WORK PLAN FOR INTERIM MEASURES CLEANUP AT SOLID WASTE MANAGEMENT UNIT

02/11 NSWC CRANE IN

8/7/1997

MORRISON KNUDSEN CORPORATION

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

August 7, 1997

Revision #2

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Prepared for

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CLIENT ACCEPTANCE:

U. S. Navy Responsible Authority — Date 10/8/97

NSWC Crane Public Works Officer — Date

U. S. EPA ACCEPTANCE:

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

Under the Resource Conservation and Recovery Act (RCRA), as administered by the United States Environmental Protection Agency (EPA), environmental contamination from past practices at the NSWC Crane are to be identified and controlled. 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 RCRA Facility Investigations (RFIs) at 33 Solid Waste Management Units (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 Initial Assessment Study (IAS) was conducted in 1981 to identify and assess sites of potential threats to health or the environment by contamination from past hazardous materials operations. The Dye Burial Grounds (SWMU #02/11) was one of the sites identified as part of the Installation Restoration (IR) program designed to identify contamination of Navy lands resulting from past operations and to institute corrective measures as needed.

The Dye Burial Grounds (SWMU #02/11) is located in the eastern section of NSWC Crane, as shown in Figure 1-2, northeast of the Ammunition Burning Ground, and sits atop a northeast trending ridge. The Dye Burial Grounds is a series of at least four main trenches, each approximately 50 feet long, 10 feet wide, and 6 feet deep according to the ISA report. 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 reportedly backfilled in 1972 to levels ranging from grade to 1 foot below adjacent grades, but were not permanently capped. Several other areas/trenches of dye contamination were found during the July/August 1996 field investigations. Figure 1-3 shows the locations of the field investigations with Table 1-1 showing the color of dye

from each location. These areas are deeper and have a greater width than the originally reported trenches. The field investigation data reveals approximately 3 feet of soil covers the dye. Figure 1-4 shows the relative location of all known trenches/areas of dye at the Dye Burial Grounds (SWMU #02/11).

The scope of this project is to install an engineered, multi-layer, interim measures cap over the dye burial areas. The cap will prevent the infiltration of storm water, which could result in migration of leachate beyond the current dye burial area. The project will also manage waste waters and restore the Dye Burial site. The interim measures cap will consist of the following layers: cap foundation layer; a geotextile cushion layer to protect the Geosynthetic Clay Liner (GCL); the GCL; the High-Density Polyethylene (HDPE) geomembrane liner; the 6" sand drainage layer with a geotextile cover; and a drainage collection system that shall transport water from the drainage layer away from the cap; the 6" gravel biotic barrier layer with a geotextile cover; and finally the 27" cover layer with a vegetative surface.

