

**Work Plan
For
Interim Measures Cleanup at
Solid Waste Management Unit #02/11**

**NSWC CRANE
CRANE, INDIANA**



**SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND**

Contract #N62467-93-D-1106

Delivery Order #0009

Statement of Work #007

July 1, 1997

Revision #1



DEPARTMENT OF THE NAVY

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

IN REPLY REFER TO:

5090
Ser 095/7134
JUL 1997

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 enclosure (1), Work Plan for Interim Measures Cleanup at Solid Waste Management Unit #02/11, as a draft report for your review (two copies). Enclosure (2) is the required Certification Statement.

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

Sincerely,

James Hunsicker

Encl:

- (1) Work Plan for SWMU #02/11
- (2) Certification Statement

Copy to: (w/o encls)
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COMNAVSEASYS COM (SEA OOT)
SOUTHNAVFACENGCOM (Code 1864)



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| 09510 | 445 |

T. Brent 09510 812-854-6160
Carol Witt-Smith 7/10/97

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

James Henrich
SIGNATURE

Environmental Protection Dept. Mgr.
TITLE

7/11/97
DATE



DEPARTMENT OF THE NAVY

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

REF: REFER TO:

5090
Ser 095/7135

97 JUL 1997

Indiana Department of Environmental Management
Defense Environmental Restoration Program
ATTN: John Manley
100 North Senate Avenue
P.O. Box 6015 (Room N-1225)
Indianapolis, IN 46206-6015

Dear Mr. Manley:

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

Sincerely,

Encl:

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DEPARTMENT OF THE NAVY

CRANE DIVISION
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COMNAVSEASYS COM (SEA OOT)
SOUTHNAVFACENGCOM (Code 1864)

Thomas J. Brent
09510 6160
17/09/97

09510
17/09/97

**WORK PLAN
INTERIM MEASURES CLEANUP AT
SOLID WASTE MANAGEMENT UNIT #02/11**

**NSWC CRANE
CRANE, INDIANA**

Revision #1

July 1, 1997

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

Prepared for

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

Prepared by:

**MORRISON KNUDSEN CORPORATION
2420 Mall Drive
Corporate Square 1 - Suite 211
North Charleston, South Carolina 29406**

PREPARED/APPROVED BY:

(Jeff Overton)
MK Project Engineer

Date

APPROVALS:

Robert E. Hlavacek
MK Program Manager

Date

CLIENT ACCEPTANCE:

U. S. Navy Responsible Authority

Date

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1.0 INTRODUCTION

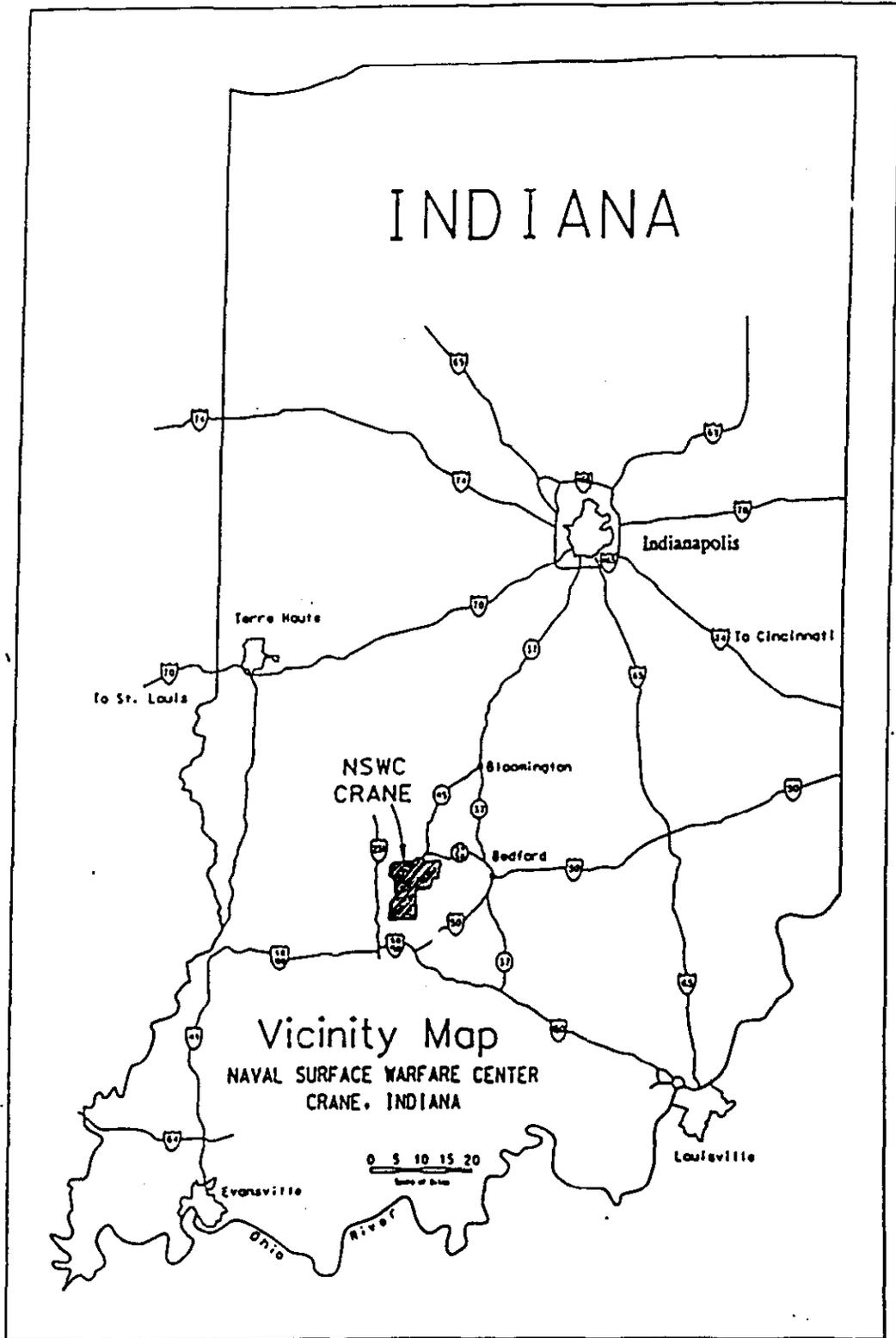
This Work Plan has been prepared by Morrison Knudsen Corporation (MK) for Southern Division (SOUTHDIV), Naval Facilities Engineering Command (NAVFACENGCOM), pursuant to the scope of work defined in Delivery Order #0009, under Contract #N62467-93-D-1106. This Work Plan describes the methods to construct a cap over burial trenches at a Solid Waste Management Unit (SWMU) known as the Dye Burial Grounds (SWMU 02/11).

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

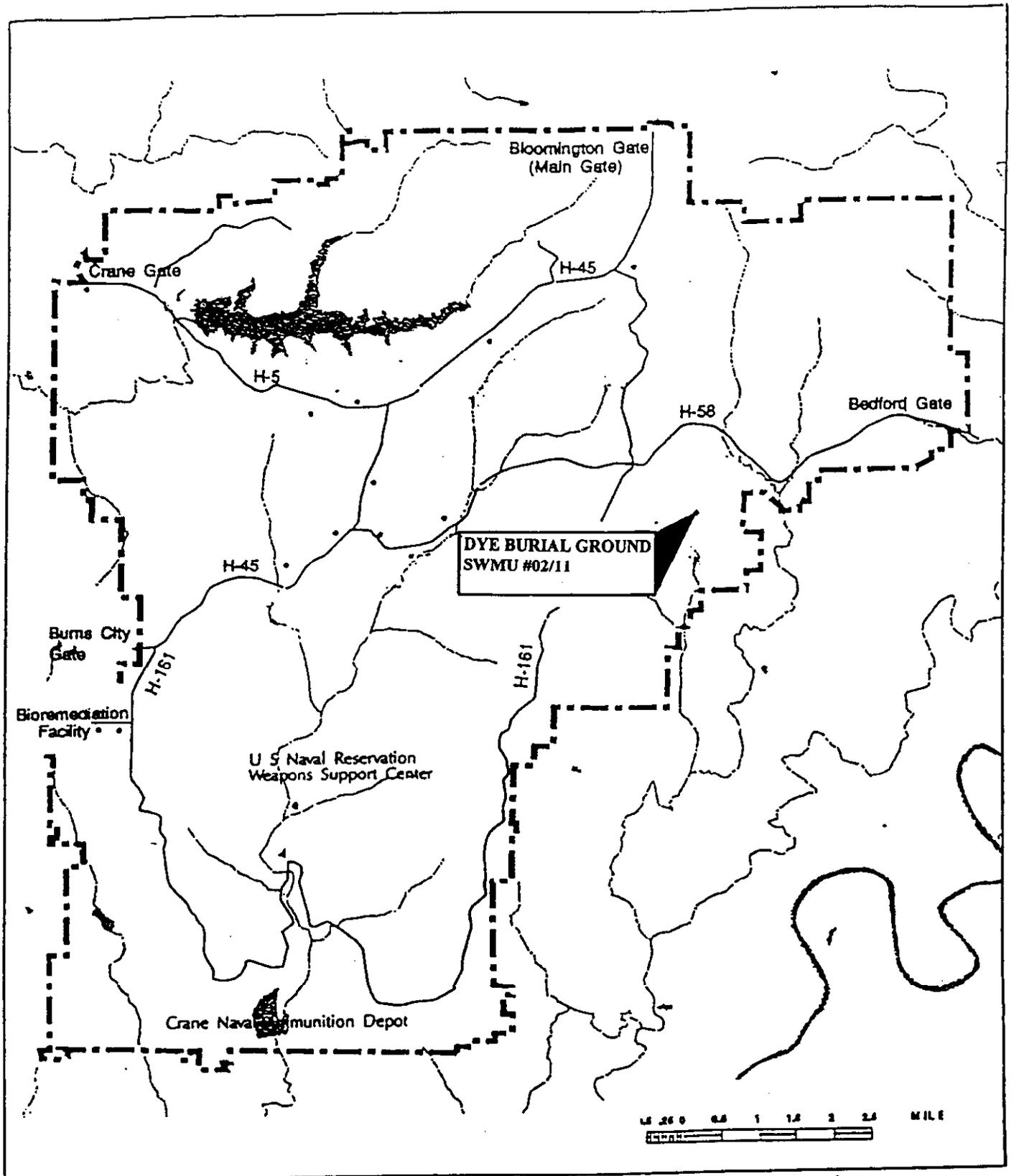
The Naval Surface Warfare Center (NSWC) Crane is located in southwestern Indiana, as shown in Figure 1-1, and provides support for equipment, shipboard weapons systems, and ordnance. In addition, NSWC supports the Crane Army Ammunition Activity (CAAA) including production and renovation of conventional munitions, storage, shipment, and demilitarization and disposal of conventional munitions.

The Dye Burial Grounds (SWMU #02/11) is located in the eastern section of NSWC Crane, as shown in Figure 1-2, just east of the Ammunition Burning Ground. The Dye Burial Grounds was a series of at least four trenches, each approximately 50 feet long, 10 feet wide, and 6 feet deep. These trenches were used to dispose of dyes and dye-contaminated material. The materials, reportedly, included magnesium, dye-contaminated boxes and rags, and approximately 60 drums of dyes. The trenches were backfilled to levels ranging from grade to 1 foot below adjacent grades.

The scope of this project is to install a multi-layer interim measures cap over the trenches to prevent the infiltration of storm water which might cause liquids in the buried materials to migrate beyond the trenches.



**FIGURE 1-1
VICINITY MAP OF NSWCR CRANE, INDIANA**



**FIGURE 1-2
LOCATION OF SOLID WASTE MANAGEMENT UNITS**

2.0 ENVIRONMENTAL COMPLIANCE

Promulgation of the United States Environmental Protection Agency's (USEPA's) regulatory program under the Resource Conservation and Recovery Act (RCRA) provided the impetus to identify and control environmental contamination from past practices at NSWC Crane. On December 23, 1989 the EPA issued the federal portion of the final RCRA permit for NSWC Crane to the U.S. Navy. This permit established the Hazardous and Solid Waste Amendment (HSWA) Corrective Action Requirements and Compliance Schedules obligating the U.S. Navy to perform Remedial Field Investigations (RFIs) at 30 SWMUs, to conduct Corrective Measures Studies, and to implement corrective measures if needed.

2.1 REGULATORY COMPLIANCE

The following regulations, guidance, and procedures may affect the work at SWMU #02/11, Dye Burial Grounds.

- U.S. Navy and/or NSWC Crane guidance
- U.S. Occupational Safety and Health Administration (OSHA)
 - 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 261, Identification and Listing of Hazardous Waste. (Required to characterize any hazardous waste that is generated.)
 - 40 CFR 262, Regulations for Hazardous Waste Generators. (Required for any hazardous waste that is generated.)
 - 40 CFR 264, Regulations for Owners and Operators of Permitted Hazardous Waste Facilities. Compliance with the following subparts may be required:
 - Subpart I, Use and Management of Containers. (Required if any hazardous waste is generated.)

Subpart N, Landfills; § 264.310, Closure and Post-closure Care. This section provides guidance on "RCRA equivalent caps" for landfills.

- Indiana Department of Environmental Management (IDEM)
 - 329 IAC 3.1-6, Identification and Listing of Hazardous Waste. This regulation incorporates by reference the federal regulations with few additions.

 - 329 IAC 3.1-7, Standards Applicable to Generators of Hazardous Waste. This regulation incorporates by reference the federal regulations with a few changes and additions.

 - 329 IAC 3.1-9, Final Permit Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities. This regulation incorporates by reference the federal regulations with a few changes and additions.

- U. S. Department of Transportation (DOT)
 - 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. Compliance with these regulations is required for off-site shipment of hazardous materials.

 - 49 CFR 173, General Requirements for Shipments and Packaging. This part describes classification and packaging of hazardous materials. Compliance with these regulations is required for hazardous materials that *are required to be shipped off-site.*

If any wastes are generated from activities in this Work Plan, they will be managed and disposed of as described in Section 8.0, Waste Management, and shall be in compliance with federal and state hazardous waste regulations. The state regulations incorporate the federal regulations with few exceptions; however, particular attention will be paid to the state manifesting requirements.

The dyes in the burial ground have not been fully analyzed or characterized. As such, it is necessary to assume any dye may be toxic or carcinogenic. For this class of compounds, decontamination procedures are standardized, but all waste is to be designated as hazardous substance, solid, NOS, and considered fully subject to RCRA Subtitle C pending future scientific work.

Off-site transportation of any hazardous waste or material will be in compliance with the DOT hazardous material transportation rules which are listed in Section 8.0. The Regulatory Specialist (RS) will coordinate the shipping effort. Manifest will be signed by NSWC Crane's Environmental Department.

All excavations will be in compliance with the NSWC Crane site requirements. MK will notify the NSWC Crane Site Representative of all construction activities, as outlined in Section 2.2 below.

2.2 PERMITS, APPROVALS, AND NOTIFICATIONS

Several permits, approvals, and notifications will be required for implementing this Work Plan. The required permits, approvals, and notifications are summarized in the following sections.

2.2.1 Construction Permits

The NSWC Crane facility requires issuance of an excavation permit before construction initiation. An Excavation and Trenching Permit application will be submitted a least seven days prior to any excavation activities. The MK Project Manager (PM) will be responsible for obtaining this permit through the Public Works Department, Building 2516. Preparation of the application and associated drawings will be coordinated with the actual start of work as the permit expires within 30 days of issuance.

2.2.2 Notifications

All federal, state, and local agency notifications will be performed by the NSWC Crane Environmental Department. The MK PM will notify the NSWC Crane Environmental Department and the Resident Officer In Charge of Construction (ROICC) of activities relating to this project. These notifications include, but are not limited to:

- Clearing and grubbing.
- Trenching and excavation.
- Backfilling and compaction.
- Storage and handling of hazardous materials.
- Inspection, manifesting, and shipping of hazardous materials.

During activities, as described in this Work Plan, emergency notifications will be required in case of fire, explosion, or spills. Notifications will be made in accordance with Section 12.0 of Appendix A, Site Safety and Health Plan (SSHP).

The notification procedures will be reviewed during the pre-construction meeting and updated as appropriate.

2.3 SPILL PREVENTION, CONTROLS AND CONTINGENCY PLAN

Fuels, hydraulic fluids, decontamination chemicals, dyes, as well as other chemicals associated with this work scope are all controlled substances and their release to the environment will be prevented or mitigated. A Spill Prevention, Controls and Contingency Plan has been developed and is included in Appendix F of this Work Plan.

3.0 PROJECT ORGANIZATION

The project team organization for this Delivery Order is shown in Figure 3-1. The responsibilities of each team member are listed in Table 3-1.

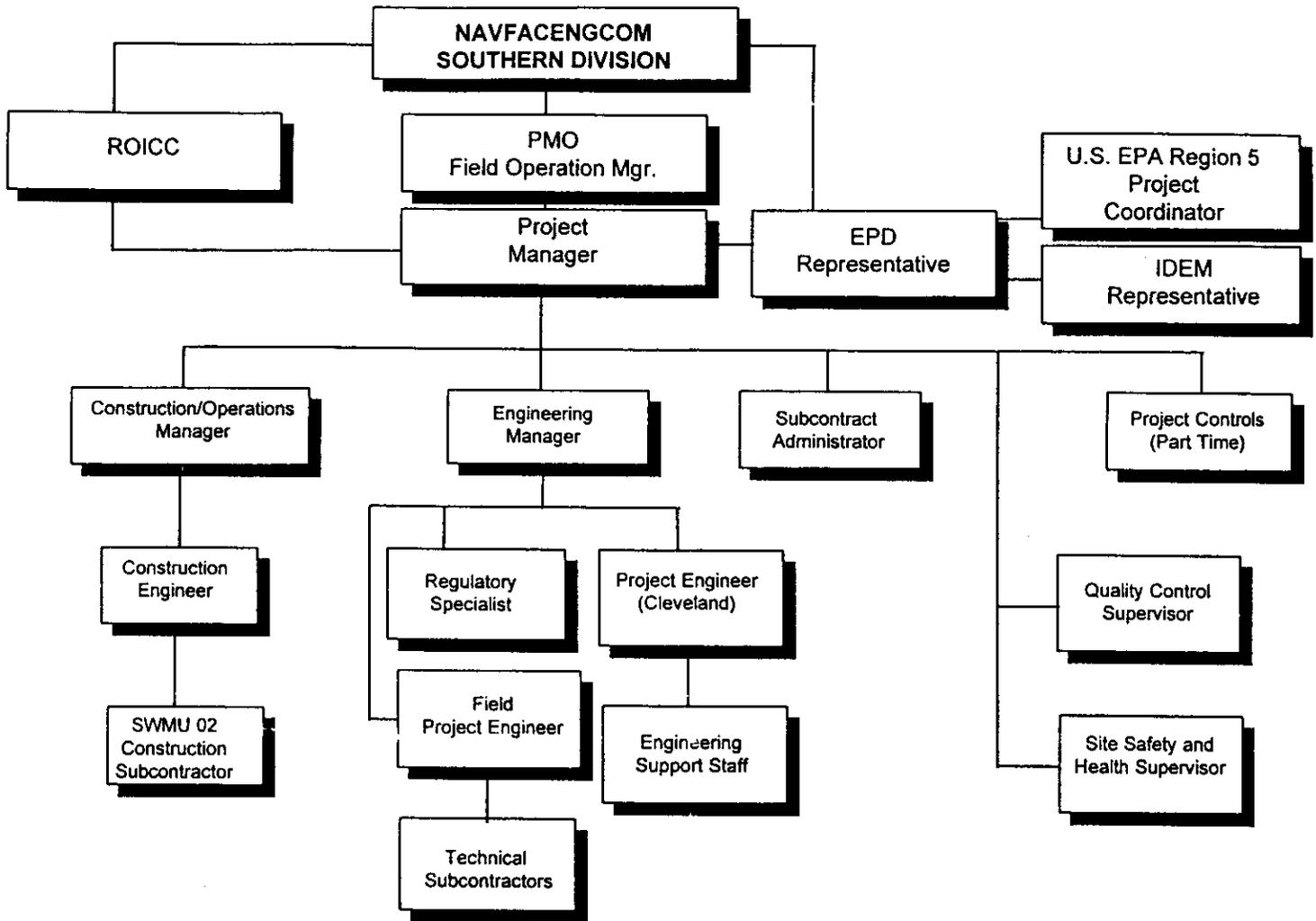


FIGURE 3-1 ORGANIZATION CHART

**TABLE 3-1
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 shall review and approve all phases of remedial activities including work plans, construction design, equipment, analytical results, etc.. |
| NSWC Environmental Protection Department (EPD) Environmental Construction Representative (ECR) | 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 NTR and in an environmental emergency, the ECR shall provide direction to Contractor and provide notification to appropriate parties. |
| NSWC Resident Officer In Charge of Construction (ROICC) | Southern Division's on-site representative and is the liaison between NSWC officials, the U.S. EPA, and the Project Manager for the SWMUs at NSWC Crane. |
| Project Manager (PM) | <p>Reports to the Field Operations Manager from the PMO. Overall responsibility for implementing this Work Plan and all other project activities. The PM will control all on-site forces to ensure completion of project tasks.</p> <ul style="list-style-type: none"> • 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. |
| Construction/ Operations Manager (OM) | <p>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 Work Plan are completed.</p> <ul style="list-style-type: none"> • 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. |
| Construction Engineer (CE) | Reports to the Construction/Operations Manager and has the first line responsibility for coordination and control of all field construction activities to ensure that all tasks included in this Work Plan are completed. |
| Engineering Manager (EM) | <p>Reports to the PM and has primary responsibility for finalizing the operations plans, provides construction support, and oversight of engineering and scientific activities.</p> <ul style="list-style-type: none"> • Provides technical direction to the engineering and science staff, • Provides oversight and coordination of the preparation of technical documents. |

**TABLE 3-1
PROJECT RESPONSIBILITIES**

| TEAM MEMBERS | RESPONSIBILITIES |
|--|---|
| Regulatory Specialist (RS) | <p>Reports to Engineering Manager with primary responsibility to determine regulatory requirements and establish methods for Contractor compliance with Navy EPD requirements.</p> <ul style="list-style-type: none"> - Review regulations for applicability to project, - Review project modifications for applicable regulations |
| Field Project Engineer (FE) | <p>Reports to the EM and has primary responsibility for technical oversight of construction.</p> <ul style="list-style-type: none"> • Supervises the activities of the technical contractors. • Coordinates with the OM to ensure that activities are properly coordinated for cap construction. • Coordinates the activities of the support staff and provides project status reports to the EM/PM. |
| Project Controls | <p>Reports to the PM with primary responsibilities of tracking of all cost and scheduling for the NSWCrane Project.</p> <ul style="list-style-type: none"> • Responsible for cost collection and reporting • Responsible for schedule development, maintenance, and reporting. |
| Project Engineer (PE) (Cleveland) | <p>Reports to the EM with primary responsibilities of coordinating the engineering effort in support of field activities.</p> <ul style="list-style-type: none"> • Assign Cleveland based resources as required for the completion of all project plans and documents. • Provide engineering support for field activities as required. |
| Engineering Support Staff | <p>Technical staff reporting to the Project Engineer with specific task responsibilities as necessary to allow the Project Engineer to fulfill his responsibilities.</p> |
| Site Safety and Health Supervisor (SSHS) | <p>Reports to the PMO with field reporting to the OM. Implements and ensures compliance with the Task-Specific Site Safety and Health Plan (SSHP). Tracks and reports on safety-related matters.</p> <ul style="list-style-type: none"> • Responsible for the control and elimination of existing and potential industrial hazards. • 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 3-1
PROJECT RESPONSIBILITIES**

| TEAM MEMBERS | RESPONSIBILITIES |
|--|--|
| Site Quality Control Supervisor (SQCS) | <p>Reports to the PMO and with field reporting to the SM. The SQCS has primary responsibility for verifying a consistently high level of quality for the project.</p> <ul style="list-style-type: none"> • Reviews and checks all documents, reports, and testing results. • Coordinates with the PM, and OM on all construction operations. • Provides surveillance of all field operation activities to ensure compliance with this Work 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. |
| Subcontract Administrator | <p>Reports to the PM with primary responsibilities to support all subcontract administration for the project.</p> <ul style="list-style-type: none"> • Initiates change orders and change order negotiations, • order and expedite all field purchased items. |

Note: See Section 3.0 of the Site Safety and Health Plan for names and contact.

4.0 PROJECT EXECUTION

4.1 WORK APPROACH

This section describes the proposed construction methods to be used at SWMU #02/11 Dye Burial Ground Cap. The scope of work involves construction of an interim cover system over the Dye Burial Ground. The work will be performed in two phases.

- Phase I includes site preparation by removing vegetation, relocating water storage tanks and boxes, development of a borrow area, establishment of sediment and erosion control devices; and site grading including the relocation of dye contaminated material and placement of a clean soil layer over the cap area.
- Phase II is the installation of the cover system components, extension and providing a protective casing for existing monitoring wells, and seeding/revegetating disturbed areas.

The original design of the cap was prepared by the U.S. Army Corps of Engineer's Waterways Experiment Station (WES) in Vicksburg, Mississippi and the expanded redesign of the Dye Burial Cap was performed by MK. The design drawings and specifications are provided in Appendix B and C respectively.

4.2 SITE ASSESSMENT

The site is located along a ridge top that is generally flat. A low, narrow, apparently man-made ridge runs from the north end to the southeast boundary of the site. Numerous trees and other types of vegetation are present within the planned cover areas. An unimproved access road to the site impinges onto the northern portion of the planned cap area. Based on available information, the dye burial trenches are each approximately 10 feet wide, 50 feet long, and 6 feet deep. Materials disposed of in the trenches included magnesium, boxes and rags contaminated with dyes, and approximately 60 drums of dye. The trenches have been backfilled with soil. The trenches were backfilled to grade or 1 foot below the adjacent grades. The trench materials are expected to be considerably softer than the relatively stiff native soils.

Geophysical surveys were conducted at the site between January 23 and 26, 1991 by personnel of WES using electromagnetic, magnetic, and ground penetrating radar instrumentation. The results of these geophysical surveys indicated that there are approximately 17 unidentified anomalies located within the dye burial ground that may contain dye material.

A survey of the site as-built conditions was performed in June, 1997 and a topographical map prepared, as provided in Appendix B. The map shows the existing site conditions including the locations of monitoring wells, trenches, sump, plastic covers, and the access road and other physical features of the site.

4.3 RADIOLOGICAL SURVEY

A radiological survey will be performed prior to mobilization for construction. The radiological survey will be performed by personnel certified and trained for the work. The Dye Burial Ground Quality Assurance Project Plan (QAPP), under separate cover, outlines the procedures for performing the radiological survey. The information obtained from the survey will determine if additional investigations are required to remove point sources and will identify the level of protection required to perform work at the site. If point source removal is required due to elevated radiological levels, a separate work plan will be developed for the removal and handling of the radiologically contaminated materials.

4.4 MOBILIZATION

All equipment to will be steam cleaned and inspected before mobilization to the site. Upon arrival at the site, the equipment will be inspected for the presence of dirt, oils and grease. The general condition of the equipment will also be inspected and tested to ensure that all safety systems are functional and there are no leaking systems. The performance of the equipment will be tested to determine if the equipment is capable of performing the required tasks.

All construction materials for the cover system will be labeled, delivered to the site, and stored, per the requirement of the specifications. Measures will be taken to protect the construction materials (especially the cover Geosynthetics) from the elements or other damage during storage at the site.

Storm water and erosion control measures will be implemented as necessary to control storm water runoff and to prevent erosion, as outlined in Section 9.0 of this plan.

4.5 SITE PREPARATION

Site preparation will be performed prior to placement of the cover system. Site preparation includes:

- Access road construction,
- water storage tank relocation and installation,
- mud tank relocation,
- vegetation removal and site grading,

- relocation of dye contamination into the cap area,
- and placement of a clean soil layer over the cap area.

Site preparation activities, especially excavation of dye contaminated material will be performed in a manner to prevent cross contamination. Operation will be continually monitored to ensure all precautions are being taken during excavation and placement at dye impacted areas.

4.5.1 Access Road Relocation

The existing access road leading to the site is partially located within the footprint of the proposed cap. The access road will be removed and relocated adjacent to the new cap. The new gravel access road will be constructed along the east and south side of the proposed cap. A 10 foot gravel path will be placed along the north side of the proposed cap for access to the monitoring wells in that area.

4.5.2 Vegetation Removal

Site vegetation requiring removal consists primarily of grasses, small shrubs, and trees up to 14 inches in diameter. Trees within the construction area will be cut flush to ground level. The stumps will be treated with an approved herbicide, such as commercial grade Roundup™, to stop plant growth. Herbicides will be applied in accordance with appropriate Federal and State regulations. Stumps at the borrow area will be removed and disposed of by cutting and chipping.

All trees, limbs, and brush less than three inches in diameter will be chipped. The chips will be stockpiled in a designated area or disposed at an off-site landfill. All trees larger than three inches in diameter will be blocked in four to eight foot lengths and stacked at a designated location. Crane Public Works Department will be contacted to coordinate the appropriate disposal of the wood chips and blocked wood.

The vegetation will be removed by mowing close to the ground surface and then by removing the clippings. Vegetation removal in the area of the cap will be accomplished with low ground pressure equipment and/or hand labor as necessary to prevent rutting the area.

4.5.3 Dye-Contaminated Soil Excavation

Dye contaminated soil excavation will be performed until the area is visually clean and as a minimum to the lines and grades indicated on the drawings provided in Appendix B. The excavated area will be photographed for documentation indicating a visually clean excavation.

Equipment or material used during dye contaminated soil excavation will be decontaminated as stated in Section 7.0 of this plan. Soils excavated from the dye contaminated areas will be placed within the cap area.

Dye contaminated material unearthed during the perimeter drainage/anchor trench excavation will be placed within the cap area. Spots of dye contamination on the side or bottom of the trench that can easily be removed, will be hand excavated and placed within the cap area. Large areas will be covered with a 4 mil or thicker plastic sheeting. Should dye contaminated material outside the designated area be uncovered, it will be excavated or re-covered with fill material. Clean cover soil will be placed over the dye contaminated material to a depth of one foot at the end of each day.

4.5.4 Site Grading

After removal of vegetation and dye contaminated soil, the site will be graded according to the drawings in Appendix B. Subsurface materials removed may be placed and compacted over the cap area to the required grades or stockpiled for use as cover soil. Any fill placed in the cap area during the grading process will be compacted in a manner that will not rut or pump the underlying soil. Proof-rolling will be performed prior to placement of the geotextile fabrics and membrane. Rocks larger than three-eighths inch, roots, and other debris will be removed from the graded surface prior to cover system placement. The finished graded area will be surveyed to confirm proper slopes and dimensions. All grade breaks or changes in direction will be rounded to reduce strain on the Geotextiles. Any areas where existing plastic sheeting is removed to perform site grading will be re-covered with plastic or at least 6-inches of clean soil the same day.

4.5.5 Equipment Decontamination

Should any contamination of equipment or materials be suspected, the materials and equipment will be decontaminated or disposed. Potentially contaminated materials, soils, and fluids, will be collected and sampled to determine proper disposal methods as described in the Quality Assurance Project Plan (QAPP) under separate cover. Decontamination of equipment will be performed as stated in Section 7.0 of this plan.

4.5.6 Water Control

4.5.6.1 Contaminated Water Control

Contaminated water will be controlled throughout the construction process and if necessary during a winter shutdown. The following subsections discuss the general processes that will be employed to control contaminated water in the event that it is encountered during different stages of the interim measure.

4.5.6.2 Water Control During Excavation

Contaminated soil will require excavation and relocation to the capped area. Excavation will be limited to non-rainy periods to prevent migration of dye away from proposed excavation areas. Sufficient time will be allotted to excavate, backfill, and transport the dye contaminated soil to within the footprint of the cap and cover with soil. The dye contaminated soil will be covered with plastic sheeting in the event that immediate covering with clean soil is not possible.

In the event stormwater becomes contaminated with dye, this water will be placed in storage tanks, sampled and analyzed per the provisions of the QAPP.

4.5.6.3 Seepage Control During Construction

During construction of the cap, seepage of dye contaminated water may emanate from beneath the unfinished cap caused by the squeezing of the water-saturated soils due to the surcharge load of the cap materials. To control this water, a sump will be excavated in the location of the seepage and lined with plastic sheeting. Water from this temporary holding facility will be pumped into storage tanks. The water will be sampling and analyzed according to the procedure outlined in the QAPP.

4.5.6.4 Seepage Control During a Winter Shutdown

In the event that a winter shutdown is required, a plastic lined sump will be constructed to capture seepage emanating from the rough cover. The sump area will be covered with a framework, plastic, and straw bales to prevent freezing of the dye contaminated water, allowing it to be periodically pumped, as necessary to a holding tank. The holding tank water will be sampled and analyzed as discussed above.

4.5.6.5 Seepage Control After Construction

In the event that seepage is encountered after the cap has been constructed, a seepage collection sump will be constructed to capture the seepage. The sump will be plastic lined and covered to prevent freezing of the seepage during the winter, as discussed above. The sump will be checked periodically and pumped to holding tanks if necessary. The water will be sampled and analyzed according to the procedures outlined in the QAPP.

4.5.6.6 Decontamination Water Control

A decontamination facility will be constructed using two split halves of an 8" PVC pipe overlain by a HDPE liner. Boards will be placed over the plastic sheeting to allow trucks and other equipment to drive onto the plastic sheeting where the equipment can be washed. The washwater will be collected in a small depression in the plastic lined area,

with the washwater being pumped to a holding tank. The water will be sampled and analyzed according to the procedures outlined in the QAPP. For additional detail on decontamination of equipment, see Section 8.0 of this plan.

4.6 WINTERIZATION

Construction of the Dye Burial Cap is expected to be completed by November, 1997. In the event of inclement weather prevents completion of construction activities by November, 1997 winterization of the cap will be required for a safe winter shutdown. Winterization of the site will include:

- Smooth drum rolling of the in-place material,
- weekly inspection of the site,
- site maintenance as needed through the winter for the cap,
- site erosion control devices including the borrow area,
- and regrading and elevation verification before cap construction resumed in the spring.

Winterization will only be performed if the entire cap is not completed by November, 1997.

4.7 COVER SYSTEM CONSTRUCTION

Cover system construction will begin when site preparation activities are completed, documented, and accepted, in writing, by the geotextile membrane/fabric installer. Components of the cover system and details are shown on the drawings found in Appendix B.

4.7.1 Soil Bedding Layer

The bedding layer soil will act as a protective layer between the dye contaminated material and the cap cover system. The bedding layer will be placed at time of site grading to the lines and grades as shown on the drawings in Appendix B. Bedding soil will be material suitable for its intended use and will be free of debris, organic materials, rocks or gravel larger than 3/8 inch, or other objects that might damage the liner materials. Bedding layer soil will be obtained from an approved on-site borrow source.

4.7.2 Drainage/Anchor Trench

The drainage/anchor trench will be constructed around the perimeter of the cap as shown on the drawings in Appendix B. Clean soil from the excavation of the drainage/anchor trench will be temporarily stockpiled for use in the cover soil layer. Any dye contaminated soil excavated during trench construction will be spread in thin layers over the cap foundation and will be covered with at least 6 inches of clean fill. Spots of

dye contamination on the side or bottom of the trench that can easily be removed, will be hand excavated and placed within the cap area. Large areas will be covered with a 4 mil or thicker plastic sheeting.

4.7.3 Geotextile Cushion

A non-woven geotextile cushion will be placed directly on top of the graded surface and in the drainage/anchor trench. The cushion will extend two feet beyond the outer edge of the perimeter drainage/anchor trench. The geotextile will be seamed during placement in accordance with the specifications and/or the manufacturer's recommendations. The location of all seams will be surveyed or measured and recorded on as-built drawings.

4.7.4 Geosynthetic Clay Liner

A geosynthetic clay liner (GCL) will be placed on top of the geotextile cushion and will extend to the edge of the cushion layer. The GCL will not be placed on wet surfaces or during inclement weather. The quantity of GCL to be placed on a given construction day will equal the quantity that can be covered by a fully seam-sealed high-density polyethylene geomembrane during the same day or otherwise fully protected from the elements. The GCL will be placed with all seams overlapped and sealed according to the manufacturer's recommendations. The location of all seams shall be surveyed or measured and recorded on as built drawings.

4.7.5 High-Density Polyethylene Geomembrane Liner

A 60-mil textured high-density polyethylene (HDPE) liner will be installed on top of the GCL on the same day as the GCL installation. The HDPE liner will extend to the edge of the previous layers. The HDPE will be placed and seam sealed according to the specifications and the manufacturer recommendations. Seams will be tested in accordance with the specifications and the manufacturer recommendations. At a minimum, the seaming and testing will meet the requirements of the publication "*Technical Guidance Document: The Fabrication of Polyethylene FML Field Seams*" which was prepared for the Environmental Protection Agency by Drexel University in Philadelphia, PA. The entire geomembrane liner will be inspected for tears, holes, and defects after placement and prior to the placement of subsequent layers. Care will be taken to protect the liner from damage by equipment or personnel during and after installation.

The installation of the liner, the location of seams, and all test results will be fully documented.

4.7.6 Drainage Collection System

Non-woven geotextile will be placed in the drainage collection trench and lapped over the edges of the trench. A 4-inch perforated ADS collection pipe will be installed in the geotextile-lined trench. The pipe will be joined using standard factory couplings in accordance with manufacturer's guidelines. The perimeter drain pipe will be joined by a standard tee fitting to the non-perforated 4-inch ADS pipes which will provide the drainage outlet to daylight.

The alignment of the drainage pipe will be surveyed to verify proper grades and for as-built purposes. After the grades have been checked, gravel materials will be placed carefully by hand to bed the pipe and to cover the pipe. The gravel used will have all particles smaller than 2 inches but larger than ½-inch pipe perforation size. Gravels used for the drainage collection trench will be verified to be rounded to sub-rounded prior to placement. The geotextile will then be wrapped around the collection pipe and gravel and overlapped as shown on the drawings in Appendix B of this plan.

4.7.7 Sand Drainage Layer

A 6-inch-thick sand layer meeting the specified hydraulic conductivity requirements will be placed on top of the HDPE liner from the exterior edge of the drainage trenches inward to cover the rest of the cap. The sand will be spread and lightly compacted in one lift using equipment no heavier than that used for the site preparation in the area of the trenches to prevent abrasion, puncture, or rutting damage to the underlying geosynthetics. The sand layer will be surveyed after placement to ensure that proper layer thickness and grades have been achieved. The survey information shall be recorded for as-built purposes.

4.7.8 Geotextile Fabric

A non-woven polypropylene geotextile filter fabric will be installed over the sand drainage layer. The geotextile will extend at least 2 feet beyond the outer edge of the drainage/anchor trench to the edge of the HDPE previously placed. The geotextile will be fully seamed during placement according to the specifications and manufacturer's recommendations. The location of all seams will be recorded on as-built drawings.

4.7.9 Biotic Barrier Layer

A 6-inch biotic barrier (gravel) layer meeting the specified hydraulic conductivity requirements will be spread over the geotextile layer to the design dimensions which extend from the crest to the exterior edge of the drainage collection trench. This material also will be confirmed to be non-angular prior to use at the site. The biotic barrier will be spread in one lift with light equipment to prevent rutting and/or other damage to the underlying layers. The biotic barrier will be surveyed after placement to

ensure that proper thicknesses and grades have been achieved. The survey data will be recorded on as-built drawings.

4.7.10 Geotextile Fabric

A non-woven geotextile filter fabric layer will be installed over the biotic barrier layer and extended at least 2 feet beyond the outer edge of the drainage/anchor trench. The geotextile will be seamed during placement according to specifications and the manufacturer's recommendations. The location of all seams shall be recorded on as-built drawings.

4.7.11 Topsoil Cover Layer and Finish Grade

A nominal 27-inch-thick layer of soil will be placed on top of the geotextile fabric to the designed grades and dimensions as shown on the drawings in Appendix B. The layer will be placed in 12-inch lifts and compacted to the specified densities. Existing subsoils at the site have been tested and confirmed to be capable of meeting the permeability requirements of the design if placed with proper moisture content and compactive effort. Placing and compacting will be performed by equipment selected to prevent rutting or other damage to underlying layers and geotextiles. The top 3 inch of the cover soil layer will be composed of topsoil having a minimum organic content of 5 percent. The topsoil cover layer will be surveyed and photographed to document as-built conditions. Compaction testing of the cover layer will be performed in a manner that prevents any penetration or disturbance of the underlying fabric layers. Other disturbed areas outside of the cap area will be graded to blend with the natural topography and to eliminate ponding of stormwater.

4.7.12 Roadway Gravels

The areas designated for access roads shall be graded to provide access to monitoring wells and other areas of the site. The access roadway will consist of non-woven geotextiles covered by 6 inches of course drain gravel followed by 6 inches of surfacing gravel. The roadway will be placed to the lines and grades as shown on the drawings in Appendix B.

4.7.13 Restore Site

The finished topsoil layer and other areas disturbed during construction will be seeded and mulched according to the specifications found in Appendix C.

If construction areas will be left unprotected for more than one month, but are not ready for permanent seeding, the exposed areas will be planted with a temporary cover crop. The temporary cover crop will consist of 100 pounds/acre spring oats and 20

pounds/acre annual ryegrass for spring seedings, or 150 pounds/acre wheat or rye for fall seedings.

All seeded areas will be mulched to prevent erosion and ensure seeding success. Mulch will be blown straw disked or crimped into the soil. A permanent seeding drilled directly into a previously planted temporary cover crop will not require mulching.

All sloped areas exceeding 4H:1V will be covered with an erosion mat meeting the requirements of the specifications.

4.7.14 Warning Signs

Warning signs will be placed around the perimeter of the cap to mark the boundary of the capped area. The signs will be placed in the approximate locations shown on the drawings. The exact locations may vary to assure maximum visibility to vehicles on the gravel access road.

4.8 TESTING/INSPECTIONS

Various tests and inspections will be performed to verify that cover construction is in accordance with the project design criteria. Some of these tests will be performed on materials prior to delivery to the site (preconstruction testing), some during placement (conformance testing), and others after placement (acceptance testing). The tests and inspections will consist of both laboratory and field efforts as outlined in Section 5.0 and the specifications. Inspection checklists for the various tasks associated with the cap construction are provided in Appendix D. Additional checklists may be prepared by the Site Quality Control Supervisor in accordance with the requirements of the three phases of control.

4.9 SITE CLEANUP AND DEMOBILIZATION

The site will be cleaned up by removing all construction debris and litter. Rutted or otherwise disturbed areas will be restored. Upon completion of the construction activities, construction equipment will be decontaminated/cleaned as necessary and moved off site.

4.10 COVER SYSTEM DOCUMENTATION

The following is a list of documentation to be provided throughout the various phases of construction. A final Interim Measures Completion Report will be generated within 180 days after completion of cap construction.

