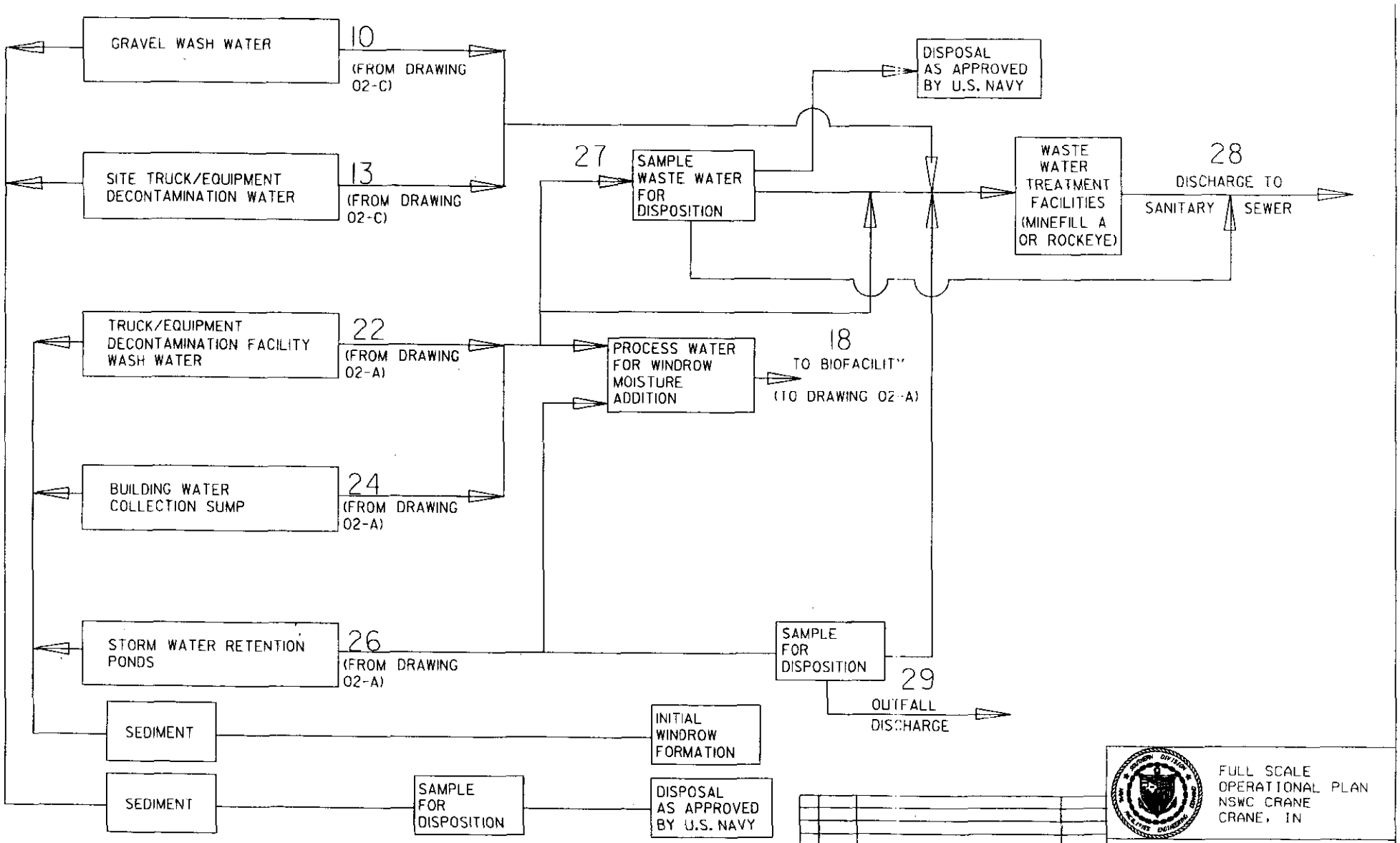
REV.	DATE		APPROVE
0	02/09/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL GROUP
MK-FERGUSON PLAZA 1500 WEST 3RD STREET
CLEVELAND, OH 44113-1406 (216) 523-5600

FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. 4324-0009-02-A
BIOREMEDIATION FACILITY
PROCESS FLOW DIAGRAM

DWG DATE: 01/27/98 | FILE NAME: BIOREMA1.DGN

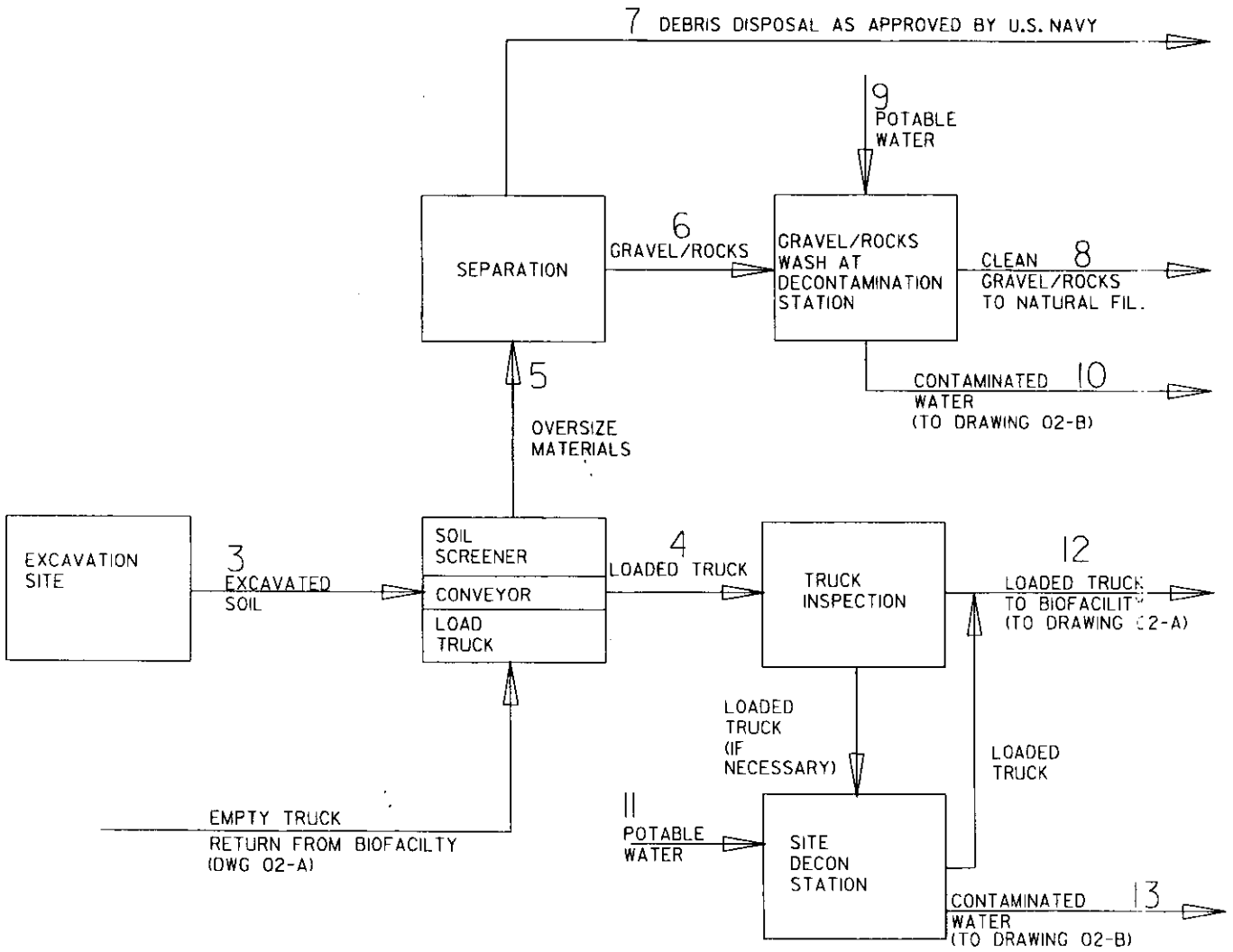


REV.	DATE		APPROVE
0	02/09/96	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL GROUP
MK-FERGUSON PLAZA 1600 WEST 3RD STREET

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. 4324-0009-02-B
BIOREMEDIATION FACILITY
PROCESS FLOW DIAGRAM



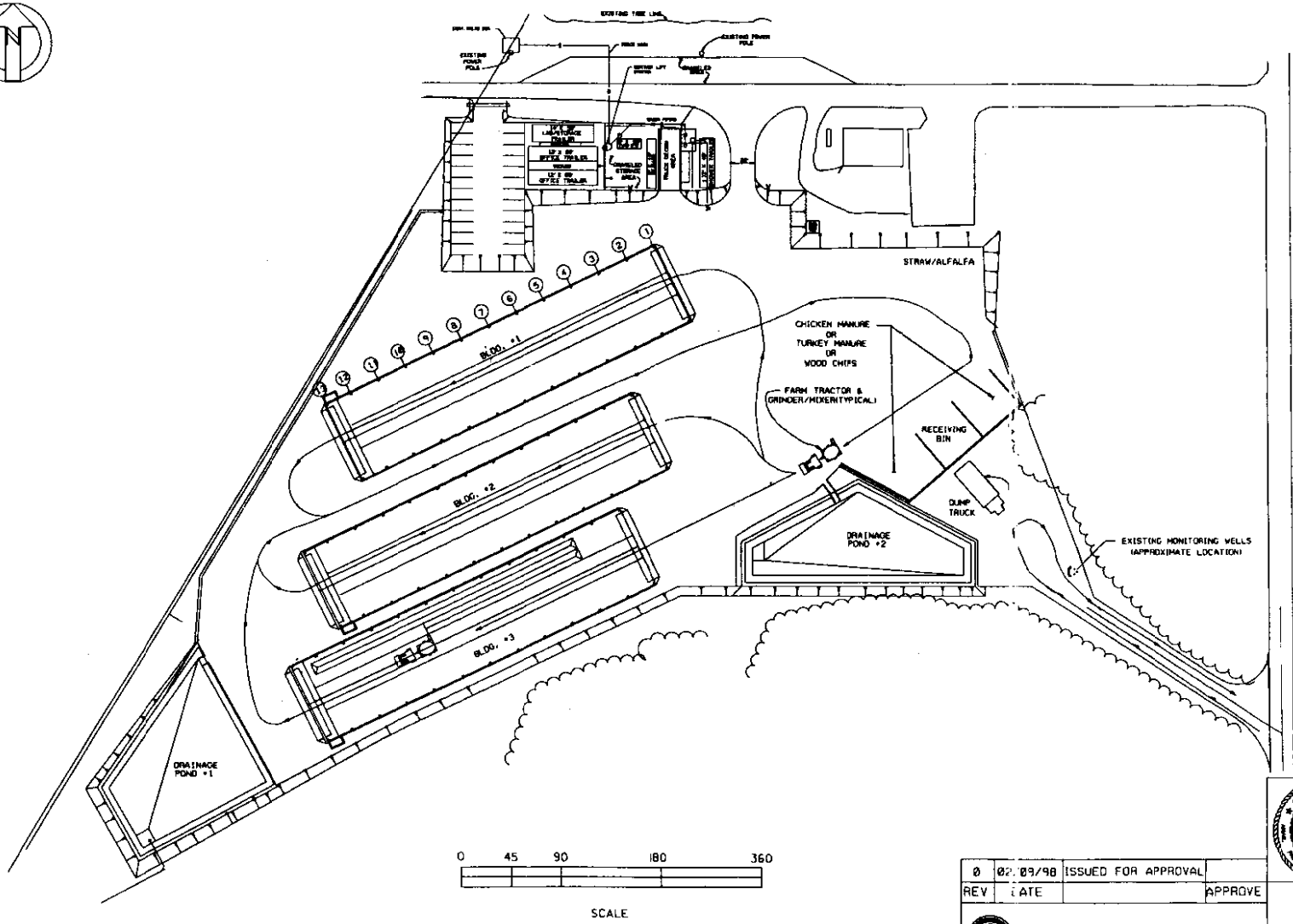
REV.	DATE		APPROVE
0	02/05/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL GROUP
MK-FERGUSON PLAZA 1600 WEST 3RD STREET
CLEVELAND, OHIO 44113-1406 (216) 523-5600

FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. 4324-0009-02-C
BIOREMEDIATION FACILITY
PROCESS FLOW DIAGRAM

DWG DATE: 01/27/98 | FILE NAME: BIOREMCI.DGN



LEGEND

- DENOTES DRAINAGE FLOW
- DENOTES ASPHALT BERM
- 5180 / 710.84 PP — DENOTES EXISTING POWER POLE
- DENOTES EXISTING SANITARY SEWER MANHOLE
- DENOTES NEW WATER LINE (INSTALL 3' BELOW GRADE)
- SANITARY SEWER LINE

NOTE: COLUMN LINES TYPICAL BUILDINGS 1, 2, AND 3.

REV	DATE		APPROVE
0	02/09/98	ISSUED FOR APPROVAL	

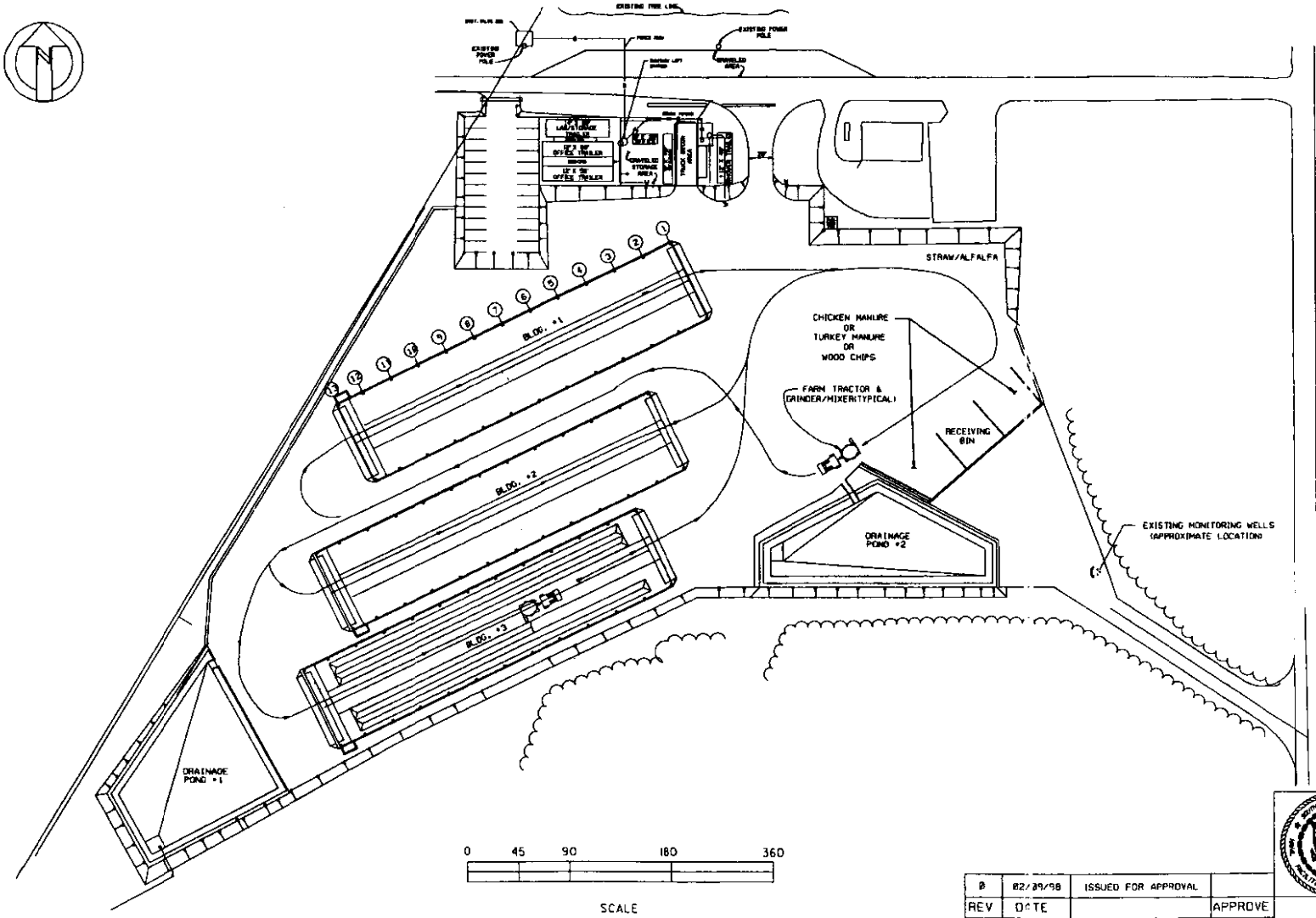
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

SOURCE: JACOBS ENGINEERING GROUP

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. P-100
BIOREMEDIATION FACILITY
AMENDMENT LOADING WINDROW 1

DWG DATE: 01/27/98 | FILE NAME: TRAF.DGN



LEGEND

- DENOTES DRAINAGE FLOW
- DENOTES ASPHALT BERM
- 5100 710.04 PP — DENOTES EXISTING POWER POLE
- DENOTES EXISTING SANITARY SEWER MANHOLE
- DENOTES NEW WATER LINE (INSTALL 3' BELOW GRADE)
- SANITARY SEWER LINE

NOTE: COLUMN LINES TYPICAL BUILDINGS 1, 2, AND 3.

REV	DATE		APPROVE
0	02/09/98	ISSUED FOR APPROVAL	

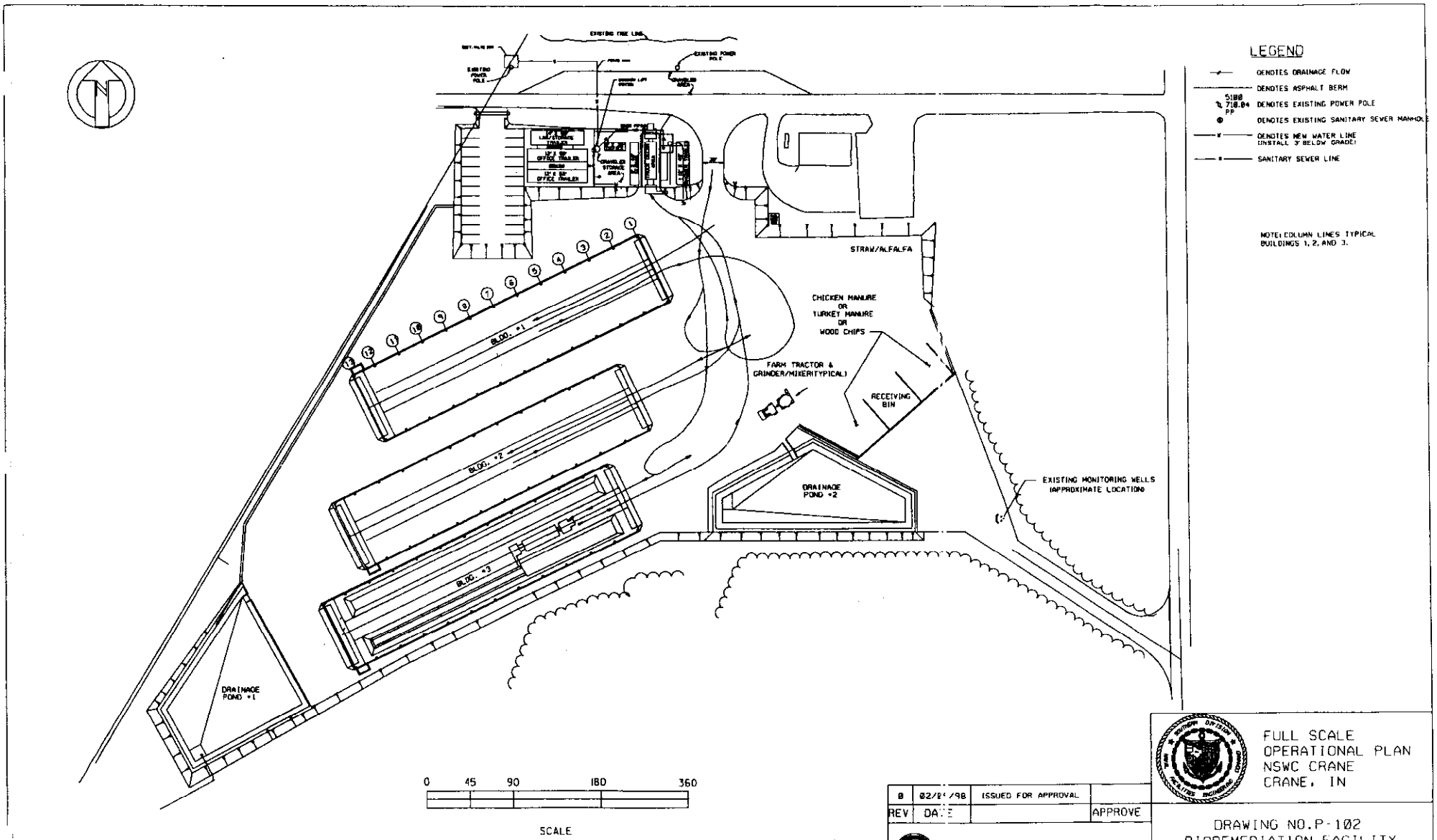
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

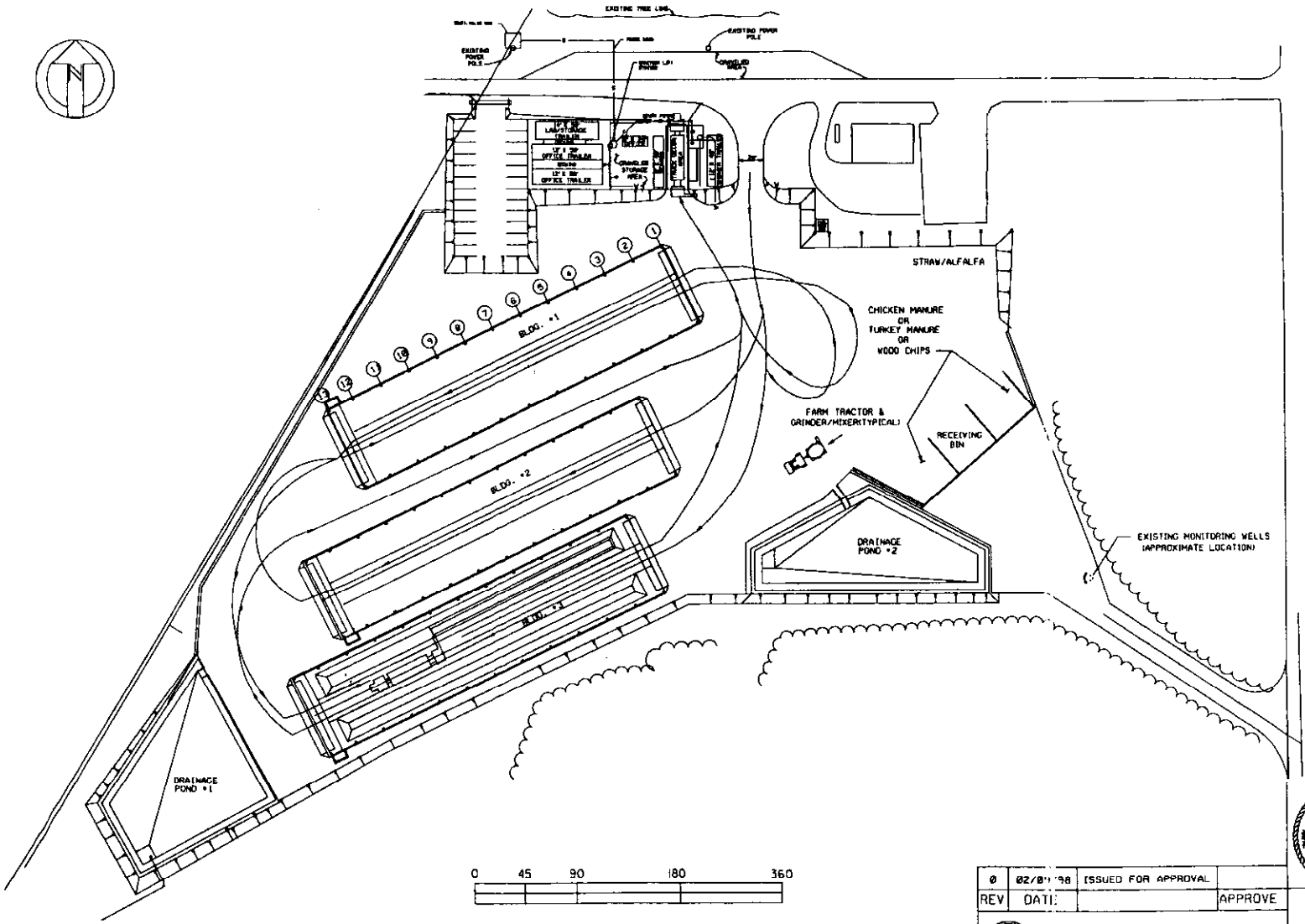
SOURCE: JACOBS ENGINEERING GROUP

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. P-101
BIOREMEDIATION FACILITY
AMENDMENT LOADING WINDROW 2

DWG DATE: 01/27/98 | FILE NAME: TRAF.DGN


EXISTING TREE LINE
EXISTING POWER POLE
EXISTING POWER POLE
GRAVEL STORAGE AREA
STRAW/ALFALFA
CHICKEN MANURE
OR
TURKEY MANURE
OR
WOOD CHIPS
FARM TRACTOR &
GRINDER/MIXER(TYPICAL)
RECEIVING BIN
BLDG. #1
BLDG. #2
BLDG. #3
DRAINAGE POND #1
DRAINAGE POND #2
EXISTING MONITORING WELLS (APPROXIMATE LOCATION)
0 45 90 180 360
SCALE
LEGEND
DENOTES DRAINAGE FLOW
DENOTES ASPHALT BERM
5100
710.04
P.P.
DENOTES EXISTING POWER POLE
DENOTES EXISTING SANITARY SEWER MANHOLE
DENOTES NEW WATER LINE (INSTALL 3' BELOW GRADE)
SANITARY SEWER LINE
NOTE: COLUMN LINES TYPICAL BUILDINGS 1, 2, AND 3.
0 02/2?/98 ISSUED FOR APPROVAL
REV DATE APPROVE
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES
SOURCE: JACOBS ENGINEERING GROUP
FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN
DRAWING NO. P-102
BIOREMEDIATION FACILITY
SOIL LOADING WINDROW 2
DWG DATE: 01/27/98
FILE NAME: TRAF.DGN



LEGEND

- DENOTES DRAINAGE FLOW
- DENOTES ASPHALT BERM
- 5100 / 710.04 PP — DENOTES EXISTING POWER POLE
- DENOTES EXISTING SANITARY SEWER MANHOLE
- W — DENOTES NEW WATER LINE (INSTALL 3' BELOW GRADE)
- S — SANITARY SEWER LINE

NOTE: COLUMN LINES TYPICAL BUILDINGS 1, 2, AND 3.

REV	DATE		APPROVE
0	02/0[illegible]/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

SOURCE: JACOBS ENGINEERING GROUP

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

DRAWING NO. P-103
BIOREMEDIATION FACILITY
SOIL LOADING WINDROW 1

DWG DATE: 01/27/98 | FILE NAME: TRAF.DGN

APPENDIX D
STANDARD OPERATING PROCEDURES

LIST OF FIELD STANDARD OPERATING PROCEDURES

SOP Number	Description
SOP 1.0	Soil Screening Operation
SOP 2.0	Truck Scale Operation
SOP 3.0	Amendment Proportioning and Mixing
SOP 4.0	Loading of Amendments into Windrows
SOP 5.0	Transport and Loading of Soil into Windrows
SOP 6.0	Windrow Turning and Moisture Addition
SOP 7.0	Decontamination of Structures, Equipment, Rocks, and Personnel

FIELD SOP: 1.0
TITLE: SOIL SCREENING OPERATION

1.0 PURPOSE

This procedure describes the operations related to using the soil screener at the excavation sites.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations.

3.0 EQUIPMENT

The following equipment will be used to screen the excavated soil for removal of large particles not suitable for composting at the Bioremediation Facility:

3.1 Soil Screener

The soil screener is a Knight Manufacturing Corporation model 005580 ProScreen Trommel Screen. The screener is used to filter out the large particles over 1.5 inches in diameter that are not suitable for composting. It is equipped with a conveyor for fines stacking or loading.

3.2 Backhoe

The backhoe is a CAT 416 B that is used to load excavated soil into the screener and for reject material handling.

3.3 Semi-Tractor and Live-Bottom Trailer

The semi-tractor is a Mack model 169CH613. The live-bottom trailer is a Red River model HS 236 102. The trailer is 43 feet long and has a minimum capacity of 48 cubic yards. It has a conveyor floor which is capable of discharging material out the rear of the trailer. The tractor-trailer rig is used to transport screened soil from the excavation sites to the composting facility.

3.4 Stacking Conveyor

The stacking conveyor is a trough belt conveyor which is used to convey the screened material from the discharge of the screener to the live-bottom trailer.

3.5 Center Pivot Loader

The rubber tired loader is a Catepillar 966F and is used for moving larger quantities of material, particularly when loading trucks.

4.0 SAFETY AND HEALTH PRECAUTIONS AND CONTROLS

1. Follow explosives Handling Procedures as required by NSWC Crane Safety Department.

2. Use modified Level D PPE per the Site Safety and Health Plan (SSHP), Appendix A. Personnel shall avoid direct contact with contaminated soil as much as possible. Hearing protection is required within 15 feet of operating equipment.

3. Maintain clear distance of approximately 15 feet and wear high visibility vest when working within moving machinery path. Stay in equipment operators line-of-sight. Ensure back-up alarms are operational on equipment.

4. Ensure all rotating and conveyer equipment guards are in place and functional prior to equipment operation.

5. Ensure Screener is operated on level ground and is properly locked and stabilized in position.

6. Know location of emergency stop switch on Screener control panel.

7. Shut-down Screener and remove key prior to refueling and servicing.

8. Ensure trailer brakes are locked on Semi-Tractor and Live-Bottom Trailer prior to loading.

5.0 PROCEDURE

5.1 Placement

Placement of the screener unit will be per the Soil Excavation Plan, Appendix E.

5.2 Screener Start-up

5.2.1 Starting Engine

1. Check all fluid levels before starting engine.

2. Turn all switches to off and make sure emergency stop switches are deactivated (out position).

3. Pull out the throttle enough for 1000 RPM.

4. Push and hold override button. If the red light turns on, an automatic shutdown or emergency stop switch is engaged and will not allow the engine to start. Check all gauges and switches and correct the shutdown condition. Turn the ignition switch until the engine starts. Immediately release the key, but hold the override button for approximately 5 seconds or until oil pressure is maintained.

5. Check all engine gauges and allow engine to warm up before increasing throttle to operating speed.

5.2.2 Positioning The Conveyor

After the engine has warmed up, the fines conveyor can be moved into position.

1. Remove the transport lock.

2. Make sure the area under the conveyor is clear of obstructions or bystanders.

3. Lower and extend the conveyor using the fine conveyor cylinder switch on the control panel.

4. Insert locking pins in side frame.

5.2.3 Starting The Components

1. Increase engine speed to 1800-2000 RPM.

2. With the fines conveyor speed adjustment at 0, start the fines conveyor and increase to desired speed. Check the belt tracking and alignment and adjust if necessary.

3. With the drum speed adjustment at 0, start the drum and increase to desired speed.

4. With the feed conveyor adjustment at 0, start the feed conveyor and increase to desired speed. Check the belt tracking and alignment and adjust as necessary.

5.3 Loading Screener

Excavated soil will be loaded directly into the screener hopper with the backhoe for processing.

1. Begin feeding carefully to be sure that the screen speeds are suitable.

2. The loader operator must use good judgement when loading the screen. Any objects which could severely damage the screen must be separated before loading into the hopper.

3. Generally, load material into the front end of the hopper.

4. Operate the prescreen whenever necessary to remove large material from the top. Make sure no one is standing in the dump area before operating the prescreen.

5.4 Product Handling to Truck

Screened material will be conveyed from the screener unit into the tractor trailer bed via the stacking conveyor and/or via the center pivot loader.

5.5 Rejected Material

Rejected material from the screening process will be discharged into a lined pile or a planned excavation area. The material will be segregated into separate lined piles based on material type, i.e., wood waste, rocks, and other.

FIELD SOP: 2.0
TITLE: TRUCK SCALE OPERATION

1.0 PURPOSE

This procedure describes the operations related to using the truck scale at the Bioremediation Facility.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations. Trucks carrying contaminated soil or amendments shall be weighed prior to entering the Bioremediation Facility. Trucks carrying treated soil shall be weighed prior to disposal at the on-site landfill or excavation areas or other areas as directed by NSWC Crane EPD. Amendment delivery trucks will be weighed (randomly at the rate of 20 percent of trucks by amendment type) at the truck scale.

3.0 EQUIPMENT

The following equipment will be used to weigh the quantity of amendments or soil to be used for compost windrows at the Bioremediation Facility.

3.1 Truck Scale

The truck scale is manufactured by Tennessee Scale Works Inc., and is a Weigh-Tronix model FCTS7010-100T truck scale system. The system is equipped with a WI-130 electronic indicator/control panel which includes the following features:

- Eighteen Operational Keys,
- Eleven Operational Annunciators,
- Eight digit, seven segment, 0.8 inch high LED display,
- Three independently programmable units of measure,
- Battery backup real time clock and RAM,
- Self diagnostics,
- Circuitry protection, and
- Nema 4X enclosure.

The system is designed to be self prompting utilizing the vehicle driver as the scale operator. All necessary information is keyed in by the driver and is transmitted to the remote printer located in the Bioremediation Facility office trailer. The system is provided with a ProxLink Radio Module and a LX-300 printer.

The ProxLink Radio Module is a small communication device that replaces cables with a wireless Radio Frequency (RF) technology. This allows the transmission and receiving of all scale data to the remote printer without the use

of wires. The receiving LX-300 printer is an Epson inkjet printer with Epson replacement parts and accessories.

3.2 Semi-Tractor and Live-Bottom Trailer

The semi-tractor is a Mack model 169CH613 truck. The live-bottom trailer is a Red River model HS 236 102. The trailer is 43 feet long and has a minimum capacity of 48 cubic yards. It has a conveyor floor which is capable of discharging material out the rear of the trailer. The tractor-trailer rig is used to transport soil to the composting facility as well as transport finished compost from the Bioremediation Facility.

4:0 PROCEDURE

4.1 Placement

The truck scale is placed at the entrance to the Bioremediation Facility on Highway (H)-161.

4.2 Truck Scale Operation

The truck scale operation will be utilized in monitoring both loaded and empty soil weights. NSWC Crane trucks and amendment delivery trucks already programmed into the truck scale memory are not required to re-weigh after unloading because tare weights will be known.

4.2.1 Loaded Truck Operation

1. Drive the semi-truck and trailer (or dump truck) onto the scale platform.

2. Ensure all wheels are located on the truck scale weight platform.

3. Press the "IN" button on the scale indicator.

4. Enter the truck identification number.

5. The indicator will display the inbound weight. Press any key to continue.

6. The driver may now exit the scales and proceed to his/her destination (i.e., Bioremediation Facility, on-site landfill, excavation sites, or other areas directed by NSWC Crane EPD).

4.2.2 Empty Truck Operation

1. Drive the semi-truck and trailer onto scale platform.

2. Ensure all wheels are located on the truck scale weight platform.

3. Press the "OUT" button on the scale indicator.

4. Enter the truck identification number.

5. The indicator will display the gross, tare, and net weights. Press any key to continue.

6. After the outbound process is completed, a ticket will be printed for the driver.

7. The driver may now exit the truck scale for the outbound destination.

4.3 Truck Scale Calibration

Periodic maintenance and calibration will be performed as part of the purchased extended maintenance agreement. This function will be performed by:

Indianapolis Scale Company
7302 Kentucky Avenue
Camby, Indiana 46113

Phone: (317) 856-6606
FAX: (317) 856-6655
Contact: Jim Holbrook

All necessary maintenance and calibration records will be provided to the Bioremediation Facility Operations Quality Control Supervisor for records retention at the facility.

5.0 Record Keeping

The Facility Operations Quality Control Supervisor shall maintain a listing of all Vehicle Identification numbers which coordinates with the Supplier names, or the Clean or Contamination Soil Trucks. Every time the scale is used, a scale ticket is produced at the printer in the facility, and stored with the daily log.

The scale tickets identify the following information:

- Date,
- Time,
- Vehicle Number,
- Gross Weight,
- Tare Weight, and
- Net Weight.

An example of the truck scale ticket is attached as Figure 1.

SOP 2.0 FIGURE 1
TRUCK SCALE TICKET

```
        * * *

Date    : 01-23-98
Time    : 15:02:46
Vehicle : 2

Gross Wt:  65740 lb
Tare Wt :  31820 lb
===================
Net Wt  :  33920 lb
```

FIELD SOP: 3.0
TITLE: AMENDMENT PROPORTIONING AND MIXING

1.0 PURPOSE

This procedure describes the methods which will be used to combine and mix amendments in the proper proportions for full-scale operations at the Bioremediation Facility.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations.

3.0 EQUIPMENT

The following equipment will be used to combine and mix the compost amendments in the prescribed proportions for full-scale operations:

3.1 Farm Tractor

The Farm Tractor is a John Deer model 7710. The tractor is used to power the power takeoff (PTO) grinder/mixer and to transport the grinder/mixer to and from the compost buildings.

3.2 Grinder/Mixer

The grinder/mixer is a Supreme model 700. The grinder/mixer is a 700 cubic foot capacity tub grinder commonly used in agricultural applications to blend and discharge livestock feed into feeding troughs. It has built in scales that provide a digital readout to the nearest ten pounds. It will be used to weigh amendments as they are being added to proportion the blend, and to chop and mix the amendment mixture.

3.3 Center Pivot Wheel Loader

The Center Pivot Wheel Loader is a Caterpillar model 966F. It is equipped with a 6.0 cubic yard bucket. This loader will be used to load amendments into the grinder/mixer.

4.0 SAFETY AND HEALTH PRECAUTIONS AND CONTROLS

1. Use Modified Level D PPE (per the SSHP, Appendix A) including disposable dust masks when off loading, grinding, and loading amendments. Hearing protection is required within 15 feet of operating equipment.

2. Maintain clear distance of approximately 15 feet and wear high visibility

vest when working in a moving machinery path. Stay in equipment operators line-of-sight.

3. Ensure all rotating equipment guards are in place and functional prior to equipment operation.

4. Lock out and tag out power to the PTO when removing any remaining material from the grinder/mixer using a broom or brush. At no time should a person reach into the bin or enter the bin of the grinder/mixer unless the unit is locked out and tagged out from the PTO drive coupling.

5.0 PROCEDURE

The amendment mixtures will normally be generated within the same work day that the soil addition is performed. However, the amendment mixtures may be generated no more than two days in advance of the soil addition.

The full-scale recipe will be per Section 1.4 of the Full-Scale Operational Plan.

The amendments will be combined in 15 cubic yard batches. Figure 1 is a spreadsheet showing the required volume of each amendment required per batch, the estimated weight, % carbon, % nitrogen, the C:N ratio, the cost per ton, and the unit cost per cubic yard for Mix 3, Mix 7a, and Mix 7b at 25% soil loading. The Figure 1 will be revised if 30% soil loading is approved by the U.S. Navy and the U.S. EPA. An addendum to this SOP will be issued for approval before using 30% soil loading.

5.1 Zero Balance the Scales

The scales of the grinder/mixer must be zero balanced prior to each use. This is accomplished as follows:

1. Remove any remaining material from the grinder/mixer using a broom or brush.

2. Press the [ON] key on the scale display.

3. Press the [NET/GROSS] key and within three seconds,

4. Press the [ZERO] key.

5. "ZERO" will be displayed to indicate zero balancing is complete.

5.2 Loading Amendments

The bulking agents should be loaded first (e.g., straw, alfalfa, and wood chips). The manures should be loaded next to provide improved mixing. After zero balancing the scales, as described above, the amendments shall be loaded into the grinder/mixer as follows:

1. Activate the mixer drive to begin mixing.

2. Load the first amendment via the center pivot loader from the amendment storage bin and gradually dump into the grinder/mixer until the desired volume is added. Record the volume and actual weight on the appropriate *Record of Recipe* form (Figures 2a, 2b, and 2c) for that batch.

3. Press the [TARE] key on the scale display to establish a temporary zero point.

4. Press the [NET/GROSS] key to select NET mode.

5. Load the desired volume of the second amendment in a similar fashion. Record the actual volume and weight on the appropriate *Record of Recipe* form (Figures 2a, 2b, and 2c) for that batch.

6. Repeat steps 2, 3 and 4 for each additional amendment to be added.

5.3 Blending of Amendments

Once all amendments for that batch have been loaded into the grinder/mixer, the mixer continues to chop and blend the amendment mixture as the grinder/mixer is pulled to the composting building by the farm tractor. Each load shall be blended for a minimum of ten minutes. The blended amendment batch will be unloaded as described in Field SOP 4.0.

NSWC CRANE

FULL-SCALE RECIPE BATCH QUANTITIES

SOP 3.0 FIGURE 1

MIX #3

Ingredient	Qty. (CY)	Qty. (lbs.)	% Carbon	% D.M.	Carbon (lbs.)	% Nitrogen	Nitrogen (lbs.)	C:N Ratio	Cost (as of Dec. 1997) ($/Ton)
Straw		0	0.4240	0.88	0.00	0.0123	0.00	34.47	$65
Chicken Manure		0	0.1870	0.88	0.00	0.0558	0.00	3.35	$25
Alfalfa	5	675	0.3290	0.85	188.76	0.0314	18.02	10.48	$165
Cow Manure		0	0.3820	0.21	0.00	0.0257	0.00	14.86	$22
Turkey Manure	5	3,915	0.4160	0.74	1,205.19	0.0260	75.32	16.00	$25
Vegetable Waste		0	0.4000	0.30	0.00	0.0140	0.00	28.57	$95
Saw Dust		0	0.6000	0.61	0.00	0.0008	0.00	750.00	$20
Wood Chips	5	2,650	0.6000	0.88	1,399.20	0.0008	1.87	750.00	$20
Totals	15	7,240							
	Mix Density (lbs/CY) = 483				2,793.16		95.21	29.34	
	Mix Unit Cost ($/CY) = $8.74								

MIX #7a

Ingredient	Qty. (CY)	Qty. (lbs.)	% Carbon	% D.M.	Carbon (lbs.)	% Nitrogen	Nitrogen (lbs.)	C:N Ratio	Cost (as of Dec. 1997) ($/Ton)
Straw	14.3	1,158	0.4240	0.88	432.18	0.0123	12.54	34.47	$65
Chicken Manure	0.7	1,015	0.1870	0.88	167.03	0.0558	49.84	3.35	$25
Alfalfa		0	0.3290	0.85	0.00	0.0314	0.00	10.48	$165
Cow Manure		0	0.3820	0.21	0.00	0.0257	0.00	14.86	$22
Vegetable Waste		0	0.4000	0.30	0.00	0.0140	0.00	28.57	$95
Saw Dust		0	0.6000	0.61	0.00	0.0008	0.00	750.00	$20
Wood Chips		0	0.6000	0.88	0.00	0.0008	0.00	750.00	$20
Totals	15	2,173							
	Mix Density (lbs/CY) = 145				599.21		62.38	9.61	
	Mix Unit Cost ($/CY) = $3.36								

MIX #7b

Ingredient	Qty. (CY)	Qty. (lbs.)	% Carbon	% D.M.	Carbon (lbs.)	% Nitrogen	Nitrogen (lbs.)	C:N Ratio	Cost (as of Dec. 1997) ($/Ton)
Straw	12	972	0.4240	0.88	362.67	0.0123	10.52	34.47	$65
Chicken Manure	3	4,350	0.1870	0.88	715.84	0.0558	213.60	3.35	$25
Alfalfa		0	0.3290	0.85	0.00	0.0314	0.00	10.48	$165
Cow Manure		0	0.3820	0.21	0.00	0.0257	0.00	14.86	$22
Vegetable Waste		0	0.4000	0.30	0.00	0.0140	0.00	28.57	$95
Saw Dust		0	0.6000	0.61	0.00	0.0008	0.00	750.00	$20
Wood Chips		0	0.6000	0.88	0.00	0.0008	0.00	750.00	$20
Totals	15	5,322							
	Mix Density (lbs/CY) = 355				1,078.51		224.12	4.81	
	Mix Unit Cost ($/CY) = $5.73								

SOP 3.0 FIGURE 2a

RECORD OF RECIPE (MIX NO. 7B)

Building # _____ **Windrow #** _____ **PERFORMED BY:** _____

DATE: ___/___/___ **INSPECTED BY:** _____

Design Quantity: **Chicken Manure**_____**CY** _____**Pounds**
Straw_____**CY**_____**Pounds**
Soil_____**CY**_____**Pounds**

Batch Number	CHICKEN MANURE Supplier:_____		STRAW Supplier:_____		SOIL		TOTAL ACTUAL QUANTITY	
	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds
Total								

Comments:

SOP 3.0 FIGURE 2b

RECORD OF RECIPE (MIX NO. 7A)

Building # _____ **Windrow #** _____ **PERFORMED BY:** _____

DATE: ___/___/___ **INSPECTED BY:** _____

Design Quantity: **Chicken Manure**_____**CY** _____**Pounds**
Straw_____**CY**_____**Pounds**
Soil_____**CY**_____**Pounds**

Batch Number	CHICKEN MANURE Supplier:_____		STRAW Supplier:_____		SOIL		TOTAL ACTUAL QUANTITY	
	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds
Total								

Comments:

SOP 3.0 FIGURE 2c

RECORD OF RECIPE (MIX NO. 3)

Building # _____ **Windrow #** _____ **PERFORMED BY:** _____

DATE: ___/___/___ **INSPECTED BY:** _____

Design Quantity: **Alfalfa**_____**CY**_____**Pounds**
Turkey Manure_____**CY** _____**Pounds**
Wood Chips_____**CY**_____**Pounds**
Soil_____**CY**_____**Pounds**

Batch Number	ALFALFA Supplier:_____		TURKEY MANURE Supplier:_____		WOOD CHIPS Supplier:_____		SOIL		TOTAL ACTUAL QUANTITY	
	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds	cubic yards	pounds
Total										

Comments:

FIELD SOP: 4.0
TITLE: LOADING OF AMENDMENTS INTO WINDROWS

1.0 PURPOSE

This procedure describes the methods which will be used to load amendment blends into windrow configurations for full-scale operations.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations.