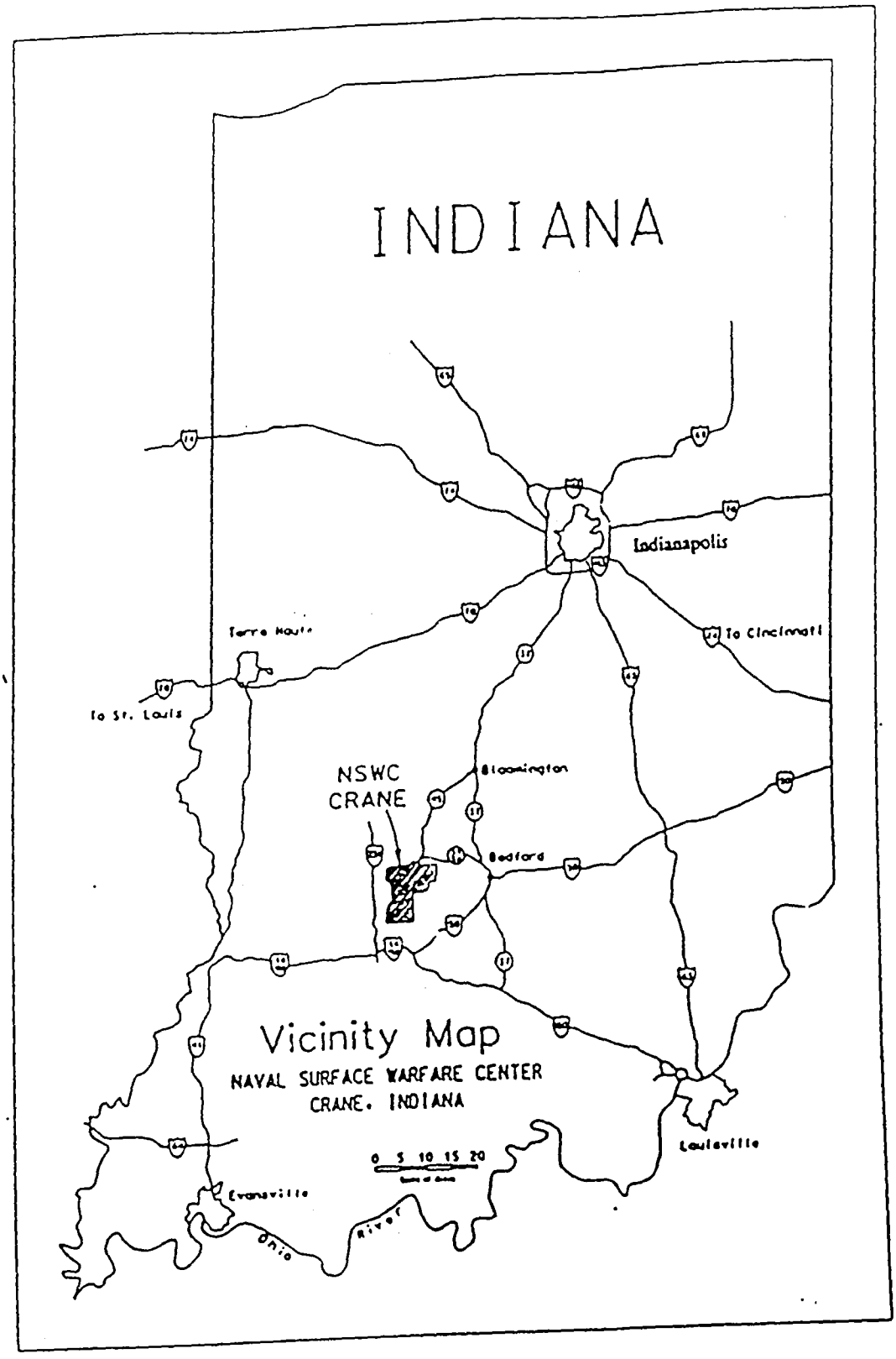


FIGURE 1-1
VICINITY MAP OF NSWC CRANE, INDIANA

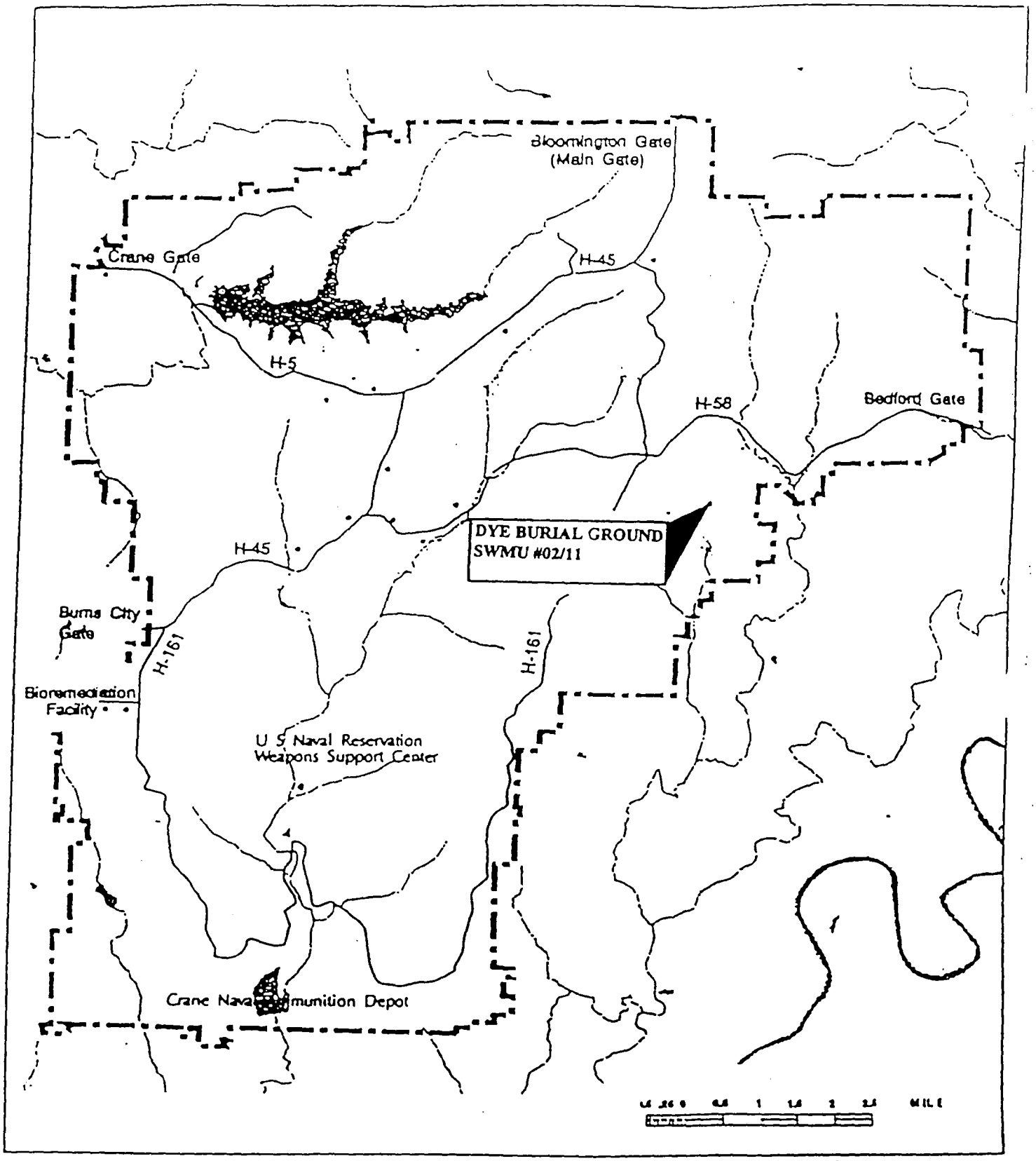
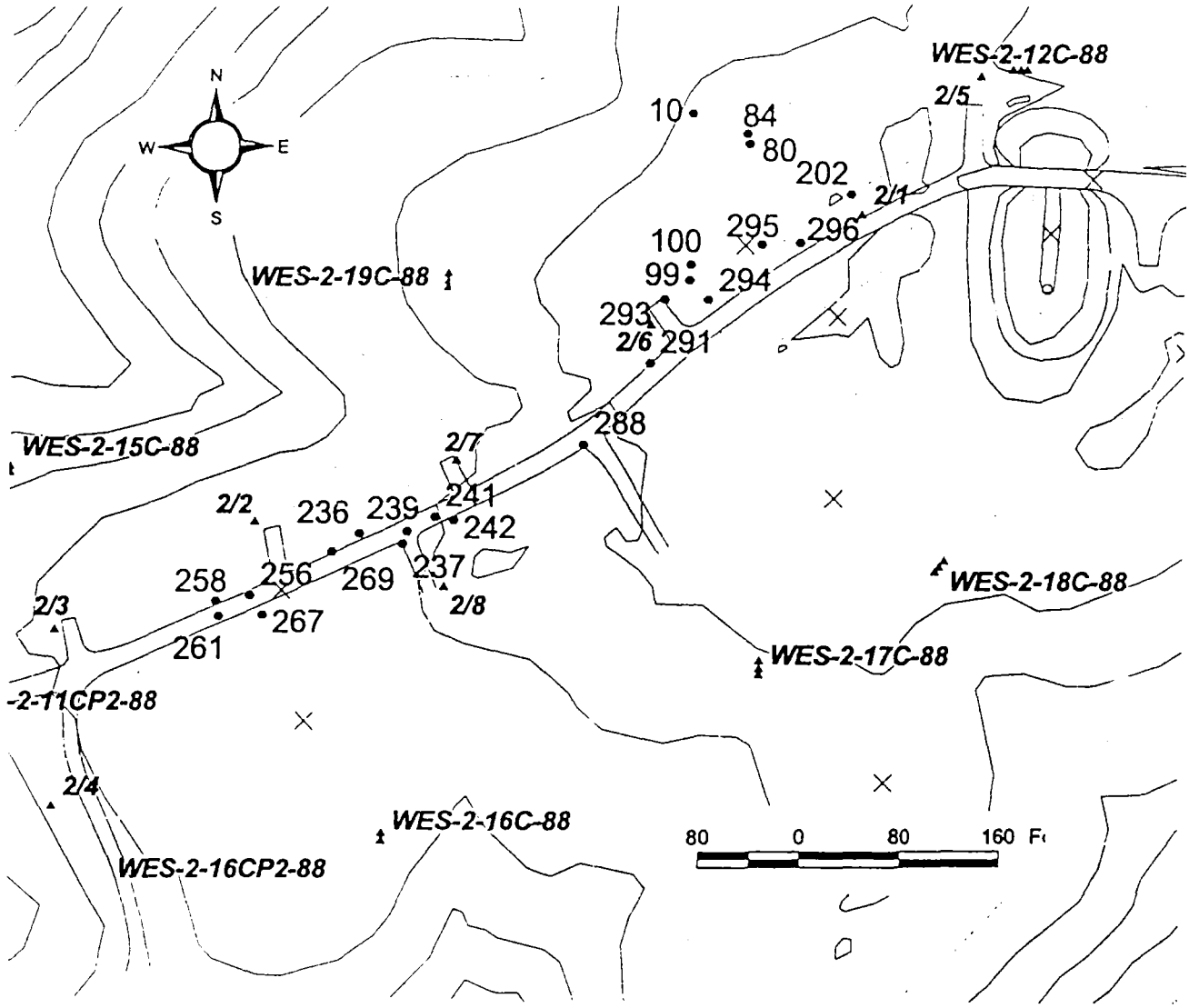


FIGURE 1-2
LOCATION OF SOLID WASTE MANAGEMENT UNITS



▲ Welltags

⬢ Dbg

1996 DBG Boring Location

Sample #	Location #	Color
96RW01S61	261	Purple
96RW01S58	258	Purple & Dark Blue
96RW01S56	256	Purple
96RBWS67	267	Purple & Blue
96RBW01S69	269	Yellow & Blue
96RW01S36	236	Yellow, Blue, Green, w/brown fiber mtl.
96RW01S37	237	Yellow w/fiber
96RW01S39	239	Blue
96RW01S41	241	Blue & Yellow
96RW01S42	242	Yellow
96RBW01S88	288	??
96RBW01S91	291	???
96RW01S93	293	Green
96RW01S94	294	Green
96RB01S99	99	Green Blue, Teal, Light Blue
96RB01S100	100	Light Blue
96RBW01S95	295	???
96RBW01S96	296	Dk Green, Yellow, Red, Purple, Orange Yellow
96RW01S02	202	Red
96RB01S80	80	Red
96RB01S84	84	Blues & Red