**Table 4-1
Cover System
Documentation**

| Work Plan, Spec or Drawing Reference | Material/Commodity Description | Time of Submittal |
|--------------------------------------|---|---------------------|
| 01300 | As-Built Construction Sch. | AWC |
| 01300 | 3-wk Construction Sch. | Weekly |
| 01300 | Proposal Products List | 10 days after award |
| 01300 | Gradation Permeability Drainage Rock | PTW |
| 02200 | Density & Moisture | AWC |
| 02200 | Drainage Layer Gradation & Permeability | PTW |
| 02200 | Biotic Layer Gradation & Permeability | PTW |
| 02200 | Certificate of Compliance for Drainage Pipe | PTW |
| 02200 | Certificate of Pesticide License | PTW |
| 02200 | Certificate of Category 6 Right of Way Pest Control License | PTW |
| 02200 | Lay Thickness Measurement | AWC |
| 02200 | Survey Data As-Built a) Completion of cap foundation grading b) Under Drain trench grading c) Completed sand drainage layer d) Completed biotic barrier layer e) Final grading and topsoil | |

**Table 4-1
Cover System
Documentation
Cont'd**

| Work Plan, Spec or Drawing Reference | Material/Commodity Description | Time of Submittal |
|---|--|----------------------|
| | f) FRAC tank storage and containment area g) Relocated road alignment h) Swale reconstruction i) Cushion layer seaming location j) Geosynthetic Clay Liner seaming locations k) HPDE Geomembrane liner seaming locations l) Drainage layer geotextile seaming location m) Biotic barrier layer geotextile seaming location | AWC |
| 02249 | Resin Supplier | PTW |
| 02249 | Certificate of Compliance & Quality Control Certificate for Resin Supplier | PTW |
| 02249 | Result of Test and Certificate of Compliance that Geotextile meets manufacturer's specification | PTW |
| 02249 | Statement of reclaimed polymer cleanliness | PTW |
| 02249 | List of material comprising Geotextiles | PTW |
| 02249 | Manufacturer's Specifications | PTW |
| 02249 | Certificate of Compliance by Geotextile Manufacturer | PTW |
| 02249 | Needle-Free Certification | PTW |
| 02249 | Quality Control Certificates | PTW |
| 02249 | Scaled Panel Layout | PTW |
| 02249 | Subgrade surface acceptance | PTW |
| 02250 | Manufacturer's Qualifications | PTW |
| 02250 | Installers Qualifications | PTW |

**Table 4-1
Cover System
Documentation
Cont'd**

| Work Plan, Spec or Drawing Reference | Material/Commodity Description | Time of Submittal |
|---|--|----------------------|
| 02250 | Installers Superintendents Qualifications | PTW |
| 02250 | Installers QA/QC Managers Qualifications | PTW |
| 02250 | Installers Master Seamers Qualifications | PTW |
| 02250 | Resin Suppliers | PTW |
| 02250 | Resin Suppliers Quality Control Certifications | PTW |
| 02250 | Manufacturer Test Results | PTW |
| 02250 | List of Materials for Geomembrane | PTW |
| 02250 | Manufacturer Specifications | PTW |
| 02250 | Writer Certificate of Compliance | PTW |
| 02250 | Manufacturer quality Control Certificates | PTW |
| 02250 | Quality Control Program Procedure Manual | PTW |
| 02250 | Certification that the Installation Supervisor and master sources has reviewed the QC program, the project plans & subcontract specifications | PTW |
| 02250 | Scaled panel layout for Geomembrane | PTW |
| 02250 | Installation and repair procedure | PTW |
| 02250 | Test Laboratory Certificates | PTW |
| 02250 | Installation QC Records | AWC |
| 02250 | Subgrade Surface Records | AWC |
| 02250 | Destructive Seam Test Results | AWC |
| 02250 | Non-Destruct Seam Test Results | AWC |

**Table 4-1
Cover System
Documentation
Cont'd**

| Work Plan, Spec or Drawing Reference | Material/Commodity Description | Time of Submittal |
|---|--|----------------------|
| 02250 | Daily Seam Records | Daily AWC |
| 02250 | Daily Non-compliance & Corrective Measures | Daily |
| 02250 | As-Built Drawings | AWC |
| 02250 | Manufacturer Written Warranty | AWC |
| 02250 | Installers Written Warranty | AWC |
| 02250 | Material Samples | PTW |
| 02250 | Conformance Test Samples | As Obtained |
| 02250 | Destructive Seam Test Samples | As Obtained |
| 02253 | Bentonite Origin Supplier | PTW |
| 02253 | Resin Origin Supplier for (GCL) | PTW |
| 02253 | Test results from GCL Manufacturer on Bentonite | PTW |
| 02253 | Test Results from GCL Manufacturer on Geotextile | PTW |
| 02253 | Manufacturers Specification for GCL | PTW |
| 02253 | Written Certification of Minimum Average roll values | PTW |
| 02253 | GCL to be needle free certification | PTW |
| 02253 | Manufacturers Quality Control Certifications and results of Quality Control Tests and testing procedures | PTW |
| 02253 | Certificate of Compliance for GCL | PTW |
| 02253 | Certification of Montmoullonite Content | PTW |
| 02253 | Subgrade Surface Acceptance | PTW |
| 02253 | Manufacturers Specifications | PTW |
| 02255 | Certificate of Compliance | PTW |

| Table 4-1 Cover System Documentation Cont'd | | |
|--|--|----------------------|
| Work Plan, Spec or Drawing Reference | Material/Commodity Description | Time of Submittal |
| 02255 | Manufacturers Instructions | PTW |
| 02255 | Material Sample | PTW |
| 02936 | Seed Mixture and Rate Calculations | 14 Days PTW |
| 02936 | Fertilizer Composition and Rate Calculations | 14 Days PTW |
| 02936 | Rate of Application for Seed Fertilizer and Mulch | 14 Days PTW |
| 02936 | Indication of Conformance | 14 Days PTW |
| Section 4.4 | Radiological Survey | PTW |
| Section 4.8 | Photographic Documentation | AWC |

PTW Prior to Work Commencement
 AWC At Work Completion
 PTM Prior to Mobilization
 NTP Notice to Proceed

5.0 QUALITY CONTROL

As prime contractor, MK will implement and retain full authority of the Quality Control Plan (QCP) for this project. The QCP is found in Appendix E and is to be used in conjunction with this Work Plan. MK will manage all matters involving Quality Control performed in the execution of NAVFAC Delivery Orders. This approach provides the Navy with a quality management system having clear lines of authority and responsibility, and a consistent approach and application of quality requirements.

The QCP identifies quality testing and inspection requirements for the scope of work to be performed. The specifications include additional testing requirements beyond those detailed in the QCP. To supplement the information contained therein, detailed inspection checklists have been prepared and are provided in Appendix D. Additional field inspection checklists will be prepared, if necessary, by the Site Quality Control Supervisor for each work item prior to initiation of any related activities. The detailed inspection checklist will include all requirements of this work plan, the subcontract documents, manufacturer's recommendations, and site requirements. The contract documents will contain specific data and material submittal requirements which must be strictly adhered to.

In addition, the NSWC EPD personnel will perform quality checks and inspections of the work and operations based on the approved Work Plan. The U.S. EPA also retains authority to perform quality checks and inspections.

This program will also adhere to the provisions of the Quality Assurance Project Plan (QAPP) which is under separate cover.

6.0 SAFETY AND HEALTH

The Site Safety and Health Plan (SSHP) for this Work Plan is specific to interim measures cleanup activities for SWMU 02/11 and is found in Appendix A. All details in the SSHP will be followed during the execution of the work.

It is anticipated that the requirements of hazardous waste operations will be applicable to this project. The design and its conformance to the site requires equipment to contact materials buried in the trenches.

7.0 DECONTAMINATION ACTIVITIES

7.1 MINIMIZATION OF CONTAMINATION

MK will employ procedures to minimize contamination to equipment and to the personal protective equipment (PPE) of workers to the extent practicable. As previously noted this construction program will be designed to prevent exposure of buried dye trench waste materials during construction activities. However, dye contaminated materials will be relocated to within the footprint of the cap resulting in contamination of excavation and transportation equipment and to personal protective equipment of the workers and necessitating decontamination procedures and facilities. A discussion of the decontamination facilities that will be constructed and procedures for personnel and equipment decontamination are presented below. Decontamination activities will be performed in compliance with the Site Safety and Health Plan.

7.2 DECONTAMINATION FACILITIES

Decontamination equipment and materials will be available at the work site in the event contaminants should be uncovered. Any wastes generated by decontamination activities shall be collected, sampled, and disposed of in a manner approved by the U.S. EPA and the U.S. Navy.

7.3 PERSONNEL DECONTAMINATION

Personnel working on the ground, in the area of the trenches, prior to installation of the liner materials shall be required to wear rubber boots. Personnel leaving the work area shall remove their boots prior to exiting. All boots shall be washed daily and inspected prior to reuse.

Wash stations shall be available to permit employees to wash their hands and face prior to leaving the work area for breaks, lunch, or at the end of the day. There shall also be an adequate quantity of washing supplies on-site to perform decontamination of personnel should it be necessary.

All contaminated personal protective equipment and clothing shall be properly disposed or cleaned and inspected for reuse.

7.4 DECONTAMINATION OF HEAVY EQUIPMENT

Portions of construction and field equipment that have come into contact with any potentially contaminated material will be decontaminated. Heavy equipment, such as trucks and backhoe's, may be cleaned by high-pressure water or steam. The equipment will be visually inspected for signs of contamination. If signs of contamination are still present, the cleaning procedures will be repeated until the criteria for cleanliness has been met.

As previously discussed in Section 4.0, decontamination wash water will be collected, sampled and analyzed per the provisions of the QAPP, and appropriately disposed.

8.0 WASTE MANAGEMENT

8.1 PURPOSE AND ORGANIZATION

Waste management, including disposal functions, will be conducted in accordance with the site's requirements at the on-site landfill or at an off-site landfill.

The construction of the cap at the Dye Burial Grounds is not expected to result in the generation of any hazardous wastes. In the unlikely event that hazardous waste is encountered or generated it will be characterized per the QAPP, manifested in accordance with applicable regulations, and the manifests will be signed by NSWC Crane's Environmental Protection Department for disposal.

This section provides guidance for organizing and executing the handling, temporary storage, transportation, and disposal of hazardous and nonhazardous wastes and materials for NSWC Crane. This section outlines personnel responsibilities; personnel training requirements; the procedures for storing, classifying, packaging, labeling, marking, placarding, and tracking off-site shipments; the procedures for completing shipping papers; and the requirements for notification, RECORD KEEPING, and reporting of shipments.

This section will be used in conjunction with DOT, EPA, and State of Indiana Administrative Code, as appropriate, regarding classification and transportation of hazardous wastes or materials. A list of these regulations is included in Section 8.6.

8.1.1 Personnel Responsibilities

The Project Manager will designate a Regulatory Specialist (RS) to oversee, manage, and carry out on-site and off-site waste shipments. The RS will be trained in accordance with DOT regulations promulgated by 49 CFR 172 Subpart H. This training will be documented and the records maintained in accordance with Section 8.5 of this plan.

The RS will be responsible for assisting the NSWC Site Representative to ensure that regulated shipments are processed in accordance with the requirements of the project plans, disposal facility acceptance criteria, state regulations, and federal regulations. The NSWC Site Representative will coordinate coverage of the 24-hour emergency response telephone number required during off-site transport (see Section 8.3.1). The RS will assist the NSWC officials in the resolution of any transportation-related incidents.

The RS will coordinate, schedule, and oversee site workers who perform waste excavation, loading, and transport services to ensure the interim storage, transportation, and disposal of hazardous and nonhazardous wastes and materials comply with federal, state, and local laws. The RS will also oversee and recommend additional analyses, as necessary, to ensure compliance with transportation and treatment/disposal requirements.

8.1.2 Personnel Training Requirements

The RS must successfully complete the Hazardous Material training required under 49 CFR 172.704 and the 40-hour training and 8-hour supervisor course required under 29 CFR 1910.120. All personnel handling hazardous wastes and materials must successfully complete the 29 CFR 1910.120 training.

In addition, the RS and site personnel handling hazardous wastes and materials must be enrolled in a medical surveillance program.

8.2 PROCEDURES

This section describes storage, loading, shipping, and final inspection procedures.

8.2.1 Temporary Storage

The RS will establish temporary 90-day storage areas for any containerized hazardous wastes from the Solid Waste Management Unit (SWMU). All hazardous waste containers will be marked and stored in accordance with the generator requirements in 40 CFR 262.34(a) unless other arrangements have been made with the EPA under the RCRA permit. Storage areas will be designated to minimize container contact with water and minimize precipitation, run-on, accumulation, and run-off.

Containers stored in the temporary storage area will remain closed except during the addition of material. The RS and the NSWC Site Representative will inspect the interim storage area weekly to verify that all containers are in good condition, are properly marked, and the containment system has not deteriorated and is functioning properly. Inspections will be documented in the field logbook.

When the temporary storage areas are no longer needed, each area will be closed in accordance with 40 CFR Part 265.111. At a minimum, the closure will ensure that the need for further maintenance is minimized and that the release of hazardous constituents from each area is minimized or eliminated. This will be accomplished by removing or decontaminating all residues, structures and subsoils within each area.

8.2.2 Preparation for Shipment

Document Control. The RS will establish a shipping information and tracking system that includes:

- Personnel training documentation.
- Subcontractor EPA identification numbers and addresses.
- Emergency and spill response information taken from the Task-Specific Site Safety and Health Plan.
- Development of a complete manifest package.
- Waste shipment log.

Personnel and Subcontractor Qualifications. Subcontractor and site personnel qualifications shall be reviewed to ensure personnel, waste transport, and waste disposal subcontractors are readily available and qualified. Licensing and permitting requirements for transport and disposal subcontractors will be reviewed to ensure subcontractor compliance with DOT and EPA regulations. Before waste shipment, the RS will verify that the destination facility selected by the subcontractor is properly licensed and in compliance with its permit.

Waste Disposal Site Acceptance. The RS will initiate and oversee the waste disposal site acceptance approvals for treatment and disposal of hazardous and nonhazardous wastes. Waste disposal sites will be selected by the subcontractors. Approval must be secured from the treatment or disposal site before any waste shipment is allowed to leave the work site or the interim storage area.

Waste Classification. Using the laboratory analyses for waste profiling, the RS will determine the proper shipping name for all wastes in accordance with regulations established in 49 CFR 172. Additionally, the RS will identify hazard classes per 40 CFR 261 and 329 IAC 3.1-6-3, UN numbers, packing group numbers, applicable Reportable Quantity (RQ) requirements, and DOT packaging instructions (refer to 49 CFR 172.101, Hazardous Materials Table) for all hazardous material shipments. The NSWC Site Representative and the RS will review the designations for concurrence or to identify discrepancies.

Waste Screening and Decontamination. The RS will be familiar with and oversee waste field screening methods that use field instruments and portable test kits to ensure that wastes shipped to off-site or on-site waste disposal facilities comply with their respective waste acceptance criteria. Personnel and equipment decontamination procedures must be reviewed to determine if procedures are adequate to prevent contaminating areas outside the work site. In addition, the RS will ensure site access is controlled during and after work hours.

Shipping Papers. Shipping papers with the emergency response information requirements, including the 24-hour emergency response telephone number, will be prepared in accordance with 49 CFR 172 Subpart C. The appropriate hazard guide is selected from the DOT Emergency Response Guidebook and attached with the analytical data on the shipment.

Shipping Number. A unique shipment number from the project Waste Shipment Log will be assigned to each truck. This unique shipment number indicates waste type identification, UN identification number, weight, truck, date the waste was placed in the truck, departure date, destination, applicable RQ requirements, and the appropriate hazard guide number selected from the DOT Emergency Response Guidebook.

Bill of Lading. A bill of lading (for example, shipping manifest and weigh bills) will be completed for all shipments—both hazardous and nonhazardous. The bill of lading includes all information required under 49 CFR 172. Subpart C, and specific site requirements.

Manifest. The manifest package will consist of, at a minimum, a bill of lading, the hazardous waste manifest, the waste profile sheets, material or waste safety data sheets, and/or the land disposal restriction notification and certification forms. The complete package shall be in full compliance with all applicable federal, state, and local laws and regulations including, but not limited to, 329 IAC 3.1-7-3 through 329 IAC 3.1-7-13, 40 CFR 262 Appendix (Uniform Hazardous Waste Manifest and Instructions), and 40 CFR 761 (for PCB shipments).

The RS will prepare the manifest package that will include:

- A completed bill of lading describing the name and address of the shipper and consignee, the waste's proper shipping name, hazard class, the UN numbers, packing group number, applicable RQ requirements, and the 24-hour emergency contact phone number.
- The completed EPA hazardous waste or PCB manifest for off-site hazardous waste shipments. Information is similar to the bill of lading or shipping manifest. Manifests shall be signed or certified by the NSWC Site Representative only.
- A completed Waste Safety Data Sheet (WSDS) and/or hazard guide selected from DOT's Emergency Response Guidebook.
- The disposal site's approved waste profile.
- A completed land disposal restriction notification and certification form. The land disposal restrictions (LDRs) require notification of the treatment and

disposal facility for all restricted hazardous wastes. The RS will decide if the shipment will include LDR-restricted wastes and decide the type of treatment required. The notice must include the EPA hazardous waste number, corresponding treatment standards, manifest number, and waste analysis data as itemized in 40 CFR 268.7.

The RS will review the completed manifest package or shipping document and submit these documents to the NSWC Site Representative for approval and signature.

Submittals. For each waste shipment, the RS shall submit the following to the NSWC Site Representative for review and signature:

- Hazardous waste or Contaminated media manifests.
- Waste Safety Data Sheets (WSDS).
- Land disposal restriction notification and certification forms.
- All other supporting documentation for a complete package.

Supporting documentation shall include analytical results, available MSDSs, and any other information received and used to identify the proper waste code.

Signatures. As the generator, the NSWC Site Representative shall be responsible for certifying and signing all manifests and associated disposal paperwork.

Designation of Generator. The generator and signer of Hazardous Waste or Contaminated Media Manifests, Waste Profile Sheets, and Land Disposal Restriction Notifications and Certifications shall be identified by the NSWC Site Representative before conducting field work. The RS shall submit the executed manifest package, along with the above information and the quantities shipped, as an appendix to the final report covering field activities.

8.2.3 Requirements During Loading

The RS will assist the NSWC Site Representative in ensuring that all trucks are properly licensed and permitted to transport the waste to the selected disposal site. A DOT Hazardous Materials Registration must be provided by the transporter and accompany each hazardous material shipment.

No vehicle shall be allowed to leave the site without first being decontaminated and declared clean.

The RS and the NSWC Site Representative will inspect carriers to ensure that trucks have overall adequate protection to prevent leakage, spillage, or fugitive dust on highways during shipment.

Vehicles will be placarded in accordance with 49 CFR 172.500, Subpart F, "Placarding."

8.2.4 Final Inspection

The RS and the NSWC Site Representative will conduct the final inspection at the weighing area where the off-site transporter will begin highway transport to the disposal facility. At a minimum, the RS and the NSWC Site Representative will check the packaging and placarding, and review the manifest and bill of lading.

8.3 NOTIFICATION REQUIREMENTS

8.3.1 DOT Notifications

In accordance with DOT regulations, the NSWC Site Representative will provide a 24-hour telephone number to contact for all hazardous material shipments.

8.3.2 Emergency Notifications

All emergencies on the project site will be managed by the NSWC Site Representative in accordance with the Task-Specific Site Safety and Health Plan.

8.4 DISPOSAL SITES

Morrison Knudsen will submit to NSWC Crane EPD the name of the off-site TSD facility, for approval, to be used for off-site disposal for hazardous materials. The on-site landfill will be used for the disposal of nonhazardous waste.

If waste is not accepted at the disposal facility, for any reason, it shall be returned to the shipper.

8.5 WASTE REPORTING AND RECORD KEEPING REQUIREMENTS

8.5.1 Reports

Records Inventory and Disposal Schedule. The RS will assist with tracking and documenting receipt of all off-site shipments to the disposal facility.

Shipment Reports. For hazardous waste and contaminated media sent off site for disposal, the RS shall provide the NSWC Site Representative with the following:

1. The complete manifest package for certification of the manifest and associated disposal documents that the packaging, marking, labeling, storage, and disposal of waste have been accomplished as required by federal, state, and local laws and regulations.

storage, and disposal of waste have been accomplished as required by federal, state, and local laws and regulations.

2. Location, name, and identification of the off-site facility and written verification of the status of the facility permit and operating conditions.
3. Certification of disposal for individual delivery orders requiring packaging, handling, transportation, treatment, or disposal of hazardous wastes or hazardous materials shall be tracked in accordance with the manifest requirements. Nonhazardous wastes shall also be tracked as stated above.

8.5.2 RECORD KEEPING

Training Documentation. The Site Shipping Officer will maintain the following records:

- Hazmat employee's name.
- Most recent training completion date.
- Description of the training.
- Instructor's name and address.
- Certification that the Hazmat employee has been trained and tested.
- Certification for completion of the Hazardous Waste Operations and Emergency Response (29 CFR 1910.120) training.

Manifests The RS will assist the NSWC Site Representative to ensure that one copy of the manifest, all supporting documentation (including waste analyses), required reports, and records are maintained. The manifests will be maintained by the NSWC Representative in accordance with applicable RCRA permit requirements, 40 CFR 761 regulations, and IAC requirements.

DISTRIBUTION OF HAZARDOUS WASTE MANIFEST

| | Disposal Site | Shipper | Carrier | Van Copy* | Pro. Mgr. | Disp. Coord. | Mail* |
|------------------------------|---------------|---------|---------|-----------|-----------|--------------|-------|
| UHWM** | orig | orig | orig | copy | copy | copy | N/A |
| Land Ban (LDR) Certification | orig | copy | copy | copy | copy | copy | N/A |
| Bill of Lading | copy | copy | orig | copy | copy | copy | N/A |
| Driver Instruction* | copy | copy | orig | copy | copy | copy | N/A |
| Inventory Sheet | N/A | copy | N/A | copy | copy | orig | N/A |
| Admin. Info | N/A | N/A | N/A | N/A | copy | orig | N/A |

| | Disposal Site | Shipper | Carrier | Van Copy* | Pro. Mgr. | Disp. Coord. | Mail* |
|-----------------------|---------------|---------|---------|-----------|-----------|--------------|-------|
| Coordinator Checklist | N/A | N/A | N/A | N/A | copy | orig | N/A |
| Emergency Action | copy | copy | orig | copy | copy | copy | N/A |

* IF APPLICABLE

** ADDITIONAL DISTRIBUTION AS REQUIRED BY STATE (FOLLOW FORM INSTRUCTIONS IN 329 IAC 3.1-7-6)

ORIG - 1st Original

2 ORIG - 2nd Original

3 ORIG - 3rd Original

4 ORIG - 4th Original Procedure

9.0 ENVIRONMENTAL PROTECTION

9.1 INTRODUCTION

This section describes the environmental protection measures to be used at the NSWC Crane Dye Burial Ground. These measures include land protection, protection of fish and wildlife, wetland protection, historical and archaeological resource protection, dust control, and erosion control. Each of these measures is discussed further in Section 9.2.

All work will be done in a way that minimizes pollution of the air, the water, and the land. Within applicable regulatory requirements, noise and the disposal of solid waste materials and other pollutants will be controlled to protect human health and the environment.

The site will be restored as required by the drawings.

9.2 MEASURES FOR PROTECTING NATURAL RESOURCES

9.2.1 Land Protection

The land areas will be preserved in their present condition except areas designated to be cleared for cap construction, storage areas, and access routes. Trees and shrubs will not be removed, cut, defaced, injured, or destroyed without the approval of a representative of the Natural Resources Department, building 3219.

Protection of Trees. All trees that are to remain at the site and could be injured during operations will be protected by placing boards, planks, or poles around them. No ropes, cables, or guy wires will be attached or fastened to nearby trees for anchorage.

Restoration of Damaged Trees. Any trees or landscape features that are scarred or damaged during field activities will be replaced with equivalent, undamaged trees and landscape features. The approval of the NSWC Site Representative or designee will be obtained before replacing trees.

Protection of Water Resources. The approval of the NSWC Site Representative or designee is required before any equipment will be allowed to ford streams. In areas where frequent crossings will be required, temporary culverts or bridges will be installed. Temporary culverts or bridges will be removed upon completion of work, and the area repaired to its original condition.

Discharges to any stream will be regulated under the Clean Water Act, using an existing amended or new NPDES permit. Wherever possible, discharge to streams will be avoided and effluent will be sent to the Wastewater Treatment or Sewage Treatment System, provided acceptance criteria are met and discharge requirements of the NPDES permit for the System are not violated. Analytical results of the effluent will be provided to the NSWC Site Representative or designee.

9.2.2 Removal of Temporary Construction Facilities

Traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, and stockpiles of excess or waste materials will be removed. Temporary roads, parking areas, and similar temporarily used areas will be graded to conform with surrounding contours.

9.2.3 Protection of Fish and Wildlife

The work will not disturb fish or wildlife, alter water flows, or otherwise significantly disturb the native habitat on or adjacent to the project. Special precautions will be taken to ensure no contamination migration occurs outside the dye burial ground.

If activities will be conducted at the site which may potentially bring harm to the ecology (i.e. removal of trees), the Department of Natural Resources representative from NSWC will be contacted. The representative will complete a brief assessment as to the impact of the site activities prior to beginning remedial work.

9.2.4 Wetland Protection

No wetland areas will be disturbed while the cap system is installed. If disturbance may potentially occur, a 404 permit (dredge and fill permit, section 404 of 33 U.S.C. 1344) will be completed and submitted to the Army Corps of Engineers for review and approval.

9.2.5 Historical and Archaeological Resources

Site work will comply with the requirements of the *National Historic Preservation Act*, regarding discovery of artifacts and/or human remains. Although no historical and archaeological items or human skeletal remains are expected to be found, the NSWC Site Representative will be notified immediately in the event any archeological items are encountered. Any items discovered will be carefully preserved and work stopped in the area until direction is received from the NSWC Site Representative to resume work.

9.2.6 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 site will be controlled with a wetting spray.

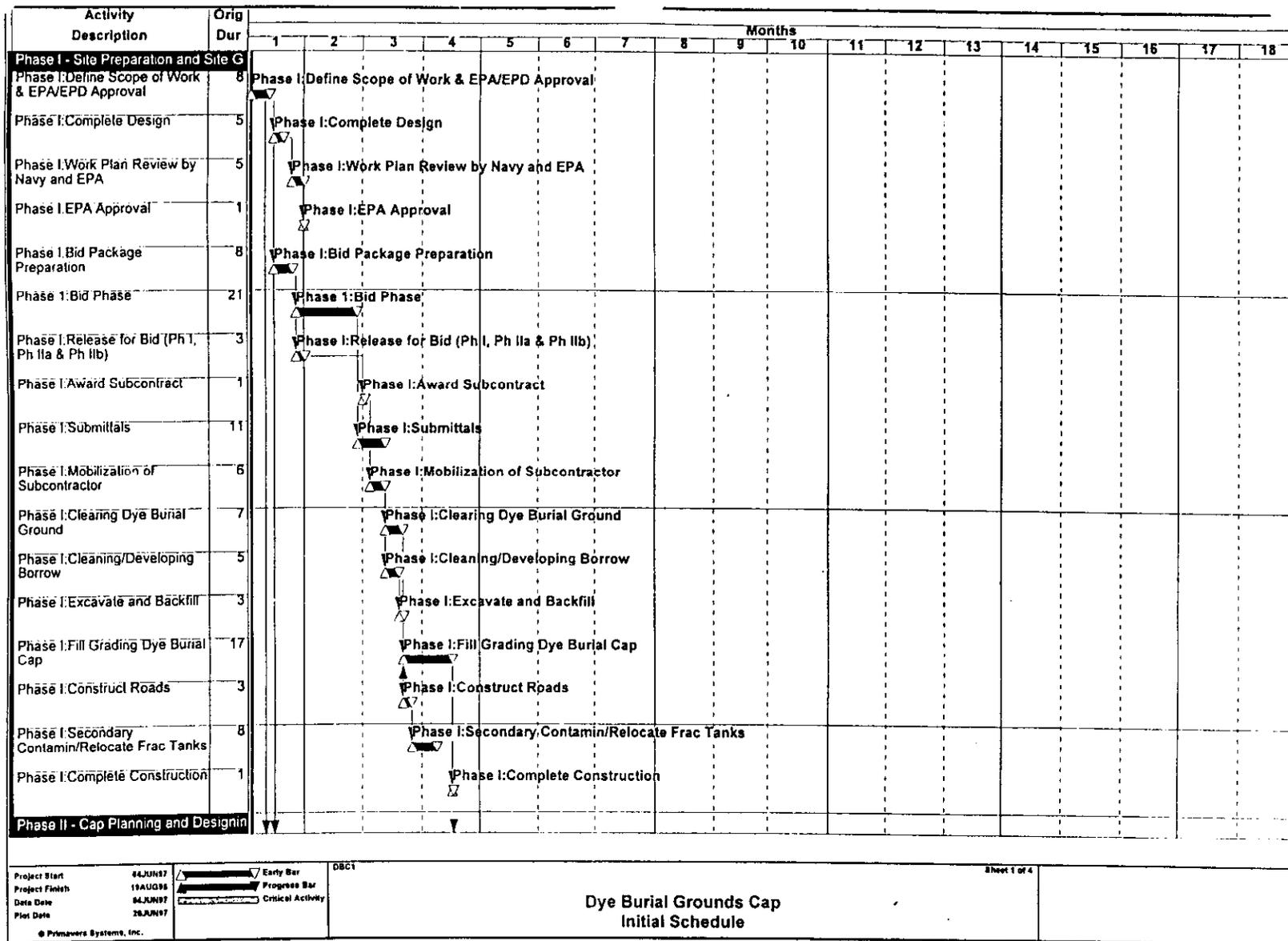
9.2.7 Erosion and Sediment Control

Temporary erosion control measures, in accordance with NSWC Crane's Pollution Prevention Plan, 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 two acres, and the excavations will be protected when work is not in progress.

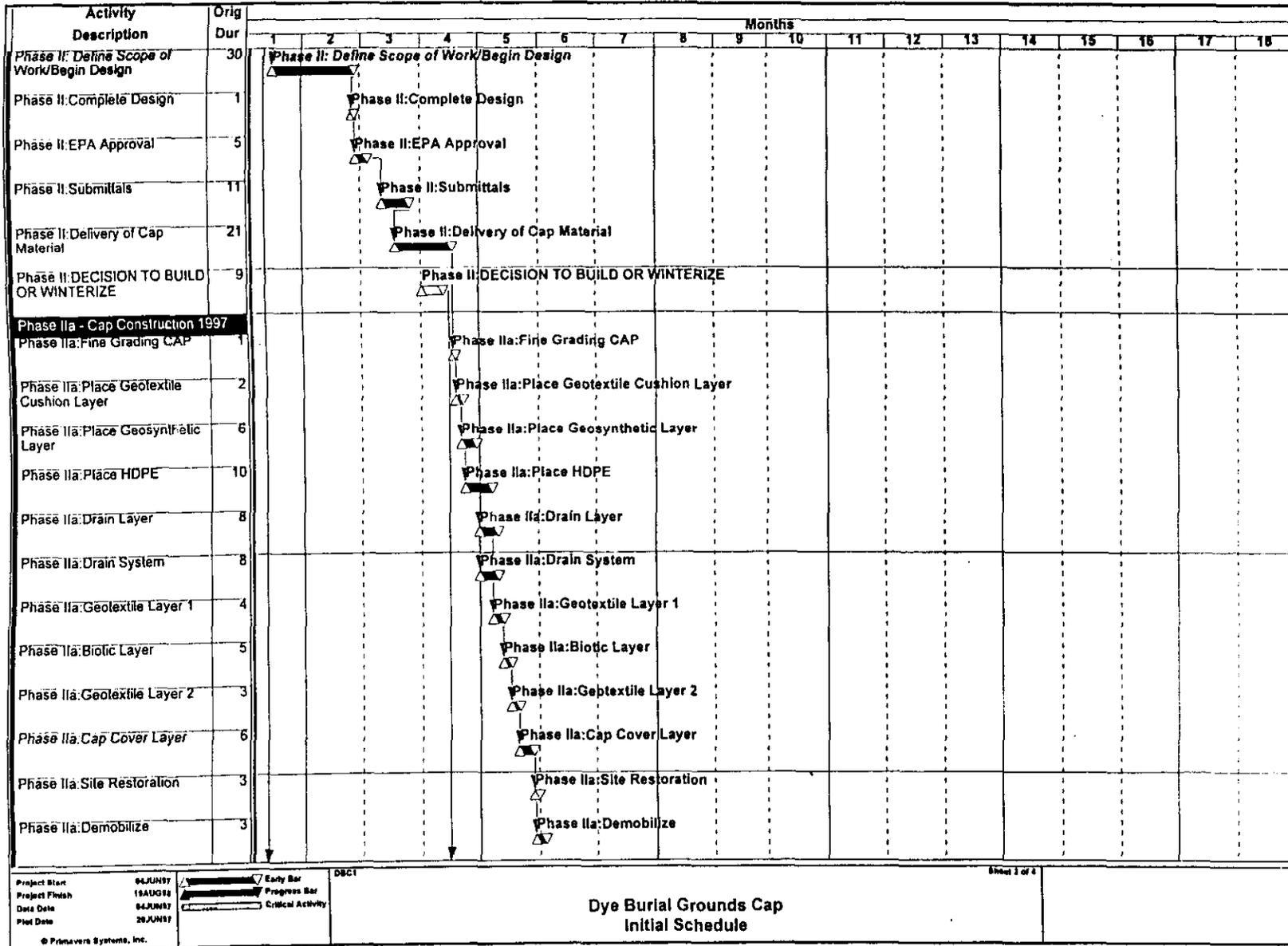
All erosion control structures in excavation areas are to be built to conform to site-specific conditions. Generally, erosion control structures will consist of berms, ditches, sumps or straw bale dikes. These structures will be maintained as often as required to ensure that sediment is minimally permitted to migrate and surface water is not allowed to enter or exit construction areas. Water contained and collected within the construction areas will be pumped to on-site storage tanks and handled as stated in Section 8.0.

10.0 SCHEDULE

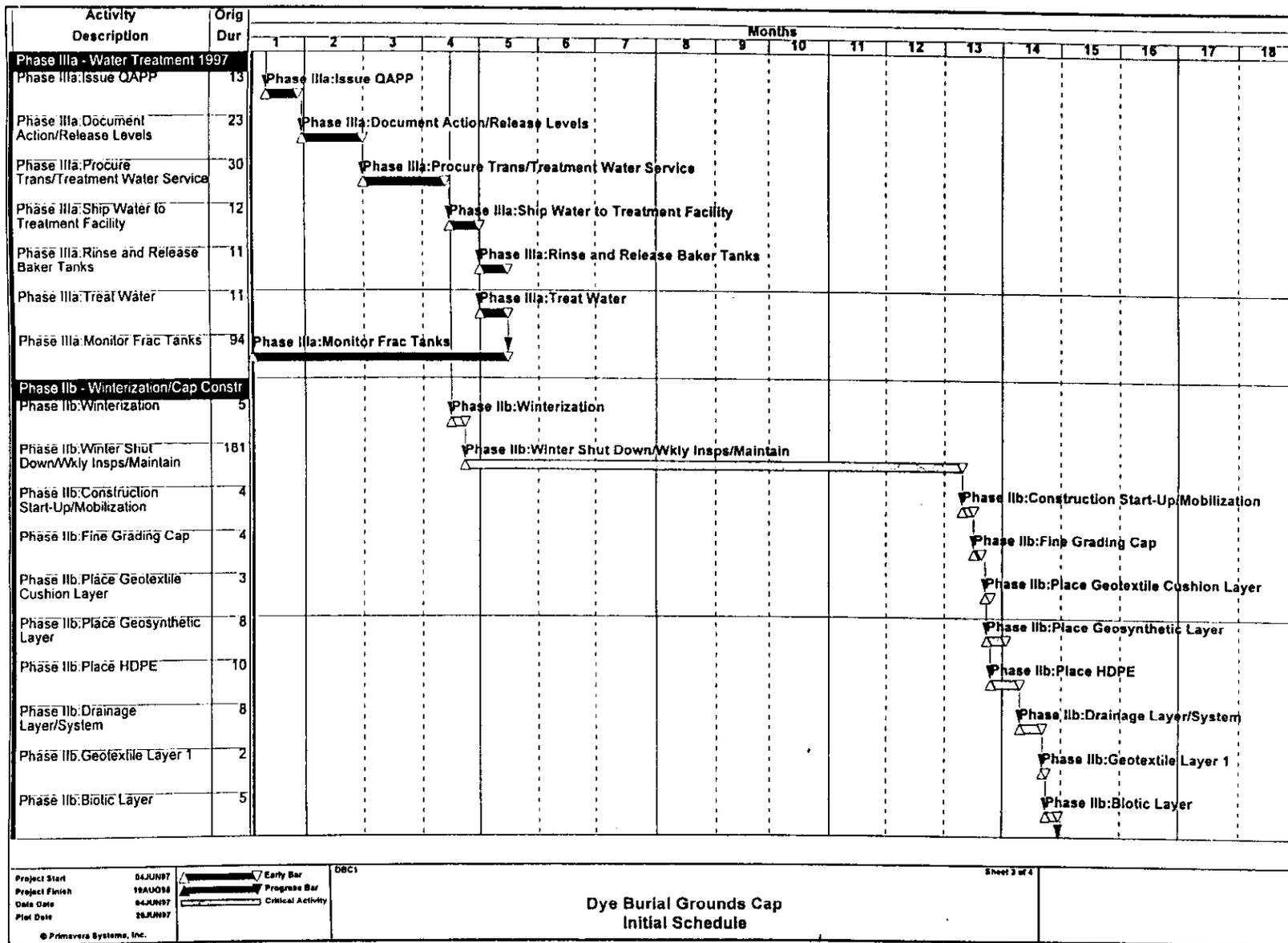
This section presents the proposed schedule, shown in Figure 10-1, for completing this scope of work.



**FIGURE 10-1
SWMU #02/11 INTERIM MEASURES CLEANUP SCHEDULE**



**FIGURE 10-1
 SWMU #02/11 INTERIM MEASURES CLEANUP SCHEDULE**



**FIGURE 10-1
SWMU #02/11 INTERIM MEASURES CLEANUP SCHEDULE**

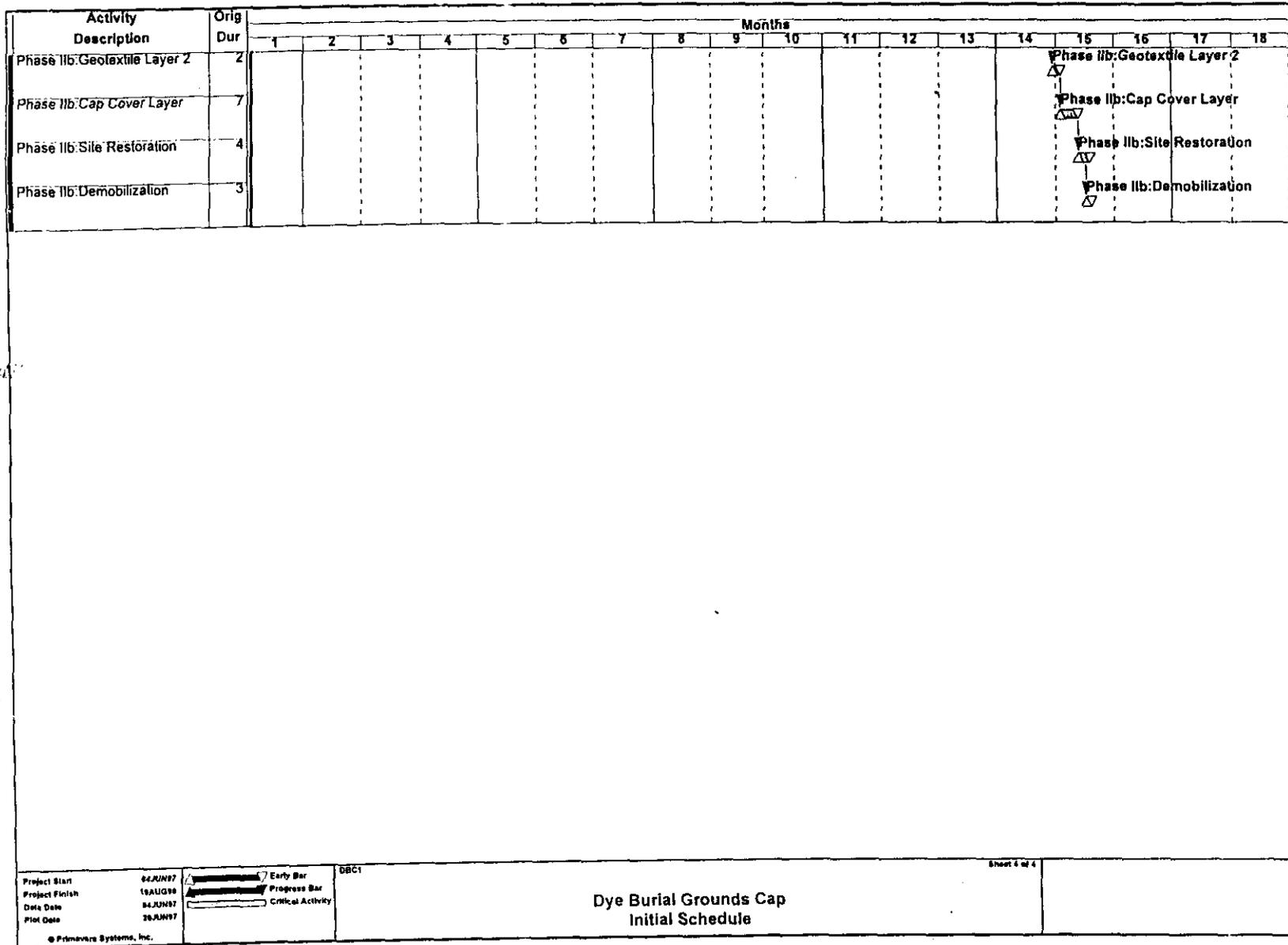


FIGURE 10-1
SWMU #02/11 INTERIM MEASURES CLEANUP SCHEDULE

11.0 REFERENCES

- Department Of The Navy, 1991. RFI Interim Measures Geophysical Investigation - SWMU 02/11, Dye Burial Grounds. Draft. Waterways Experimental Station. May 1991.
- Indiana Administrative Code. *Identification and Listing of Hazardous Waste*. 329 IAC 3.1-6.
- Indiana Administrative Code. *Standards Applicable to Generators of Hazardous Waste*. 329 IAC 3.1-7.
- Indiana Administrative Code. *Final Permit Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*. 329 IAC 3.1-9.
- Indiana Administrative Code. *PCB Waste Management*. 329 IAC 4-1.
- NEESA, 1983. Initial Assessment Study of Naval Weapons Support Center Crane, Indiana; NEESA 13-0003. Naval Energy and Environmental Support Activity, May 1983.
- USACE, 1995. Recommended Remedial Measures at Crane NSWC Dye Burial Grounds (DBG) - Solid Waste Management Unit (SWMU) 02/11. Draft. Waterways Experiment Station. July 1995.
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- U.S. Department of Transportation; Research and Special Programs Administration. *Emergency Response Guidebook*, RSPA P5800.6.
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U.S. Environmental Protection Agency, 1991. *Design and Construction of RCRA/CIRCLA Final Covers*; EPA/625/4-91/025. Office of Research and Development, Washington D.C.

U.S. Environmental Protection Agency, 1993. *Quality Assurance and Quality Control for Waste Containment Facilities*; EPA/600/12-93/182. Office of Research and Development, Washington D.C.

APPENDIX A

SITE SAFETY AND HEALTH PLAN

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ATTACHMENTS

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- B WORK ZONE MAP

SITE SAFETY AND HEALTH PLAN FOR REMEDIATION ACTIVITIES AT SWMU #02/11, NSWC CRANE

1.0 SITE DESCRIPTION, CONTAMINANT CHARACTERIZATION AND REFERENCES

1.1 INTRODUCTION

This Site Safety and Health Plan (SSHP) describes safety and health requirements for cap construction at the Dye Burial Ground (DBG). This SSHP, together with the MK General Safety and Health Plan (GSHP) [MK 1996a] 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 along with the U.S. Army Corps of Engineers' *Safety and Health Requirements Manual* EM 385-1-1 dated September 1996 [ACOE,1996]. This SSHP is applicable to all personnel who enter into work areas described in this SSHP and who are under MK or MK's Subcontractors' control.