3.0 EQUIPMENT

The following equipment will be used to transport amendment blends to the composting buildings and load the blends into a windrow configuration for full-scale operations:

3.1 Farm Tractor

The Farm Tractor is a John Deere model 7710. The tractor is used to power the power takeoff (PTO) grinder/mixer and to transport the grinder/mixer to and from the compost buildings.

3.2 Grinder/Mixer

The grinder/mixer is a Supreme model 700. The grinder/mixer is a 700 cubic foot capacity tub grinder commonly used in agricultural applications to blend and discharge livestock feed into feeding troughs. It has built in scales that provide a digital readout to the nearest ten pounds. It will be used to grind, mix, and weigh amendments as they are being added to proportion the blend.

3.3 Windrow Turner

The windrow turner is a Scarab model 20HYD450. This is a specialized piece of equipment designed to turn, mix and aerate a 20 foot wide windrow with a maximum height of 7 feet.

4.0 SAFETY AND HEALTH PRECAUTIONS AND CONTROLS

1. Use Modified Level D PPE (per the SSHP, Appendix A) including disposable dust masks when off loading, grinding, and loading amendments. Hearing protection is required within 15 feet of operating equipment.

2. Maintain clear distance of approximately 15 feet and wear high visibility vest when working within the moving machinery path. Stay in equipment

operators line-of-sight.

3. Ensure all rotating equipment guards are in place and functional prior to equipment operation.

4. Lock out and tag out power to the PTO when removing any remaining material from the grinder/mixer using a broom or brush. At no time should a person reach into the bin or enter the bin of the grinder/mixer unless the unit is locked out and tagged out from the PTO drive coupling.

5. All personnel shall maintain minimum 30 feet clearance from the front or rear of the windrow turner during turning of the windrows.

5.0 PROCEDURE

The amendments for the full-scale recipe will be combined in multiple batches as described in Field SOP 3.0. Figure 1 provides the windrow formation dimensions.

5.1 Building Windrow

The amendment portion of the each windrow will be constructed as follows:

1. Transport the first batch of amendment blend from amendment storage area to the composting building via the tractor pulled grinder/mixer.
2. Position the grinder/mixer in the building at approximately column line 2 and begin discharging the amendment blend through the side mounted discharge conveyor to form the outer-most windrow first as shown on drawing P-100 found in Appendix C of the Full-Scale Operational Plan.
3. Continue discharging and begin traveling forward as the pile builds to a height of approximately six feet to maintain a long row of this height.
4. Once a batch is unloaded, return to the amendment storage area for another batch.
5. Discharge the next batch, starting where the previous batch left off continuing to build a long windrow approximately six feet high.
6. Repeat steps 4 and 5 until the first row of the desired length of windrow is formed.
7. Move the grinder/mixer adjacent to the start of the first row and begin discharging the balance of the second row into another six feet high pile such that it overlaps the first by about three feet, yielding a combined width of 18 to 20 feet.
8 Once the next batch is unloaded, return to the amendment storage area for another batch.
9. Discharge the next batch, starting where the previous batch left off, and so on until the entire length of amendment windrow is complete.

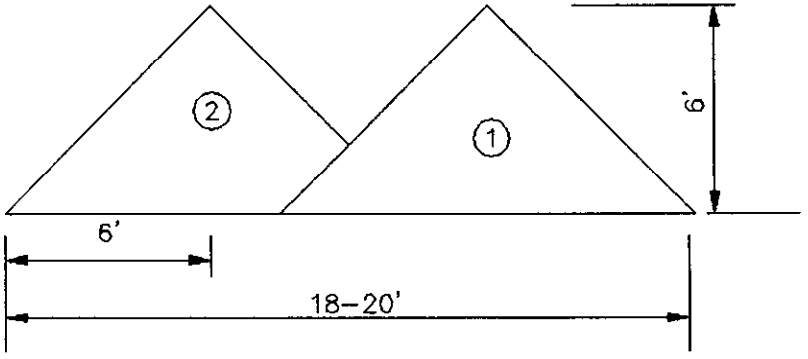
10. Remove any remaining material from the grinder/mixer using a broom or brush.

5.2 Shaping Amendment Portion of Windrow

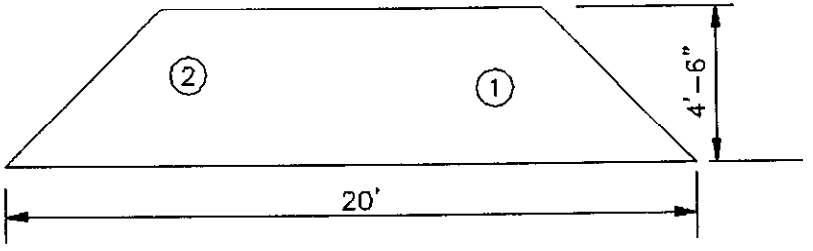
Once the amendments have been loaded into the two overlapping piles, the windrow will be shaped by the windrow turner. This will be accomplished by turning the amendments with the discharge flap on the back of the windrow turner adjusted to produce a single windrow approximately 4 feet 6 inches tall. The resulting windrow will be approximately 20 feet wide at the base. Any miscellaneous amendment material disbursed during windrow formation will be collected and returned to its originating pile. The collection and floor cleaning will be performed using the skid steer loader as well as manual shovels and brooms.

LEGEND

1. AMENDMENT BLEND
2. AMENDMENT BLEND
3. SCREENED SOIL



A



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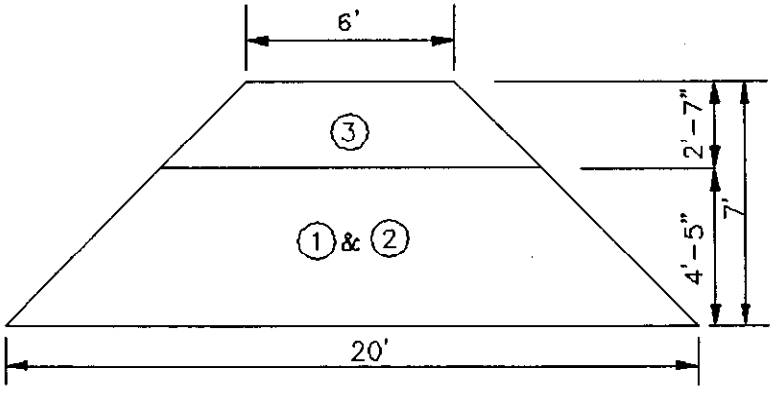
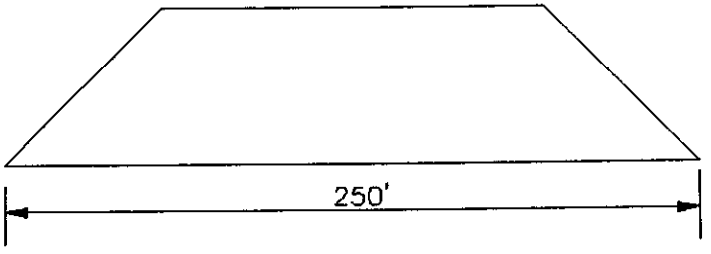


C



D

WINDROW DIMENSIONS

MORRISON KNUDSEN CORP.	
Drawing FIGURE 1	Rev. 0
Date 1/27/98	Sheet 1

FILE: F:\PHCHARVAT\ACAD\CRANE\ONESV.DWG

FIELD SOP: 5.0
TITLE: TRANSPORT AND LOADING SOIL INTO WINDROWS

1.0 PURPOSE

This procedure describes the methods which will be used to transport soil to the composting facility and load the soil into windrows for full-scale operations.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations.

3.0 EQUIPMENT

The following equipment will be used to transport soil to the composting buildings and convey the soil to windrows for full-scale operations:

3.1 Semi-Tractor and Live-Bottom Trailer

The semi-tractor is a Mack model 169CH613. The live-bottom trailer is a Red River model HS 236 102. The trailer is 43 feet long and has a minimum capacity of 48 cubic yards. It has a conveyor floor which is capable of discharging material out the rear of the trailer. The tractor-trailer rig will be used to transport soil to the composting facility.

3.2 Hopper/Conveyor

The Hopper/Conveyor is a specially designed piece of equipment that will be used to convey soil from the live-bottom trailer to the windrows. The unit attaches to the rear of the trailer via two swivel hooks and latches. The conveyor is self powered by a diesel engine mounted on the unit. Soil from the live-bottom trailer is discharged into a hopper on the Hopper/Conveyor and is then conveyed to the center of the windrow off the right side of the unit.

4.0 SAFETY AND HEALTH PRECAUTIONS AND CONTROLS

1. Follow explosives handling procedures as required by NSWC Crane Safety Department.

2. Use modified Level D PPE (per the SSHP, Appendix A) when off-loading contaminated soils into windrows and Modified Level D for set-up and preparation tasks associated with off-loading. Hearing protection may be required based on results of sound level surveys.

3. Maintain clear distance of approximately 15 feet and wear high visibility vest when working around moving machinery. Stay in equipment operators line-of-sight.

4. Ensure all rotating equipment guards are in place and functional prior to equipment operation.

5.0 PROCEDURE

Soil will be excavated from the excavation areas and screened as specified in the Soil Excavation Plan, Appendix E.

5.1 Transporting Soil

Screened soil will be transported from the excavation areas or from stockpile at the Bioremediation Facility building using the semi-tractor and live-bottom trailer. Soil at NSWC Crane averages 1.1 tons per cubic yard. The empty weight of each tractor-trailer rig is approximately 16.3 tons. Loaded with 15 cubic yards of soil (16.5 tons), the total load of 32.8 tons will not exceed the 36 ton capacity limit of two bridges on the NSWC Crane base. Transportation route from the excavation sites to the composting facility is shown in the Soil Excavation Plan, Appendix E. Prior to leaving the composting facility, the exterior of the tractor-trailer rig will be decontaminated at the equipment decontamination facility located at the composting facility exit as discussed in Field SOP 7.0.

Screened soil may be transported and stockpiled in one of the buildings at the Bioremediation Facility, if necessary with approval of NSWC Crane EPD. Stockpiled soil will be covered to prevent dust from emminating.

5.2 Loading Soil into Windrows

The general sequence of activities for loading soil into the windrows is as follows:

1. The semi-tractor trailer rig loaded with soil arrives at the windrow and the volume and weight of soil is recorded on the *Record of Recipe* form (See Field SOP 3.0). At this time, the *Record of Recipe* form has already been partially completed during the amendment proportioning and mixing procedure, Field SOP 3.0.

2. The semi-tractor trailer enters the compost building.

3. The Hopper/Conveyor is connected to the rear of the semi-tractor trailer via two swivel hooks and latches.

4. Once positioned to the left of the first amendment pile, the engine of the Hopper/Conveyor will be started.

5. Next the bottom flap at the rear of the trailer will be opened to a minimum of six inches.

6. Then the trailer and Hopper/Conveyor will be activated. Soil will begin discharging into the Hopper/Conveyor and onto the amendment windrow. Care should be taken not to transfer excess soil onto the Hopper/Conveyor and causing a Hopper/Conveyor overload. The speed of the Hopper/Conveyor should always be slightly faster than the trailer discharge conveyor.

7. As the soil begins to pile up about two feet above the top of the amendments, the tractor-trailer will be driven forward at a slow rate of speed such that a uniform two feet high pile of soil is maintained until the trailer is emptied. Refer to Figure 1 of Field SOP 4.0 for windrow formation dimensions.

8. If the trailer is emptied prior to reaching the end of the windrow, another trailer of soil will begin discharging where the previous trailer emptied. This process will continue until the entire length of windrow has been brought to the proper height with soil.

9. Once the trailer is emptied, the conveyor will be disconnected and the tractor-trailer will proceed to the vehicle decontamination facility if leaving the Bioremediation Facility.

10. The exterior of the tractor-trailer will be decontaminated prior to exiting the facility.

11. The tractor-trailer will return for another load of soil.

12. This process will be repeated until all windrows have been loaded with soil.

Drawings P-102 and P-103 in Appendix C of this Full-Scale Operational Plan provide the travel path for loading soil into the windrows.

FIELD SOP: 6.0
TITLE: WINDROW TURNING AND MOISTURE ADDITION

1.0 PURPOSE

This procedure describes the methods which will be used to turn full-scale windrows and add water to adjust moisture content.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations.

3.0 EQUIPMENT

The following equipment will be used to turn full-scale windrows and add water to adjust moisture content of the compost windrows:

3.1 Windrow Turner

The Windrow Turner is a Scarab model 20HYD450. This is a specialized piece of equipment designed to turn, mix and aerate a twenty-foot wide windrow with a maximum height of seven feet. It is equipped with a 600-gallon tank and spray nozzles to add moisture to windrows during the turning process.

3.2 Mobile Water Tank

The Mobile Water Tank is a 1,100 gallon capacity, trailer mounted poly tank. It is equipped with a five horse power gasoline powered discharge pump with a two-inch discharge. It can be pulled by a farm tractor, one-ton pick-up truck or other comparable equipment.

3.3 Portable Transfer Pump

The Portable Transfer Pump is a five horse power gasoline powered pump with a two-inch semi-rigid suction pipe and a two-inch flexible discharge hose.

4.0 SAFETY AND HEALTH PRECAUTIONS AND CONTROLS

1. Follow explosives handling procedures as required by the NSWC Crane Safety Department.

2. Use modified Level D PPE per the SSHP, Appendix A. Personnel shall avoid direct contact with contaminated soil as much as possible. Hearing protection is required within 15 feet of the equipment.

3. Maintain clear distance of approximately 15 feet and wear high visibility vest when working around moving machinery. Stay in equipment

operators line-of-sight. Ensure back-up alarms are operational on equipment.

4. Ensure all rotating equipment guards are in place and functional prior to equipment operation.

5. All personnel shall maintain minimum 30 feet clearance from in the front or rear of the windrow turner during turning of the windrows.

6. Operate Windrow Turner with cab door closed and latched in position.

7. Use lockout controls on Windrow Turner when cleaning the flaps and drum during windrow turning activities.

5.0 PROCEDURE

Turning frequency may be adjusted at the direction of the Operations Manager, with concurrence of the NSWC Crane EPD. Windrows will be turned after water addition or if temperatures exceed 70°C and if excess moisture is present.

5.1 Windrow Turning

Each windrow will be turned daily after pre-turn monitoring of the windrow is complete, however, specific process conditions may occur which require additional turning events.

5.1.1 Additional Turning Requirements

1. If the moisture content is within the required range and the temperature at any monitoring location in the compost pile exceeds 70°C, then windrow turning will be performed within 6 hours in order to provide aeration and cooling. Temperatures greater than 60°C may be detrimental to microbial growth and explosives degradation will be reduced.

2. If the moisture content is above 60% maximum WHC, and the windrow temperature is below 45°C, then keep turning the windrow to provide aeration and drive off excess moisture.

3. If moisture content is within the acceptable range, and the windrow temperatures are falling, and the oxygen content is below 5%, then a second windrow turning event will be performed within the same day.

4. If, after thorough turning, the oxygen content is still below 5%, and temperatures are below 40 degrees C, and target levels of TNT, HMX, and RDX are not being degraded then the windrow may be considered

complete with the concurrence of NSWC Crane EPD.

5.1.2 Windrow Turning Procedure

During the turning process, the operator will try to keep the soil within the building containment. The following steps will be followed during the turning process:

1. Position the windrow machine at the windrow to be turned.

2. Engage the drum on the windrow machine and begin turning the windrow. NOTE: More than one pass may be required complete turning.

3. Upon completion of turning the end of the windrow, stop the windrow machine and disengage the drum.

4. Lockout the windrow machine; the driver will exit the cab, lock the door and wait on the windrow machine platform until given clearance by the person cleaning the underside of the machine.

5. Clean caked material from the drum and flaps of the windrow machine.

6. Cleanup material which has been thrown beyond the ends of the windrow and place in back onto the windrow using a skid steer loader or similar piece of equipment.

7. Repeat steps 1 through 6 for the remaining windrows to be turned.

5.2 Moisture Addition

Water will be added to the windrows to adjust moisture content. The operating goal for compost moisture content is 40 to 60% of the maximum Water Holding Capacity (WHC) of the compost. A 50% WHC is the ideal moisture content for the composting process. Refer to the approved QAPP for Full-Scale Operations for determination of actual moisture and WHC.

Water will be added using; the spray nozzles on the windrow machine during the turning process; a hose with a flow meter and spray nozzle connected to the buildings potable water source; or a hose and spray nozzle connected to the trailer mounted calibrated tank and pump.

5.2.1 Water Sources and Their Usage

During the Bioremediation Facility operations, fluids will be generated which may be used for windrow moisture addition. At no time shall fluid be used for

moisture addition if it contains decontamination soaps, antibacterial substance, or chemical compounds from instrument and sample equipment decontamination. Water known to have been impacted by spills or releases will not be used for the moisture addition.

Building Sump Water: Excess water collected during the composting operation in the building sumps. Building sump water may be used as moisture addition at anytime during the composting process in the same building as the sump.

Truck wash decontamination fluid: Decontamination fluids generated at the Bioremediation Facility decontamination building may be used as moisture addition water only during the first seven days of windrow formation.

Storm-water retention pond fluid: Storm-water collected in the Bioremediation Facility retention ponds may be used for windrow moisture addition at anytime during the composting process if the retention pond level is in excess of 18 inches. Retention pond fluid less than 18 inches deep may only be used during the first seven days of windrow formation.

Potable water: Potable water will be used at any time. Potable water is available at the east end of each building inside the exclusion zone and east of the diesel fuel storage tank outside the exclusion zone.

In summary, water from building sumps, storm-water retention pond fluids in excess of 18 inches, and potable water may be used for windrow moisture addition at anytime during the composting process. Water from truck wash decontamination at the Bioremediation Facility and storm-water retention pond fluids less than 18 inches can be used only during the first seven days of windrow formation.

5.2.2 Moisture Addition Requirements

If the moisture content is below 45% of the maximum WHC, then moisture addition will be performed during or prior to the windrow turning process. Due to high evaporation rates with high ambient temperatures, to avoid adding too much moisture, no more than 300 gallons will be added to any 25-foot section of windrow prior to an additional moisture content analysis.

5.2.3 Moisture Addition Procedure

Using the Windrow Turner

1. The 600-gallon Poly tank on the windrow machine is marked in 50 gallon increments.

2. Start with water level at a predetermined level (suggested at 300 gallons).

3. Engage spray nozzles at the start of windrow turning.

4. Each pass with the windrow machine will add approximately 30 to 50 gallons of water.

5. Monitor level of water in tank to assure no more than the desired amount is added to the windrow.

6. Two or three passes may be required to add the desired amount of moisture.

7. Record source and amount of water added on the *Windrow Process Data - Daily Log* found in the approved QAPP for Full-Scale Operations (Field SOP QAPP-4.0.

Using the Trailer Mounted 1,100-gallon Tank and Pump

1. The 1,100-gallon trailer mounted poly tank is marked in 100 gallon increments.

2. Start with a water level at a predetermined level.

3. Add water to the windrows using the hose and spray nozzle attached to the trailer mounted pump. Spray the windrow with an even light spray.

4. Monitor the level of water in the tank to assure no more than the desired amount is added to the windrow.

5. If large quantities of water are required one-half of the water may be applied before the first windrow turning pass and the one-half after. The windrow will be turned after each water application.

6. Record source and amount of water added on the *Windrow Process Data - Daily Log* found in the approved QAPP for Full-Scale Operations (Field SOP QAPP-4.0.

Using the Retention Pond Water or Building Sump Directly with a Pump

1. Place the portable pump intake hose at the required depth. Ensure that the hose does not get clogged.

2. Add water to the windrow using the hose and spray nozzle.

2. Spray the windrow with an even light shower distributing the water the entire length of the windrow on all sides.

3. Monitor the flow meter to assure no more than the desired amount is added to the windrow.

4. Record source and amount of water added on the *Windrow Process Data - Daily Log* found in the approved QAPP for Full-Scale Operations (Field SOP QAPP-4.0.

Using the Building Potable Water Source

1. Add water to the windrow using the hose and spray nozzle connected to the building potable water source. An in-line flow meter will be used to monitor the volume of water added.

2. Spray the windrow with an even light shower distributing the water the entire length of the windrow on all sides.

3. Monitor the flow meter to assure no more than the desired amount is added to the windrow.

4. Record source and amount of water added on the *Windrow Process Data - Daily Log* found in the approved QAPP for Full-Scale Operations (Field SOP QAPP-4.0.

FIELD SOP: 7.0
TITLE: DECONTAMINATION OF STRUCTURES, EQUIPMENT, ROCKS, AND PERSONNEL

1.0 PURPOSE

This procedure describes the methods which will be used to decontaminate structures, large equipment, sampling equipment, rocks, and personnel.

2.0 SCOPE

This procedure applies to the Naval Surface Warfare Center, Crane, Indiana site for Bioremediation Facility full-scale operations.

3.0 PROCEDURE

3.1 Decontamination of Sampling Equipment

Non-disposable equipment used for obtaining samples for off-site laboratory analysis, such as explosives and metals, shall be decontaminated per the following procedure after each windrow cross-section.

Non-disposable equipment used for obtaining samples for on-site laboratory analysis, such as pH and moisture, shall be decontaminated per the following procedure after each windrow.

All generated decontamination liquids shall be managed according to NSWC Crane EPD procedures.

3.1.1 Disposable Equipment

Dedicated disposal, one-time use, equipment used for sampling water, soil, sediment, air, or compost media shall be segregated and disposed of as solid or special waste according to NSWC Crane EPD procedures. The sampling person must take appropriate measures to prevent any cross-contamination with other equipment or structures.

3.1.2 Non-Disposable Equipment

3.1.2.1 Sampling Equipment Used for Off-site Laboratory Samples

All non-disposable sampling equipment will be decontaminated according to the following procedure and sequence.

1. Remove solids from the sampling equipment and place back on the pile.

2. Place a bucket or tub over plastic sheeting placed on the area where the bucket or tub is going to be set.

3. Place the equipment in the bucket or tub containing an Alconox water solution. Wash or brush the sampling equipment in the solution.

4. Rinse the equipment over the bucket or tub for a potable water rinse; the rinse can be performed using clean, unused garden sprayers, spray bottles, or squeeze bottles.

5. If analysis of the material does not include metals, proceed to step 6. If analysis of the material includes metals then rinse the equipment with a solution of 10% nitric acid over the bucket or tub; the equipment will then be rinsed with potable water over the same bucket or tub. The acid will be contained in small spray or squeeze bottles; the nitric acid solution can be obtained from the laboratory.

6. Rinse the equipment with laboratory reagent grade water over the bucket. This rinse can be performed using spray or squeeze bottles; the distilled/deionized grade water will be supplied by the laboratory.

7. Allow the equipment to air dry or wipe dry with a clean paper towel.

8. At the end of sampling event, store the equipment in plastic bags or sheeting to prevent contamination after decontaminating.

3.1.2.2 Sampling Equipment Used for On-site Laboratory Samples

Non-compost Sampling Equipment

Cleaning of on-site laboratory non-disposable equipment (except for compost sampling and windrow sampling equipment) will be performed as described in Section 3.1.2.1 above except emersion in the decontamination fluids may not be permissible. Spray bottles of cleaning and rinse fluids will be used.

Compost Sampling Probe Equipment

1. Using a disposable paper towel, remove any solids that may adhere to the probe shaft and place back on the pile.

2. Remove the Teflon tip from the probe by loosening the screw and sliding out the tip. Clean the tip and probe air inlets with a spray bottle containing tap water. If necessary, use a plastic awl to poke out any material clogging the air inlet holes.

3. Allow the probe shaft to drain, dry the teflon tip with a clean disposable paper towel, replace the probe tip after making sure it has been cleaned, and secure in place with the screw.

4. Remove the probe suction tube from the monitor and connect to the outlet of the aspirator bulb. Using the aspirator bulb, blow air through the probe tip to expel any remaining water. Reconnect the probe suction tube to the monitor.

5. After the last use for the day and the equipment has been decontaminated, store the equipment in the sample equipment transfer vehicle.

Windrow Measuring Equipment

All measuring sticks will be dedicated to each individual windrow. The sticks will have any solids brushed off at the end of measurements for that windrow. Any solid residues shall be placed onto that windrow. The measuring sticks shall be stored adjacent to the windrows, next to the containment wall of the building.

3.2 Excavation Equipment And Rock Decontamination

3.2.1 Excavation equipment and Decontamination Pad

Equipment such as conveyors, backhoe, soil screener, and smaller equipment used within the excavation site exclusion zone will be decontaminated in a designated temporary decontamination facility as described in the Soil Excavation Plan found in Appendix E of this Operational Plan. Prior to exiting the EZ, all equipment will pass through the CRZ for decontamination.

1. Sweep or brush all loose dirt off the exterior and interior of the equipment.
2. The equipment will then be cleaned using a high-pressure, low volume water spray system in the temporary decontamination facility. This system consists of a hand held wand connected to a portable, gas-powered high-pressure pump unit. Trucks used for transporting excavated soil are only required to have the truck wheel wells and potentially contaminated exteriors (based on visual inspection) cleaned prior to exiting the CRZ. Complete decontamination of the truck's potentially contaminated surfaces will be performed at the Bioremediation Facility upon completion of excavation and soil transport.
3. The decontamination activity will begin at the highest point of the affected equipment with the decontamination spray being formed in a downward motion. This will allow the upper portions of the equipment to remain clean as the lower portions are being rinsed.

4. After cleaning the vehicle or equipment body, the wheel wells, under carriage (if necessary), and tires will be washed.
5. The equipment will be visually inspected. If evidence of soil remains on the equipment, recleaning will be performed until no visual signs of soil remain on the equipment exterior.

3.2.2 Rock Decontamination

1. Lay the affected rocks in a single layer in the lined and bermed decontamination area.
2. Thoroughly rinse each rock using a high pressure low volume spray. Wash all visible signs of explosives residue from the rocks (a minimum of 5 minutes per cubic yard of rocks).
3. Turn each rock over and repeat step 2. Allow to drain.
4. Return the rocks to a clean storage bin, elevate bin and rinse thoroughly again. Allow to drain.
5. Rinse rocks a second cycle in the bin. Allow to drain.
6. All decontamination water collects in the pad sump and is transferred to a poly tank for disposal as approved by NSWC Crane EPD based on results of the decontamination rinse water.
7. Collect final rinse samples for off-site laboratory analysis per SOP QAPP-2.0 in the approved QAPP for Full-Scale Operations.
8. When drained, cover and stockpile the decontaminated rocks in a lined and bermed area until final disposition has been obtained from NSWC Crane EPD.

3.2.3 Decontamination of Miscellaneous Materials Found During Excavation

Miscellaneous materials (e.g., wood, construction debris, metal pieces) found during excavation activities will be decontaminated per Section 3.2.2. Yucca plants will be mixed in with the soil to be composted and therefore will not be decontaminated. Decontaminated materials will be stockpiled until final disposition has been obtained from NSWC Crane EPD.

3.2.4 Personnel Decontamination At The Excavation Site

Personnel will be required to pass through a decontamination area before exiting the EZ. The personnel decontamination area will be located in the CRZ adjacent to the EZ. The area will include, as required, a protective clothing removal area and container, respirator removal area and containers, storage for clean personnel protection equipment and clothing, and wash station supplies for hands and face.

All contaminated personal protective equipment and clothing shall be properly disposed of or cleaned and inspected for reuse.

3.3 Decontamination Related to Bioremediation Facility Operations

The items requiring decontamination related to the Bioremediation Facility operations include: large equipment, personnel, and various structures (amendment storage area, compost buildings, retention ponds, truck wash facility, and paved surfaces).

3.3.1 Equipment Decontamination At The Bioremediation Facility

Large equipment such as mixers, conveyors, trucks, and equipment used within the Bioremediation Facility to create or turn the windrows will be decontaminated in the truck decontamination facility or designated areas as described in Section 7.0 of this Operational Plan. Prior to exiting the facility, all loose dirt will be swept or brushed off the exterior of the equipment. The equipment will then be cleaned using a high-pressure, low-volume water spray system. This system consists of a hand held wand connected to an overhead high-pressure supply line. All surfaces of the equipment which have come into contact with potentially contaminated material will be cleaned with this system and visually inspected. Interior surfaces, such as truck beds, may not be decontaminated if returning to the excavation site for additional contaminated soil. Complete decontamination of the truck's potentially contaminated surfaces will be performed at the Bioremediation Facility upon completion of excavation and soil transport.

The decontamination activity will begin at the highest point of the affected equipment with the decontamination spray being formed in a downward motion. This will allow the upper portions of the equipment to remain clean as the lower portions are being rinsed. Truck beds and loader buckets will be slightly tilted to obtain a sloped surface for an effective washout motion. After cleaning the vehicle or equipment body, the wheel wells, under carriage (if necessary), and tires will be the washed. The equipment will be visually inspected. If evidence of soil remains on the equipment, recleaning will be performed until no visual signs of soil remain.

Exceptionally large equipment such as the windrow turner and the center-pivot wheel loader, will be decontaminated in the compost building upon completion of the Full-Scale Operation. The equipment will be cleaned using the high-pressure portable spray unit described in Section 3.2 using the same procedure as described above. All decontamination fluids will be collected in the building sump.

3.3.2 Personnel Decontamination At The Bioremediation Facility

The Bioremediation Facility personnel decontamination area consists of a

shower/locker room trailer with a change room area, lockers, lavatory, toilets and showers as described in Section 8.0 of this Operational Plan. Persons working within the Bioremediation Facility will operate in modified Level D PPE as described in the SSHP, Appendix A. Boot covers, Tyvek™ suits and disposable gloves will require no decontamination, and will be disposed of according to NSWC Crane EPD Procedures.

Respirators will be washed per procedures described in the SSHP, Appendix A.

3.3.3 Decontamination Of The Amendment Storage Area

At completion of the Full-Scale Operation, the Bioremediation Facility Amendment Storage Area may require cleaning and decontamination to prevent storm-water run-off of residual particulate, nitrates, and manures. All excess amendments remaining from Full-Scale Operations shall be swept and removed from the Bioremediation Facility according to NSWC Crane EPD requirements. The amendment Storage Area surfaces will be cleaned of all visible signs of amendment material using the portable gas-powered high-pressure wash unit. Washing will begin with the storage bin walls and proceed from top to bottom. The asphalt surfaces will then be washed commencing with the northern most area working south so as to maintain wash water flow with the asphalt slope contour towards the Storm-Water Collection and Retention Pond #2. All wash water and sediment will be collected in the Storm-Water Collection and Retention Pond. Once the amendment storage area has been cleaned, the Storm-Water Collection and Retention Pond fluid and sediment will be sampled for disposition as described in the the approved QAPP for Full-Scale Operations.

3.3.4 Decontamination Of The Compost Structures, Ponds, And Larger Equipment

At completion of the Full-Scale Operation, the Bioremediation Facility compost buildings and larger equipment such as the compost turning machine, will require cleaning and decontamination to prevent tracking of residual contaminants and amendments outside the area. All excess compost material remaining from Full-Scale Operations shall be swept and removed from the compost buildings. The building surfaces and larger equipment will be cleaned of all visible signs of compost material and dust using the portable gas-powered high-pressure wash unit. The decontamination process of the buildings will begin after the equipment is clean and will start at the interior roof surface and work downward from the steel members, to the metal siding interior, and down the concrete wall surface. The floor will then be high-pressure washed in the same manner proceeding from the higher elevations sloping to the fluid collection trench and building sump. All decontamination fluids and sediments will be collected in the building sump and sampled for analysis and disposal. Additional wall and floor final rinse samples will be analyzed to evaluate facility cleanliness. Additional

cleaning of the buildings will be implemented as required based on rinsate sample results.

3.3.5 Decontamination Of The Truck Wash Facility

At the completion of the Full-Scale Operation and once all equipment and vehicles have been decontaminated, the truck wash facility itself will be pressure washed and decontaminated. The decontamination will begin at the interior roof level and work downward from the top of the epoxy coated walls to the floor. The floor will then be high-pressure washed in the same manner proceeding from the higher elevations sloping to the fluid collection trench. All decontamination fluids and sediments will be collected in the truck wash facility sump and sampled for analysis and disposal. Additional cleaning of the wash facility will be implemented as required based on results of the rinsate sample analysis. The same procedure will be followed for the cleaning and sampling of the truck wash sump.

3.3.6 Decontamination of the Paved Surfaces

At the completion of the Full-Scale Operation, all pavement shall be pressure rinsed and water shall be directed towards the retention ponds. The asphalt surfaces will be washed commencing with the northern most area working south so as to maintain wash water flow with the asphalt slope contour towards the Storm-Water Collection and Retention Pond #2. All wash water and sediment will be collected in the Storm-Water Collection and Retention Ponds.

3.3.6 Decontamination of the Retention Ponds

Once the asphalt surface areas have been cleaned, the Storm-Water Collection and Retention Pond fluid and sediment will be sampled for disposition as described in the approved QAPP for Full-Scale Operations. Upon disposal of fluids and sediments collected in the Retention Ponds, the ponds will be washed as required based on results of the fluid and sediment sample analysis.

APPENDIX E
SOIL EXCAVATION PLANS FOR FULL-SCALE OPERATIONS

LIST OF APPENDICES FOR SOIL EXCAVATION PLANS

APPENDIX E1: SWMU-12/14, MINE FILL A
APPENDIX E2: SWMU-13/14, MINE FILL B
APPENDIX E3: SWMU-03/10, AMMUNITION BURNING GROUND
APPENDIX E4: SWMU-10/15, ROCKEYE

APPENDIX E1
SWMU-12/14, MINE FILL A SOIL EXCAVATION PLAN FOR FULL-SCALE OPERATIONS

APPENDIX E1
SWMU-12/14, MINE FILL A SOIL EXCAVATION PLAN FOR FULL-SCALE OPERATIONS

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1.0
INTRODUCTION

The scope of work includes excavating, screening, and transporting explosives contaminated soils to the Bioremediation Facility, and backfilling and restoring the excavated area with non-contaminated backfill. This Plan addresses the excavation, screening, and transportation of explosives contaminated soil from areas of SWMU-12/14, Mine Fill A. An estimated 11,000 cubic yards of explosives contaminated soil is expected to be excavated and transported for bioremediation.

1.1 PURPOSE

The purpose of this Soil Excavation Plan is to provide methods and controls for excavation, screening, transporting, and storage of explosives contaminated soils during Full-Scale bioremediation operations. This Plan may be modified, amended, or revised, with the approval of the United States (U.S.) Navy and the United States Environmental Protection Agency (U.S. EPA), to optimize system performance throughout the Full-Scale operation activities. The following documents are provided for the Soils Bioremediation Project and will be used in conjunction with each other:

1. The approved *Full-Scale Operational Plan For Soils Bioremediation Facility*, which addresses the descriptions and requirements for operating the full-scale Bioremediation Facility.

2. The approved *Quality Assurance Project Plan (QAPP) For Full-Scale Operations at the Soils Bioremediation Facility*, which addresses the quality assurance, sampling and analytical requirements of the bioremediation full-scale operation.

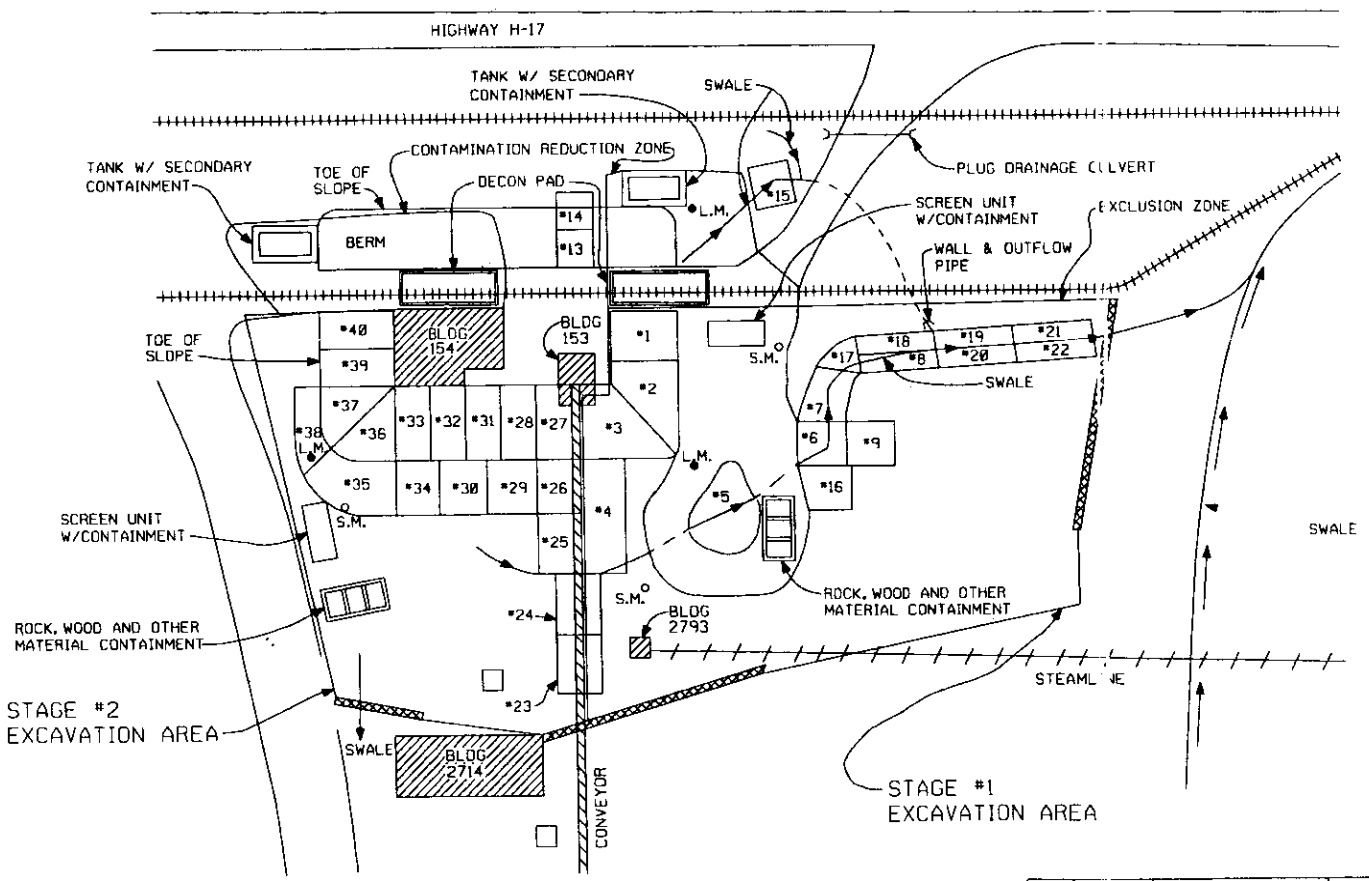
3. The approved *Full-Scale Site Safety and Health Plan* (SSHP), which is Appendix A to the Full-Scale Operational Plan For Soils Bioremediation Facility and addresses the life cycle safety and health management, emergency preparedness and prevention, contingency planning, and emergency procedures.

1.2 SITE ASSESSMENT

The potential areas of excavation are depicted in Figures E1-1, E1-2, E1-3, and E1-4 near or around Buildings 153, 158, 152, and 157 respectively and are identified as excavation stages 1 through 10. In 1985, soil samples were collected around Buildings 153 and 158 with the highest concentrations of contaminants detected near Building 153. These sampling results indicated concentrations of individual constituents in the soil ranged from undetected to 15,300 milligrams per kilogram (mg/kg) RDX. TNT and

HMX were reported as high as 3790 mg/kg and 1340 mg/kg respectively (Halliburton, 1992). The analytical results are shown in Table E1-1 with the sample locations depicted in Figure E1-5. Additional analytical results from recent sampling events prior to Pilot Scale Operations in areas identified as Grids 1 through 9 indicate levels of TNT, RDX, and HMX as high as 3,000, 14,000, and 1,200 mg/kg respectively in sample MPSICS05 from Grid 3 north of Building 153. These areas of excavation are depicted in Figure E1-1. Recent sampling has also been performed in areas west of Building 158 which are identified in Figure E1-2. Analytical results show elevated levels of TNT, RDX, and HMX as high as 260, 830, and 100 mg/kg respectively in samples MPSICS23 and MPSIC25 in the area west of Building 158, Grids 11 and 12. Areas around Buildings 153 and 157 are also identified as potentially contaminated soil sources and are shown in Figures E1-3 and E1-4. Visual inspections and additional field sampling shall be conducted to identify contaminated soil sources beyond the grids identified, i.e., the extent of contamination. A summary table of the 1997 sample results with chain-of-custody (COC) forms is provided in Attachment E1-A of this Plan.

Based on review of the area to be excavated, an NSWC Crane Site Representative has provided an unexploded ordnance (UXO) survey clearance for work to proceed and a copy is provided in Attachment E1-A of this Plan. The excavation crew personnel have obtained awareness training in the associated hazards of potential UXO existing in subsurface soils. If visual observations indicate potential UXO is encountered in the area during work activities, all work will stop, the NSWC Crane Environmental Protection Department (EPD) representative will be contacted, and a surface UXO survey will be performed to identify and remove any unexploded ordnance prior to work resuming. Data has also been collected to create a topographical map of the site and to verify the quantities of material to be excavated. A copy of this map is Attachment E1-B of this Plan. Excavation permits will be obtained for all site activities prior to mobilization.



NOT TO SCALE

LEGEND

- BUILDING
- CONVEYOR
- STEAMLINE
- RAILROAD
- EXCLUSION ZONE LIMIT
- STRAW BALE SILT FENCE
- CONTAMINATION REDUCTION ZONE LIMIT
- L.M. LIGHTNING MAST
- S.M. SEWER MANHOLE
- *9 GRID NUMBER

NOTE:
1. FUTURE EXCAVATION GRIDS SHALL BE DEFINED BASED ON FIELD SAMPLE RESULTS.

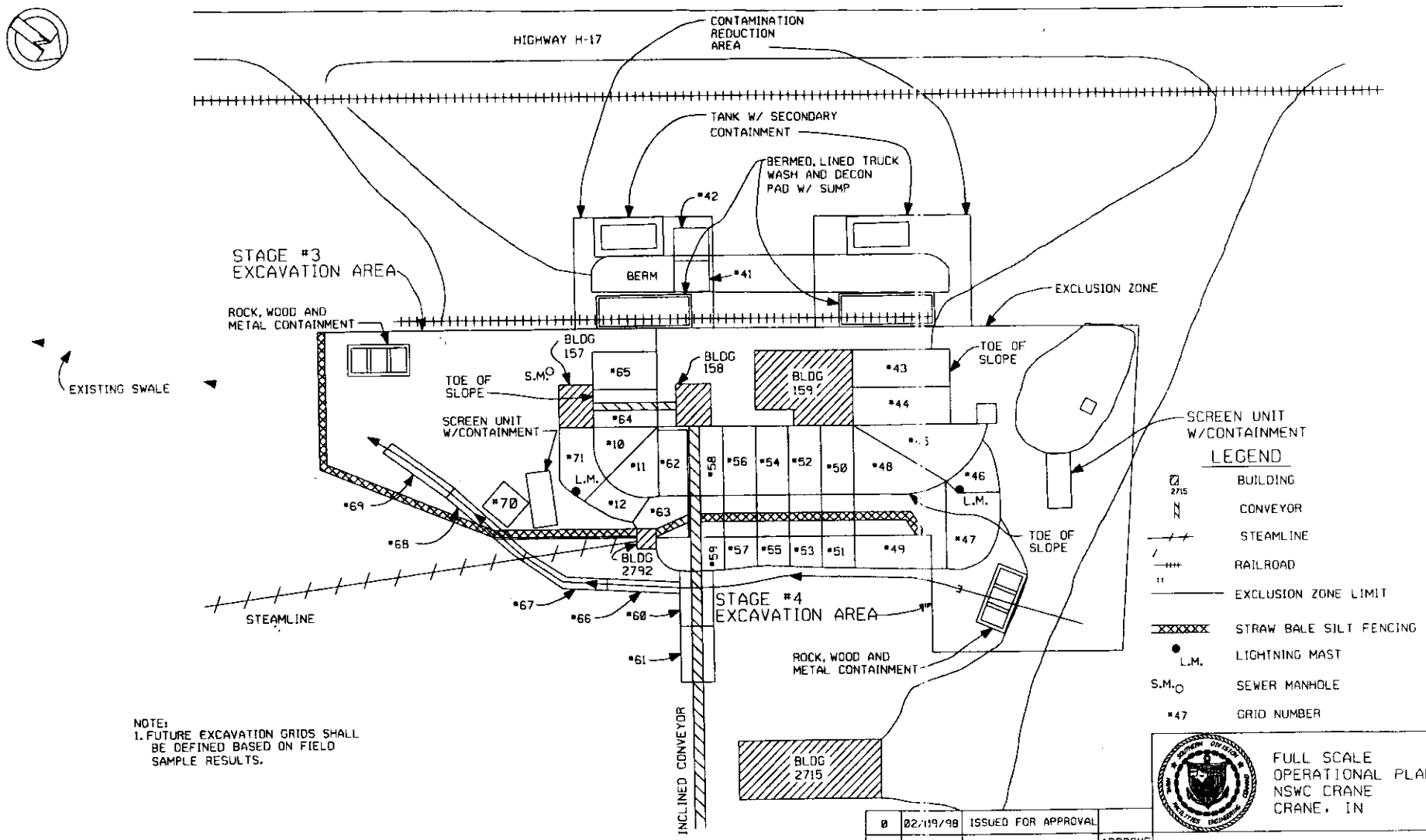
REV	DATE		APPROVE
0	02/19/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

FIGURE E1-1
SOIL EXCAVATION PLAN
MINE FILL A, BLDG 153 & 154

DWG DATE: 1/26/98 | FILE NAME: FIGE1-1.DGN



NOTE:
1. FUTURE EXCAVATION GRIDS SHALL BE DEFINED BASED ON FIELD SAMPLE RESULTS.