TABLE 1-1

FIGURE 1-3
1996 DYE BURIAL GROUNDS FILED INVESTIGATION LOCATIONS

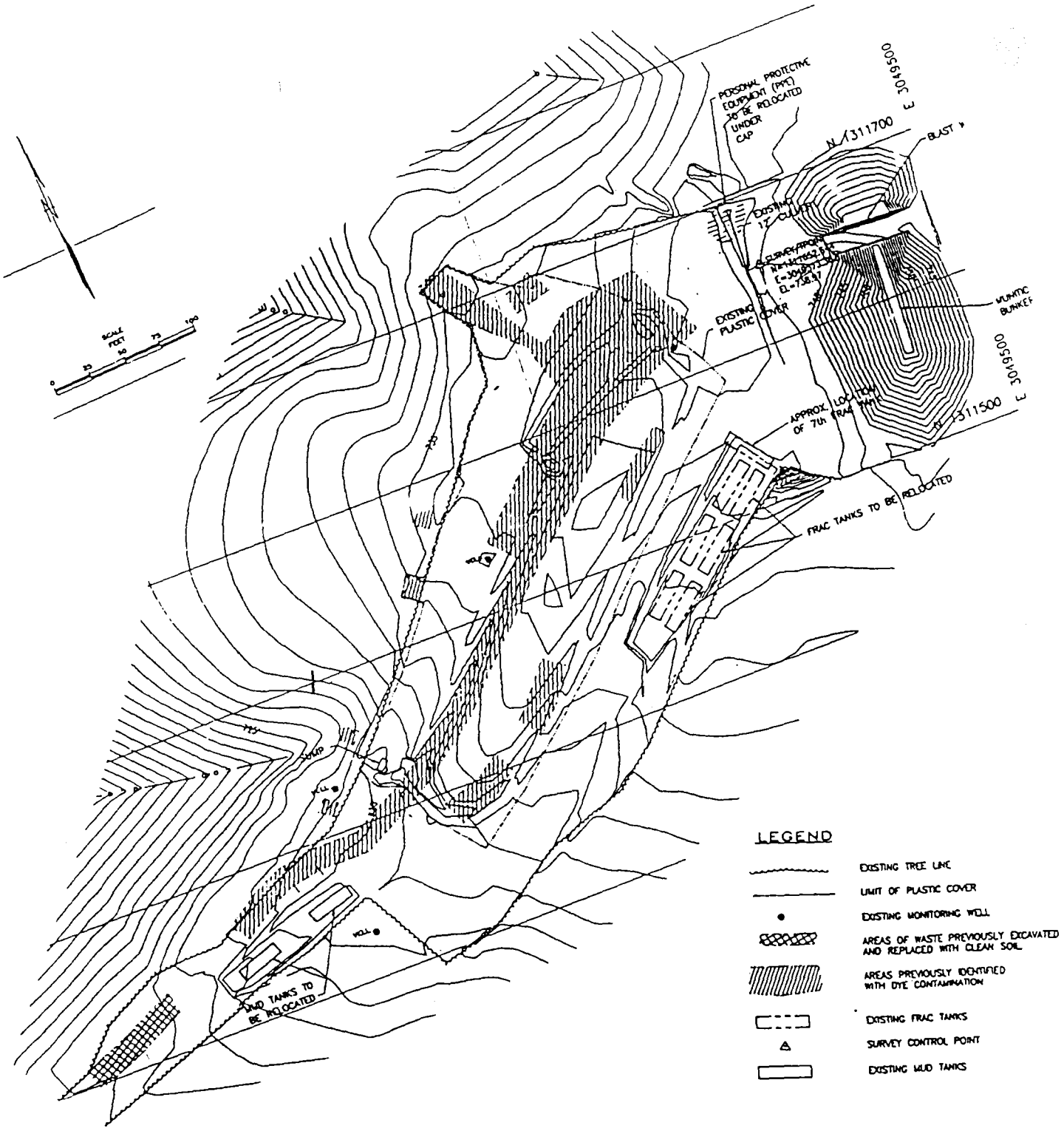


FIGURE 1-4
LOCATION OF BURIED DYE TRENCHES

2.0
ENVIRONMENTAL COMPLIANCE

Promulgation of the United States Environmental Protection Agency's (USEPA) 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 33 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 NSWC-EPA requirements.

The generation of dye contaminated material will be minimized. Material contaminated with dyes shall be disposed of by burial under the DBG cap if the material is solid, i.e., PPE, rags used for decontamination, etc., or stored in a holding tank if liquid. Run-off water contaminated with dye, decontamination water, and water contaminated with dye and a second hazardous substance shall be contained and stored in separate holding containers until analyzed, treated, and disposed of in accordance with the Quality Assurance Project Plan for Release Characterization at the Dye Burial Grounds (QAPP-DBG and US Navy Environmental Protection Department (EPD) requirements. Non-dye contaminated hazardous waste generated at the DBG, (i.e. oil, diesel, herbicide, and hydraulic fluid spill); and solid waste, (i.e. office trash and construction debris) will

be managed and disposed of as described in Section 8.0, Waste Management, and shall be in compliance with federal, state, and NSWC Crane site requirements.

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 at least seven days prior to any excavation activities. The RAC 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.

A Hot Work Permit is required by the NSWC Crane facility for any burning, welding, or any other spark producing activity (including grinding). The NSWC Crane Fire Services shall be notified 2 hours before hot work is scheduled to begin. Fire Services will conduct a tour of the area, and set storage, use, fire watch, and fire extinguisher requirements before issuing the one day Hot Work Permit.

2.2.2 Notifications

All federal, state, and local agency notifications will be performed by the NSWC Crane EPD. The RAC 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.
- Storage, and handling/management of dye contaminated or hazardous wastes.

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, herbicides, 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 the construction of the DBG cap is shown in Figure 3-1. The responsibilities of each team member are listed in Table 3-1.

Dye Burial Grounds Cap SWMU #02/11

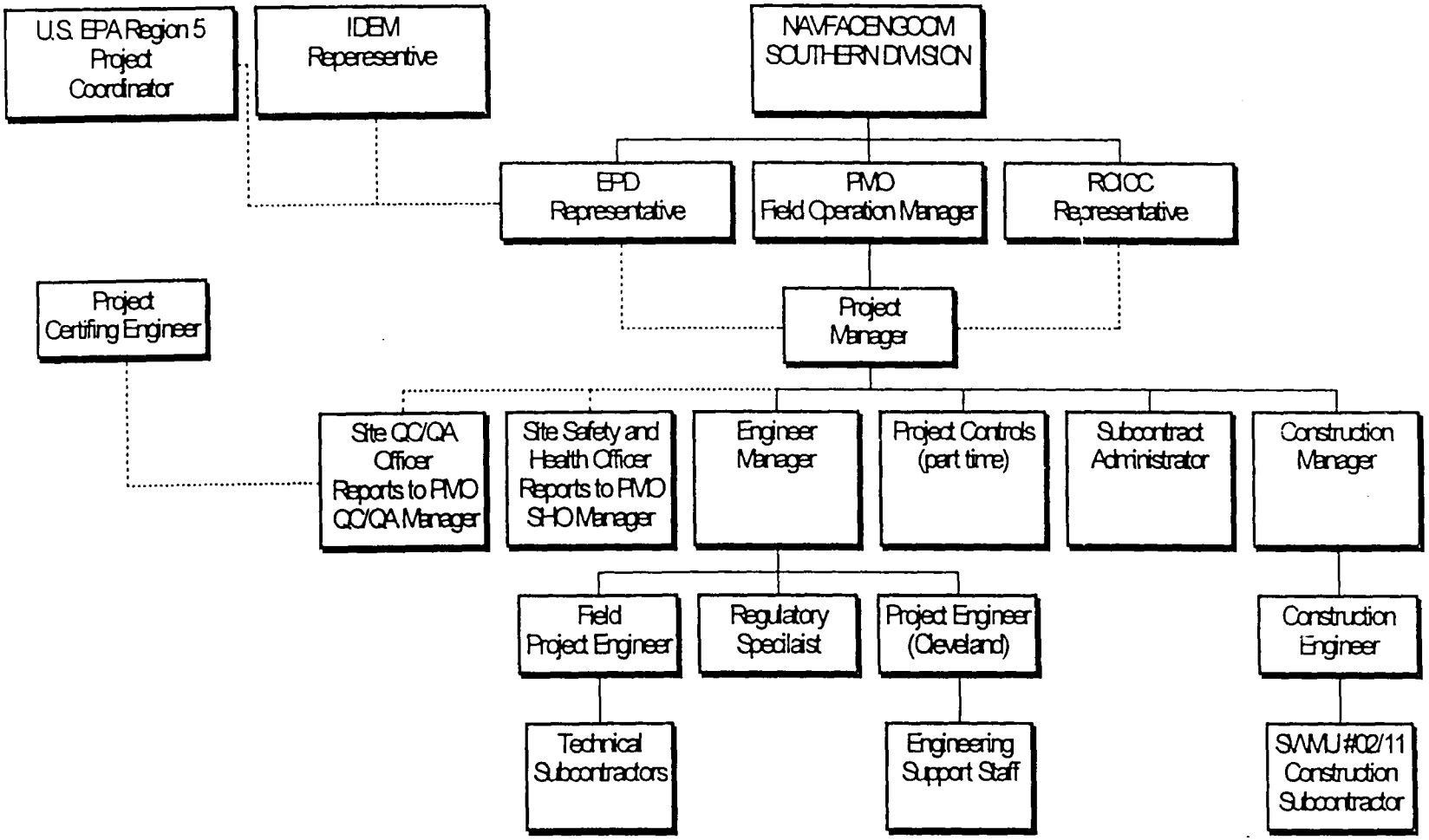


FIGURE 3-1 ORGANIZATION CHART

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. Is the primary coordinator between the NSWC, and the U.S. EPA. 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.
Certifying Engineer (Operates separately from the contractor and owner/operator registered Professional Engineer and approved by the permitting agency)	Responsible for certifying to the owner/operator and permitting agency that in the engineer's opinion, the facility has been constructed in accord with plans and specifications and document approved by the permitting agency. The certification statement is normally accompanied by a final report that contains all the appropriate documentation, including daily observation reports, sampling locations, test results, drawings of record or sketches, and other relevant data.
RAC Project Manager (PM)	Reports to the Field Operations Manager from the PMO. Has 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. • 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. • Has overall responsibility for cost, schedule control, safety, and quality.
RAC Construction/ Operations Manager (OM)	Reports to the PM and has primary responsibility for the coordination and control of all field activities to ensure that all tasks included in this Work Plan are completed. • Coordinates the activities of all field operations personnel. • Provides daily reports to the PM on the status of field operation activities. • Responsible for equipment maintenance, procurement of amendments, and miscellaneous equipment rental.