1.2 SITE DESCRIPTION

This SWMU is located in the eastern section of NSWC Crane, just east of the Ammunition Burning Ground. There is a series of three trenches, each approximately 50 feet long, 10 feet wide, and 6 feet deep used for disposal of dyes and dye contaminated material. The material included magnesium, dye contaminated boxes and rags, and approximately 60 drums of dyes. These materials were buried from approximately 1952 to 1964. The trenches have been backfilled to levels ranging from one foot below adjacent grades. MK will manage the construction of a multi-layered cap over the burial trenches.

1.3 CONTAMINANT CHARACTERISTICS

Military dyes buried at this location consist of a number of different types to include red, green, orange, orange-red, yellow, blue, violet smoke dye. Each dye can be made from a variety of chemical constituents as reported in NEESA 13-003 such as methylaminoanthraquinone and auramine. NEESA 13-003 reported some of the dyes are considered toxic and potentially carcinogenic and others are relatively safe materials. Computer searches using the TOMES Database revealed many of the compounds are generally classified as primary irritants and sensitizing agents. Carcinogenic data was associated with animal and micro-organism studies only. No flammability characteristics were identified. NEESA 13-003 reported that a visual survey completed in 1981 produced no evidence of soluble dyes migrating with the groundwater. The insoluble smoke markers are probably still reasonably intact. A groundwater assessment was conducted of the Dye Burial Grounds and reported in IN5 170 023 498. Analysis of one round of water samples from 23 selected wells detected low quantities of various compounds including organic compounds, metals and sulfates. Five compounds tested were above drinking water or

other interim health standard in at least one well. They were beryllium, selenium, nickel, chloroform and sulfates. Tested contaminants were found in all 23 wells sampled representing all four aquifers. Nickel, zinc and sulfates were the most persistent and most highly concentrated compounds detected. No indicator compounds (uniquely traceable to buried materials at the SWMU # 02/11) were identified. Magnesium, probably as a powder is considered one of the compounds buried. No data on its physical characteristics and as to whether it was containerized or not is available.

Recent laboratory analysis of contaminated run-off stored in six holding tanks at the DBG indicate the presence of three dyes: Disodium Fluorescein, Alphazurine B, and Acid Fast Violet BG. All chemicals are eye and skin irritants and may cause gastric disturbances. *Acid Fast Violet BG is a confirmed animal carcinogen and its use was prohibited by the FDA in 1973.*

Prior to construction, the surface soil in the cap construction area will be radiologically screened for the presence of Radium-226 and 228 (Ra-226/228). There is no documentation of the use of Ra-226/228 in any of the dyes disposed at NSWC Crane, however, the screening will be performed to ensure worker health protection. Details of the screening procedure is documented in the QA Project Plan.

The construction of the cap will be completed as non intrusively as possible with the burial ground. Materials used in the cap are essentially chemical inert materials such as construction sand and clay and the various types of liner material. The liner material will be sealed using either double fusion welding or conventional welding techniques.

Table 1 provides a generic summary on potential contaminants to include a description, exposure limits, signs and symptoms of acute exposure and recommended first aid is listed. MSDS's or NIOSH Pocket Guides for each of the contaminants and other chemical substances used in remedial construction shall be organized into a separate MSDS Binder located on site.

1.4 REFERENCES

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2. USACE, 1995. *Recommended Remedial Measures at Crane NSWC Dye Burial Grounds (DBG) - Solid Waste Management Unit (SWMU) 02/11*. Draft. Waterways Experimental Station. May 15, 1995.
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13. *Safety Procedures and Guidelines Manual*, Morrison Knudsen Corporation, 10/95.
14. The following MK NAVFAC SouthDiv Project Procedures:
 - PHSP 01.1, Hazardous Energy Control (Lockout/Tagout)*, 3/15/96.
 - PHSP 02.1, Emergency Response*, 3/15/96.
 - PHSP 03.1, Spill Response*, 3/15/96.
 - PHSP 04.1, Incident Reporting*, 3/15/96.
 - PHSP 05.1, Excavations*, 5/21/96.
15. *General Safety and Health Plan (GSHP) (MK 1996a)*, Prepared by Morrison Knudsen under contract N62467-93-D- 1 106, August 1, 1996, Revision A.

2.0 SAFETY AND HEALTH HAZARDS SUMMARY

2.1 OVERVIEW

During remedial construction activities, the potential risk of acute exposure to the buried chemical contaminants listed in Table 1 is considered low if the administrative controls and Personal Protective Equipment requirements protecting against contact are strictly adhered to. Protection against excessive levels of airborne dust will be accomplished through engineering dust controls and a dust monitoring program. Risks from chemical exposures from polymer chemicals used in cap seaming and burns from heated surfaces will be controlled by implementation of the manufacturers recommendation on equipment operation as determined during pre-use assessments completed by the Contractor.

The highest risks are those associated with physical hazards such as heavy equipment operation and materials handling; walking and working surfaces, especially in wet and muddy environments; traffic control and worker protection during work in and around roadways and parking areas used by heavy equipment; occupational noise levels from equipment; physical and biological hazards during clearing and grubbing; and eye/head/feet physical hazards. Heat stress could likely be a problem during the summer months and cold stress during the winter months.

2.2 ACTIVITY HAZARD ANALYSES (AHA)

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 SSHO, MK General Superintendent and Contractor Job Supervisors(s) and Contractor SSHO 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 Contractor Job Supervisor and the Contractor SSHO with review by the MK SSHO before the activity takes place. The Plan-Of-The-Day (POD) or the Pre-Entry Briefing meeting is utilized to review the AHA and is conducted with all affected workers by MK.

2.3 CHEMICAL HAZARDS

The potential chemical contaminants considered the most significant in terms of safety and health are the buried chemical dyes. However, minimal intrusive work is required and contact with these chemicals is expected to be very minimal except for when a trench will be excavated into the suspected dye trench to install a drain as part of the leachate collection system. In that case, precautions will be taken for direct contact exposure potential. Contact with groundwater is not anticipated on this project. Chemical vapors generated during seaming operations should present minimal risk.

2.4 BIOLOGICAL HAZARDS

Potential hazards include insect, rodents, spiders and snake bites. Irritating plants such as poison ivy and sumac could also be present. Of particular concern is the potential for tick bites. All personnel will be aware of potential biological hazards and methods to control or mitigate exposure at the site specific training.

2.5 CONSTRUCTION SAFETY HAZARDS

2.5.1 Physical Hazards

The physical hazards associated with the project include the use of heavy equipment including material handling equipment, and power and handtools. Examples include backhoes, excavators and dump trucks; cutting saws for clearing and grubbing; and material handling equipment for off loading and placement of membrane layers. Other physical hazards include trench excavations; heat stress or cold stress depending on time job is started; adverse weather conditions, and noise. Other possible safety hazards include the potential for slipping, falling, head trauma, lifting heavy objects, struck by and struck against and pinch points. All these physical hazards could cause slips, trips, and falls, cuts, contusions, and lacerations, traffic accidents, electric shock, crunching, pinching, injury from falling objects and heat/cold stress related disorders. Hazards also arise from vehicular traffic in and around the capping and lay down areas during construction activities. The minimum level of PPE is Level D which includes hard hat, safety glasses with side shields, and sturdy work shoes with the exception of shoes used during liner installation, required by the installer to prevent damage to the geosynthetic materials.

2.5.2 Noise

Certain operations may create noise levels that exceed the applicable limits (e.g. clearing and grubbing saws and grinders). Hearing protection will be provided for all field personnel and its use is required when noise levels exceed 85 dBA steady state or 140 dBA impulse, regardless of the duration of exposure. The Subcontractor SSHO will assess hearing protection device needs in accordance with GSHP Section 2.5.2. Oversight will be provided by the MK SSHO.

2.5.3 Heat and Cold Stress

Oversight will be provided by MK SSHO.

2.5.4 Excavations

Open 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 where the depth > 4 feet will be adequately barricaded. The deepest excavation on this project is anticipated as approximately 6 feet for installation of the trench collection system.

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). The Subcontractor shall coordinate preparation of the application and associated drawings with the MK General Superintendent. Regardless of the size of the trench, the Subcontractor shall designate a competent person who will evaluate all excavations and trenches on a daily basis in accordance with 29 CFR 1926 Subpart P.

2.5.5 Fire and Explosion

No hot work or open flames will be allowed in the work area without a Hot Work Permit. At least one 20 lb or equivalent "ABC" fire extinguisher shall be maintained for fire response in the work zone. Mobile equipment shall be equipped with a 5 lb fire extinguisher and office trailers shall be equipped with at least a 10 lb fire extinguisher.

2.5.6 Electrical Hazards, Control of Hazardous Energy (Lockout/Tagout)

Ground Fault Circuit Interrupters (GFCIs) will be installed on all portable electrical equipment and installations 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. In addition, during service and maintenance of motorized equipment, the key shall be removed and in the possession of the service/maintenance person and a "Danger Do Not Operate" tag signed by this person shall be displayed near the start-up controls.

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 an incoming safety inspection by the MK SSHO. The MK SSHO reserves the right to reject any subcontractor equipment. Corrective action will be pursued with the Subcontractor Supervisor.
- Daily safety checklists shall be completed by heavy equipment operators and delivered to the MK Site Project Office on a daily basis. The checklist should be based on the equipment manufacturers recommended guidelines for daily checks using a format established and prepared by the owner/operator/subcontractor and approved by the MK SSHO.

2.5.8 Traffic and Work Site Control Safety

Potential hazards from vehicular traffic around the work areas will be controlled by placing approved barricades and signs around the work area. Workers required to work in traffic paths or roadways will be required to wear high visibility reflective vests. Suggested types of barricades along with placement and signs will follow the requirements of EM 385-1-1, Section 8 and 29 CFR 1926.201 and 202.

2.5.9 Clearing and Grubbing Safety

Clearing and grubbing of any work site shall be completed in accordance with the requirements of EM 385-1-1 Section 31.

2.5.10 Access and Haul Road Safety

The designated access road constructed for this project shall be constructed in accordance with EM 385-1-1 Section 21.1.

3.0 RESPONSIBILITIES AND AUTHORITIES SUMMARY

Section 3.0 in the GSHP describes the roles and responsibilities of project personnel with regard to safety and health. The Subcontractor shall designate a competent and qualified person, subject to the approval of the MK SSHO. This person shall be referred to as the Subcontractor SSHO. The Subcontractor SSHO shall be qualified to perform air monitoring to support the Subcontractor's operation. The Subcontractor SSHO shall provide a daily site safety report and shall coordinate his efforts with the MK SSHO. 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 2. Figure 1 is the route map to the nearest medical facilities.

3.1 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.

Directions to Bedford Medical Center:

From the Bloomington Gate, head east on Highway 58 to the city of Bedford, then turn left onto 16th Street. The distance to hospital is approximately 20 miles. This gate is open during the hours of 6 AM to 8 AM and 3 PM to 6 PM on Mondays through Fridays.

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 AND SAFETY MEETING REQUIREMENTS SUMMARY

This Section lists all regulatory driven and project specific training and meetings required for this job.

4.1 HAZARDOUS WASTE OPERATIONS TRAINING (HAZWOPER)

The requirements for Hazardous Waste Operations Safety and Health Training per 29 CFR 1910.120(e)(3) apply for initial fill and geosynthetic material. After this, training per 1910.120 (e)(3) will no longer be required assuming no other intrusive work below the initial cap is required.

4.2 SITE SPECIFIC TRAINING

All employees shall receive initial site specific training prior to commencement of work. Site specific training will be performed by the Subcontractor SSHO and will include the following:

- Health and Safety Plan Contents
- Hazard Communication
- PPE Requirements
- Emergencies
- Safe Vehicle/Equipment Operations

4.3 CPR/FIRST AID AND BLOODBORNE PATHOGENS

The Subcontractor SSHO and at least one other Subcontractor site worker at each work site shall be certified in basic first aid and CPR by the American Red Cross or equivalent organization. These personnel are also required to be trained in accordance with 29 CFR 1910.1030 Bloodborne Pathogens.

4.4 SAFETY MEETINGS

Weekly safety meetings shall be conducted in coordination with MK SSHO.

4.5 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. Figure 3 or equivalent will be used to document attendance.

4.6 PRE-ENTRY BRIEFINGS (MEETING)

Where necessary, pre-entry briefings will be included with the POD meetings.

4.7 QUALITY CONTROL PREPARATORY INSPECTION PHASE MEETING

Whenever necessary, the MK SSHO will attend Quality Control Preparatory Phase Inspection Meetings to discuss any safety and health concerns requiring special attention and to review anticipated safety requirements for each definable feature of work.

4.8 RECORD KEEPING

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

5.0 MEDICAL PROGRAM SURVEILLANCE PROGRAM REQUIREMENTS

5.1 SUMMARY

Participate in a medical surveillance program in accordance with OSHA 1910.120 and 1926.65 is anticipated only for the first phase of the project. Afterwards, when no intrusive activities are required, medical surveillance is not required.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.1 GENERAL REQUIREMENTS

The PPE Level is initially scoped as Level D (hardhat, safety glasses with side shields, and sturdy work boots) with the exception of some additional protective equipment during selected tasks to include: 1) hearing protection, leather leggings/aprons and face shield when using hand held sawing equipment during clearing and grubbing; 2) rubber boots and gloves during ground work prior to placement of the first fabric; 3) hearing protection (when required); 4) other personnel protective equipment that the manufacturer recommends during cap construction and seaming. Where contact with dye material is possible, Modified Level D is required. Modified Level D includes rubber boots, chemical resistant coveralls (e.g. standard Tyvek or equivalent) for minor splash protection and rubber or nitrile gloves. Table 3 provides a summary of the PPE requirements by task.

7.0 AIR 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. All air monitoring will be conducted by the Subcontractor SSHO based on guidance presented in Table 4.

7.1 AIR MONITORING

7.1.1 Airborne Dust

A direct-reading real-time instrument capable of detecting airborne dust (e.g., Laser Dust Monitor) shall be used to assess airborne dust (aerosol) concentrations whenever visible observation indicates excessive dust is being generated. Results of the airborne dust monitoring will be documented. If necessary, the level of PPE used by personnel will be modified if engineering controls have been ineffective or cannot be used. When such monitoring is conducted and results are greater than 10 mg/m³ total dust concentration, the operation contributing to the high dust level shall be shut down and corrective action taken.

The direct-reading real-time 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.

Airborne dust is not expected to present a significant health risk during site operations. Dust generating activities will be controlled at all times using best engineering control methods such as water spray, tarping or covering, dust suppressants and vehicle-speed control measures.

7.1.2 Perimeter Monitoring

Perimeter monitoring to evaluate emissions of airborne dust shall be performed periodically during site preparation and cover system construction. The frequency corresponds to that specified in Section 7.1.1. When such monitoring is conducted and results are greater than 1.0 mg/m³ (10 times less than the TLV-TWA listed in Section 7.1.1), the operation contributing to the high dust level shall be shut down and corrective action taken.

7.1.3 Noise Monitoring

Noise monitoring will be performed by the Subcontractor SSHO at the initiation of each task or operation to determine the sound levels associated with the particular task or operation. Sound levels will be determined 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. Areas requiring hearing protection will be posted to alert workers to the requirement for hearing protection.

7.1.4 Heat Stress and Cold Stress Monitoring

All employees will be encouraged to drink plenty of fluids, at least 5 to 7 ounces of water every 15 - 20 minutes, and take rest breaks as when needed. Employees will be briefed on the signs and symptoms of heat stress and required treatment. Based on current project scheduling, cold stress should not become a factor on this job.

7.2 AIR SAMPLING

No time integrated industrial hygiene sampling are anticipated for this project.

7.3 RECORD KEEPING AND CHAIN OF CUSTODY

Where applicable, written records of all monitoring will be maintained on site and affected employees will be notified of monitoring results representative of their exposure.

8.0 GENERAL SAFETY RULES AND PROCEDURES

The following are general safety rules and procedures. The MK SSHO will review this list at the site specific safety meeting.

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 and subcontractor personnel assigned to this project are responsible for following this SSHP unless modified in the subcontracting special conditions document, for using safe practices, and for 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

- The Contractor will provide first aid kits including CPR kit (Pocket Mask) and biohazards control kit. Also, the Subcontractor shall complete the Work Zone Map 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, drink, smoke, take medications, chew gum or tobacco, or put objects in mouth while in the work zones or when handling samples.
- After handling potentially contaminated materials, 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 hard hats, safety glasses with side shields, and sturdy work boots when inside the work boundaries. Wear reusable rubber boots for the initial ground work prior to placement of the first fabric.
- Remain a safe distance from heavy equipment when not involved in operation or monitoring activities. Wear high visibility vests when working in heavy equipment or traffic paths.

- Do not under any circumstances 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 explosion proof sampling equipment and tools when potential for flammable atmospheres exist.
- Use ground fault circuit interrupters (GFCI) with all electrical tools and equipment.
- Stand clear of trenches during excavation.
- 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 competent person.
- Cease all work operations on the site at sunset unless the control zone is adequately illuminated.
- Subcontractor Job Supervisors and Subcontractor SSHO shall attend the POD meeting prior to the start of the work and conduct pre and post entry briefs with all affected workers.
- Avoid direct contact with contaminated materials unless necessary for sample collection or required observation.
- Remove disposable clothing and follow decontamination procedures.

9.0 SITE CONTROL MEASURES

9.1 SITE WORK ZONES

Work zones shall be established for the flow of personnel and equipment. 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 field activities, Work Zones shall be established by the Subcontractor with the approval of the MK SSHO as necessary to meet operational and safety objectives. These work zones will be depicted on Work Zone Maps that are field prepared by the Subcontractor to be posted by the Subcontractor Job Supervisor near the entrance to the work area. In addition to the zones, these maps should show assembly points, evacuation routes, location of first aid equipment and fire extinguisher, and emergency communications equipment. One copy of the work zone maps and all revisions shall be delivered to the MK SSHO by the Subcontractor Job Supervisor to be retained by the MK SSHO in Attachment B of the field master copy SSHP.

9.1.1 Exclusion Zone

The exclusion zone (EZ) is the designated area where hazardous substances are present or expected to be encountered during remedial construction activities. Entry into this area is limited to personnel required to perform the work and who are wearing the specified PPE and have attended a Plan of the Meeting (POD).

An EZ will be established to encompass the contaminated area or potentially contaminated area. For this job, the establishment of an EZ is only necessary during the initial ground work prior to placement of the first fabric where contact with contaminated material is possible. Afterwards, the entire work zone can be treated as a construction work zone and controlled appropriately.

The EZ will be clearly delineated through the use of barrier fences with appropriate signs, or other suitable means. Access control points into the contamination reduction zone 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.

9.1.2 Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the potentially contaminated area, the EZ and the clean area, the Support Zone (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 only use of a CRZ is anticipated during initial clearing and grubbing and work near the base layer. Provisions for any equipment decontamination will be incorporated as determined to be necessary by the Subcontractor SSHO with approval by the MK SSHO. After completion of the first layer, the use of a CRZ is not anticipated as necessary and the entire work area can be treated as a construction work zone.

9.1.3 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.

9.1.4 Work Zone Controls

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

HAZARDOUS AREA KEEP OUT
DANGER
AUTHORIZED PERSONNEL ONLY
OR
CONSTRUCTION AREA KEEP OUT

10.0 PERSONNEL AND EQUIPMENT DECONTAMINATION AND HYGIENE PROCEDURES

10.1 GENERAL

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. 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.

10.2 PERSONNEL DECONTAMINATION

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

- Equipment drop.
- Boot wash station (a tub of water and detergent with brushes for cleaning and another tub of water for rinsing).
- Glove wash station (similar to boot wash station) if necessary.
- Disposable clothing drop if necessary. All contaminated or potentially contaminated disposable clothing shall be placed into appropriately labeled containers.

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. A water and detergent solution will be used for highly contaminated equipment, followed by a high-pressure water rinse if necessary. All water used during decontamination will be contained for disposal. Some construction and field equipment will be decontaminated at the temporary decontamination facility.

10.4 SANITATION, PERSONNEL HYGIENE AND WASHING FACILITIES

A hand and face washing facility shall be made available in the near the Work Zones consisting of water, towels and soap for personnel, as necessary. Personnel exiting the Work Zones 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 made available by the Subcontractor in accordance with EM 385-1-1 Section 2.

10.5 DECONTAMINATION WASH WATER

Where applicable, equipment and personnel decontamination areas will be designed to allow for collection of all wash/rinse waters into appropriately labeled containers.

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 the Subcontractor. The location of the first aid kit shall be communicated to project personnel as part of the site-specific training. Included with the first aid kit shall be a CPR Pocket Mask and a biohazards control kit.

A spill control kit shall be available at each controlled work area. If applicable, the Subcontractor is responsible for furnishing their office trailers with the necessary fire extinguishers and first aid kits. 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 Subcontractor prepared Work Zone Map.

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 Officer in Charge of Construction (ROICC) of all injuries even if preliminary information is available. The MK SSHO and MK PM shall follow the guidance presented in MK NAVFAC SOUTHDIV Procedure PHSP-04.1 titled Incident Reporting. 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 injury must be provided to the ROICC and MK Charleston PMO within 24 hours of the incident. This report is to include:

- a. Employer's First Report of Injury (Workman's Comp Insurance Form)
- b. Supervisor's Accident Investigation Report (MK Form CAS 24/77)
- c. Accident Data Report (MK Form 6783/91)
- d. 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

12.1 GENERAL

This section describes a contingency plan to be implemented in the event of injuries, illnesses, accidents, and fires. 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 MK SSHO, MK General Superintendent, Subcontractor SSHO and/or Subcontractor Job Supervisors 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 2.
- Initiate emergency response action.

12.2 PRE-EMERGENCY PLANNING

During mobilization activities for this project, the MK Project Manager, MK General Superintendent and the MK SSHO shall review the NAVFAC SouthDiv Project Procedure PHSP 02.1 and execute the steps necessary to assure effective emergency response requirements and resources are established for this project.

In addition to the guidance provided in this document and the preconstruction meeting, site specific training shall 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. Information must be included on the Work Zone Maps to be completed by the MK Subcontractors.
- **Emergency Response Coordinator.** The MK 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. Responsibilities will be delegated where appropriate to the Contractor SSHO.
- **Evacuation Routes.** Routes will be specified as needed. Information must be included on the Work Zone Maps.
- **Means of Evacuation.** The number of personnel that may be evacuated from the work site by various routes will be evaluated by the MK 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. Information must be included on the Work Zone Maps.
- Designation of a location for first aid services, fire extinguisher(s) and spill control equipment. Information must be included on the Work Zone Maps.

12.3 RESPONSIBILITIES

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

12.3.1 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 Subcontractor SSHO.

12.3.2 Project Manager

The Project Manager is responsible for assuring adherence to the administrative elements and implementation of the Emergency Response Plan (this section of the SSHP). He will 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.

12.3.3 MK Certified Industrial Hygienist (CIH)

The CIH is responsible for preparing the Emergency Response Plan (this section of the SSHP). The CIH will develop and review the Emergency Response Plan, evacuation plans, and oversee implementation at the site. The CIH will ensure that supervisors and employees meet the training requirements of the plan and approve the equipment used in the plan. The CIH may designate duties on site to the MK SSHO. The CIH is the designated Health and Safety Manager based in Boise, ID.

12.3.4 MK Site Safety and Health Officer (SSHO)

The MK 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 MK SSHO to keep them up-to-date and to ensure that they are applicable and relevant to emergency response organizations.

12.3.5 Subcontractors

All MK and Subcontractor personnel will comply with the provisions of this plan and participate in training as required to implement response procedures. All personnel will be cognizant of their work areas and notify their supervisors and the Subcontractor SSHO of hazards at the site.

12.4 EMERGENCY RECOGNITION AND PREVENTION

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

12.5 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 site personnel. Additional information will be provided in the site briefing concerning other hazards that may arise at the site. Safety Zones or assembly points must be included on the Work Zone Map.

12.6 SITE SECURITY AND CONTROL

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

12.7 EVACUATION ROUTES

Evacuation routes will be established based on scope of work, location of work and atmospheric conditions. Evacuation routes shall be posted in various locations on the site if necessary and included on the Work Zone Map. All site personnel will be made aware of evacuation procedures during site-specific training especially pre entry briefings. Topography, layout and prevailing wind conditions shall be considered in establishing evacuations routes and assembly points.

12.8 EMERGENCY DECONTAMINATION

In the event an employee 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 employee 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 MK SSHO shall contact the medical facility to establish a contact person for the necessary information.

12.9 EMERGENCY MEDICAL TREATMENT AND FIRST AID

See Section 11.

12.10 COMMUNICATIONS

The MK SSHO, the MK General Superintendent, Subcontractor SSHO, and the Subcontractor Job Supervisor(s) at each work site area shall be equipped with two-way radios for communications on site as warranted.

12.11 CRITIQUE OF RESPONSE AND FOLLOW-UP

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

12.12 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number X3300, the Environmental Department (X1132, X3114, or X6160), and to the MK SSHO at 812-854-6941. The MK SSHO will assure that the Navy designated authority is notified promptly and directing initial emergency response actions until the arrival of the NSWCC Crane designated authority. The designated authority can include the resident officer in charge of security, fire department and/or ambulance services or the Environmental Protection Department Manager.

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

A. Incident Type: Accident involving vehicles and mobile equipment, process equipment and support structures.

Response Actions:

1. Notify the NSWCC Crane Security Desk at X 3300 and provide the following information:
 - a. Name and phone number of person calling;
 - b. Location of incident;
 - c. Type of incident;
 - d. Injured or trapped personnel and potential material release or spill conditions.
 2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO designates one person to meet the emergency response units at the nearest road where the units will be approaching.
 3. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO assumes initial command of the situation and directs personnel to do one of the following either separately or concurrently:
 - a. 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.
 - b. If fire is present, initiate initial fire attack and knockdown using available fire extinguishing equipment followed by evacuating the work zone or immediate area.
- B. Incident Type: Preparation for adverse weather condition to include high winds, tornado, heavy rains, severe lightning.**

Response Actions:

1. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO notify the NSWCC Security Desk at X 3300, and provide the following information:
 - a. Name and phone number of person calling;
 - b. Location of work site(s);
 - c. Preparation for adverse weather condition has begun;
 - d. Permanent structure location where personnel will be relocating to on Base.
2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO direct personnel to shutdown operations, secure loose materials, park and secure mobile equipment. Personnel shall be directed to a permanent building after completing decontamination procedures.
3. MK SSHO, MK General Superintendent or Subcontractor Job

Supervisor(s)/SSHO complete accountability and await clearance from Base Security to resume operations or take other action.

4. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO shall inspect all offices, trailers, mobile equipment, work sites for damage or downed power lines.
5. Designated excavation Competent Person shall inspect all excavations for faulting, flooding, or cave in potential prior to restart of any work in that area.

C. Incident Type: Medical and Rescue Emergencies.

Response Actions:

1. Notify the NSWC Security Desk at X 3300 and provide the following information:
 - a. Name and phone number of person calling;
 - b. Location of incident;
 - c. Type of incident;
 - d. Person(s) injured or trapped and if exposure to hazardous material.
2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO designates one person to meet the emergency response units at the nearest road where the units will be approaching.
3. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO 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 per the following guidance:
 - 1) 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.

2) 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.

D. Incident Type: Unexpected physical contact with unidentified or identified buried objects during initial preparation of work area for cap installation.

Response Actions:

1. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO evacuate immediate area around object to a safe distance and begin exposure assessment.
2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO shall assess the need for any emergency decontamination of personnel potentially exposed and take action. An assessment of the airborne exposure potential shall be made visually and backed up PID monitoring in general area by the MK SSHO if determined to be necessary.
3. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO shall secure area and notify the Emergency Response Number X3300 if necessary and the Environmental Department (X1132, X3114, or X6160). MK shall await clearance from Base Environmental Department to resume operations or take other action.

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. Entries in the logbook shall be time sequenced. The entries must be written in ink and the bottom of each page must be signed. The logbook shall be hard bound. No pages will be removed from the log book. Corrections must be lined out and initialed. The logbook will contain specific information recorded on a daily basis utilizing the Form shown in Figure 3.

Records of training and site orientations; briefings including pre entry briefs; Subcontractor prepared equipment inspection sheets shall 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 SSHO. This report shall identify work activities, safety and health-related deficiencies, and corrective measures. As a minimum, the checklist shown in Figure 4 shall be completed by the MK SSHO.

13.3 FIELD MASTER COPY OF SSHP

The MK SSHO shall maintain a field master copy of this SSHP document to include all redlines and the completed work zone maps. This copy shall be properly filed with project records at the completion of the project to be 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 procedure PHSP-04.1 titled Incident Reporting for both MK and Subcontractor personnel as stated in Section 11.3.

The MK SSHO shall receive copies of all records for injuries and illnesses of Subcontractor personnel incidental to the work, including copies of the Worker's Compensation First Report of Injury. The Subcontractor shall record injury and illnesses on their OSHA 200 Log, a copy of which is delivered to the MK SSHO on a monthly basis. Reporting shall follow the guidance stated above. A record of all first aid treatments not otherwise recordable shall be maintained and furnished to the Navy's designated authority upon request. The MK SSHO shall maintain records of employee exposure to potentially harmful toxic materials, harmful physical agents and medical records, in accordance with

29 CFR 1910.120. Employee's will be notified of time integrated sampling results where applicable via memo to his/her employer.

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. 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 Activity Hazards Analysis (AHA) worksheets reflected field conditions. The report shall be directed to the MK SouthDiv Program Health and Safety Manager within ten working days after project demobilization.

14.0 ON-SITE WORK PLANS

A Site-Specific Work Plan of which this document is designated Appendix A was developed to define the work tasks and identify the work objectives. The means and personnel required to complete the task is identified along with consideration for methods, logistics, quality control/assurance and resources.

15.0 COMMUNICATION PROCEDURES

15.1 RADIO COMMUNICATION, TELEPHONE, ALARMS AND DRILLS/EXERCISES

Refer to Section 12.10 of this Plan. Cellular telephones shall be selected as a secondary choice of emergency communication if two-way radios or direct line telephone is not available. 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 for confirmation of emergency communication using NSWCC Crane protocols.

16.0 SPILL CONTAINMENT PLAN

16.1 GENERAL

Spill and release accident scenarios during remediation could occur and involve residue process material and reinstates from decontamination activities. The following information will be used by project personnel to respond to and mitigate any releases on the project site.

In the event of a spill or release, the MK SSHO, MK General Superintendent, Subcontractor SSHO, and/or Subcontractor Job Supervisors 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 2.
- Evacuate the work zone to a safe place of refuge.

16.2 PREPLANNING FOR SPILL CONTROL

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. All aspects of the Emergency Response Plan as described in Section 12, will be reviewed by site personnel to ensure adequacy and that resources are available.

During mobilization activities for this project, the MK Project Manager, MK SSHO, Subcontractor SSHO, MK General Superintendent and Subcontractor Job Supervisor(s)/SSHO shall review the NAVFAC SouthDiv Project Procedure PHSP 03.1 and the Base Oil and Hazardous Substances Spill Contingency Plan. After review, they shall execute the steps necessary to assure effective spill response planning requirements and resources are established for this project.

MK 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. Prior to the start of work, MK will review PHSP 03.1 and meet with site representatives on spill control and assure the SSHP is consistent with site requirements for spill control. Specific roles and responsibilities will be reviewed for MK and Navy personnel. The Base Fire Department will be notified of any spills classified above operational and will assist in spill containment. The Base Response Team (SRT) will provide overall command and control of the clean-up activity for spills classified above operational until relieved by a higher authority.

16.3 SPILL AND FIRE CONTROL MATERIALS AND EQUIPMENT

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.

16.4 SPILL CONTROL MEASURES

Deleted Item.

16.5 DRUM, CONTAINER, AND TANK HANDLING AND MOVING PROCEDURES

Deleted Item.

16.6 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number X3300, the Environmental Department (X1132, X3114, or X6160), and to the MK SSHO at 812-854-6941. The MK SSHO will assure that the Navy's Technical Representative (NTR) or ROICC is notified promptly. The MK SSHO, the MK General Superintendent, Subcontractor SSHO and the Subcontractor Job Supervisor(s) are responsible for directing initial emergency response actions until the arrival of the NSWCrane designated authority. The designated authority can include the officer in charge of security, fire department and/or ambulance services. The following contains the initial response actions to be taken by MK personnel and subcontractors at the work site for spill and release emergencies.

Response Actions:

1. Notify the NSWCrane Security Desk at X 3300 and provide the following information:
 - a. Name and phone number of person calling;
 - b. Location of incident;
 - c. Type of incident;
 - d. Injured or trapped personnel and potential material release or spill conditions.
2. Quickly assess probability of safely stopping spill. If physical, chemical, or biological health hazards exist, immediately evacuate the area to a safe distance upwind and updrift from the spill.
3. MK SSHO, MK General Superintendent, or Subcontractor Job Supervisor(s)/SSHO

designates one person to meet the emergency response units at the nearest road where the units will be approaching.

4. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s)/SSHO 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 and meet the incoming response units and provide all available information.
 - B. Initiate initial spill response using available spill response equipment only for small operational spills where personnel are trained to mitigate. Evacuate the work zone or immediate area if there are any health threats or risks to personnel.

17.0 CONFINED SPACES

Not anticipated on this project.

TABLES

Table A-1 Potential Contaminants

| Potential Contaminants | Description | Exposure Limits | Signs and Symptoms | First Aid |
|------------------------|--|--|---|---|
| Sodium fluorescein | Dark red powder, water soluble. Stable compound, not volatile or combustible. | None reported. | May cause eye, skin, digestive tract, and respiratory irritation. Potential carcinogen based on animal studies. | Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately. |
| Alphazurine | Reddish-violet powder or granules with metallic luster, water soluble. Stable compound, not volatile or combustible. | None reported. | May cause eye, skin, digestive tract, and respiratory irritation. Limited evidence of carcinogenicity in animals. | Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately. |
| Acid Fast Violet BG | Fine powder, black in color, water soluble. Stable compound, powder may be combustible. | None reported. | May cause eye, skin, digestive tract, and respiratory irritation. Potential carcinogen based on animal studies. | Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately. |
| Magnesium | May be present in burial ground as finely divided white particulate. | OSHA PEL 10 mg/m ³ as 8 hr. TWA (skin notation) | Irritant to eyes, nose and skin. | Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately. |

Table A-2 Personnel Names and Telephone Numbers

| <u>Contact</u> | <u>Person or Agency</u> | <u>Telephone</u> |
|-------------------------------|--|--|
| Fire Department | NSWC Fire Department (Base) | 3300 emergency (812) 854-1235 |
| Ambulance Service | NSWC Ambulance (Base) | 3300 emergency (812) 854-1100 |
| Law Enforcement | NSWC Security (Base) | (812) 854-3318 |
| Robert Hlavacek | MK Program Manager (MK PMO) | (803) 554-9367 |
| Martin Wilson | MK Field Operations Manager | (803) 554-6003 |
| David Beall | MK Project Manager at NSWC Crane | Office: (812) 854-6941 |
| Tom Dogai | MK Site Construction/ Operations Manager | Office: (812) 854-6941 |
| Richard Spurgeon | MK Site Safety and Health Supervisor | Office: (812) 854-6941 |
| Don Miller | MK Engineering Manager | Office: (216) 523-2121 |
| Lois Bigley | MK Site Quality Control Supervisor and Project Engineer | Office: (812) 854-6941 |
| William Piispanen | MK Health and Safety Program Manager | (208) 386-5930 |
| Cmdr. Fred Smith | NSWC Crane PWD/Eng. Dept | (812) 854-1834 |
| Capt. J.M. Carney | NSWC Base Commander | (812) 854-1210 |
| Jim Hunsicker or Tom Brent | NSWC Environmental Protection Services | (812) 854-6160 |
| Adrienne Townsel-Wilson | SOUTHNAVFACENGCOCM | 803-820-5582 |
| Brent Robertson | ROICC(NTR) | (812) 854-3318 |
| Lt. Dale Eads | NSWC E.O.D. (Base) | (812) 854-3456 |
| Dale Groh | NSWC Safety Directory | (812) 854-3601 |
| Poison Control Center | Poison Control Center | (800) 942-5969 |
| National Response Center | National Response Center | (800) 424-8802 |
| Regional USEPA | USEPA (Region 5) Emergency State of Indiana Emergency | (312) 353-2318 (317) 233-7745 |

| <u>Contact</u> | <u>Person or Agency</u> | <u>Telephone</u> |
|-------------------------|---|----------------------------------|
| Hospital | NSWC Base Medical Facility Head Nurse (Mary Muessig) | (812) 854-1220 (812) 854-4319 |
| Hospital | Bedford Medical Center 2900 West 16 th Street Bedford, IN 47432 | (812) 275-1200 |
| Hospital | Bloomington Hospital 601 West Second Street Bloomington, IN | (812) 336-9515 |
| Utility Locator Service | Public Works Dept. | (812) 854-1834 |

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 Bedford Gate, travel east on Highway 158 to the city of Bedford. Highway 158 becomes 16th Street. The Bedford Gate hours are M-F 6-8 AM and 3-6 PM only. Must use Bloomington Gate all other times.

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.

Table A-3 Minimum Personal Protective Equipment Requirements by Task

| Site | Activity | PPE |
|----------------------------|--|--|
| Install interim cap system | <ol style="list-style-type: none"> 1. Mobilization (all subtasks) 2. Site Preparation <ol style="list-style-type: none"> a. Access Road Relocation b. Vegetation Removal (clearing and grubbing) c. Dye Contaminated soil excavation. d. Site Grading e. Equipment Decontamination 3. Cover System Construction <ol style="list-style-type: none"> a. Install appropriate layers per plan. b. site restoration c. testing/inspection 4. General Site Cleanup Activities and Demobilization | <ol style="list-style-type: none"> 1. Level D, modify where necessary as determined by MK SSHO. 2. <ol style="list-style-type: none"> a. Level D b. Modified Level D, downgrade to D per MK SSHO. c. Modified Level D. d. Modified Level D e. Modified Level D or C depending on decon method (C=high pres wash) 3. <ol style="list-style-type: none"> a. Level D, modified where necessary by the MK SSHO. b. Level D c. Level D. 4. Level D, modify where necessary. |

Table A-4 Air Monitoring and Sampling Requirements

| Site | Activity | Monitoring | | | |
|----------------------------|------------------------------------|------------|------------------|-------|-------------|
| | | Dust | Perimeter (Dust) | Noise | Heat Stress |
| Install interim cap system | 1. Mobilization | 1. O | 1. N | 1. O | 1. O |
| | 2. Site Preparation | 2. Y | 2. O | 2. Y | 2. O |
| | 3. Cover System Construction | 3. Y | 3. O | 3. Y | 3. O |
| | 4. Site Cleanup and Demobilization | 4. O | 4. N | 4. O | 4. O |

Y = Yes, O = Optional at discretion of MK SSHO, not anticipated as necessary, N = Not required

Figure A-1 Map to Nearest Medical Facility

See Following Page for 11" X 17" foldout

Figure A-1

Directions to the Nearest Medical Facility

Legend

-  Primary Route
-  Naval Reservation Boundary

Directions to NSWC Medical Department on site:

The NSWC Medical Department manages and coordinates the on-site ambulance service. Located in Building 12 off of H-2 just north of H-5.

Directions to Bedford Medical Center:

From the Bedford Gate, head east on 158 to the city of Bedford. 158 turns into 16th Street. Gate open M-F only 6-8 AM and 3-6 PM.

From Bedford Gate, head east on 158 to the city of Bedford. 158 turns into 16th street.

Directions to Bloomington Hospital:

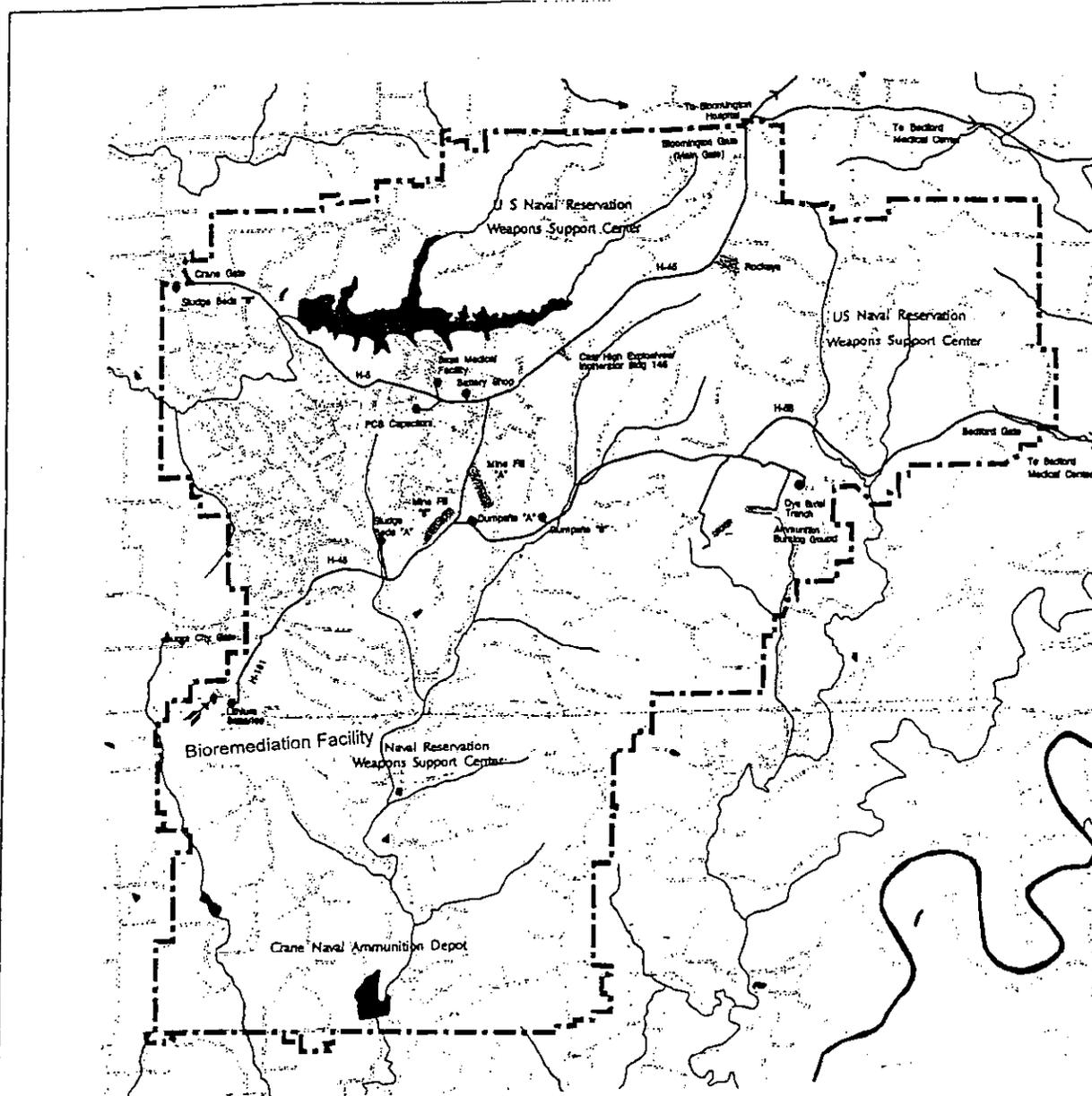
Exit Base on H5-45 through the Bloomington Gate, follow Highway 45 North to Bloomington. At Highway 45 and Highway 37, continue going straight over the bypass (Bloomfield Road), follow Bloomfield road north which turns into 2nd Street. Follow 2nd Street and hospital is on your right.