NOT TO SCALE

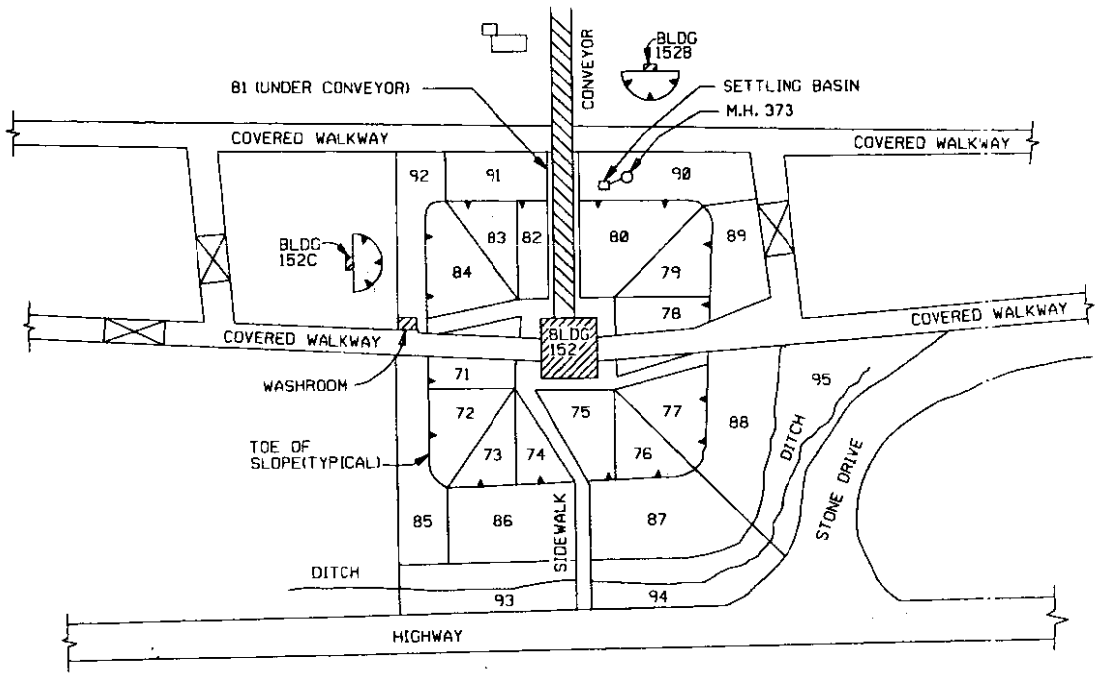
REV	DATE		APPROVE
0	02/19/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FULL SCALE OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

FIGURE E1-2
SOIL EXCAVATION PLAN
MINE FILL A, BLDG 158 & 159

DWG DATE: 1/26/98 | FILE NAME: FIGE1-2.DGN



NOT TO SCALE

LEGEND

	BUILDING
	CONVEYOR
M.H. 373	SEWER MANHOLE
	REMOVABLE PANEL

NOTES:

1. EXCLUSION ZONE AND EQUIPMENT LAYOUT WILL BE ESTABLISHED AFTER INITIAL SAMPLING HAS BEEN PERFORMED.
2. APPROXIMATELY 40' FROM TOP OF WALL TO TOE OF SLOPE ON GRIDS 71-77.

REV	DATE		APPROVE
0	02/19/98	ISSUED FOR APPROVAL	

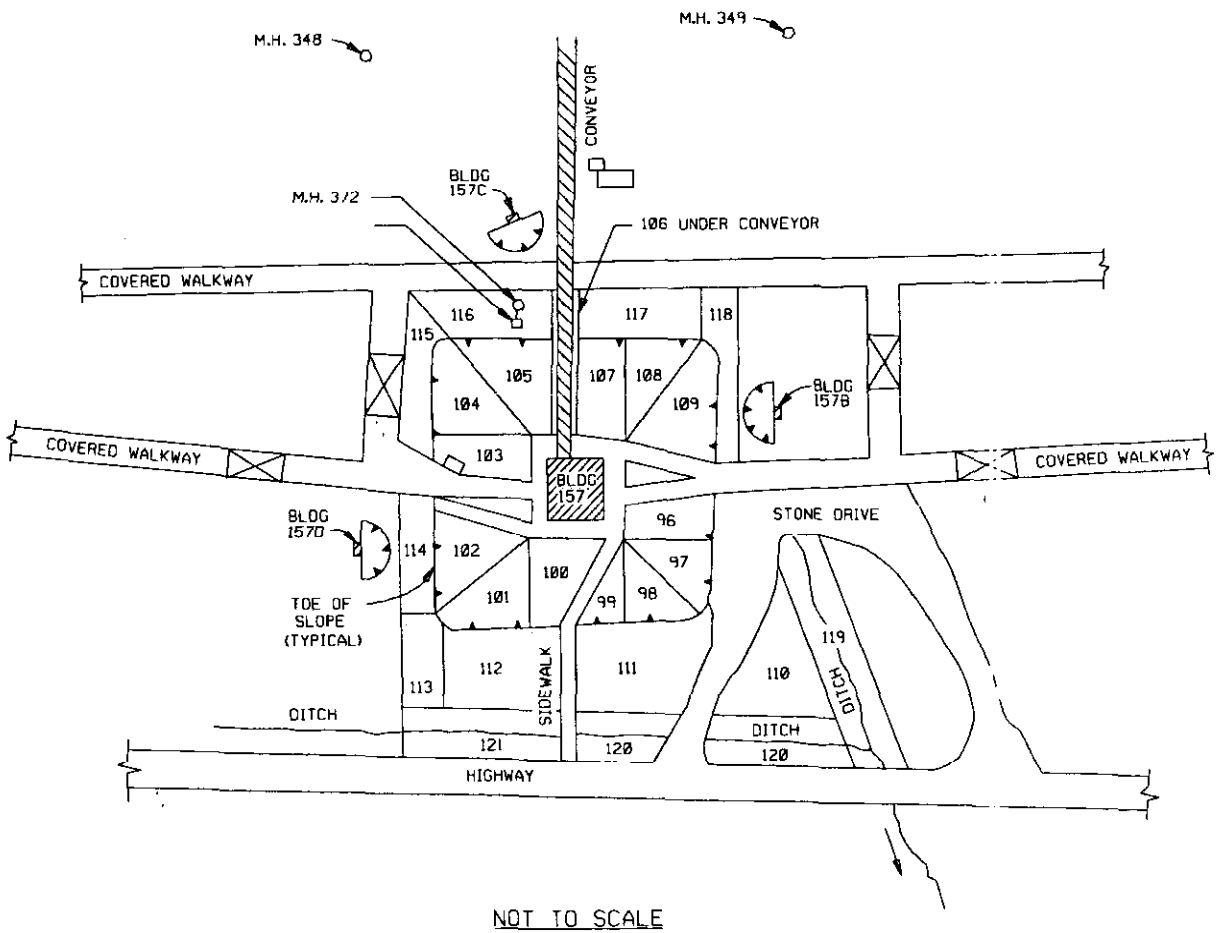
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

FIGURE E1-3
SOIL EXCAVATION PLAN
MINE FILL A, BLDG 152

DWG DATE: 01/26/98 | FILE NAME: FIGE1-3.DGN

FILE: FIGE1-3.DGN



NOT TO SCALE

LEGEND

- BUILDING
- CONVEYOR
- M.H. 349 SEWER MANHOLE
- REMOVABLE PANELS

NOTES:

1. EXCLUSION ZONE LAYOUT AND EQUIPMENT LAYOUT WILL BE ESTABLISHED AFTER INITIAL SAMPLING HAS BEEN PERFORMED.

REV	DATE		APPROVE
0	02/09/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

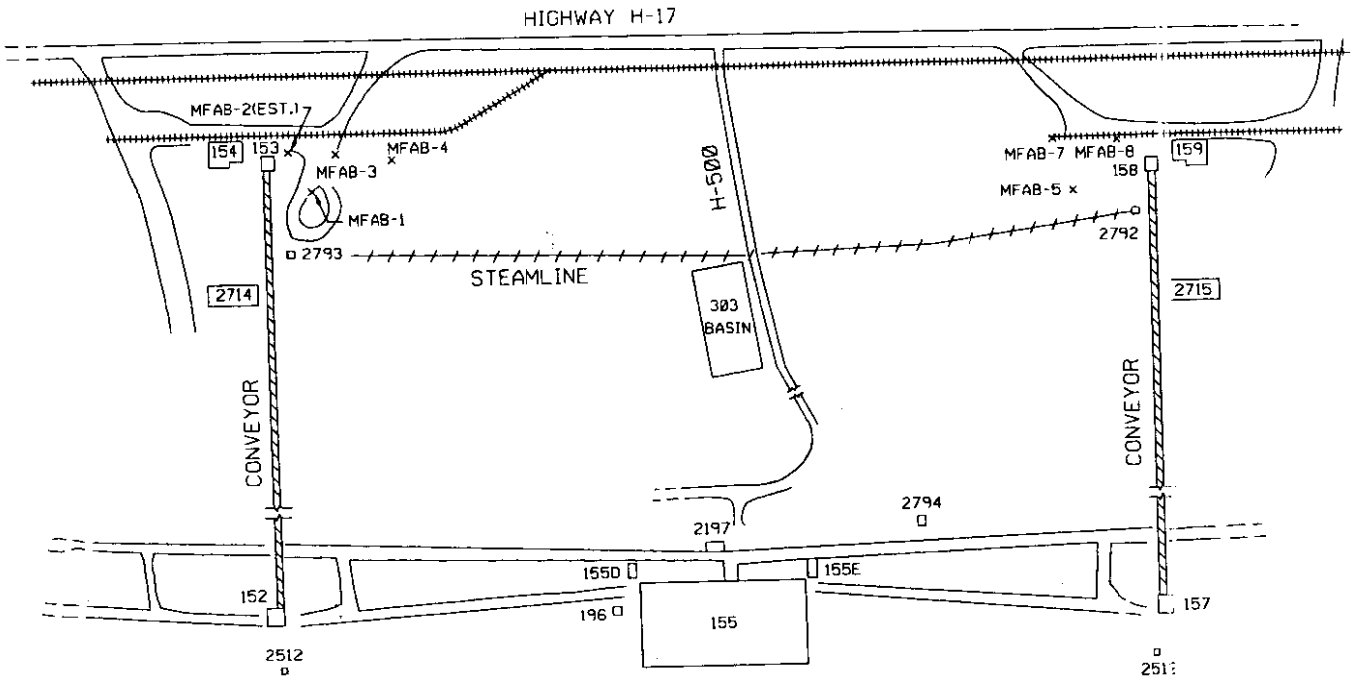
FIGURE E1-4
SOIL EXCAVATION PLAN
MINE FILL A, BLDG 157

DWG DATE: 01/26/98 | FILE NAME: FIGE1-4.DGN

FILE: FIGE1-4.DGN

TABLE E1-1 SUMMARY OF PREVIOUS SOIL BORING RESULTS - MINE FILL A			
Sample I.D./Location	**TNT (mg/kg)**	**HMX (mg/kg)**	**RDX (mg/kg)**
MFA-1/45 feet away from northeast corner of box bin at building 153	69	292	2,620
MFA-2/at base of berm 10 feet south of box bin	3,790	1,340	15,300
MFA-3/10 feet out from end of drain pipe	8	908	8,150
MFA-4/10 feet down ditch from MFA-3	<3.6	64	374
MFA-5/28 feet east of building 158, in ditch	64	99	906
MFA-7/two feet southeast of static pole south of building 158, in run-off ditch	<3.6	<5.0	<7.2
MFA-8/near base of berm, 15 feet west of corner of box bin	5.2	52	349

Notes:
1. Soil samples were collected from borings installed 20" below ground surface. Samples were analyzed for TNT, RDX and HMX. Reference for data and locations found on Figure E1-5 is *Final RCRA Facility Investigation Phase I, Environmental Monitoring Report, Solid Waste Management Units #19/00, #08/17, #12/14 and #13/14, Naval Surface Warfare Center, Crane Division, Crane, Indiana, Halliburton NUS (August 1992).*



LEGEND

- 2512 — BUILDING
- MFAB-2 × — PREVIOUS SAMPLING LOCATION(ESTIMATED)
- CONVEYOR
- STEAMLINE
- RAILROAD

(NOT TO SCALE)

REV	DATE		APPROVE
0	02/09/98	ISSUED FOR APPROVAL	

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN

FIGURE E1-5
MINE FILL A
SAMPLE LOCATIONS

DWG DATE: 1/26/98 | FILE NAME: FIGE1-5.DGN

FILE: FIGE1-5.DGN

2.0
MOBILIZATION

Prior to mobilization of excavation equipment, the work area configuration, the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and Support Zone (SZ), soil screener location, stockpile area, etc. shall be located as shown on Figures E1-1 through E1-4. The work area configuration is composed of the EZ boundary, the CRZ with appropriate decontamination stations, the SZ, run-on and run-off controls, and vehicle access routes. Tools, equipment, and supplies will be delivered to the site, barricades installed, and the personnel mobilized.

Prior to arrival on-site, the Contractor will inspect the equipment for the presence of dirt, oils, and grease. The general condition of the equipment will be inspected and tested to ensure that all safety systems and alarms are functional. The performance of the equipment will be tested to determine if the equipment can perform the required tasks.

A pre-excavation meeting will be held to review pertinent information including the excavation plan, figures, and the building foundation, area utility, and service drawings. All personnel scheduled to participate within the EZ shall attend the meeting and be briefed on the hazards and safety issues expected during the excavation activities.

3.0
SEDIMENT AND EROSION CONTROL

Storm-water and erosion control measures will be implemented as necessary to control storm-water run-on/ run-off and to prevent erosion. Straw bales will be placed along the edges of exclusion zones in sloped areas so that potential run-on and run-off are diverted in a manner that prevents surface water entry or exit from the excavation. During daily operations, open excavations will be covered during periods of precipitation to prevent contact waters from forming. Potentially contaminated storm-water that may collect in the excavation will be either sent directly to the Mine Fill A contaminated water pretreatment system or containerized and sampled to determine its disposition.

4.0
EXCAVATION AND SCREENING OF CONTAMINATED SOIL

4.1 PERMITS

Prior to initiating any excavating, a Digging Permit will be required. In addition, a statement of clearance for safe access based on the removal or absence of unexploded ordnance in the work zone has been obtained and is included in Attachment E1-A of this Plan.

4.2 SOIL EXCAVATION

An estimated 11,000 cubic yards of explosive contaminated soil will be excavated at Mine Fill A by a backhoe/loader and/or a skid steer loader. Particular attention will be paid to the areas near and about the Mine Fill buildings. Excavation will proceed cautiously due to the potential of unknown buried utilities and piping. NSWC Crane utility and building foundation drawings are provided in Attachment E1-B of this Plan.

Soil excavation will begin in areas with pre-determined grids near Buildings 153 and 158 as shown on Figures E1-1 and E1-2. Each grid will be excavated until confirmation sample results indicate that cleanup goals have met, however the maximum depth of excavation will not exceed two feet. If cleanup goals have not met and the area requires excavation in excess of two feet, NSWC Crane EPD will provide further direction. In areas of shallow bedrock, excavation will cease upon bedrock contact. Areas under construction will be identified and barricaded for personnel protection as described in the SSHP, Appendix A. The area will be sampled and covered to avoid leaving open excavations during periods of predicted precipitation. During daily operations, open excavations will be covered during periods of predicted precipitation to prevent contact waters from forming.

4.3 SOIL SCREENING

Contaminated soil will be screened at the excavation site to remove oversize material (1½" or larger) from the soil prior to transport to the Bioremediation Facility for Full-Scale composting. The excavated soil will be loaded into the soil screening equipment using a backhoe/loader, excavator, or trackhoe. The screening will be performed in accordance with Field Standard Operating Procedure (SOP) 1.0 in Appendix D using a screen with a minimum 50 ton/hr capacity. The screener is a standard design, portable, road legal for towing, self-powered, and has a feed hopper with grizzly bars, fines stacking conveyor and a reject (oversized material) discharge conveyor. The screening unit will be located in a bermed lined area to prevent run-off and cross contamination of the surrounding area as shown on Figures E1-1 through E1-4.

After processing, the screened material will be dropped from the fines stacking conveyor into a yard conveyor for direct loading into the live-bottom semi-tractor trailers for transport to the Bioremediation Facility. Prior to leaving the excavation site, all truck wheels and wheel wells will be decontaminated as described in Section 6.0 of this Plan. Loose soil on the truck bed exterior will be broomed or brushed off and placed back in the truck bed. The truck bed containing excavated soil will be covered with a tarp prior to transportation to the Bioremediation Facility.

The oversized material (larger than 1½ inches) that is screened out shall be separated into stockpiles, i.e., rocks, wood waste, and soil clods. The stockpiles will be located in bermed and lined storage areas adjacent to the site to prevent run-off from the piles. Each storage area will be a minimum of 10 feet by 10 feet, constructed using 10-mil or greater HDPE liner and will be located in a grid area of existing contaminated soil to be excavated during the full-scale operations. Prefabricated bins or pans may be placed on the lined area for containment of rejected material. All stockpiled material will be covered with plastic.

The soil clods shall be spread out within the EZ in a four to six inch thick layer, on a planned excavation area and allowed to dry sufficiently prior to pulverizing by the excavating equipment. The drying soil will be covered at the end of each day and during rain events to prevent saturation of the soil increasing the drying time. The soil shall then be cycled through the screener again.

Wood wastes, such as tree roots, lumber pieces etc., will be stockpiled in a covered, lined, and bermed area for use as a potentially contaminated bulking material for future full-scale operations. Rocks larger than 1 ½ inches in diameter will be decontaminated as described in Section 6.0 of this Plan. If the analysis of the final rinse water indicates levels of contaminants less than the cleanup levels, the rock will be used as a natural backfill material. If levels of contaminants are above the cleanup levels, the NSWC Crane EPD will be notified for disposition.

Potentially contaminated vegetation waste such as sod and Yucca plants shall be transported to the bioremediation facility, shredded if necessary, and incorporated into the compost piles.

Should other materials be found during the excavation activities, the Contractor shall notify the NSWC Crane EPD for disposition.

4.4 SOIL STOCKPILING

Stockpiling of screened soil in a building at the Bioremediation Facility may be performed during the winter months and inclement weather. The screened soil shall be placed in the building no closer than 30 feet from the open ends. The screened soil shall not be stockpiled in such a manner as to have soil in contact with the metal siding.

The slope of the pile shall be limited to contact at one foot below the top of the concrete wall.

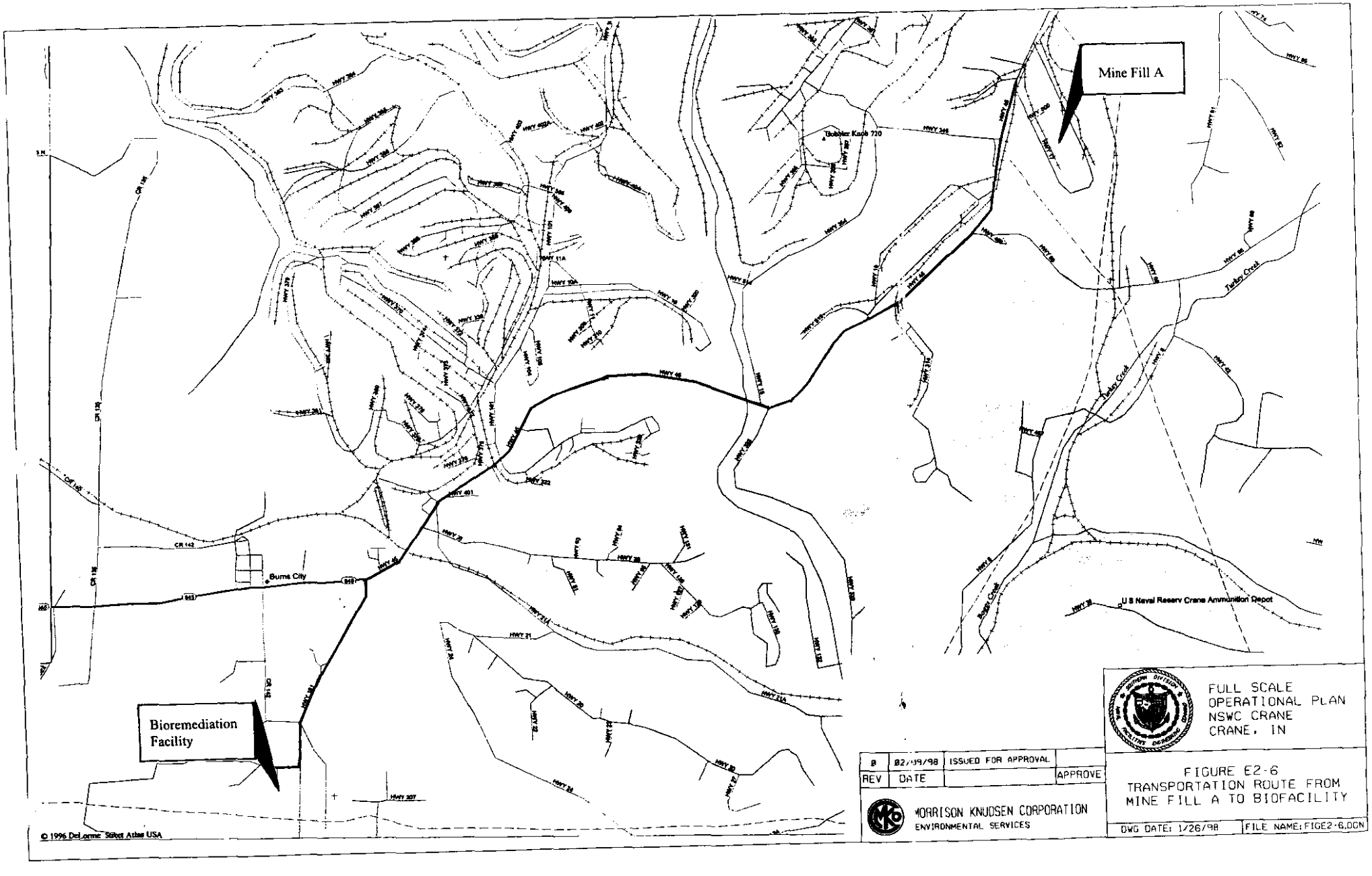
Portions of the stockpile not in use will be tarped or covered with plastic and weights to prevent dust from being transported out of the building during windy conditions. The coverings shall also limit the potential of leachate generation during heavy rainfall with high winds blowing into the building. Should covering of the contaminated soil prove to be insufficient during periods of high winds or heavy rainfall, a contingency plan to possibly enclose the southwest end or both ends of the building will be created and approved by the NSWC Crane EPD prior to implementation. The contingency plan includes providing retractable mesh or solid fabric curtains covering the entire width of the building openings. The eves of the building ends may remain open to aid in air circulation through the building.

4.5 SOIL TRANSPORTATION

The transport route may vary pending NSWC Crane operations during the periods of soil transport. However, the following transportation route to the Bioremediation Facility and Figure E1-6 should be utilized for the Mine Fill A excavation activities.

> The vehicles will exit the Mine Fill A facility by turning left onto Highway 45 (H-45). Travel south on H-45 for approximately 4½ miles and turn left on Highway 161 (H-161). Continue on H-161 past the golf course, and turn right onto the NSWC landfill entrance road. The Bioremediation Facility is immediately on the left.

Each truck load of screened soil will be weighed to determine and record the quantity and weight of soil entering the Bioremediation Facility. The trucks will be weighed at the truck scale at the entrance to the Bioremediation Facility access road as described in Field SOP 2.0 in Appendix D of this Plan.


Mine Fill A
Bioremediation Facility
Burns City
Bobbie Knob 720
Turkey Creek
U S Naval Reserv Crane Ammunition Depot
© 1996 DeLorme Street Atlas USA
FULL SCALE
OPERATIONAL PLAN
NSWC CRANE
CRANE, IN
FIGURE E2-6
TRANSPORTATION ROUTE FROM
MINE FILL A TO BIOFACILITY
REV
DATE
APPROVE
0
02/09/98
ISSUED FOR APPROVAL
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES
DWG DATE: 1/26/98
FILE NAME: FIGE2-6.DGN

5.0
SAMPLING

All sampling for waste, pre-excavation, in-process, and post-excavation characterization will be in accordance with the approved Full-Scale QAPP [MK, 1998a]. The QAPP describes sampling and analysis procedures including laboratory methodologies, Quality Assurance/Quality Control requirements, and field Standard Operating Procedures. The QAPP is bound under separate cover and is to be used in conjunction with this Soil Excavation Plan.

5.1 SAMPLING AREAS

Primary sampling areas will be designated north and northeast of Building 153 (in Figure E1-1) excluding grids 1 and 2 which have been previously excavated and backfilled during pilot-scale operations but may require additional excavation pending the establishment of full-scale cleanup levels. These areas encompass an earthen berm around Building 153 which is contaminated with explosives, based on previous sampling results. Additional sampling areas, north and west of the turn-around road will be grid using a nodal spacing noted on the drawings.

Areas around Building 158 (in Figure E1-2) will also be sampled, if necessary, to determine the extent of affected soil. Similarly, areas around Buildings 152 and 157 will be grid to determine the extent of affected soil to be excavated. The grids and excavation areas around Buildings 152 and 157 are shown in Figures E1-3 and E1-4 respectively.

Grid layout and boundaries will be affected by the presence of buildings, utilities, etc. Grid borders will be flagged in the field, and areas will be chosen which will be accessible by heavy equipment (i.e. individual grid blocks will not be placed in the midst of heavy utilities or surface structures). Grid blocks are not expected to be perfectly square (i.e. those in the berm).

5.2 PRE-EXCAVATION SOIL SAMPLING

Soil sampling will be performed in accordance with Section 4.0 of the approved Full-Scale QAPP [MK, 1998a]. Soil samples will be collected from each grid block or sampling area. Five grab samples will be collected: one from the center and one from near each of the four corners of each grid block. Grab samples will be composited using a procedure which will provide a more representative sample, as explosives contamination is known to vary over short distances (U.S. EPA, 1996). A total of two composites, one for the surface to 12-inch depth and one for the two-foot to three-foot depth, will be collected per grid block. Each composite sample will be analyzed for parameters listed in Table 6-1 and Section 1.3 of the Full-Scale Operations Plan. A

minimum of one sample for volatile organics analysis will be collected from the center of each grid block at the 12 to 18-inch depth and will not be composited.

5.3 MARKING GRID BLOCKS FOR EXCAVATION

Analytical results will be used to mark grid blocks or sampling areas as requiring excavation. If a grid block or sampling area shows contamination (off-site laboratory results TNT or RDX shows greater than cleanup goals in Table 1-2 of the Full-Scale Operations Plan) to a depth of three feet, the grid block or area will be marked for three feet of excavation. If a grid block or area shows contamination at the one-foot depth, the block or area will be marked for one foot of excavation. If a grid block shows no contamination at the one-foot and the three-foot depth, the grid block shall not be marked for excavation. Additional grid blocks will be sampled as necessary to allow excavation of the required volume of soil.

5.4 IN-PROCESS EXCAVATION SOIL SAMPLING

Field test kits for explosives will be used to delineate the horizontal and vertical extent of contamination during excavation activities, followed by confirmation sampling and laboratory analysis. After the initial and in-process excavation activities are complete in each grid, the horizontal and vertical extent of remaining contaminants will be determined by using colorometric field test kits for TNT and RDX as described in Section 4.0 of the approved Full-Scale QAPP [MK, 1998a]. A sampling grid will be laid out along the base of the excavation(s), using a nodal spacing provided in Figures E1-1 through E1-4 of this Plan. Each grid block will be sampled using procedures described in the approved Full-Scale QAPP [MK, 1998a] for in-process excavation sampling. Discrete samples will be collected from the four corners and center of the grid block, from surface to six inches below ground surface within the excavation, using a drive sampler, composited and analyzed for TNT and RDX (field test kits).

Pin flags will be placed every 20 feet along sidewalls greater than one foot in depth. Samples will be collected at each pin flag location, using a drive sampler. One sample will be collected from 0-6 inches into the sidewall surface at the midpoint between the surface and bottom of excavation. The sample will be analyzed for TNT and RDX (field test kits).

After the soil is excavated to a depth where field screening indicate acceptable concentrations of explosives, post-excavation soil samples will be collected for analysis by a laboratory. Post-excavation soil samples will be taken as described in Section 5.5 of this Plan.

5.5 POST-EXCAVATION SOIL SAMPLING

Once soil has been removed, the open excavation at Mine Fill A will be sampled and

covered. After analytical results are obtained and determined to meet the cleanup levels, the excavation shall be backfilled from an approved on-site borrow source. The on-site borrow source will be sampled and approved based on analytical results prior to temporary backfilling operations.

The purpose of sampling the excavation is to determine the level of contamination remaining, with respect to explosives, totals of site-specific metals and site-specific VOCs. A sampling grid will be laid out along the base of the excavation(s), using a nodal spacing as provided in Figures E1-1 through E1-4 of this Plan. Each grid block will be sampled using procedures described in the approved Full-Scale QAPP [MK, 1998a] for pre-excavation sampling. However, only one composite sample and one grab sample (for VOCs) will be collected from each grid block. The composite sample will be analyzed for totals of site-specific metals and explosives, and will be collected from the surface to six-inch interval in a manner similar to pre-excavation composite samples. The grab sample will be analyzed for site-specific VOCs, and will be collected from the center of the grid block, six inches below ground surface, using a drive sampler.

Pin flags will be placed every 20 feet along sidewalls greater than one foot in depth. Samples will be collected at each pin flag location, using a drive sampler. One sample will be collected from 0-6 inches into the sidewall surface at the midpoint between the surface and bottom of excavation. The sample will be analyzed for site-specific metals, explosives analysis, and site-specific VOCs analysis.

6.0
DECONTAMINATION

6.1 EXCAVATION DECONTAMINATION FACILITY

The excavation site equipment decontamination facility shall be constructed of a single sheet of 60-mil high-density polyethylene (HDPE), polyvinyl chloride (PVC) drain pipe, sandbags or cinder blocks, wood frame side walls, if necessary, and a container to collect decontamination water. The HDPE liner shall be placed over sand or smooth clay bedding material. The sides shall be constructed of the liner draped over sandbags or a bermed perimeter of other material such as 16 inch PVC pipe. The decontamination facility shall be sloped to a sump or collection area. A single sheet of HDPE shall cover the base of the decontamination facility. If the ground is too soft to support the decontamination pad, plywood may be used as a base for support. The decontamination facility shall be clearly delineated with orange construction fence, wire and signs, or equivalent.

The liner will be visually inspected before use on a daily basis to detect possible failures of the liner material. Inspection of the excavation site decontamination will be performed using checklist provided in Appendix F of the Full-Scale Operational Plan. The inspection process will consist of checking for the following:

- Evidence of tears and holes.
- Evidence of seepage.
- The sheeting is adequately fastened to the side walls.
- The liner adequately covers the sandbags or berms at the end section.

If the liner is damaged, it will be repaired or replaced before further use of the facility. Any soil beneath the liner in the area of the breach will be sampled and analyzed for contaminants.

Records will be maintained specifying facility construction material and methods, disposition of liquids and solids, daily inspections, and any repairs and/or breaches of liner integrity.

All decontamination fluids collected in the sump will be containerized at the end of each shift during periods of predicted precipitation. The collected fluids will be sampled to determine disposal requirements. If precipitation is predicted, the decontamination pad will be covered to prevent accumulation of storm-water.

6.2 EQUIPMENT DECONTAMINATION

Prior to exiting the excavation site, loaded trucks will be inspected for exterior cleanliness. In case of spillage of contaminated soil onto the truck exterior or if the truck is driven over a contaminated area, the decontamination process will take place at the excavation site decontamination pad. The equipment decontamination procedure is described in detail in Field SOP 7.0 provided in Appendix D of the Full-Scale Operational Plan.

6.3 GRAVEL/ROCK DECONTAMINATION

Periodically, the need for washing of gravel and/or rocks will occur when excavating in roadway areas, near building foundations, or rocky terrain. The rocks and boulders in the oversized material rejected from the soil screening process will be sorted out from the soil clumps and vegetation (logs, stumps, roots, brush, rotten wood, and other refuse) as described in Section 4.3 of this Plan. The separated rocks or gravel will be loaded into container and taken to the decontamination pad. The rocks and or gravel will be thoroughly washed of all visible signs of soil with the high-pressure, low-volume spray wash unit as described in Field SOP 7.0 found in Appendix D of the Full-Scale Operational Plan. Visual examination and rinse water samples, tested for explosives using laboratory analysis, will be used for verification of rock decontamination. The wash and rinse water will be collected and treated in the Mine Fill A water treatment facility or sampled per Table 6-1 of the Full-Scale Operational Plan and disposed of at the on-site sewer treatment system or disposed of as directed by NSWC Crane EPD. Figure 1-4 of the Full-Scale Operational Plan provides the decision-making flowchart for the rock decontamination.

7.0
SITE CLEANUP AND DEMOBILIZATION

As equipment is no longer required in the EZ it will be decontaminated and moved to the SZ. After all contaminated materials are containerized, the remaining equipment will be decontaminated and moved to the SZ. The decontamination equipment will then be cleaned and the work zone barriers removed. After all equipment has been decontaminated, the decontamination facility will be dismantled. The contaminated materials will be managed according to NSWC Crane EPD requirements.

All decontamination fluids will be collected, sampled, and either be disposed at the on-site sewage treatment plant; or disposed at the Mine Fill A treatment facility; or disposed of in a method approved by the NSWC Crane EPD.

After the decontamination facility has been dismantled and removed, the underlying surface will be visually inspected. Visibly contaminated material will be removed and managed as a potentially affected material, according to NSWC Crane EPD management procedures.

8.0
BACKFILLING AND SITE RESTORATION

The extent of any excavation and the points at which post-excavation samples were taken will be surveyed to determine the volume of the excavation, to record the extent of the excavation, and to record the location of the post-excavation samples. The post-excavation sampling is further described in Section 4.5 of the approved Full-Scale QAPP [MK, 1998a]. The excavation will be backfilled to grade with non-contaminated fill from an on-site NSWC Crane EPD-approved borrow source at the end of the excavation period.

If an excavation is to remain open for an extended period of time due to equipment down time, berms will be placed around the excavation and the excavation covered to prevent run-on or run-off during a rain event.

The backfill material may be placed in 12-inch lifts or lifts based on use of area as approved by NSWC Crane EPD. Backfilled areas may be covered with a minimum of three inches of topsoil (which may include the treated soil compost material), seeded with native grasses, fertilized, and watered. Erosion control measures, if used, will be maintained until the growth of grasses is sufficient to prevent erosion.

If structures are destroyed during excavation, they will be restored to acceptable condition as approved by NSWC Crane EPD and Navy ROICC.

9.0
REFERENCES

Halliburton, 1992. *Final RCRA Facility Investigation Phase I, Environmental Monitoring Reports; Solid Waste Management Units #19/00, #08/17, #12/14, #13/14; Naval Surface Warfare Center, Crane Division, Crane, Indiana.* Halliburton NUS Environmental Corporation. August.

MK, 1998a, *Quality Assurance Project Plan (QAPP) For Full-Scale Operations at the Soils Bioremediation Facility at NSWC Crane, Crane, Indiana*, Delivery Order No. 0009, Contract No. N62467-93-D-1106. February 1998.

MK, 1998b, *Appendix A to the Full-Scale Operational Plan; Full-Scale Site Safety and Health Plan at NSWC Crane, Crane, Indiana*, Delivery Order No. 0009, Contract No. N62467-93-D-1106. February 1998.

U.S. Environmental Protection Agency, 1996. EPA Federal Facilities Forum Issue; *On-site Analytical Methods And Field Sampling For Explosives In Soil.* A. B. Crockett, H. D. Craig, T. F. Jenkins, and W. E. Sisk. Draft Version 6, May 1996.

ATTACHMENT E1-A
UXO CLEARANCE AND 1997 ANALYTICAL RESULTS

ATTACHMENT E1-A
UXO CLEARANCE AND 1997 ANALYTICAL RESULTS

TABLE OF CONTENTS

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Clearance Letter dated May 30, 1995	3 pages
Chain-of-Custody Record	8 pages
Analytical Results	6 pages

DEPARTMENT OF THE NAVY
OFFICER IN CHARGE OF
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACTS
CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
BUILDING 2516
CRANE, INDIANA 47522-5082

4330
OICC
30 May 95

RECEIVED
JUN 01 1995
MK-CRANE

Morrison Knudsen Corp.
CTR 12
NSWC Crane In
Crane, IN 47522

Subj: Contract N62467-93-D-1106, ENVIRONMENTAL RAC CONTRACT
4324-0009 NSWC-CRANE

Encl: NSWC Memo code 067 dtd. 22 May 95.

Gentlemen:

Enclosed is the EOD clearance for the remedial sites as requested. Should you have any questions, please call me at 812-854-3318.

Sincerely,

Brent Robertson
Navy Technical Representative

cc: Caryl Hickel; SDIV Code 0514 w/o enlc.
Jimmy Jones; SDIV Code 18011 w/o encl.
Adrienne Wilson; SDIV Code 1864 w/o encl.
File

GOT Copy

NSWC - CRANE 4324-0009			
PROJECT MEMBER	ACT	INFO	INIT
PROJECT MANAGER			
PROJECT ENGINEER	X		
GNL SUPT			
SAFETY AND HEALTH		✓	OK
QA/QC SUPERVISOR			
PROJECT CONTROLS			
FIELD ENGINEERING			
PMO-CHARLESTON		✓	OK
FILE: 11,011.F			
FILE: 18,001.F			
FILE:			

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

IN REPLY REFER TO:

8020
067
22 May 95

MEMORANDUM

From: Explosives Safety Officer
To: Officer in Charge of NAVFAC Contracts

Subj: CONSTRUCTION CONTRACT N62467-93-C-1106, ENVIRONMENTAL RESPONSE ACTION CONTRACT

Ref: (a) OIC for NAVFAC Contracts memo OIC 4330 of 12 May 95

1. In response to reference (a), the following information is provided regarding the known history of the sites making up the various work areas:

a. Lithium Battery Burial Site - This area has no history of ordnance dumping being only a designated land fill for inert materials.

b. PCB Capacitor Burial Site - This dump site is fairly new and no historical information exists to suggest it being used for any dumping except inert materials.

c. Battery Shop - The area and the type of work conducted in the area suggests no involvement with explosive ordnance.

d. Highway 58 Dump site A - The location of this site to ordnance functions may make the presence of "ordnance looking" material possible. In reviewing the way materials were disposed of through the years, there is no strong evidence to suggest live ordnance was "dumped" as opposed to being processed through the Detonation Range. This is so because the Detonation Range has been a viable alternative for the destruction of ordnance materials since 1946. There has been inert (concrete filled) hardware dumped at various sites throughout the years because no other alternative was available. Such hardware as 12.75" warheads (Hedgehog) were found dumped near some of the buildings and used as filler to prevent land erosion. These items caused quite a stir when first uncovered until a check was made as to their make-up and purpose.

e. Highway 58 Dump site B - Same comment as for Dump site A.

f. Dye Burial Ground - Though not much is known about this burial plot, the only evidence that exists illustrates that bulk dye was dumped in open trenches and that hardware (especially containing explosives) was not a factor.

Subj: CONSTRUCTION CONTRACT N62467-93-C-1106, ENVIRONMENTAL RESPONSE ACTION CONTRACT

g. Bioremediation Facility Area - This area was identified because of the land configuration (flat with minimal explosives safety quantity distance controls) and no record exists in this office regarding its use as a dumping ground.

h. Cast High Explosives/Incinerator Building - As a cast high explosives area, the probability of uncovering unexploded ordnance is minimal. As the Incinerator Building, there is a probability that ordnance parts (fuze bodies, small caliber projectiles etc.) can be found in the area surrounding the Building 146 facility.

i. Sludge Drying Beds A & B - There is no risk of unexploded ordnance or ordnance looking hardware being in these two beds.

j. Rockeye - There is no reason to believe unexploded ordnance exists in this area.

k. Ammunition Burning Ground - There is evidence that ordnance looking hardware could be found in this area. Of all the excavation that has been conducted for the purpose of cleaning up ash pits and so on, there has been minimal active explosive material found.

l. Mine Fill A - There is no evidence to suggest that unexploded ordnance was ever dumped in this area.

m. Mine Fill B - Same comment as for Mine Fill B.

2. Point of contact is Dale Groh, Code 067, Building 12, Extension 3601.

D. L. Groh

D. L. GROH

COC #(6)

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 4324-0009-07

Project Name: NSWC-CRANE / MINE FILL A

Samplers: (Signature) Ann M. Simon

Sampler: (Print) ANN M. SIMON

Analysis Required

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Method 8270 VOCS-SIM Method	Metals-Fe, Pb, Cr, Cd	TCLP-metals	Explosives	RCRA metals	Remarks
soil	GRIDBLOCK 1-shallow 6-12"	2/19/97	1450	MPSTCS01		X	X	X	X	X		14-day
soil	GRIDBLOCK 1-deep 2-2.5"	2/19/97	1610	MPSICS02		X		X	X	X		TAT
water	TRIPBLANK	[illegible]	[illegible]0	MPSTS0219			X					
water	Field Blank A	2/20/97	0745	MPSFA0220			X			X	X	
water	Rinse Blank	2/20/97	1135	MPSRE0220			X			X	X	
soil	GRID BLOCK 2-deep	2/20/97	1120	MPSICS04				X	X	X		
soil	GRID BLOCK 2-shallow	2/20/97	1025	MPSTCS03			X	X	X	X		
water	Field Blank B	2/20/97	1500	MPSFB0220		X	X			X	X	

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
[signature] / MKC	2/20/97 1700				
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

COC # [illegible]

Project No.: 4724-[illegible]-07

Project Name: [illegible] / [illegible] A

Samplers: (Signature): [illegible]

Sampler: (Print) [illegible]

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Method 8240 VOC. Est. List		Metals-Total Cr, Cd, Pb			TCLP: Metals, Pesticides											Remarks
SOIL	GRID LOCK #3 6-12"	2/24/97	0945	MPSIC505		X	X		X			X		X									14 DAY
SOIL	[illegible]	2/24/97	1040	MPSIC506		X			X			X		X									THT
WATER	[illegible]	2/24/97	1200	MPSTRC234		X	X																↓
SOIL	GRIDLOCK #4 6"-12"	2/24/97	1320	MPSIC507		X	X		X			X		X									↓
SOIL	GRIDLOCK #4 18"-24"	2/24/97	1400	MPSIC508		X			X			X		X									
																							Southwest
																							Laboratory

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
[illegible]	[illegible]				
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000 COC PS003

Project No.: 4324.0009.07
Project Name: MSIUC - Crane / Mill A
Samplers: (Signature)
Sampler: (Print) Sam Tate, Jr.

Analysis Required

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Method 8240 VOC's-Secondary	Metals As, Cd, Cr, Pb	TCLP Metals	Explosives	RCRA Metals	Remarks
Soil	Grid Block #5 6"-12"	2/25/97	0914	MPSICS09		X	X	X	X	X		14 Day
Soil	Grid Block #5 2'-2.5'	2/25/97	1025	MPSICS10		X		X	X	X		Turnaround
Soil	Grid Block #5 ~~2'-2.5'~~ 6"-12"	2/25/97	0914	MPSICS11		X	X	X	X	X		
												Southwest
Water	Trip Blank	2/25/97	1200	MPSTB0225		X						Laboratories
Water	Rinse Blank	2/25/97	1315	MPSRB0225		X					X	
Soil	Grid Block #6 6"-12"	2/25/97	1402	MPSICS12		X	X	X	X	X		
Soil	Grid Block #6 2'-2.5'	2/25/97	1447	MPSICS13		X		X	X	X		

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Relinquished By: (Signature)	Date/Time	Received By: (Signature)
Company: Morrison Knudsen Corp	2/25/97 1700	Company:	Company:		Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Received for Laboratory By: (Signature) Company:	Date/Time	Total No. Samples This Shipping Container: Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Doc# P5004

Project No.: 4324-0009-07

Project Name: Nsluc Cyanide / Minidill A

Samplers: (Signature)

Sampler: (Print) Samuel Tate Jr.