TABLE 3-1
PROJECT RESPONSIBILITIES

TEAM MEMBERS	RESPONSIBILITIES
RAC 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.
RAC Engineering Manager (EM)	Reports to the PM and has primary responsibility for finalizing the operations plans, provides construction support and oversight of engineering and scientific activities. • Provides technical direction to the engineering and science staff. • Provides oversight and coordination of the preparation of technical documents.
RAC Regulatory Specialist (RS)	Reports to Engineering Manager with primary responsibility to determine regulatory requirements and establish methods for Contractor compliance with Navy EPD requirements. • Review regulations for applicability to project, • Review project modifications for applicable regulations
RAC Field Project Engineer (FE)	Reports to the EM and has primary responsibility for technical oversite of construction. • 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.
RAC Project Controls	Reports to the PM with primary responsibilities of tracking of all cost and scheduling for the NSWC Crane Project. • Responsible for cost collection and reporting. • Responsible for schedule development, maintenance, and reporting.
RAC Project Engineer (PE) (Cleveland)	Reports to the EM with primary responsibilities of coordinating the engineering effort in support of field activities. • Assign Cleveland based resources as required for the completion of all project plans and documents. • Provide engineering support for field activities as required.
RAC Engineering Support Staff	Technical staff reporting to the Project Engineer with specific task responsibilities as necessary to allow the Project Engineer to fulfill his responsibilities.

TABLE 3-1
PROJECT RESPONSIBILITIES

TEAM MEMBERS	RESPONSIBILITIES
RAC Site Safety and Health Supervisor (SSHS)	Reports to the PMO with field reporting to the PM. Implements and ensures compliance with the Task-Specific Site Safety and Health Plan (SSHP). Tracks and reports on safety-related matters. • 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.
RAC Site Quality Control Supervisor (SQCS)	Reports to the PMO with field reporting to the PM. The SQCS has primary responsibility for verifying a consistently high level of quality for the project. • 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	Reports to the PM with primary responsibilities to support all subcontract administration for the project. • Initiates change orders and change order negotiations, • Orders and expedites 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 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/revegetation disturbed areas.

The original design of the cap was prepared by the U.S. Army Corps of Engineers' 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 main dye burial trenches are each approximately 10 feet wide, 50 feet long, and 6 feet deep, with several other areas/trenches of buried dye found in the 1996 field investigation. Materials disposed of in the trenches included magnesium, boxes and rags contaminated with dyes, and approximately 60 drums of dye. Known colors of the dye buried at the DBG include; yellow, blue, teal, green, red, and purple. 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 the U.S. Army Engineers Waterways Experiment Station, (WES) using electromagnetic, magnetic, and ground penetrating radar instrumentation. The results of these geophysical surveys indicated there are approximately 17 unidentified

anomalies located within the dye burial ground that may contain dye material. An interim measures cap design was based on this information and construction started in 1996. An additional field investigation by the NSWC-EPD and U.S. EPA was conducted in 1996 locating additional areas/trenches of dye. The interim measures cap then needed to be expanded to include these added trenches, requiring an new cap configuration, and delaying the construction of the interim measures cap for the DBG.

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

4.3 RADIOLOGICAL SURVEY

A radiological survey was performed prior to mobilization for construction. The radiological survey was performed by personnel certified and trained for the work. The Quality Assurance Project Plan for Release Characterization at the Dye Burial Ground (QAPP-DBG), under separate cover, outlines the procedures for performing the radiological survey. The information obtained from the survey was to determine if additional investigations would be required to remove point sources and to identify the level of protection required to perform work at the site. If point source removal was required due to elevated radiological levels, a separate work plan would have been developed for the management of the radiologically contaminated materials and the impact to the current cap design. The radiological survey conducted in July 1997 performed in accordance with the proposed QAPP-DBG procedure, found no elevated radiological levels at the DBG and no need for additional investigation or point source removal. A second radiological survey will be performed if required once the QAPP-DBG has been approved, but it has been determined by this initial radiological survey that no radiological contamination is present; therefore, will have no impact on the level of protection required to perform work at the site or to the current cap design.

4.4 MOBILIZATION

All equipment 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 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, including migration of storm water into area of dye contamination, 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:

- Construction of the relocated access road, outside the limits of the cap construction.
- Relocation of waste water storage tanks, outside the limits of the cap construction, including the construction of a secondary containment berm.
- Installation of two additional 500 BBL FRAC tanks, increasing the total number of FRAC tanks to eleven.
- Mud tank relocation.
- Vegetation removal and site grading.
- Relocation of designated dye contaminated areas into the cap area.
- development of a borrow source for cap foundation and cover material.
- Placement of cap foundation, a clean soil layer varying in thickness from 6 feet to 6 inches over the cap area. The minimum clean soil cover over the cap area is to be increased to 1 foot if a winter shut down of construction is needed before the cap construction is started.

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 abandoned and a new access road constructed adjacent to the new cap. The new gravel access road will be constructed along the east and south side of the proposed cap, following the existing contours of the area to eliminate any excavation of the area. The construction of the access road will utilize a geotextile for subgrade stabilization and thereby reducing the potential of exposing dye contamination. A 10-foot cleared path, again following the existing lay of the land will be placed along the north side of the proposed cap for foot 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 a NSWC-EPD approved herbicide, such as commercial grade Roundup™, to stop plant growth. Herbicides will be applied in accordance with appropriate Federal and State regulations with special care to be taken not to spill the herbicide. Stumps at the borrow area will be disposed of by placing them in the adjacent wooded area to be used as animal habitat per the direction of the NSWC.

All trees, limbs, and brush not contaminated with dye and less than three inches in diameter will be chipped. The chips will be spread in a thin layer within the adjacent wooded area as directed by NSWC or used as an amendment for the top three inches of topsoil. All trees larger than three inches in diameter will be cut and blocked in four-to-eight-foot lengths and stacked at a designated location within the borrow or DBG site. The removal of the blocked wood from the construction site shall be coordinated by the NSWC-EPD with the NSWC Public Works Department.

The vegetation will be removed by mowing close to the ground surface and then 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 to reduce potential contact with dye contaminated waste.

4.5.3 Dye-Contaminated Soil Excavation

Dye contaminated soil excavation of the designated areas will be performed until the area is visually clean, i.e., no color from the dyes are visible within the area, and at 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.

Excavation of the denoted areas of dye contamination will be accomplished by exhumation of the area starting from the point farthest from the cap area and working toward the cap, thus preventing cross contamination of a clean area. Where practical, a single piece of equipment will be used for both excavation and placement of the dye contaminated material within the cap area. Dye contaminated soil to be placed within the cap area will be placed in a maximum loose lift thickness of 12 inches and compacted by either use of the same equipment used to excavate the material or by placing a barrier, 4 mil. Visqueen, between the dye contaminated soil and a tamper compactor. Non-soil dye contaminated material, i.e. rags or PPE, shall be spread within the cap area as low as possible to afford the maximum cap foundation cover. After the non-soil dye contaminated material is placed within the cap, it shall be covered by soil and compacted in place. All dye contaminated material placed within the cap

area shall be covered with either 6 inches of clean soil fill or Visqueen sheeting at the end of the working shift. Any open areas of dye contaminated excavations shall be covered and barricaded in such a manner to prevent or limit storm water runoff and personnel from entering the 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.

If dye contaminated material is unearthed during the perimeter drainage/anchor trench excavation, it shall be spread in a thin layer within the cap area to minimize the effect on the final cap configuration. Where contaminated material is discovered beyond the trench limits during excavation of the perimeter drainage/anchor trench, the trench depth or outside edge shall be increased 6 inches or to clean soil, whichever is less. The area over excavated shall be backfilled with compacted clean soil to the specified trench elevation and width. Contaminated materiel discovered on the inside edge of the perimeter drainage/anchor trench shall remain undisturbed in place, but shall be covered by plastic sheeting to prevent potential spread of contamination.

Careful visual inspection shall take place during all earth disturbing activities. Should dye contamination be discovered outside the delimited areas of known contamination, the NSWC-EPD shall be notified and work shall be stopped in that area until NSWC-EPD determines what measures are warranted to continue. The NSWC-EPD will determine if this area is to be excavated or covered with 1 foot of clean fill material. All areas of dye contamination will be covered with either soil or plastic sheeting at the end of each work shift.