1 inch = 1.5 miles



MORRISON KNUDSEN CORPORATION
Engineering, Construction
& Environmental Group



Date _____ Report Number _____

Location(s) Work Activity and # Employees: _____

Weather: Wind speed _____ Wind direction _____
Temp. & Pressure _____ Precipitation _____
Amount sun _____

Monitoring conducted:

| <u>Location</u> | <u>Sampled for</u> | <u>Instrument used</u> | <u>Results</u> | <u>Sampled By/Time</u> |
|-----------------|--------------------|------------------------|----------------|------------------------|
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

Levels of Protection: _____

Problems or Unusual Situations: _____

Correspondence: _____

Other Comments: _____

MK SSHO Printed Name: _____ Signature _____ Date _____

| SURVEILLANCE NO: | | ACTIVITY: | | | | PROJECT NO: | |
|------------------|---|---------------------|--|----------------------|-----|-------------------------------|--|
| DATE: | | LOCATION: | | | | SURVEYED ORGANIZATION: | |
| | | SITE/AREA CONTACT: | | RESPONSIBLE MANAGER: | | PRIME: | |
| | | | | | | 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 |
| Section 1 | | | | | | | |
| 1 | Scope of work and site contaminants accurately described? | | | | | | |
| Section 2 | | | | | | | |
| 2 | Activity hazard analysis prepared for each major work phase? (EM 385-1-1, Section 01.A.09) | | | | | | |
| 3 | All hazards including chemical and physical adequately described? | | | | | | |
| Section 3 | | | | | | | |
| 4 | Roles and responsibilities described and personnel roster up-to-date? | | | | | | |
| Section 4 | | | | | | | |
| 5 | All site personnel completed required training? | | | | | | |
| 6 | Training documented and records on site? | | | | | | |
| Section 5 | | | | | | | |
| 7 | All site personnel completed initial medial qualification? | | | | | | |
| Section 6 | | | | | | | |
| 8 | PPE available and in good condition? | | | | | | |
| 9 | PPE work per SSHP and/or SSHO direction? | | | | | | |
| 10 | Personnel trained in proper use, limitations, and inspection of PPE? | | | | | | |
| 11 | PPE inspected per SSHP? | | | | | | |
| 12 | PPE donning/doffing procedures in place? | | | | | | |

FIGURE A-5. SSHP Weekly Inspection Checklist (continued)

Surveillance No. _____

| 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 |
|----------|---|---------------------|---|-------------------|-----|-------------------------|--|
| 13 | Written SOP available describing respirator selection and use? | | | | | | |
| | Section 7 | | | | | | |
| 14 | Air monitoring conducted per SSHP? | | | | | | |
| 15 | Monitoring equipment properly maintained and calibrated? | | | | | | |
| 16 | Employees notified of monitoring results? | | | | | | |
| 17 | Chain of custody prepared and maintained for all samples? | | | | | | |
| | Section 4 and 8 | | | | | | |
| 18 | Weekly safety meeting held? | | | | | | |
| 19 | Pre entry briefs held? and signature sheet completed? | | | | | | |
| 20 | Haz Com programs in place? | | | | | | |
| 21 | Competent person evaluates excavation? | | | | | | |
| 22 | Personnel responsible for work maintains control of area and general safety requirements are being followed ? | | | | | | |
| | Section 9 | | | | | | |
| 23 | Work zone maps prepared and updated? | | | | | | |
| 24 | Maps posted near work area and stored in field master SSHP? | | | | | | |
| 25 | Traffic patterns established and rules observed? | | | | | | |
| | Section 10 | | | | | | |
| 26 | Inspections performed of all personnel, clothing and equipment leaving exclusion zone? | | | | | | |
| 27 | All materials decontaminated prior to existing contamination reduction zone? | | | | | | |
| 28 | Decon stations properly established? | | | | | | |
| 29 | Proper personal hygiene practices observed? | | | | | | |

FIGURE A-5. SSHP Weekly Inspection Checklist (continued)

Surveillance No. _____

| 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 |
|----------|---|---------------------|--|-------------------|-----|-------------------------------|--|
| 30 | Decon solutions collected and properly disposed of? | | | | | | |
| | Section 11 | | | | | | |
| 31 | At least two employees on each shift trained in CPR and first aid and bloodborne pathogens? | | | | | | |
| 32 | First aid kit at each work site? | | | | | | |
| 33 | All first aid and medical cases promptly reported to MK SSHO? | | | | | | |
| | Section 12 | | | | | | |
| 34 | All personnel trained on Emergency Response Plan and Contingency Procedures? | | | | | | |
| 35 | Emergency pre-planning addressed in safety meeting? | | | | | | |
| 36 | List of emergency services/contact is up to date and posted? | | | | | | |
| 37 | Assembly points identified and communicated to employees? | | | | | | |
| 38 | Evacuation routes established and communicated to employees? | | | | | | |
| 39 | Communication methods are adequate | | | | | | |
| 40 | All drills, exercises, and emergencies critiqued? | | | | | | |
| 41 | All emergencies promptly reported to MK SSHO? | | | | | | |
| | Section 13 | | | | | | |
| 42 | MK SSHO maintains project log book? | | | | | | |
| 43 | Daily reports completed by SSHO? | | | | | | |
| 44 | Daily inspections completed by SSHO? | | | | | | |
| 45 | Weekly reports prepared by SSHO? | | | | | | |
| 46 | Records of all injuries and illnesses maintained by SSHO? | | | | | | |
| | Section 14 | | | | | | |
| 47 | Work plans available and up to date? | | | | | | |

| 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 |
|----------|--|---------------------|--|-------------------|-----|-------------------------------|--|
| 48 | SOPs developed as needed? | | | | | | |
| | Section 15 | | | | | | |
| 49 | Two-way radios available per SSHP? | | | | | | |
| 50 | Cellular telephone available as needed? | | | | | | |
| 51 | Emergency alarms available and personnel trained on what actions to take? | | | | | | |
| 52 | Drills and exercises conducted to test communication methods? | | | | | | |
| | Section 16 | | | | | | |
| 53 | Spill response measures reviewed with personnel? | | | | | | |
| 54 | Suitable quantities of spill supplies available? | | | | | | |
| 55 | Spills promptly reported to SSHO? | | | | | | |
| 56 | Operations arranged to minimize spills? | | | | | | |
| | Section 17 | | | | | | |
| 57 | Confined space requirements of 385-1-1, Section 06.0.01 followed? Personnel trained? | | | | | | |

Inspection Performed By: _____

Date: _____

Abatement Accepted By: _____

Date: _____

FIGURE A-5. SSHP Weekly Inspection Checklist (continued)

Surveillance No. _____

| 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 |
|----------|---|---------------------|--|-------------------|-----|-------------------------------|--|
| 30 | Decon solutions collected and properly disposed of? | | | | | | |
| | Section 11 | | | | | | |
| 31 | At least two employees on each shift trained in CPR and first aid and bloodborne pathogens? | | | | | | |
| 32 | First aid kit at each work site? | | | | | | |
| 33 | All first aid and medical cases promptly reported to MK SSHO? | | | | | | |
| | Section 12 | | | | | | |
| 34 | All personnel trained on Emergency Response Plan and Contingency Procedures? | | | | | | |
| 35 | Emergency pre-planning addressed in safety meeting? | | | | | | |
| 36 | List of emergency services/contact is up to date and posted? | | | | | | |
| 37 | Assembly points identified and communicated to employees? | | | | | | |
| 38 | Evacuation routes established and communicated to employees? | | | | | | |
| 39 | Communication methods are adequate | | | | | | |
| 40 | All drills, exercises, and emergencies critiqued? | | | | | | |
| 41 | All emergencies promptly reported to MK SSHO? | | | | | | |
| | Section 13 | | | | | | |
| 42 | MK SSHO maintains project log book? | | | | | | |
| 43 | Daily reports completed by SSHO? | | | | | | |
| 44 | Daily inspections completed by SSHO? | | | | | | |
| 45 | Weekly reports prepared by SSHO? | | | | | | |
| 46 | Records of all injuries and illnesses maintained by SSHO? | | | | | | |
| | Section 14 | | | | | | |
| 47 | Work plans available and up to date? | | | | | | |

ATTACHMENT A

ACTIVITY HAZARD ANALYSIS (AHA)

ACTIVITY HAZARD ANALYSIS (AHA)

ACTIVITY 1: Mobilization (Phase I and II)

ANALYZED BY/DATE: Frank J. Petrik 6/30/97

REVIEWED BY/DATE: _____

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS |
|---|---|---|
| <p>1. Walk area down, establish work zone and laydown areas.</p> | <p>1.a. Struck by and struck against physical objects during loading and unloading operations and setup.</p> <p>1.b. Biological; weeds, snakes, spider's; other plant life.</p> <p>1.c. Contact by inhalation, direct contact or ingestion of chemical contaminants or possibly contact with unexploded ordnance (UXO).</p> | <p>1.a. Preplan work layout (Work Zone Map completed and posted by Subcontractor). Backup alarms on all motorized heavy equipment. Use correct hand and power tools for job and good housekeeping practices. Fueling and dispensing area established per NFPA 30 requirements.</p> <p>Note: MK PM and MK SSHO to reverify the need for non-intrusive UXO surveys for areas previously untouched.</p> <p>1.b. MK SSHO to discuss specific biological hazards awareness and communicate findings at POD and/or Pre Entry Briefs.</p> <p>1.c. Level D PPE expected. MK SSHO to visual inspect area for evidence of contaminants and will also conduct general area scans for VOCs using PID.</p> |
| <p>2. Off load equipment and construction materials.</p> | <p>2a. Ergonomic type injuries during offloading of cap materials (e.g. rolls of material)</p> <p>2b. Struck by and struck against physical objects during loading and unloading operations and setup.</p> | <p>2.a. Protect against pinch points during manual material handling. Insure safe lifting and handling procedures, mechanize where possible. Insure adequate number of personnel used on manual lifting and moving operations.</p> <p>2.b. Insure competent person supervises all rigging and slinging operations during offloading.</p> |
| <p>3. Radiological surveying</p> | <p>3. Physical injuries handling equipment and heat stress. Potential for nonionizing radiation exposure is considered very low.</p> | <p>3. Surveying to be completed by specialty contractor certified for task.</p> |
| <p>EQUIPMENT TO BE USED: Heavy equipment for offloading and materials handling. Hand and power tools.</p> | | |
| <p>INSPECTION REQUIREMENTS: Daily, prior to use per manufacturer's recommendation.</p> | | |
| <p>TRAINING REQUIREMENTS: Site Safety and Health Plan (Project Kickoff), POD, and OSHA Hazard Communication.</p> | | |

ACTIVITY HAZARD ANALYSIS (AHA)

ACTIVITY 2: Site Preparation

ANALYZED BY/DATE: Frank J. Petrik 6/30/97

REVIEWED BY/DATE: _____

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS |
|---|---|---|
| 1. Access road relocation. 2. Vegetation removal (clearing and grubbing). 3. Water storage tank relocation and installation. 4. Excavation of dye contaminated material. 5. Placement of clean soil layer over the cap area. 6. Equipment Decontamination | General Summary for all Tasks: Struck by and struck against heavy equipment. Biological; weeds, snakes, spider's; other plant life. Heat Stress. Contact by inhalation, direct contact or ingestion of chemical contaminants or possibly contact with unexploded ordnance (UXO). Decontamination: Contact with contaminated materials; inhalation of airborne aerosols; contact with high pressure wash; unexpected movement of item to be decontaminated. | General Summary for all Tasks: Preplan work layout (Work Zone Map completed and posted by Subcontractor). Backup alarms on all motorized heavy equipment. Design new road in accordance with EM 385-1-1 Section 21.1. High visibility vests for personnel working near heavy equipment. Note: MK PM and MK SSO to reverify the need for non-intrusive UXO surveys for suspect areas. MK SSO to discuss specific biological hazards awareness and communicate findings. Heat Stress precautions include awareness training, high fluid intakes, and work/rest or light work regimes where necessary. Level D PPE expected. MK SSO to visual inspect area for evidence of contaminants. Modified Level D where potential contact with contaminated material is possible. Clearing and grubbing - Protect against pinch points during clearing and grubbing. Insure safe lifting and handling procedures, mechanize where possible. Insure adequate number of personnel used on manual lifting and moving operations. Use faceshields where applicable, chipping tasks .. recommended by manufacturer of equipment. Review MSDSs for any herbicides used at site. Personnel operating hand held compaction equipment require metatarsal foot protection if applicable to type of unit. Site Decontamination Facility to provide isolation and controlled access. MK SSO and General Superintendent shall review material handling procedures and equipment placement to insure good practices and approved equipment is used. Decontamination: Level C PPE with faceshield if high pressure wash, modify per MK SSO review. Secure items to be decontaminated. Visual inspect integrity of Facility's containment liners and containers used for waste waters. CRZ provided for worker decontamination. MSDS's obtained and reviewed for all cleaning solutions and chemicals. |
| EQUIPMENT TO BE USED: Heavy equipment, power and hand tools. | | |
| INSPECTION REQUIREMENTS: Daily, prior to use per manufacturer's recommendation. | | |
| TRAINING REQUIREMENTS: Site Safety and Health Plan (Project Kickoff), POD, and OSHA Hazard Communication. Note: Hazwoper training requirements and medical surveillance requirements apply up to the first cap layer where the potential for contact with contaminated material is possible. | | |

ACTIVITY HAZARD ANALYSIS (AHA)

ACTIVITY 3: Cover System Construction

ANALYZED BY/DATE: Frank J. Petrik 6/30/97

REVIEWED BY/DATE:

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS |
|--|---|--|
| <p>1. Install various liners and membranes.</p> <p>2. Site Restoration.</p> | <p>Contact by inhalation, direct contact or ingestion of chemical materials used in liner sealing. Contact with hot surfaces of sealing equipment.</p> <p>Nuisance dust exposure, noise and heat stress.</p> <p>Ergonomic type injuries during placement of cap materials (e.g., rolls of material)</p> <p>Struck by and struck against physical objects during placement of cap materials.</p> <p>Inhalation of airborne organics from mulch application and fertilizer application. Physical injuries including struck by and struck against during offloading and spreading materials. Vibration and noise from compactor, electric or air source.</p> | <p>Level D PPE expected. MK SSHO shall insure all MSDS's for chemicals used are reviewed and exposures control's are in place per manufacturer's recommendation. Use of Seaming equipment may require PPE upgrade to include leather work gloves. MK SSHO shall conduct periodic dust and noise monitoring. Emphasize heat stress precautions and controls.</p> <p>Protect against pinch points during manual material handling. Insure safe lifting and handling procedures, mechanize where possible. Insure adequate number of personnel used on manual lifting and moving operations.</p> <p>Insure competent person supervises all rigging and slinging operations during placement of cap materials. Work Zone Map completed and posted by Subcontractor. Backup alarms on all motorized heavy equipment. High visibility vests for personnel working near heavy equipment.</p> <p>Where necessary, modified Level D during application of fertilizers and mulches. MK SSHO shall insure all MSDS's for chemical fertilizers and soil preparations used are reviewed and exposures controlled. May require heavy work glove and wrist supports for vibration dampening during compaction and hearing protection.</p> |
| <p>EQUIPMENT TO BE USED: Heavy equipment, power and hand tools.</p> | | |
| <p>INSPECTION REQUIREMENTS: Daily, per manufacturer's recommendation.</p> | | |
| <p>TRAINING REQUIREMENTS: Site Safety and Health Plan (Project Kickoff), POD and OSHA Hazard Communication.</p> | | |

ACTIVITY HAZARD ANALYSIS (AHA)

ACTIVITY 4: Testing and Inspection of cover in the field

ANALYZED BY/DATE: Frank J. Petrik 6/30/97

REVIEWED BY/DATE: _____

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS |
|--|--|---|
| <p>Non destructive seam testing to include vacuum testing and air pressure testing.</p> <p>Destructive seam testing.</p> | <p>Mechanical energy and/or electrical energy, air pressure.</p> | <p>GFCI's on portable electrical test equipment and all cords and connections inspected prior to use. Equipment operated per manufacturer's recommendation. MK SSHO to assess PPE requirements based manufacturer's recommendation and task assessment, may require full face shield.</p> |
| <p>EQUIPMENT TO BE USED: Test equipment per ASTM standards</p> | | |
| <p>INSPECTION REQUIREMENTS: Daily, prior to use per manufacturer's recommendation.</p> | | |
| <p>TRAINING REQUIREMENTS: Site Safety and Health Plan (Project Kickoff), POD and OSHA Hazard Communication.</p> | | |

ATTACHMENT B

WORK ZONE MAPS

Note: Work Zone Maps are field prepared by the Subcontractor. The MK SSHO will insert one copy of the map(s) into the field master copy of this SSHP as provided by the Subcontractor.

APPENDIX B

CONSTRUCTION DRAWINGS

| | | |
|-------------|------|--|
| Drawing No. | C-01 | Title Sheet |
| Drawing No. | C-02 | Existing Site Plan |
| Drawing No. | C-03 | Cap Foundation Grading Plan |
| Drawing No. | C-04 | Cap Cross Sections |
| Drawing No. | C-05 | Cap Cross Sections |
| Drawing No. | C-07 | Typical Cap Cross Sections and Details |

APPENDIX C

CONSTRUCTION SPECIFICATIONS

| | | | |
|---------|-------|-------------------------|----------|
| SECTION | 01090 | REFERENCE STANDARDS | 1 PAGE |
| SECTION | 01300 | SUBMITTALS | 4 PAGES |
| SECTION | 02200 | SITework | 14 PAGES |
| SECTION | 02249 | GEOTEXTILES | 8 PAGES |
| SECTION | 02250 | GEOMEMBRANE | 25 PAGES |
| SECTION | 02253 | GEOSYNTHETIC CLAY LINER | 6 PAGES |
| SECTION | 02255 | EROSION MAT | 3 PAGES |
| SECTION | 02936 | SEEDING | 6 PAGES |

SWMU # 02/II

DYE BURIAL GROUND INTERIM MEASURES CAP

AT

EASTERN SECTION

OF

*NSWC, CRANE DIVISION
INDIANA*

REVISIONS

| REV. | DATE | DESCRIPTION | BY | LEAD ENGR | DEPT MGR | PROJ MGR |
|------|---------|---------------------------|----|-----------|----------|----------|
| A | 6/15/97 | ISSUED FOR BID AND REVIEW | | | | |
| 0 | 6/25/97 | ISSUED FOR CONSTRUCTION | | | | |
| | | | | | | |
| | | | | | | |

NOTES

DRAWINGS LIST

| DRAWING NUMBER | DRAWING TITLE |
|---------------------------------------|---|
| <u>PHASE I</u> | |
| C-01 | TITLE SHEET |
| C-02 | EXISTING SITE PLAN |
| C-03 | CAP FOUNDATION GRADING PLAN PHASE I CONSTRUCTION |
| C-04 | CAP CROSS SECTIONS |
| C-05 | CAP CROSS SECTIONS |
| C-06 | NOT USED |
| C-07 | TYPICAL CAP CROSS SECTIONS AND DETAILS |
| <u>PHASE II TO BE SUBMITTED LATER</u> | |
| C-08 | UNDERDRAIN DRAINAGE PLAN |
| C-09 | FINAL INTERIM COVER GRADING PLAN |
| C-10 | TO BE DETERMINED |

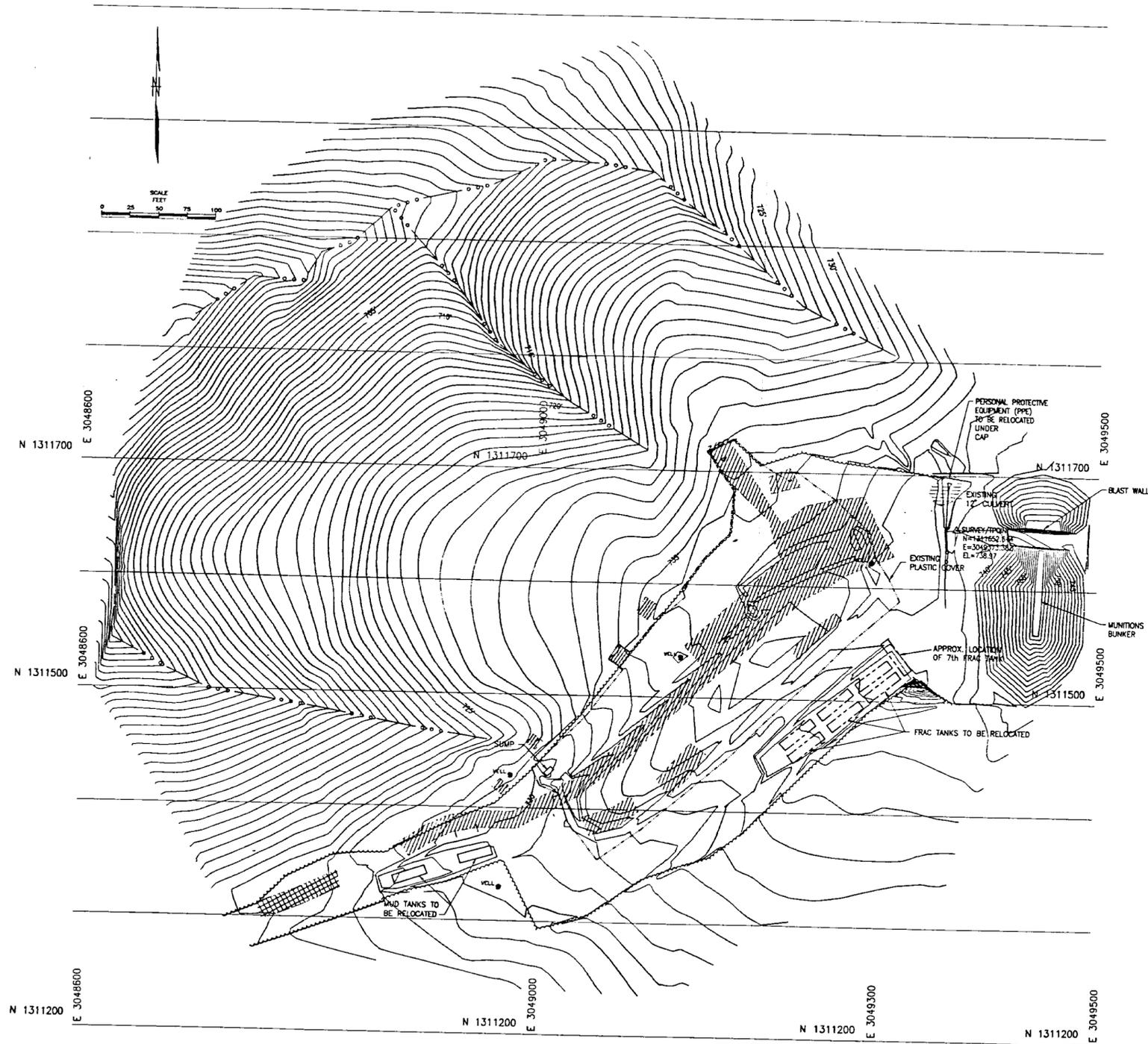
GENERAL NOTES:

1. THE EXISTING SITE MAPPING, BASE MAPPING AND TOPOGRAPHY WERE DEVELOPED AND PROVIDED BY MSE CORPORATION, INDIANAPOLIS, INDIANA. THE MAPPING WAS PERFORMED IN APRIL, JUNE, AND AUGUST OF 1995 AND RESURVEYED IN JUNE 1997.
2. THE HORIZONTAL DATUMS ARE BASED ON STATE PLANE COORDINATES. ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL.
3. THIS DRAWING IS PREPARED ONLY ON DESIGN CRITERIA, PARAMETERS, AND GUIDANCE SET FORTH IN "RECOMMENDED REMEDIAL MEASURES AT NAVAL SURFACE WARFARE CENTER, CRANE (NSWCC), DYE BURIAL GROUND (DBG), SOLID WASTE MANAGEMENT UNIT (SWMU) 02/II" BY USACOE, WATERWAYS EXPERIMENTATION STATION, TECHNICAL PAPER GL-95-XX, JULY 1995 AND SUBSEQUENT COMMENTS BY THE U.S. EPA AND CORPS OF ENGINEERS WES.

SWMU #02/II
DYE BURIAL GROUND
INTERIM MEASURES CAP
NSWC, CRANE DIVISION
EASTERN SECTION
TITLE SHEET

 MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

| DEPT | MECH | STRUC | MESH | ELECT | PIPING | INST | CIVIL | GEOTECH | OTHER |
|----------------------------|----------|-------|-------------------|-------|--------|------|-------|---------|-------|
| BY | | | | | | | | | |
| DATE | | | | | | | | | |
| SCALE: | NTS | | WORK ORDER NUMBER | | | | | | |
| DRAWN: | R. EVANS | | 6/16/97 | | 4324 | | | | |
| DESIGNED: | C. WHITE | | DRAWING NUMBER | | | | | | |
| CHECKED: | | | | | REV | | | | |
| VERIFIED: | | | | | C-01 | | | | |
| APPROVED: | | | | | 0 | | | | |
| AUTOCAD FILE NAME: 4324-01 | | | | | | | | | |

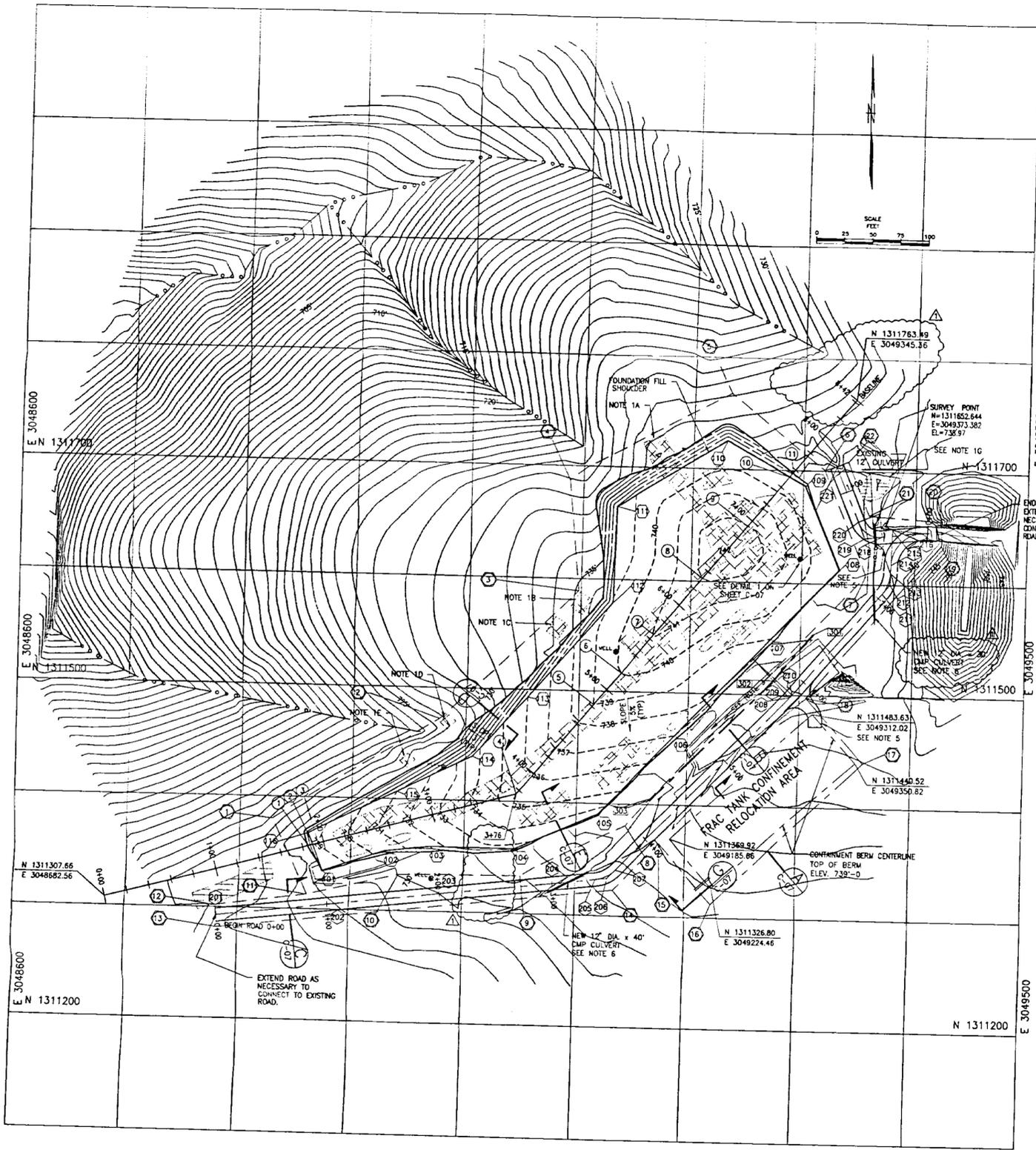


| REVISIONS | | | | |
|-----------|---------|---------------------------|----|-------------------------------------|
| REV. | DATE | DESCRIPTION | BY | LEAD DESIG. PROJ. ENGR. MGR. / MGR. |
| A | 6/19/97 | ISSUED FOR BID AND REVIEW | | |
| 0 | 6/25/97 | ISSUED FOR CONSTRUCTION | | |
| | | | | |
| | | | | |

| NOTES | |
|---------------|--|
| LEGEND | |
| | EXISTING TREE LINE |
| | LIMIT OF PLASTIC COVER |
| | EXISTING MONITORING WELL |
| | AREAS OF WASTE PREVIOUSLY EXCAVATED AND REPLACED WITH CLEAN SOIL |
| | AREAS PREVIOUSLY IDENTIFIED WITH DYE CONTAMINATION |
| | EXISTING FRAC TANKS |
| | SURVEY CONTROL POINT |
| | EXISTING MUD TANKS |

SWMU#02/II
 DYE BURIAL GROUND
 INTERIM MEASURES CAP
 NSWC, CRANE DIVISION
 EASTERN SECTION
 EXISTING SITE PLAN

| | | | | | | | | | |
|---|---------------|-------|------|-------------------|--------|-------|----------------|-----|------------|
| MORRISON KNUDSEN CORPORATION ENVIRONMENTAL SERVICES | | | | | | | | | |
| DEPT | ARCH | STRUC | MECH | ELECT | PIPING | INSTR | QA/QC | LOG | PROJ. MGR. |
| DATE | | | | | | | | | |
| SCALE | 1" = 50' - 0" | | | WORK ORDER NUMBER | | | | | |
| DRAWN: | R. EVANS | | | 6/16/97 | | | 4324 | | |
| DESIGNED: | C. WAITE | | | 6/17/97 | | | | | |
| CHECKED: | | | | | | | DRAWING NUMBER | | |
| VERIFIED: | | | | | | | C-02 | | |
| APPROVED: | | | | | | | REV | | |
| AUTOCAD FILE NAME: 4324-02.DWG | | | | | | | | | |



BASE LINE CONTROL POINTS

| PT # | EASTING | NORTHING | ELEVATION |
|------|------------|------------|-----------|
| 1 | 3048861.10 | 1311356.43 | 727 |
| 2 | 3048865.66 | 1311357.67 | 728.8 |
| 3 | 3048870.72 | 1311359.05 | 729 |
| 4 | 3049045.12 | 1311406.70 | 735.3 |
| 5 | 3049113.49 | 1311487.93 | 739 |
| 6 | 3049137.41 | 1311516.61 | 740 |
| 7 | 3049166.27 | 1311551.98 | 741 |
| 8 | 3049209.99 | 1311602.98 | 742 |
| 9 | 3049249.91 | 1311650.05 | 742 |
| 10 | 3049287.16 | 1311694.32 | 739 |
| 11 | 3049290.14 | 1311697.87 | 737.6 |

FOUNDATION FILL SHOULDER CONTROL POINTS

| PT # | EASTING | NORTHING | ELEVATION |
|------|------------|------------|-----------|
| 101 | 3048874.86 | 1311334.89 | 728.25 |
| 102 | 3048929.70 | 1311353.49 | 739.5 |
| 103 | 3048970.32 | 1311358.46 | 731.75 |
| 104 | 3049044.43 | 1311358.14 | 732.8 |
| 105 | 3049119.55 | 1311390.61 | 733.75 |
| 106 | 3049188.15 | 1311461.85 | 737 |
| 107 | 3049272.92 | 1311549.89 | 739 |
| 108 | 3049333.73 | 1311612.74 | 736 |
| 109 | 3049301.67 | 1311686.45 | 739 |
| 110 | 3049230.46 | 1311725.04 | 739 |
| 111 | 3049130.81 | 1311664.65 | 738.25 |
| 112 | 3049130.33 | 1311580.49 | 739 |
| 113 | 3049053.59 | 1311493.21 | 736 |
| 114 | 3049005.71 | 1311439.44 | 733.75 |
| 115 | 3048939.63 | 1311406.72 | 731 |
| 116 | 3048861.49 | 1311368.01 | 728.5 |

CLEARING LINE CONTROL POINTS

| PT # | EASTING | NORTHING |
|------|---------|----------|
| 1 | 3048829 | 1311380 |
| 2 | 3048976 | 1311472 |
| 3 | 3049097 | 1311588 |
| 4 | 3049087 | 1311687 |
| 5 | 3049233 | 1311767 |
| 6 | 3049318 | 1311700 |
| 7 | 3049357 | 1311607 |
| 8 | 3049144 | 1311380 |
| 9 | 3049049 | 1311334 |
| 10 | 3048942 | 1311332 |
| 11 | 3048861 | 1311313 |
| 12 | 3048780 | 1311301 |
| 13 | 3048782 | 1311281 |
| 14 | 3049134 | 1311323 |
| 15 | 3049176 | 1311365 |
| 16 | 3049224 | 1311312 |
| 17 | 3049357 | 1311440 |
| 18 | 3049306 | 1311498 |
| 19 | 3049423 | 1311635 |
| 20 | 3049423 | 1311657 |
| 21 | 3049359 | 1311661 |
| 22 | 3049339 | 1311708 |

CENTER LINE OF SWALE CONTROL POINTS

| PT # | EASTING | NORTHING |
|------|---------|----------|
| 3001 | 3049311 | 1311554 |
| 3002 | 3049276 | 1311512 |
| 3003 | 3049167 | 1311404 |

DYE BURIAL ACCESS ROAD CENTER LINE CONTROL POINTS

| PT # | STATION | EASTING | NORTHING | DESCRIPTION | |
|------|---------|------------|------------|--|-------------------------------------|
| 201 | 0+00 | 3048781.30 | 1311292.70 | BEGIN CONSTRUCTION ROAD SECTION ONE | |
| 202 | 1+00 | 3048880.62 | 1311304.34 | | |
| 203 | 2+00 | 3048979.94 | 1311315.98 | | |
| 204 | 3+00 | 3049079.26 | 1311327.64 | | |
| 205 | CURVE 1 | 3+39.47 | 3049118.46 | P.C. R=30'-0", Δ=38.7° | |
| 206 | | | 3049128.92 | P.I. | |
| 207 | | 3+59.73 | 3049136.31 | P.T. | |
| 208 | CURVE 2 | 5+80.16 | 3049291.21 | P.C. R=50'-0", Δ=4.2° | |
| 209 | | | 3049292.49 | P.I. | |
| 210 | | 5+83.83 | 3049293.67 | P.T. | |
| 211 | CURVE 3 | 7+05.99 | 3049371.77 | P.C. R=30'-0", Δ=39.2° | |
| 212 | | | 3049378.70 | P.I. | |
| 213 | | 7+26.52 | 3049378.94 | P.T. | |
| 214 | CURVE 4 | 7+33.62 | 3049379.10 | P.C. R=30'-0", Δ=91.9° | |
| 215 | | | 3049379.79 | P.I. | |
| 216 | | 7+81.74 | 3049410.74 | P.T. END CONSTRUCTION, CONNECT TO EXISTING | |
| 218 | | 0+00 | 3049410.74 | 1311647.21 | BEGIN CONSTRUCTION ROAD SECTION TWO |
| 219 | CURVE 5 | 0+40.18 | 3049370.80 | P.C. R=21'-0", Δ=73.9° | |
| 220 | | | 3049355.09 | P.I. | |
| 221 | | 0+67.27 | 3049334.10 | P.T. | |
| 222 | | 1+15.22 | 3049329.52 | 1311703.50 | END CONSTRUCTION |

REVISIONS

| REV | DATE | DESCRIPTION | BY | LEAD | CHKD | APPD |
|-----|---------|---------------------------|----|------|------|------|
| A | 6/19/97 | ISSUED FOR BID AND REVIEW | | | | |
| D | 6/25/97 | ISSUED FOR CONSTRUCTION | | | | |
| Δ | 6/27/97 | REISSUED FOR CONSTRUCTION | | | | |

NOTES

- LEGEND**
- ACCESS ROAD CENTERLINE
 - FILL CONTOUR
 - CLEARING LINE
 - SWALE CENTERLINE
 - FRAC TANK RELOCATION AREA
 - CONTAINMENT BERM CENTERLINE
 - EXISTING MONITORING WELL
 - FILL BASE LINE POINTS
 - FILL SHOULDER POINTS (100 SERIES)
 - ROAD CENTERLINE CONTROL POINTS (200 SERIES)
 - CLEARING LINE CONTROL POINTS
 - SWALE CONTROL POINTS
 - GENERAL WASTE AREAS
 - ISOLATED AREAS OF BERMS TO BE LOWERED. SEE NOTE 1H
 - PERSONAL PROTECTIVE EQUIPMENT TO BE RELOCATED UNDER FILL. SEE NOTE 1G
 - AREAS OF WASTE PREVIOUSLY EXCAVATED AND REPLACED WITH CLEAN SOIL

1. AREAS OF WASTE TO BE EXCAVATED AND PLACED WITHIN CAP AREA: ALL AREAS ARE APPROXIMATE, AND MAY VARY IN SIZE FROM DIMENSIONS SHOWN. ALL WASTE AREAS CONTIGUOUS TO THE CAP SHOULD BE EXCAVATED FOR A DISTANCE OF AT LEAST 2 FEET INSIDE THE LOCATION OF THE PERIMETER DRAINAGE / ANCHOR TRENCH. MATERIALS SHOULD BE PLACED IN THIN LIFTS IN AREAS WHERE THE CAP FOUNDATION FILL IS THICKER, SO THEY DO NOT PROJECT ABOVE THE CAP FOUNDATION GRADE. LEAVE ROOM FOR AT LEAST 6 INCHES OF CLEAN FILL SOIL BETWEEN THE BOTTOM OF THE CAP AND THE WASTE. ANY AREAS WHERE EXISTING PLASTIC IS REMOVED SHALL BE RECOVERED WITH PLASTIC OR AT LEAST 6 INCHES OF CLEAN SOIL THE SAME DAY.
 - A. NORTH LEG
 - B. NORTH AREA (E) PLASTIC COVER 2/10/97
 - C. NORTH AREA (W) PLASTIC COVER 2/20/97
 - D. AREA OF RELEASE 01/27/97 (E)
 - E. AREA OF RELEASE 01/27/97 (W)
 - F. MISCELLANEOUS SPOTS (NOT SHOWN ON DRAWING) TYPICALLY LESS THAN 12 INCHES DIAMETER SHALL BE REMOVED BY HAND EXCAVATION.
 - G. PERSONAL PROTECTIVE EQUIPMENT (PPE) TO BE REMOVED AND PLACED WITHIN THE CAP AREA.
 - H. ISOLATED AREAS OF BERMS WITHIN THE CAP AREA SHALL BE LOWERED BY HAND EXCAVATION TO MAINTAIN A MINIMUM OF 6 INCHES OF CLEAN FILL BETWEEN POTENTIAL WASTE AND THE BOTTOM OF THE CAP. AREAS ARE APPROXIMATE, AND SHALL BE IDENTIFIED IN GREATER DETAIL IN THE FIELD.
2. CLEAR ZONE AROUND CAP PERIMETER AS SHOWN WILL BE USED FOR ACCESS TO THE PERIMETER OF THE CAP AND EXISTING MONITORING WELLS.
3. RE-ESTABLISH DRAINAGE ON SOUTHEAST SIDE OF CAP. MATCH EXISTING GRADE AT INLET AND OUTLET OF SWALE.
4. FIELD FIT VERTICAL ALIGNMENT OF ACCESS ROAD AS DIRECTED BY CONTRACTOR.
5. EXTEND ACCESS ROAD TO FRAC TANK CONFINEMENT RELOCATION AREA AND AT INTERSECTION OF SECTIONS ONE AND TWO AS DIRECTED BY CONTRACTOR.
6. FIELD FIT CULVERT ALIGNMENTS AND INVERT SLOPES AS DIRECTED BY CONTRACTOR.