Analysis Required

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	See attached	VOC - Method 8260	Metals BA, Cd, Cr, Pb	TCLP Metals	Explosives								Remarks
Soil	Grid Block 7 Shallow	3/27/97	1235	CRA MPSICS14		X	X		X	X	X								14 Day
Soil	Grid Block 7 Deep	3/27/97	1305	CRA MPSICS15		X			X	X	X								Turnaround
Water	Trip Blank	3/27/97	1200	CRA MPSTB		X	X		SPT. X										Southwest
																			Laboratories
~~Soil~~	~~Grid Block 9 Shallow~~			~~CRA MPSICS16~~		~~X~~	~~X~~		~~X~~	~~X~~	~~X~~	~~S.TAT~~							
~~Soil~~	~~Grid Block 9 Deep~~			~~CRA MPSICS17~~		~~X~~			~~X~~	~~X~~	~~X~~	~~S.TAT~~							

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Morrison Knudsen Corp	3/27/1600				
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

COC# 85005

Project No.: 4324-[illegible]
Project Name: [illegible] / [illegible] 1/11 A
Samplers: (Signature) [illegible]
Sampler: (Print) [illegible]

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	VOC [illegible]	Metals, Barium, Cr, Pb	TCLP Metals	Explosives	Remarks
Soil	[illegible] Shallow	3/31/97	1142	CRA MPSTC16		X	X	X	X	X	14 Day
Soil	[illegible] Deep	3/31/97	1315	CRA MPSTC17		X		X	X	X	Turnaround
Water	Field Blank	3/31/97	0900	CRA MPSTC0328		X	X				
											Southwest
Soil	[illegible] Shallow	3/31/97	1312	CRA MPSTC18		X	X	X	X	X	Laboratories
Soil	[illegible] Deep	3/31/97	1438	CRA MPSTC19		X		X	X	X	
Soil	[illegible] Deep	3/31/97	1428	CRA MPSTC20		X	X	X	X	X	

Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company
[illegible] / [illegible]	3/31/97 1330				
Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company
Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Received for Laboratory By: (Signature) / Company	Date/Time	Total No. Samples This Shipping Container: / Company
Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 432 4-000 9-07

Project Name: NSWC Crane / Mini Fill A

Samplers: (Signature) [illegible]

Sampler: (Print) [illegible] Samuel Tate Jr.

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	VOC - Ethanol Spike	Explosives	RCRA Metals	Remarks
Water	Trip Blank	9/30/97	0960	CRA HBTB0228		X	X			14 Day
Water	Rinse Blank	9/30/97	1520	CRA HPSRB0228		X	X	X	X	Turnaround
Water	Field Blank A	9/30/97	0930	CRA HPSFA0228		X	X	X	X	
Water	Field Blank B	9/30/97	1530	HPSFB0228		X	X	X	X	Southwest
										Laboratories

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
[illegible] / Morrison Knudsen Corp	9/30/97 1830				
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000 CEC# 15007

Project No.: 4324-004-007

Project Name: NSWC CRANE / MINE FILL A

Samplers: (Signature)

Sampler: (Print) JEFF CHERTON

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	VOC - METHOD 8240	METALS PER CLP	TCLP METALS	EXPLOSIVES	RCRA METALS	Remarks
WATER	TRIP BLANK	3/11/97	0800	CRA MIPSTB0311A		X	X					14 DAY
												TURNAROUND
SOIL	GRID BLOCK #10 SHALLOW	3/11/97	0900	CRA MIPSIC521		X	X	X	X	X		
SOIL	GRID BLOCK #10 DEEP	3/11/97	0940	CRA MIPSIC522		X		X	X	X		SOUTHWEST
												LABORATORIES
SOIL	GRID BLOCK #11 SHALLOW	3/11/97	1015	CRA MIPSIC523		X	X	X	X	X		
SOIL	GRID BLOCK #11 DEEP	3/11/97	1045	CRA MIPSIC524		X		X	X	X		
SOIL	GRID BLOCK #12 SHALLOW	3/11/97	1315	CRA MIPSIC525		X	X	X	X	X		
SOIL	GRID BLOCK #12 DEEP	3/11/97	1345	CRA MIPSIC526		X		X	X	X		

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
[illegible]	3/14/97 1600				
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

PS008

Project No.: 4331-0009-07

Project Name: Nine Creek / Mill Pond A

Samplers: (Signature)

Sampler: (Print) JEFF CRAWFORD

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	VOC-Method 8240	Explosives	RCRA Metals	Remarks
Water	Trip Blank	3/11/97	1200	CRA MPSTBC311C		X	X			14 Day
Water	Field Blank	3/11/97	1400	CRA MPSRBC311		X	X	X	X	Turnaround
Water	Field Blank A	3/11/97	1415	CRA MPSFA0311		X	X	X	X	
Water	Field Blank B	3/11/97	1430	CRA MPSFB0311		X	X	X	X	Sediment
										Laboratories

Relinquished By: (Signature)	Date/Time	Received By: (Signature)	Relinquished By: (Signature)	Date/Time	Received By: (Signature)
Company: Morrison Knudsen Corp.	3/11/97 1610	Company:	Company:		Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Received for Laboratory By: (Signature) Company:	Date/Time	Total No. Samples This Shipping Container: Company:
Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:	Relinquished By: (Signature) Company:	Date/Time	Received By: (Signature) Company:

SiteID	MPSICS01		MPSICS02		MPSTB0219	MPSFA0220		MPSFB0220		MPSICS03		MPSICS04		MPSRB0220	
SampleDate	2/19/97		2/19/97		2/19/97	2/20/97		2/20/97		2/20/97		2/20/97		2/20/97	
Explosives															
HMX	77000	UG/KG	59000	UG/KG	N/A	13.0 U	UG/L	13.0 U	UG/L	120000	UG/KG	5800	UG/KG	13.0 U	UG/L
RDX	690000 D	UG/KG	480000 D	UG/KG	N/A	14.0 U	UG/L	14.0 U	UG/L	1000000 D	UG/KG	31000	UG/KG	14.0 U	UG/L
TNB	1250 U	UG/KG	1250 U	UG/KG	N/A	7.30 U	UG/L	7.30 U	UG/L	1250 U	UG/KG	250 U	UG/KG	7.30 U	UG/L
DNB	1250 U	UG/KG	1250 U	UG/KG	N/A	4.00 U	UG/L	4.00 U	UG/L	1250 U	UG/KG	250 U	UG/KG	4.00 U	UG/L
TETRYL	3250 U	UG/KG	3250 U	UG/KG	N/A	10.0 U	UG/L	10.0 U	UG/L	3250 U	UG/KG	650 U	UG/KG	10.0 U	UG/L
NB	1300 U	UG/KG	1300 U	UG/KG	N/A	7.00 U	UG/L	7.00 U	UG/L	1300 U	UG/KG	260 U	UG/KG	7.00 U	UG/L
TNT	66000	UG/KG	7900	UG/KG	N/A	6.40 U	UG/L	6.40 U	UG/L	210000 D	UG/KG	4600	UG/KG	6.40 U	UG/L
4ADNT	1250 U	UG/KG	1250 U	UG/KG	N/A	7.00 U	UG/L	7.00 U	UG/L	1250 U	UG/KG	250 U	UG/KG	7.00 U	UG/L
2ADNT	1400 P	UG/KG	850 J	UG/KG	N/A	12.0 U	UG/L	12.0 U	UG/L	1250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L
26DNT	1300 U	UG/KG	1300 U	UG/KG	N/A	9.40 U	UG/L	9.40 U	UG/L	1300 U	UG/KG	260 U	UG/KG	9.40 U	UG/L
24DNT	1250 U	UG/KG	1250 U	UG/KG	N/A	5.70 U	UG/L	5.70 U	UG/L	1250 U	UG/KG	250 U	UG/KG	5.70 U	UG/L
2NT	1250 U	UG/KG	1250 U	UG/KG	N/A	12.0 U	UG/L	12.0 U	UG/L	1250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L
4NT	1250 U	UG/KG	1250 U	UG/KG	N/A	8.00 U	UG/L	8.00 U	UG/L	1250 U	UG/KG	250 U	UG/KG	8.00 U	UG/L
3NT	1250 U	UG/KG	1250 U	UG/KG	N/A	7.90 U	UG/L	7.90 U	UG/L	1250 U	UG/KG	250 U	UG/KG	7.90 U	UG/L
Total Metals															
Mercury	N/A		N/A		N/A	10 U	UG/L	0.1 U	UG/L	N/A		N/A		0.1 U	UG/L
Arsenic	N/A		N/A		N/A	26.4	UG/L	10 U	UG/L	N/A		N/A		10 U	UG/L
Barium	110	MG/KG	69.5	MG/KG	N/A	3 U	UG/L	2 U	UG/L	114	MG/KG	97.4	MG/KG	2 U	UG/L
Cadmium	0.251 U	MG/KG	0.243 U	MG/KG	N/A	4 U	UG/L	3 U	UG/L	0.25 U	MG/KG	0.251 U	MG/KG	3 U	UG/L
Chromium	20.3	MG/KG	14.6	MG/KG	N/A	4.5	UG/L	4 U	UG/L	18.9	MG/KG	15.7	MG/KG	4 U	UG/L
Lead	18.8	MG/KG	13.3	MG/KG	N/A	0.1 U	UG/L	3 U	UG/L	22.4	MG/KG	17.3	MG/KG	3 U	UG/L
Silver	N/A		N/A		N/A	5 U	UG/L	5 U	UG/L	N/A		N/A		5 U	UG/L
Selenium	N/A		N/A		N/A	6 U	UG/L	6 U	UG/L	N/A		N/A		6 U	UG/L
TCLP Metals															
Mercury	0.001 U	MG/L	0.001 U	MG/L	N/A	N/A		N/A		0.001 U	MG/L	0.001 U	MG/L	N/A	
Arsenic	0.1 U	MG/L	0.1 U	MG/L	N/A	N/A		N/A		0.1 U	MG/L	0.1 U	MG/L	N/A	
Barium	0.73	MG/L	0.96	MG/L	N/A	N/A		N/A		0.888	MG/L	0.67	MG/L	N/A	
Cadmium	0.004 U	MG/L	0.004 U	MG/L	N/A	N/A		N/A		0.004 U	MG/L	0.004 U	MG/L	N/A	
Chromium	0.005 U	MG/L	0.005 U	MG/L	N/A	N/A		N/A		0.005 U	MG/L	0.005 U	MG/L	N/A	
Lead	0.04 U	MG/L	0.04 U	MG/L	N/A	N/A		N/A		0.04 U	MG/L	0.04 U	MG/L	N/A	
Silver	0.005 U	MG/L	0.005 U	MG/L	N/A	N/A		N/A		0.005 U	MG/L	0.005 U	MG/L	N/A	
Selenium	0.1 U	MG/L	0.1 U	MG/L	N/A	N/A		N/A		0.1 U	MG/L	0.1 U	MG/L	N/A	
Volatile Organics															
Vinyl Chloride	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	10 U	UG/L	12 U	UG/KG	N/A	10 U	UG/L
Methylene Chloride	3 J	UG/KG	N/A		5 U	UG/L	7	UG/L	5 U	UG/L	2 J	UG/KG	N/A	5 U	UG/L
Acetone	12 U	UG/KG	N/A		10 U	UG/L	76	UG/L	14	UG/L	12 U	UG/KG	N/A	13	UG/L
1,1-Dichloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
Chloroform	6 U	UG/KG	N/A		5 U	UG/L	23	UG/L	5 J	UG/L	6 U	UG/KG	N/A	4 J	UG/L
1,2-Dichloroethane	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
2-Butanone	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	10 U	UG/L	12 U	UG/KG	N/A	10 U	UG/L
Carbon Tetrachloride	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
Trichloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
Benzene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
4-Methyl-2-Pentanone	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	10 U	UG/L	12 U	UG/KG	N/A	10 U	UG/L
Tetrachloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
Toluene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
Chlorobenzene	6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A	5 U	UG/L
Xylene (Total)	2 J	UG/KG	N/A		1 JB	UG/L	5 U	UG/L	2 JB	UG/L	6 U	UG/KG	N/A	5 U	UG/L

SiteID	MPSICS05		MPSICS06		MPSICS07		MPSICS08		MPSTB0224		MPSICS09		MPSICS10		MPSICS11	
SampleDate	2/24/97		2/24/97		2/24/97		2/24/97		2/24/97		2/25/97		2/25/97		2/25/97	
Explosives																
HMX	1200000	UG/KG	13000	UG/KG	120000 D	UG/KG	27000	UG/KG	N/A		130000 D	UG/KG	8900	UG/KG	140000 D	UG/KG
RDX	14000000	UG/KG	71000 D	UG/KG	660000 D	UG/KG	250000 D	UG/KG	N/A		300000 D	UG/KG	35000 DJ	UG/KG	680000 D	UG/KG
TNB	8800 P	UG/KG	810	UG/KG	250 U	UG/KG	250 U	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
DNB	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
TETRYL	16250 U	UG/KG	650 U	UG/KG	650 U	UG/KG	650 U	UG/KG	N/A		650 U	UG/KG	650 U	UG/KG	650 U	UG/KG
NB	6500 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	N/A		260 U	UG/KG	260 U	UG/KG	260 U	UG/KG
TNT	3000000 D	UG/KG	8800	UG/KG	10000	UG/KG	1200 P	UG/KG	N/A		300 P	UG/KG	3000	UG/KG	250 U	UG/KG
4ADNT	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	1100	UG/KG	N/A		190 J	UG/KG	250 U	UG/KG	250 U	UG/KG
2ADNT	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	740	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
26DNT	6500 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	N/A		260 U	UG/KG	260 U	UG/KG	260 U	UG/KG
24DNT	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
2NT	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
4NT	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
3NT	6250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	N/A		250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
Total Metals																
Mercury	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Arsenic	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Barium	105	MG/KG	77	MG/KG	77.9	MG/KG	90.6	MG/KG	N/A		48.6	MG/KG	49.7	MG/KG	41.9	MG/KG
Cadmium	0.248 U	MG/KG	0.249 U	MG/KG	0.247 U	MG/KG	0.25 U	MG/KG	N/A		0.3 U	MG/KG	0.3 U	MG/KG	0.3 U	MG/KG
Chromium	11.1	MG/KG	11.3	MG/KG	11.7	MG/KG	12.5	MG/KG	N/A		10.3	MG/KG	11.1	MG/KG	14.1	MG/KG
Lead	18.4	MG/KG	12.8	MG/KG	13	MG/KG	16.3	MG/KG	N/A		10.3	MG/KG	8.6	MG/KG	9.2	MG/KG
Silver	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Selenium	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
TCLP Metals																
Mercury	0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L	N/A		0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L
Arsenic	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	N/A		0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L
Barium	0.77	MG/L	0.91	MG/L	1.02	MG/L	0.9	MG/L	N/A		0.9	MG/L	0.9	MG/L	0.9	MG/L
Cadmium	0.004 U	MG/L	0.004 U	MG/L	0.004 U	MG/L	0.004 U	MG/L	N/A		0.004 U	MG/L	0.004 U	MG/L	0.004 U	MG/L
Chromium	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	N/A		0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L
Lead	0.04 U	MG/L	0.04 U	MG/L	0.04 U	MG/L	0.04 U	MG/L	N/A		0.04 U	MG/L	0.04 U	MG/L	0.04 U	MG/L
Silver	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	N/A		0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L
Selenium	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	N/A		0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L
Volatile Organics																
Vinyl Chloride	12 U	UG/KG	N/A		12 U	UG/KG	N/A		10 U	UG/L	12 U	UG/KG	N/A		12 U	UG/KG
Methylene Chloride	2 J	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	2 JB	UG/KG	N/A		2 JB	UG/KG
Acetone	12 U	UG/KG	N/A		13	UG/KG	N/A		10 U	UG/L	10 J	UG/KG	N/A		12 U	UG/KG
1,1-Dichloroethene	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
Chloroform	2 JB	UG/KG	N/A		2 JB	UG/KG	N/A		5 U	UG/L	2 JB	UG/KG	N/A		1 JB	UG/KG
1,2-Dichloroethane	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
2-Butanone	12 U	UG/KG	N/A		12 U	UG/KG	N/A		10 U	UG/L	12 U	UG/KG	N/A		12 U	UG/KG
Carbon Tetrachloride	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
Trichloroethene	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
Benzene	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
4-Methyl-2-Pentanone	12 U	UG/KG	N/A		12 U	UG/KG	N/A		10 U	UG/L	12 U	UG/KG	N/A		12 U	UG/KG
Tetrachloroethene	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
Toluene	6 U	UG/KG	N/A		2 J	UG/KG	N/A		5 U	UG/L	1 J	UG/KG	N/A		6 U	UG/KG
Chlorobenzene	6 U	UG/KG	N/A		6 U	UG/KG	N/A		5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG
Xylene (Total)	6 U	UG/KG	N/A		6 U	UG/KG	N/A		1 JB	UG/L	2 J	UG/KG	N/A		6 U	UG/KG

SiteID	MPSICS12		MPSICS13		MPSRB0225		MPSTB0225		MPSICS14		MPSICS15		MPSTB0227		MPSFA0228	
SampleDate	2/25/97		2/25/97		2/25/97		2/25/97		2/27/97		2/27/97		2/27/97		2/28/97	
Explosives																
HMX	300000 DJ	UG/KG	17000	UG/KG	13.0 U	UG/L	N/A		9000	UG/KG	6500	UG/KG	N/A		13.0 U	UG/L
RDX	1700000 D	UG/KG	87000 D	UG/KG	14.0 U	UG/L	N/A		25000	UG/KG	8000	UG/KG	N/A		14.0 U	UG/L
TNB	250 U	UG/KG	250 U	UG/KG	7.30 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		7.30 U	UG/L
DNB	250 U	UG/KG	250 U	UG/KG	4.00 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		4.00 U	UG/L
TETRYL	650 U	UG/KG	650 U	UG/KG	10.0 U	UG/L	N/A		650 U	UG/KG	650 U	UG/KG	N/A		10.0 U	UG/L
NB	260 U	UG/KG	260 U	UG/KG	7.00 U	UG/L	N/A		260 U	UG/KG	260 U	UG/KG	N/A		7.00 U	UG/L
TNT	2100	UG/KG	450	UG/KG	6.40 U	UG/L	N/A		540 P	UG/KG	250 U	UG/KG	N/A		6.40 U	UG/L
4ADNT	250 U	UG/KG	250 U	UG/KG	7.00 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		7.00 U	UG/L
2ADNT	250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L	N/A		280	UG/KG	250 U	UG/KG	N/A		12.0 U	UG/L
26DNT	260 U	UG/KG	260 U	UG/KG	9.40 U	UG/L	N/A		260 U	UG/KG	260 U	UG/KG	N/A		9.40 U	UG/L
24DNT	250 U	UG/KG	250 U	UG/KG	5.70 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		5.70 U	UG/L
2NT	250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		12.0 U	UG/L
4NT	250 U	UG/KG	250 U	UG/KG	8.00 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		8.00 U	UG/L
3NT	250 U	UG/KG	250 U	UG/KG	7.90 U	UG/L	N/A		250 U	UG/KG	250 U	UG/KG	N/A		7.90 U	UG/L
Total Metals																
Mercury	N/A		N/A		0.1 U	UG/L	N/A		N/A		N/A		N/A		0.1 U	UG/L
Arsenic	N/A		N/A		10 U	UG/L	N/A		N/A		N/A		N/A		10 U	UG/L
Barium	48.4	MG/KG	70.2	MG/KG	2 U	UG/L	N/A		55.7	MG/KG	24.4	MG/KG	N/A		27.4	UG/L
Cadmium	0.3 U	MG/KG	0.3 U	MG/KG	3 U	UG/L	N/A		0.371 U	MG/KG	0.358 U	MG/KG	N/A		3 U	UG/L
Chromium	15.6	MG/KG	8.8	MG/KG	5 U	UG/L	N/A		15.1	MG/KG	13.9	MG/KG	N/A		5 U	UG/L
Lead	11.8	MG/KG	7.4	MG/KG	3 U	UG/L	N/A		18.9	MG/KG	13.6	MG/KG	N/A		3 U	UG/L
Silver	N/A		N/A		5 U	UG/L	N/A		N/A		N/A		N/A		5 U	UG/L
Selenium	N/A		N/A		5 U	UG/L	N/A		N/A		N/A		N/A		5 U	UG/L
TCLP Metals																
Mercury	0.001 U	MG/L	0.001 U	MG/L	N/A		N/A		0.001 U	MG/L	0.001 U	MG/L	N/A		N/A	
Arsenic	0.1 U	MG/L	0.1 U	MG/L	N/A		N/A		0.1 U	MG/L	0.1 U	MG/L	N/A		N/A	
Barium	0.9	MG/L	0.9	MG/L	N/A		N/A		0.67	MG/L	1.1	MG/L	N/A		N/A	
Cadmium	0.004 U	MG/L	0.004 U	MG/L	N/A		N/A		0.004 U	MG/L	0.004 U	MG/L	N/A		N/A	
Chromium	0.005 U	MG/L	0.005 U	MG/L	N/A		N/A		0.005 U	MG/L	0.005 U	MG/L	N/A		N/A	
Lead	0.04 U	MG/L	0.04 U	MG/L	N/A		N/A		0.04 U	MG/L	0.04 U	MG/L	N/A		N/A	
Silver	0.005 U	MG/L	0.005 U	MG/L	N/A		N/A		0.005 U	MG/L	0.005 U	MG/L	N/A		N/A	
Selenium	0.1 U	MG/L	0.1 U	MG/L	N/A		N/A		0.1 U	MG/L	0.1 U	MG/L	N/A		N/A	
Volatile Organics																
Vinyl Chloride	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L
Methylene Chloride	2 JB	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Acetone	12 U	UG/KG	N/A		11	UG/L	10 U	UG/L	12 U	UG/KG	N/A		26	UG/L	10 U	UG/L
1,1-Dichloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Chloroform	1 JB	UG/KG	N/A		4 J	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	41	UG/L
1,2-Dichloroethane	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
2-Butanone	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L
Carbon Tetrachloride	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Trichloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Benzene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
4-Methyl-2-Pentanone	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L
Tetrachloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Toluene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Chlorobenzene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L
Xylene (Total)	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L

SiteID	MPSFB0228		MPSICS16		MPSICS17		MPSICS18		MPSICS19		MPSICS20		MPSRB0228		MPSTB0228A	
SampleDate	2/28/97		2/28/97		2/28/97		2/28/97		2/28/97		2/28/97		2/28/97		2/28/97	
Explosives																
HMX	13.0 U	UG/L	3400	UG/KG	340000 DJ	UG/KG	12000	UG/KG	1600 J	UG/KG	1000 J	UG/KG	13.0 U	UG/L	N/A	
RDX	14.0 U	UG/L	2200	UG/KG	1700000 D	UG/KG	12000	UG/KG	9300	UG/KG	6600	UG/KG	14.0 U	UG/L	N/A	
TNB	7.30 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	7.30 U	UG/L	N/A	
DNB	4.00 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	4.00 U	UG/L	N/A	
TETRYL	10.0 U	UG/L	650 U	UG/KG	650 U	UG/KG	650 U	UG/KG	650 U	UG/KG	650 U	UG/KG	10.0 U	UG/L	N/A	
NB	7.00 U	UG/L	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	7.00 U	UG/L	N/A	
TNT	6.40 U	UG/L	250 U	UG/KG	9900	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	6.40 U	UG/L	N/A	
4ADNT	7.00 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	7.00 U	UG/L	N/A	
2ADNT	12.0 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L	N/A	
26DNT	9.40 U	UG/L	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	9.40 U	UG/L	N/A	
24DNT	5.70 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	5.70 U	UG/L	N/A	
2NT	12.0 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L	N/A	
4NT	8.00 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	8.00 U	UG/L	N/A	
3NT	7.90 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	7.90 U	UG/L	N/A	
Total Metals																
Mercury	0.1 U	UG/L	N/A		N/A		N/A		N/A		N/A		0.1 U	UG/L	N/A	
Arsenic	10 U	UG/L	N/A		N/A		N/A		N/A		N/A		10 U	UG/L	N/A	
Barium	2 U	UG/L	35.7	MG/KG	73.6	MG/KG	57.7	MG/KG	35.2	MG/KG	40.4	MG/KG	9.8	UG/L	N/A	
Cadmium	3 U	UG/L	0.36 U	MG/KG	0.378 U	MG/KG	0.378 U	MG/KG	0.355 U	MG/KG	0.356 U	MG/KG	3 U	UG/L	N/A	
Chromium	5 U	UG/L	11.5	MG/KG	16.2	MG/KG	21.9	MG/KG	10.4	MG/KG	9.61	MG/KG	5 U	UG/L	N/A	
Lead	3 U	UG/L	8.29	MG/KG	15.9	MG/KG	12.5	MG/KG	7.09	MG/KG	7.12	MG/KG	3 U	UG/L	N/A	
Silver	5 U	UG/L	N/A		N/A		N/A		N/A		N/A		5 U	UG/L	N/A	
Selenium	5 U	UG/L	N/A		N/A		N/A		N/A		N/A		5 U	UG/L	N/A	
TCLP Metals																
Mercury	N/A		0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L	N/A		N/A	
Arsenic	N/A		0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	N/A		N/A	
Barium	N/A		0.65	MG/L	1.3	MG/L	0.46	MG/L	0.53	MG/L	0.62	MG/L	N/A		N/A	
Cadmium	N/A		0.004 U	MG/L	0.004 U	MG/L	0.004 U	MG/L	0.004 U	MG/L	0.004 U	MG/L	N/A		N/A	
Chromium	N/A		0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	N/A		N/A	
Lead	N/A		0.04 U	MG/L	0.04 U	MG/L	0.04 U	MG/L	0.09	MG/L	0.045	MG/L	N/A		N/A	
Silver	N/A		0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	N/A		N/A	
Selenium	N/A		0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	0.1 U	MG/L	N/A		N/A	
Volatile Organics																
Vinyl Chloride	10 U	UG/L	12 U	UG/KG	N/A		13 U	UG/KG	N/A		12 U	UG/KG	10 U	UG/L	10 U	UG/L
Methylene Chloride	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	41 B	UG/L
Acetone	12	UG/L	30	UG/KG	N/A		8 J	UG/KG	N/A		12 U	UG/KG	14	UG/L	9 JB	UG/L
1,1-Dichloroethene	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
Chloroform	4 J	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	4 J	UG/L	1 J	UG/L
1,2-Dichloroethane	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
2-Butanone	10 U	UG/L	12 U	UG/KG	N/A		13 U	UG/KG	N/A		12 U	UG/KG	10 U	UG/L	10 U	UG/L
Carbon Tetrachloride	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
Trichloroethene	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
Benzene	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
4-Methyl-2-Pentanone	10 U	UG/L	12 U	UG/KG	N/A		13 U	UG/KG	N/A		12 U	UG/KG	10 U	UG/L	10 U	UG/L
Tetrachloroethene	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
Toluene	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
Chlorobenzene	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L
Xylene (Total)	5 U	UG/L	6 U	UG/KG	N/A		6 U	UG/KG	N/A		6 U	UG/KG	5 U	UG/L	5 U	UG/L

SiteID	MPSTB0228B		MPSFA0311		MPSFB0311		MPSICS21		MPSICS22		MPSICS23		MPSICS24	
SampleDate	2/28/97		3/11/97		3/11/97		3/11/97		3/11/97		3/11/97		3/11/97	
Explosives														
HMX	N/A		13.0 U	UG/L	13.0 U	UG/L	37000	UG/KG	18000	UG/KG	46000	UG/KG	15000	UG/KG
RDX	N/A		14.0 U	UG/L	14.0 U	UG/L	180000 D	UG/KG	180000 D	UG/KG	560000 D	UG/KG	150000 D	UG/KG
TNB	N/A		7.30 U	UG/L	7.30 U	UG/L	300	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
DNB	N/A		4.00 U	UG/L	4.00 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
TETRYL	N/A		10.0 U	UG/L	10.0 U	UG/L	650 U	UG/KG	650 U	UG/KG	650 U	UG/KG	650 U	UG/KG
NB	N/A		7.00 U	UG/L	7.00 U	UG/L	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG
TNT	N/A		6.40 U	UG/L	6.40 U	UG/L	1900	UG/KG	8700	UG/KG	260000 D	UG/KG	61000 D	UG/KG
4ADNT	N/A		7.00 U	UG/L	7.00 U	UG/L	980	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
2ADNT	N/A		12.0 U	UG/L	12.0 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
26DNT	N/A		9.40 U	UG/L	9.40 U	UG/L	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG	260 U	UG/KG
24DNT	N/A		5.70 U	UG/L	5.70 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
2NT	N/A		12.0 U	UG/L	12.0 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
4NT	N/A		8.00 U	UG/L	8.00 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
3NT	N/A		7.90 U	UG/L	7.90 U	UG/L	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG	250 U	UG/KG
Total Metals														
Mercury	N/A		0.1 U	UG/L	0.1 U	UG/L	N/A		N/A		N/A		N/A	
Arsenic	N/A		10 U	UG/L	10 U	UG/L	N/A		N/A		N/A		N/A	
Barium	N/A		2 U	UG/L	2 U	UG/L	57.7	MG/KG	32.6	MG/KG	45.2	MG/KG	50.5	MG/KG
Cadmium	N/A		3 U	UG/L	3 U	UG/L	0.3 U	MG/KG	0.3 U	MG/KG	0.3 U	MG/KG	0.3 U	MG/KG
Chromium	N/A		5 U	UG/L	5 U	UG/L	11	MG/KG	9.7	MG/KG	11.6	MG/KG	13	MG/KG
Lead	N/A		3 U	UG/L	3 U	UG/L	10.7	MG/KG	10.6	MG/KG	9.3	MG/KG	9.1	MG/KG
Silver	N/A		5 U	UG/L	5 U	UG/L	N/A		N/A		N/A		N/A	
Selenium	N/A		5 U	UG/L	5 U	UG/L	N/A		N/A		N/A		N/A	
TCLP Metals														
Mercury	N/A		N/A		N/A		0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L	0.001 U	MG/L
Arsenic	N/A		N/A		N/A		0.01 U	MG/L	0.01 U	MG/L	0.01 U	MG/L	0.01 U	MG/L
Barium	N/A		N/A		N/A		0.67	MG/L	0.4	MG/L	0.48	MG/L	0.65	MG/L
Cadmium	N/A		N/A		N/A		0.003 U	MG/L	0.003 U	MG/L	0.003 U	MG/L	0.003 U	MG/L
Chromium	N/A		N/A		N/A		0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L
Lead	N/A		N/A		N/A		0.003 U	MG/L	0.016	MG/L	0.019	MG/L	0.02	MG/L
Silver	N/A		N/A		N/A		0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L	0.005 U	MG/L
Selenium	N/A		N/A		N/A		0.017	MG/L	0.0098	MG/L	0.005 U	MG/L	0.005 U	MG/L
Volatile Organics														
Vinyl Chloride	10 U	UG/L	10 U	UG/L	10 U	UG/L	13 U	UG/KG	N/A		12 U	UG/KG	N/A	
Methylene Chloride	40 B	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Acetone	8 JB	UG/L	7 J	UG/L	10 U	UG/L	8 JB	UG/KG	N/A		11 JB	UG/KG	N/A	
1,1-Dichloroethene	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Chloroform	5 U	UG/L	1 J	UG/L	39	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
1,2-Dichloroethane	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
2-Butanone	10 U	UG/L	10 U	UG/L	10 U	UG/L	13 U	UG/KG	N/A		3 J	UG/KG	N/A	
Carbon Tetrachloride	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Trichloroethene	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Benzene	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
4-Methyl-2-Pentanone	10 U	UG/L	10 U	UG/L	10 U	UG/L	13 U	UG/KG	N/A		12 U	UG/KG	N/A	
Tetrachloroethene	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Toluene	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Chlorobenzene	5 U	UG/L	5 U	UG/L	5 U	UG/L	7 U	UG/KG	N/A		6 U	UG/KG	N/A	
Xylene (Total)	1 JB	UG/L	5 U	UG/L	5 U	UG/L	2 J	UG/KG	N/A		6 U	UG/KG	N/A	

SiteID	MPSICS25		MPSICS26		MPSRB0311		MPSTB0311A		MPSTB0311B	
SampleDate	3/11/97		3/11/97		3/11/97		3/11/97		3/11/97	
Explosives										
HMX	100000 D	UG/KG	46000	UG/KG	13.0 U	UG/L	N/A		N/A	
RDX	830000 D	UG/KG	410000 D	UG/KG	14.0 U	UG/L	N/A		N/A	
TNB	840	UG/KG	660	UG/KG	7.30 U	UG/L	N/A		N/A	
DNB	250 U	UG/KG	250 U	UG/KG	4.00 U	UG/L	N/A		N/A	
TETRYL	650 U	UG/KG	650 U	UG/KG	10.0 U	UG/L	N/A		N/A	
NB	260 U	UG/KG	260 U	UG/KG	7.00 U	UG/L	N/A		N/A	
TNT	12000	UG/KG	76000 D	UG/KG	6.40 U	UG/L	N/A		N/A	
4ADNT	4100	UG/KG	250 U	UG/KG	7.00 U	UG/L	N/A		N/A	
2ADNT	250 U	UG/KG	940	UG/KG	12.0 U	UG/L	N/A		N/A	
26DNT	260 U	UG/KG	260 U	UG/KG	9.40 U	UG/L	N/A		N/A	
24DNT	250 U	UG/KG	250 U	UG/KG	5.70 U	UG/L	N/A		N/A	
2NT	250 U	UG/KG	250 U	UG/KG	12.0 U	UG/L	N/A		N/A	
4NT	250 U	UG/KG	250 U	UG/KG	8.00 U	UG/L	N/A		N/A	
3NT	250 U	UG/KG	250 U	UG/KG	7.90 U	UG/L	N/A		N/A	
Total Metals										
Mercury	N/A		N/A		0.1 U	UG/L	N/A		N/A	
Arsenic	N/A		N/A		10 U	UG/L	N/A		N/A	
Barium	58.6	MG/KG	53.5	MG/KG	2 U	UG/L	N/A		N/A	
Cadmium	0.3 U	MG/KG	0.3 U	MG/KG	3 U	UG/L	N/A		N/A	
Chromium	15.5	MG/KG	13.6	MG/KG	5 U	UG/L	N/A		N/A	
Lead	13.2	MG/KG	11.9	MG/KG	3 U	UG/L	N/A		N/A	
Silver	N/A		N/A		5 U	UG/L	N/A		N/A	
Selenium	N/A		N/A		5 U	UG/L	N/A		N/A	
TCLP Metals										
Mercury	0.001 U	MG/L	0.001 U	MG/L	N/A		N/A		N/A	
Arsenic	0.01 U	MG/L	0.01 U	MG/L	N/A		N/A		N/A	
Barium	0.55	MG/L	0.69	MG/L	N/A		N/A		N/A	
Cadmium	0.003 U	MG/L	0.003 U	MG/L	N/A		N/A		N/A	
Chromium	0.005 U	MG/L	0.009	MG/L	N/A		N/A		N/A	
Lead	0.003 U	MG/L	0.046	MG/L	N/A		N/A		N/A	
Silver	0.005 U	MG/L	0.005 U	MG/L	N/A		N/A		N/A	
Selenium	0.0081	MG/L	0.0096	MG/L	N/A		N/A		N/A	
Volatile Organics										
Vinyl Chloride	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	10 U	UG/L
Methylene Chloride	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Acetone	9 JB	UG/KG	N/A		7 J	UG/L	10 U	UG/L	10 U	UG/L
1,1-Dichloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Chloroform	6 U	UG/KG	N/A		1 J	UG/L	5 U	UG/L	5 U	UG/L
1,2-Dichloroethane	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
2-Butanone	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	10 U	UG/L
Carbon Tetrachloride	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Trichloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Benzene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
4-Methyl-2-Pentanone	12 U	UG/KG	N/A		10 U	UG/L	10 U	UG/L	10 U	UG/L
Tetrachloroethene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Toluene	11	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Chlorobenzene	6 U	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L
Xylene (Total)	2 J	UG/KG	N/A		5 U	UG/L	5 U	UG/L	5 U	UG/L

ATTACHMENT E1-B
NSWC CRANE DRAWINGS

LIST OF NSWC CRANE MINE FILL A DRAWINGS

UTILITY AND FOUNDATION DRAWINGS:

Drawing No.	Description
176293	Box Emptying Bldg. 153 & TNT Storage Bldg. 154, Plant A
176295	Box Emptying & TNT Storage Bldgs, 1st Floor Framing & Foundation Plans
176296	Box Emptying & TNT Storage Bldgs, 2nd Floor & Roof Framing Plans
176297	Box Emptying & TNT Storage Bldgs, 1st Floor Plans & Elevations
176299	Box Emptying & TNT Storage Bldgs, Sections & Elevations
176300	Box Emptying & TNT Storage Bldgs, Sections & Details
176301	Box Emptying & TNT Storage Bldgs, Windows & Door Details
176302	Box Emptying & TNT Storage Bldgs, Conveyors & Equipment
180484	"A" Area - Conveyor No. 2 Between Bldg 152 & 153
187419	Box Emptying & TNT Storage Bldgs, Box Conveyor General Drawing
187421	Box Emptying & TNT Storage Bldgs, Details of Box Top Conveyor
571931	MFA Plot Plan - General & Steam
571932	MFA Plot Plan - General & Steam
571933	MFA Plot Plan, Elevations, Telephone, Fire Alarm, Water, and Sanitary Sewer
571934	MFA Plot Plan, Elevations, Telephone, Fire Alarm, Water, and Sanitary Sewer

MINE FILL A TOPOGRAPHICAL MAP:

MSE Surveying Map Dated June 12, 1995

APPENDIX E2
SWMU-13/14, MINE FILL B SOIL EXCAVATION PLAN FOR FULL-SCALE OPERATIONS

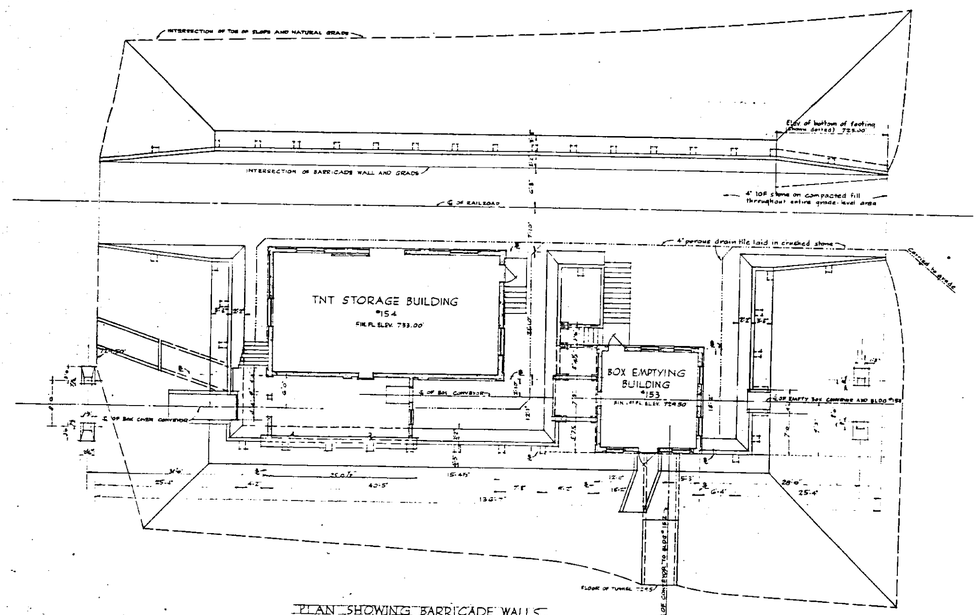
Appendix E2 will be issued for approval as an addendum to this Operational Plan prior to beginning excavation at SWMU-13/14, Mine Fill B

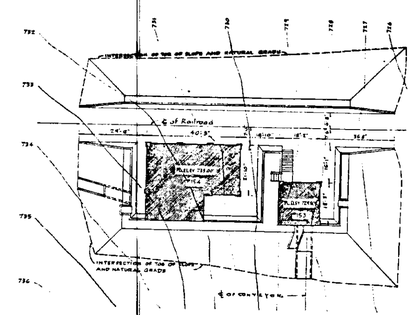
APPENDIX E3
SWMU-03/10, AMMUNITION BURNING GROUND
SOIL EXCAVATION PLAN
FOR FULL-SCALE OPERATIONS

Appendix E3 will be issued for approval as an addendum to this Operational Plan prior to beginning excavation at SWMU-03/10, Ammunition Burning Ground

APPENDIX E4
SWMU-10/15, ROCKEYE SOIL EXCAVATION PLAN FOR FULL-SCALE OPERATIONS

Appendix E4 will be issued for approval as an addendum to this Operational Plan prior to beginning excavation at SWMU-10/15, Rockeye





PLOT PLAN FOR BLDG. 153 & 154

Scale: 1" = 20'

NORTH

Revisions	Date	Brief	By
	12-23-41	Revised concrete foundation	

CONTRACT NOy 4469

Drawn by R.G.R.
Traced by A.J.P.
Checked by R.G.R.