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. Clean 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 of the cap area will be performed prior to placement of the geotextile fabrics and membrane. Rocks larger than three-eights inch, roots, and other debris will be removed from the graded surface of the cap foundation prior to the cap cover system placement. The finished graded area will be surveyed to confirm proper slopes and dimensions of the cap. 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 6-inches of clean soil on 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 dye contaminated materials not decontaminated or soils shall be buried within the cap foundation and contained under the Dye Burial Grounds Interim Measures Cap. Liquids will be collected, stored and sampled to determine proper disposal methods as described in the QAPP-DBG under separate cover. Decontamination wash/rinse water and dye contaminated waste water shall be containerized in separate holding tanks. Decontamination of equipment and materials will be performed as stated in Section 7.0 of this plan.

4.5.6 Water Management

The DBG shall be inspected weekly and after a rain event of 0.5 inch more for the following: to insure erosion control measures are in place and operating properly; no breaches in construction berms; no sediment laden water observed outside the controlled areas; potential dye contaminated material is covered; is no visible water observed outside the controlled areas; and no colored water is seeping out from under the cap area. These inspections should continue for erosion control until vegetation is established after cap construction has been completed and for dye contaminated water upon concluding the erosion control inspection or as determined and directed by NSWC-EPD.

4.5.6.1 Contaminated Water Management

Storm water runoff will be controlled throughout the construction process, and if necessary, during a winter shutdown to limit the amount of potential dye contaminated water. The following subsections discuss the general processes that will be employed to prevent, control, and manage contaminated water during the different stages of the interim measure.

4.5.6.2 Water Management During Excavation

Designated areas of contaminated soil will require excavation and relocation to the cap 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 the footprint of the cap and cover the dye contaminated material with clean soil. The dye contaminated material will be covered with plastic sheeting in the event that immediate covering with clean soil is not possible. Areas of dye contaminated excavation not verified and backfilled the same day will be protected from immigration of storm water runoff by covering the area with plastic and diverting clean storm water runoff away from the excavation.

In the event storm water runoff or ponding water becomes contaminated with dye, this water will be trapped, collected, placed in a holding tank, sampled, analyzed per the provisions of the QAPP-DBG, and disposed of as directed by the NSWC-EPD.

4.5.6.3 Seepage Management 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, should seepage occur, a sump will be excavated in the location of the seep. The sump area shall be covered with a framework, and plastic, allowing it to be periodically pumped, as necessary to a holding tank, see Figure 4-1. The size of the sump area will depend on the volume of the seep. Water trapped and collected in this temporary sump will be pumped into the holding tanks. The water will be sampled and analyzed according to the procedure outlined in the QAPP-DBG and disposed of as directed by the NSWC-EPD.

All non-dye contaminated storm water runoff leaving exposed areas of the site shall be directed through a sediment control device such as silt fence, hay bales, or a silt trap, until vegetation has been re-establish.

Other erosions and sediment control measures that may be utilized during cap construction and site restoration are: construction of diversion berms to prevent storm water runoff from entering the construction area; placement of erosion matting on slopes greater than 4:1; smooth drum roll the surface of the cap when adverse weather is predicted; and the use of silt fences and hay bales to divert water.

4.5.6.4 Seepage Management 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 under the rough cover if necessary to capture dye contaminated water. 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 described in the QAPP-DBG and released or disposed of as directed by the NSWC-EPD.

4.5.6.5 Seepage Management 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-DBG.

4.5.6.6 Decontamination Water Management

A decontamination station, see Construction Drawing C-07 in Appendix B, 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 and material can be washed and decontaminated. The washwater shall be collected in a small depression in the plastic lined area, with the washwater being pumped to the designated holding tank. Decontamination water shall be segregated from other dye contaminated water The water will be sampled and analyzed according to the procedures outlined in the QAPP. For additional detail on decontamination of equipment, see Section 7.0 of this plan.

4.5.6.7 Holding Tanks and Secondary Containment

There are eight 500 BBL, 21,000 gal., FRAC tanks and two 9,000 gal. covered mud boxes in three separate secondary containment berms being used as the dye contaminated water holding tanks. Of these eight FRAC tanks, six are filled to approximately 12 inches from the top, one is 3/4 full, and one is empty. All three locations of these holding tanks are within the footprint or construction zone of the interim measures cap and will need to be relocated during construction of the cap. See Construction Drawing # C-03 in Appendix B for FRAC Tank Confinement Relocation Area. During the site preparation, a secondary containment area shall be constructed, see Construction Drawing # C-07 in Appendix B, within the FRAC Tank Confinement Relocation Area, south of the relocated access road and southeast of the DBG cap. The existing FRAC tanks shall be relocated to the FRAC Tank Confinement Relocation Area by locating an empty FRAC tank into the confinement area and pumping the contents of one FRAC tank into the empty FRAC tank located within the confinement area, then relocating the FRAC tank just pumped into the confinement area; repeating these steps until all the FRAC tanks are relocated into the confinement area.

The dye contaminated water contained within the mud boxes shall be pumped into a FRAC tank located within the confinement area. The mud boxes and frac tanks shall be decontaminated during the contaminated water treatment phase. A Water Treatment Work Plan is expected to be approved prior to cap completion. To assist in relocation of the FRAC tanks and ensure adequate storage capacity two additional FRAC tanks shall be procured for use at the DBG. Before accepting a FRAC tank on site, it shall be visually inspected for signs of contamination and structural damage. All FRAC tanks used at the DBG shall, at a minimum, have a Level I Tank Certification. All holding tanks shall be inspected daily during construction activity at the site and weekly during down periods such as winter shutdown, or after completion of the interim measures cap. The tanks shall be inspected for noticeably bulging, tilt or excessive

settling, leaks, cracks, and punctures. The secondary containment area shall also be inspected for breaches in the berms, noticeable colored water and to insure the drainage valve is closed. A minimum of 10,000 gal primary storage capacity and a secondary containment of 110% of the largest tank shall be maintained until all the water within the holding tank water has been sampled and analyzed in accordance with the QAPP-DBG and disposed of as directed by the NSWC-EPD.

Dye contaminated runoff water prior to construction, during construction, and after construction, construction decontamination wash/rinse water, and dye contaminated water with contaminated with other known hazardous substances (i.e., hydraulic fluid from equipment breakdown) shall be segregated and contained in separate holding tanks. The size of the holding tank shall be dependent upon the quantity of waste water of each category generated. A list of each of the holding containers, estimated quantity, and contents shall be given to the NSWC-EPD upon completion of cap construction and updated if additional liquid is placed within any holding tank.

4.6 WINTERIZATION

Construction of the Dye Burial Cap is expected to be completed by the end of November 1997. In the event inclement weather prevents completion of construction activities by November 1997, winterization of the cap will be required for a safe winter shutdown. The decision to proceed with cap construction or prepare for winterization will be made the first part of September. Winterization of the site will include:

- Increasing in-place clean soil cover material to a minimum thickness of 1 foot.
- 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.
- 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.

Should winterization of the cap become necessary, a Winterization Plan and Inspection Checklist will be developed with coordination and approval of the NSWC-OICC and EPD.

4.7 COVER SYSTEM CONSTRUCTION

Cover system construction will begin when site preparation activities are completed, documented, and the cap subsurface or cap foundation has been accepted, in writing, by the geotextile membrane/fabric installer, and by the Site Quality Control Supervisor

(SQCS) and coordinated with the certifying engineer. Components of the cover system and details are shown on the drawings found in Appendix B.

The cap cover system shall be constructed and documented with regard *to"Technical Guidance Documents: Quality Assurance and Quality Control for Waste Containment Facilities EPA/600/R-93/182 September 1993; Quality Management for Remedial Action and Remedial Design Waste Containment Systems EPA/540/R-92/073 October 1992; and any other applicable EPA guidance documents for cover system construction".*

4.7.1 Cap Foundation Layer

The cap foundation layer soil will act as a protective layer between the dye contaminated material and the cap cover system and establish the cap configuration. The cap foundation layer will be placed at the time of site grading to the lines and grades as shown on the drawings in Appendix B. Cap foundation soil will be material suitable for its intended use and classified as either CH, CL or SC by ASTM soil classification. Foundation cap material shall be free of debris, more than 5% by weight of organic, rocks, or cobblers greater than 3 inches, more than 10% gravel, and any other objects or material that might prevent proper compaction. Cap Foundation soil shall be obtained from the NSWC-OICC designated on-site spoils and borrow source. The surface of the cap foundation layer shall be free of debris, organic materials, rocks, roots, and gravel larger than 3/8 inch, or other object that might damage the liner. The cap foundation soil shall be placed in a maximum lift thickness of 12 inches and compacted to 90% of the maximum dry density as determined by ASTM 698 or as approved the SQCS and NSWC-EPA. A visual inspection of the foundation cap material will be performed once the material has been placed in its loose lift for pockets of organics or gravel, and rocks greater than 3 inches, which shall be removed prior to compaction of the lift.