SWMU#02/II
DYE BURIAL GROUND INTERIM MEASURES CAP
CAP FOUNDATION GRADING PLAN
PHASE ONE CONSTRUCTION

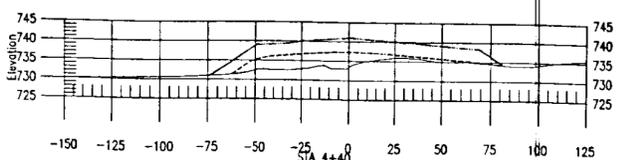
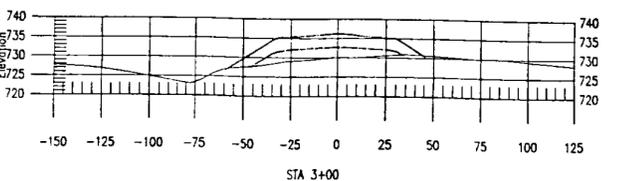
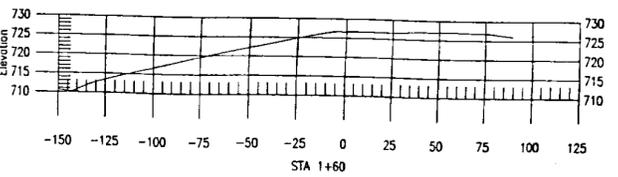
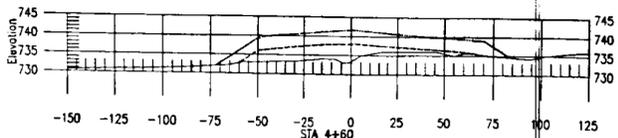
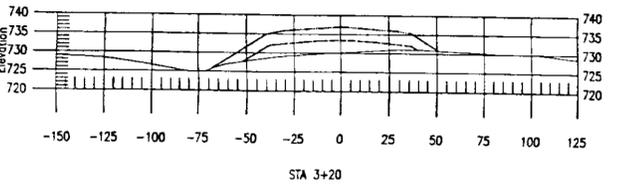
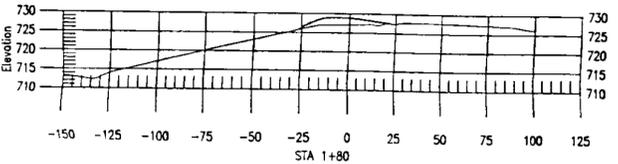
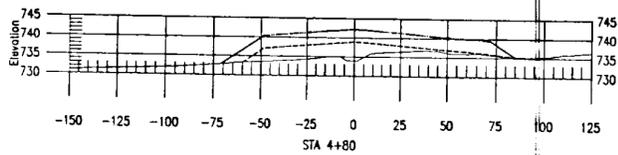
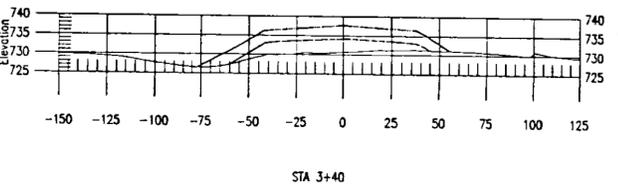
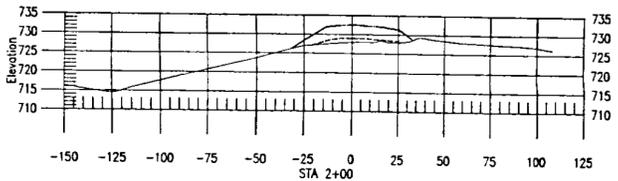
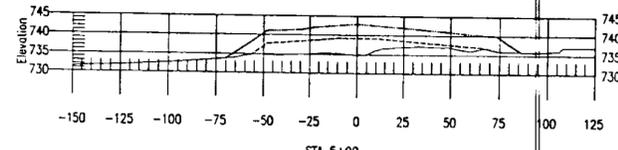
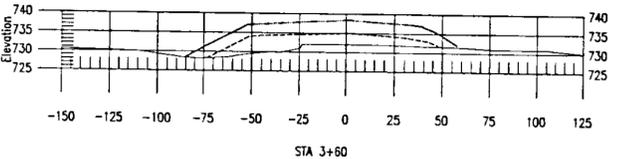
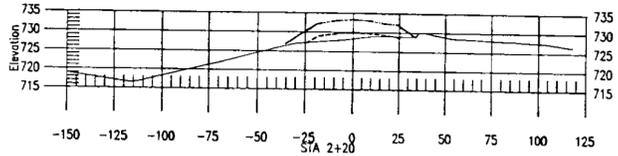
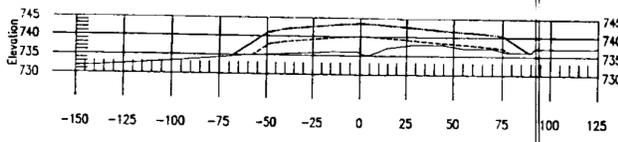
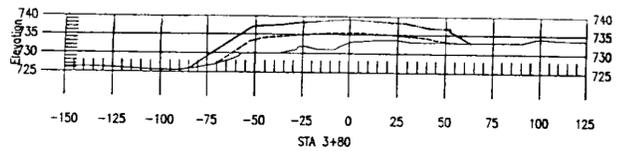
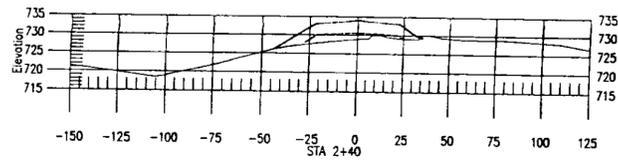
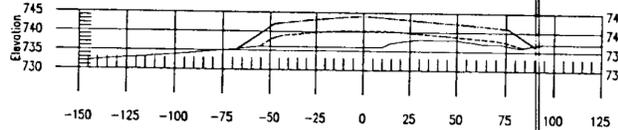
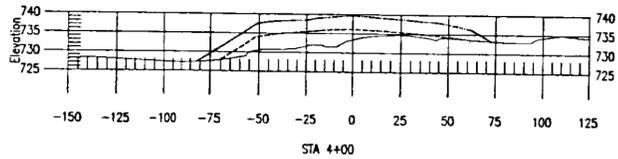
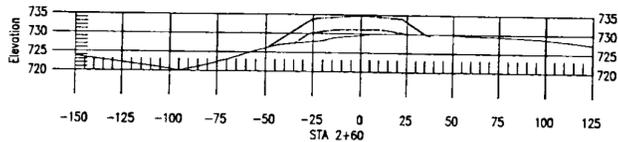
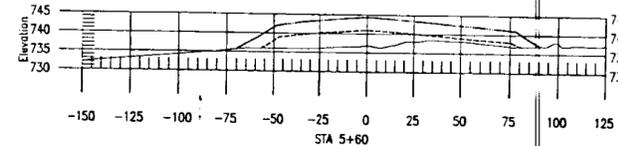
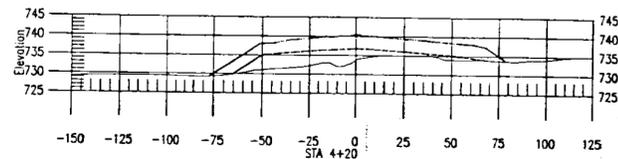
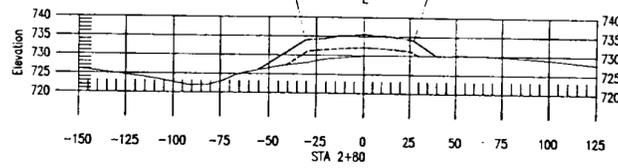
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

| DEPT | ARCH | STRUC | MCH | ELECT | PPNG | INT | D/A | DATE | SCALE | WORK ORDER NUMBER |
|--------------------|-------------|---------|-----|-------|------|-----|-----|------|-------------|-------------------|
| | | | | | | | | | 1" = 50'-0" | 4324 |
| DATE | | | | | | | | | | |
| SCALE: | | | | | | | | | | |
| DRAWN: | R. EVANS | 6/18/97 | | | | | | | | |
| DESIGNED: | C. WAITE | 6/18/97 | | | | | | | | |
| CHECKED: | | | | | | | | | | |
| VERIFIED: | | | | | | | | | | |
| APPROVED: | | | | | | | | | | |
| AUTOCAD FILE NAME: | 4324-03.DWG | | | | | | | | | |

NOTE:
STA 7+81.74 ROAD SECTION ONE
STA 0+00 ROAD SECTION TWO

70-0

SHOULDER BASE LINE SHOULDER (TYP)



SCALE 1" = 40'-0 HORIZONTAL
SCALE 1" = 20'-0 VERTICAL

REVISIONS

| REV. | DATE | DESCRIPTION | BY | LEAD DEPT | PROJ |
|------|---------|---------------------------|----|-----------|------|
| A | 6/19/97 | ISSUED FOR BID AND REVIEW | | | |
| B | 6/25/97 | ISSUED FOR CONSTRUCTION | | | |

NOTES

LEGEND

- TOP OF CAP (PHASE TWO CONSTRUCTION)
- TOP OF FOUNDATION FILL (PHASE ONE CONSTRUCTION)
- EXISTING GROUND SURFACE

SWMU#02/II
DYE BURIAL GROUND
INTERIM MEASURES CAP
NSWC, CRANE DIVISION
EASTERN SECTION
CAP CROSS SECTIONS

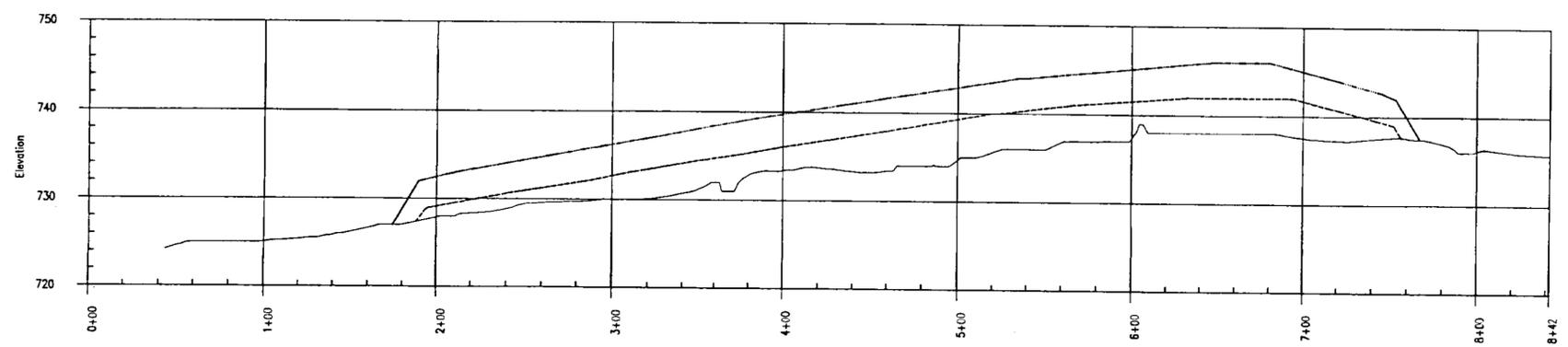
MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

| DEPT | ARCH | STRUC | MECH | ELECT | PIPING | HAZ | S/A | ENG | PROJ |
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| | | | | | | | | | |
| SCALE: 1" = 40'-0 HORI | | | | | | | | WORK ORDER NUMBER | |
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| CHECKED: C. WAITE 6/20/97 | | | | | | | | DRAWING NUMBER | |
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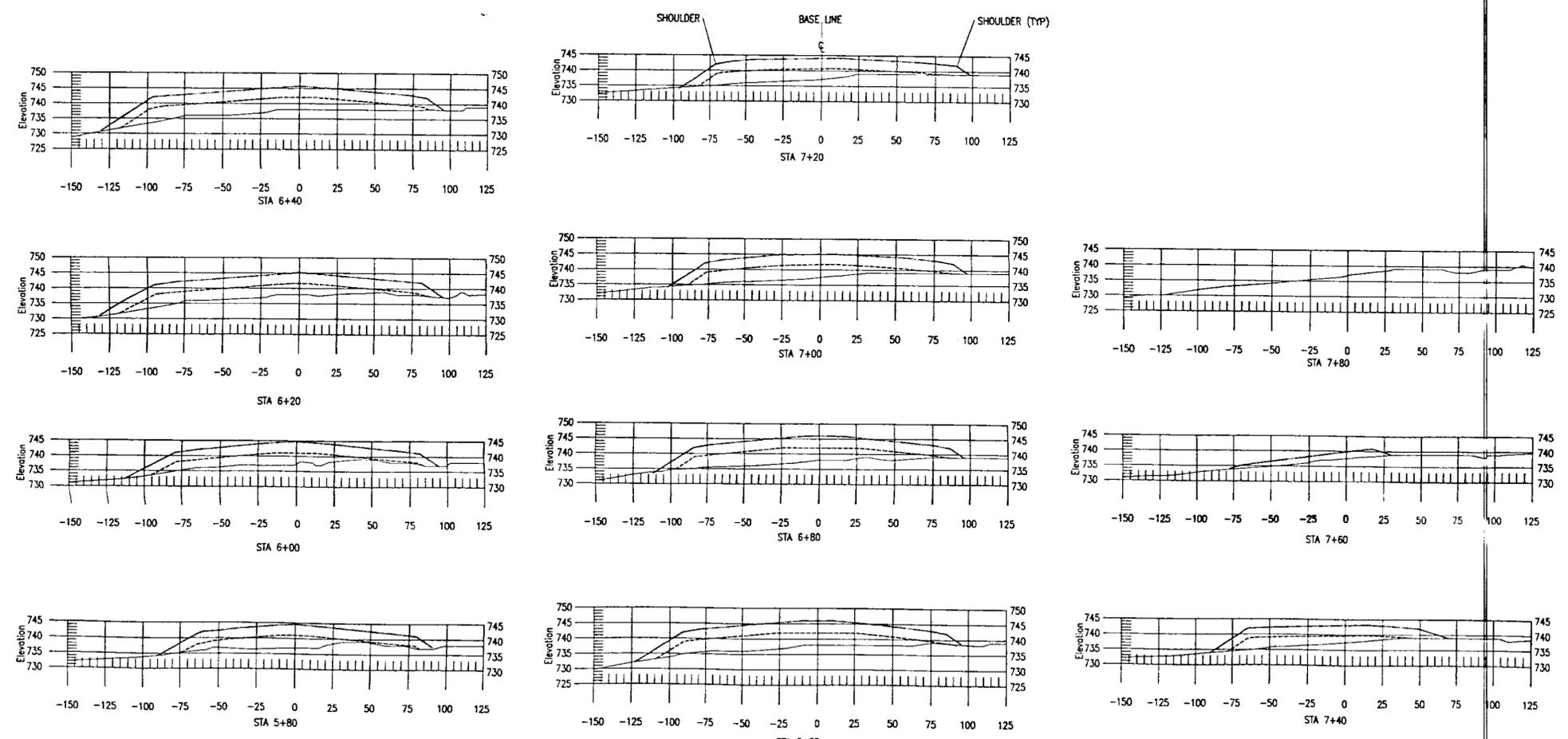
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|-----------|---------|---------------------------|----|-----------------------------|
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| A | 6/19/97 | ISSUED FOR BID AND REVIEW | | |
| D | 6/25/97 | ISSUED FOR CONSTRUCTION | | |
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NOTES

- LEGEND**
- TOP OF CAP (PHASE TWO CONSTRUCTION)
 - TOP OF FOUNDATION FILL (PHASE ONE CONSTRUCTION)
 - EXISTING GROUND SURFACE



SCALE 1" = 40'-0 HORIZONTAL
SCALE 1" = 20'-0 VERTICAL
PROFILE ALONG BASE LINE

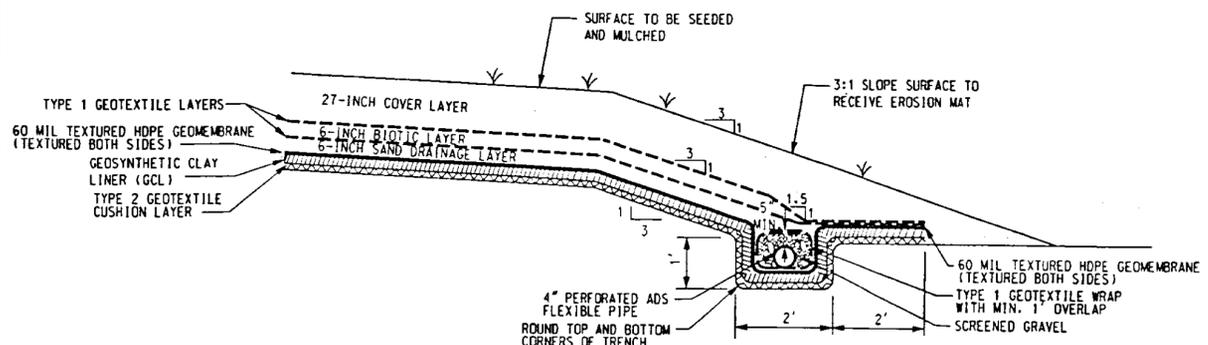


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SCALE 1" = 20'-0 VERTICAL

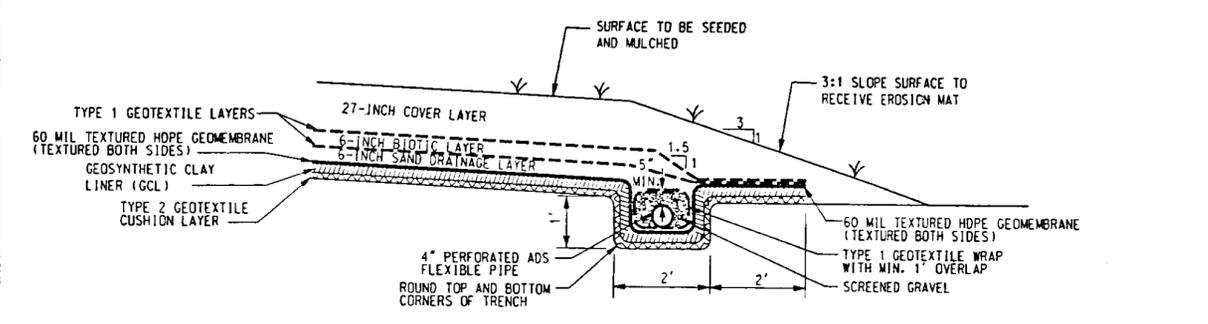
SWMU#02/11
DYE BURIAL GROUND
INTERIM MEASURES CAP
NSWC, CRANE DIVISION
EASTERN SECTION
CAP CROSS SECTIONS

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

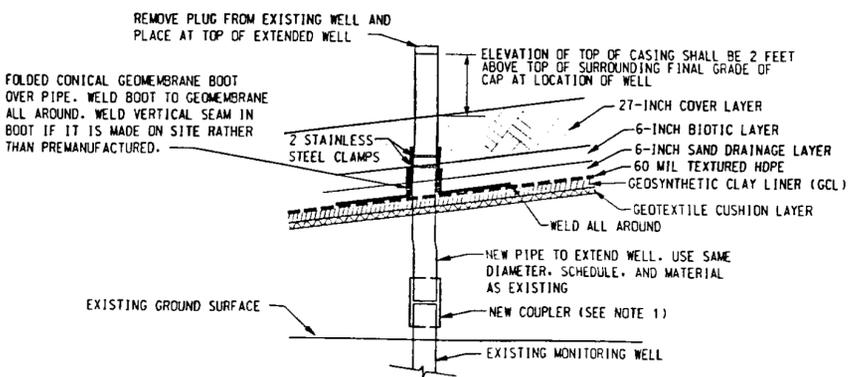
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| VERIFIED: | C-05 |
| APPROVED: | REV |
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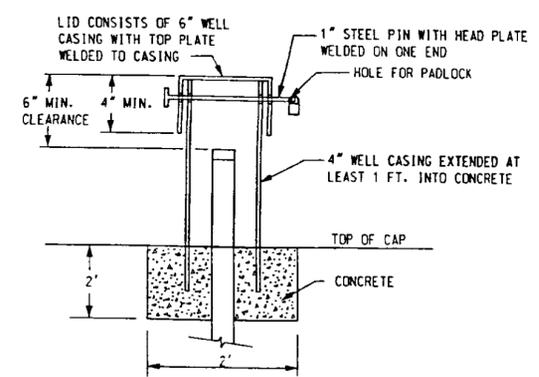
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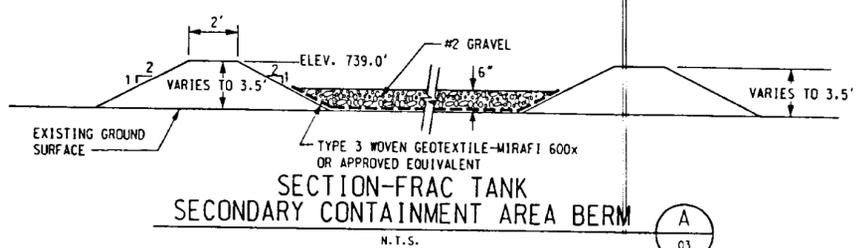
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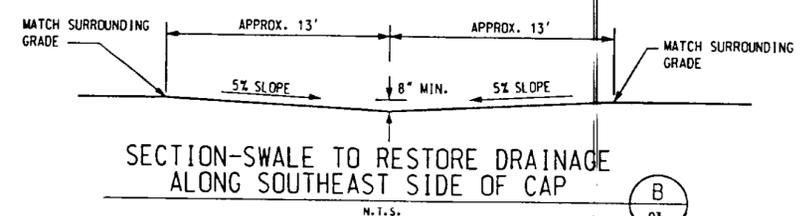
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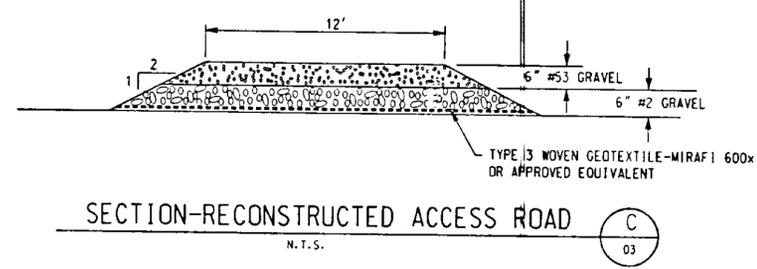
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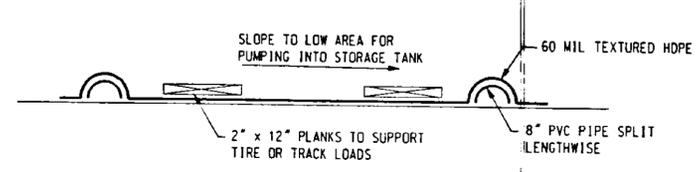
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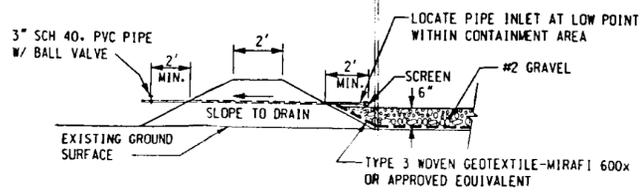
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N.T.S.



SECTION-RECONSTRUCTED ACCESS ROAD
N.T.S.



TEMPORARY DECONTAMINATION STATION DETAIL
N.T.S.



SECTION-FRAC TANK SECONDARY CONTAINMENT AREA
N.T.S.

| REVISIONS | | | |
|-----------|----------|--------------------------|----|
| REV. | DATE | DESCRIPTION | BY |
| A | 06/19/97 | ISSUE FOR REVIEW AND BID | |
| 0 | 06/25/97 | ISSUE FOR CONSTRUCTION | |

NOTES
1. WELL EXTENSION COUPLER SHALL BE INSTALLED USING CONTRACTOR-APPROVED METHOD TO AVOID WELL CONTAMINATION.

SWM#02/11
DYE BURIAL GROUND INTERIM MEASURES CAP
NSWC, CRANE DIVISION
EASTERN SECTION
TYPICAL CAP CROSS SECTIONS AND DETAILS

| | | | | | | | | | |
|--|-----------|--------|-----------------|-------|-------|------|----|-----|-----|
| MORRISON KNUDSEN CORPORATION ENVIRONMENTAL SERVICES | | | | | | | | | |
| DEPT | ARCH | STRUCT | Mech | ELECT | PLUMB | TRAC | QA | INS | OTC |
| DATE | | | | | | | | | |
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| DRAWN: | B. MARKER | | 06/24/97 | | | | | | |
| DESIGNED: | C. WAITE | | 4324 | | | | | | |
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| APPROVED: | | | REV 0 | | | | | | |
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SECTION 01090

REFERENCE STANDARDS

NSWC CRANE DYE BURIAL CAP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for maintaining standards, drawings, and documentation.

1.2 QUALITY ASSURANCE

- A. For Products or workmanship specified by association, trade, or other consensus standards, the Subcontractor shall comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The Subcontractor shall conform to reference standard by date of issue current on date for receiving bids.
- C. The Subcontractor shall obtain copies of standards when required by the Contract Documents.
- D. The Subcontractor shall maintain copies of standards, submittals, and contract documents at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, the Subcontractor shall request clarification from the Contractor before proceeding.
- F. Required reference standards are listed in the individual specification sections.

END OF SECTION

SECTION 01300

SUBMITTALS

**NSWC CRANE
DYE BURIAL CAP**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction schedules.
- C. Proposed Products list.
- D. Installation Drawings.
- E. Samples.
- F. Test reports.
- G. Certificates.
- H. Manufacturer's instructions.

1.2 RELATED SECTIONS

- A. Section 01010 - Statement of Work.

1.3 SUBMITTAL PROCEDURES

- A. The Subcontractor shall transmit the required number of each submittal under the cover of a Transmittal Letter.
- B. Sequentially number the Transmittal Letters. Item numbers shall be discrete and the description of each item submitted shall include the item number from the contract submittal schedule. Resubmitted items shall be submitted as the same item number with a sequential alphabetic suffix.

- C. Identify Project, Contractor, Subcontractor, and/or supplier. The description will include the contract submittal schedule number, the item, drawing/detail number, and specification number, as required to fully identify the submitted item.
- D. Sign the Transmittal Letter, certifying that the Subcontractor has reviewed the data for completeness and compliance with contract documents, specifications, and drawings.
- E. Schedule submittals to maintain the Project Schedule, and deliver to Project Manager at:

Morrison Knudsen Corporation
300 Highway 361, CTR - 12
P.O. Box 310
Crane, Indiana 47522

- F. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.
- G. Identify deviations from the Contract Documents and product or system limitations which may be detrimental to successful performance of the completed construction.
- H. Provide space for Contractor review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION SCHEDULES

- A. Submit initial schedule in duplicate within 10 days after Notice of Contract Award. The schedule shall be in bar chart form and show the complete sequence of construction by activity, identifying work on separate stages and other logically grouped activities. The duration of each activity shall be shown. Submittal dates and material delivery dates shall be indicated.
- B. Revision and resubmittal of the schedule may be required.

- C. An as-built schedule shall be submitted at contract close out.
- D. A three-week construction schedule showing the current week and two future weeks shall be submitted by 10:00 a.m. each Thursday and reviewed during the weekly schedule meeting at 1:00p.m. Thursday.

1.5 PROPOSED PRODUCTS LIST

- A. Within 10 days after Contract Award, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 INSTALLATION DRAWINGS

- A. Installation Drawings For Review/Approval shall be submitted to the Contractor for review for the purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- B. Submit a reproducible and three copies of all approved installation drawings.
- C. A copy of approved installation drawings shall be maintained in the field by the Subcontractor during performance of work. These drawings shall be maintained showing as-built conditions and submitted as part of project completion.

1.7 SAMPLES

- A. Submit three samples to illustrate functional characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Include identification on each sample, with full Project information and intended use.
- C. Submit the number of samples specified in individual specification sections; all of which will be retained by the Contractor.
- D. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.8 TEST REPORTS

- A. Submit three sets of test reports for information for the limited purpose of assessing conformance with project design.

1.9 CERTIFICATES

- A. When specified in individual specification sections, submit three sets of certification by the manufacturer and installation/application subcontractor to the Contractor in quantities specified in the vendor data schedule.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but *must be acceptable to the Contractor.*

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit three sets of printed instructions for delivery, storage, assembly, and installation, to the Contractor.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

END OF SECTION

SECTION 02200

SITE WORK

**NSWC CRANE
DYE BURIAL CAP**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Performing site preparation, excavation, backfilling, grading, and associated work, for Dye Burial Ground Cap.

1.2 RELATED SECTIONS

- A. Section 01010 - Statement of Work
- B. Section 02249 - Geotextiles
- C. Section 02250 - Geomembranes
- D. Section 02253 - Geosynthetic Clay Liner
- E. Section 02255 - Erosion Mat
- F. Section 02936 - Seeding (Topsoil)

1.3 REFERENCE STANDARDS

- A. Conform to reference standard by date of issue current on date of bid submission.
- B. AASHTO - American Association of State Highway and Transportation Officials
- C. ANSI - American National Standards Institute
- D. ASTM - American Society for Testing and Materials

1.4 QUALITY ASSURANCE

- A. The Contractor shall judge adequacy of site preparation, including erosion and sediment control measures, suitability of bearing material at excavated levels, acceptability of available fill material, and the correct placement and compaction of fill and backfill to specified densities. Stripping, cutting, excavating, filling, backfilling, and compacting procedures require Contractor approval as they are successively performed. All work found unsatisfactory shall be corrected by the Subcontractor in an approved manner.

Requests for and confirmation of approvals must be documented on the "CONTRACTOR APPROVAL FORM", a copy of which is attached to this specification.

1.5 PROJECT/SITE CONDITIONS

- A. The Subcontractor shall provide a surveyor to set benchmarks and reference points. The Subcontractor shall maintain bench marks, monuments, and other reference points.
- B. Burning of combustible materials at the site is not permitted.

1.6 SEQUENCING/SCHEDULING

- A. Schedule all work so that excavated areas shall have minimum exposure to adverse weather conditions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. **Fill and Backfill Materials:** All fill and backfill materials are subject to the approval of the Contractor based on the use intended. Materials shall be obtained from a Contractor approved borrow area. Fill and backfill materials shall be suitable for the intended use and free of debris, organic materials and frozen matter. Prior to placement of geosynthetics, the area within the plan dimensions of the cap shall be free of any gravel, rocks larger than $\frac{3}{8}$ inch, or other objects that might damage the liner materials.

The borrow source for cap foundation fill and for cap cover material has been identified approximately 1.2 miles from the site. This borrow source shall require complete development, including clearing, grubbing, stripping and reclamation at the conclusion of the project.

Reclamation shall include grading to drain, erosion protection, seeding and mulching disturbed areas, and runoff control including diversion ditches as necessary. The Subcontractor shall submit a borrow source reclamation plan to the Contractor for approval before commencing reclamation work.

This borrow source shall be visited during the mandatory prebid Subcontractors meeting. Topsoil for the upper 3" of the cover shall be obtained from this or other designated source approved by the Contractor. Samples and a description of the topsoil source must be submitted to the Contractor for approval prior to use.

Additional requirements are:

1. Sand Drainage layer shall be constructed using "23 - 24 sand" or equivalent, which has been tested and meets permeability requirement of $\geq 1 \times 10^{-2}$ cm/sec. Test documentation must be submitted to assure compliance with the specific permeability requirements of the design.
 2. Biotic layer shall be constructed using "RH5 gravel" or equivalent which has been tested and meets the permeability requirement of $\geq 1 \times 10^{-1}$ cm/sec. Test documentation must be submitted to assure compliance with the specific permeability requirements of the design. This material must also be confirmed to be non-calcareous and non-angular prior to use.
- B. Drain Pipe: Perforated and non perforated drain pipe shall consist of corrugated polyethylene drainage tubing conforming to the requirements of AASHTO M-252. Advanced Drainage Systems, Inc. (ADS) pipe or other approved pipe shall be used. Specific requirements for 4" pipe are as follows:

| <u>Attribute</u> | <u>4"</u> |
|--|-----------|
| Weight (minimum): Pounds/Foot | .4 |
| Inside Diameter: (Nominal) | 4.10" |
| Outside Diameter: (Nominal) | 4.72" |
| Wall Thickness: (Nominal) | .020" |
| Pipe Stiffness (minimum): 5% Deflection | 50 PSI |

| Attribute | 4" |
|--|---|
| Water Inlet Area: (Perforated Pipe) | Min. 1.0 Sq. In./Ft |
| Marketing: | ADS® 4" I.D. ASTM F405 AASHTO M-252 |

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide, erect, maintain 24 hours per day, and later remove temporary safeguards such as barricades, guard-rail, and signs, for protection of personnel, the public, equipment, and materials as required.
- B. Maintain grades to promote water drainage. Provide and operate equipment to keep construction areas free of subsurface, surface, and storm-water. Provide necessary diversion ditches or other approved facilities for removing water. Provide straw bales and/or silt fences as necessary to control erosion and sediment transport off site. Dispose of water so the construction areas, storage areas, and other surfaces are not flooded. The Subcontractor shall submit a storm water control and erosion control plan to the Contractor for approval prior to construction.
- C. Select stripped and excavated materials which can be reused shall be classified and temporarily stockpiled. Store materials suitable for filling and backfilling at a sufficient distance from edges of excavations to avoid slides and cave-ins due to overloading. Dispose of unsuitable and excess material and debris onsite within a ten mile radius at a location approved by the Contractor. Clean soil excavated from the drainage/anchor trench shall be temporarily stockpiled for use in the cover layer. Any contaminated soil excavated during trench construction shall be spread in thin layers within the cap area to be covered subsequently by the cap. Stockpile areas shall be selected and maintained by the Subcontractor, subject to approval by the Contractor.
- D. *Protect trees designated by the Contractor for retention from damage with burlap wrapping, barricades, or other approved methods.*
- E. Protect existing monitoring wells during all phases of construction.

3.2 FIELD QUALITY CONTROL

- A. Perform work in accordance with the drawings and specifications. Where conflicts arise, obtain resolution before proceeding with the work.
- B. An Indiana-licensed surveyor to establish bench-marks and a reasonable number of work points including those designated on the construction drawings shall be provided by Subcontractor. This surveyor shall also verify compliance with drawings and specifications as work items are completed.

3.3 SITE CLEARING

- A. Prior to beginning tree removal, all trees within the construction area shall be checked for Indiana bat nest locations by the NSWC Crane representative. The Subcontractor shall notify the Contractor prior to initiation of work to accommodate proper tree inspection.
- B. Clear the site of all trees and brush to the limits shown on the drawings. Additional clearing that is required to facilitate construction shall be approved prior to work.
- C. Trees, brush and all other vegetation shall be removed at the ground surface. Roots and any other subsurface vegetation shall not be removed, but shall be left in place. Exposed trunks or stems shall be injected or painted with commercial grade Roundup or approved equal herbicide.

The Subcontractor must have a Pesticide Application Business license, and individual(s) performing the work shall be licensed in Category 6, Right of Way Pest Control. Both of these licenses shall be obtained from the Office of the Indiana State Chemist. Information regarding application for these licenses may be obtained by calling (765) 494-1594.

- D. All removed trees shall be blocked in four or eight foot lengths and stacked in an area approved by the Contractor. Limbs and brush less than three inches in diameter shall be chipped, and hauled to an off site disposal area approved by the Contractor. This shall include all trees and vegetation cut during previous work at the site, but left piled on site. Uprooted stumps left from previous work at the site shall be hauled to an approved disposal site.

3.4 STRIPPING AND CUTTING

- A. Topsoil shall not be stripped from the cap area.
- B. Special care shall be exercised to prevent disturbance of the ground particularly in the area of the waste. It may be necessary to trim minor amounts of material from berms left within the cap area during the previous construction, in order to provide the minimum separation of 6 inches between

the top of waste or contaminated materials and the bottom of the lower geotextile cushion layer. This should be performed using hand equipment, after removal of the existing plastic cover.

- C. Waste Removal - Several areas of waste or dye-contaminated soil have been identified outside the area to be covered by the cap. See Drawing Nos. C-02 and C-03 for approximate locations of known areas of waste. These areas include a pile of Personal Protective Equipment (PPE) at the east end of the site. Waste and dye contaminated soils in these areas shall be excavated and moved into the area to be covered by the cap prior to placement of the cap foundation fill. These materials shall be spread in thin layers in the central portions of the cap, so that they shall not interfere with the proposed elevation of the cap prism.

Where the waste or contaminated soil is near the proposed perimeter of the cap, and extends continuously beneath the cap, excavation shall extend a minimum distance of 2 feet in from the interior side of the perimeter drainage/anchor trench. Excavated areas shall be backfilled with clean soil, placed and compacted in accordance with Article 3.6 of this specification. Small isolated areas of dye-contamination other than those identified on the drawings may be encountered. These shall be removed at the direction of the Contractor, and placed within the cap area. It is expected that some or most of these areas may be small enough to require only hand excavation.

All areas from which waste is removed must be inspected and approved by the Contractor prior to placement of any backfill.

- D. Swale - A shallow swale shall be excavated along a portion of the south side of the cap to re-establish a natural drainage path disturbed by previous construction, as shown on the drawings and cross sections. Clean soil from this excavation shall be used as cap foundation material. Any waste or contaminated soil encountered during excavation of the swale shall be disposed of beneath the cap area. Excavation of this swale shall be performed as part of Phase I work.
- E. During Phase II work, perform excavation of drainage collection/anchor trenches to required elevations or levels. Stockpile clean excavated material separately for later use in the topsoil cover layer or other filling activities. Some of the grading shall involve filling as required in Article 3.6. Remove rock, gravel, and debris, encountered in the area and keep separate from stockpiles. If materials are removed below required elevations through error, backfill with suitable material and compact as required in Article 3.6.

If contaminated soil is encountered within the drainage/anchor trench excavation, it shall be spread in thin layers over the previously placed cap foundation fill. Thin layers are required to blend in with the contours of the cap foundation, and to minimize the effect on final cap configuration or

geometry. Where contaminated soil is encountered in the trench, the trench depth shall be increased 6 inches or to clean soil, whichever is less. The over excavation shall be backfilled with compacted, clean soil to the specified bottom of trench level.

Top and bottom corners of the trench shall be rounded using hand equipment to avoid crimping or pinching of geotextiles, geomembranes or GCL layers placed in the trench later.

Installation of specified cap components, construction of the cap, and backfilling of the trench shall follow immediately behind the excavation. Only as much trench shall be excavated on any given day as can be constructed and backfilled on that day. Runoff water shall be carefully diverted to prevent it from flowing into open, exposed portions of the trench. Construction of the trenches and cap shall begin at the uphill (East) end, and proceed in the downhill direction.

- F. All equipment that come in contact with dye contaminated soil or waste shall be decontaminated in accordance with project specifications, work plans, health and safety plans or other project contract documents.

3.5 SUBGRADE PREPARATION

- A. Plastic sheeting presently covers most of the proposed cap area. Outer portions of this plastic which extend beyond the proposed trench location shall be folded back into the interior of the cap at least 5 feet inside the perimeter drainage/anchor trench. Alternating strips of the plastic approximately 15 feet wide shall be cut roughly perpendicular to the long dimension of the cap and folded back to expose the underlying soil. This shall allow direct contact between the existing soil and the cap foundation fill. Portions or strips of the plastic left in place shall be cut or perforated using shovels or hand tools at a maximum of 2 foot spacings or otherwise destroyed in place to prevent an impervious barrier between the existing soil and the cap foundation material. Use of other equipment such as discs or aerators to destroy the plastic in place must be approved by the Contractor prior to the work. Any areas which are uncovered shall be recovered either with additional plastic or at least 6 inches of clean soil the same day.

3.6 FILLING, BACKFILLING AND COMPACTING

- A. General: Fill and backfill materials shall consist of general fill and backfill required for site grading or backfilling of over excavation, and the cap layers consisting of sand, biotic, and topsoil cover. Before placing these materials, excavations and placement surfaces shall be free of construction materials, debris, and other foreign materials. Use an effective method approved by the Contractor during placing for keeping granular and earth fill separate during placement.

B. Extend existing monitoring wells located within the fill placement areas. Prior to placement of fill, existing monitoring wells to be saved shall be extended in top elevation as shown on the drawings and detail sheets. Top of the well pipe shall be approximately 2 feet above top of the finish cap grade at the well location.

C. Placing Fill and Backfill:

1. Use materials approved by the Contractor and as specified.
2. Deposit fill and backfill material in maximum 12-inch-thick loose layers and compact each layer to the required density.
3. The topsoil cover layer requires special placement considerations. The lower portion of this layer shall be constructed with materials stockpiled during the excavation of the drainage/anchor trench and swale, and from the designated borrow area. The upper three inches of this layer shall be constructed with topsoil material from a designated topsoil borrow source.
4. Drainage/anchor trenches shall be filled/backfilled as outlined in Specification 01010 - Statement of Work.
5. At the time of filling or backfilling and compacting, fill material shall be + or - 3% of optimum moisture content. The cover layer material shall be in the range of optimum to +3%. Sand and biotic materials shall be essentially dry during compaction. Do not compact fill until it is within the required moisture range. Pile or spread out, material which is too wet; if necessary, disk, harrow, or pulverize it, to facilitate drying. If it is necessary to add moisture to fill soils or surfaces that are too dry, the soil shall be thoroughly mixed by discing, tilling, or blading to provide a uniform moisture condition prior to compaction.

D. Compacting:

1. Furnish satisfactory power-operated or power-driven hand-operated equipment required to compact fill and backfill. This equipment must meet the Contractor's approval. If the fill or degree of compaction is unsatisfactory, make necessary adjustments until specifications are met. Material placed over layers not satisfactorily compacted shall be removed and the unsatisfactory areas recompact.
2. Compact each layer of the cap foundation fill to at least 95 percent of the laboratory dry density as determined by ASTM D698, or as specified by the Contractor. Care shall be taken to avoid rutting, pumping, or otherwise disturbing the soil or material underlying the layer being compacted.

3. Compact each layer of the topsoil cover layer to at least 90% of the laboratory maximum dry density as determined by ASTM D698, or as specified by the Contractor.
4. Sand and biotic layers shall be carefully placed in one lift and lightly compacted to the extent that rutting and disturbance of underlying layers and damage to underlying membranes or fabrics is avoided.
5. Roadway gravels and drainage material (#2 gravel) shall be compacted by at least two passes of a compactor or dozer. Surface materials (#53 gravel) shall be compacted to 95 percent of the laboratory maximum density as determined by ASTM D698.

3.7 FIELD INSPECTION AND CONTROL

- A. Field quality control inspections and tests shall be performed on the placed materials by the Subcontractor and documented by the Subcontractor to verify that placement is in conformance with the requirements. These inspections are outlined in Table 1. Any test requirements presented in the QC Plan that are in addition to those indicated in Table 1 shall also be performed by the Subcontractor.

| Table 1 Earthwork Field Inspections and Testing | | | |
|--|---|-------------------------------------|--------------------------|
| Activity | Inspection/Test(s) | Frequency | Test Method(s) |
| Backfill Over-excavated Areas | Moisture and Density | 1 per lift per area backfilled | ASTM D2922 ASTM D3017 |
| | Visual Observation ¹ | Continuous | N/A |
| Place Grading Fill | Moisture and Density | 1 per lift per 5000 ft ² | ASTM D2922 ASTM D3017 |
| | Visual Observation ¹ | Continuous | N/A |
| Place Drainage/ Anchor Trench Backfill, Sand Drainage Layer, and Biotic Barrier Layer | Layer Thickness ² (Sand Drainage and Biotic Layers) | 1 per 5000 ft ² | see Note 2 |
| | Visual Observation ¹ | Continuous | N/A |
| Topsoil Cover Layer | Moisture and Density | 1 per lift per 5000 ft ² | ASTM D2922 ASTM D3017 |
| | Visual Observation ¹ | Continuous | N/A |
| Notes: | | | |
| ¹ Visual observations shall include, but not be limited to, observations of material uniformity, lift thickness and uniformity, complete coverage by compaction equipment, potential damage to underlying materials, and maintenance of completed work. | | | |
| ² Layer thickness measurements shall be performed by a convenient method approved by the Contractor. Care shall be taken in measuring layer thickness so that damage to underlying geosynthetics is prevented. | | | |

B. Surveys:

1. Surveys shall be performed by the Subcontractor's registered surveyor to verify conformance of the completed earthwork segments with the construction drawings and specifications. The surveys shall include, but may not be limited to, the following:
 - Establish Clearing Limits
 - Completion of cap foundation grading.
 - Completion of drainage/anchor trench grading.

- Completed thickness of sand drainage layer.
- Completed thickness of biotic barrier layer.
- Final grading and completion of topsoil cover layer.
- New frac tank storage and containment area.
- Relocated road alignment.
- Swale reconstruction alignment.
- Initial and Final grading of the Borrow Area.

2. The system of surveying that the Subcontractor uses to verify conformance with the construction drawings and specifications shall be pre-approved by the Contractor. At a minimum, this system shall include/utilize the work points designated on the construction drawings, plus an additional amount of survey points so that there is a minimum of one point for every 5000 ft² of completed work for each item listed in Article 3.7B.1. The Subcontractor shall also visually inspect finished grades of completed work items to ensure proper grades between survey point locations.
3. Other surveys, such as geosynthetic seam locations, shall be performed and documented by the Subcontractor as required throughout the Subcontract Documents.

- C. Subcontractor shall perform and document calibrations of all test instruments used at the site.
- D. Subcontractor shall document all test locations on scaled drawings.
- E. Failed Tests/Inspections: Where completed work has failed testing and/or inspection, the Subcontractor shall rework and/or replace and retest the failed area until acceptable, at the Subcontractor's expense. The dimensions of the reworked failed area shall extend to one-half the distance between the location of the failed test and the location(s) of adjacent passing tests. For isolated areas where tests have failed, such as backfill of over excavated waste areas, the entire area shall be reworked and retested. An alternative to delineating the area to be reworked would be to perform additional testing to further isolate the failed area to be reworked.
- F. Contractor reserves the authority to require additional testing by the Subcontractor at the Subcontractor's expense where the Contractor deems completed work quality to be questionable or nonuniform. Should the original work in question be proven acceptable, Contractor shall bear the cost of the verification tests.

3.8 GRADING

- A. Perform grading to achieve the final elevations required by the drawings. Surfaces shall be well-compacted, reasonably smooth and free from irregularities, with uniform transitions made to adjacent areas.
- B. Finish ditches and swales and all areas adjacent to the completed cap to drain by gravity flow without ponding. Take measures to prevent erosion of freshly graded areas until permanent drainage and erosion control facilities are installed. Repair and reestablish areas of settlement or erosion to required elevations and slopes prior to acceptance of the work. Provide dust control measures as necessary.
- C. Blend cut areas with existing grades.
- D. Form correct grades, crowns, cross-sections and slopes within a tolerance of ± 0.1 foot per 10 feet. Fill and level depressions which might retain water or interfere with drainage.