Sheet 2 of 11

Engineer Job No. 4005

Engineer Dwg. No. A-2

Scale as noted

NAVY DEPARTMENT — BUREAU OF YARDS & DOCKS

Approved ..... For Chief of Bureau

Y & D Drawing No. 176293

U. S. NAVAL AMMUNITION DEPOT

BURNS CITY, INDIANA

BOMB & MINE FILLING PLANT

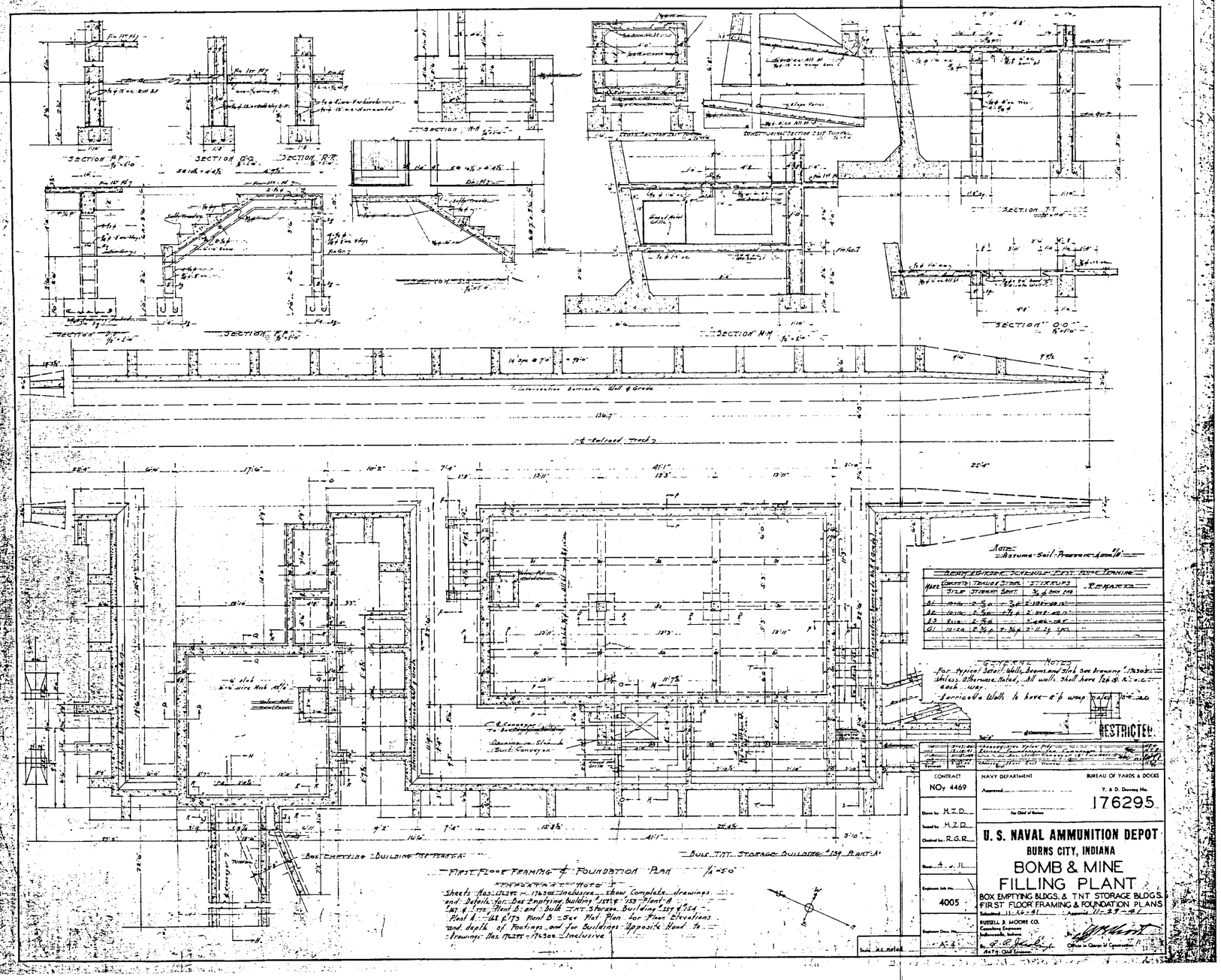
BOX EMPTYING BLDG. 153 & TNT STORAGE BLDG. 154 PLANT "A"

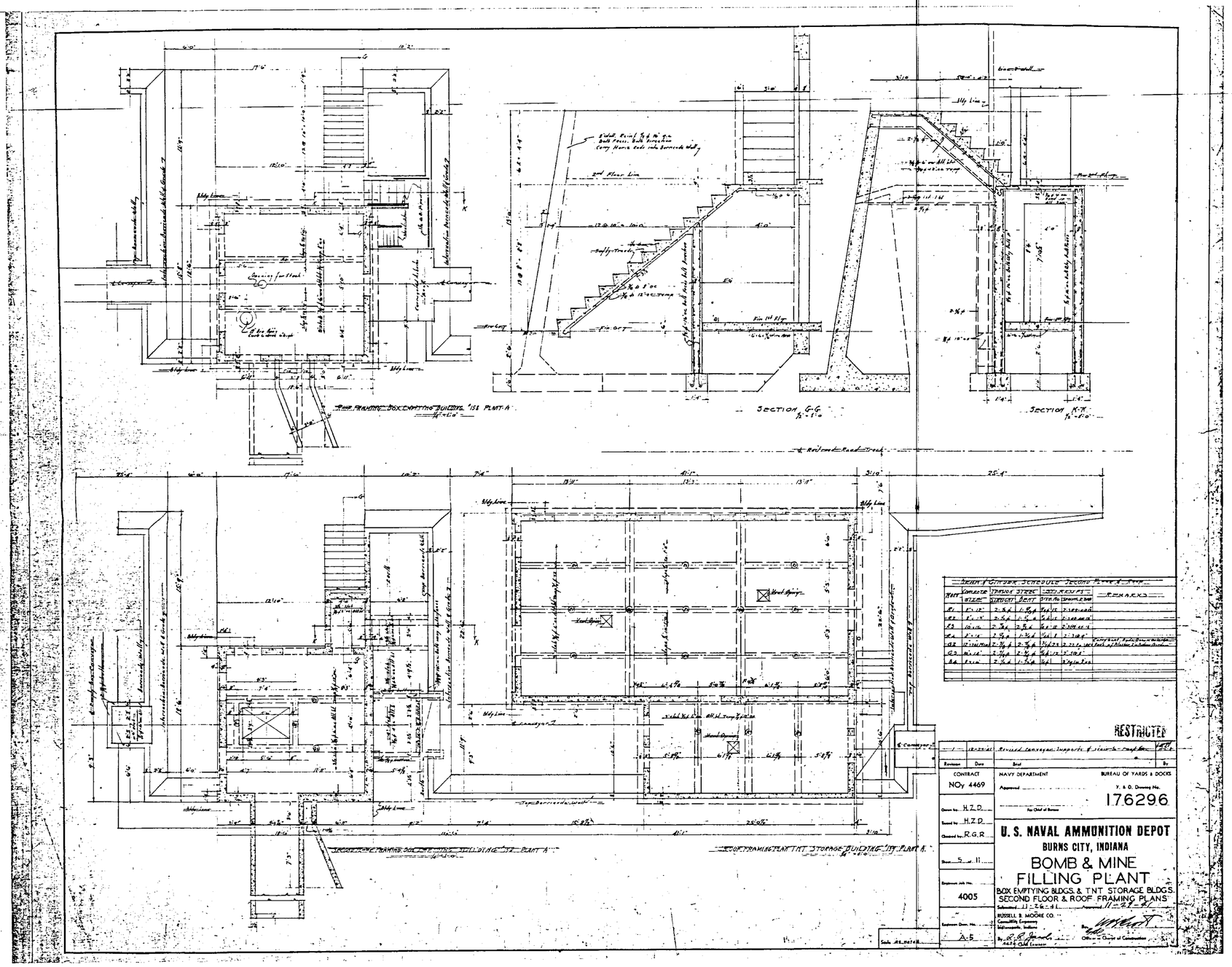
Submitted 11-26-41 Approved 11-27-41

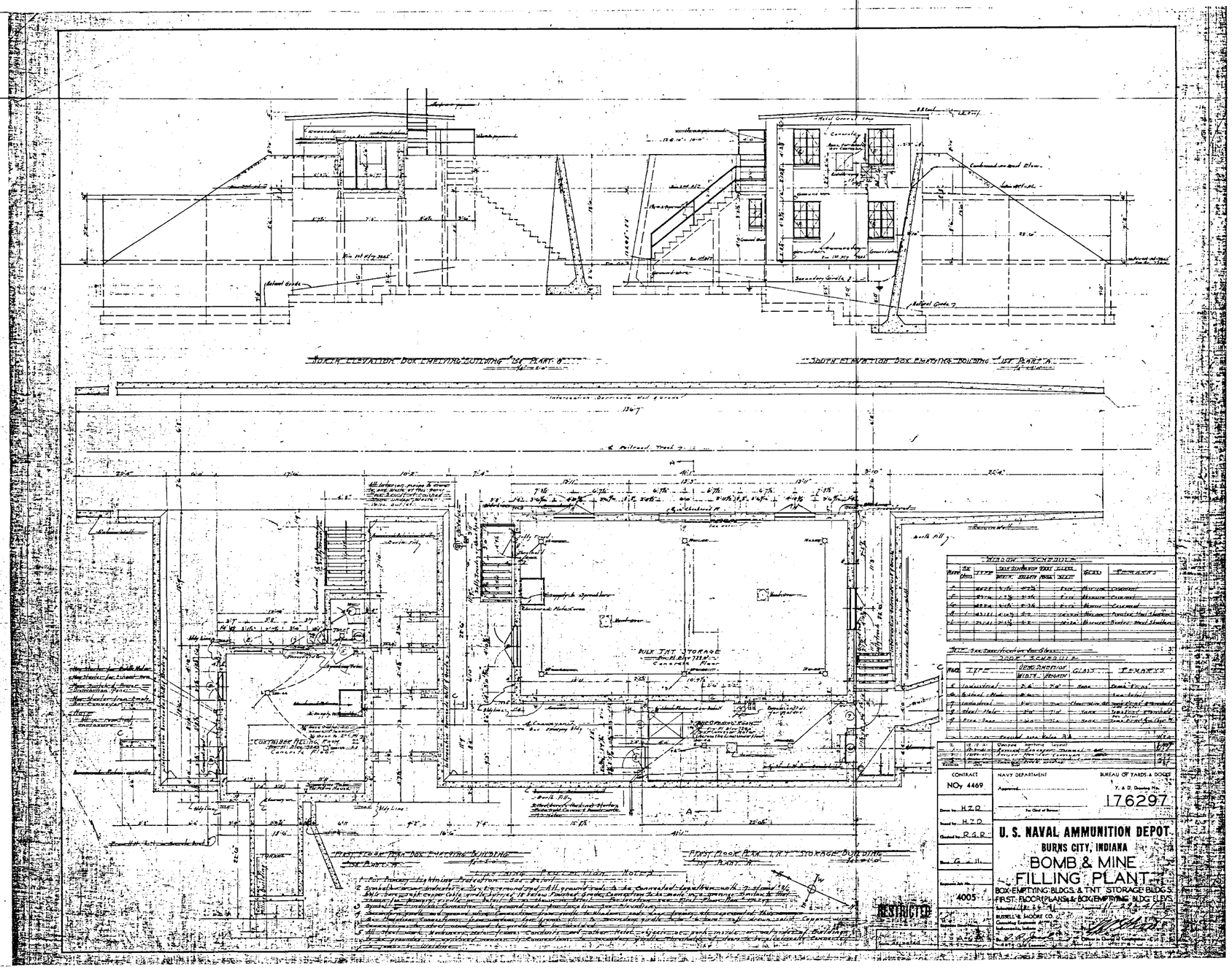
RUSSELL B. MOORE CO.
Consulting Engineers
Indianapolis, Indiana

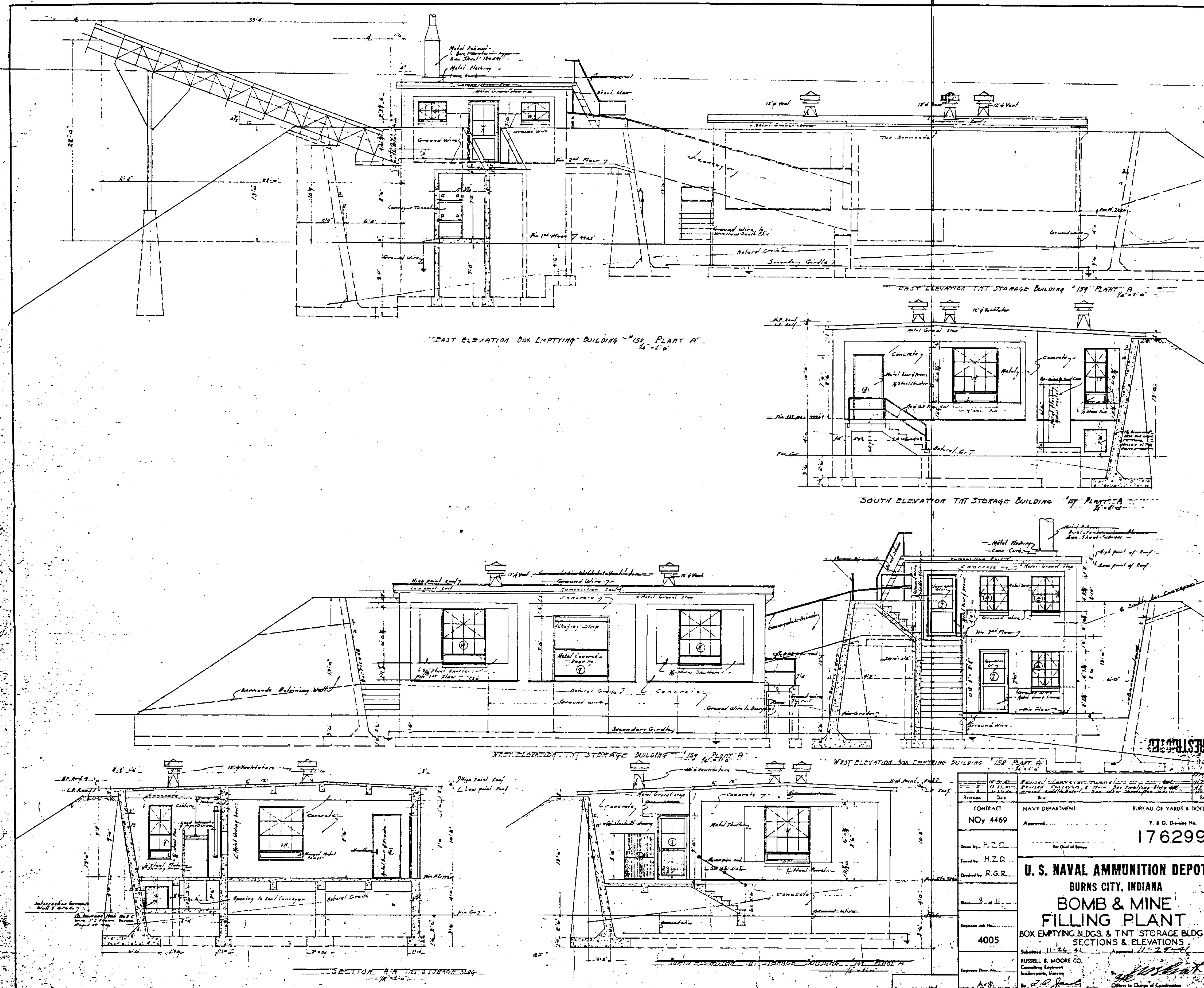
By R. B. Moore
Asst. Chief Engineer

Officer in Charge of Construction


SECTION P-P
SECTION Q-Q
SECTION R-R
SECTION H-H
SECTION M-M
SECTION T-T
SECTION O-O
Box Emptying Building "B" Plant A
Bulk TNT Storage Building "B" Plant A
First Floor Framing & Foundation Plan
Note
Assume Soil Pressure 4000 lb
Footing Schedule
Mark
Concrete Footing Size
Steel Size
Remarks
Footing Notes
For typical detail walls, beams and slab see drawing 176308
Unless otherwise noted, all walls shall have 1/2" ϕ R.D. o.c. each way.
Typical Wall to have 4" ϕ weep holes
RESTRICTED
Contract
NOy 4469
Navy Department
Bureau of Yards & Docks
Y. & D. Drawing No.
176295
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE
FILLING PLANT
BOX EMPTYING BLDGS. & TNT STORAGE BLDGS.
FIRST FLOOR FRAMING & FOUNDATION PLANS
Drawn by H.Z.D.
Traced by H.Z.D.
Checked by R.G.R.
Engineer Job No.
4005
Engineer Dwg. No.
A-2
Russell B. Moore Co.
Consulting Engineers
Indianapolis, Indiana
Scale as noted


SECTION G-G
SECTION K-K
RESTRICTED
CONTRACT
NOy 4469
NAVY DEPARTMENT
BUREAU OF YARDS & DOCKS
Y. & D. Drawing No.
176296
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE
FILLING PLANT
BOX EMPTYING BLDGS. & TNT STORAGE BLDGS.
SECOND FLOOR & ROOF FRAMING PLANS
RUSSELL B. MOORE CO.
4005
A-5


NORTH ELEVATION BOX EMPTYING BUILDING 1ST PLANT "O"
SOUTH ELEVATION BOX EMPTYING BUILDING 1ST PLANT "N"
Intersection Centerline Mill & Grade
Railroad Track
BULK TNT STORAGE
CONTAINER FILLING ROOM
FIRST FLOOR PLAN BOX EMPTYING BUILDING 1ST PLANT "N"
FIRST FLOOR PLAN TNT STORAGE BUILDING 1ST PLANT "N"
WINDOW SCHEDULE
DOOR SCHEDULE
CONTRACT NOy 4469
NAVY DEPARTMENT
BUREAU OF YARDS & DOCKS
Y. & D. Drawing No.
176297
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE FILLING PLANT
BOX EMPTYING BLDGS. & TNT STORAGE BLDG'S
FIRST FLOOR PLANS & BOX EMPTYING BLDG ELEVS.
Drawn by H.Z.D.
Traced by H.Z.D.
Checked by R.G.R.
4005
RESTRICTED



Revision	Date	Brief	By
1	12-5-41	Revised Conveyor Tunnel	HZD
2	12-23-41	Revised Conveyors & stair Box Emptying Bldg	HZD
3	1-31-42	Revised [illegible] See other Sheets for details	HZD

CONTRACT NOy 4469

NAVY DEPARTMENT — BUREAU OF YARDS & DOCKS

Approved .... For Chief of Bureau

Y. & D. Drawing No. 176299

Drawn by H.Z.D.
Traced by H.Z.D.
Checked by R.G.R.
Sheet 8 of 11
Engineers Job No. 4005
Engineers Drawing No. A-8

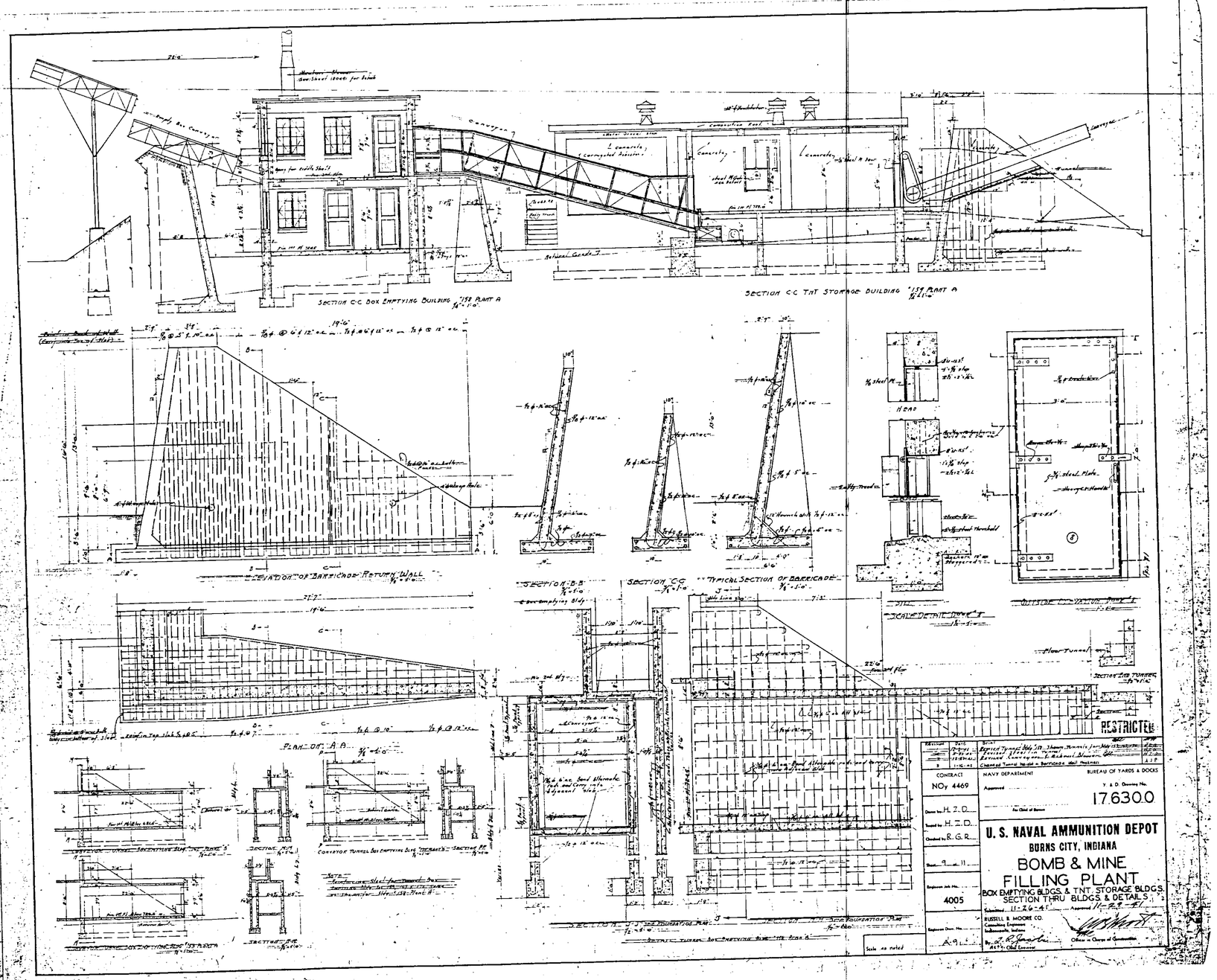
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE FILLING PLANT
BOX EMPTYING BLDGS. & TNT STORAGE BLDGS.
SECTIONS & ELEVATIONS

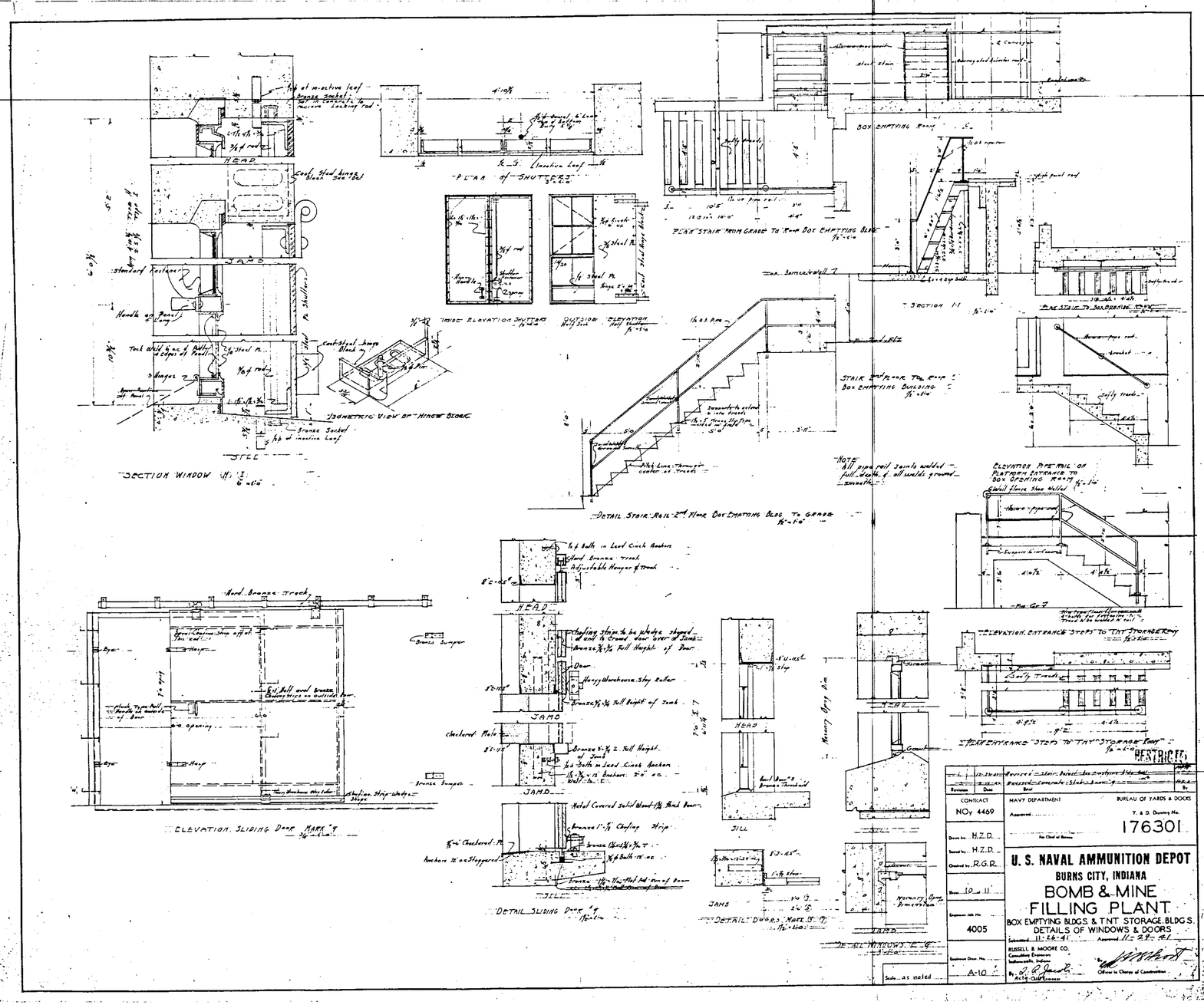
Submitted 11-26-41 Approved 11-29-41

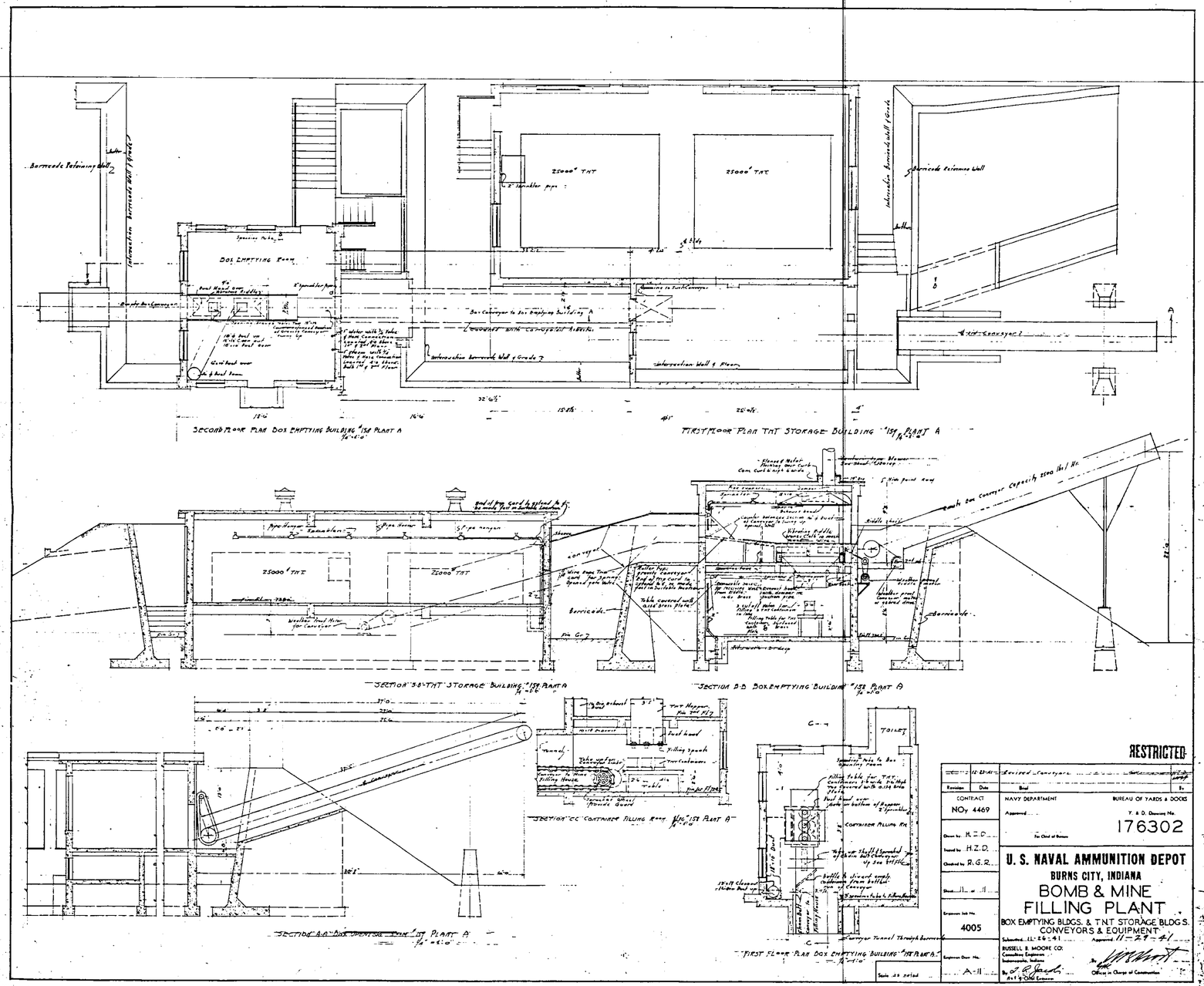
RUSSELL B. MOORE CO.
Consulting Engineers
Indianapolis, Indiana

By [signature] Asst. Chief Engineer

By [signature] Officer in Charge of Construction


SECTION C-C BOX EMPTYING BUILDING "158" PLANT A
SECTION C-C TNT STORAGE BUILDING "159" PLANT A
ELEVATION OF BARRICADE RETURN WALL
SECTION B-B
SECTION C-C
TYPICAL SECTION OF BARRICADE
HEAD
SCALE DETAIL
PLAN OF A-A
RESTRICTED
CONTRACT NOy 4469
NAVY DEPARTMENT
BUREAU OF YARDS & DOCKS
Y. & D. Drawing No. 17.630.0
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE FILLING PLANT
BOX EMPTYING BLDGS. & TNT. STORAGE BLDGS.
SECTION THRU BLDGS. & DETAILS
Drawn by H. Z. D.
Traced by H. Z. D.
Checked by R. G. R.
Sheet 9 of 11
Engineer Job No. 4005
Engineer Dwg. No. A-9
Scale as noted
RUSSELL & MOORE CO.
Consulting Engineers
Indianapolis, Indiana
Chief Engineer
Officer in Charge of Construction


SECTION WINDOW
PLAN of SHUTTERS
ISOMETRIC VIEW OF HINGE BLOCK
ELEVATION SHUTTERS
DETAIL STAIR RAIL 2nd FLOOR BOX EMPTYING BLDG. TO GRADE
PLAN STAIR FROM GRADE TO FLOOR BOX EMPTYING BLDG.
SECTION 1-1
STAIR 2nd FLOOR TO ROOF BOX EMPTYING BUILDING
ELEVATION PIPE RAIL ON PLATFORM ENTRANCE TO BOX EMPTYING ROOM
ELEVATION ENTRANCE STEPS TO TNT STORAGE ROOM
PLAN ENTRANCE STEP TO TNT STORAGE ROOM
ELEVATION SLIDING DOOR MARK "9"
DETAIL SLIDING DOOR
DETAIL DOORS
DETAIL WINDOWS
HEAD
JAMB
SILL
RESTRICTED
CONTRACT NOy 4469
NAVY DEPARTMENT
BUREAU OF YARDS & DOCKS
Y. & D. Drawing No.
176301
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE FILLING PLANT
BOX EMPTYING BLDGS. & TNT STORAGE BLDGS.
DETAILS OF WINDOWS & DOORS
RUSSELL & MOORE CO.
Consulting Engineers
Indianapolis, Indiana
Drawn by H.Z.D.
Traced by H.Z.D.
Checked by R.G.R.
Drawn 10 — 11
Engineer Job No. 4005
Engineer Dwg. No. A-10
Scale as noted

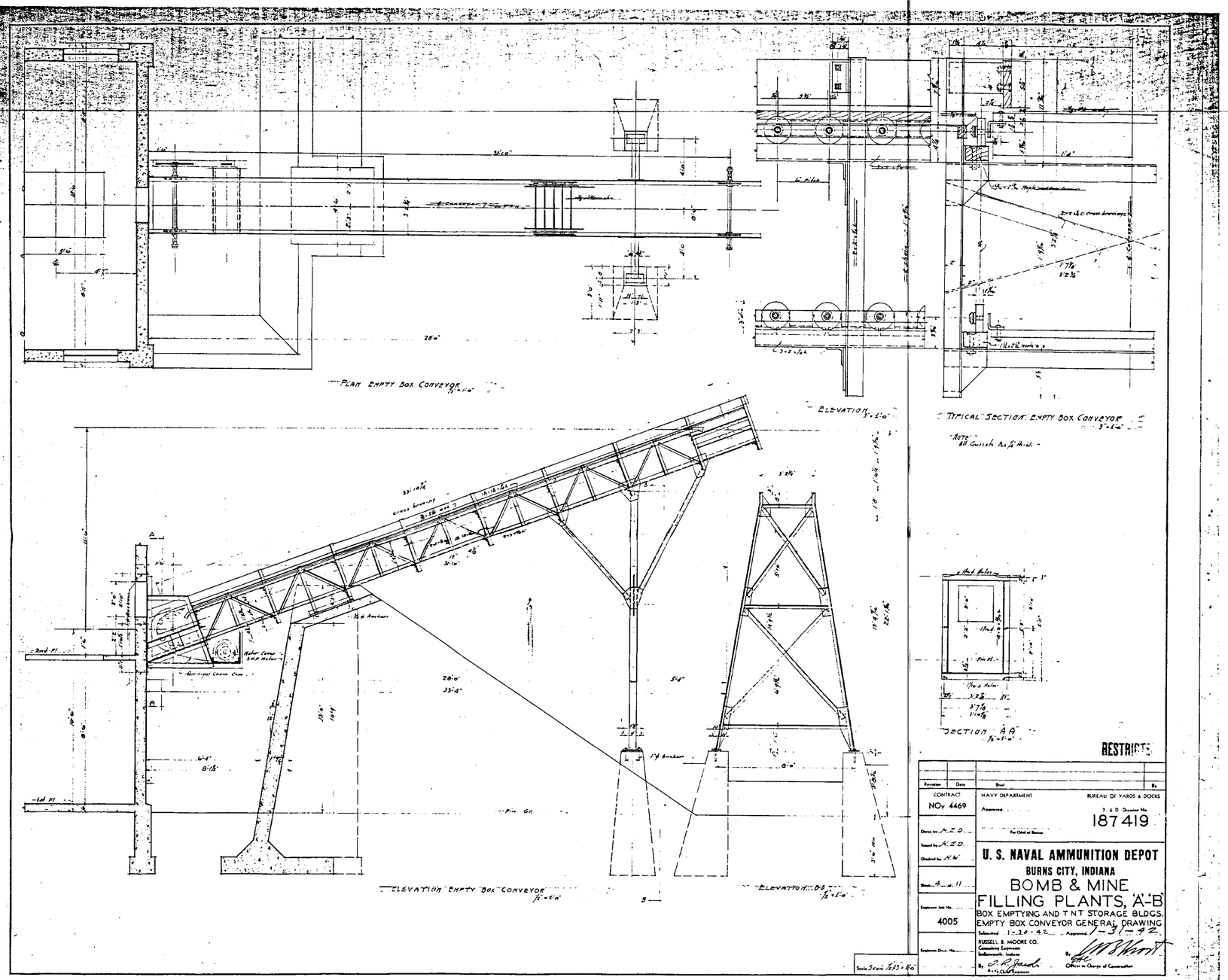


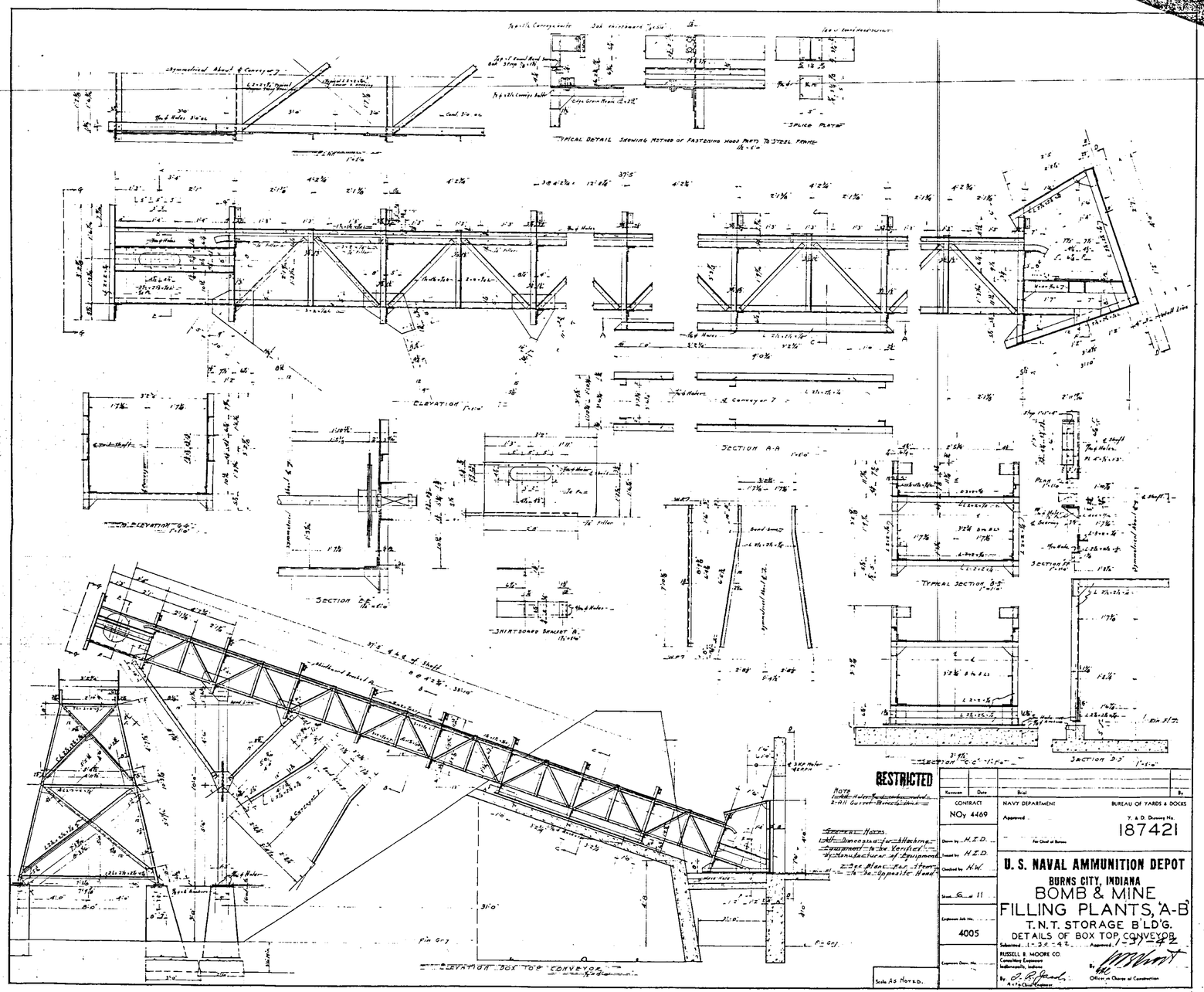
RESTRICTED

Revision	Date	Brief	By
	11-13-41	Revised Conveyors	

CONTRACT NOy 4469	NAVY DEPARTMENT — BUREAU OF YARDS & DOCKS
Drawn by H.E.D.	Approved ... For Chief of Bureau
Traced by H.Z.D.	Y. & D. Drawing No. 176302
Checked by R.G.R.	
Sheet 11 of 11	**U. S. NAVAL AMMUNITION DEPOT**
Engineer Job No. 4005	**BURNS CITY, INDIANA**
Engineer Dwg. No. A-11	BOMB & MINE FILLING PLANT
	BOX EMPTYING BLDGS. & TNT STORAGE BLDGS. CONVEYORS & EQUIPMENT
	Submitted 11-26-41 Approved 11-27-41
	RUSSELL B. MOORE CO. Consulting Engineers Indianapolis, Indiana — By J. R. Jacobs, Asst. to Chief Engineer
	By ... Officer in Charge of Construction

Scale .25 noted


PLAN EMPTY BOX CONVEYOR
ELEVATION
TYPICAL SECTION EMPTY BOX CONVEYOR
ELEVATION EMPTY BOX CONVEYOR
ELEVATION
SECTION AA
RESTRICTED
CONTRACT NOy 4469
NAVY DEPARTMENT
BUREAU OF YARDS & DOCKS
Y & D Division No.
187 419
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE
FILLING PLANTS, 'A'-'B'
BOX EMPTYING AND T N T STORAGE BLDGS.
EMPTY BOX CONVEYOR GENERAL DRAWING
4005
RUSSELL & MOORE CO.
Consulting Engineers
Indianapolis, Indiana
Officer in Charge of Construction



Revision	Date	Brief	By

CONTRACT NOy 4469

NAVY DEPARTMENT — BUREAU OF YARDS & DOCKS

Approved ..... For Chief of Bureau

Y. & D. Drawing No. 187421

Drawn by H.I.D.
Traced by H.I.D.
Checked by H.W.
Scale 1/8" = 1'-0"
Engineer Job No. 4005
Engineer Dwg. No.

U. S. NAVAL AMMUNITION DEPOT

BURNS CITY, INDIANA

BOMB & MINE FILLING PLANTS, 'A-B'

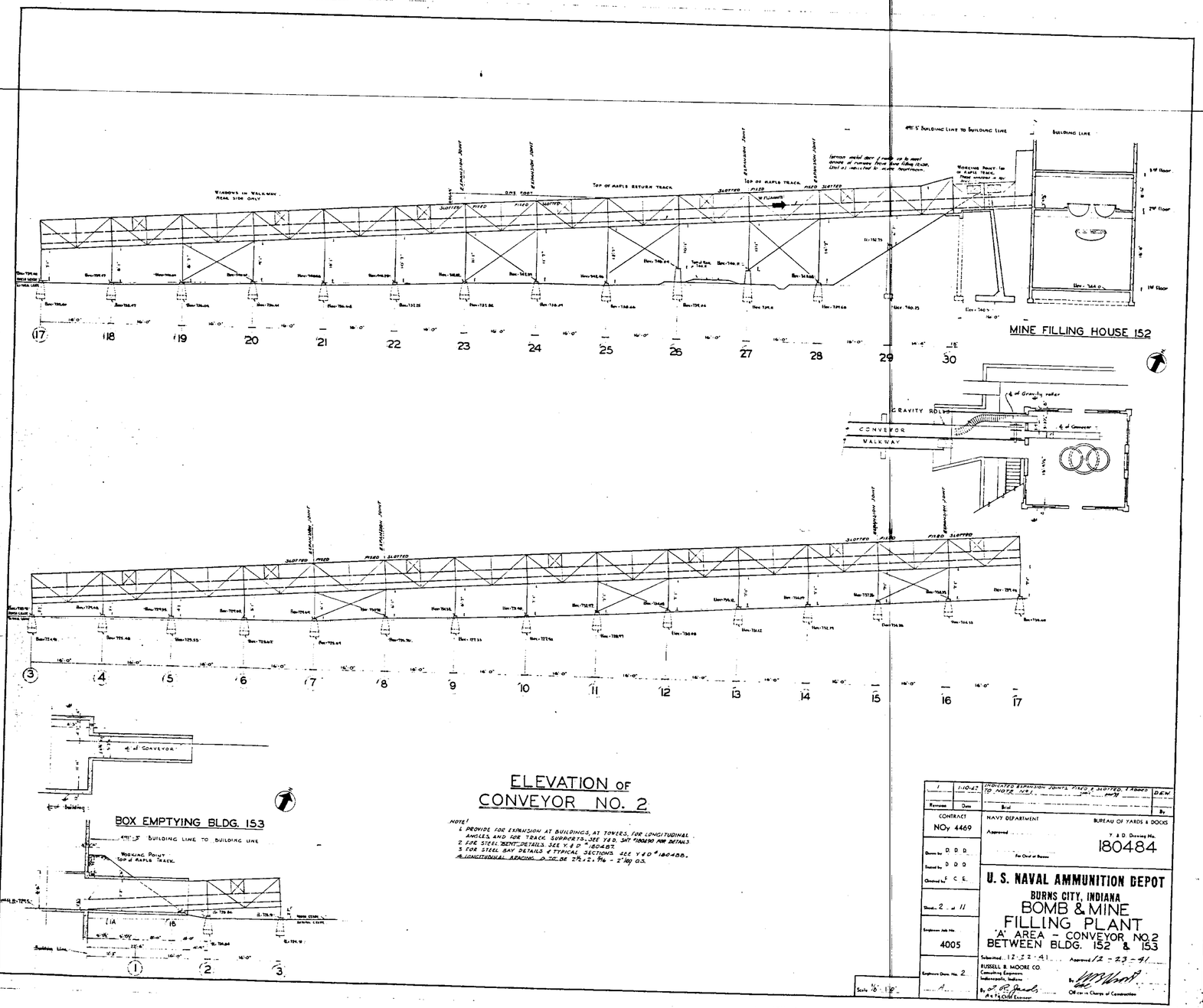
T.N.T. STORAGE B'LD'G.