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 shall be spread in thin layers over the cap foundation and covered with plastic sheeting to prevent spread of dye contamination until the cover system can be constructed over the area. Spots of dye contamination on the side or bottom of the trench that can easily be removed shall be hand excavated and placed within the cap area. Areas of dye contamination exceeding 6 inches in depth on the bottom and outside edge of the drainage/anchor trench shall be excavated to 6" or clean soil, whichever is less, and placed within the cap area. The area over excavated shall be backfilled with compacted, clean soil to the specified trench elevation and width. Contaminated material discovered on the inside

edge of the perimeter drainage/anchor trench shall remain undisturbed in place, but shall be covered by 4 mil. or thicker plastic sheeting to prevent potential spread of contamination. Once the anchor/drainage trench is excavated, the Geotextile Cushion, Geosynthetic Clay Liner (GCL), and High-Density Polyethylene Geomembrane Liner (HDPE), shall be anchored within the drainage/anchor trench by extending these cover system materials into and 2 feet beyond the 1 foot by 2 foot trench, see Construction Drawing # C-07 in Appendix B for additional details. After the above cover system materials have been anchored, the drainage collection system shall be installed as described in Section 4.7.6., Drainage Collection System, of this section.

4.7.3 Geotextile Cushion

A 120 mil. non-woven geotextile cushion will be placed directly on top of the approved graded cap foundation surface and in the drainage/anchor trench. The cushion will extend two feet beyond the outer edge of the perimeter drainage/anchor trench. During placement the geotextile will be seamed 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 to be included as part of the Final Interim Measures Completion Report. This report will also contain the quality control certifications including the following data: mass per unit area, trapezoidal tear strength, burst strength, puncture strength, thickness, apparent opening size, permittivity and verification the geotextiles have been inspected continuously for the presence of broken needles and the material is needle free.

Handling of the rolls of geotextiles shall be done in a competent manner such that the geotextile is not damaged. The temporary storage of the geotextile shall be for less than six months at the DBG site unless otherwise directed by the NSWC-EPD or OICC. The NSWC has approved a lay down area across the gravel road from the DBG where the geotextile roll may be stored until used. The field storage area for the geotextile rolls shall be in a dry area where water does not accumulate. The rolls shall be elevated off the ground as not to form a dam that would trap water. Stacking the rolls for storage shall be performed in such a way that the cores are not crushed and the geotextile is not damaged.

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 and included in the Final Interim Measures Completion Report along with the quality control certifications.

Any patch, used for repair of a tear, a hole, or a rip in the geotextile shall be done using the same type of geotextile as the damaged geotextile. The size of the geotextile patch must extend at least 12 inches beyond any portion of the damaged geotextile and be sealed with adhesive or heat bonded to the product to avoid shifting during placement of the HDPE liner. If bentonite particles are lost from within the GCL or if the clay has shifted, the patch should consist of the full GCL product. It should extend as least 12 inches beyond the extent of the damaged area. Similar application of additional bentonite for lapping the rolls should be employed during patching.

The GCL shall arrive on site with clearly visible labels identifying the name and address of the manufacturer, trademark date of manufacture, location of manufacture, style, roll number, lot number, serial number, dimensions, and weight shipped in a protective wrapping. Storage of the GCL at the field site shall be within the site boundaries or NSWC-OICC designated lay down area. Field storage of the GCL shall be limited by having the delivery of the product coincide with the placement of the GCL as closely as practicable, due to the potential for moisture pickup (even through the plastic covering) or accidental damage. During the limited field storage, the GCL shall either be temporarily stored in the trailer delivering the product or in an acceptable storage area off the ground and covered with a tarpaulin as approved by the SQCS and the NSWC-EPD. The GCL rolls shall be properly positioned, protected, and maintained until they are placed and covered.

4.7.5 High-Density Polyethylene Geomembrane Liner

A 60-mil textured high-density polyethylene (HDPE) liner will be installed on top of the accepted GCL. The quantity of HDPE liner placed and fully seamed is to match the quantity of GCL placed each day, the HDPE is to extend to the edge of the previous placed GCL layer. The HDPE will be placed and seam sealed according to the specifications and the manufacturer is 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. and the "*Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams*" EPA/530/SW-91/051 May 1991. 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, panel layout, repair locations, and all test results will be fully documented in the Final Interim Measures Completion Report.

The NSWC-EPD shall be provided with the proposed panel layout and HDPE product selection prior to HDPE liner placement. Panel placement shall be configured such that seams are running vertically up and down the side slopes, while minimizing the number of field seams required.

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 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. The gravel used will have all particles smaller than 2 inches but larger than ½-inch, the pipe perforation size. Gravels used for the drainage collection trench will be verified to be rounded to sub-rounded prior to placement. A geotextile material shall be placed in such a manner to encircle the gravel bedded collection pipe and gravel drainage material without contacting pipe. Additional drainage gravel shall be placed filling the trench, as shown on the Construction Drawing C-07, in Appendix B of this plan.

Four outlet drain pipes shall be connected to the drainage collection system to transport water collected through the drainage layer and collection system away from the interim measures cap. These pipes shall extend from the drainage trench past the toe of the cap to a point where the pipe invert meets the existing ground surface, see Construction Drawing C-09 in Appendix B for additional details.

4.7.7 Sand Drainage Layer

A minimum 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. To prevent abrasion, puncture, or rutting damage to the underlying geosynthetics, 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. Caution shall be used to ensure that a minimum of 6 inches of sand is moved forward ahead of construction equipment so equipment does not damage the under laying geosynthetic layers. 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. During placement 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. Care shall be taken not to rut or damage the under laying sand drainage layer during placement. Storage, handling, and testing shall be similar to those of the cushion layer geotextile.

4.7.9 Biotic Barrier Layer

A minimum 6-inch biotic barrier (washed cobblers and 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. To prevent rutting and/or other damage to the underlying layers, the biotic barrier will be spread in one lift with light equipment. 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. During placement the geotextile will be seamed 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 in Section 02200, Site Work, in Appendix C of this plan. 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 inches 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 underlaying fabric layers. Other disturbed areas outside 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 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 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, see Section 02255, Erosion Mat , in Appendix C of this plan.

4.7.14 Warning Signs

Warning signs will be placed around the entire 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 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 Schedule	AWC
01300	3-wk Construction Schedule	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 f) FRAC tank storage and containment area g) Relocated road alignment h) Swale reconstruction I) Cushion layer seaming Location	

Table 4-1 Cover System Documentation Cont'd		
Work Plan, Spec or Drawing Reference	Material/Commodity Description	Time of Submittal
	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	during construction