3.9 OTHER ITEMS

- A. Lay drain pipe at correct elevations. Perforated section shall be bedded with gravel as specified in Section 01010 - Statement of Work. The surface drain outlet sections shall be bedded in sand and covered with a 6- inch sand layer prior to backfilling the trench. The pipe shall be joined in accordance with manufacturers recommendations and as approved by the Contractor.
- B. Geotextile shall be placed as shown on the drawings and in accordance with manufacturer's recommendations and other project specifications (see Section 01010 - Statement of Work). Cover materials shall be pushed over the geotextile so that equipment does not run on the geotextile. Refer to Section 02249 - Geotextiles. Placement methods must meet the approval of the Contractor.
- C. All disturbed and work areas not graveled shall be prepared, seeded, mulched, and fertilized. Slopes steeper than 4H:IV shall be covered with erosion mat. Seeded areas shall be watered and maintained until grasses are fully established. Refer to Sections 02255 - Erosion Mat and 02936 - Seeding.

3.10 WINTERIZATION

- A. If it is necessary to delay Phase II Construction until the spring, it shall be necessary to winterize the site. Winterization shall include, sealing by drum rolling of the in-place material, weekly inspection of the site and site maintenance as needed through the winter for the cap, site erosion control

devices, and the borrow area. Winterization also includes regrading and elevation verification before cap construction resumes.

- B. Winterization shall also involve decontamination and at least a partial demobilization and remobilization of equipment and personnel from the site.

END OF SECTION

**CONTRACTOR APPROVAL FORM
NSWC CRANE
DYE BURIAL GROUND
INTERIM MEASURES CAP**

SUBCONTRACTOR NOTICE OF PREPARATION

| |
|--|
| Area/Item (ready to be inspected/approved): _____ |
| Date: _____ |
| Comments: _____ |
| _____ Subcontractor's Signature |
| _____ Title |

CONTRACTOR APPROVAL/DISAPPROVAL

| | |
|--|---|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Disapproved |
| Date: _____ | |
| Comments: _____ | |
| Additional Work Items: _____ | |
| _____ Contractor Signature/Date | |

Acknowledged

OICC Signature

Date

Acknowledged

EPD Signature

Date

SECTION 02249
GEOTEXTILES
NSWC CRANE
DYE BURIAL CAP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes the requirements for selection and installation of geotextiles. The term "geotextiles," as used in this section, is synonymous with geotextile layer, geotextile fabric, filter fabric, and geotextile cushion.

1.2 RELATED SECTIONS

- A. Section 01010 - Statement of Work
- B. Section 02200 - Sitework
- C. Section 02250 - Geomembrane
- D. Section 02255 - Erosion Mat
- E. Section 02253 - Geosynthetic Clay Liner

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Use the latest revision date available at the time of contract issuance.

- B. American Society for Testing and Materials (ASTM)

ASTM D1777, Method for Measuring Thickness of Textile Materials.

ASTM D3776, Test Methods for Mass Per Unit Area (Weight) of Woven Fabric.

ASTM D3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method.

ASTM D4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).

ASTM D4533, Test Method for Trapezoid Tearing Strength of Geotextiles.

ASTM D4632, Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).

ASTM D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

1.4 SUBMITTALS

- A. Pre-installation: Submit the following to Contractor for approval, prior to geotextile deployment.
1. Origin (resin supplier's name and resin production plant) and identification (brand name and number) of resin used to manufacture the geotextile.
 2. Copies of quality control certificates issued by resin supplier.
 3. Results of tests conducted by geotextile manufacturer to verify that quality of resin used to manufacture geotextile meets manufacturer's resin specifications.
 4. Statement indicating that reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness.
 5. List of materials which comprise the geotextile, expressed in the following categories as percent by weight: base polymer, carbon black, other additives.
 6. Manufacturer's specification for the geotextile which includes properties contained in Tables 1 and 2.
 7. Written certification that the minimum average roll values given in the manufacturer's specification are guaranteed by the geotextile manufacturer.
 8. Written certification that geotextile manufacturer has continuously inspected geotextile for the presence of needles and found geotextile to be needle-free.
 9. Quality control certificates signed by a responsible entity employed by the geotextile manufacturer. Each quality control certificate shall include roll

identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for tests and corresponding methods specified in Article 1.3 of this Section.

10. Scaled panel layout plan(s), including details required for installation. Drawings shall be fully dimensioned.

B. Installation: Submit the following as installation proceeds: Subgrade surface acceptance, signed by the Installer for each area that will be covered directly by geotextile.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping:

1. Geotextiles shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.
2. Geotextile rolls shall be marked or tagged with the following information:
 - a. Manufacturer's name
 - b. Product identification
 - c. Unit weight
 - d. Roll number
 - e. Roll dimensions (length and width)

B. Storage and Protection:

1. The Contractor will designate an open on-site storage area for geotextile rolls from time of delivery until installed.
2. Subcontractor shall store and protect geotextile from dirt, water, ultraviolet light exposure, and other sources of damage and preserve integrity and readability of geotextile roll labels.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish materials whose "minimum average roll values," as defined by Federal Highway Administration (FHWA), meet or exceed geotextile property values specified in Tables 1, 2 and 3.

- B. Geotextiles shall be stock products, i.e., except when specifically authorized in writing by the Contractor, supplier shall not furnish products specifically manufactured to meet specifications in Tables 1, 2 and 3.
- C. Geotextile shall be comprised of polymeric yarns, fibers, or filaments oriented into a stable network which retains its structure during handling and placement.
- D. Geotextile shall be thermally treated on one side.

2.2 SOURCE QUALITY CONTROL

- A. The geotextile manufacturer must demonstrate that all requirements of this Section are met.
- B. Tests, Inspection:
 - 1. Geotextiles shall be tested by geotextile manufacturer to evaluate characteristics for quality control. Samples not satisfying specifications in Tables 1 and 2 and manufacturer's specifications shall result in rejection of applicable rolls. At a minimum, the following tests shall be performed by the geotextile manufacturer in accordance with test methods specified in Tables 1, 2 and 3.
 - a. Mass per unit area
 - b. Grab strength
 - c. Trapezoidal tear strength
 - d. Burst strength
 - e. Puncture strength
 - f. Thickness
 - 2. At a minimum, quality control tests shall be performed by the geotextile manufacturer for every 100,000 ft² (10,000 m²) of geotextile produced.
 - 3. At geotextile manufacturer's discretion and expense, additional testing of individual rolls may be required by the Contractor to more closely identify noncomplying rolls and to qualify individual rolls.

**Table 1
Geotextile Fabric Type 1**

| <u>Property</u> | <u>Qualifier</u> ² | <u>Unit</u> | <u>Value</u> | <u>Test Method</u> |
|---------------------|-------------------------------|--------------------------|--------------|-------------------------|
| Thickness | Minimum | mils | 75 | ASTM D1777 ¹ |
| Weight | Minimum | oz/sq.yd | 6 | ASTM D3776 |
| AOS | Minimum | U.S. std. sieve size no. | 70 | ASTM D4751 |
| Grab strength | Minimum | lb | 180 | ASTM D4632 |
| Trapezoidal tear | Minimum | lb | 70 | ASTM D4533 |
| Puncture resistance | Minimum | lb | 80 | ASTM D4833 |
| Burst strength | Minimum | psi | 290 | ASTM D3786 |
| U.V. resistance | Minimum | % ⁴ | 70 | ASTM D4355 ³ |

Notes:

¹4 psf (0.2 kPa).

²All properties are "minimum average roll values" as defined by FHWA.

³Fabric conditioned per ASTM D4355.

⁴Percent of minimum grab strength by ASTM D4632 after conditioning.

**Table 2
Geotextile Cushion Type 2**

| <u>Property</u> | <u>Qualifier</u> ² | <u>Unit</u> | <u>Value</u> | <u>Test Method</u> |
|---------------------|-------------------------------|--------------------------|--------------|-------------------------|
| Thickness | Minimum | mils | 120 | ASTM D1777 ¹ |
| Weight | Minimum | oz/sq.yd | 12 | ASTM D3776 |
| AOS | Minimum | U.S. std. sieve size no. | 70 | ASTM D4751 |
| Grab strength | Minimum | lb | 275 | ASTM D4632 |
| Trapezoidal tear | Minimum | lb | 110 | ASTM D4533 |
| Puncture resistance | Minimum | lb | 135 | ASTM D4833 |
| Burst strength | Minimum | psi | 400 | ASTM D3786 |
| U.V. resistance | Minimum | % ⁴ | 70 | ASTM D4355 ³ |

Notes:

¹4 psf (0.2 kPa).

²All properties are "minimum average roll values" as defined by FHWA.

³Fabric conditioned per ASTM D4355.

⁴Percent of minimum grab strength by ASTM D4632 after conditioning.

Type 3 Geotextile shall be a woven fabric having the properties listed in Table 3 below. This material shall be equal to Mirafi 600x or other approved material.

**Table 3
Geotextile Fabric Type 3**

| Property | Qualifier¹ | Unit | Value | Test Method |
|---|------------------------------|----------------------------------|--------------|--------------------------|
| Grab Tensile Strength at 15% elongation | Minimum | lbs | 300 | ASTM D 4632 |
| Mullen Burst Strength | Minimum | psi | 600 | ASTM D 3786 |
| Puncture Resistance | Minimum | lbs | 120 | ASTM D 4833 |
| Trapezoid Tear Strength | Minimum | lbs | 115 | ASTM D 4533 |
| Permittivity | Minimum | sec ⁻¹ | .02 | ASTM D 4491 |
| UV Resistance | Minimum | % strength retained ³ | 70 | ASTM D 4355 ² |

¹All properties are "minimum average roll values" as defined by FHWA.

²Fabric conditioned per ASTM D4355.

³Percent of minimum grab strength by ASTM D4632 after conditioning.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Subcontractor shall provide Certified Material Test Reports from the material supplier for specification conformance.

3.2 INSTALLATION

- A. Install geotextile according to the construction drawings and specifications, in particular Specification 01010 - Statement of Work.
- B. The supporting soil subgrade to support the Type 2 cushion geotextile shall be smooth and free of all rocks larger than 3/8 inch, and all roots, sharp objects, or debris of any description. The supporting soil shall provide a firm, measurable foundation for the materials, with no abrupt changes or breaks in grade. No standing water or excess moisture will be permitted. No geotextiles shall be placed prior to subgrade approval by the Contractor.
- C. Geotextile Deployment: Handle geotextiles in a manner to ensure they are not damaged. Comply with the following:

1. On slopes, anchor geotextile securely and deploy it down the slope in a controlled manner to continually keep geotextile in tension.
2. Weight geotextile with sandbags or equivalent in the presence of wind. Do not remove weight until replaced with cover material.
3. Cut geotextiles with a geotextile cutter (hook blade) or other manufacturer approved method. Protect adjacent materials from potential damage due to cutting of geotextile.
4. Prevent damage to underlying layers during placement of geotextile.
5. During geotextile deployment, do not entrap in or beneath geotextile, stones, debris, or moisture that could damage geomembrane or hamper subsequent seaming.
6. Visually examine entire geotextile surface before seaming. Ensure no potentially harmful foreign objects, are present. Remove foreign objects encountered or replace geotextile.

D. Seaming Procedures:

1. In general, no horizontal seams or splices are allowed on side slopes (i.e., seams shall be downslope, not across the slope), except as part of a patch. A splice is defined as a seam connecting the ends of two rolls.
2. Overlap geotextile a minimum of 3 in. or the minimum recommended by the manufacturer (which ever is greater) prior to seaming.
3. Continuously sew Type I and Type II geotextiles. Spot sewing is not allowed. Type III geotextiles may be overlapped.
4. When sewing, use polymeric thread with chemical and ultraviolet light resistance properties equal to or exceeding those of the geotextile.
5. Use a locking stitch.
6. Visually examine all seams after completion.

D. Defects and Repairs: Repair holes or tears in geotextile as follows.

1. Sew into place, in accordance with Article 3.2B of this Section, a patch made from same geotextile.

2. Remove any soil or other material that may have penetrated the torn geotextile.

E. Completed geotextile installation is subject to Contractor's approval prior to placement of subsequent layers.

3.3 INTERFACE WITH FILLING OPERATIONS

A. Ensure the following when deploying materials located on top of a geotextile.

1. Geotextile and underlying materials are not damaged.
2. Minimal slippage of geotextile on underlying layers occurs.
3. No excess tensile stresses occur in geotextile.

END OF SECTION

SPECIFICATION 02250

GEOMEMBRANE

NSWC CRANE DYE BURIAL CAP

PART 1 GENERAL

1.1 SPECIFICATION INCLUDES

- A. This specification covers the requirements for installation of a textured (on both sides), high-density polyethylene (HDPE) geomembrane liner for the Dye Burial Ground Cap.

1.2 RELATED SPECIFICATIONS

- A. Specification 01300 - Submittals
- B. Specification 02253 - Geosynthetic Clay Layer (GCL)

1.3 REFERENCES

- A. The applicable provisions of the technical codes and standards shall be the latest revision date at the time of bid submission.
- B. American Society for Testing and Materials (ASTM)

ASTM D638, Test Method for Tensile Properties of Plastics. Note Test Method Modifications in Appendix A of ASTM.

ASTM D751, Methods of Testing Coated Fabrics.

ASTM D792, Test Method for Specific Gravity and Density of Plastics by Displacement.

ASTM D1004, Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

ASTM D1204, Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.

ASTM D1238, Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer (Condition 190/2.16).

ASTM D1505, Test Method for the Density of Plastics by the Density-Gradient Technique.

ASTM D1603, Test Method for Carbon Black in Olefin Plastics.

ASTM D1693, Test Method for Environmental Stress-Cracking of Ethylene Plastics.

ASTM D3015, Recommended Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds.

ASTM D4437, Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.

ASTM D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

ASTM D5199, Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.

C. United States Environmental Protection Agency (EPA)

EPA/530/SW-89/069, The Fabrication of Polyethylene FML Field Seams.

EPA/530/SW-91/051, Inspection Techniques for the Fabrication of Geomembrane Field Seams.

EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities.

1.4 DEFINITIONS

- A. HDPE, HDPE liner, or HDPE geomembrane are synonymous names for this contract.
- B. The installer of the geomembrane can be synonymous with the Subcontractor or can be a lower tier subcontractor to the Subcontractor.

1.5 QUALITY ASSURANCE

- 1. Quality assurance (QA) and quality control (QC) shall be governed by:

1. The liner manufacturer's QA/QC manual, a copy of which shall be submitted for review and approval by the Contractor prior to the beginning of installation.
 2. The installer's construction QA/QC plan, using as a guideline the U.S. EPA publication "Quality Assurance and Quality Control for Waste Containment Facilities," publication EPA/600/R93/182, on pertinent sections related to liner installation. A copy of the installer's QA/QC plan shall be submitted for review and approval by the Contractor prior to the beginning of installation.
- B. In the event of a conflict between the referenced standards and this Specification, the stricter requirements shall apply.

1.6 QUALIFICATIONS

- A. **Manufacturer:** The manufacturer shall have been engaged in the business of manufacturing HDPE liner materials for at least the last five years. The manufacturer shall demonstrate that it has manufactured a minimum of 20,000,000 square feet of the liner material to be supplied.
- B. The installer shall be approved by the Contractor.
- C. **Superintendent:** The Subcontractor is responsible for the installer's field crew. The Subcontractor's superintendent shall represent the installer at all site meetings and shall be responsible for acting as the installer's spokesperson on the project. The superintendent shall have previously managed, at a minimum, two installation projects within the last five years which entailed the installation of at least 2,000,000 square feet of polyethylene geomembrane.
- D. **QA/QC Manager:** The Subcontractor's Quality Assurance/Quality Control (QA/QC) Manager shall have documented experience inspecting installation of membrane liners of the type specified.
- E. **Master Seamer:** The master seamer shall have experience seaming a minimum of 2,000,000 square feet of polyethylene geomembrane within the last eight years using the same type of seaming apparatus to be used at the site.

1.7 SUBMITTALS

- A. The provisions of Specification 01300 shall be met.
- B. **Pre-installation:** The following shall be submitted to the Contractor for approval, prior to geomembrane shipment.

1. Origin (resin supplier's name and resin production plant), identification (brand name and number), and production date of resin.
 2. Quality control certificates of conformance shall be issued by the resin supplier to the Subcontractor.
 3. Results of tests conducted by geomembrane manufacturer to verify that resin used to manufacture geomembrane meets specifications in PART 2.
 4. List of materials which comprise geomembrane, expressed in the following categories as percent by weight: polyethylene, carbon black, other additives.
 5. Manufacturer's specification which includes properties contained in PART 2 measured using the appropriate test methods.
 6. Written certification that the geomembrane will meet or exceed the manufacturer's performance specification.
 7. Quality control certificates, signed by a responsible entity employed by geomembrane manufacturer. Each quality control certificate shall include applicable roll identification numbers and results of the quality control tests specified in Article 1.3 of this Specification.
 8. Quality control program procedures manual. The manual shall include signed forms for inspections, repairs, and tests.
 9. Certification that both the installation supervisor for the installer and the master seamer have reviewed the quality control program, the project plans, and this specification.
 10. Proof of installer's qualification to perform this work, including training records or work performance certifications for the superintendent and master seamer.
 11. Scaled panel layout plan(s), including all details required for installation. Panels shall be numbered. Drawings shall be fully dimensioned.
 12. *Installation and repair procedures.*
 13. *Testing laboratory certifications.*
- C. Installation: The following shall be submitted as installation proceeds or within two weeks of the completion of installation, as appropriate.

1. Quality control documentation recorded during installation.
2. Subgrade surface acceptance certificates, signed by Installer or Subcontractor, for each area that will be covered directly by geomembrane.
3. Test results for test seams and field and laboratory destructive tests.
4. Results of non-destructive seam testing.
5. Daily records of seam welding by location, seam type, and welder.
6. Daily records of noncompliance and corrective measures.
7. As-built drawings shall be prepared by the Subcontractor during installation and shall be finalized when installation is complete. Panels shall be identified using agreed-upon (between the Contractor and Subcontractor) nomenclature. Repairs shall be located on as-built drawings.

1.8 WARRANTY

- A. A written warranty shall be obtained from the manufacturer (for material) and the installer/Subcontractor (for workmanship). These documents shall warrant both the quality of the material and workmanship for a 20-year period. Warranty period begins at time of written acceptance by Contractor of materials and workmanship.

1.9 FIELD SAMPLES

- A. Geomembrane sampling shall be done in accordance with this specification.
 1. Conformance Testing (Article 3.1A of this Specification).
 2. Destructive Seam Testing (Article 3.4D of this Specification).

1.10 LABORATORY SAMPLES

- A. Laboratory samples shall be tested by an independent laboratory. The laboratory shall be provided by the subcontractor at his expense.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping:

1. Labels on each roll delivered to site shall identify the following:
 - a. Manufacturer's name
 - b. Product identification
 - c. Production date
 - d. Thickness
 - e. Roll number
 - f. Roll dimensions
2. The geomembrane rolls shall be properly loaded and secured to prevent damage during transit.
3. The geomembrane shall be protected from excessive heat, cold, puncture, cutting, or other damaging or deleterious conditions that could damage the geomembrane.
4. The personnel responsible for loading, transport, and unloading of geomembrane shall be fully aware of the consequences of damage to geomembrane, and familiar with handling and transport constraints imposed by the manufacturer.

B. Acceptance at Site:

1. All geomembrane rolls shall be inventoried and surface inspected for defects and damage upon delivery.
2. Any geomembrane roll that shows signs of damage shall be unrolled and inspected.
3. Damage resulting from handling and transport of geomembranes shall be repaired at no cost to the Contractor. The Contractor may require the replacement of damaged materials at the Subcontractor's expense.

C. Storage and Protection:

1. Contractor will designate an open on-site storage area for geomembrane rolls from time of delivery until installed. Unloading and cribbing shall be provided and performed by the Subcontractor.
2. The Subcontractor shall preserve the integrity and readability of geomembrane roll labels.

1.12 SITE CONDITIONS

A. Geomembrane Deployment:

1. Deployment shall not proceed at an ambient temperature below 32°F or above 104°F unless otherwise authorized, in writing, by the Contractor.
2. Liner shall not be deployed during precipitation, in the presence of excessive moisture (e.g., fog, dew), in areas of ponded water, or in the presence of excessive winds, as determined by the Contractor.
3. Do not undertake deployment if weather conditions will preclude material seaming on the same day.

B. Seaming:

1. Normal Weather Conditions: Normal seaming procedures may take place if the following weather conditions exist:
 - a. Ambient temperature between 32°F and 104°F.
 - b. Dry conditions, i.e., no precipitation or other excessive moisture, such as fog or dew.
 - c. No winds in excess of manufacturer's recommended limit.
2. If deployment and/or seaming during adverse weather has been authorized by the Contractor:
 - a. Seam in accordance with Article 3.3.G.2 if ambient temperature is below 32°F.
 - b. Seam in accordance with Article 3.3.G.3 if ambient temperature is above 104°F.
 - c. Do not seam during precipitation, in the presence of moisture (e.g., fog, dew) in excess of the manufacturer's recommended limit, in an area of ponded water, or in the presence of winds in excess of the manufacturer's recommended limit.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Only HDPE textured geomembranes and resins whose material properties meet specifications shown in Table 1 shall be accepted.

- B. Geomembrane manufactured from non-complying resin shall be rejected.
- C. Resin shall be designed and manufactured specifically for use in geomembranes.
- D. The geomembrane shall have the following characteristics:
 - 1. Contain a maximum of 1 percent by weight of additives, fillers, or extenders (not including carbon black).
 - 2. No striations, pinholes, or bubbles on surface. Free of blisters, undispersed raw materials, or other signs of contamination by foreign matter. The liner edges shall be straight and free of nicks or cuts.

**Table 1
HDPE TEXTURED (BOTH SIDES) GEOMEMBRANE PROPERTIES**

| <u>Property</u> | <u>Qualifier</u> | <u>Unit</u> | <u>Specified Value</u> | <u>Test Method</u> | <u>Testing Frequency*</u> |
|---|------------------|-------------|------------------------|------------------------------------|---------------------------|
| Thickness | minimum avg | mils | 60 | ASTM D5199 | a |
| Thickness | minimum | mils | 54 | ASTM D751* | a |
| Density | minimum | g/cc | 0.940 | ASTM D1505 or ASTM D792 | b |
| Melt index (resin) | range | g/10 min. | 0.1-1.1 | ASTM D1238 (Condition 190/2.16) | b |
| Tensile properties: (each direction) | | | | ASTM D638* | |
| 1. Yield strength | minimum | lb/in | 132 | | c |
| 2. Break strength | minimum | lb/in | 132 | | c |
| 3. Elongation at yield | minimum | % | 12 | | c |
| 4. Elongation at break | minimum | % | 240 | | c |
| Tear strength | minimum | lb/in. | 40 | ASTM D1004 Die C | c |
| Puncture resistance | minimum | lb | 78 | ASTM D4833 | c |
| Carbon black content | range | % | 2.0 to 3.0 | ASTM D1603 | b |
| Carbon black dispersion | rating | N/A | A-1 or A-2 | ASTM D3015 | b |
| Dimensional stability (each direction) | max. change | % | 2.0 | ASTM D1204* | b |
| Environmental stress crack | minimum | hours | 1500 | ASTM D1693* | b |

***Notes for Table 1**

| <u>Property</u> | <u>Test Method</u> | <u>Modifications</u> |
|-------------------------------|--------------------|---|
| Thickness | ASTM D751 | Measure thickness at one foot intervals across width of roll (perpendicular to machine direction) and report average, standard deviation, and lowest individual readings. |
| Tensile Properties | ASTM D638 | Type IV Die. ASTM D638 test specification shall be used. The grip separation shall be 2.5 inches. This test does not require use of extensometers. Rate of grip separation will be 2 inches per minute. A gauge length of 1.3 inches for yield values, and 2.5 inches for break values shall be used to calculate elongation from grip movement. |
| Dimensional Stability | | ASTM D1204 212°F for 15 minutes. |
| Environmental Stress Crack | | ASTM D1693 Use Condition "B" (50°C) with the exception of the following modifications: 1. Use an aqueous solution containing 10% Igepal by volume. 2. The final product shall be tested as produced, regardless of thickness. 3. The notch depth shall be as stated in Condition B, 0.30 to 0.40 mm (0.012 to 0.015 in), for all sheet thicknesses. 4. Cut five specimens with length parallel to machine direction (MD) and five with length parallel to traverse direction (TD). 5. Failure time shall be time in hours to first specimen failure. |

***Legend to "Testing Frequency" Column:**

a = Start of a given material type and/or gauge and once per roll.

b = Once for each gauge produced from 180,000 lb of resin. At least one test of each type required (if quantity is less than 180,000 lb).

c = Start of a given material type and/or gauge. At least one test of each type required.

- E. The geomembrane shall be manufactured to a minimum 15-foot seamless width.
- F. Welding material (extrudate) shall be made of the same resin with the same additives as the geomembrane.
- G. Metal battens or straps and hardware shall be stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. **Conformance Testing:** Upon delivery, conformance samples shall be obtained by the Subcontractor for the geomembrane. Conformance tests consist of thickness, density, and tensile properties. Testing shall be performed in accordance with test methods and testing frequencies outlined in Part 2 PRODUCTS. One or two sets of tests shall be performed for each material type.
- B. **Sampling Procedures:** Rolls to be sampled shall be selected by the Contractor. Samples shall be 3 feet long by the roll width. The machine direction during manufacture shall be marked with an arrow on the sample. The lot and roll number shall be marked. Samples shall be taken at a rate of at least one per lot.
- C. **Test Results:** All conformance test results shall be reviewed and accepted or rejected by the Contractor prior to deployment. If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out of specification and rejected. Alternatively, procedures outlined in an approved quality control program may be taken to bracket the portion of the lot not meeting specification.

3.2 PREPARATION

- A. **Surface Preparation:**
 - 1. The Subcontractor shall be responsible for preparing supporting surface for geomembrane placement. The supporting surface consists of the prepared subgrade and graded surface, followed by the cushion geotextile, then the GCL. Sitework requirements are included in Specification 02200.

2. The surface beneath the geomembrane will be the GCL, which shall be smooth and free of all sharp objects or debris of any description. The supporting surface shall provide a firm, measurable foundation for the materials with no abrupt changes or breaks in grade. No standing water or excessive moisture will be permitted.
3. The Contractor may release the supporting soil in sections. Each section shall be inspected and accepted or rejected with specific deficiencies noted. Once the Subcontractor (i.e., the geomembrane installation subcontractor) accepts a section of the supporting soil, he is responsible for the condition of the surface and shall correct any damage at his own expense.
4. Once the Subcontractor has accepted a section of supporting soil, he shall protect that section from erosion or softening due to precipitation or cracking due to desiccation.
5. Repairs shall be performed by the Subcontractor at Subcontractor's expense to repair supporting soil damage caused by installation activities.
6. The installer shall certify that the surface on which the geomembrane will be installed is acceptable. It shall be the installer's responsibility to indicate to the Contractor any change in its condition due to natural or other causes that may require repair work.

3.3 INSTALLATION

A. Panel Nomenclature:

1. A field panel is defined as a unit of geomembrane which is to be seamed in the field, i.e., a field panel is a roll or a portion of roll cut in the field.
2. Each field panel shall be identified with an identification code (number or letter-number) consistent with Subcontractor's layout plan. This identification code and layout plan shall be agreed upon by the Contractor and the Subcontractor.

B. Protection:

1. No equipment shall be used which damages the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons, or other means.

2. No construction equipment shall be allowed to travel over the textured geomembrane liner unless the liner is adequately protected. Protective measures shall be approved by the Contractor.
3. The underlying subgrade shall be kept clean and free of debris.
4. Personnel shall not be allowed to smoke or wear damaging shoes while working on geomembrane.
5. The panels shall be unrolled in a manner which does not cause excessive stretching, scratches, or crimps in geomembrane and does not damage subgrade.
6. Wind uplift shall be prevented by providing adequate temporary loading and/or anchoring (e.g., sandbags, tires) that does not damage the geomembrane. All materials used to secure the geomembrane shall be removed prior to placing overlying materials.
7. Areas where excessive traffic or abrasion is expected shall be protected with geotextiles, extra geomembrane, or other suitable protective materials.

C. *Field Panel Deployment:*

1. Field panels shall be installed at the locations indicated on the Subcontractor's layout plan, as approved by the Contractor.
2. The amount and orientation of slack in the field panels shall be determined by the installer so that:
 - a. The textured liner will conform to supporting soil surface irregularities without being taut or "bridging" when exposed to the minimum anticipated ambient temperature.
 - b. No large wrinkles capable of being folded over will form when the liner is exposed to the maximum anticipated ambient temperature.

Inadequate or excessive slack, as determined by the Contractor, shall not be permitted.

3. Seriously damaged (torn, twisted, or crimped) field panels, or portions thereof, shall be replaced at no cost to the Contractor. Less serious damage shall be repaired according to Article 3.3.H of this Specification. The Contractor shall determine if material is to be repaired or replaced at no cost to the Contractor.

4. Remove from work area damaged panels or portions of damaged panels which have been rejected. Repairs shall be made using procedures described in Article 3.3.H of this Specification.
5. Do not deploy more geomembrane field panels in one day than can be seamed during that day.

D. Seam Layout:

1. Orient seams parallel to line of maximum slope for geomembranes on slopes steeper than 10 percent.
2. No seam shall be parallel to a toe of slope within 5 feet of the toe of slope.
3. Do not locate seams within 5 feet of excavation grade breaks unless otherwise approved by the Contractor.
4. Within the above constraints, the Subcontractor shall provide a panel layout which maximizes the lengths of field panels and minimizes the number and distance of field seams.

E. Temporary Bonding:

1. Hot air device ("Liester") may be used to temporarily bond geomembrane panels that are to be extrusion welded.
2. Do not damage geomembrane when temporarily bonding adjacent panels. Apply minimum amount of heat to lightly tack geomembrane panels together. Control temperature of hot air at nozzle of any temporary welding apparatus to prevent damage to geomembrane.
3. Do not use solvent or adhesive unless product is approved for use in writing by the Contractor.

F. Seaming Methods: Approved processes for field seaming are extrusion welding and fusion welding. Other methods recommended by the manufacturer may be submitted for approval.

1. Align geomembrane panels to have a nominal overlap of 3 inches for extrusion welding and 5 inches for fusion welding. Provide sufficient overlap to allow peel tests to be performed on seam.
2. Use double fusion welding as primary method of seaming adjacent field panels.

- a. For cross seam tees associated with fusion welding, extrusion weld to a minimum distance of 4 inches on each side of tee.
 - b. Place electric generator on a smooth base such that no damage occurs to geomembrane.
 - c. Place a protective layer, e.g., insulating plate or fabric, beneath hot welding apparatus after usage.
 - d. When subgrade conditions dictate, use a movable protective layer directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between sheets and prevent debris from collecting around pressure rollers.
3. Use conventional extrusion welding as a secondary method for seaming between adjacent panels and as a primary method of welding for detail and repair work.
- a. Purge heat-degraded extrudate from barrel of extruder under the following conditions:
 1. Prior to beginning a seam.
 2. Whenever extruder has been inactive for 2 minutes or more.
 - b. Place electric generator on a smooth base such that no damage occurs to geomembrane.
 - c. Place a smooth insulating plate or fabric beneath hot welding apparatus after usage.
 - d. Use clean and dry welding rods or extrudate pellets.
 - e. Complete grinding process without damaging geomembrane according to manufacturer's instructions within one hour of seaming operation. The depth of grinding shall not exceed 10% of the geomembrane thickness.
 - f. Minimize exposed grinding marks adjacent to an extrusion weld. Do not extend exposed grinding marks more than 1/4 inch from seam area.

G. Seaming Procedures:

1. General Seaming Procedures:

- a. If required, provide a firm substrate by using a flat board, or similar hard surface directly under seam overlap to achieve proper support for seaming apparatus.
- b. Align seams with the fewest possible number of wrinkles and fishmouths.
- c. Provide adequate illumination if seaming operations are carried out at night.
- d. Extend seams to outside edge of panels.
- e. Do not field seam without master seamer being present.
- f. Prior to seaming, ensure that seam area is clean and free of moisture, dust, dirt, debris, or foreign material of any kind.
- g. Cut fishmouths or wrinkles along ridge of wrinkle in order to achieve a flat overlap. Seam the cut fishmouths or wrinkles and patch portions where overlap is inadequate. Use oval or round patch of same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

2. Cold Weather Seaming Procedures: Meet the following conditions, in addition to general seaming procedures, if seaming is conducted when ambient temperature is below 40°F or if temperatures are close to 40°F and wind or other adverse conditions exist.

- a. The Subcontractor shall determine geomembrane surface temperatures at intervals of at least once per 100 feet of seam length to determine if preheating or other protective measures are required. For extrusion welding, preheating is required if surface temperature of geomembrane is below 40°F.
- b. Preheating may be waived by the Contractor based on recommendation from the Subcontractor, if demonstrated to the Contractor's satisfaction that welds of equivalent quality may be obtained without preheating at the expected temperature of installation.

- c. If preheating is required, the Subcontractor shall inspect all areas of geomembrane that have been preheated by a hot air device prior to seaming, to ensure that they have not been overheated.
 - d. The Subcontractor shall confirm that surface temperatures are not lowered below minimum surface temperatures specified for welding due to winds or other adverse conditions. It may be necessary to provide wind protection for seam area.
 - e. Preheating devices used shall be pre-approved by the Contractor prior to use.
 - f. Additional destructive seam tests (as described in Article 3.4D of this Specification) shall be taken at an interval between 250 feet and 500 feet of seam length, at the Contractor discretion.
 - g. Sheet grinding may be performed before preheating, if applicable.
 - h. Trial seaming, as described in Article 3.4B of this Specification, shall be conducted under the same ambient temperature and preheating conditions as the actual seams. New trial seams shall be conducted if ambient temperature drops by more than 5°F from initial trial seam test conditions.
3. Warm Weather Seaming Procedures: Meet the following conditions, in addition to general seaming procedures, if seaming is conducted when ambient temperature is above 104°F.
- a. At ambient temperatures above 104°F, no seaming of geomembrane shall be permitted unless demonstrated to the Contractor satisfaction that geomembrane seam quality will not be compromised.
 - b. Trial seaming (as described in Article 3.4B) shall be conducted under the same ambient temperature conditions as the actual seams.
 - c. At the option of the Contractor additional destructive seam tests (as described in Article 3.4D) may be required for any suspect areas.

H. Repair Procedures:

- 1. Repair portions of geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, or damaged by wrinkle creases.
- 2. Final decision as to appropriate repair procedure shall be made by the Contractor based on Subcontractor input.

3. Available repair procedures include the following:
 - a. Patching: A piece of geomembrane extrusion welded into place. Use to repair large holes, tears, undispersed raw materials, and contamination by foreign matter.
 - b. Spot Welding or Seaming: A bead of molten extrudate placed on flaw. Use to repair small tears, pinholes, or other minor, localized flaws.
 - c. Capping: A strip of geomembrane extrusion welded into place over an inadequate seam. Use to repair large lengths of failed seams.
 - d. Extrusion Welding the Flap: A bead of molten extrudate placed on exposed flap of fusion weld. Use to repair areas of inadequate fusion seams, which have an exposed edge. Repairs of this type shall be approved by the Contractor and shall not exceed 50 feet in length.
 - e. Removal and Replacement: Remove bad seam and replace with a strip of new material welded into place. Use to repair large lengths of failed seams.
 4. For any repair method, satisfy the following:
 - a. Grind surfaces of geomembrane which are to be repaired using extrusion methods, no more than one hour prior to repair.
 - b. Ensure surfaces are clean and dry at time of repair.
 - c. Extend patches or caps at least 6 inches beyond edge of defect. Round corners of patches with a radius of approximately 3 inches.
 5. Do not place overlying layers over locations which have been repaired until appropriate passing nondestructive and laboratory test results are obtained.
- I. Trenches:
1. Excavate trenches, unless otherwise specified, to lines and grades shown prior to geomembrane placement.
 2. Rounded corners shall be provided in trenches to avoid sharp bends in geomembrane.

3. If trench is excavated in clay material susceptible to desiccation, the amount of trench open at any time should be minimized.
4. After Subcontractor prepares the subgrade, ensure loose soil does not underlie geomembrane in trench.

3.4 FIELD QUALITY CONTROL

A. Visual Inspection:

1. All seam and non-seam areas of geomembrane shall be examined for identification of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.
2. Clean geomembrane surfaces if the Contractor determines that the amount of dust or mud inhibits examination.
3. Nondestructively test each suspect location in seam and non-seam areas using methods described in Article 3.4C of this Specification as appropriate.

B. Trial Seams:

1. Make trial seams on pieces of textured geomembrane liner to verify that conditions are adequate for production seaming.
2. Make trial seams at beginning of each seaming period whenever the welding apparatus has been turned off for more than 5 minutes, and at least *once each five hours, for each production seaming apparatus/operator combination used that day*. A trial seam shall also be done at the end of the day's work. Each seamer shall make at least one trial seam each day.
3. Make trial seams under same conditions as actual seams.
4. *Make trial seams only under observation of the Contractor.*
5. Overlap seams of geomembrane pieces shall be as indicated in Article 3.3F of this Specification.
6. Make trial seam sample at least 5 feet long by 1 foot wide (after seaming) with seam centered lengthwise.
7. Cut two specimens from sample with a 1-inch-wide die perpendicular to the seam. These specimen locations shall be taken along the trial seam

sample by the Subcontractor at locations determined by the Contractor. Test specimens will be peeled using a field tensiometer provided by the subcontractor. The tensiometer shall be capable of maintaining a constant jaw separation rate of two inches per minute. Specimens should not fail in the seam as described in Article 3.4D.5 of this Specification.

8. If a specimen fails, the entire trial seam operation shall be repeated. If the second trial seam fails, do not use seaming apparatus and seamer in production seaming until the deficiencies are corrected and two consecutive successful trial welds are achieved.
9. Cut remainder of successful trial seam into three pieces; two to be retained in the Contractor's archives and one to be retained by Subcontractor for possible laboratory testing. If required by the Contractor, remaining portion of trial seam sample can be subjected to destructive testing as indicated in Article 3.4D of this Specification.

C. Nondestructive Seam Testing:

1. General:
 - a. The purpose of nondestructive tests is to check the integrity of the seams. It does not provide quantitative information on seam strength.
 - b. Nondestructively test all field seams over their full length using a vacuum test unit, or air pressure (for double fusion seams only).
 - c. Perform nondestructive testing as seaming work progresses.
2. Vacuum Testing: Use the following procedures:
 - a. Energize vacuum pump and reduce tank pressure to approximately 5 psi (10 in.Hg) gauge pressure.
 - b. Wet strip of geomembrane approximately 12 inches by 48 inches with soapy solution.
 - c. Place box over wetted area.
 - d. Close bleed valve and open vacuum valve.
 - e. Ensure that a leak-tight seal is created.

- f. For a period of not less than 10 seconds, apply vacuum and examine geomembrane through viewing window for presence of soap bubbles.
 - g. If no bubbles appear within 10 seconds, close vacuum valve and open bleed valve, move box over to next adjoining area with a minimum 3-inch overlap and repeat process.
 - h. Mark and repair areas where soap bubbles appear in accordance with Article 3.3H of this Specification.
3. Air Pressure Testing (for Double Fusion Seam Only): Use the following procedures:
- a. Temporarily seal both ends of seam to be tested using locking pliers or other similar devices.
 - b. Insert needle or other approved pressure feed device into air channel created by fusion weld.
 - c. Place a protective layer between air pump and geomembrane.
 - d. Pressurize air channel to a pressure of approximately 30 psi. Close valve and allow pressure to stabilize for approximately 2 minutes. Ensure after 2-minute stabilization period, the pressure is between 30 psi and 35 psi.
 - e. Observe the air pressure 5 minutes after the initial 2-minute stabilization period ends. If pressure loss exceeds 3 psi or the pressure does not stabilize, locate faulty area and repair in accordance with Article 3.3H.
 - f. Cut opposite end of tested seam area once testing is completed to verify continuity of the air channel. If air does not escape, locate blockage and retest unpressurized area. Repair cut end of air channel in accordance with Article 3.3H of this Specification.
 - g. Remove needle or other approved pressure feed device and seal hole in geomembrane.
4. Inaccessible Seams:
- a. Cap-strip seams that cannot be nondestructively tested.
 - b. Cap-strip material shall be composed of the same type and thickness geomembrane as the geomembrane to be capped.

D. Destructive Seam Testing:

1. General:

- a. The purpose of destructive seam testing is to evaluate seam strength.
- b. Perform destructive seam tests as seaming progresses, not at the completion of all field work.
- c. A failed destructive seam sample shall result if grips of testing machine cannot be closed on sample test flap due to excessive temporary welding.

2. Location and Frequency:

- a. A minimum frequency of one test location per 500 feet of seam length for each seam type performed by each welder, or at least one per day if 500 feet is not seamed in one day. This minimum frequency is to be determined as an average taken throughout the entire facility.
- b. Test locations shall be determined during seaming, at the Contractor's discretion.
- c. Subcontractor will not be informed in advance of the locations where seam samples will be taken.
- d. The Contractor reserves the right to increase the frequency of testing in accordance with performance results of samples previously tested.

3. Sampling Procedures:

- a. Cut samples at locations chosen by the Contractor.
- b. The Subcontractor shall number each sample and record sample number and location on the panel layout drawing.
- c. Repair holes in geomembrane resulting from destructive seam sampling immediately in accordance with repair procedures described in Article 3.3H of this Specification.
- d. Nondestructively test continuity of new seams in the repaired area according to Article 3.4C of this Specification.

4. Sample Dimensions: Take the following two types of samples at each sampling location:

- a. Take two samples for field testing. Cut each of these samples with a 1 inch wide die perpendicular to the seam, with the seam centered parallel to width. The distance between these two samples shall be 42 inches. If both samples pass the field test described in Article 3.4D.5 of this Specification, take a sample for laboratory testing as described in Article 3.4D.4.b. below.
- b. The sample for laboratory testing shall be located between the samples cut for field testing. Cut samples for laboratory testing 12 inches wide by 42 inches long with seam centered lengthwise. Cut this sample into three parts. The Subcontractor shall distribute the parts as follows:
 - 1) One portion to Subcontractor for optional laboratory testing, 12 inches by 12 inches.
 - 2) Two portions to the Contractor for archive storage, 12 inches by 12 inches.
- c. Final determination of sample sizes shall be agreed upon at the pre-construction meeting.

5. Field Testing:

- a. Test the two 1-inch-wide strips described in Article 3.4D.4 for peel strength. Use a tensiometer as described in Article 3.4D 5b. below to conduct these tests. The value at failure shall exceed the criteria in Table 2.
- b. Use a tensiometer capable of maintaining a constant jaw separation rate of two inches per minute.
- c. Test field samples only under the Contractor's observation.