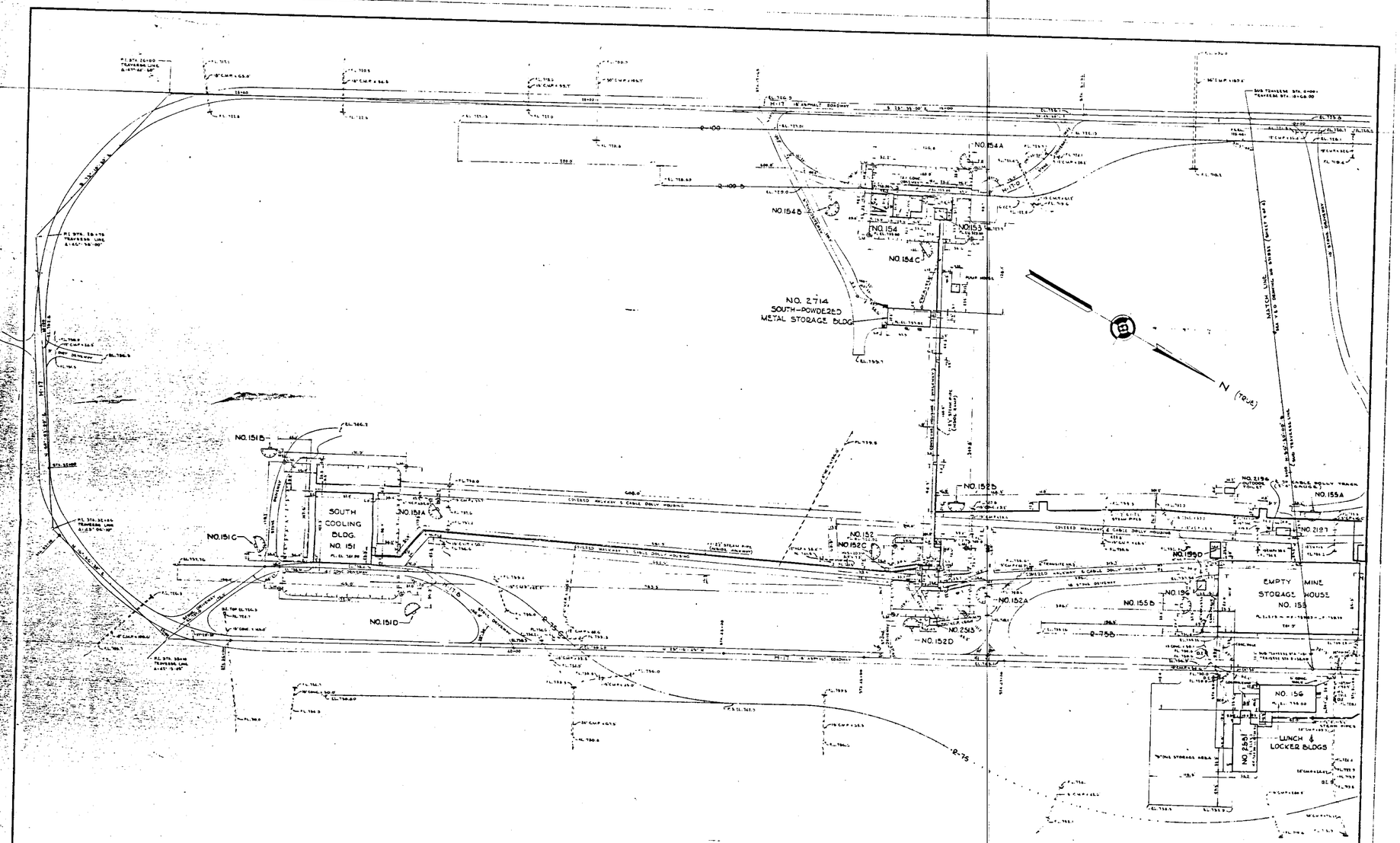
DETAILS OF BOX TOP CONVEYOR

Submitted 1-30-42 Approved 1-31-42

RUSSELL B. MOORE CO.
Consulting Engineers
Indianapolis, Indiana
By J. R. Geach
Asst. Chief Engineer

By W. Wright
Officer in Charge of Construction


MINE FILLING HOUSE 152
ELEVATION OF CONVEYOR NO. 2
BOX EMPTYING BLDG. 153
CONVEYOR
WALKWAY
GRAVITY ROLLS
BUILDING LINE
TOP OF MAPLE RETURN TRACK
TOP OF MAPLE TRACK
EXPANSION JOINT
SLOTTED
FIXED
NOTE!
1. PROVIDE FOR EXPANSION AT BUILDINGS, AT TOWERS, FOR LONGITUDINAL ANGLES, AND FOR TRACK SUPPORTS. SEE Y&D. SHT #180490 FOR DETAILS.
2. FOR STEEL BENT DETAILS, SEE Y&D #180487.
3. FOR STEEL BAY DETAILS & TYPICAL SECTIONS SEE Y&D #180488.
4. LONGITUDINAL SPACING 0 TO BE 2'-2.7/16 - 2'-1/16 O.C.
Scale 1/8" = 1'-0"
1 1-10-42 INDICATED EXPANSION JOINTS FIXED & SLOTTED, & ADDED TO NOTE NO 1. DEN
Revision Date Brief By
CONTRACT NOy 4469
NAVY DEPARTMENT
BUREAU OF YARDS & DOCKS
Y & D. Drawing No. 180484
For Chief of Bureau
Drawn by D. D. D.
Traced by D. D. D.
Checked by E. C. E.
Sheet 2 of 11
Engineers Job No. 4005
Engineers Dwg. No. 2
U. S. NAVAL AMMUNITION DEPOT
BURNS CITY, INDIANA
BOMB & MINE FILLING PLANT
'A' AREA - CONVEYOR NO. 2
BETWEEN BLDG. 152 & 153
Submitted 12-22-41 Approved 12-23-41
RUSSELL B. MOORE CO.
Consulting Engineers
Indianapolis, Indiana
By J. R. Jacobs
Asst. Civil Engineer
By W. B. Wood
Officer in Charge of Construction



SCHEDULE OF BUILDINGS

NO.	NAME
151	COOLING BLDG.
152	FILLING HOUSE
153	BOX EMPTYING BLDG.
154	STORAGE BLDG.
155	EMPTY MINE STORAGE HOUSE
155D	CABLE DRIVE HOUSE
156	LUNCH, LOCKER & OFFICE BLDG.
196	PAINT LOCKER
2197	CAR REPAIR SHED
2515	SAFETY BOOT & SHOE BLDG.
2551	LUNCH & LOCKER BLDG.
2714	POWDERED METAL STORAGE BLDG.

SYMBOLS

RAILROAD
RAILROAD & HIGHWAY
STEAM ABOVE GROUND

LEGEND

F.L. FLOOD LINE
L.W. LIGHTING MAST
G.I. GRID INLET
P.S. POINT OF SWITCH

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

PWD DRAWING NO.

DEPARTMENT OF THE NAVY — BUREAU OF YARDS & DOCKS
NINTH NAVAL DISTRICT — CHICAGO, ILLINOIS
U.S. NAVAL AMMUNITION DEPOT CRANE, INDIANA

PLOT PLAN
MINE FILLING AREA "A"
GENERAL & STEAM

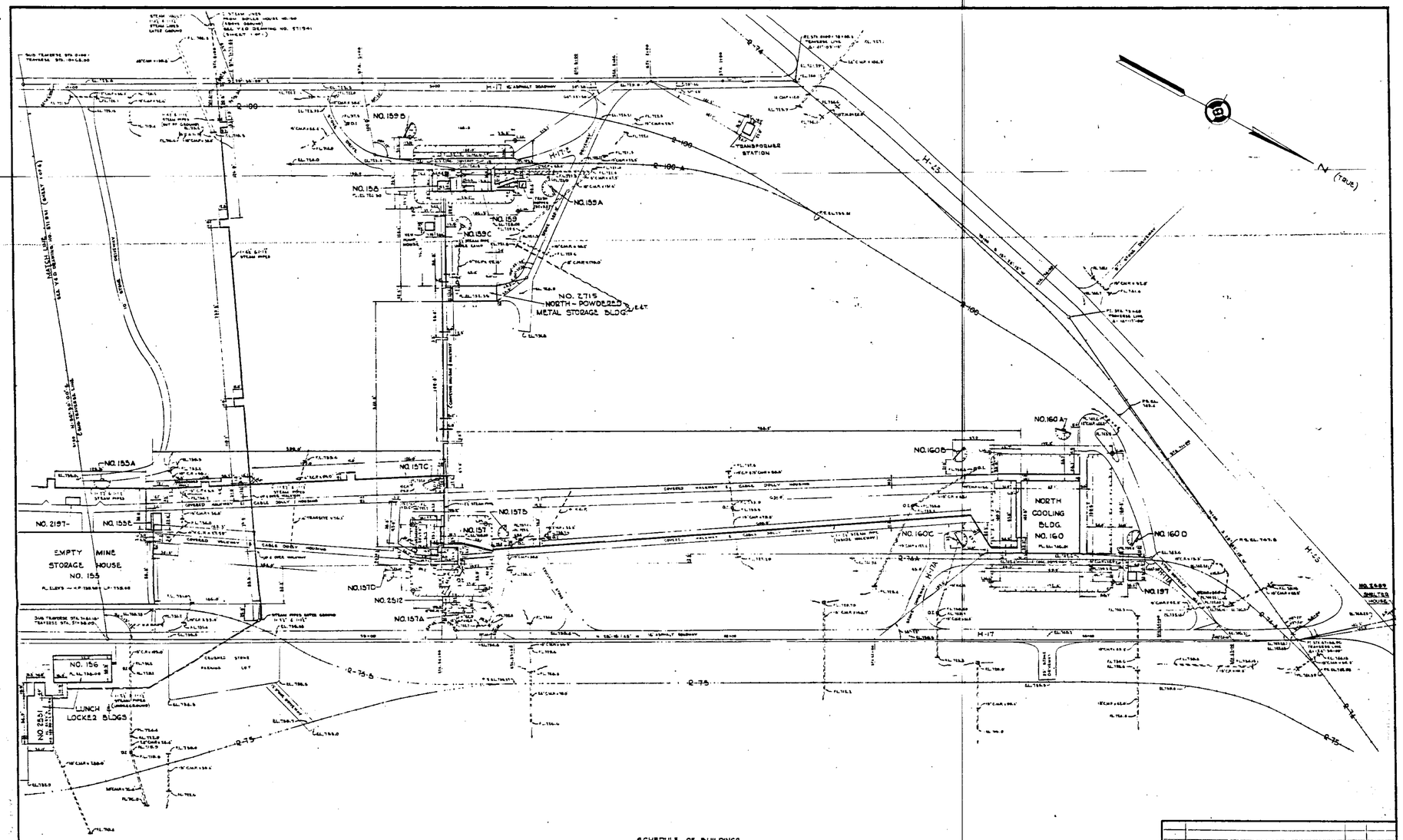
DRAWN BY D.F. BAUMGARTEN
TRACED BY
CHECKED BY
RED. BY
F.W. PAGE / W. SNYDER

H. LUM, CARLE & COMPANY
CONSULTING ENGINEERS
130 N. WACKER DRIVE
CHICAGO, ILLINOIS

APPROVED — DATE 7-9-43

APPROVED FOR BUREAU OF YARDS & DOCKS
CHIEF CIVIL ENGINEER BUREAU OF YARDS & DOCKS
DATE 2-1-54

SCALE 1:32 — FEET
SHEET 1 OF 4 — DATE 13 SEP
TAD DRAWING NO. 571 2551



SCHEDULE OF BUILDINGS

NO.	NAME
155	EMPTY MINE STORAGE HOUSE
155E	CABLE DRIVE HOUSE
156	LUNCH LOCKER & OFFICE BLDG
157	FILLING HOUSE
158	BOX EMPTYING BLDG
159	STORAGE
160	COOLING BLDG.
187	PAINT LOCKER
2197	CAR REPAIR SHED
2512	SAFETY BOOT & SHOE BLDG.
2551	LUNCH & LOCKER BLDG.
2687	SHELTER HOUSE
2715	POWDERED METAL STO. BLDG.

SYMBOLS

RAILROAD
CULVERT & HEADWALL
STEAM ABOVE GROUND
DROP INLET
LIGHTING MAST
DUGOUT

LEGEND

F.L. FLOW LINE
L.M. LIGHTING MAST
D.I. DROP INLET
S.H. SENTRY HOUSE
P.S. POINT OF SWITCH

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

PWO DRAWING NO.

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND — NAVY DEPARTMENT
NINTH NAVAL DISTRICT — CHICAGO, ILLINOIS — BUREAU OF YARDS & DOCKS
U.S. NAVAL AMMUNITION DEPOT CRANE, INDIANA

DRAWN BY J.F. MORGAN
TRACED BY R.A. SMITH
CHECKED BY R.A. SMITH
PRE. ENGR. R.C. FULLERTON
CHF. ENGR. J.H. MOLSTEN

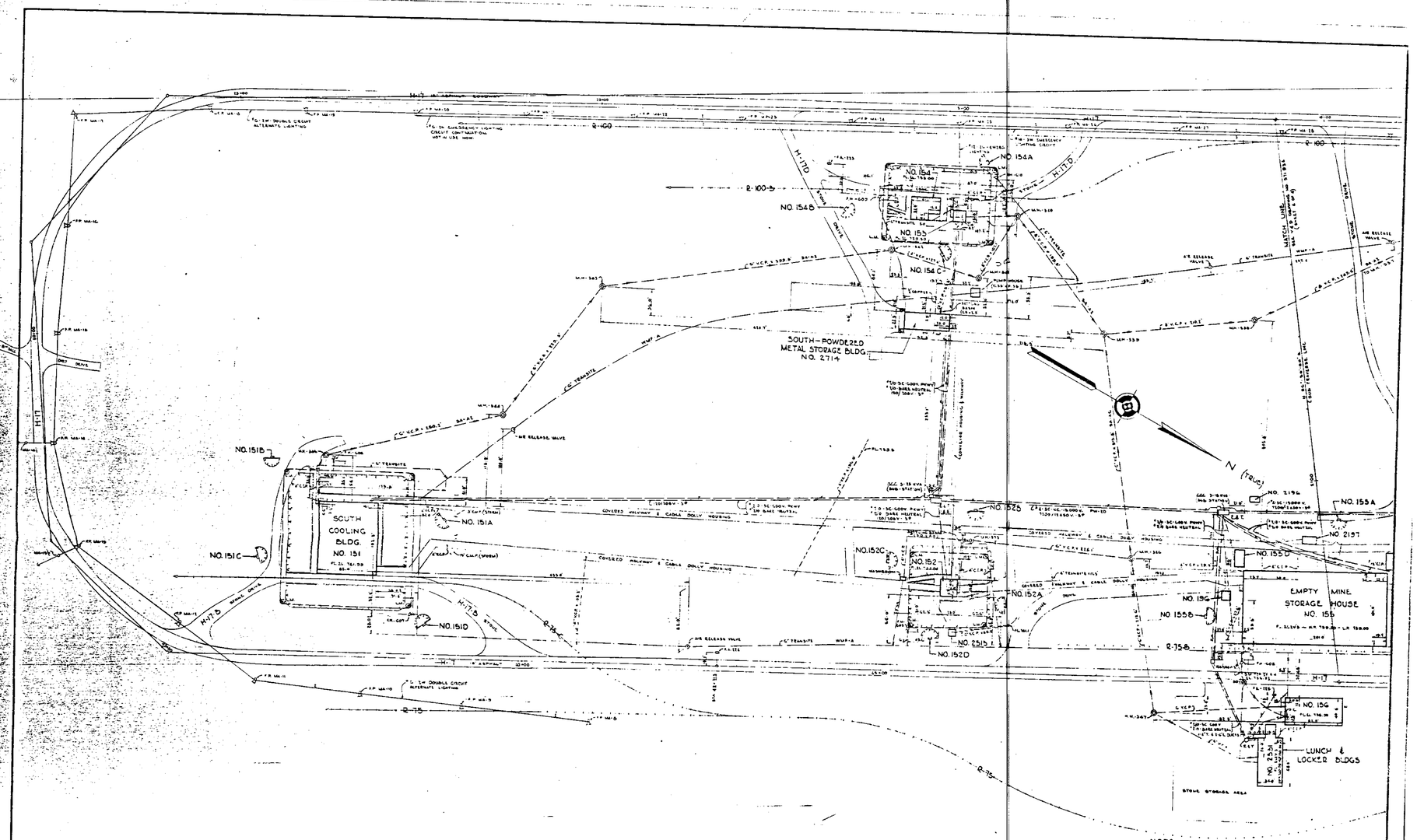
W. LEONE SANDERS & COMPANY
CONSULTING ENGINEERS
150 N. WACKER DRIVE
CHICAGO, ILLINOIS

PLOT PLAN
MINE FILLING AREA "A"
GENERAL & STEAM

APPROVED [signature] (CHIEF CIVIL ENGINEER) DATE 7-24-43

APPROVED FOR BUREAU OF YARDS & DOCKS [signature] (APPROVED FOR CHIEF OF BUREAU)
DATE 2-1-54

SCALE 1" = 50'
SHEET 1 OF 4
NOT 73,727
YARD DRAWING NO. 371932



SCHEDULE SANITARY SEWER MANHOLE ELEV'S		
M.H. NO.	TOP ELEV.	OUTLET INV. ELEV.
338	727.5	723.4
339	726.6	723.4
340	727.6	723.3
341	729.5	726.1
342	732.1	729.8
343	736.6	731.0
344	740.9	734.0
345	739.0	733.6
346	739.6	733.1
347	740.0	737.0
348	743.4	738.8

SCHEDULE OF BUILDINGS

NO.	NAME
151	COOLING BLDG.
152	FILLING HOUSE
153	BOX EMPTYING BLDG.
154	STORAGE BLDG.
155	EMPTY MINE STORAGE HOUSE
155D	CABLE DRIVE HOUSE
156	LUNCH, LOCKER & OFFICE BLDG.
196	PAINT LOCKER
2197	CAR REPAIR SHED
2515	SAFETY BOOT & SHOE BLDG
1551	LUNCH & LOCKER BLDG.
1715	POWDERED METAL STO BLDG

SYMBOLS

- RAILROAD
- SEWER
- WATER MAIN
- OVERHEAD LIGHTING - 2 WIRE
- OVERHEAD LIGHTING - 3 WIRE
- 3φ PRIMARY OVERHEAD
- 3φ PRIMARY UNDERGROUND
- 3φ SECONDARY OVERHEAD
- 3φ SECONDARY UNDERGROUND
- 1φ SECONDARY UNDERGROUND
- TELEPHONE OVERHEAD
- TELEPHONE UNDERGROUND
- FIRE ALARM OVERHEAD
- FIRE ALARM UNDERGROUND
- MANHOLE
- VALVE
- AIR RELEASE VALVE
- FIRE HYDRANT
- FLOOD LIGHT
- POWER POLE
- ELECTRIC & TELEPHONE VAULT
- LIGHTING MAST
- TRANSFORMER
- DISTRIBUTION CAN
- FIRE ALARM BOX
- DUCBUT

LEGEND

- M.H. MANHOLE
- F.H. FIRE HYDRANT
- F.P. FLOODLIGHT POLE
- E.&T. ELECTRIC & TELEPHONE VAULT
- F.A. FIRE ALARM BOX
- L.M. LIGHTING MAST
- D.C. DISTRIBUTION CAN

NOTE: THE FIRE ALARM SYSTEM HAS BEEN DESTROYED BY NEW CONSTRUCTION AND IS NOT YET STILL DISCONNECTED

SYMBOL	DESCRIPTION	DATE	APPROVAL
	REVISIONS		

PWD DRAWING NO.

DEPARTMENT OF THE NAVY — NINTH NAVAL DISTRICT — BUREAU OF YARDS & DOCKS
CHICAGO, ILLINOIS
U.S. NAVAL AMMUNITION DEPOT CRANE, INDIANA

PLOT PLAN
MINE FILLING AREA "A"
ELECTRICAL, TELEPHONE, FIRE ALARM, WATER & SANITARY SEWER

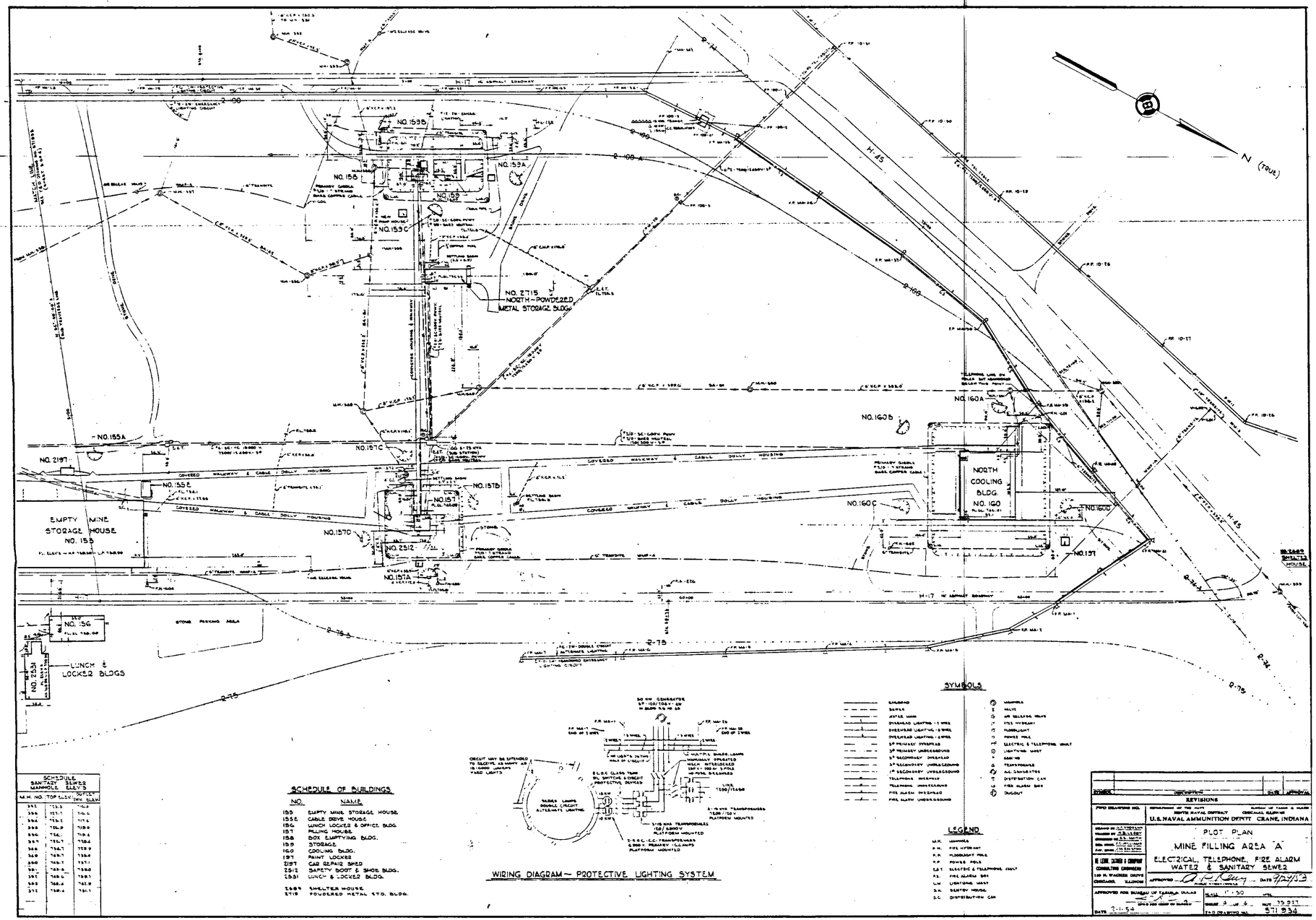
DESIGNED BY R.B. SMITH
DRAWN BY R.B. SMITH
CHECKED BY R.B. SMITH
APPROVED BY R.B. SMITH
F.W. STAHL / M.B. SMITH

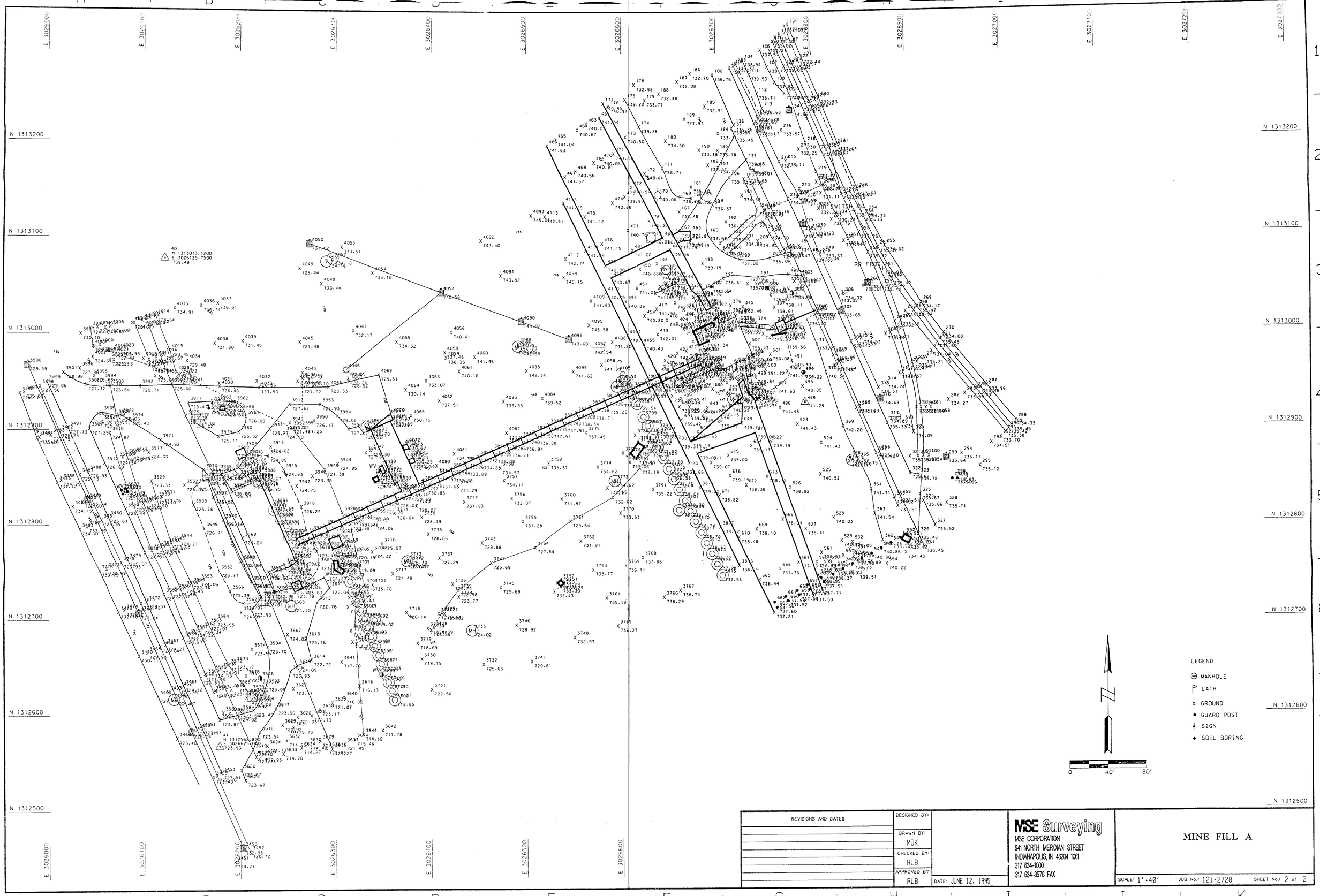
R. LEONE GAINES & COMPANY
CONSULTING ENGINEERS
180 N. WACKER DRIVE
CHICAGO, ILLINOIS

APPROVED — DATE 7/16/53

APPROVED FOR BUREAU OF YARDS & DOCKS
CHIEF CIVIL ENGINEER BUREAU OF YARDS & DOCKS
DATE 5-1-54

SCALE 1" = 50'
SHEET 3 OF 6
NAVY 73-737
F&R DRAWING NO. 571933


N (TRUE)
NO. 159B
NO. 158
NO. 159
NO. 153A
NO. 159C
NO. 2715
NORTH-POWDERED
METAL STORAGE BLDG.
NO. 160A
NO. 160B
NO. 155A
NO. 2197
NO. 157C
NO. 155E
NO. 157B
NO. 157
NO. 157D
NO. 2512
NO. 157A
NO. 160C
NO. 160D
NO. 157
NORTH
COOLING
BLDG.
NO. 160
EMPTY MINE
STORAGE HOUSE
NO. 155
COVERED WALKWAY & CABLE DOLLY HOUSING
NO. 156
LUNCH & LOCKER BLDGS
NO. 2551
STONE PARKING AREA
H-45
H-17
2-78
SYMBOLS
RAILROAD
SEWER
WATER MAIN
OVERHEAD LIGHTING - 1 WIRE
OVERHEAD LIGHTING - 3 WIRE
OVERHEAD LIGHTING - 4 WIRE
3Φ PRIMARY OVERHEAD
3Φ PRIMARY UNDERGROUND
3Φ SECONDARY OVERHEAD
3Φ SECONDARY UNDERGROUND
1Φ SECONDARY UNDERGROUND
TELEPHONE OVERHEAD
TELEPHONE UNDERGROUND
FIRE ALARM OVERHEAD
FIRE ALARM UNDERGROUND
MANHOLE
VALVE
AIR RELEASE VALVE
FIRE HYDRANT
FLOODLIGHT
POWER POLE
ELECTRIC & TELEPHONE VAULT
LIGHTING MAST
SENTRY
TRANSFORMER
A.C. SUBSTATION
DISTRIBUTION CAN
FIRE ALARM BOX
DUGOUT
LEGEND
M.H. MANHOLE
F.H. FIRE HYDRANT
F.P. FLOODLIGHT POLE
P.P. POWER POLE
E&T ELECTRIC & TELEPHONE VAULT
F.B. FIRE ALARM BOX
L.M. LIGHTING MAST
S.H. SENTRY HOUSE
D.C. DISTRIBUTION CAN
WIRING DIAGRAM — PROTECTIVE LIGHTING SYSTEM
50 KW GENERATOR
SCHEDULE OF BUILDINGS
NO. NAME
155 EMPTY MINE STORAGE HOUSE
155E CABLE DRIVE HOUSE
156 LUNCH LOCKER & OFFICE BLDG.
157 FILLING HOUSE
158 BOX EMPTYING BLDG.
159 STORAGE
160 COOLING BLDG.
197 PAINT LOCKER
215T CAR REPAIR SHED
2512 SAFETY BOOT & SHOE BLDG.
2551 LUNCH & LOCKER BLDG.
2689 SHELTER HOUSE
2719 POWDERED METAL STO. BLDG.
SCHEDULE
SANITARY SEWER
MANHOLE ELEV'S
M.H. NO. TOP ELEV. INV. ELEV.
REVISIONS
U.S. NAVAL AMMUNITION DEPOT CRANE, INDIANA
PLOT PLAN
MINE FILLING AREA "A"
ELECTRICAL, TELEPHONE, FIRE ALARM
WATER & SANITARY SEWER
LEE LEONE, JAMES & COMPANY
CONSULTING ENGINEERS
SCALE 1" = 50'
APPROVED FOR BUREAU OF YARDS & DOCKS
DATE 2-1-54
571 934



REVISIONS AND DATES	DESIGNED BY:	
	DRAWN BY: MOK	
	CHECKED BY: RLB	
	APPROVED BY: RLB	DATE: JUNE 12, 1995

MSE Surveying
MSE CORPORATION
941 NORTH MERIDIAN STREET
INDIANAPOLIS, IN 46204 1061
317 634-1000
317 634-3576 FAX

MINE FILL A

SCALE: 1" = 40' JOB No.: 121-2728 SHEET No.: 2 of 2

APPENDIX F
QUALITY CONTROL DOCUMENTATION

TABLE OF CONTENTS

ITEM	PAGE
OPERATORS DAILY MEMO AND SAFETY INSPECTION SHEET	F-3
KNIGHTS SOIL SCREENER - MODEL PRO-SCREEN 1605	F-4
MAC SEMI-TRACTOR TRUCK AND RED LINER LIVE-BOTTOM TRAILOR	F-6
HOPPER/SOIL DUMP CONVEYOR SYSTEM	F-11
CATERPILLAR BACKHOE - MODEL 416B	F-14
CATERPILLAR CENTER-PIVOT WHEEL LOADER - MODEL 1966	F-16
JOHN DEERE SKID STEER LOADER - MODEL 6675	F-17
JOHN DEERE FARM TRACTOR - MODEL 7710	F-20
SUPREME GRINDER/MIXER - MODEL 700	F-23
SCARAB WINDROW TURNER - MODEL 20HYD450	F-28
INSPECTION PLAN AND LOG	F-32
INSPECTION CHECKLISTS:	
Soil Excavation/Screening/Rock Washing	3 pages
Amendment/Soil Handling, Storage, Mixing, and Unloading	3 pages
Composting Operations	3 pages
Windrow Sampling	7 pages
Soil Excavation Sampling	5 pages
Support Facility Maintenance	2 pages
Retention Pond and Building Sump Inspection	1 page
Excavation Site Conditions Inspection	1 page

OPERATORS DAILY MEMO AND SAFETY INSPECTION

Equipment Type:				Shift:	Date:	Operator:	Form EQ-01
Inspection Item	OK	N/A	REPAIR	Adjustments or Repairs Required			
Service, Parking & Emergency Brakes							
Steering Mechanism							
Tires, Wheels Nuts							
Lights, Reflectors							
Coupling Devices							
Operating Controls							
Windshield Wipers							
Horn & Backup Alarm							
Seat Belts/Shoulder Harness							
Fire Extinguisher							
Mirrors							
Hydraulic Systems Operation							
Fluid Levels							

Knight Soil Screener - Model Pro-Screen 1605

LUBRICATION & SERVICE

ALWAYS STOP SCREENER, TURN OFF ENGINE AND REMOVE KEY BEFORE SERVICING, REPAIRING, OR CLEANING. USE SAFE SHOP PROCEDURES AND EXERCISE CAUTION WHEN WORKING ON THIS MACHINE!

DAILY SERVICE (10 Hour Maximum Interval):

- Grease trunnion wheel bearings.
- Grease fine conveyor pulley and return roller bearings.
- Check conveyor belt tracking.
- Check and clean all belt scrapers.
- Check all conveyor guides and rollers for rocks or obstructions.
- Check cooling system fluid level.
- Check fuel engine and hydraulic oil levels.
- Check air filter indicator (while running) and replace if necessary.
- Check engine and hydraulic temperature (while running).
- Check or clean radiator and oil cooler.

WEEKLY SERVICE (50 Hour Maximum Interval):

- Grease feed conveyor pulley and return roller bearings.
- Grease Prescreen pivots.
- Check oil level in feed conveyor gear reducer.
- Oil drum drive chain.
- Check fuel filter and drain water sump under fuel tank.

MONTHLY SERVICE (250 Hour Maximum Interval):

- Change engine oil and filter.
- Check conveyor belt tension.
- Clean air prefilter
- Oil Feed conveyor drive chain.
- Service battery.

500 HOUR SERVICE:

- Change hydraulic return filter.
- Lubricate fifth wheel plate.
- Grease extension conveyor.
- Refer to engine lubrication and service chart.

1600 HOUR SERVICE:

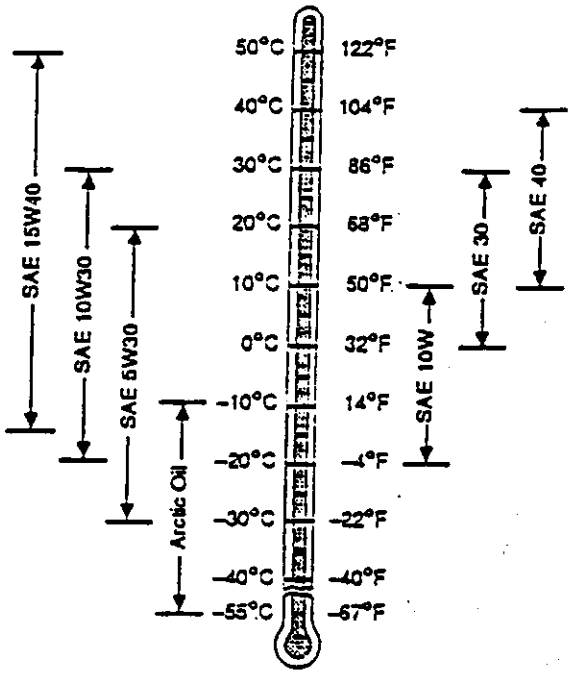
- Drain and clean hydraulic oil reservoir.
- Change hydraulic oil, clean strainer, cap and magnetic trap.
- Change feed conveyor gear reducer oil.
- Check wheel bolts.
- Check fifth wheel kingpin condition.
- Check brake components.
- Drain and flush cooling system, and change anti-freeze.

LUBRICATION & SERVICE

ALWAYS STOP SCREENER, TURN OFF ENGINE AND REMOVE KEY BEFORE SERVICING, REPAIRING, OR CLEANING. USE SAFE SHOP PROCEDURES AND EXERCISE CAUTION WHEN WORKING ON THIS MACHINE!

GREASE - For lubricating bearing, use a good quality multi-purpose grease.

ENGINE OIL - API service classification of CD or higher. Refer to chart for viscosity.



HYDRAULIC OIL - Recommend use of 10W30 motor oil (API Service Class CD) for all uses in temperatures down to zero degrees (F). For operation in temperatures below zero degrees (F), use 5W30 motor oil.

DIESEL FUEL - Use good quality fuel blended for area temperatures and conditions.

ROLLER CHAIN OIL - Use engine oil or spray on chain lubricant.

Mack Semi-tractor Truck
and Red River Live-Bottom Trailer

ENGINE OIL, OIL & FUEL FILTERS and COOLANT CONDITIONER CHANGE

Mileage (in Thousands)*	12.5	25	37.5	50	62.5	75	87.5	100
Kilometers (in Thousands)*	20	40	60	80	100	120	140	160
Engine Hours*		600		1200		1800		2400
Oil & Filter Change		✓		✓		✓		✓
Coolant Conditioner Change		•		•		•		•

*Whichever Comes First

Line Haul Operations – High mileage types of usage such as over-the-road, point-to-point operations. Vehicles used for pump-off, or similar types of service, where the engine idles for periods of time without the vehicle being driven, require oil change intervals based on hours of engine operation rather than accumulated chassis mileage even if vehicle usage exceeds 100,000 miles/160 000 km per year.

SHORT HAUL – Low Mileage/High Hour Operations

Vehicle Usage Greater Than 100,000 Miles/160 000 KM Per Year

MAINTENANCE AND LUBRICATION

Days of Usage*	45	90	135	180	225	270	315	360
Hours of Operation*	150	300	450	600	750	900	1050	1200
Maintenance Schedule	A	B	A	C	A	B	A	D
Chassis Lubrication†		L		L		L		L
Gear Oil Change				○				○

*Whichever Comes First

ENGINE OIL, OIL & FUEL and COOLANT CONDITIONER CHANGE

Days of Usage*	45	90	135	180	225	270	315	360
Hours of Operation*	150	300	450	600	750	900	1050	1200
Oil Only Change		✓				✓		
Oil & Filter Change				✓				✓
Coolant Conditioner Change		■		•		■		•

*Whichever Comes First

Short Haul Operations – Low mileage/High hour types of usage such as stop-and-go driving, on/off highway, pick-up and delivery, pump-off operations, etc.

† Recommended Spicer Clutch Release Bearing Lubrication Intervals:

- On-Highway: Every 10,000 miles (16 000 km) or once per month
- Off-Highway/Severe Service: Every 250 hours or once per month

Also refer to pages 148 and 150 for additional information.

200100a

MACK PREVENTIVE MAINTENANCE INSPECTION

☐ CHECK TO INDICATE INSPECTION TO BE PERFORMED

☐ A Inspection (see this page)

☐ B Inspection (see back page)

☐ Lubricate Chassis

☐ Change Engine Oil & Filters

☐ Change Gear Oil

Date _____

Customer _____

Fleet No. _____

Mileage _____

Chassis No. _____

Repair Order No. _____

NOTE: REFER TO MAINTENANCE AND LUBRICATION MANUAL TS494 OR MASTER MANUAL SECTION 3-101 FOR INSPECTION INSTRUCTIONS

ROAD TEST

OK	NC	Engine:
		Engine Alarms
		Starter Operation
		Engine Sound
		Exhaust Smoke
		Oil Pressure _____ (idle)
		Oil Pressure _____ (gov.)
		Fuel Gauge
		Volts _____ (max.)
		Engine Temp. _____ (max.)
		Tachometer/Speedometer
		Exhaust Pyrometer
		Turbo Operation
		Pull Limiter/LDA
		Shutters
		Air Compressor:
		Operation
		Gov. Cut In _____
		Gov. Cut Out _____
		Low Air Pressure Indicator

OK	NC	Clutch:
		Free Pedal
		Clutch Release
		Clutch Brake Operation
		Steering:
		Bind
		Free Play
		Wander/Shimmy
		Power Steering Operation
		Electronic Maxi-Miser:
		Electrical Check
		Magnetic Road Speed Sensor
		Road Speed Limit Setting
		Brakes:
		Unusual Noise
		Pull
		Drag

OK	NC	Parking Brake:
		Holding Ability
		Release
		Heater/Defroster
		Operation
		Air Conditioner:
		Operate 5 Minutes
		Trans./Aux. Trans./ Transfer Case/Flywheel PTO:
		Shifting
		Noise/Vibration
		Carrier:
		Noise
		Vibration
		Propeller Shaft:
		Noise/Vibration
		Engine Brake Operation
		Engine Shutdown

"A" INSPECTION
(To Be Performed After Road Test Above)

OK	NC	Cab:
		Mirrors/Glass
		Horns
		Clean Around Treadle Valve
		Windshield Wiper/Washer
		Back-Up Lights
		Tail Lights
		Brake Lights
		Turn Signals
		Hazard Warning Signal Flasher
		Marker Lights
		Headlights HI _____ LO _____
		Instrument Panel Lights
		V-MAC:
		Check for active faults

OK	NC	
		Battery Water Level
		Air System:
		Leaks
		Drain Reservoirs Slowly
		Spring Brake Application
		Alcohol Evap. Reservoir Level
		Radiator:
		Leaks/Coolant Level
		Antifreeze _____° Protection
		Belts:
		Condition/Tension with Gauge
		Engine:
		Leaks/Oil Level
		Governor Seals
		Drain Dearts From Fuel Tank(s)

OK	NC	Dry Air Cleaner:
		Replace Element if Necessary
		Engine Air Induction System:
		Hose & Pipe Condition
		Tighten Clamps
		Drain CMCAC Condensation
		Electronic Maxi-Miser:
		Control Cable Routing
		Accelerator Linkage Movement
		Exhaust System Leaks
		Steering Gear:
		Mounting
		Linkage
		Power Steering:
		Leaks/Fluid Level

NC — Needs Correction

COMMENTS _____

CONTINUED ON BACK

"A" INSPECTION
CONTINUED

OK	NC	Front Axle & Suspension:
		Broken Spring Leaves
		Wheel Seal Leaks
		Wheel Bearing Lube Level
		Adjust Brakes
		Trans./Aux. Trans. Transfer Case/Flywheel PTO:
		Leaks/Lube Level
		Mounting
		Propeller Shafts:
		Universal Joints
		Yoke/Flange Bolts
		Center Bearing

OK	NC	Rear Axle/Bogie & Suspensions:
		Broken Spring Leaves
		Wheel Seal Leaks
		Adjust Brakes
		Carrier(s):
		Leaks/Lube Level
		Tires:
		Condition
		Pressure
		Wheels/Rims:
		Condition
		Stud/Nut Torque
		Axle Flange Nut Torque

OK	NC	
		Trailer Cord
		Trailer Hoses/Glad Hands
		Fifth Wheel
		PTO/Hoist:
		Lube Level
		Operation
		Safety Equipment:
		Fire Extinguisher Pressure
		ICC Safety Kit
		Flaps

"B" INSPECTION
(To Be Performed After Road Test)

OK	NC	Cab:
		Mirrors/Glass
		Horns
		Clean Around Treadle Valve
		Windshield Wiper/Washer
		Back-Up Lights/Tail Lights
		Brake Lights
		Turn Signals
		Hazard Warning Signal Flasher
		Marker Lights
		Headlights Hi: _____ LO _____
		Instrument Panel Lights
		Seats/Seat Belts
		Doors & Latches
		Hood & Latches
		Tilt Cab:
		Reservoir Fluid Level
		Operation
		Battery:
		Water Level
		Clean & Tighten Terminals
		Cable Condition/Routing
		Air System:
		Leaks
		Drain Reservoirs Slowly
		Spring Brake Application
		Service Air Dryer
		Alcohol Evap. Reservoir Level
		Hose Condition
		Air Compressor Filter (Mack V8)
		Service Air System Components
		Radiator:
		Leaks/Coolant Level
		Antifreeze
		Hose Condition
		Tighten Hose Clamps

OK	NC	
		Alternator Mounting
		Belts:
		Condition/Tension with Gauge
		Alignment
		Engine:
		Leaks/Oil Level
		Governor Seals
		Drain Debris From Fuel Tank(s)
		Dry Air Cleaner:
		Replace Element if Necessary
		Engine Air Induction System:
		Hose & Pipe Condition
		Tighten Clamps
		Torque CMCAC Hose Clamps
		Drain CMCAC Condensation
		Electronic Maxi-Miser:
		Control Cable Mounting
		Accelerator Linkage Movement
		Exhaust System:
		Leaks
		Muffler/Pipes/Flex Tube
		Steering Gear:
		Mounting
		Linkage
		Power Steering:
		Leaks/Fluid Level
		Front Axle & Suspension:
		Toe-In
		Broken Spring Leaves
		Wheel Seal Leaks
		Wheel Bearing Lube Level
		Adjust Brakes

OK	NC	Trans./Aux. Trans./ Transfer Case/Flywheel PTO:
		Leaks/Lube Level
		Mounting
		Torque Bell Housing Cap Screws
		Propeller Shafts:
		Universal Joints
		Yoke/Flange Bolts
		Center Bearing
		Rear Axle/Bogie & Suspension:
		Spring/Trunnion Insulators
		Broken Spring Leaves
		Wheel Seal Leaks
		Adjust Brakes
		Carrier(s):
		Leaks/Lube Level
		Tires:
		Condition/Match
		Pressure/Tread Depth
		Wear Pattern
		Wheels/Rims:
		Condition
		Stud/Nut Torque
		Axle Flange Nut Torque
		Trailer Cord
		Trailer Hoses/Glad Hands
		Fifth Wheel
		PTO/Hoist:
		Lube Level
		Operation
		Safety Equipment:
		Fire Extinguisher Pressure
		ICC Safety Kit
		Flaps

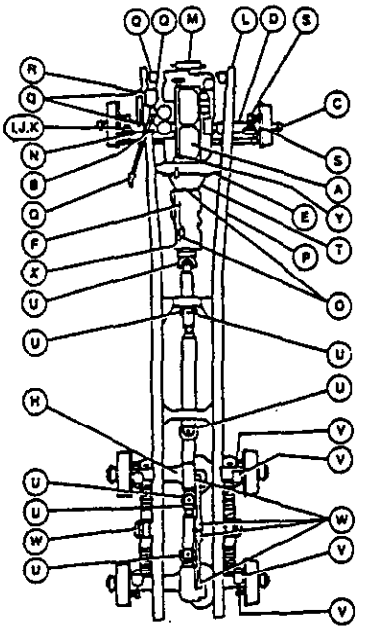
NC — Needs Correction

COMMENTS _____

MACK CHASSIS
PREVENTIVE MAINTENANCE SCHEDULE
LUBRICATION CHART

LUBE	ACTION TAKEN	KEY	ITEM
EO-L		A	ENGINE CRANKCASE
EO-L		B	POWER STEERING RESERVOIR
GO-H		C	FRONT WHEEL BEARINGS
GO-H		D	FRONT DRIVE AXLE
		E	FLYWHEEL PTO
		F	TRANSMISSION
		G	TRANSFER CASE
		H	REAR AXLE
MG-C			FRONT DRIVE AXLE
		I	SLIDING SPLINES
		I	UNIVERSALS
		J,K	KING PINS*
		J,K	UNIVERSALS (CARDANS)*
MG-C		L	CAB/HOOD HINGES
EO-L		M	SHUTTERS
		N	ACCELERATOR HINGE PIN
		N	BRAKE TREADLE HINGE PIN
MG-C		N	BRAKE VALVE PLUNGER
MG-C		O	SHIFT LINKAGE
CF-A		P	CAB TILT RESERVOIR
MG-C		Q	SPRING PINS*
		Q	SHACKLES*
		Q	DRAG LINK
		Q	STEERING UNIVERSALS
		Q	SLIP YOKE
		Q	PURGE FITTING
MG-C		R	STEERING GEAR ADAPTER BUSHING
MG-C		S	FRONT SLACK ADJUSTER*
		S	FRONT BRAKE CAMSHAFT*
		S	STEERING KNUCKLE PINS*
		S	CROSS STEERING TUBE SOCKETS*
MG-C		T	CLUTCH RELEASE SHAFT*
		T	CLUTCH RELEASE BEARING
MG-C		U	PROP SHAFT UNIVERSALS
		U	PROP SHAFT SLIDING SPLINE
MG-C		V	REAR BRAKE CAMSHAFT*
		V	REAR SLACK ADJUSTERS*
		V	SPRING PINS*
		W	TORQUE ROD BALL STUDS
		W	SPRING TRUNNION*
AND		X	SPEEDOMETER ADAPTOR (mech.)
		X	MAXI-MISER
AND		Y	TACHOMETER ADAPTOR (mech.)