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

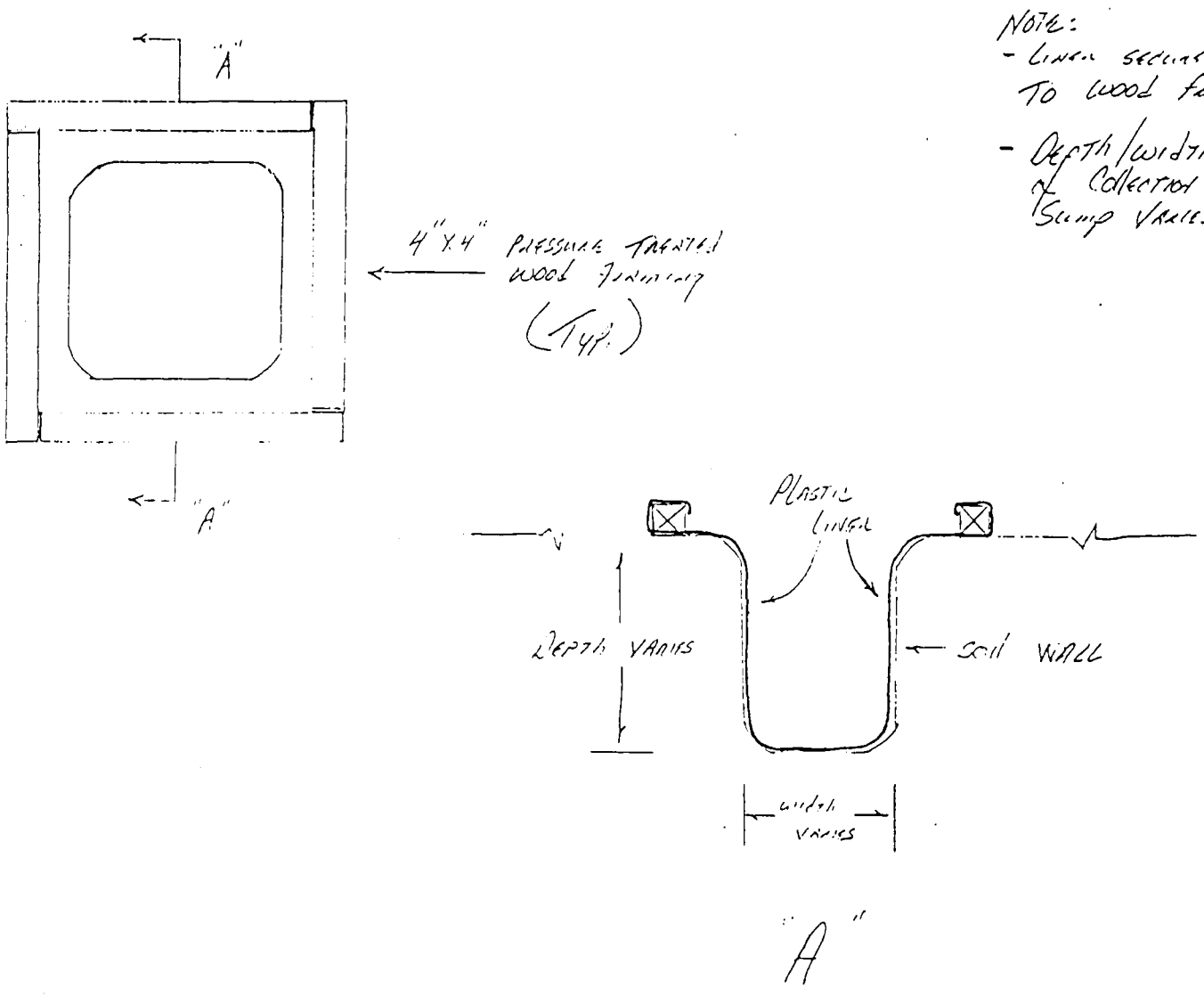


FIGURE 4-1
TYPICAL LINED SUMP

5.0
QUALITY CONTROL

The major purpose of the quality assurance process is to provide written documentation for those individuals who were unable to observe the entire construction process, so that those individuals can make informed judgments concerning the quality of construction for the project. Quality Control tests and results must be thoroughly documented. The Site QA/QC Officer shall prepare a daily written summary documenting construction activities including: inspection and testing, problem identification and corrective measures to be ultimately included in the completion report.

As a minimum, the following documents shall be utilized to ensure construction quality assurance:

1. "Technical Guidance Document: Construction Quality Management for Remedial Action and Remedial Design Waste Containment Systems", EPA/540/R-92/073, October 1992.

2. "Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams", EPA/530/SW-91/051, May 1991.

3. "Technical Guidance Document: Quality Assurance and quality Control for Waste Containment Facilities", EPA/600/R-93/182, September 1993.

4. "Seminars: Construction Quality Assurance/Construction Quality Control (CQA/CQC) for Waste Containment Facilities, Hydrologic Evaluation of Landfill Performance (HELP) Model", EPA/625/K-94/001, May 1994.

5. NSWC Crane Dye Burial Cap Subcontract Package 4324-106, including technical specifications and drawings.

6. "Quality Control Plan for Interim Measures Cleanup at the Dye Burial Grounds", August 1997.

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 and representatives from NSWC-OICC department will perform quality checks and inspections of the work and operations based on the approved Work Plan, reference documents and NSWC procedures. The U.S. EPA also retains authority to perform quality checks and inspections, throughout all phases of construction.

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 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, designated areas of dye contaminated materials will be relocated to within the footprint of the cap resulting in contamination of excavation, transportation equipment, and personal protective equipment of the workers necessitating decontamination procedures and facilities. A discussion of the decontamination facilities to 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 dye trenches (exclusion zone), prior to installation of the cell foundation cover, shall be required to wear rubber or disposable boots. Personnel in direct contact with dye contaminated material shall, at a minimum, be required to wear disposable coveralls and gloves. Personnel leaving the exclusion zone shall remove their PPE prior to leaving the contamination reduction zone (CRZ).

Wash station shall be available for employees to wash their hands and faces 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 for personnel decontamination if necessary.

All contaminated PPE shall be disposed of within the cap foundation layer or decontaminated by removing all loose material with a soft bristle brush or cloth, rinsing the article thoroughly with clean water, washing the article with soapy water, a final thorough rinse with clean water, and air dried. The decontamination steps are to be repeated until there are no visual signs of dye contamination.

7.4 DECONTAMINATION OF HEAVY EQUIPMENT

Any parts of construction equipment and hand tools that have come into contact with potentially dye contaminated material will be decontaminated by the following process:

- Gross decontamination within the exclusion zone - removal of large pieces of dirt and mud with a shovel or brush.

- Preliminary wash - a wash with a soap and water solution. Soap shall be a non-phosphate detergent such as Tide or Alconox.

- Acetone/isopropyl alcohol wipe - a wipe down of the affected area with a cloth treated with acetone or isoprophyll alcohol and rinsed with clean water. This step is to be repeated until the cloth is clear of color and any visible dye is removed from the item being decontaminated. Acetone may also be applied directly to the equipment by use of a spray bottle to control the amount and direction of the spray. Pumps and hoses shall be decontaminated by running a 3-10% acetone solution through their systems until discharge water is clear and then rinsed with clean water.

- Final inspection and uncontrolled release - after the item has been decontaminated, a final visual inspection shall be conducted. If no dye colorization is found, the item may be released.

- Decontamination wash water shall be collected and stored in a holding tank until the water is sampled and analyzed per the provisions of the QAPP-DBG and appropriately disposed as directed by NSWC-EPD. Decontamination water shall be collected and changed as needed or at a minimum, daily.

8.0
WASTE MANAGEMENT

The NSWC-EPD representative shall coordinate all waste management and disposal. The RAC must comply with all NSWC-EPD requirements for management of any solid wastes, hazardous wastes, or dye-contaminated materials. Primarily, the management philosophy is to minimize the strength and quantity of waste generated by this project.

All dye contaminated fluids (decontamination or other) shall be collected and stored. Dye contaminated fluids (other than those with characteristic fluorescent green color) shall be segregated from the existing green dye water in the FRAC tanks. Collected fluids shall be managed in accordance with the NSWC-EPD requirements when a disposal or treatment method is determined and approved by the U.S. EPA.

All non-fluid (i.e., solid) dye contaminated material shall be decontaminated prior to release or shall be placed below the cap. Dye contaminated material generated after the completion of the cap foundation layer must be handled in compliance with NSWC-EPD requirements for contaminated materials or waste as appropriate.

Any hazardous materials which are not dye contaminated shall be dispositioned as directed by the NSWC-EPD Representative. Non-hazardous, non-dye contaminated materials can be released as appropriate (RAC shall reuse, excess, or dispose of the materials in accordance with NSWC-EPD requirements or guidance).

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 wildlife, removal of temporary facilities, dust control, and erosion and sediment 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 construction specifications and 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, the U.S. Fish and Wildlife Service, and the NSWC-EPD.

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 or repaired with approval of the NSWC-EPD representative.

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 Wildlife

The work will not disturb wildlife, or otherwise significantly disturb the native habitat on or adjacent to the project. 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 and an EPD 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.

The U.S. Navy and its contractors must comply with the ESA provisions to protect potential Indiana Bat habitat at the NSWC site.

9.2.4 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 by wetting the area with a water spray or NSWC-EPD approved dust surfactant, such that no runoff occurs. Construction precautions and personnel PPE for excavation of the dye contaminated material is address in the Site Specific Health and Safety Plan in Appendix A of this plan.