**Table 2
HDPE SEAM PROPERTIES**

| <u>Property</u> | <u>Qualifier</u> | <u>Unit</u> | <u>Required Value</u> | <u>Test Method</u> |
|----------------------|------------------|-------------|-----------------------|--------------------|
| Thickness | minimum avg | mils | 60 | |
| Bonded seam strength | minimum | lb/in | 120 | ASTM D4437* |
| Peel adhesion: | | | | |
| Fusion | minimum | lb/in | 90 | ASTM D4437* |
| Extrusion | minimum | lb/in | 78 | ASTM D4437* |

***Notes for Table 2**

| <u>Property</u> | <u>Test Method</u> | <u>Modifications</u> |
|----------------------|--------------------|--|
| Bonded seam strength | ASTM D4437 | For shear tests, sheet shall yield before failure of the seam. For peel adhesion, seam separation shall not extend more than 10% into seam. For either test, testing shall be discontinued when the sample has visually yielded. |

- d. If field sample passes in accordance with this Specification, the seam qualifies for laboratory testing.
 - e. If any field test sample fails to pass, then follow procedures outlined in Article 3.4D.6.
 - f. Final judgment regarding seam acceptability, based on failure criteria in these specifications, rests with the Contractor.
6. Destructive Test Failure Procedures: Apply following procedures when a sample fails destructive testing using a field tensiometer. Testing shall be done by Subcontractor only in the presence of the Contractor.
- a. Subcontractor has following options:
 - 1) Repair seam between any two passing destructive test locations.
 - 2) Trace welding path to an intermediate point (at least 10 feet from point of failed test in each direction) and take a small sample with a 1-inch-wide die for an additional field test at each location. If these additional samples pass the test, take full laboratory samples. If these laboratory samples pass the tests, repair seam between these locations. If either sample fails, repeat process to establish zone in which seam should be repaired.

- b. Acceptable repaired seams shall be bound by two locations from which samples passing laboratory destructive tests have been taken. Passing laboratory destructive tests as described in Article 3.4D, may be used as the boundaries of the failing seam. In cases exceeding 150 feet of repaired seam, a sample taken from the zone in which the seam has been repaired shall pass destructive testing. Make repairs in accordance with Article 3.3H.
- c. When a sample fails, the Contractor may require additional testing of seams that were welded by the same welder and/or welding apparatus during the same time shift

E. Repair Verification:

1. The Subcontractor shall number and log each repair.
2. Nondestructively test each repair using methods described in Article 3.4C as appropriate.
3. Passing nondestructive test results indicate an adequate repair.
4. Repairs more than 150 feet long require destructive test sampling, in accordance with Article 3.4D of this Specification.
5. Failed destructive or nondestructive tests indicate that the repair shall be redone and retested until a passing test results.

F. Large Wrinkles: Wrinkles are considered to be large when geomembrane can be folded over onto itself when ambient temperatures are lowest during installation period.

1. When seaming of the textured geomembrane liner is completed, and prior to placing overlying materials, the Subcontractor shall identify all large wrinkles.
2. Cut and reseam all large wrinkles identified. Test seam produced while repairing large wrinkles in accordance with Article 3.4C.
3. Repair large wrinkles during coldest part of the installation period.

3.5 PROTECTION

- A. The installer shall meet with the Subcontractor and any other parties performing work that may affect the integrity of the geomembrane and present instructions relating to the maintenance and protection of the geomembrane.

- B. The installer shall place sufficient sandbags to prevent damage by wind such as wrinkling.

3.6 ACCEPTANCE

- A. The installer shall retain all ownership and responsibility for the geomembrane until acceptance by the Contractor. The textured geomembrane liner will be accepted by the Contractor when all of the following conditions are met:
 1. Installation is finished.
 2. Verification of the adequacy of all field seams and repairs, including associated testing, is complete.
 3. QA/QC documented acceptance including all deficiencies repaired, accepted and closed out shall be maintained throughout construction and submitted to the Contractor.
 4. Certification, including "as-built" drawings, is provided by the installer to the Contractor.
 5. Receipt of warranty.

END OF SECTION

SECTION 02253
GEOSYNTHETIC CLAY LINER
NSWC CRANE
DYE BURIAL CAP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes the requirements for selection, installation, and protection of geosynthetic clay liner (GCL).

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 02200 - Site Work
- C. Section 02249 - Geotextiles

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Use the latest revision date available unless otherwise indicated.

- B. American Society for Testing and Materials (ASTM)

ASTM D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembrane, and Related Products.

ASTM D4595, Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

ASTM D5084, Measurement of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Permeameter.

1.4 SUBMITTALS

- A. Pre-installation: Submit the following to the Contractor for approval, prior to GCL deployment.

1. Origin (bentonite supplier's name and location of mine and location of processing facility) of bentonite.
 2. Origin (resin supplier's name and resin production plant) and identification (brand name and number) of resin used to manufacture each geotextile.
 3. Results of tests conducted by GCL manufacturer to verify that quality of bentonite used to manufacture GCL meets manufacturer's bentonite specifications.
 4. Results of tests conducted by GCL or geotextile manufacturer to verify that geotextiles used to manufacture GCL meet the GCL manufacturer's geotextile specifications.
 5. Manufacturer's specification for GCL which includes properties contained in Table 1.
 6. Written certification that the minimum average roll values given the manufacturer's specification are guaranteed by the GCL manufacturer.
 7. Written certification that GCL manufacturer has continuously inspected GCL for the presence of needles and found GCL to be needle-free.
 8. Quality control certificates signed by a responsible entity of the GCL manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for tests and corresponding methods specified in Table 1.
 9. Written certification that the Montmorillonite content of the sodium bentonite is typically at least 90% when tested using x-ray diffraction.
- A. Installation: Submit the following as installation proceeds: Subgrade surface acceptance, signed by the Installer for each area that will be covered directly by GCL.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping:

1. GCL shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.
2. GCL rolls shall be marked or tagged with the following information:
 - a. Manufacturer's name

- b. Product identification
 - c. Roll number
 - d. Roll dimensions
 - e. Roll weight
 - 3. Do not damage the rolls during unloading or handling.
- B. Storage and Protection:**
- 1. After Subcontractor mobilization, store and protect GCL from dirt, water, ultraviolet light exposure, and other sources of damage.
 - 2. Preserve integrity and readability of GCL roll labels.
 - 3. Store the rolls off the ground on pallets in their original, unopened cover.
 - 4. Place a heavy, protective waterproof tarpaulin over the packaged rolls.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide GCL capable of retaining its structure during handling, placement, and long-term service.
- B. GCL provided shall be a stock product, i.e., except when specifically authorized in writing by the Contractor. The supplier shall not furnish products specifically manufactured to meet specifications of this project.
- C. The outer layers of the GCL shall consist of woven or non-woven geotextiles.
- D. The primary constituent of the GCL shall be sodium bentonite, placed on the carrier layer geotextile at a minimum rate of 1 pound per square foot.
- E. Each roll shall be marked with a continuous "match line" at each edge to ensure minimum recommended overlap is maintained during installation.
- F. Bright lighting shall be placed behind the GCL prior to roll up to ensure consistency of the bentonite layer within the GCL.
- G. Needle detecting devices will be present prior to roll up to ensure no broken needles are present in the final product.

2.2 SOURCE QUALITY CONTROL

- A. Ensure that GCL manufacturer meets conditions in this Section.
- B. Tests, Inspection:
1. GCL shall be tested by manufacturer to evaluate characteristics for quality control. Samples not satisfying specifications shall result in rejection of applicable rolls. At a minimum, the following tests shall be performed for quality control with test methods specified in Table 1.
 - a. Hydraulic conductivity
 - b. Puncture
 - c. Wide-width tensile strength
 2. At GCL manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify noncomplying rolls and to qualify individual rolls.
 3. GCL manufacturer shall perform quality control tests for at least every 40,000 ft² of GCL produced.
 4. Results of tests and inspections shall be documented and submitted to the Contractor.

**Table 1
GCL Properties**

| <u>Property</u> | <u>Qualifier</u> | <u>Value</u> | <u>Test Method</u> |
|---|------------------|---------------------------|--------------------|
| Hydraulic conductivity @ 2 psi confining pressure | Maximum | 1 x 10 ⁻⁸ cm/s | ASTM D5084 |
| Tensile strength | Minimum | 70 lb/in | ASTM D4595 |

PART 3 EXECUTION

3.1 EXAMINATION

- A. Subcontractor shall collect samples of GCL to be installed and provide certified conformance testing documentation.

3.2 SUBGRADE PREPARATION

- A. The subgrade shall meet the density requirement contained in Section 02200.
- B. Ensure that rutting or raveling is not caused by installation equipment (i.e., proofroll).
- C. Ensure a surface free of debris, roots, or stones larger than 3/8 inch.
- D. Prior to deployment, ensure that the subgrade has been rolled to provide smooth, firm surface.

3.3 INSTALLATION

- A. GCL Deployment: Handle GCL in a manner to ensure it is not damaged. Comply with the following:
 - 1. On slopes, anchor GCL securely and deploy it down the slope in a controlled manner to continually keep GCL in tension.
 - 2. Weight GCL with sandbags or equivalent in the presence of wind.
 - 3. Cut GCL with a geotextile cutter (hook blade), scissors, or other approved device. Protect adjacent materials from potential damage due to cutting of GCL.
 - 4. Prevent damage to underlying layers during placement of GCL.
 - 5. During GCL deployment, do not entrap in or beneath GCL, stones, trash, or moisture that could damage GCL.
 - 6. Visually examine entire GCL surface. Ensure no potentially harmful foreign objects, such as needles, are present.
 - 7. Do not place GCL in the rain or at times of impending rain.
 - 8. Do not place GCL in areas of ponded water.
 - 9. Replace GCL that is hydrated before placement of overlying geomembrane.
 - 10. In general, only deploy GCL that can be covered during that day by geomembrane, and will not be affected or potentially hydrated by water from surface drainage.

11. For nonwoven, needle punched GCL's, face the nonwoven carrier geotextile against the geotextile cushion layer.
12. Face the woven carrier geotextile against geomembrane.
13. On side slopes, run GCL to the bottom of the slope as indicated.
14. Minimize dragging of GCL panels.

B. Overlaps:

1. On slopes, overlap GCL to the manufacturer's match line.
2. In general, no horizontal seams are allowed on side slopes.
3. Apply bentonite to overlapped area at a rate required by the manufacturer.

C. Defects and Repairs:

1. Repair all flaws or damaged areas by placing a patch of the same material extending at least 1 foot beyond the flaw or damaged area.
2. Add powdered sodium bentonite to the overlapped edges of the patch at a rate of 1/4 lb per linear foot or as otherwise recommended by the manufacturer.

D. Interface with Other Products: Ensure the following when deploying overlying material.

1. GCL and underlying materials are not damaged.
2. Minimal slippage of GCL on underlying layers occurs.
3. No excess tensile stresses occur in GCL.
4. If necessary, approved adhesives can be used to keep overlap seams and patches in place during placement of overlying materials.

END OF SECTION

SECTION 02255
EROSION MAT
NSWC CRANE
DYE BURIAL CAP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes the requirements for furnishing and installing erosion mat.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 02200 - Site Work
- C. Section 02936 - Seeding

1.3 SUBMITTALS

- A. Pre-installation:
 - 1. Manufacturer's specification for the erosion mat which includes the properties outlined in Part 2, Products.
 - 2. Written certification that the roll values given in the manufacturer's specification are guaranteed by the manufacturer for at least 1 year.
 - 3. Manufacturer's instructions for installation.
 - 4. Sample material.
- B. Installation: Subgrade surface acceptance certificate, signed by the installer, for each area that will be directly covered by erosion mat.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping:

1. Erosion mats or blankets shall be supplied in rolls wrapped in relatively impermeable protective covers.
2. Erosion mat rolls shall be marked or tagged with the following information:
 - a. Manufacturer's name
 - b. Product identification
 - c. Roll number
 - d. Roll dimensions

B. Storage and Protection:

1. The Subcontractor will provide an open on-site storage area for erosion mat rolls from time of delivery until installed.
2. The Subcontractor shall store and protect erosion mats from dirt, water, and other sources of damage.
3. The Subcontractor shall preserve integrity and readability of erosion mat roll labels.

PART 2 PRODUCTS

2.1 MATERIALS

A. Erosion mat shall meet the following requirements:

1. Suitable for installation on 1H:1V slopes and for slope lengths up to 30 feet.
2. Completely degradable within 3 years.
3. Constructed of natural fibers, weed-free, and suitable for underseeding.
4. Reinforced with netting, machine produced, and manufactured as rolls with a minimum weight of 0.5 lbs/s.y.
5. Mat shall be a material suitable for control of long term erosion, such as North American Green SC 150, or other approved material.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ensure surface upon which erosion mat will be placed is smooth and free of trash and debris.
- B. Seed and fertilize the subgrade in accordance with Section 02936.

3.2 INSTALLATION

- A. Slopes: Place erosion mat on all cut or fill surfaces to be permanently seeded with slopes steeper than 4H:1V.
- B. Ditches: Place erosion mat in all ditch areas to be permanently seeded. Erosion mat shall be applied in the direction of water flow and as required by the manufacturer. When using two or more mats side-by-side, do not place seams formed by edges of adjoining blankets directly in the middle of ditch inverts.
- C. Staking: Stake erosion mat to the subgrade at a spacing interval and pattern recommended by the manufacturer using wooden pegs. Butt ends and edges snugly together and stake in place. Use a common row of stakes at seams formed by adjoining mats. Stakes shall meet the manufacturer's specifications for wooden pegs.
- D. Place erosion mat as soon as possible after seeding.

3.3 PROTECTION

- A. Maintain and repair erosion mat as necessary through the end of construction.

3.4 QUALITY CONTROL

- A. Verify and document acceptance of mat installation and submit documentation to the Contractor.
- B. Verify and document deficiencies repaired, accepted and closed out and submit documentation to the Contractor.

END OF SECTION

SECTION 02936

SEEDING

NSWC CRANE DYE BURIAL GROUND

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Seeding, mulching, and fertilizing.
- B. Maintenance.

1.2 RELATED SECTIONS

- A. Section 01010 - Statement of Work
- B. Section 01300 - Submittals
- C. Section 02200 - Site Work
- D. Section 02255 - Erosion Mat

1.3 DEFINITIONS

- A. Weeds: As defined by Indiana Seed Law and Federal Seed Act.
- B. Seed: All seeds used shall be measured on the basis of pure live seed (PLS). The quantity of PLS shall be the product of the viable germination rate times the percent purity.
- C. Stand of Turf: 95 percent ground cover of the seeded species.
- D. Topsoil: Fertile, agricultural soil, typical for this locality, capable of sustaining vigorous plant growth.

1.4 SUBMITTALS

- A. Documentation of seed mixture and composition, fertilizer chemical composition, calculations showing computations for rates and application of seed, fertilizer and mulch, manufacturer's name and indication of

conformance to state and federal laws shall be submitted by Subcontractor for approval 14 days before use.

- B. Material Safety Data Sheets (MSDS) shall accompany all chemical compounds and be reviewed per the Special Conditions.

1.5 REGULATORY REQUIREMENTS

- A. Subcontractor shall comply with regulatory agencies for fertilizer composition.
- B. Federal Seed Act including all current revisions, Rules and Regulations of Secretary of Agriculture, January 1985 (DOA FSA).

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Subcontractor shall protect seed from moisture and from contamination during delivery, on-site storage, and handling. Seed that has become wet or moldy, or otherwise damaged, is not acceptable.
- B. Subcontractor shall deliver seed mixture in sealed packages, bearing the producer's guaranteed analysis for PLS, percentages for mixtures, purity, germination, weed seed content, and inert material.
- C. Subcontractor shall deliver fertilizer to the site in original, unopened containers bearing the manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer may be furnished in bulk with a certificate indicating the above information. Containers shall be marked and labeled per 29 CFR 1910.1200.
- D. Subcontractor shall store seed and fertilizer in a cool dry location away from contaminants.
- E. Subcontractor shall protect mulch from rain and other sources of moisture.

PART 2 PRODUCTS

2.1 SEED SUPPLIERS

- A. Not used.

2.2 SEED

- A. Classification: The seed shall be in compliance with Indiana Seed Law consisting of the latest season's crop. Field mixes will be acceptable when the field mix is performed on site in the presence of the Contractor.
- B. Composition: Seed shall consist of a mixture of the following grasses: Kentucky 31 fescue, perennial rye, and Kentucky bluegrass. The mixture shall consist of 50 pounds per acre Kentucky 31 fescue, 35 pounds per acre perennial rye, and 25 pounds per acre Kentucky bluegrass for a total of 110 pounds of seed per acre. All weights shall be on the basis of PLS.
- C. Components: The pure seed comprising the seed mixture shall have following properties:

| Seed | Minimum percent pure seed | Minimum percent germination and hard seed | Maximum percent weed seed |
|--------------------|---------------------------|---|---------------------------|
| Kentucky 31 fescue | 98 | 85 | 0.75 |
| Perennial rye | 95 | 90 | 0.5 |
| Kentucky bluegrass | 85 | 80 | 0.5 |

2.3 TOPSOIL AND TOPSOIL COVER LAYER

- A. The topsoil cover layer for the cap is constructed to a minimum 27-inch compacted thickness as described in Specifications 01010 and 02200, and the construction drawings. The lower portion of this layer (approximately 2 feet) is constructed with materials from the approved borrow source, and from any clean soil excavated from the drainage/anchor trench. The upper few inches of this layer consist of imported topsoil having at least 5 percent organics obtained from an approved topsoil source.
- B. Other portions of the site besides the cap area that were disturbed during construction may also require application of topsoil that is stockpiled during initial stripping.

2.4 ACCESSORIES

- A. Fertilizer: FS O-F-241, Type I, Class 2, free flowing, uniform in composition with nitrogen-phosphorus potash ratio of 12 percent Nitrogen, 12 percent phosphorus, and 12 percent soluble potash. Material Safety Data Sheets shall be provided to the contractor for all fertilizer.
- B. Water shall be suitable for irrigation and free of substances or matter that could inhibit vigorous growth of grass.

- C. Mulch shall consist of cereal straw of oats, rye, wheat, or barley from the latest season's crop. The straw shall be of an air dry condition and of proper consistency for placing with commercial mulch blowing equipment. Mulch shall be free from noxious weeds, mold, and other deleterious materials. If cereal straw is not available, hay from the species being seeded may be used.
- D. Erosion control materials shall be per Section 02255.

PART 3 EXECUTION

3.1 PLACING TOPSOIL

- A. Subcontractor shall place the topsoil cover layer as specified in Specification 02200 - Site Work.
- B. Subcontractor shall place topsoil in other areas besides the cap footprint that are disturbed during construction and where seeding is required to a nominal depth of 3 inches.
- C. Subcontractor shall place topsoil during dry weather. Topsoil shall not be placed when it is saturated or frozen.
- D. Subcontractor shall fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- E. Subcontractor shall remove roots, weeds, rocks, and foreign material while spreading.
- F. Subcontractor shall manually spread topsoil (except for topsoil cover layer) close to plant life to prevent damage.
- G. Subcontractor shall scarify the upper 3 to 4 inches of the previously compacted topsoil cover layer.
- H. Subcontractor shall lightly compact or roll placed and/or scarified topsoil.
- I. Subcontractor shall leave stockpile area and site clean and raked, ready to receive seeding and mulch.

3.2 FERTILIZING

- A. Subcontractor shall review the Material Safety Data Sheets (MSDS) and determine the necessary precautions and controls for safe application.

- B. Subcontractor shall apply fertilizer according to manufacturers' instructions at the rate specified.
- C. Subcontractor shall incorporate and thoroughly mix fertilizer into the soil to a minimum depth of two inches and a maximum depth of four inches.
- D. Subcontractor shall lightly water to aid the dissipation of fertilizer.

3.3 SEEDING

- A. Immediately before seeding, Subcontractor shall restore soil to the proper grade. Do not seed when the ground is muddy, frozen, snow covered, or in an unsatisfactory condition for seeding. Do not apply seed in excessive winds. If special conditions exist that may warrant a variance in the above seeding conditions, submit a written request to the Contractor stating the special conditions and proposed variance.
- B. Subcontractor shall apply seed within 24 hours after seedbed preparation. Apply at the rate of 110 pounds per acre evenly in two intersecting directions. Sow one-half the seed in one direction, and sow the remainder at the right angle to the first sowing. Cover the seed to a depth of $\frac{1}{4}$ to $\frac{1}{2}$ inch by means of spike-tooth harrow, cultipacker, or other approved device.
- C. Subcontractor shall not seed areas more than that which can be mulched on the same day.
- D. Planting Season: Subcontractor shall sow seeds from February 1 to May 1 for spring planting and from August 5 to November 30 for fall planting.
- E. Subcontractor shall roll seeded area with a roller not exceeding 90 pounds for each foot of roller width. If seeding is done with a cultipack-type seeder or by hydroseeding, rolling may be eliminated.
- F. Immediately following seeding and compacting, Subcontractor shall apply the mulch evenly at a rate of 2 tons per acre. Subcontractor shall anchor by crimping mulch with a disc-type roller having flat serrated discs spaced not more than 10 inches apart, with cleaning scrapers.
- G. On slope steeper than 4H:1V, Subcontractor shall apply erosion mat as detailed in Section 02255.
- H. Subcontractor shall apply water with a fine spray to a depth of 1 inch immediately after each area has been mulched and matted. Area shall be watered weekly with a fine spray to a depth of 1 inch if natural precipitation is lacking.

3.4 SEED PROTECTION

- A. Subcontractor shall implement erosion control methods for topsoil and seeded areas such as hay bales and storm water runoff diversion. Subcontractor shall provide maintenance of erosion control measures until growth of grasses is sufficient to prevent future erosion.

3.5 MAINTENANCE OF STAND

- A. Subcontractor shall maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 4 QUALITY CONTROL

4.1 QUALITY ASSURANCE

- A. Subcontractor shall provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Subcontractor shall provide fertilizer in containers showing manufacturer's name, type, grade, nutrient proportions, year of production, net weight, date, and location of packaging.
- C. Final inspection will be made upon written request from the subcontractor at least 10 days before the last day of the turf establishment period. Final acceptance will be based upon a satisfactory stand of turf. Areas that do not have a satisfactory stand of turf shall be replanted at the subcontractor's expense.
- D. Contractor shall provide Quality Control field inspections as documented in the Quality Control Plan.

END OF SECTION

APPENDIX D

FIELD INSPECTION CHECKLISTS

**MORRISON KNUDSEN CORPORATION**

Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title

**SITE PREPARATORY WORK
Dye Burial Ground**

Checklist Number

DBP-01

Revision Date

NOV 95

Checklist

Page 1 of 1**ITEM
NO.****ITEM CHECKED****Accept/
Reject****REMARKS****VERIFIED
BY/
DATE****PREPARATORY INSPECTION**

1

Conduct preparatory phase meeting prior to initiating work items for site clearing, stripping, and cutting.

2

Verify submittals required by Vendor Data Schedule have been approved and signed.

3

Conduct on-ground examination of areas to be cleared and identify items or existing features, including plant life, to be undisturbed and protected. Resolve discrepancies prior to commencement of work.

4

Ensure that a Decontamination Plan has been developed and approved.

5

Verify that a review of Safety requirements is performed as a part of the preparatory inspection.

INITIAL PHASE CONTROL

1

Protection of items not to be removed or disturbed has been provided, as necessary.

2

Verify that dust control measures are available and effective.

3

Verify run-on/run-off controls are ready to implement.

4

Confirm work areas have been located with the limits of work clearly established (stakes, lines, monuments).

ADDITIONAL NOTES OR COMMENTS

Specific Item Identification or Location, as applicable:

Morrison Knudsen Project

NSWC - Crane, Indiana

Delivery Order Number

0009, Statement of Work #007

Checklist Title

SITE PREPARATORY WORK,
Dye Burial Ground DBP-01

PAGE 1 OF 1



Checklist Title

SITE PREPARATORY WORK
Dye Burial Ground

Checklist Number

DBP-02

Revision Date

NOV 95

Checklist

Page 1 of 1

| ITEM NO. | ITEM CHECKED | Accept/ Reject | REMARKS | VERIFIED BY/ DATE |
|--------------------------------|---|-------------------|---------|----------------------|
| FOLLOW-UP PHASE CONTROL | | | | |
| 1 | Verify ground surface vegetation indicated for removal, has been close cut to the ground, and clippings removed from construction limits. | | | |
| 2 | Verify grubbing to remove stumps, roots, debris, or other deleterious materials not suitable for reuse. | | | |
| 3 | Verify final removal and disposal of cleared and grubbed wastes in an approved manner. | | | |
| 4 | Verify stripping of topsoil and stockpiled for final restoration of the site around the Dye Burial Cap. | | | |
| 5 | Verify removal of excessive grass and other vegetation from topsoil. | | | |
| 6 | Verify topsoil around the trenches are stockpiled and protected from erosion hazards. | | | |
| 7 | Verify standing (ponded) water within the construction area has been properly removed prior to work activities. | | | |
| 8 | Verify that materials are properly stockpiled and protected from erosion during the grading activities. | | | |
| 9 | Verify the required grades and dimensions of the completed site preparation by survey. | | | |
| 10 | Verify that trenches are not disturbed during site preparatory work. | | | |
| 11 | Note exposed contaminated materials during grading activities for the possibilities of equipment/personnel contamination. | | | |
| 12 | Verify completion of the site clearing activities is complete and in accordance with the approved work plan and specifications. | | | |
| 13 | See that corrective measures have been performed, verified, and documented if applicable. | | | |

ADDITIONAL NOTES OR COMMENTS

Specific Item Identification or Location, as applicable:

| | | | |
|---|---|---|-------------|
| Morrison Knudsen Project NSWC - Crane, Indiana | Delivery Order Number 0009, Statement of Work #007 | Checklist Title SITE PREPARATORY WORK, Dye Burial Ground DBP-02 | PAGE 1 OF 1 |
|---|---|---|-------------|



| | | | |
|---|------------------|----------------|--------------------|
| Checklist Title | Checklist Number | Revision Date | Checklist |
| RUN ON/RUN OFF CONTROL Dye Burial Ground | DBRR-01 | Nov. 95 | Page 1 of 1 |

| ITEM NO. | ITEM CHECKED | Accept/Reject | REMARKS | VERIFIED BY/DATE |
|----------|--------------|---------------|---------|------------------|
|----------|--------------|---------------|---------|------------------|

Preparatory Inspection

| | | | | |
|---|--|--|--|--|
| 1 | Schedule preparatory phase meeting to ensure run on/run off control measures are understood and effective. | | | |
| 2 | Ensure that a Run on/Run off Control Plan has been developed and approved by the Project Manager. | | | |
| 3 | Review work areas requiring either permanent or temporary protection from water run on and erosion control. | | | |
| 4 | Verify that adequate control products such as bales, silt fences, and 6 mil. plastic, are available and in adequate quantities to provide effective protection.. | | | |

Initial Inspections

| | | | | |
|---|--|--|--|--|
| 1 | Upon commencement of site activities, ensure that adequate physical protection is provided to prevent uncontrolled run on/run off. | | | |
| 2 | Monitor open excavations to ensure that physical protection is provided to prevent storm water entry to the excavation. | | | |
| 3 | Ensure initial compliance with the provisions of the plans discussed in the preparatory phase. | | | |

ADDITIONAL NOTES OR COMMENTS:

Specific Item Identification or Location, as applicable:



FIELD INSPECTION CHECKLIST

Checklist Title

RUN ON/RUN OFF CONTROL
Dye Burial Ground

Checklist Number

DBRR-02

Revision Date

Nov. 95

Checklist

Page 1 of 1

| ITEM NO. | ITEM CHECKED | Accept/Reject | REMARKS | VERIFIED BY/DATE |
|----------------------|--|---------------|---------|------------------|
| Follow-up Inspection | | | | |
| 1 | Verify that all excavated materials planned for re-use are properly stockpiled and protected from erosion. | | | |
| 2 | Ensure on-going compliance with stormwater prevention plan for Run-on Run-off controls as discussed in the Preparatory and Initial Phases. | | | |
| 3 | Verify the readiness and effectiveness of temporary erosion measures, by adequate use of berms and perimeter ditches. | | | |
| 4 | Verify 6 mil. plastic is on hand to be used as covering to prevent erosion of cap layers during construction. | | | |
| 5 | Ensure that water removed from excavated areas is properly characterized prior to disposal. | | | |

ADDITIONAL NOTES OR COMMENTS:

(This area is currently blank for additional notes or comments.)

Specific Item Identification or Location, as applicable:

**MORRISON KNUDSEN CORPORATION**

Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title

**Soils Layering Backfill and Compaction
Dye Burial Ground**

Checklist Number

DBF-01

Revision Date

NOV 95

Checklist

Page 1 of 1**ITEM
NO.****ITEM CHECKED****Accept/
Reject****REMARKS****VERIFIED
BY/
DATE****Preparatory Inspection**

1

Confirm an appropriate proctor (i.e., ASTM D698) of the soil around the Dye Burial Trench to be used as fill/backfill has been performed and approved.

2

Confirm an appropriate proctor of any necessary designated borrow source has been performed and approved.

3

Confirm work areas have been located with the limits of work clearly established (stakes, lines, monuments) and that the lines and grades called for on the drawings are understood.

4

Verify that proper equipment is on hand and appropriate for placement, grading, and wetting and compacting soils.

5

Verify precautions are taken to prevent/contain the spillage of gas, oil, slurry, etc. to assure compliance with the base spill plan.

6

Verify preconstruction elevation survey to be used for measurement of earthwork, if applicable, is available for and prior to conducting earthwork in a given area.

7

Verify that earthwork is performed in accordance with the drawings and within established bounds.

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project

NSWC - CRANE

Delivery Order Number

0009, Statement of Work #007

Checklist Title
Soils and Layering Backfill
and Compaction Dye
Burial and Compaction
DBF-01

PAGE 1 OF 1



Checklist Title

SOILS LAYERING BACKFILL AND COMPACTION
Dye Burial Ground

Checklist Number

DBF-02

Revision Date

NOV 95

Checklist

Page 1 of 1

| ITEM NO. | ITEM CHECKED | Accept/Reject | REMARKS | VERIFIED BY/DATE |
|-----------------------|---|---------------|---------|------------------|
| Initial Phase Control | | | | |
| 1 | Verify that the equipment selected is unlikely to rut or disturb the graded area, especially over the trenches. | | | |
| 2 | Verify the likelihood of exposure to contaminated materials during the cover construction. | | | |
| 3 | If no contaminated materials have been noted, modify decontamination procedures appropriately. | | | |
| 4 | Verify the prepared surface for cover placement has been inspected for debris, roots, sharp objects, and large particles. | | | |
| 5 | Verify that the cover materials delivered to the site have appropriate certifications (i.e. geosynthetics). | | | |
| 6 | Verify cover materials (sand, biotic barrier, and topsoil) have been approved and meet the requirements. | | | |
| 7 | Verify the delivered cover materials are documented to be in conformance with the drawings and specifications. | | | |
| 8 | Ensure protection from the elements of cover materials at the temporary site storage area. | | | |

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project

NSWC - CRANE

Delivery Order Number

0009, Statement of Work #007

Checklist Title
Soils and Layering Backfill
and Compaction Dye
Burial and Compaction
DBF-02

PAGE 1 OF 1



MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title

SOILS LAYERING BACKFILL AND COMPACTION
Dye Burial Ground

Checklist Number

DBF-003

Revision Date

NOV 95

Checklist

Page 1 of 1

ITEM NO.

ITEM CHECKED

**ACCEPT/
REJECT**

REMARKS

**VERIFIED
BY/
DATE**

Follow-up Inspection

1

Verify grades are in accordance with the drawings and specifications.

2

Verify adequate proofrolling and compaction of existing subgrade, including thorough and uniform coverage by compactor, compactor performance, and desired results in conformance with specifications Section 02200.

3

Verify that offsite borrow source materials are acceptable in conformance with specification Section 02200.

4

Verify adequate compaction of new general fill and regraded subgrade, including thorough and uniform coverage by compactor, compactor performance, and desired results in conformance with specifications Section 02200.

5

Verify as-built grade of regraded subgrade and new general fill forming the base of landfill cover by instrument survey on approved survey point system.

6

Verify material for granular drainage is 23-24 sand from Rogers Groups, Greene County.

7

Confirm that placement of granular layer does not cause excessive shifting of or damage to the underlying geosynthetics.

8

Verify densification of granular drainage layer by light compaction. Confirm that layer deflection is minimal during compaction.

9

Verify nominal thickness by random gauging or probing, taking into account anticipated densification and volume reduction after rolling.

10

Verify final thickness of granular drainage layer is at least the minimum design thickness specified on the drawings.

As-built by
Instrument
Survey

11

Verify materials for topsoil cover layer appear to comply with materials specified.

12

Confirm that placement of topsoil cover layer does not cause excessive shifting of or damage to the geotextile.

13

Verify nominal thickness by random gauging or probing, taking into account anticipated densification and volume reduction after rolling.

14

Verify densification of topsoil cover layer. Confirm that layer deflection is acceptable during compaction.

15

See that corrective action measures have been performed where required, verified, and documented.

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project

NSWC - Crane

Delivery Order Number

0009, Statement of Work #007

Checklist Title Soils and Layering
Backfill and Compaction Dye Burial
and Compaction DBF-03

Page 1 of 1



Checklist Title

**GEOSYNTHETIC CLAY LINER
INSTALLATION
Dye Burial Ground**

Checklist Number

GCL-01

Revision Date

NOV. 95

Checklist

Page 1 of 1

**ITEM
NO.**

ITEM CHECKED

**Accept/
Reject**

REMARKS

**VERIFIED
BY/
DATE**

Initial Phase Control

1

Verify that outer layer of GCL rolls are in acceptable condition with no excess hydration of deformation of clay.

2

Verify GCL rolls are labeled or tagged with Manufacturers Name and Production ID.

3

Verify each roll is marked with continuous 'match line' at each edge to ensure proper lap.

4

Verify that panels are not damaged as they are deployed, nor show excessive damage in the rolls or along edges.

5

Verify that initial panel placement is reasonably straight and free of irregularities.

6

Verify that minimum observed overlay is according to specifications or manufacturers design.

7

Verify that damaged portions of the rolls are removed and patched with like material.

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project

NSWC - CRANE

Delivery Order Number

0009, Statement of Work #007

Checklist Title
Geosynthetic Clay Liner
Installation GCL-01

PAGE 1 OF 1



Checklist Title

**GEOSYNTHETIC CLAY LINER
INSTALLATION
Dye Burial Ground**

Checklist Number

GCL-02

Revision Date

NOV. 95

Checklist

Page 1 of 1

**ITEM
NO.**

ITEM CHECKED

**Accept/
Reject**

REMARKS

**VERIFIED
BY/
DATE**

Follow-up Control

1

Verify continued minimum overlapping of panels in conformance with the specifications Section 02253.

2

Verify seaming method (overlap only, heat tack, bentonite seal, or other) is performed 100 percent of seam lengths.

3

Verify deficient overlaps and seams are repaired by placing additional capping strip, as required by the specifications.

4

Verify repairs to tears, rips, or other damage are made with appropriate coverage and overlap of patches in conformance with specifications.

5

Verify that GCL does not exhibit hydration as evidenced by excess thickness, softness, deformation or extrusion of clay at edges.

6

Verify hydrated GCL as removed and replaced or overlain with new GCL, as appropriate.

7

Verify GCL extends into anchor trench.

8

See that corrective action measures have been performed where required, verified, and documented.

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project
NSWC - CRANE

Delivery Order Number
0009, Statement of Work #007

Checklist Title
Geosynthetic Clay Liner
Installation GCL-02

PAGE 1 OF 1



| | | | |
|---|--------------------------------------|---------------------------------|---------------------------------|
| Checklist Title GEOTEXTILE FILTER FABRIC AND CUSHION INSTALLATION Dye Burial Ground | Checklist Number GEOTEX-01 | Revision Date NOV. 95 | Checklist Page 1 of 1 |
|---|--------------------------------------|---------------------------------|---------------------------------|

| ITEM NO. | ITEM CHECKED | Accept/Reject | REMARKS | VERIFIED BY/ DATE |
|----------|--------------|---------------|---------|-------------------|
|----------|--------------|---------------|---------|-------------------|

Preparatory Phase Control

| | | | | |
|---|--|--|--|--|
| 1 | Conduct preparatory phase meeting prior to initiating work items for geotextile installation. Verify preconstruction submittals have been submitted and approved. | | | |
| 2 | Confirm that installer has approved subgrade conditions prior to placement of geotextiles. | | | |
| 3 | Confirm work areas and patterns of panel installation have been established and are in conformance to the approved panel layout drawing. Verify any noted changes or discrepancies. Resolve discrepancies prior to commencement of work. | | | |
| 4 | Confirm installer has proper equipment and trained personnel for handling and installing materials without damage to the materials or previously completed construction items. | | | |
| 5 | Verify storage methods are adequate to protect geotextile rolls from damage due to moisture, UV degradation or contamination. | | | |

Initial Phase Control

| | | | | |
|---|--|--|--|--|
| 5 | Verify geotextile rolls are in acceptable condition without excessive damage. Verify that damaged portions of rolls are removed as necessary. | | | |
| 6 | Verify that panels are not damaged as they are deployed, nor show excessive damage on the rolls or along edges. | | | |
| 7 | Verify that initial panel placement is reasonably straight, adequately overlapped for seaming and free of irregularities. Verify that minimum observed overlap is according to specifications. | | | |

ADDITIONAL NOTES OR COMMENTS

| | | | |
|--|---|--|-------------|
| Morrison Knudsen Project NSWC - CRANE | Delivery Order Number 0009, Statement of Work #007 | Checklist Title Geosynthetic Clay Liner Installation GEOTEX-01 | PAGE 1 OF 1 |
|--|---|--|-------------|



Checklist Title

**GEOTEXTILE FABRIC
INSTALLATION
Dye Burial Ground**

Checklist Number

GEOTEX-02

Revision Date

NOV. 95

Checklist

Page 1 of 1

**ITEM
NO.**

ITEM CHECKED

**Accept/
Reject**

REMARKS

**VERIFIED
BY/
DATE**

Follow-up Phase Control

1

Verify continued minimum overlapping of panels in conformance with the Specifications Section 02249.

2

Verify approved seaming method (overlap only, heat tack, stitching, or other) is performed 100 percent of seam lengths.

3

Verify deficient overlaps (if sole method of adjoining panels) are repaired by placing additional capping strips or stitched together, as required by the specifications.

4

Verify repairs to tears, rips or other damage are made with appropriate coverage and overlap of patches in conformance with specifications.

5

See that corrective action measures have been performed where required, verified, and documented.

6

Verify subcontractors QC documentation prior to subsequent layering.

ADDITIONAL NOTES OR COMMENTS

Morrison Knudsen Project

NSWC - CRANE

Delivery Order Number

0009, Statement of Work #007

Checklist Title

Geosynthetic Clay Liner
Installation GEOTEX-02

PAGE 1 OF 1



Checklist Title

TOPSOIL PLACEMENT
Dye Burial Ground

Checklist Number

DBTS-01

Revision Date

Nov. 95

Checklist

Page 1 of 1

ITEM NO.

ITEM CHECKED

Accept/Reject

REMARKS

VERIFIED BY/ DATE

Preparatory Inspection

- | | | | | |
|---|---|--|--|--|
| 1 | Schedule a preparatory phase meeting prior to initiating topsoil placement activities. | | | |
| 2 | Verify that all subgrade backfill placement is complete, testing is acceptable, and documented density tests are submitted to Morrison Knudsen. | | | |
| 3 | Ensure the topsoil removed initially is staged to be reused for the topsoil cover layer over the cap. | | | |
| 4 | Ensure documentation for seed and fertilizer has been submitted and approved. | | | |

Initial Inspection

- | | | | | |
|---|--|--|--|--|
| 1 | Verify that all topsoil cover layer materials are free of clay or debris, including roots, branches or stones in excess of one inch in diameter. | | | |
| 2 | Ensure that topsoil placement is performed in dry weather. | | | |
| 3 | Ensure that topsoil is placed according to project drawings and specifications. | | | |

Follow-up Inspection

- | | | | | |
|---|--|--|--|--|
| 1 | Verify that topsoil placement continues in accordance with the Work Plan and Specifications. | | | |
| 2 | Ensure that topsoil is finish graded to eliminate low areas and to maintain the profile and contour of the subgrade. | | | |
| 3 | Ensure that topsoil is seeded with approved grass seed native to the area. | | | |
| 4 | Ensure that seed is raked into the topsoil lightly, immediately mulched according to the specifications and watered. | | | |
| 5 | Verify that seeded areas are marked by the subcontractor with stakes and string to indicate the boundaries of the seeded area. | | | |

Morrison Knudsen Project

NSWC - CRANE

Delivery Order Number

0009, Statement of Work #007

Checklist Title

TOPSOIL PLACEMENT
DBTS-01

PAGE 1 OF 1

APPENDIX E
QUALITY CONTROL PLAN

QUALITY CONTROL PLAN

INTRODUCTION

The Quality Control requirements for the construction activities associated with the SWMU #02, Dye Burial Ground Cap at NSWC Crane, Delivery Order No. 0009, Statement of Work 007, are presented in work activities covered under this Quality Control Plan (QCP).

Quality Control Plan

The QCP presented herein is structured to implement the procedures necessary to achieve and maintain a consistently high level of quality in construction activities associated with environmental remediation performed for the U.S. Navy, Naval Facilities Engineering Command, Southern Division. This consistency will be accomplished through the standardization and through documentation of field techniques and activities for each Definable Feature of Work. This QCP summary is presented in a format specified by the Navy, and is intended to be a working document that provides the structure for achieving a high level of confidence in the quality of Delivery Order work activities.

Definable Features of Work

The definable features of work identified for the construction work under Statement of Work #007 are presented in the Work Plan, and reiterated here. They include:

- Site Preparatory Work
- Site Grading
- Erosion Control/Dewatering Methods
- Geotextile Cushion Installation
- Geosynthetic Clay Liner Installation
- HDPE Geomembrane Liner Installation
- Sand Drainage Layer Installation
- Geotextile Fabric Installation
- Drainage Collection System Installation
- Biotic Barrier Layer Installation
- Cover Layer Installation and Finish Grading
- Gravel Roadways and Site Restoration
- Winterization

The Morrison Knudsen (MK) Site Quality Control Supervisor (SQCS) will be responsible for the implementation of the Three Phases of Control inspection program for each Definable Feature of Work and document on checklists.

Quality Records

Records generated as a result of construction activities are Quality Records and will be processed in accordance with the requirements of this QCP. Documents such as Certified Material Test Reports for the Geotextile Fabrics, and HDPE liner, sand, biotic and cover materials, soils compaction test results, and checklists prepared for inspection activities on the Definable Features of Work are required to be mentioned. Further, Quality Records provide the documented evidence of events that have occurred for all features of the remedial work and their adequate generation, review, protection, and submittal is essential to the success of the project.

Three Phases of Control

This QCP integrates the Navy's Quality control system of the *Three Phases of Control*. These phases, Preparatory, Initial, and Follow-up, represent a logical and systematic approach to assuring the control and the quality of the construction work processes. Integration of the Three Phases of Control is accomplished by the performance of Preparatory, Initial, and Follow-up inspections at representative points in the construction work process. Details of these inspections are contained in Field Inspection Checklists prepared by MK.

At each phase, Quality Control verification activities may be supplemented by the performance of detailed inspections of a particular activity. In these cases, Field Inspection Checklists will be generated to assure a thorough verification of the work process. When utilized, the completed Field Inspection Checklist is attached to the combined *Contractor Production Report/Contractor Quality Control Report (Form 01400-1/2)*.

Preconstruction/Quality Control Meetings

To ensure that all parties performing work at NSWC Crane fully understand the Quality requirements established for this Delivery Order, a Coordination and Mutual Understanding meeting will be held prior to the start of construction activities. Attendees at the meeting include the Contracting Officer, or designee, the MK Project Manager (PM), the MK Construction Superintendent, and the MK SQCS. Minutes of the meeting shall be prepared by the MK SQCS and signed by all meeting attendees. A copy of the minutes of the meeting are then provided to the Navy and the MK Charleston Project Management Office (PMO).

After construction activities commence, the MK SQCS will conduct *QC Meetings* at least once every two weeks or more frequently, if appropriate. QC Meetings will be

held with the MK PM and Superintendents, foreman, or managers responsible for upcoming work.