* Indicates lubrication on both sides of vehicle.



NOTE
Clean all fittings with non-flammable solvent and wipe clean with a rag before applying grease gun.

ACTION TAKEN CODES	LUBRICANT CODES	
Check Level. Add Lubricant if Necessary	EO-L	Multi-Viscosity Engine Oil
Lubricate Fitting	GO-H	Gear Oil
Lubricate Surfaces	MG-C	Chassis Lube
Remove, Clean, Repack Adapter	CF-A	Cab Tilt Fluid
	TF-C-1	Dexron Trans Fluid
	And	Anderol 766
Remove, Clean, Reinstall		

000089a

Live-Bottom Trailer

EQUIPMENT:	INSPECT/CHECK:
WHEEL & RIMS	DAILY
TIRES	DAILY
TIRE PRESSURE	WEEKLY
5TH WHEEL KING PIN PLATE	INSPECT/GREASE DAILY
WHEEL HUBS	INSPECT OIL LEVEL DAILY
SUSPENSION SYSTEM	INSPECT MONTHLY
BRAKE SYSTEM	CHECK/INSPECT WEEKLY
SPRING BRAKES	CHECK/INSPECT SIX MONTH
CONVEYOR SYSTEM	CHECK/INSPECT DAILY CHANGE OIL/YEARLY LUBE WEEKLY
CONVEYOR BELT ADJUSTMENT	CHECK/INSPECT DAILY
LIGHTING AND WIRING	INSPECT DAILY
HYDRAULIC SYSTEM	INSPECT DAILY

Hopper/Soil Dump Conveyor System
(Wilson Mfg. Towable Conveyor)

4.1. Maintenance plan

ATTENTION!
Always ensure that the engine has stopped before performing maintenance work.
For the handling of used oil, filters and cleaners adhere to the rules of legislation.
Protect the starter key against unauthorized use.
Disconnect the negative terminal of the battery.
After maintenance work check to see if all tools are removed and all safety devices are in place.
Before starting look out for persons within the dangerous area around the engine and the working equipment.

	Intervals	Maintenance work	Chapt.
8-15	Every 8–15 hours	- Check lub.-oil level. - Check durst level in container of cyclone pre-cleaner.	4.2.1. 4.2.2.
250	Every 250 hours	- Change lub.-oil. * - Clean blower fan, cooling ribs and oilcooler. - Check condition of airfilter(s) (with dusty working conditions). - Check all safety devices for proper functioning. - Check screw connections for tightness. - Check fuel prefilter for contamination and replace, if necessary. **	4.2.3. 4.2.4. 4.2.6. 5.3. 5.4.
		The cylinder head nuts must NOT be tightened.	
500	Every 500 hours	- Replace fuel prefilter. - Maintain air filter(s). - Check and adjust tappet clearance. - Change lub.-oil and oilfilter. *	4.2.5. 4.2.6. 4.2.7. 4.2.8.
1000	Every 1000 hours	- Replace fuel filter.	4.2.9.

* Please also refer to page 22.

** The degree of contamination of fuel, the care when filling in fuel as well as the contamination inside fuel tank are decisive factors for replacement intervals of the fuel prefilter.

MAINTENANCE GUIDELINES FOR 36" TOWABLE CONVEYOR

DIESEL ENGINE:

The diesel engine is lubricated and serviced from the factory, however it is necessary to follow the suggested maintenance schedule provided in the engine operator's manual. (See section on engine.)

WAGON:

1) Grease spindles weekly.
2) Keep proper air pressure in tires. (*Manufacturer's suggested: 90 PSI.*)

CONVEYOR:

1) Keep head free of build-up.
2) Keep wiper adjusted against belt.
3) Always run conveyor until empty.
4) Weekly lubrication of all bearings and idlers will increase their life.
5) Gear box oil should be checked monthly and changed annually.
6) It is important to keep belt tight and tracking properly. Tension is obtained at the intermediate drive. Keep both take-ups adjusted evenly.
7) Track belt at the head, tail, and drive.

NOTE Literature on components is supplied for individual maintenance and operation.

Hopper/Dump Conveyor

SAFETY FOR 36" TOWABLE CONVEYOR

1) Covers and guards are provided for your protection. ◆◆ ◆◆◆ operate equipment without these in place.

2) Turn power off before doing any maintenance or adjustments. (Remove key from diesel engine.)

3) Keep hands, feet, and clothing from moving parts.

4) The exhaust system on the engine becomes extremely hot when in use. ◆◆ ◆◆◆ ◆◆◆◆◆!

5) ◆◆ ◆◆◆ attempt to ride on the unit while traveling.

6) Follow safety guidelines in diesel engine manual when performing any maintenance.

7) Pull unit slowly (High speed could result in conveyor turning over).

Caterpillar 416B, 426B, 428B, 436B & 438B Backhoe Loaders Lubrication and Maintenance Intervals

When Required ..... Item

Fuel System – Clean filter elements 25
Cab Air Filter – Clean filter element 19
Fuse Panel and Circuit Breaker – Replace fuses 9
Air Conditioner – Check 18
Bucket Teeth (if equipped) - Replace tips 11

Every 10 Service Hours or Daily

Windows – Clean 20
Seat Belt – Inspect 10
Engine Crankcase – Check oil level 24
Hydraulic System – Check oil level 27
Transmission/Torque Converter – Check oil level 7
Radiator – Check coolant level 26
Air Cleaner – Inspect/Service Bowl and Elements 5
Water Separator – Drain 4
Fuel Tank – Fill 6
Lubrication Grease Points – Lubricate 13
Wheel Nuts – Check torque until the specified torque is maintained 3
Brake Fluid – Check level 17
Emergency Steering – Check 16

Every 50 Service Hours or Weekly *

Parking and Service Brakes – Check the brakes on new or rebuilt machines for the first time at 50 Service Hours. Then check at the normal interval thereafter 14
Front Powered Axle (If Equipped) - Lubricate the fittings 1

Every 250 Service Hours or Monthly *

Engine Crankcase (Heavily loaded machines) – Change oil and filter 24
Radiator – Add coolant additive 26
Rear Axle – Check oil level 15
Front Powered Axle (If Equipped) – Check oil level 1
Alternator, Fan and Compressor Belts – Inspect/adjust 22
Batteries – Inspect 21
Parking Brakes – Check/adjust 14
Extendable Stick (If Equipped) – Inspect/replace 12

Every 500 Service Hours or 3 Months *

Engine Crankcase (Lightly loaded machines) – Change oil and filter 24
Hydraulic System – Change filter element 27
Transmission/Torque Converter – Change filter/wash breather 7
Drive Shaft Joints (MPGM) – Lubricate 8
Fuel System – Change filter elements 25

Every 1000 Service Hours or 6 Months *

Transmission/Torque Converter – Change oil 7
Front Wheel Bearings – Lubricate 2
Rear Axle – Change oil 15
Front Powered Axle (If Equipped) – Change oil 1

Every 2000 Service Hours or 1 Year *

Hydraulic System – Change oil 27
Engine Valve Lash – Adjust 23

Every 3000 Service Hours or 2 Years *

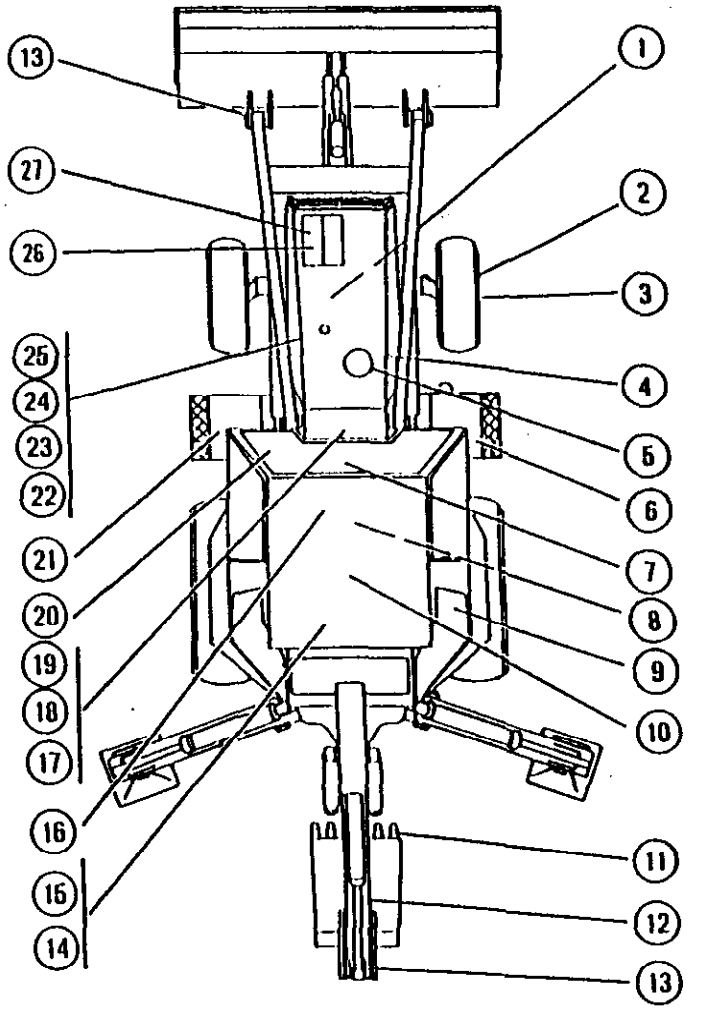
Radiator – Clean/flush 26

* First Perform Previous Service Hour Items

Refill Capacities (Approximate)

Compartment or System	Liters	U.S. Gallons	Imperial Gallons
Engine Crankcase Oil w/Filter	8	2.1	1.8
Hydraulic Tank Oil	37.9	10.0	8.4
Transmission and Torque Converter	10	2.6	2.2
Radiator Coolant	11.4	3	2.5
Cooling System Coolant (N/A Engines)	15.2	4	3.3
Cooling System Coolant (T/A Engines)	17.8	4.7	3.9
Fuel Tank	106.12	28	23.35
Rear Axle	18.5	4.8	4.1
Front Powered Axle - Center Axle	7.5	2.0	1.7
Front Powered Axle Final Drives (Each Side)	.75	.20	.17

This Lubrication and Maintenance Interval Chart is for Product Identification Numbers 8SG1-UP, 5YJ1-UP, 7EJ1-UP, 6MJ1-UP, and 3KK1-UP. For additional information, refer to SEBU6414 Operation & Maintenance Manual.



Daily Walk-Around Inspection

Machine

For maximum service life of the machine, make a thorough walk around inspection of the machine daily. Report or repair any damage, replace any worn or missing parts, tighten any loose fasteners.

Look around and under the machine for such items as loose fasteners, trash build up, oil or coolant leaks, broken or worn parts or other evidence of damage.

Check lights for broken bulbs or lenses. Make sure that all covers and guards are firmly in place. Inspect for damage.

Inspect all steps, walkways, handholds for condition and cleanliness. Check Rollover Protective Structure (ROPS) for damage, loose bolts.

If any liquid levels are found low (hydraulic system oil, engine crankcase oil, cooling system coolant, etc.), refill to correct level and record amount and type of liquid added.

Front and Rear Axles (1) (15)

Check axle housings for signs of leakage, loose or missing hardware.

Wheels and Tires (2) (3)

Inspect rims and tires for damage, excessive wear, loose or missing fasteners. Remove rocks from tire tread.

Check for missing inflation valves. Measure tire pressure.

Engine Air Intake (5)

Check precleaner bowl for dust accumulation, debris, or damage. Empty precleaner bowl before dirt reaches FULL mark.

Operator's Compartment (10)

Inspect compartment for cleanliness. Check all instrument panels for broken gauges, indicators, and lights. Inspect seat belt and mounting for excessive wear or damage.

Check rear view mirrors for cracks, loose hardware, and correct adjustment. Inspect windshield wipers for worn or damaged blades, and windshield washer for correct fill.

Buckets and Linkage (11)

Check bucket for loose or missing bolts, teeth, and edges. Check attachments, cylinders, and linkage for excessive wear or damage.

Check external hydraulic lines for leakage, rubbing wear or loose fasteners. Inspect cylinder rods for scoring. Check all mounting brackets for cracks.

Engine Compartment (22)

Inspect for oil, fuel, and coolant leaks. Remove any trash build-up. If the oil level check shows milky oil, do NOT start the engine.

Cooling System (26)

Check for coolant leaks. Check coolant level. Check for cracked hoses, loose hose clamps and connections. Remove any trash build up.

If machine is equipped with temperature recorder labels, record highest temperature showing on the label.

Hydraulic System (27)

Inspect hydraulic system for signs of leakage. Check tank, all hoses, tubes, plugs, joints and fittings.

General

For more detailed and additional information, check the "Walk-Around Inspection" section in the Operation & Maintenance Manual for this machine.

Never start or operate a machine or any implement or attachment, if leakage, damage, loose or missing parts or fasteners or any other suspicious condition is discovered or present.

Make sure that the machine and all implements and attachments are in good operating condition, and that all necessary repairs, replacements, cleanup, etc. are completed before starting or operating any equipment.

Caterpillar 966F Series II Wheel Loader Lubrication and Maintenance Intervals

When Required — Item

Engine Air Intake System – Service filters 14
Ether Starting Aid (If Equipped) – Replace cylinder 13
Fuel System – Service when loss of power 24
Fuses and Circuit Breakers – Replace/reset 12
Windshield Wipers and Washer – Inspect 25, 29
Bucket Edge – Replace if damaged 1
Bucket Tips – Replace if damaged 35
Filter Inspection – Inspect used filter for debris 15
Ride Control Accumulator (If Equipped) – Check pressure

Every 10 Service Hours or Daily

Engine Crankcase Oil – Check oil level 15
Transmission System Oil – Check oil level 9
Hydraulic Tank Oil – Check oil level 10
Radiator – Check coolant level 17
Walk-Around Inspection – Inspect machine
Fuel Tank – Drain water and sediment 27
Air Reservoir – Drain moisture and sediment 17
Seat Belt – Inspect 11
Brakes, Indicators and Gauges – Test 8
Back-up Alarm – Test 18

Every 50 Service Hours or Weekly *

Cab Air System – Clean filters 28
Bucket Lower Pivot Bearings – Lubricate 2 fittings 3
Tires – Check inflation pressure 5

Every 100 Service Hours or 2 Weeks *

Rear Axle Trunnion – Lubricate 2 fittings 23
Steering Cylinder Bearings – Lubricate 4 fittings 23
Bucket Upper Pivot Bearing – Lubricate 1 fitting 2
Lift Arm and Cylinder Linkage – Lubricate 6 fittings 7, 31, 33
Bucket Cylinder and Linkage Bearings – Lubricate 4 fittings 7, 31, 33
Logging Fork Clamp (If Equipped) – Lubricate 6 fittings

Every 250 Service Hours or Monthly *

Engine Oil and Filter – Change. If the sulfur content in the fuel is greater than 1.5% by weight, use an oil with a TBN of 30 and reduce the oil change interval by one half 15
Engine Valve Lash – Adjust on new or reconditioned engines, then at normal interval thereafter 22
Engine Crankcase Breather – Clean 21
Cooling System – Add coolant additive 17
Brakes – Test 8
Brake Oil Reservoirs (If Equipped) – Check oil level 28
Drive Shaft Spline – Lubricate fitting 30
Fan Bearing – Lubricate fitting 19
Air Conditioner (If Equipped) – Test 19
Fan and Alternator Belts – Inspect/adjust 19
Batteries – Inspect 16, 20

Every 500 Service Hours or 3 Months *

Transmission Oil Filter – Change filter 9
Hydraulic Oil System – Change filter 10
Fuel System – Change filter/clean screen 24
Fuel Tank Cap and Fill Screen – Clean 27

Every 1000 Service Hours or 6 Months *

Transmission System Oil – Change 9
Drive Shaft Universal Joints – Lubricate 5 fittings 6
Drive Shaft Support Bearing – Lubricate fitting 7
Frame Pivot Bearings – Lubricate 2 fittings 30
Rollover Protective Structure (ROPS) – Inspect 25

Every 2000 Service Hours or 1 Year *

Hydraulic Tank – Change oil 10
Differentials – Change oil 26, 33,
Engine Valve Lash and Fuel Injector Timing – Adjust 22
Engine Valve Rotators – Check 22
Wet Disc Brakes – Inspect 26, 33

Every 3000 Service Hours or 2 Years *

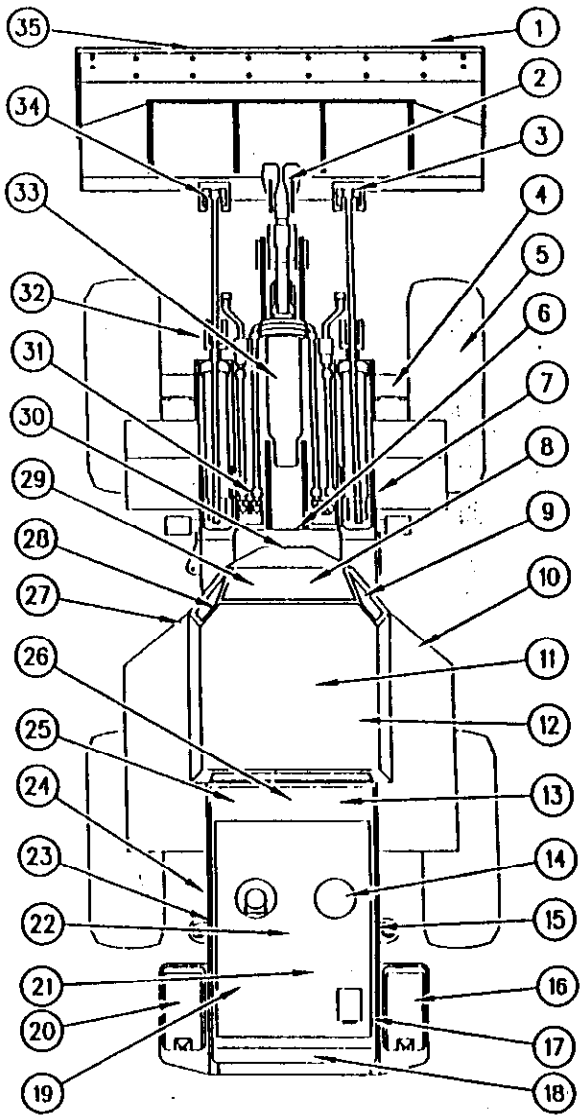
Cooling System Coolant – Change 17

* First Perform Previous Service Hours Items

Refill Capacities

Compartment or System	Liters	U.S. Gal.	Imperial Gal.
Cooling System	43.3	11.3	9.5
Hydraulic Tank	140	36.4	30.8
Fuel Tank[1]	304	79	66.9
Fuel Tank[2]	377	98	82.9
Engine Crankcase	28	7.3	6.2
Transmission	59	15.3	13
Front Differential[3]	47	12.2	10.3
Front Differential[4]	65	16.9	14.3
Rear Differential[3]	47	12.2	10.3
Rear Differential[4]	65	16.9	14.3
Brake Reservoirs (If Equipped)	6	1.6	1.3

[1] 1SL1-1343 & 9YJ1-2123.
[2] 1SL1344-Up, 9YJ2124-Up.
[3] 1SL1-1017, 9YJ1-1187 & 8BG1-2361.
[4] 1SL1018-Up, 9YJ1188-Up & 8BG2362-Up.
For additional detailed information, refer to SEBU6627-02 Operation & Maintenance Manual.



D65364

John Deere Skid Steer Loader Model 6675

Service Interval Chart — Hourly Interval

Periodic Service	5	10	50	100	200	500	1000
Check engine oil level	I	●					
Check hydraulic system oil level		●					
Clean radiator and oil cooler from trash build up (When operating in extremely dirty conditions, service sooner or service per EIM)		●					
Check coolant level		●					
Check alternator belt tension		I	●				
Lubricate boom & cylinders			●				
Lubricate mounting plate latches (When operating in extremely dirty conditions, service sooner)			●				
Check tire pressure	I		●				
Check parking brake adjustment				●			
Change engine oil and filter (When operating in extremely dirty conditions, service sooner or service per EIM)			I		●		
Clean fuel filter sediment bowl				●			
Lubricate brake linkage				●			
Lubricate control pedal linkage				●			
Tighten cab hardware					●		
Replace in line fuel filter					●		
Replace primary air cleaner element (When operating in extremely dirty conditions, service sooner or service per EIM)						●	
Replace secondary air cleaner element (OR every third primary element replacement, whichever occurs first.)							●

Service Interval Chart — Hourly Interval

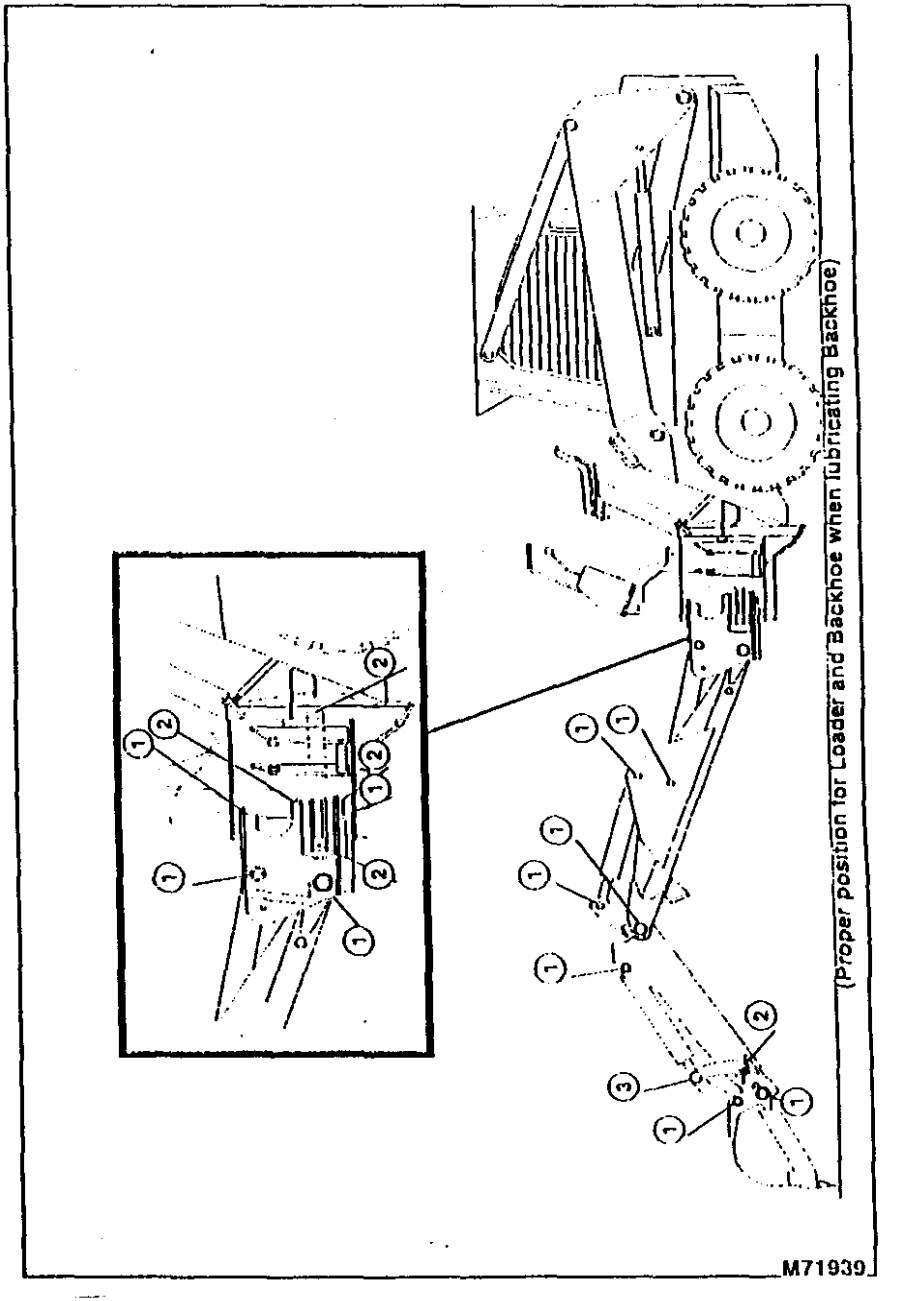
Periodic Service	5	10	50	100	250	500	1000
Check gear box oil level						●	
Check final drive oil level						●	
Check final drive chain tension				I			●
Check oil reservoir breather						●	
Tighten all hardware	I			I			●
Change hydraulic oil filter (The EIM monitors the hydraulic oil filter. Replace the filter at 500 hour intervals OR when the EIM indicates a dirty filter, which ever occurs first.)		I				●	
Change hydraulic oil							
Lubricate axles							

KEY: ● = REQUIRED SERVICE HOUR INTERVAL (Continue repeating service intervals)

I = PERFORM AT INITIAL BREAK-IN (Thereafter at hour interval shown)

Grease Fittings

- Grease fittings are provided at the twenty-four (24) points indicated in the illustration on the following page.
- The number indicates how many fittings are found at that location.
- Lubricate every 10 hours.
- If any grease fittings are missing, replace them immediately.
- Clean fittings thoroughly before using grease gun.
- Lubricate with John Deere multipurpose grease or an equivalent until grease oozes out of the sides.



SERVICE MACHINE SAFELY

Avoid High Pressure Fluids

- Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.
- Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.
- If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

SERVICE

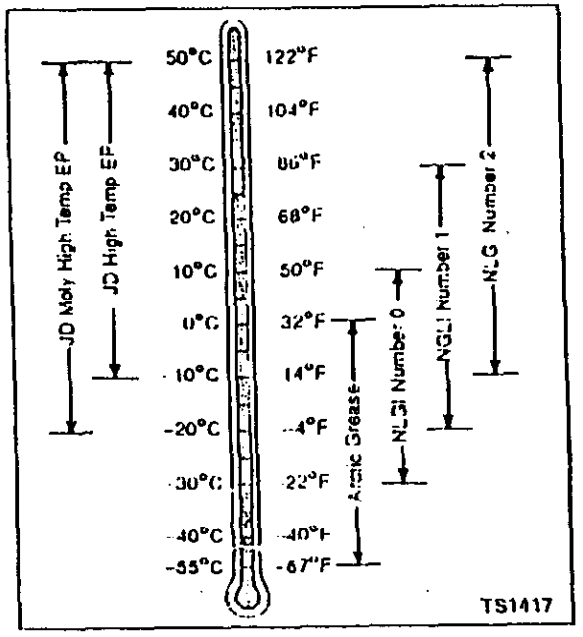
Grease

Use grease based on the expected air temperature range during the service interval.

John Deere Moly High Temperature EP Grease and John Deere High Temperature EP Grease are recommended.

Other greases that may be used are:

- SAE Multipurpose EP Grease with 3 to 5 percent molybdenum disulfide.
- SAE Multipurpose EP Grease.
- Greases meeting Military Specification MIL-G-10924C may be used as arctic grease.



John Deere Farm Tractor - Model 7710
(With Attachments)

SERVICE INTERVAL CHART
DAILY OR 10 HOURS—250 HOURS—750 HOURS

Item	Daily or 10 Hours	250 Hours	750 Hours
Check Engine Oil Level and Coolant Level	•		
Drain Water Separator, if equipped	•		
Check Transmission-Hydraulic Oil Level	•		
Lubricate Rear Axle Bearings *	•		
Lubricate 2WD Front Wheel Bearings, Front Axle Pivot Pin, Steering Spindles/Cylinder Ends and Tie Rod Ends *	•		
Lubricate MFWD Tie Rod, Kingpins and Axle Pivot *	•		
Lubricate Front PTO Shaft *	•		
Check All Tires	•		
Change Engine Oil and Filter		•	
Check Manual Brakes		•	
Service Batteries and Drain Fuel Tank Sump		•	
Inspect Tractor for Loose Bolts		•	
Check Neutral Start System and Inspect Fire Extinguisher		•	
Clean Operator Enclosure Air Filters		•	
Lubricate Three-Point Hitch and Lift Links and Lubricate Rear Window Hinge		•	
Lubricate 2WD Front Axle Pivot Pin, Steering Spindles/Cylinder Ends, and Tie Rod Ends		•	
Lubricate MFWD Tie Rod, Kingpins, and Axle Pivot and Check MFWD Axle Housing and Wheel Hub Oil Level		•	
Check Front PTO Housing Oil Level and Lubricate Front PTO Shaft		•	
Lubricate Rear Axle Bearings			•
Check Air Intake System and Check Engine Idle Speeds			•
Add Coolant Conditioner			•
Replace Transmission and Hydraulic Filter Elements			•
Clean Fuel Tank Vent Filter			•

John Deere Farm Tractor - Model 7710

SERVICE INTERVAL CHART

1500 HOURS—2000 HOURS—ANNUAL—TWO YEARS
4500 HOURS OR FIVE YEARS—AS REQUIRED

Item	1500 Hours	2000 Hours	Annual	Every Two Years	Every 4500 Hours or Five Years	As Required
Change Transmission-Hydraulic Oil	•					
Clean Hydraulic Oil Suction Screen	•				•	
Change MFWD Hub and Axle Housing Oil	•					
Check Fuel Injection Nozzles	•					
Lubricate Draft Link Support Shaft Bushing	•					
Check Belt Tensioner	•					
Clean and Repack Front Wheel Bearings	•					
Change Front PTO Housing Oil	•					
Adjust Engine Valve Clearance		•				
Replace Primary and Secondary Air Cleaner Elements			•			
Replace Operator Enclosure Air Filters			•			
Lubricate PTO Shaft			•			
Drain, Flush, and Refill Engine Cooling System				•		
Replace Thermostats				•		
Replace Engine Crankshaft Damper					•	
Replace Transmission and Hydraulic Filter Elements						•
Replace Fuel Prefilter and Filter Elements						•
Replace Water Separator Element						•
Bleed Fuel System						•
Bleed Brakes						•
Check Engine Compartment for Debris						•
Clean Radiator and Oil-Cooler-Condenser						•
Service Air Pre-Cleaner and Cleaner						•
Replace Fan Belt						•
Replace and Adjust Lights						•
Replace Fuses and Relays						•
Service Air Conditioner						•

Lubrication and Maintenance/10 and 50 Hour

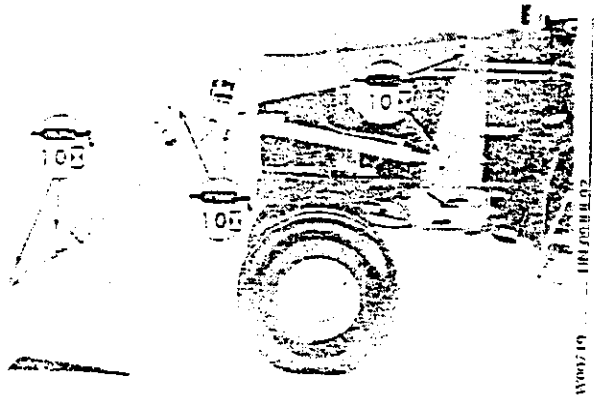
LUBRICATE LOADER

⚠ CAUTION: Help prevent personal injury caused by unexpected movement of the loader. Lower loader to the ground, engage parking brake or place transmission in "PARK", shut off engine and remove key before lubricating or servicing the loader.

1. Dump bucket and lower to the ground.

2. Lubricate twelve fittings, six on each side of loader.

3. For loader with QUIK-CHANGE bucket attach, lubricate bucket latch pins.

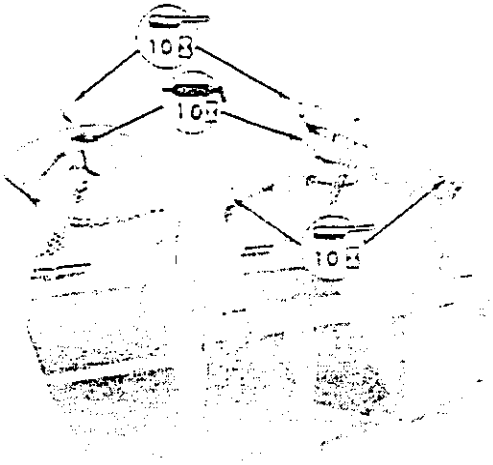


WX,620,LB,2 -19-2-JUL92

LUBRICATE GRAPPLE

1. Lubricate two fittings on back of pivot arms.

2. Apply grease, oil or spray lubricant to cylinder pivots.



SUPREME CUTTER/MIXER/FEEDER OPERATING INSTRUCTIONS CONT'D.

Tractor Operating Speed - When the mixture consists of a HIGH PERCENTAGE OF HAY, A SLOWER PTO SPEED IS RECOMMENDED if tractor horsepower is sufficient! Also, when working with large quantities of hay, a lower tractor PTO speed reduces the chances of spillage.

Stopping the Mixing Screw When Fully Loaded - It is recommended to AVOID STOPPING THE MIXING SCREW WHEN FULLY LOADED if at all possible. If a fully loaded tub is left sitting for long periods of time, or if the machine has to travel over very rough terrain for unloading purposes, the mixed ration will settle in the tub and on the flighting of the screw. The HORSEPOWER REQUIREMENT TO RESTART the screw with the tub fully loaded is MUCH HIGHER and causes MORE STRESS ON THE TRACTOR PTO CLUTCH.

MAINTENANCE:

1) Always ensure that the BATTERY IS CHARGED in order to avoid incorrect scale readings, or damage to the scale indicator.

2) Check OIL LEVELS for the PLANETARY DRIVE DAILY and the GEARBOX EVERY 3 MONTHS. We recommend SAE 80/90 GEAR LUBE OIL (use in mild climate regions) - OR - SAE 70/80 GEAR LUBE OIL (use in cold climate regions) for both the right angle drive and planetary. Damage caused by operating machine with low oil levels will not be covered by warranty.

   Planetary - filler on side of platform (black cap), fill to level on sight gauge

   Right Angle Drive - Models 350, 425, 500 & 600 - on back of gearbox, check safe oil level between filler plug and lower plug (pages 25 & 26)

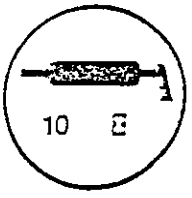
   Right Angle Drive - Model 700 - on front side of gear box check safe oil level (pages 25 & 26)

SUPREME CUTTER/MIXER/FEEDER OPERATING INSTRUCTIONS CONT'D.

3) GREASE universal joints on PTO drive REGULARLY (do not forget PTO universal joint which is underneath the machine by the planetary drive) (page 24)

4) GREASE unloading elevator bearing periodically (page 24)

5) Adjust elevator chain tension at the take up bearing, located at the lower end of the of elevator.

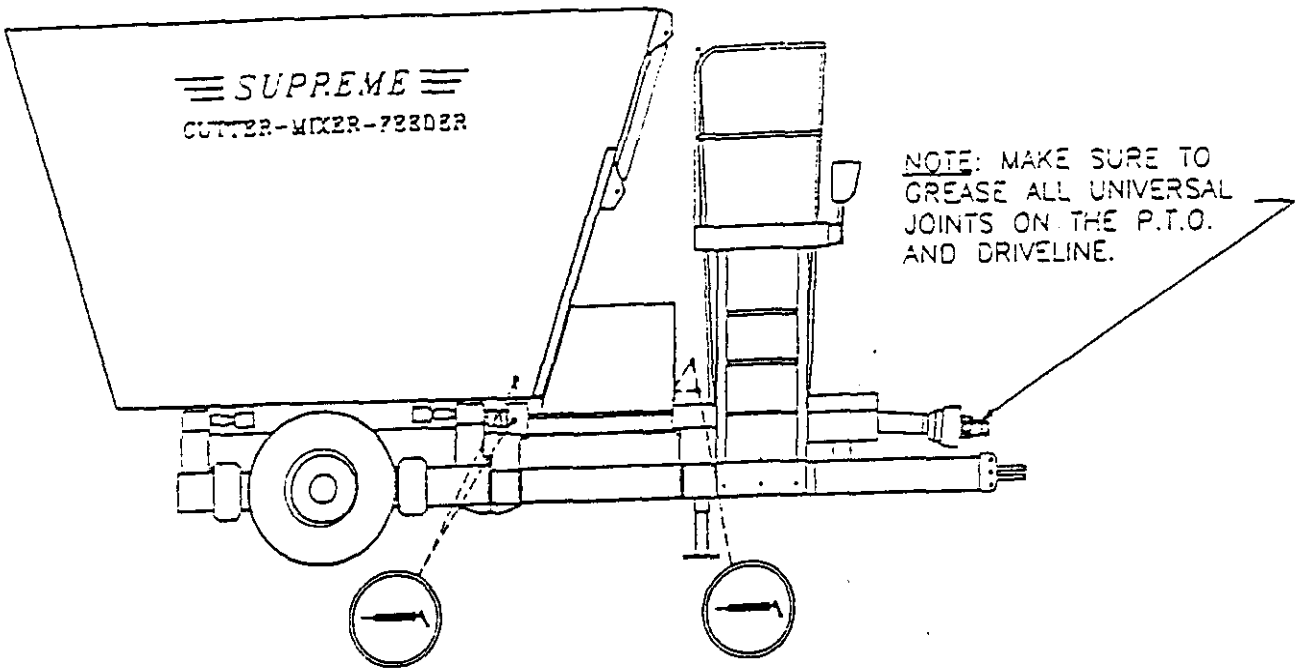
6) 

IMPORTANT: Tower bushing greasing point, located on side of machine (in front of wheel - connected to copper tube) must be GREASED EVERY 10 HOURS, as indicated by grease gun decal (page 24)

WARNING: AGAIN, WE REMIND YOU, NEVER ENTER, REACH INTO OR PUT ANY FOREIGN OBJECTS OR IMPLEMENTS INTO THE MIXING CHAMBER. KEEP CHILDREN A SAFE DISTANCE FROM THE MACHINE!

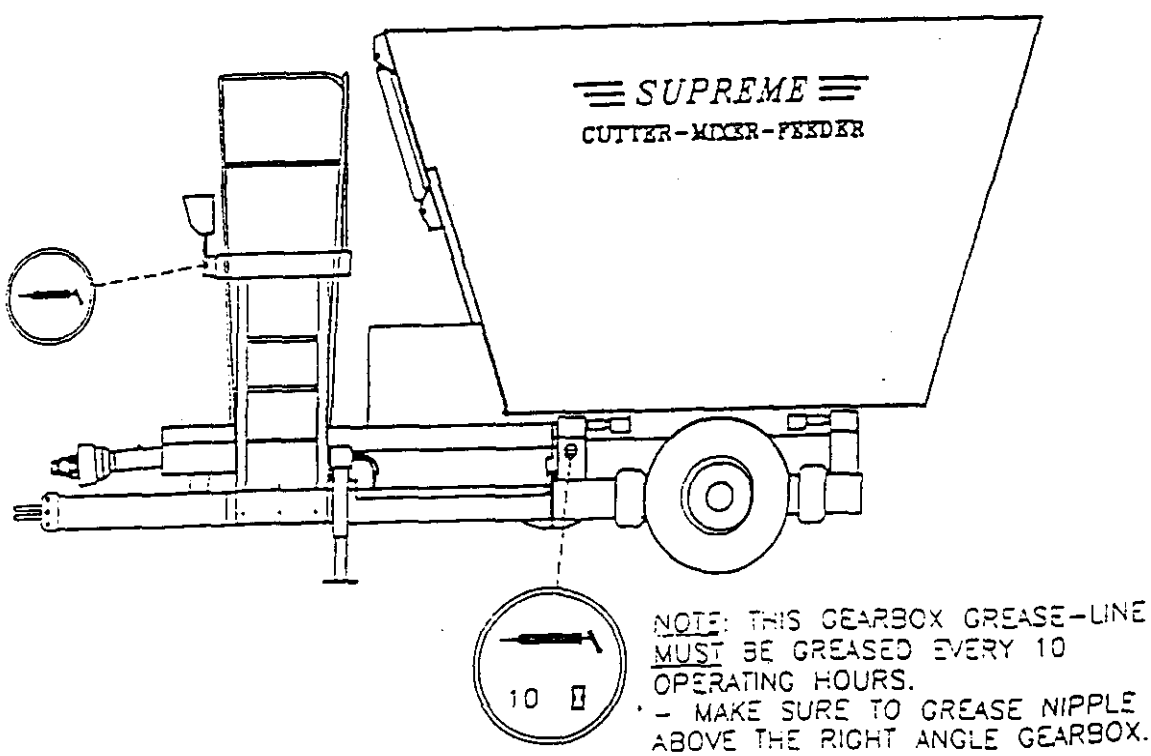
Supreme Grinder/Mixer - Model 700

SUPREME CUTTER/MIXER/FEEDER - GREASE LOCATIONS



RIGHT-HAND SIDE VIEW

NOTE: THERE ARE FOUR (4) GREASE NIPPLES FOR THE CONVEYER.



LEFT-HAND SIDE VIEW

SUPREME CUTTER/MIXER/FEEDER MISCELLANEOUS INSTRUCTIONS

"RIGHT ANGLE GEARBOX" OIL FILLING INSTRUCTIONS

MODELS 350, 425, 500, 600 & 700
SAE 80/90 GEAR OIL -OR- SAE 70/80 GEAR OIL

MODELS 350, 425, 500 & 600: REFER TO THE DRAWING TITLED "GEARBOX T269" (PAGE 26)

MODEL 700: REFER TO THE DRAWING TITLED "GEARBOX T301" (PAGE 26)

THE RIGHT ANGLE GEARBOX ON EACH OF THE ABOVE MODELS IS DETACHABLE FROM THE TWO STAGE PLANETARY GEARBOX BY FOUR (4) BOLTS AND THEREFORE HAS AN INDEPENDENT LUBRICATING SYSTEM.