The purpose of the QC Meeting is to review the minutes of the previous meeting, review the schedule, review the status of submittals, review the work to be accomplished in the next two weeks and any testing and documentation required, resolve any QC/production problems, and address any items that may require revising the QC Plan. QC Meetings will be documented, and copy of the minutes of the meeting will be provided to the Contracting Officer within two working days after the meeting.

APPENDIX F
SPILL PREVENTION, CONTROLS, AND CONTINGENCY PLAN

SPILL PREVENTION, CONTROLS AND CONTINGENCY PLAN FOR DYE CAP FACILITY

1.0 GENERAL

This Spill Prevention, Controls and Contingency Plan (SPCCP) has been developed for the use of Morrison Knudsen Corporation and its subcontractors for the Dye Burial Ground Cap at the NSWC Crane, Indiana to fulfill the requirements as stated in 29 CFR 1910.106, 40 CFR 112, and NFPA. The intent of this plan is for prevention, control, and cleanup of any hazardous and/or non-regulated material to be stored by Morrison Knudsen and its subcontractors on the NSWC site.

2.0 SPILL CONTAINMENT AND CONTROL

All locations where hazardous materials will be stored will be designed with measures for prevention of spills and releases. These preventive measures will be appropriate to the material to be contained and will be designed to prevent a discharge from reaching any watercourse. A listing of all hazardous materials, their storage locations, and maximum anticipated volumes to be stored on site will be kept by the Site Safety Supervisor along with Material Safety Data Sheets as required by 29 CFR 1910.1200 Hazard Communication.

2.1 ABOVE-GROUND STORAGE TANKS

A map showing the location of all above-ground tanks, their volumes, and materials shall be kept by MK on site. This information will be provided to the local fire departments, emergency response personnel, and any other applicable authorities requested by the Officer in Charge of Construction.

Daily visual inspections shall be made on all tanks and connections each work day. A record of these inspections will be submitted with the daily report and maintained at the MK office.

Upon arrival, all hazardous material storage tanks shall be visually inspected for structural integrity, cleanliness, and placement before use. Records of inspections, fill dates, and contents will be documented and maintained by MK.

Included in the daily inspections shall be verification there are no leaks at seams, gaskets, rivets, bolts, plugs, or valves. Should a leak be detected, MK supervision shall be immediately notified and corrective action taken. The corrective action will be to

pump the contents of the leaking tank into the reserve empty tank. All tanks will maintain a 10% freeboard which could be used for additional space.

A pump capable of maintaining 50 gallons per minute, a suction hose, and 300 feet of discharge hose in good operating condition will be maintained on site. The pump will be checked twice weekly for proper working condition. Other supplied include, but are not limited to:

- "clean" dirt pile (approximately 10 cubic yards);
- hay bales;
- fifty (50) sand bags;
- five (5) roles of 6- or 10-mil polyethylene;
- and absorbent pads.

A backhoe shall be available to respond in event of an emergency.

2.2 MATERIALS HANDLING

All drums, tanks, and storage areas which contain potentially hazardous or hazardous materials shall be properly labeled. The date for starting the fill of a hazardous or non-hazardous waste container will be marked on the container. Revisions and updates will be made as required.

Any spills or release shall be reported to the Officer in Charge of Construction. Clean up will ensue in a timely manner.

Proper measures shall be taken to ensure rain water does not accumulate in the bermed storage areas which could compromise the designed storage capacities. This may constitute occasional dewatering as directed by MK supervision.

Proper curbing and berming shall be maintained around waste material containers.

2.3 CONTAINERS AND DRUMS

Handling of containers and drums involves appropriate procedures depending on the contents. Prior to handling all containers, a visual check shall be made for:

- symbols, words, or other marks on the container indicating its contents and any specific hazards;
- and signs of deterioration such as corrosion, rust, and leaks.

3.0 RECORDS

All written records and procedures of inspections, cleaned-up spills, etc., shall be submitted to MK in the respective daily reports.

4.0 TRAINING

MK and its subcontractors are responsible for properly instructing their personnel in the operation and maintenance of their equipment to prevent the discharge of hazardous materials and in applicable pollution control laws, rules, and regulations. Each subcontractor shall have a designated person who is accountable for spill prevention and who reports to Site Management.

5.0 NOTIFICATION

The Officer in Charge of Construction shall be notified as soon as reasonably possible with regards to any spill, leak, or potential problem. This information will include, but not be limited to:

- release location;
- an estimate of the quantity released to the environment;
- the time and duration of the release;
- the medium into which the release occurred;
- proper precautions and corrective action which has and will be taking place;
- and the name and telephone number of Navy and MK personnel notified.

6.0 INVESTIGATION

The follow-up notice shall be submitted to the Officer in Charge of Construction. This notice will include, but not be limited to, actual response actions taken, any known or anticipated data or chronic health risks associated with the release, and advice regarding additional corrective actions to prevent future mishaps.

Documentation of the investigation will be done to help prevent recurrence of a similar situation. The investigation will review the contingency plan as to whether it requires a revision. Changes in the contingency plan or in operations will be made if necessary. Documentation of the investigation must be accurate, but nothing will be erased. If a mistake is found, it will be crossed out, initialed, and corrected. The documentation will include, but not be limited to:

- chronological history of events;
- names and titles of persons involved;
- orders given and by whom;

- types of soil, water, or air samples taken and the test results; exposure to work personnel and the general public;
- and description of the illness and injury during, or as a result of, the emergency.

7.0 POTENTIAL SITUATIONS AND CONTINGENCY PROCEDURES

7.1 Minor Tank Failures or Leaks

In the event a minor leak is detected, the contents of the leaking tank shall be pumped into the reserve tank. This leaking tank shall then be tagged "DO NOT USE" and another tank will be procured. The secondary containment area will be expanded if required. The area where the leak penetrated will be checked and any liquid will be pumped or absorbed and placed in the tank. Soil will be placed in the cell during spring operations.

7.2 Major Tank Failures or Leaks

In the event of a major leak, the tank shall be pumped into the reserve tank as quickly as possible. The contents at the low end of the tank containment will then be pumped into the reserve tank. The leaking tank will then be tagged "DO NOT USE" and another tank procured. The secondary containment area will be expanded if required. The dirt will then be placed on the cell during remediation operations. Future storm water will also need to be collected.

7.3 Secondary Containment Failure

All berms shall be inspected daily. Should erosion or breakdown of berms be identified, a backhoe will be summoned and repairs will be completed within a reasonable length of time or before a pending storm. Dirt from the reserve pile will then be replaced. If the failure comes during a heavy rain, a secondary berm will be constructed using the "clean" dirt pile. Additional dirt will be transported from the borrow area as needed.

7.4 Storm Water Mitigation Controls

Silt fence and hay bales have been strategically placed around the project to control the silt from leaving the site. If at any time, the mitigation system becomes inadequate, or cannot fulfill the task as designed, the system will be modified and replaced, shifted, or fortified as necessary. The silt fence and hay bales will then be replaced to maintain an emergency supply.

7.5 Potentially Dye-Contaminated Ground Water on Surface

Should potentially dye-contaminated ground water appear on the surface outside the cap area, the water shall be pumped to the reserve tank. The area will be covered with

plastic and be bermed to seal out additional moisture. The area will be noted on the site map and will be monitored. After the area is secure, an inspection will be conducted to determine the source and a more permanent fix will be engineered.

7.6 Cover Damage to the Cap or Rolloff Tanks

In the event the cap cover begins to blow or is damaged, an additional layer of 10-mil polyethylene (or two layers of 6-mil) will be placed over the area to secure it. The liner will then be secured by using additional sand bags.

In the event the rolloff containers are found with torn or damaged covers, additional polyethylene will be placed over the unit and secured with additional sand bags.

7.7 Leaking Rolloff Containers

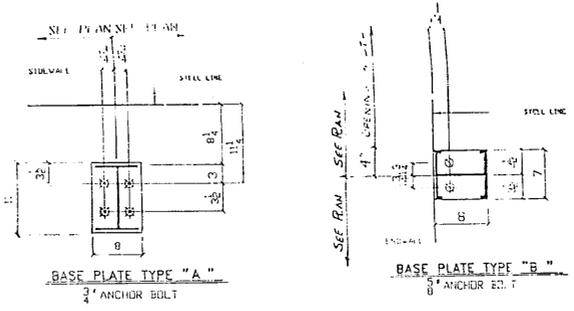
In the event a rolloff container is found to be leaking, the contents will be pumped to the reserve tank. The rolloff will then be decontaminated and removed from the project. This unit will more than likely not be replaced.

7.8 Buildup of Possible Dye-Contaminated Water under the Dye Cap due to Leakage or Ice Melt

The west berm of the dye cap or lowest point will be monitored for possible dye-contaminated water buildup. If water is detected under the cap, it will be pumped into the reserve frac tank until such time that no possibility of breach is apparent.

7.9 Additional Water Storage Space Needed

In the event there is not at least one frac tank of storage space available, additional tanks will be procured within 24 hours.



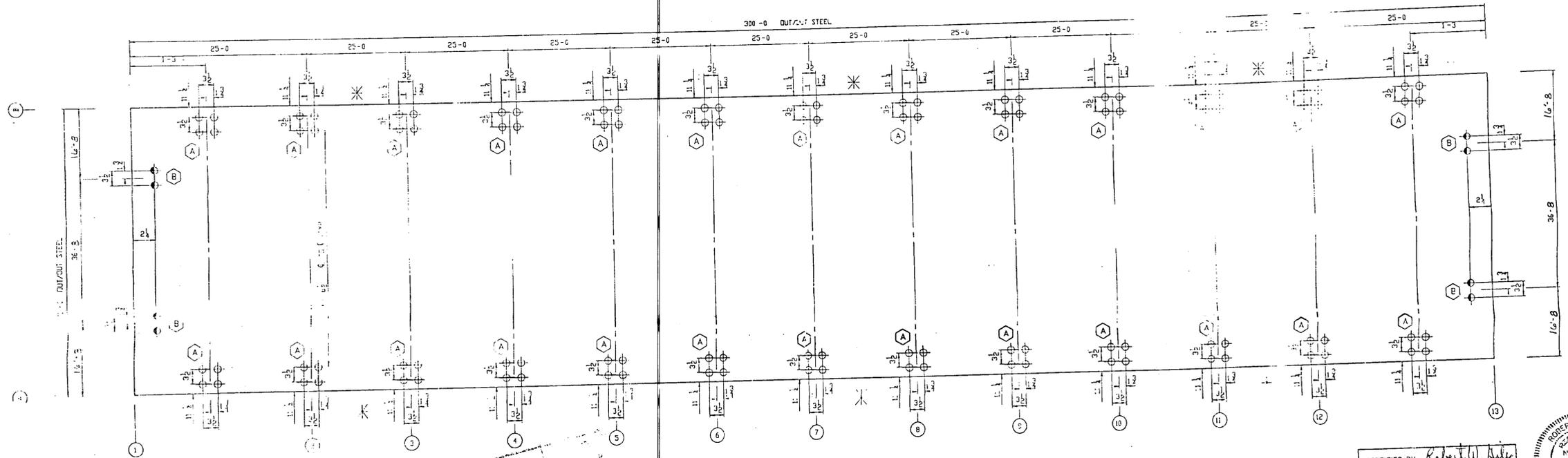
| MINOR | 10 | 11 | 11 | 11 |
|-----------|-----|------|-------|------|
| LEFT COL | HR | 0.2 | 12.1 | -7.3 |
| LEFT COL | VER | 12.6 | 17.5 | -8.2 |
| RIGHT COL | HR | -8.2 | -12.1 | 7.3 |
| RIGHT COL | VER | 12.6 | 17.5 | -8.2 |

NOTE: THE FOLLOWING LOAD COMBINATION CASES WERE USED IN DESIGNING THE BUILDING.

CASE 1: DL + LL
CASE 2: DL + VL
CASE 3: DL + LL/2 + VL
CASE 4: DL + LL + VL/2

THE FOUNDATION DESIGNER SHOULD FACTOR AND COMBINE THE REACTIONS AS REQUIRED

SIGN CONVENTION
HORIZONTAL POSITIVE IS TO THE RIGHT
VERTICAL POSITIVE IS UPWARD
MOMENT POSITIVE IS COUNTERCLOCKWISE



ANCHOR BOLT PLAN
(ONE BLDG. SHOWN) (3 BLDGS. RECD.)

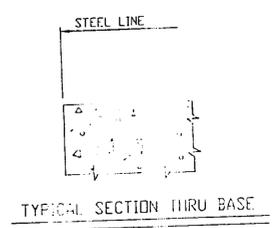
CERTIFIED BY *Robert W. Hoke*
P.E. NO. 19319 1-29-76
FOR METAL BUILDING ONLY



THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL APPROVAL IS RECEIVED.
 BY THE CONTRACTOR, ARCHITECT, ENGINEER, OR OTHER PROFESSIONAL PERSONNEL.
 NO PART OF THIS DRAWING IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE DESIGNER.

- REFERENCE NOTES:
- ANCHOR BOLTS, NUTS, AND FLAT WASHERS ARE NOT BY A & S BUILDING SYSTEMS.
 - ANCHOR BOLT DIAMETERS SHOWN ARE BASED ON A307 STEEL UNLESS NOTED AND ASSUME THAT FOUNDATION AND ITS REINFORCEMENT WILL FULLY DEVELOPE THE ANCHOR BOLT FOR THE REACTIONS GIVEN. EMBEDMENT AND END ANCHORAGE BY FOUNDATION DESIGNER.
 - THE BUILDING MANUFACTURER ASSUMES NO RESPONSIBILITY OR LIABILITY FOR FOUNDATION, FLOOR, OR SLAB DESIGN OR CONSTRUCTION.
 - THE FOUNDATION DESIGN SHOULD BE DONE WITH DUE REGARD TO THE SPECIFIC SOIL CONDITIONS PRESENT AT THE ACTUAL JOB SITE.
 - CONCRETE CONTRACTOR IS TO CLEAN CONCRETE FROM THREADS OF ALL ANCHOR BOLTS.
 - BASE PLATES MAY HAVE MORE HOLES THAN ANCHOR BOLTS SHOWN, DUE TO USE OF STANDARD BASE PLATES. BOLTS ARE REQUIRED ONLY AS SHOWN ON ANCHOR BOLT PLAN.

| | |
|-------------------|-----------------|
| LIVE LOAD (ROOF) | 20.00 PSF |
| LIVE LOAD (FLOOR) | 50.00 PSF |
| WIND LOAD | 15.00 MPH |
| SNOW LOAD | STRUCTURAL ONLY |
| DEAD LOAD | 10.00 PSF |
| COLLATERAL LOAD | 100.00 PSF |
| BUILDING CODE | 1991 UBC |
| EXPOSURE | B |
| IMPORTANCE | 1.00 |
| SEISMIC ZONE | 2A |



NOTE: A & S WILL ASSUME ALL UNCHANGED DIMENSIONS ON APPROVAL DRAWINGS ARE VERIFIED AS IS.

IN ORDER TO HOLD THE CURRENT DELIVERY SCHEDULE A SIGNED SET OF APPROVAL DRAWING MUST BE IN THE A & S OFFICE ON _____

| REV | DATE | DESCRIPTION | BY | CHKD. |
|-----|------|-------------|----|-------|
| | | | | |
| | | | | |

RECEIVED
FEB 06 1996
MK-CRANE

NOTE: ANCHOR BOLT QUANTITIES SHOWN ARE FOR (3) BUILDINGS

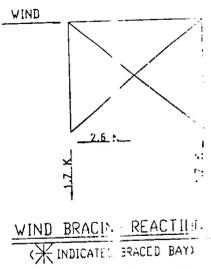
NOTICE TO BUILDING OFFICIAL: APPLICATION OF SEAL IS FOR METAL BUILDING ONLY AND DOES NOT REPRESENT THE PROFESSIONAL RECORD.

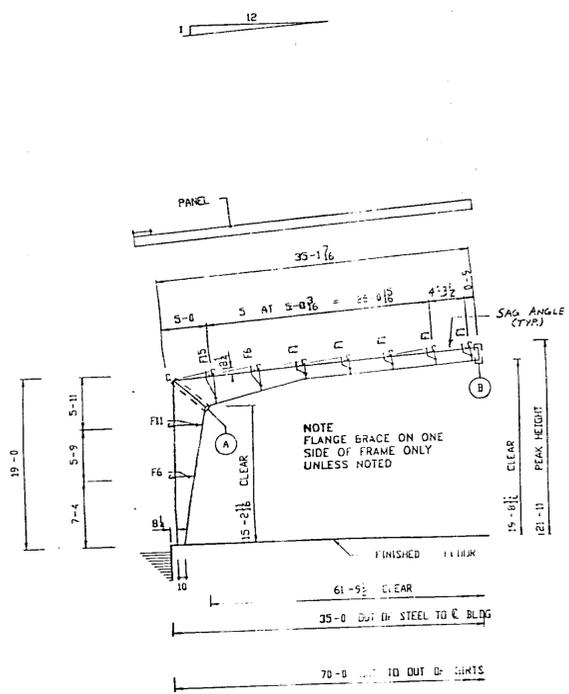
| ANCHOR BOLT SCHEDULE | BOLETS BY DIAMETER |
|----------------------|--------------------|
| TYPE | QUANTITY |
| 1/2" | 24 |
| 3/4" | 212 |

A&S BUILDING SYSTEMS
CARYVILLE, TENNESSEE

DESCRIPTION: ANCHOR BOLT SETTING PLAN
SIZE: REFERENCE DRAWING GS
SYSTEM: METAL BLDG. SYST./ CRANE RAVAL BASE

CREATED BY: SB
CHECKED BY: SB
DATE: 1/24/96
SCALE: NONE
ENGINEER: [Signature]
JOB NO: 206-035
DWG NO: F1 OF 1
ISSUE: A





CROSS SECTION
COLUMN LINES 1-13

| SPLICE BOLT TABLE | | | |
|-------------------|----|-----------------|-------|
| SPLICE | NO | SIZE | DEPTH |
| A | 18 | 0 1/2" X 2" | 3'-5" |
| B | 12 | 0 3/4" X 2 1/2" | 1'-0" |

APPROVAL DRAWING
 THIS DRAWING MUST BE RETURNED
 APPROVED BEFORE SHOP DETAILS
 AND FABRICATION CAN START
 APPROVED AS NOTED
 APPROVED MAKE CHANGES
 DISAPPROVED
 BY _____
 DATE _____
**THIS DRAWING IS NOT
 TO BE USED FOR
 CONSTRUCTION DRAWINGS
 WILL BE ISSUED AFTER
 APPROVAL IS RECEIVED.**

CERTIFIED BY Robert W. Hill
 P.E. NO. 15719 1-24-96
 FOR T.C. PURPOSES ONLY



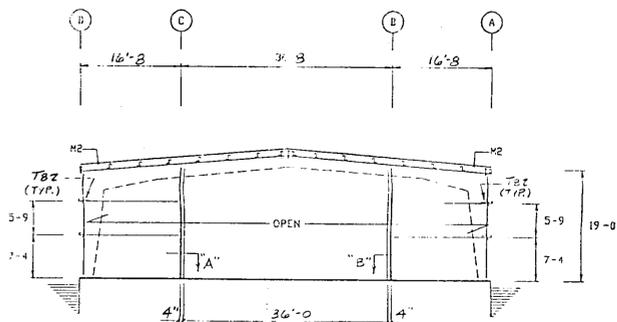
RECEIVED
 FEB 06 1996
 MK-CRANE

| REV | DATE | DESCRIPTION | BY | CKD |
|-----|------|-------------|----|-----|
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A&S BUILDING SYSTEMS
 CARYVILLE, TENNESSEE

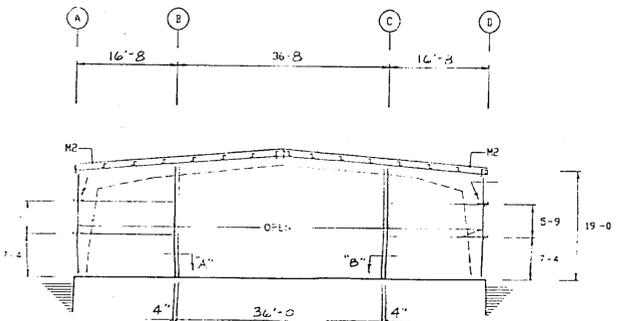
NOTICE TO BUILDING OFFICIAL:
 APPLICATION OF SEAL IS FOR
 METAL BUILDING ONLY AND DOES
 NOT REPRESENT THE PROFESSIONAL
 RECORD

| | |
|-------------|-----------------------------------|
| DESCRIPTION | ENDWALL SHEETING ELEVATION |
| SIZE | REFERENCE DRAWINGS |
| CUSTOMER | SVI BLDG. SYST./ CRANE NAVAL BASE |
| LOCATION | CRANE, IN |
| DRAWN BY | 58 |
| CHECKED BY | DATE 1/24/96 |
| SCALE | NONE |
| ENGINEER | |
| JOB NO. | 236-035 |
| DWG NO. | L4 OF 5 |
| ISSUE | A |



ENDWALL FRAMING ELEV AT COL. LINE "1"

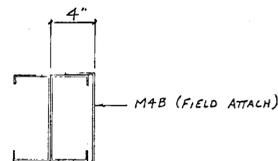
USE (4) 5/8 X 1 1/2" HT. BOLTS $\frac{1}{4}$ " M4D AT ALL E.W. COLUMN TO RAFTER CONN. (TYP. UN)



ENDWALL FRAMING ELEV AT COL. LINE "13"

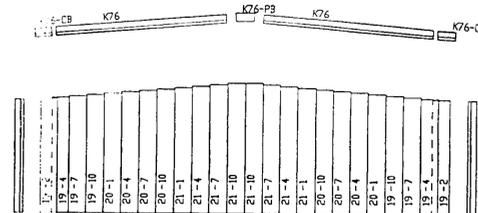
USE (4) 5/8 X 1 1/2" HT. BOLTS $\frac{1}{4}$ " M4D AT ALL E.W. COLUMN TO RAFTER CONN. (TYP. UN)

APPROVAL DRAWING
 THIS DRAWING MUST BE RETURNED AND APPROVED BEFORE SHOP DETAILS ARE SUBMITTED.
 IF APPROVED AS NOTED, NO DISAPPROVED MAKE CHANGES NOTED AND RESUBMIT.
THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION
 CONSTRUCTION DRAWINGS WILL BE ISSUED AFTER APPROVAL IS RECEIVED.

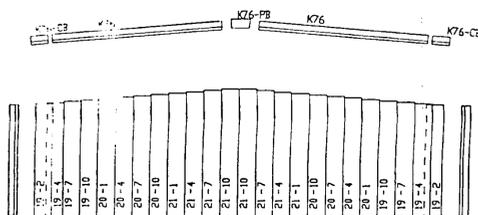


SECTION "A" (AS SHOWN)

SECTION "B" (OPP. HAND)



ENDWALL SHEETING ELEV AT COL. LINE "1"



ENDWALL SHEETING ELEV AT COL. LINE "13"

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 P.E. NO. 19219 1-29-96
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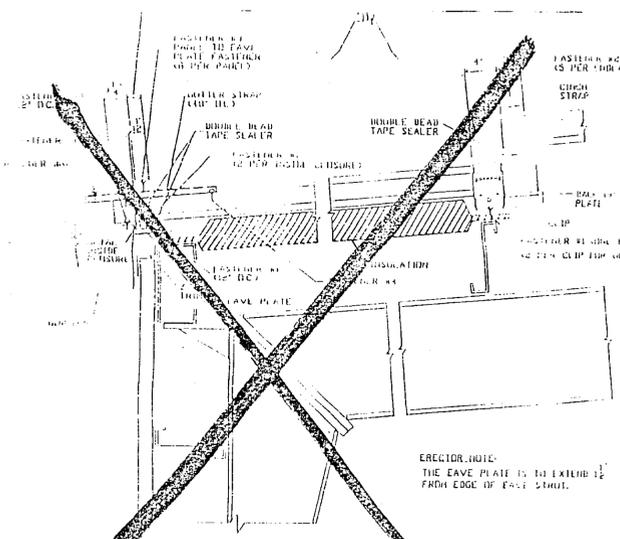
ERECTION NOTE:
 1. INSTALLATION OF TEMPORARY ERECTION BRACING IS THE RESPONSIBILITY OF THE ERECTOR AND IS NOT PROVIDED BY THE BUILDING MANUFACTURER.

| REV | DATE | DESCRIPTION | BY | CHKD. |
|-----|------|-------------|----|-------|
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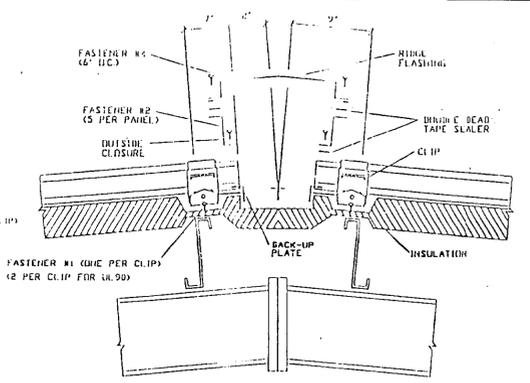
NOTICE TO BUILDING OFFICIAL:
 APPLICATION OF SEAL IS FOR METAL BUILDING ONLY AND DOES NOT REPRESENT THE PROFESSIONAL STATUS OF THE ENGINEER.

A&S BUILDING SYSTEMS
 CARYVILLE, TENNESSEE

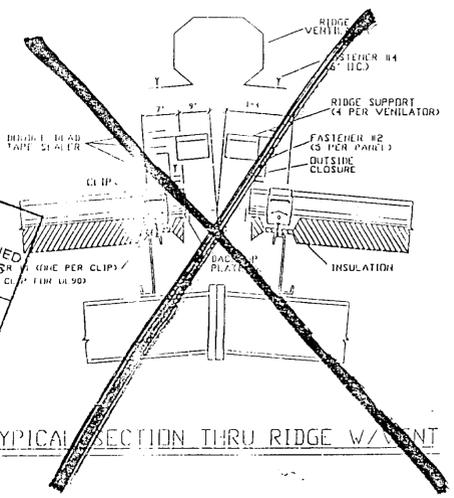
| | |
|-------------|------------------------------------|
| DESCRIPTION | ENDWALL FRAMING ELEVATION |
| SIZE | REFERENCE DRAWINGS |
| CLIENT | SWI BLDG. SYST./ CRANF. NAVAL BASE |
| LOCATION | CRANE, IN |
| DRAWN BY | 98 |
| CHECKED BY | DATE 4/6/96 |
| SCALE | ENGINEER NONE |
| JOB NO. | 296-035 |
| DWG NO. | E3 OF 5 |
| ISSUE | A |



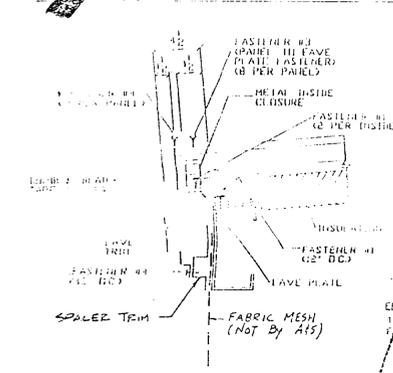
TYPICAL SECTION THRU EAVE W/ GUTTER



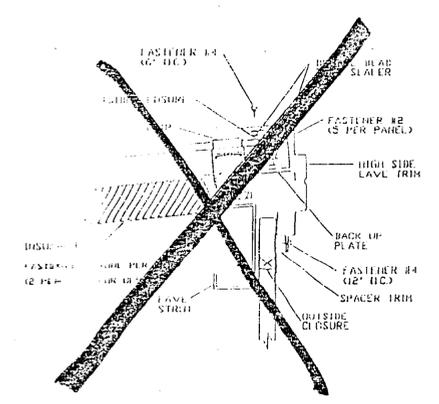
TYPICAL SECTION THRU RIDGE



TYPICAL SECTION THRU RIDGE W/ VENT

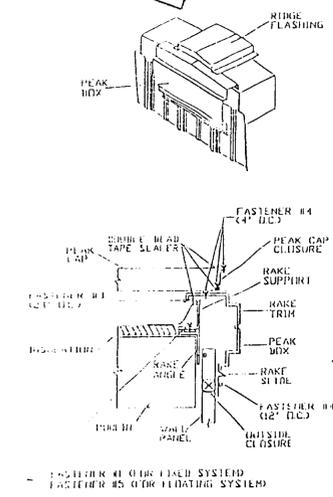


TYPICAL SECTION THRU LOW EAVE

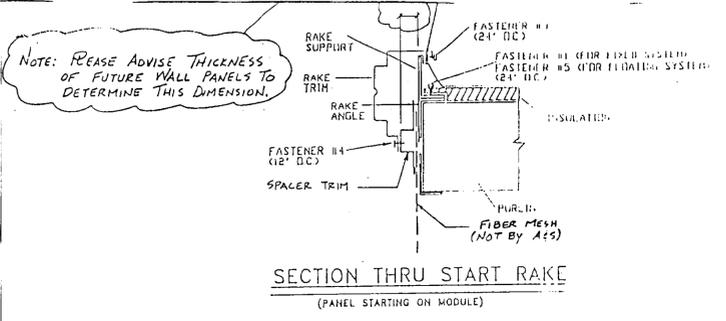


TYPICAL SECTION THRU HIGH EAVE

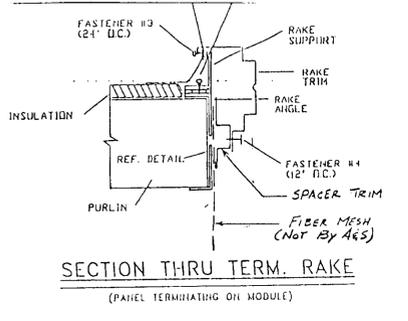
APPROVAL DRAWING
 THIS DRAWING MUST BE RETURNED APPROVED BEFORE SHOP DETAILS AND FABRICATION CAN START.
 IF APPROVED AS NOTED OR DISAPPROVED MAKE CHANGES NOTED AND RESUBMIT.
 DATE: _____
 BY: _____
THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION
 CONSTRUCTION DRAWINGS WILL BE ISSUED AFTER APPROVAL IS RECEIVED.



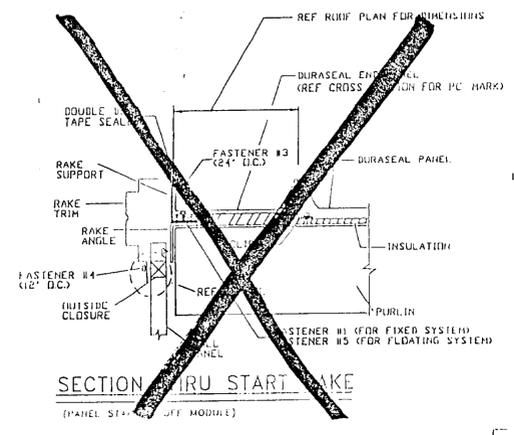
TYPICAL SECTION THRU PEAK BOX



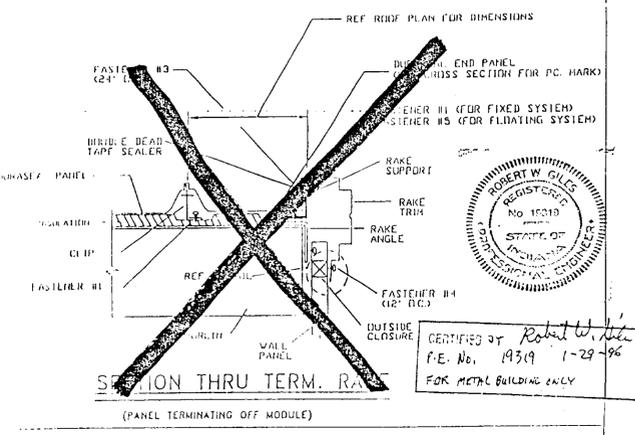
SECTION THRU START RAKE (PANEL STARTING ON MODULE)



SECTION THRU TERM. RAKE (PANEL TERMINATING ON MODULE)

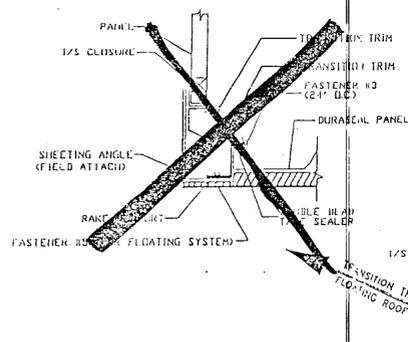


SECTION THRU START RAKE (PANEL STARTING OFF MODULE)

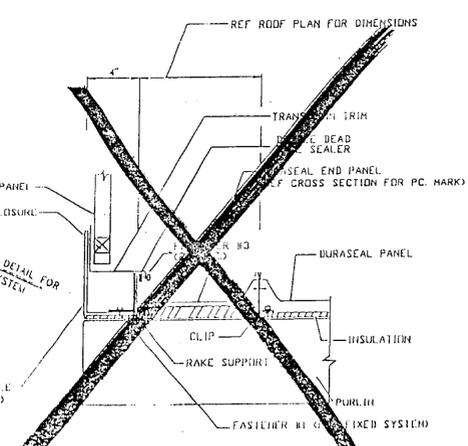


SECTION THRU TERM. RAKE (PANEL TERMINATING OFF MODULE)

FOR ADDITIONAL ERECTION DETAILS - REF. THE DURASEAL ERECTION MANUAL.



TYPICAL SECTION THRU HI-LO (FOR FIXED ROOF SYSTEMS)



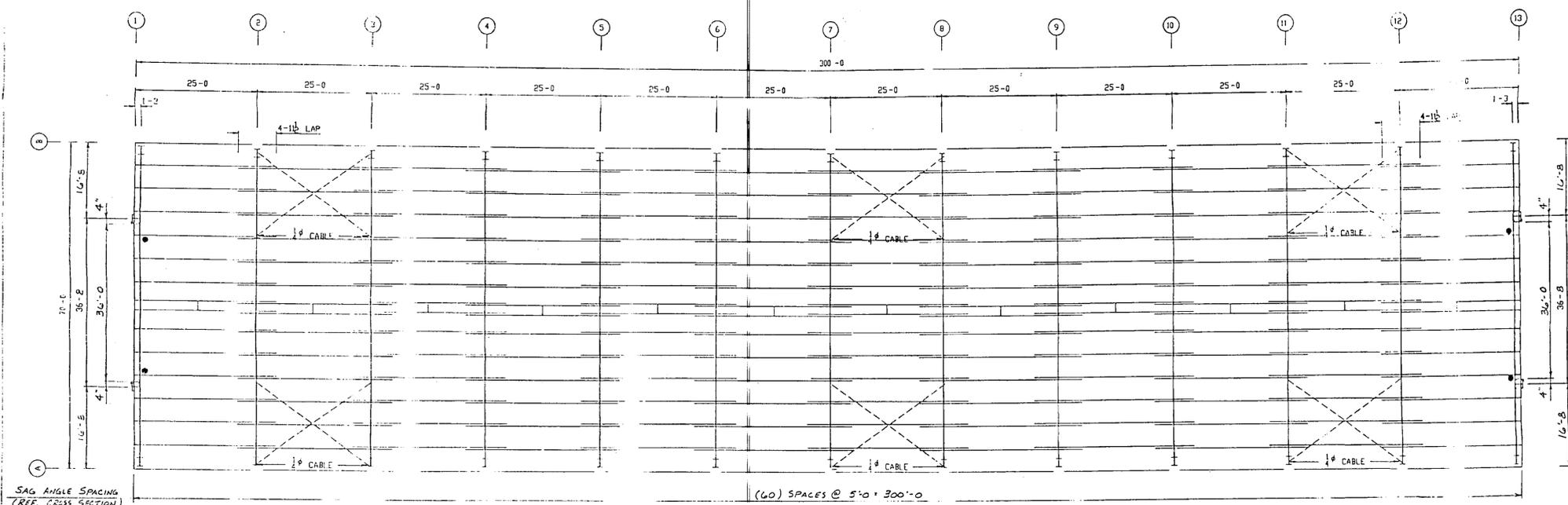
| FASTENER SELECTION TABLE | |
|--|---|
| FASTENER #1 1/4"-14x1" TYPE AB 3/8" HEX WASHER HEAD WITH 5/8" O.D. WASHER • CLIP TO PURLIN • EAVE PLATE TO EAVE STRUT • INSIDE CLOSURE TO EAVE STRUT • RAKE SUPPORT TO PURLIN (FIXED SYSTEM ONLY) | FASTENER #2 1/4"-14x1" TYPE AB 3/8" HEX WASHER HEAD WITH 5/8" O.D. WASHER (LONG LIFE EXTERIOR FASTENER) • ENDLAP • OUTSIDE CLOSURE-FLAT |
| FASTENER #2A 1/4"-14x1" TYPE AB 3/8" HEX WASHER HEAD W/ SEALING WASHER (LONG LIFE EXTERIOR FASTENER) • USE IN PLACE OF FASTENERS #1, #2, #3 AND #4 AT ALL STRAPOUTS | FASTENER #3 1/4"-14x1 1/4" SELF DRILLER 3/8" HEX WASHER HEAD WITH SEALING WASHER (LONG LIFE EXTERIOR FASTENER) • PANEL TO EAVE • STIFFENER PLATE TO UL90 SKYLIGHT • RAKE TRIM TO ROOF PANEL • RIDGE SUPPORT TO ROOF PANEL • OUTSIDE CLOSURE-TRAPEZOID |
| FASTENER #4 1/4"-14x1 1/4" SELF DRILLER 3/8" HEX WASHER HEAD WITH SEALING WASHER (LONG LIFE EXTERIOR FASTENER) • RIDGE AND OTHER FLASHING TO OUTSIDE CLOSURE • GUTTER TO PANEL • GUTTER TO STRAP • TRIM TO TRIM CONNECTIONS | FASTENER #5 1/4"-14x1 1/4" SHOULDER TEK 2 3/8" HEX WASHER HEAD, NO WASHER • RAKE SUPPORT TO PURLIN (FLOATING SYSTEM ONLY) |
| FASTENER #6 1/4"-14x1 1/4" DURASEAL 3/8" HEX WASHER HEAD WITH 5/8" O.D. WASHER • CLIP TO JOIST • EAVE PLATE TO BEAM • RAKE SUPPORT TO JOIST (FIXED SYSTEM ONLY) | FASTENER #7 1/4"-20x1 1/4" SHOULDER TEK 3/8" HEX WASHER HEAD • RAKE SUPPORT TO JOIST (FLOATING SYSTEM ONLY) |

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|-----------------------------------|-------------------------------------|---|---------------|
| DURASEAL | | A&S BUILDING SYSTEMS CARYVILLE, TENNESSEE | |
| INSTRUCTIONS STEEL CUSTOMER | ERECTION DRAWING (REF. SHEET E1) | TYPE II TRIM | DATE |
| DRAWN BY SB | CHECKED BY JWC | DATE 2/2/96 | SCALE NONE |
| ENGINEER JWC | JWD NO. 296-035 | DWG NO. E51F5 | ISSUE A |



CERTIFIED BY *Robert W. Hill*
 P.E. No. 1939 1-29-96
 FOR METAL BUILDING ONLY



SAG ANGLE SPACING
(REF. CROSS SECTION)
(SUT. E4)

ROOF FRAMING PLAN

ERECTION NOTE:
12 x 1 1/2 SELF-DRILLING SCREWS ARE TO BE USED FOR PANEL TO SUB-STEEL (RED IRON CONNECTIONS) #14 X 7/8" SELF-DRILLING LAPTEK SCREWS ARE TO BE USED FOR PANEL TO PANEL AND TRIM TO PANEL CONNECTIONS.

NOTE: USE (4)-1/2 X 1 C.P.M.B. AT PURLIN CLIP W/ (2)-1/2 X 1 C.P.M.B. AT EACH END OF ALL PURLIN LAPS.

● USE (4)-1/2 X 1 C.P.M.B. AT PURLIN CLIP.

ADDITIONAL DETAILS AND APPROVED AS NOTED AND RECORDED
 THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION DRAWINGS WILL BE ISSUED AFTER APPROVAL IS RECEIVED.

CERTIFIED BY: *Robert W. Allen*
P.E. NO. 19319 1-29-96
FOR METAL BUILDING ONLY



NOTE:
WALL PANEL BY OTHERS MUST HAVE EQUIVALENT OR GREATER STRENGTH PROPERTIES AS THOSE OF A & S BUILDING SYSTEMS' VISTASHEEN (FY=50 ksi) PANEL

NOTE:
A & S WILL ASSUME ALL UNCHANGED DIMENSIONS ON APPROVAL DRAWINGS ARE VERIFIED AS IS.

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| REV | DATE | DESCRIPTION | BY |
|-----|------|-------------|----|
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ERECTION NOTE:
1. INSTALLATION OF TEMPORARY ERECTION BRACING IS THE RESPONSIBILITY OF THE ERECTOR AND IS NOT PROVIDED BY THE BUILDING MANUFACTURER.

NOTE: (ONE BLDG. SHOWN) (3 BLDGS. REQ'D)

| DESIGN LOADS | | SHEETING | | SWING DOOR | | FRAME OPENINGS | | | | WINDOWS & LOUVERS | | SKYLITES & VENTS | | OTHER ACCESSORIES | |
|--------------|-------------------|-------------------------|---------------------|------------|---------------|----------------|-------|--------|-------------|-------------------|----------------------------------|------------------|---------------------|-------------------|--|
| NO. | DESCRIPTION | NO. | DESCRIPTION | NO. | DESCRIPTION | NO. | WIDTH | HEIGHT | DESCRIPTION | NO. | DESCRIPTION | NO. | DESCRIPTION | NO. | DESCRIPTION |
| LIVE (CRANE) | 20 PSF | (Not By A&S) | | WALLS | NO | | | | | | | | | | |
| LIVE (FRAME) | 20 PSF | 24 GA. DURASEAL (UL-90) | ROOF | | | | | | | | 3030 STD. ALUM. SASH CLEAR GLASS | | SKYLITES - WALLITES | | THICK FIBERGLASS INSUL. W/ |
| WIND | 70 MPH | COLOR | N/A | WALLS | | | | | | | 6030 STD. ALUM. SASH CLEAR GLASS | | | | BACKING FOR ROOF & WALLS (NOT BY A&S) |
| DEAD | STRUCTURAL ONLY | COLOR | GALVALUME | ROOF | | | | | | | | | | | ROOF: AS REQ'D FOR DURASEAL |
| DEAD | COLLATERAL TO PSF | | TRIM | | | | | | | | | | | | WALLS: MEMBER #12X14 STITCH #14X8 LAPTES |
| BLDG CODE | INTI USC | ROOF LINE | PLEASE ADVISE COLOR | NO. | OVERHEAD DOOR | NO. | | | | | | | | | |
| INT. | RF | WALL LINE | N/A | | (NOT BY A&S) | | | | | | LOUVERS | | | | |
| END/END | RF/RF | FLOOR | N/A | | | | | | | | WIDE X HIGH W/SCREEN | | | | |
| | | | | | | | | | | | | | | | |

NOTICE TO BUILDING OFFICIAL:
APPLICATION OF SEAL IS FOR METAL BUILDING ONLY AND DOES NOT REPRESENT THE PROFESSIONAL OF RECORD.

A&S BUILDING SYSTEMS
CARYVILLE, TENNESSEE

DESCRIPTION: ROOF FRAMING PLAN
SIZE: REFERENCE DRAWING GS
CUSTOMER: SVI BLDG. SYST./ CRANE NAVAL BASE
LOCATION: CRANE, IN

DRAWN BY: SB
CHECKED BY: [Signature]
DATE: 1/24/96
SCALE: NONE
ENGINEER: [Signature]
JOB NO.: 296-035
DWG NO.: E1 OF 5