1) REMOVE FILL PLUG

2) REMOVE OIL LEVEL PLUG

3) FORCE OIL INTO OIL FILL PLUG USING A HAND PUMP OR A PRESSURE PUMP, UNTIL OIL RUNS OUT OF THE OIL LEVEL PLUG HOLE

4) REPLACE AND TIGHTEN PLUGS

****

"PLANETARY DRIVE" OIL FILLING INSTRUCTIONS - (ALL MODELS)

MODELS 350, 425, 500, 600 & 700
SAE 80/90 GEAR OIL -OR- SAE 70/80 GEAR OIL

REFER TO THE DRAWINGS TITLED: "GEARBOX T269" (PAGE 26)
"GEARBOX T301" (PAGE 26)

1) REMOVE SUPPLY LINE "A" AND RETURN LINE "B" FROM OIL RESERVOIR AND TEMPORARILY PLUG PORTS ON RESERVOIR

2) FORCE OIL INTO SUPPLY LINE "A" BY MECHANICAL OR AIR PUMP UNTIL OIL CIRCULATES THROUGH AND COMES OUT LINE "B"

3) CONNECT BOTH LINES TO OIL RESERVOIR

4) TOP UP OIL IN RESERVOIR TO SIGHT GLASS

** USE SAE 80/90 GEAR OIL IN MILD CLIMATE REGIONS
** USE SAE 70/80 GEAR OIL IN COLD CLIMATE REGIONS

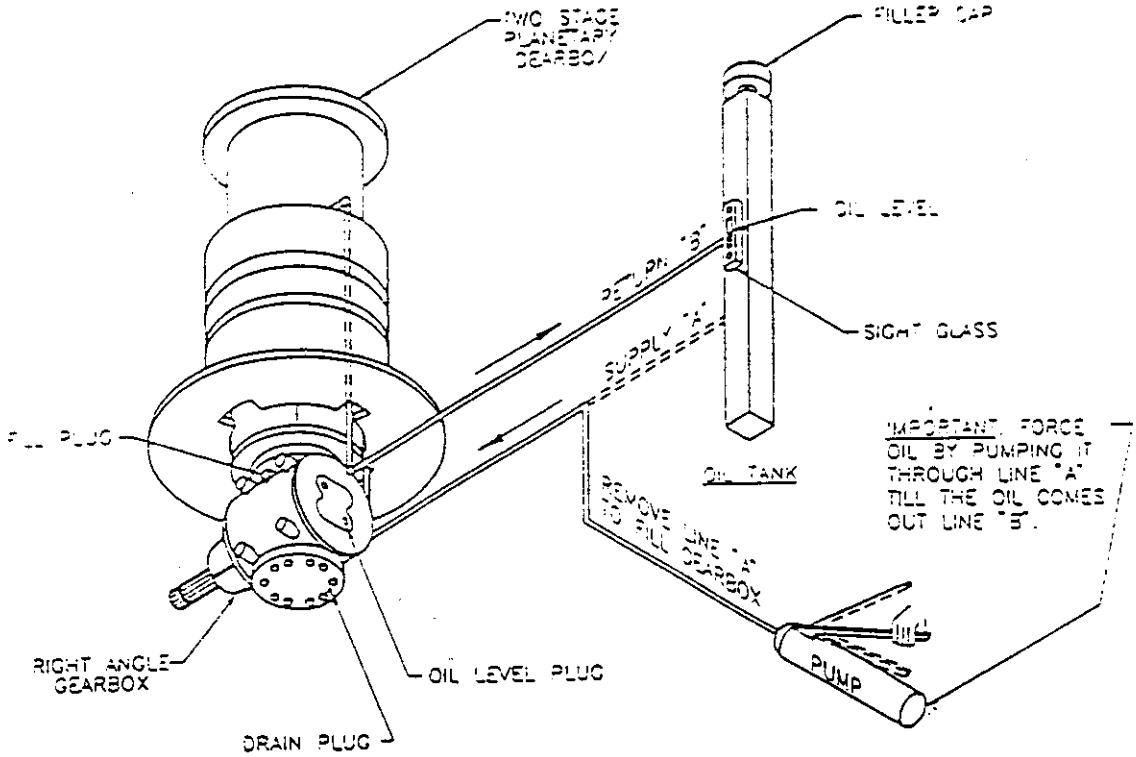
****

TORQUE SPECIFICATIONS
MODELS 350, 425, 500, 600 & 700

1) PLANETARY GEARBOX TO FLOOR - 150 FT/LBS

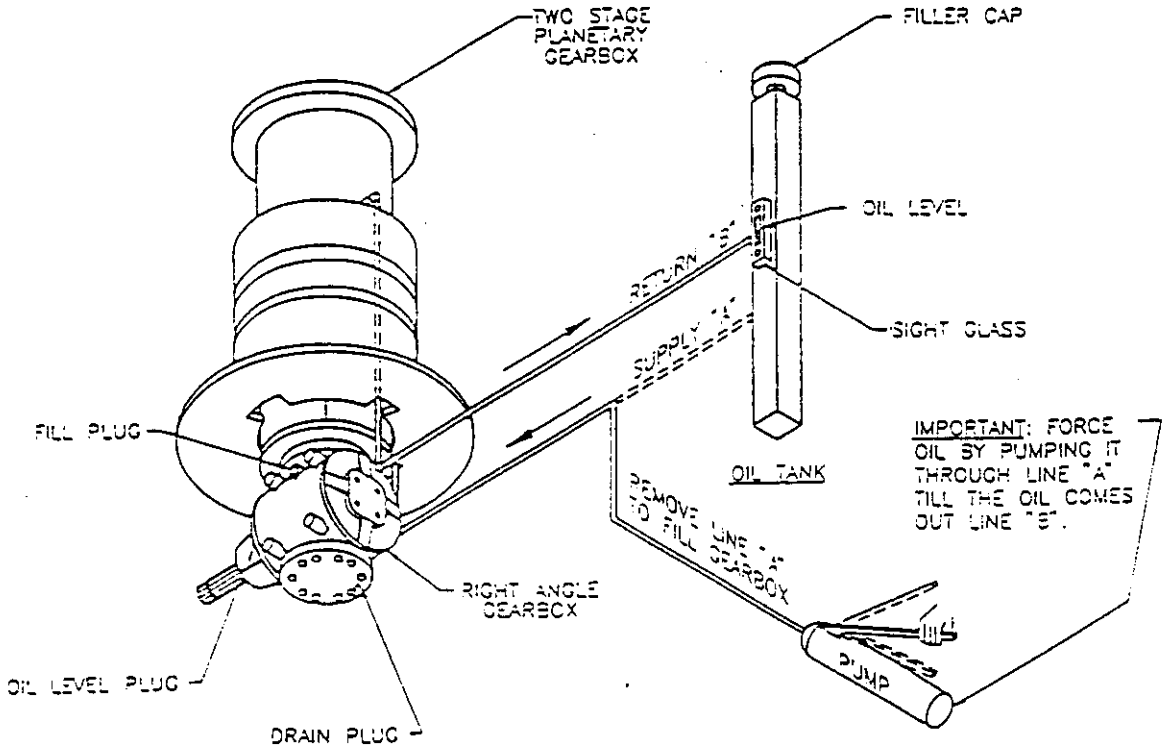
2) SCREW RIGHT ANGLE GEARBOX TO PLANETARY - 175 FT/LBS

Supreme Grinder/Mixer - Model 700



GEARBOX T259

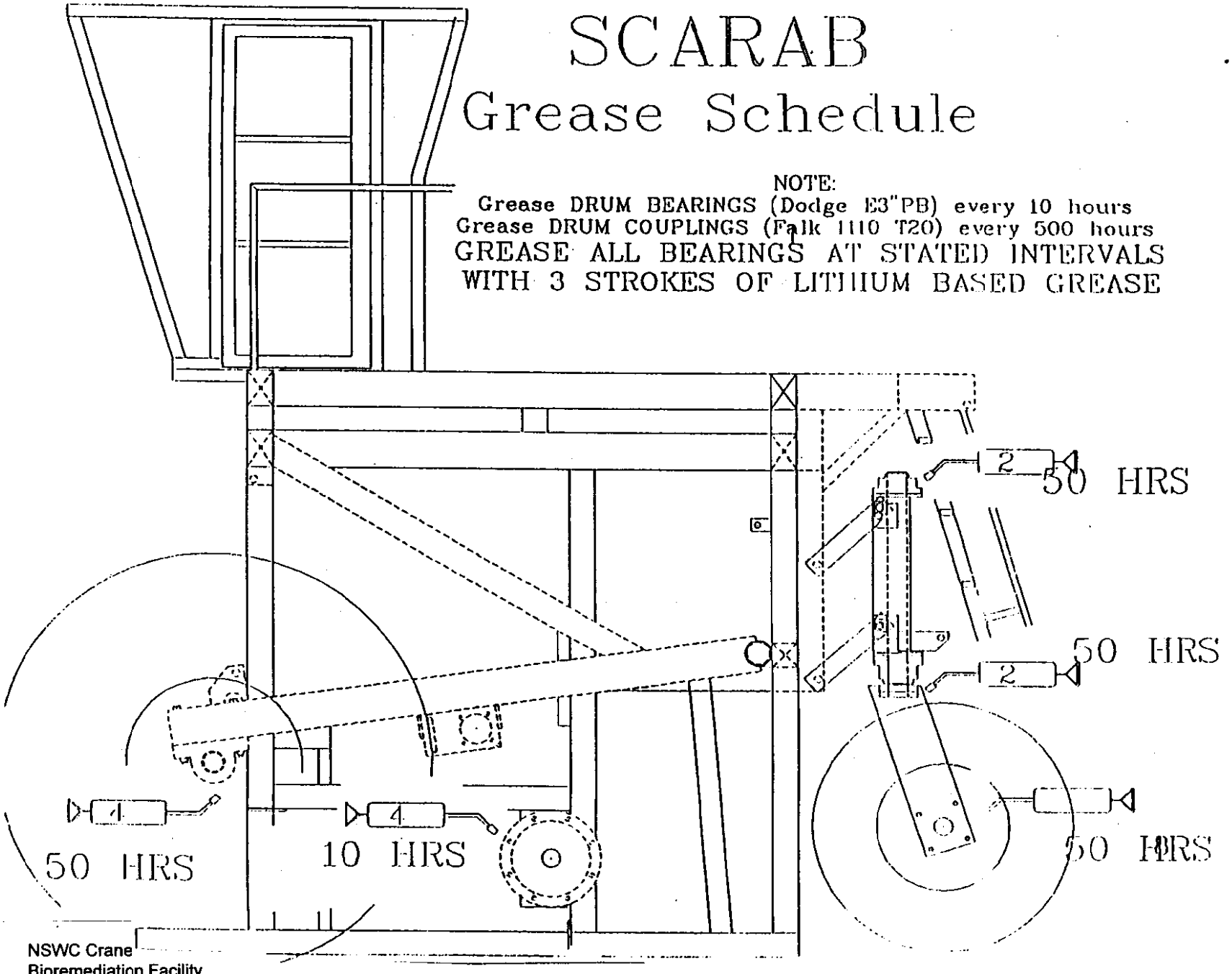
(MODELS 350, 425, 500 & 600)



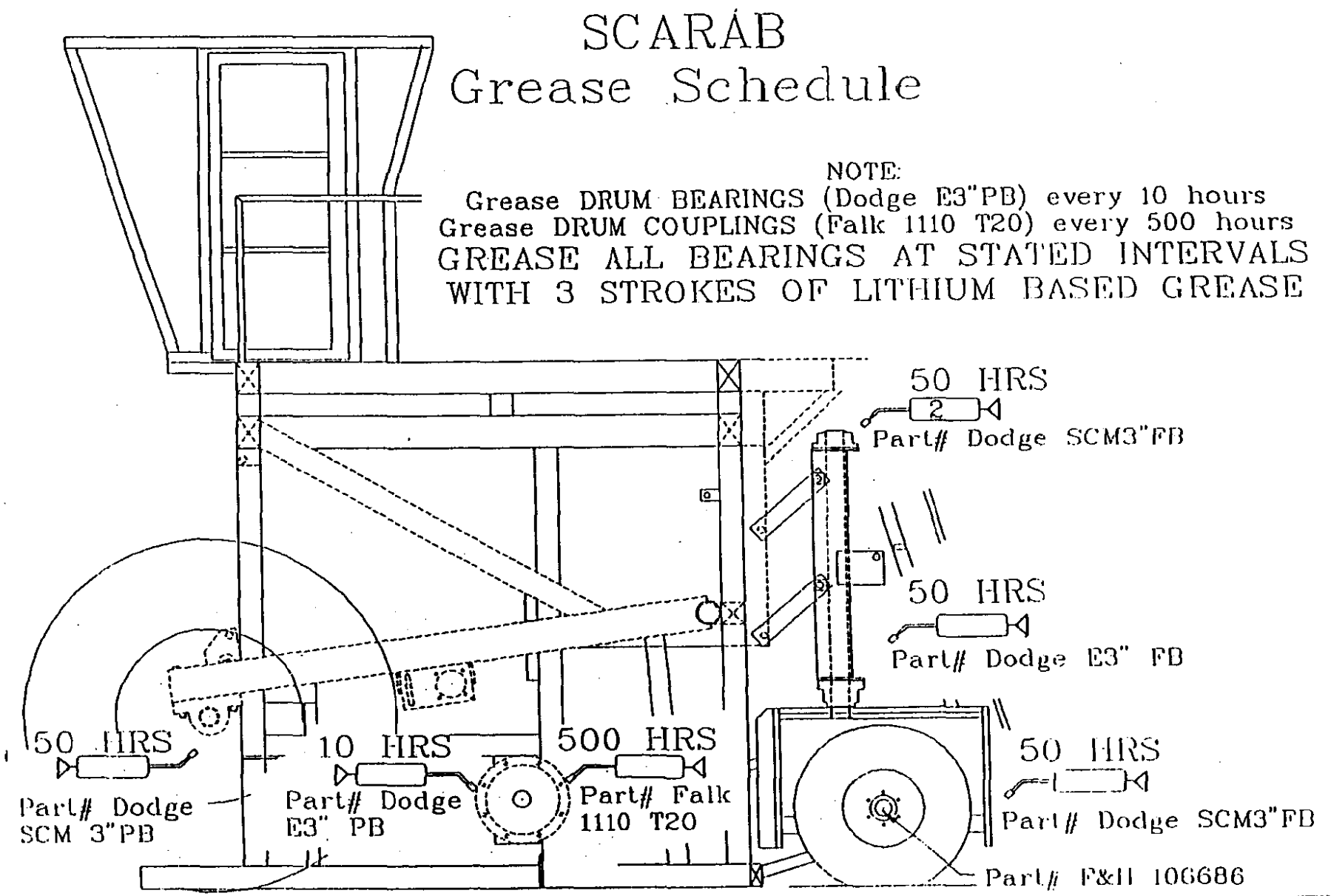
GEARBOX T301

(MODEL 700)

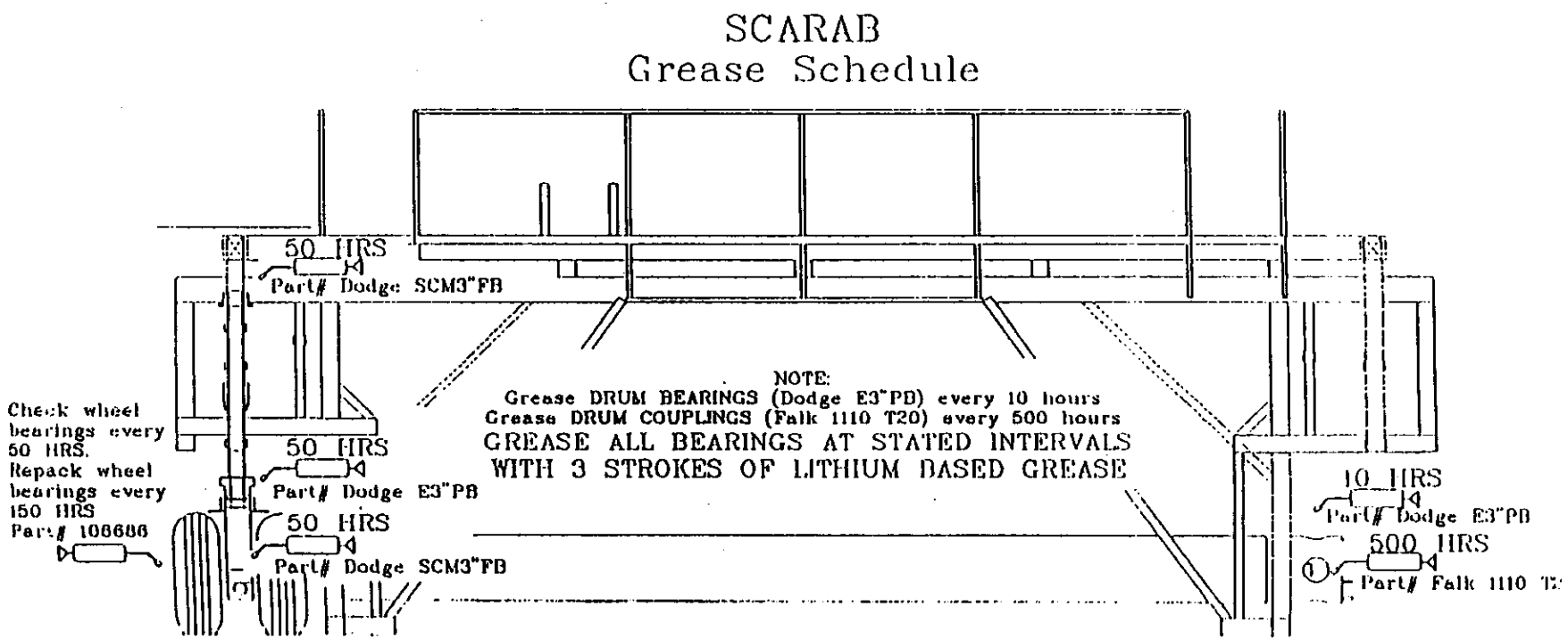
Scarab Windrow Turner - Model 20HYD450



Scarab Windrow Turner - Model 20HYD450



Scarab Windrow Turner - Model 20HYD450



Engine Maintenance Schedule

Maintenance Schedule

Equipment No. _____
Mechanic _____
Time Spent _____
Parts Order No. _____

Engine Serial No. _____
Hours, Calendar _____
Check Performed _____
Date _____

NTA855 Engines

Check each operation as performed.

Daily (Section 3)	Weekly (Section 4)	250 Hours or 6 Mos. (1) (Section 5)	1500 Hours or 1 Year (Section 6)	Annual (Section 7)	6000 Hours or 2 Years (Section 8)	Other (Section 9)
	Repeat Daily Check	Repeat (Daily/ Weekly)	Repeat Previous Intervals	Repeat Previous Intervals	Repeat Previous Intervals	
☐ Check operator's report ☐ Check engine: • Oil Level • Coolant level If make-up coolant is required, DCA4 concentration must be checked. ☐ Visually inspect engine for damage, leaks, loose or frayed belts and listen for unusual noises ☐ Visually inspect fan ☐ Drain water/ sediment from fuel tanks, fuel filters, and fuel/water separator ☐ Check/Clean air cleaner precleaner and dust pan	☐ Check air cleaner: • Check piping, hoses, and clamps • Check restriction indicator • Clean/ change air cleaner element ☐ Drain air tanks ☐ Check water inlet screens (marine only)	☐ Change engine oil ☐ Change filters • Oil full flow • Oil by-pass • Fuel filter • Water filter ☐ Clean/change • Crankcase breather • Air compressor air filter ☐ Check coolant additive (DCA4) concentration (all applications) (2).	☐ Adjust crossheads, valves and injectors	☐ Replace hoses as required ☐ Check cold start thermal aids ☐ Check batteries ☐ Steam clean engine ☐ Tighten mounting bolts ☐ Check crankshaft end clearance ☐ Check heat exchanger zinc plugs annually or as required (marine only) ☐ Check turbocharger mounting nuts	☐ Inspect the following assemblies: • Turbocharger • Vibration damper • Air compressor (Cummins/ Holset) • Fan hub • Idler pulley assembly • Water pump ☐ Clean and flush cooling system **6000 Hours or 3 Years** ☐ Clean and calibrate injectors and fuel pump	☐ + Alternator ☐ + Generator ☐ + Starter ☐ - Air compressor (Non-Cummins) ☐ + Electrical connections ☐ + Batteries ☐ + Freon compressor ☐ + Hydraulic governor + On these components follow the manufacturer's recommended maintenance procedure

(1) For standby generator sets, perform maintenance at 250 hours or 1 year.

(2) Check coolant additive concentration every 6 months unless the concentration is over 3.0 units. Then, check at every oil drain interval until concentration is below 3.0 units.

Note: Under circumstances where hours of operation are not accumulated at a fast rate, use calendar time. In other words, use hours, or calendar time, whichever comes first.

*Cummins Engine Company, Inc., recommends the use of dry type air cleaners.

INSPECTION PLAN AND LOG

BIOREMEDIATION FACILITY - FULL-SCALE OPERATION
NAVAL SURFACE WARFARE CENTER, CRANE, INDIANA

Definable Feature of Work	Inspection Checklist Number	Date Performed	Test or Inspection Results	Comments
Soil Excavation/Screening/Rock Washing	FS-01			
Amendment/Soil Handling, Storage, Mixing, and Unloading	FS-02			
Composting Operations	FS-03			
Windrow Sampling	FS-04			
Soil Excavation Sampling	FS-05			
Support Facility Maintenance	FS-06			
Retention Pond and Building Sump Inspection	FS-07			
Exavation Site Conditions Inspection	FS-08			

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-01-
ACTIVITY: Soil Excavation/Screening/Rock Washing	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
1	Excavation	Verify valid digging permit acquired through Public Works Officer. (Ops Plan 2.5)					
2		Verify adequate dust controls in place. (Ops Plan 2.7.1)					
3		Verify adequate erosion controls. (Ops Plan 2.7.2)					
4		Verify water generated in exclusion zones is collected in tanks and handled in accordance with Appendix E.(Ops Plan 2.7.2)					
5		Verify stockpiled soil >1 1/2" is covered during periods of expected precipitation. (Ops Plan 4.2)					
6		Verify excavated area is surveyed. (Ops Plan 4.4)					
7		Verify excavated area is backfilled in 12" lifts and compacted, seeded, fertilized, watered, or covered with other materials. (Ops Plan 4.4)					
8		Verify spill response equipment present and inspected weekly. (Ops Plan 11.12)					
9		Verify exterior of tractor trailer rig is inspected and decontaminated as required prior to exit of Biofacility and excavation site. (SOP 5.0, Section 5.1, Soil Excavation Plan, 6.2)					
10		Verify stockpiled soil at Biofacility covered to prevent dusting. (SOP 5.0, Section 5.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-01 -
ACTIVITY: Soil Excavation/Screening/Rock Washing	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
11		Verify Rock Washing: • Performed in lined and bermed area • Performed on both sides of rocks • Rinsing performed twice (SOP 7.0, Section 3.2)					
12		Verify decontaminated rocks are stored in a lined bermed area until final disposition. (SOP 7.0, Section 3.2)					
13		Verify PPE and clothing is properly disposed of or cleaned and inspected for reuse. (SOP 7.0, Section 3.5)					
14		Verify prior to exiting exclusion zone, all equipment passes through CRZ for decontamination.					
15		Verify logbooks have project-specific document number and; • Person logbook is assigned • Project name • Subject • Site • Start Date/End Date (QAPP, 5.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Documents: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-01 -
ACTIVITY: Soil Excavation/Screening/Rock Washing	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
16		Verify beginning of entry of logbook contains date, time, and signature of person making entry. Measurements made and samples collected are recorded in logbook. Entries in indelible ink. Corrections made by single strike mark and initialed/dated. A detailed description of sample locations recorded. All photographs taken recorded. All equipment used to make measurements identified as well as date and results of calibrations. Each page initialed and dated. When full, any unused space at bottom of page will be lined out, initialed and dated. (QAPP, 5.1.1)					

Description of Unsatisfactory conditions:

Corrective Action Required? ☐ Yes ☐ No ☐ N/A

Project Manager Corrective Action Response:

Response Accepted By:
(QC Signature/Date)

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: **FS-02-**
ACTIVITY: Amendment/Soil Handling/Storage/Mixing/Unloading	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
1	Amendment Mixing	Verify soil is added within two (2) days of amendment mixing completion. (SOP 3.0, Section 5.0)					
2		Verify each grinder/mixer batch is blended at least 10 minutes. (SOP 3.0, Section 5.3)					
3		Verify shaping of windrow prior to soil addition. (SOP 4.0, Section 5.2)					
4		Verify soil placement a uniform height of 2 feet. (SOP 4.0, Section 5.2)					
5		Verify the amount of water and source added to windrow is recorded in the daily log. (SOP 6.0, Section 5.2.3)					
6		Verify the Scarab is decontaminated prior to exiting building. (Ops Plan, 5.5)					
7		Verify all equipment leaving the facility is decontaminated using a high-pressure, low volume spray system.					
8		Verify amendment delivery trucks are weighed prior to off-loading. (Ops Plan, 5.1)					
9		Verify amendment suppliers are identified in the record of recipes. (Ops Plan, 5.1)					
10		Verify amendments are maintained inside bins, not overflowing outside partitions. (Ops Plan, 5.1.4)					
11		Verify amendments covered when not in use. (Ops Plan, 5.1.4)					
12		Verify windrow formation starts approximately at column 2 and ends at approximately column 12. (Ops Plan, 5.3)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: **FS-02-**
ACTIVITY: Amendment/Soil Handling/Storage/Mixing/Unloading	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
13		Verify Project Manager executes steps for effective spill response and project resources. (Ops Plan, 11.1)					
14		Verify personnel training includes emergency response, assembly points, coordinators, evacuation, communication, and equipment procedures. (Ops Plan, 11.1)					
15		Verify Project Manager, Operations Manager, and SSHO have radio communication as warranted. (Ops Plan, 11.9)					
16		Verify relevant activities are documented in Daily Project Logbook. (Ops Plan, 12.0)					
17		Verify pertinent data forms are maintained in an operational file at the Biofacility and transferred to 3-ring binders quarterly or upon completion of the project. (Ops Plan, 12.0)					
18		Verify logbooks have project-specific document number and; • Person logbook is assigned • Project name • Subject • Site • Start Date/End Date (QAPP, 5.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-02-
ACTIVITY: Amendment/Soil Handling/Storage/Mixing/Unloading	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
19		Verify beginning of entry of logbook contains date, time, and signature of person making entry. Measurements made and samples collected are recorded in logbook. Entries in indelible ink. Corrections made by single strike mark and initialed/dated. A detailed description of sample locations recorded. All photographs taken recorded. All equipment used to make measurements identified as well as date and results of calibrations. Each page initialed and dated. When full, any unused space at bottom of page will be lined out, initialed and dated. (QAPP, 5.1.1)					
20		Verify a minimum of 2' freeboard at all times on retention basins.					
21		Verify daily retention pond inspections are performed.					

Description of Unsatisfactory conditions:

Corrective Action Required? ☐ Yes ☐ No ☐ N/A

Project Manager Corrective Action Response:

Response Accepted By:
(QC Signature/Date)

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-03-
ACTIVITY: Composting	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
1	Composting	Verify daily turning of windrow. (Ops Plan, 5.1)					
2		Verify additional windrow turning when one of the following criteria exist. • Oxygen <5% • Temperature at any monitoring location >70^0 C • Moisture >60 % maximum WHC • After water addition (Ops Plan, 5.1.1)					
3		Verify caked material is cleaned from windrow machine drum/flaps prior to exit of building. (SOP 6.0, Section 5.1.2)					
4		Verify sources of windrow water addition: • Truck wash decontamination fluid and respective building sumps. • Retention pond water and pond level >18" • Retention pond water during first seven days of windrow formation if pond level < 18". • Potable water • No water contains soaps/anti-bacterial substance/ decon chemical compounds (SOP 6.0, Section 5.2.1 and QAPP Section 1)					
5		Verify no more than 300 gallons of water is added to any 25 foot section of windrow. (SOP 6.0, Section 5.2.2)					
6		Verify water added to windrows is recorded on daily log. (SOP 6.0, Section 5.2.3)					
7		Verify all equipment exiting facility is visually inspected and decontaminated as required using the decon facility high-pressure, low-volume spray system. (SOP 7.0, Section 3.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-03-
ACTIVITY: Composting	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
8		Verify any windrow that fails to meet performance goals is stored and retreated until performance goals are met. (QAPP, Section 1 Task 4)					
9		Verify all work is performed in a way that minimizes air, water and land pollution. (Ops Plan, 2.7)					
10		Verify work areas are maintained free from excessive dust. Any excessive dust is controlled by water spray from a potable water source. (Ops Plan, 2.7.1)					
11		Verify ponding water on asphalt is not present longer than 24 hours after a rain event. (Ops Plan, 5.1.6)					
12		Verify any sediments removed from building sumps are added to windrows only at beginning of the compost cycle. (QAPP, Section 1 Task 2, 4.2)					
13		Verify quarterly composting facility inspection and maintenance is performed regarding: • Settlement cracks in compost bldg. floors • Storm retention pond leaks • Compost building leaks (Ops Plan, 9.2)					
14		Verify Project Manager, Operations Manager, and SSHO equipped with 2-way radios as warranted. (Ops Plan, 11.9)					
15		Verify relevant activities documented in Daily Project Logbook. (Ops Plan, 12.0)					
16		Verify pertinent data forms are maintained in an operational file at Biofacility office trailer and transferred to a 3-ring binder quarterly or upon completion of the project. (Ops Plan 12.0)					
17		Verify color photographs and video are taken at various stages of excavation/transportation/windrow formation. (Ops Plan, 12.0)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-03-
ACTIVITY: Composting	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
18		Verify logbooks have project-specific document number and; • Person logbook is assigned • Logbook number • Project name • Subject • Site • Start Date/End Date (QAPP, 5.1)					
19		Verify beginning of entry of logbook contains date, time, and signature of person making entry. Measurements made and samples collected are recorded in logbook. Entries in indelible ink. Corrections made by single strike mark and initialed/dated. A detailed description of sample locations recorded. All photographs taken recorded. All equipment used to make measurements identified as well as date and results of calibrations. Each page initialed and dated. When full, any unused space at bottom of page will be lined out, initialed and dated. (QAPP, 5.1.1)					
20		Verify a minimum of 2' freeboard at all times on retention basins.					
21		Verify daily retention pond inspections are performed.					

Description of Unsatisfactory conditions:

Corrective Action Required? ☐ Yes ☐ No ☐ N/A

Project Manager Corrective Action Response:

Response Accepted By:
(QC Signature/Date)

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
1	Windrow Sampling	Verify all surfaces of equipment that have come in contact with potentially contaminated material are visually inspected and decontaminated as appropriate. (SOP 7.0, Section 3.1)					
2		Verify sampling equipment decontamination meets the following: • Solids returned to respective windrow • Equipment decontamination in bucket with Alconox and water using a brush • If metals contaminants are present, rinse equipment with 10% nitric acid solution then potable water • Final rinse of equipment with reagent grade water • Air dry or dry wipe and store equipment in plastic bags (SOP 7.0, Section 3.1)					
3		Verify compost sample probe decontamination meets the following: • Performed upon completion of each windrow • Wipe probe clean of solids using paper towel • Remove tip and clean probe and tip with spray bottle of tap water. Use plastic awl to unplug holes. • Wipe tip with paper towel and replace tip • Blow air through tip using aspirator (4-6 times) • Store equipment in transfer vehicle (SOP 7.0, Section 3.3.2; QAPP 4.0, 3.3)					
4		Verify compost measuring sticks are wiped free of solids and solids returned to respective pile. (SOP 7.0, Section 3.3.3)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
5		Verify sampling cross sections at column numbers 3, 5, 7, 9, and 11. Until windrow reduces in length to column 10 at which point number 11 will be dropped allowing 4 sample cross sections. (Ops Plan, 6.1; QAPP 4.0, 2.2)					
6		Verify ambient temperature and humidity are monitored daily. (Ops Plan, 6.1.1)					
7		Verify windrow temperature and oxygen are monitored daily at core and near surface before and after each turning event at each cross-section. (Ops Plan, 6.1.1; QAPP, 1.4.3) • Six (6) per cross-section (30 total) • Performed within 15 min. of turning for post-turn sampling					
8		Verify moisture monitoring a minimum of three times per week and following water addition. One composite sample per cross-section comprised of these discrete samples is required. (Ops Plan, 6.1.2; QAPP, 1.4.3) • Three (3) per cross-section (15 total) • Samples collected ≥ 1 hour from moisture addition • Stainless steel bowl decontaminated between windrow sampling • Sample tags retained as final evidence of moisture samples • Oven temperature 105-110^0 C for 12 hours or until constant weight achieved • Sample cooled in dessicator					
9		Verify pH level monitoring a minimum of once per week. One location per cross-section is required. (Ops Plan, 6.1.3; QAPP, 1.4.3, 4.0, 4.3, 5.4) • One (1) per cross-section (5 total) • Weight reported to tenth of a gram • pH reported to tenth of a unit • Sample stirred for 15 seconds and let set until solids settle					
10		Verify explosives sampling of compost piles on Day 0 and Day 28 (or at completion)(QAPP, Table 1-6)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
11		Verify field sampling for explosives performed at days 7, 14, 21 and lab samples collected when field samples indicate explosive levels < action level. (Ops Plan, 6.15)					
12		Verify metals sampling at days 0 and 28 if soil characterization indicates metal contaminants. (Ops Plan, 6.16; QAPP, Section 1 Task 4)					
13		Verify labs meet NEESA requirements (QAPP, 2.6.1) and have U.S. EPA Region 5 RCRA approval.					
14		Verify lab test results are signed by lab representative, test results furnished to MK QC Manager including: • Ref. to applicable contract requirements, tests or analytical procedures used • Actual test results • Cover sheet stamped (in red), "Conforms" or "Does not Conform" to specific requirements. (QAPP, 2.6.2)					
15		Verify retention ponds samples for NPDES parameters. (QAPP, 4.3, Table 4-1)					
16		Verify rinsate blank water is collected directly into sample bottles. (QAPP 4.6.2)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date

17		Verify the following QA/QC samples are taken:
		• Composting:
		  • Duplicate for metals/explosives one per pile per event
		  • Decon water sources once per month
		  • Field blank rinse one per 20 rinses
		  • Matrix spike/matrix spike duplicate one per 20 samples of compost
		I. Storm pond water:
		  • Duplicate one per 20 samples of pond water
		  • Field blank one per 20 samples
		  • Matrix spike/matrix spike duplicate one per 20 samples of water
		(QAPP, Table 4-3)					

18		Verify certification of cleanliness accompanies each box of sample bottles, unless bottles are pre-preserved by lab. (QAPP, 4.7.1)					
19		Verify logbooks have project-specific document number and: • Person logbook is assigned • Logbook number • Project name • Subject • Site • Start Date/End Date (QAPP, 5.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
20		Verify beginning of entry of logbook contains date, time and signature of person making entry. Measurements made and samples collected are recorded in logbook. Entries in indelible ink. Corrections made by single strike mark and initials/date. A detailed description of sample location recorded. All photographs taken recorded. All equipment used to make measurements identified as well as date and results of calibration. Each page initialed and dated when full. Any unused space at bottom of page will be lined out, initialed and dated.(QAPP, 5.1.1)					
21		Verify samples placed in coolers with ice contained in ziploc bags. Samples maintained a 4 +/ -2^0 C. COC sealed in ziploc bag and secured to underside of cooler lid. Cooler lid secured with packing tape and custody seals attached. (QAPP, 4.8)					
22		Verify a second duplicate temperature reading is taken if initial reading and first duplicate reading differ by more than 5^0 C. (QAPP, 4.9.1)					
23		Verify a second duplicate oxygen reading is taken if initial reading or first duplicate reading is < than 10% and the readings differ by 4% or more oxygen. (QAPP 4.9.1)					
24		Verify original COC form accompanies sample shipment, a copy retained by PM/Designee and a signed COC form is obtained from lab after samples has been received at lab. (QAPP 5.1.3)					
25		Verify labels are affixed to sample containers, writing on label in indelible ink. Samples wrapped in bubble wrap and temperature blank included with each cooler. (QAPP 5.1.4)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
26		Verify PID/pH meter and Temp/O_2 probe are calibrated daily, prior to use. Calibration data documented in logbook or forms included in SOPs. (QAPP 6.1)					
27		Verify calibration of equipment to nationally recognized standards or accepted values of physical constants. If national standards do not exist, the basis for calibration will be documented. (QAPP, 6.2)					

28		Verify critical spare parts available for instruments:
		• PID
		  • Battery charger
		  • Spare lamp
		  • Spare filter cartridges
		  • Span gas
		  • Tedlar bags
		• pH Meter
		  • pH buffers
		  • Batteries
		  • Paper towels
		  • Disposable gloves
		  • Plastic cups
		• Temp/O_2 Meters
		  • Battery charger
		(QAPP, Table 11-1)					

29		Verify RPD (Relative Percent Difference) calculated weekly. • Temp - 10% • Moisture - 20% • pH - 15% (QAPP, 12.2.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-04-
ACTIVITY: Windrow Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	N/A	U	Comments	Closure Date
30		Verify moisture scale is calibrated once per week in accordance with manufacturer's instructions and is documented in logbook. (QAPP 4.0, 4.2)					
31		Verify sample is placed in cooler with 2-3 bags of ice after sample is collected while awaiting cooler transport to support zone. (QAPP 4.0, 4.0)					

Description of Unsatisfactory conditions:

Corrective Action Required? ☐ Yes ☐ No ☐ N/A

Project Manager Corrective Action Response:

Response Accepted By:
(QC Signature/Date)

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: **FS-05-**
ACTIVITY: Soil Excavation Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
1	Excavation Sampling	Verify prior to exiting the exclusion zone all equipment passes through CRZ for decontamination. (SOP 7.0, Section 3.2)					
2		Verify appropriate measures are taken to prevent any cross contamination of other equipment or structures. (SOP 7.0, Section 3.3.1)					
3		Verify reusable sampling equipment is decontaminated in the following manner: • Remove solids from equipment and return back to grid. • Wash equipment in tub with Alconox • If metals analysis, rinse with 10% nitric acid over bucket. • Rinse equipment with reagent grade water over tub. • Air dry or wipe dry equipment and store in plastic bags. (SOP 7.0, 3.3.1)					
4		Verify pre-excavation sampling is performed in the following manner: • Grid sizes conform to those indicated in Soil Excavation Plans (App E) • Five (5) grab samples per grid (center, one in each corner) mixed to form one composite sample. • Two (2) composite samples per grid (surface to 12" depth and 12"-2' depth) Analyzed for metals, TCLP-Metals, and explosives. • One (1) grab sample collected from center of grid for VOC analysis (12"-18" depth). • Additional VOC samples if soil exhibits oil stains, unusual odors, or PID readings > BKG. (Soil Excavation Plan, Section 5.2; QAPP Table 1-6)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-05-
ACTIVITY: Soil Excavation Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	N/A	U	Comments	Closure Date
5		Verify post excavation sampling is performed in the following manner: • Grid sizes conform to those indicated in Soil Excavation Plans (App. E). • Five (5) grab samples per grid (center, one in each corner). • One (1) composite sample per grid (6" and 12" depth), analyzed for metals and explosives. • One (1) grab sample collected from center of grid (12"-18") for VOC analysis. • Sidewall samples taken every 20 feet of sidewall > 1 foot in depth (one sample 6-12" for metals/ explosives. • Additional VOC samples taken if soil exhibits oil stains, unusual odors or PID readings >BKG. (Soil Excavation Plan, Section 5.4; QAPP, Table 1-6, Task 6, 4.5.1)					
6		Verify labs meet NEESA requirements and have U.S. EPA Region 5 RCRA approval. (QAPP 2.6.1)					
7		Verify lab test results are signed by lab representative, test results furnished to MK QC Manager including; • Reference to applicable contract requirements, tests or analytical procedures used. • Actual test results • Cover sheet stamped (in red), "Conforms" or "Does Not Conform" to specification requirements. (QAPP, 2.6.2)					
8		Verify decon water is stored in a tank and sampled for explosives if used in the treatment process or sampled for explosives, RCRA metals, and POTW if shipped to on-site treatment facility. (QAPP, 4.2)					
9		Verify samples labeled and stored in cooler with ice contained in ziploc bags at 4 +/- 2^0 C. (QAPP, 4.2, 4.8)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-05-
ACTIVITY: Soil Excavation Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
10		Verify rinsate blank water is collected directly into sample bottles. (QAPP 4.6.2)					

11		Verify the following QA/QC samples are taken;
		• Excavation:
		  • Duplicate one per 20 sample of soils
		  • Decon water sources once per month
		  • Trip blank one per cooler
		  • Matrix spike/Matrix spike duplicate 1 per 20 samples of soil
		• Decon Water
		  • Duplicate one per 20 samples of decon water
		  • Decon water sources once per month
		  • Matrix spike/Matrix spike duplicate 1 per 20 samples of water
		(QAPP, Table 4-3)					

12		Verify certification of cleanliness accompanies each document of sample bottles unless bottles are pre-preserved by lab. (QAPP, 4.7.1)					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-05-
ACTIVITY: Soil Excavation Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	N/A	U	Comments	Closure Date

13		Verify samples are collected in the following containers:
		• Soil
		  • VOC - 4 oz glass jar with Teflon lid or brass sleeve
		  • Explosives - 8 oz glass jar with Teflon lid or brass sleeve
		  • Total metals - 8 oz glass jar with Teflon lid or brass sleeve
		  • TCLP metals - 8 oz glass jar or sleeve
		• Water
		  • Explosives - 1 liter amber glass jar
		  • TSS - 500 ml plastic
		  • COD - 250 ml plastic
		  • BOD - 1 liter amber glass jar
		  • Oil/Grease - 1 liter amber glass jar
		  • Nitrate - 500 ml plastic
		  • Ammonia - 500 ml plastic
		• Water Blanks
		  • VOC - 40 ml glass vials
		  • Explosives - 1 liter amber glass jar
		  • RCRA metals - 500 ml plastic
		(QAPP, Table 4-4)					

14		Verify sample is placed in cooler with 2-3 bags of ice after sample is collected while awaiting cooler transport to support zone. (QAPP 4.0, 4.0)					
15		Verify COC is enclosed in ziploc bag and taped to underside of lid in cooler. (QAPP, 4-8, 5.1.3) • Original COC accompanies sample shipment • Copy retained until signed COC by lab is obtained					
16		Verify cooler lid is secured with packing tape and custody seals completed and affixed. (QAPP, 4-8)					
17		Verify sample labels include sample I.D. number, site name, analytical method, preservatives, date and time of sampling. (QAPP, 5.1.2, 5.1.4) • Indelible ink • Samples wrapped in bubble wrap • Temperature blank included with each cooler					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-05-
ACTIVITY: Soil Excavation Sampling	FREQUENCY: WEEKLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results N/A	Results U	Comments	Closure Date
18		Verify Project Manager/designee maintains complete list of sample numbers. (QAPP, 5.1.2)					
19		Verify logbooks have project-specific document number and; • Person logbook is assigned • Logbook number • Project name • Subject • Site • Start Date/End Date (QAPP, 5.1)					
20		Verify beginning of entry of logbook contains date, time, and signature of person making entry. Measurements made and samples collected are recorded in logbook. Entries in indelible ink. Corrections made by single strike mark and initialed/dated. A detailed description of sample location recorded. All photographs taken recorded. All equipment used to make measurements identified as well as date and results of calibration. Each page initialed and dated when full. Any unused space at bottom of page will be lined out, initialed and dated. (QAPP, 5.1.1)					

Description of Unsatisfactory conditions:

Corrective Action Required? ☐ Yes ☐ No ☐ N/A

Project Manager Corrective Action Response:

Response Accepted By:
(QC Signature/Date)

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-06-
ACTIVITY: Support Facilities Quarterly Inspection	FREQUENCY: QUARTERLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results U/C	Results U	Comments	Closure Date
1		Verify decontamination of facility floors, walls, and sumps for the following attributes: evidence of heaving, cracking, or spalling; evidence of groundwater seepage; that the concrete floors properly drain to the facility sump; that the sumps retain collected fluid.					
2		Verify that the water supply connections are not damaged or leaking.					
3		Verify that building lighting is properly operating.					
4		Verify that high pressure wash system is working properly and in good condition.					
5		Verify that the decon facility concrete walls and roof are intact and not in need of repair.					
6		Verify that inspections of the concrete floors, walls, and sumps are performed and documented.					
7		Verify that the shower and office/laboratory trailers are in good condition. Verify water supply, sewage systems, and HVAC systems are properly functioning. Verify trailers maintain proper lighting.					
8		Verify the asphalt paved areas for the following attributes: evidence of heaving, cracking, or spalling; evidence of groundwater seepage; that the paved surfaces properly drain to the retention basins.					
9		Verify that the building concrete walls are intact and not in need of repair.					

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-06-
ACTIVITY: Support Facilities Quarterly Inspection	FREQUENCY: QUARTERLY
DATE:	

Item No.	Activity	Source Req.	Results A	Results U/C	Results U	Comments	Closure Date
10		Verify that the building metal siding and roofing is secure and not in need of repair.					
11		Verify that inspections of the concrete floors, walls, and sumps are performed and documented.					

Description of Unsatisfactory conditions:

Corrective Action Required? ☐ Yes ☐ No ☐ N/A

Project Manager Corrective Action Response:

Response Accepted By:
(QC Signature/Date)

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: **FS-07-**
ACTIVITY: Retention Pond And Building Sump Inspection	FREQUENCY: DAILY
DATE/TIME:	

ATTRIBUTE	RESULTS	VERIFIED BY
1. Freeboard in Pond 1.	ACCEPT/REJECT	
2. Freeboard in Pond 2.	ACCEPT/REJECT	
3. Building 1 Sump freeboard.	ACCEPT/REJECT	
4. Building 2 Sump freeboard.	ACCEPT/REJECT	
5. Building 3 Sump freeboard.	ACCEPT/REJECT	
6. Fuel tank sump depth.	ACCEPT/REJECT	
7. Fuel line accumulator reading.	ACCEPT/REJECT	
8. Decon building sump.	ACCEPT/REJECT	

WEATHER CONDITIONS:

TEMPERATURE: ^{0}F

SNOW RAIN FOG CLEAR OVERCAST
(circle which applies)

COMMENTS:

NSWC CRANE BIOREMEDIATION FACILITY FULL-SCALE OPERATIONAL PLAN	AUDIT CHECKLIST
Reference Document: Approved Full-Scale Operational Plan (Ops Plan) Approved QAPP For Full-Scale Operations	AUDIT NO: FS-08-
ACTIVITY: Excavation Site Conditions Inspection Checklist	FREQUENCY: DAILY
DATE/TIME:	

ATTRIBUTE	RESULTS	VERIFIED BY
1. Verify decontamination pad boundary barriers and signs are in place.	ACCEPT/REJECT	
2. Verify there is no evidence of tears or holes in liner.	ACCEPT/REJECT	
3. Verify there is no evidence of seepage from liner.	ACCEPT/REJECT	
4. Verify that liner sheeting is adequately attached to the walls.	ACCEPT/REJECT	
5. Verify that liner adequately covers the end sections.	ACCEPT/REJECT	
6. Verify that liner is secured from moving.	ACCEPT/REJECT	
7. Verify that expected quantities of generated liquids can be contained until collected for disposal.	ACCEPT/REJECT	
8. Verify all containers have been properly labeled.	ACCEPT/REJECT	
9. Verify all containers are in properly lined and bermed areas.	ACCEPT/REJECT	
10. Verify containers are in good condition.	ACCEPT/REJECT	
11. Verify adequate covering material at site for periods of expected precipitation.	ACCEPT/REJECT	

WEATHER CONDITIONS:

TEMPERATURE: ^{0}F

SNOW RAIN FOG CLEAR OVERCAST
(circle which applies)

COMMENTS:

APPENDIX G
TOXICITY TEST PROCEDURE

This appendix will be issued for approval as an addendum to this operational plan prior to performing the toxicity test