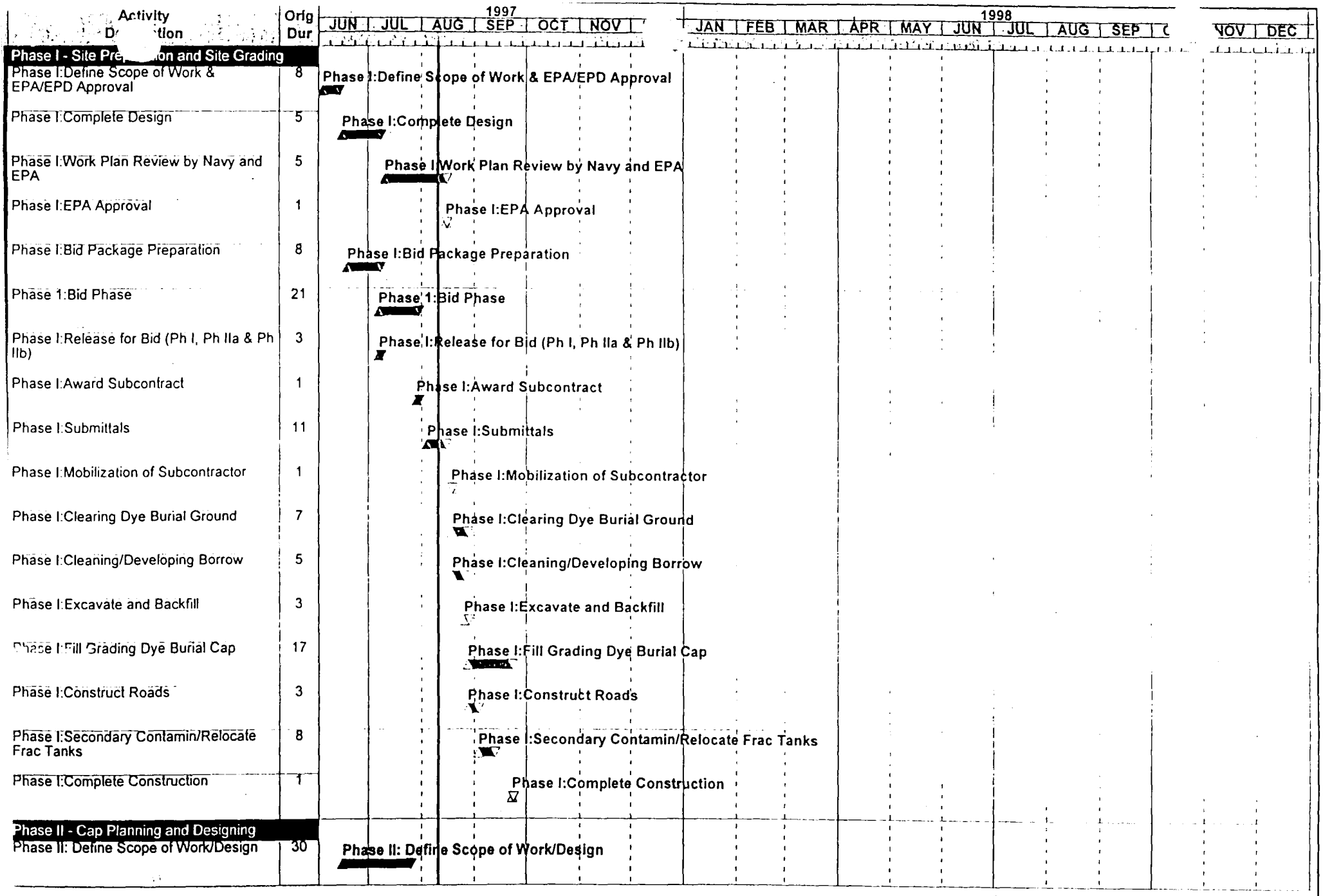
9.2.5 Erosion and Sediment Control

Temporary erosion control measures, in accordance with NSWC Crane's Pollution Prevention Plan, will be used within all areas of excavation, construction and material stockpiles until site restoration is completed and surface drainage is reestablished. The amount of bare soil exposed at any time is not expected to exceed five acres, including the DBG construction and the NSWC designated borrow areas. All exposed (bare) area will be protected by temporary erosion control measures including silt fencing, surface contouring, berms, sumps, or temporary seeding.

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 constructed of soil obtained from the NSWC designated borrow areas, drainage swales as shown on the construction drawings in Appendix B for the DBG, and as need for the borrow areas, sumps, straw bale dikes, temporary seeding, and erosion control matting. These structures will be maintained as needed to ensure that soil erosion is minimized and storm water runoff is not permitted to enter or exit the construction area in an uncontrolled manner. Dye contaminated water shall be trapped, collected and stored in a holding tank until disposed of as directed by the NSWC-EPD. During construction all non-dye impacted, sediment laden storm water shall be directed to pass through a silt fence, sediment trap or other sediment control device before being released to follow natural drainage patterns.

10.0
SCHEDULE

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



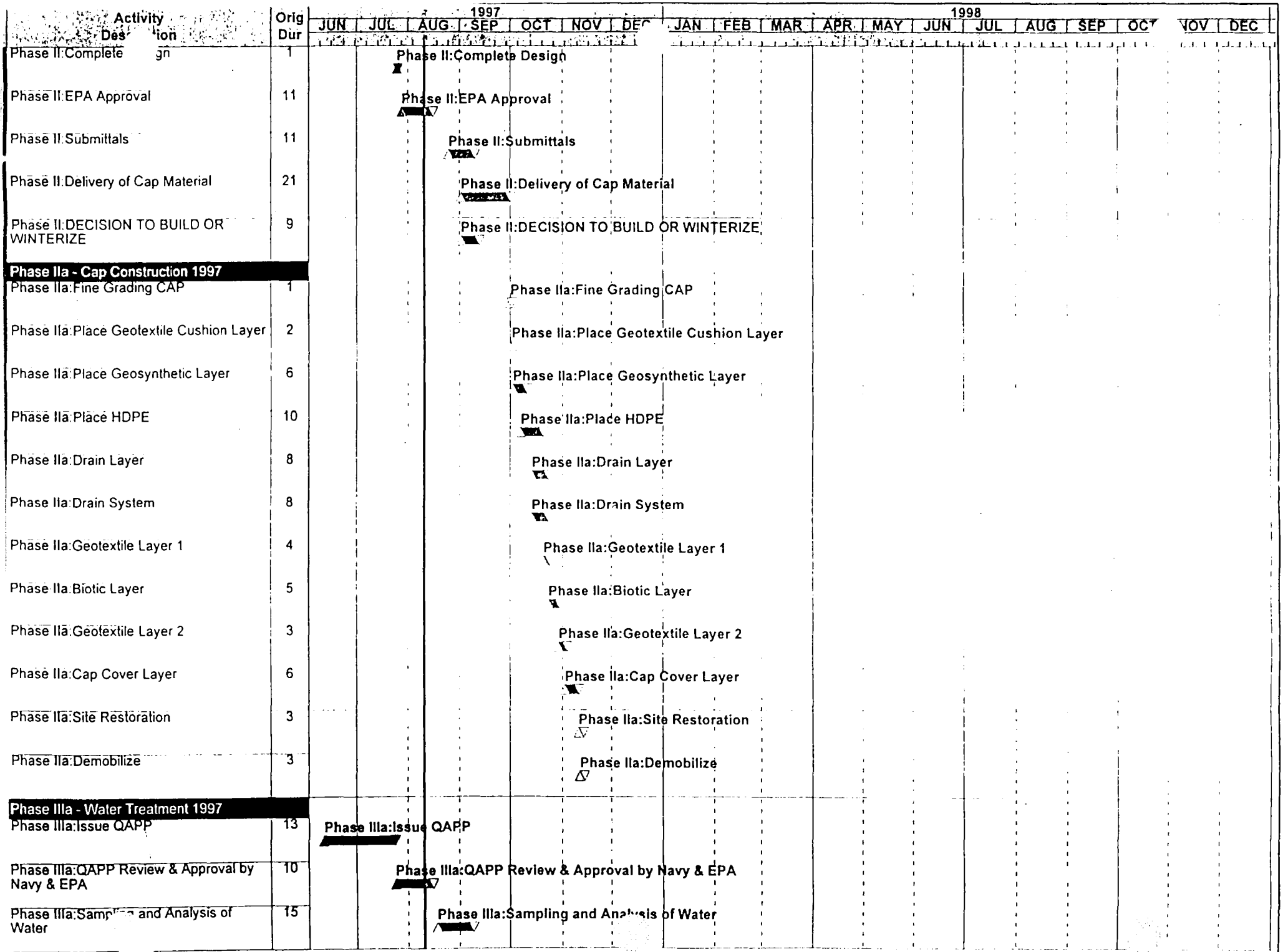
Project Start	04JUN97
Project Finish	19AUG98
Data Date	11AUG97
Plot Date	13AUG97

Early Bar
Progress Bar
Critical Activity

DBC1

Sheet 1 of 3

Dye Burial Grounds Cap
Initial Schedule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DEC
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Phase II:Submittals 11
Phase II:Delivery of Cap Material 21
Phase II:DECISION TO BUILD OR WINTERIZE 9
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Phase IIa:Place Geotextile Cushion Layer 2
Phase IIa:Place Geosynthetic Layer 6
Phase IIa:Place HDPE 10
Phase IIa:Drain Layer 8
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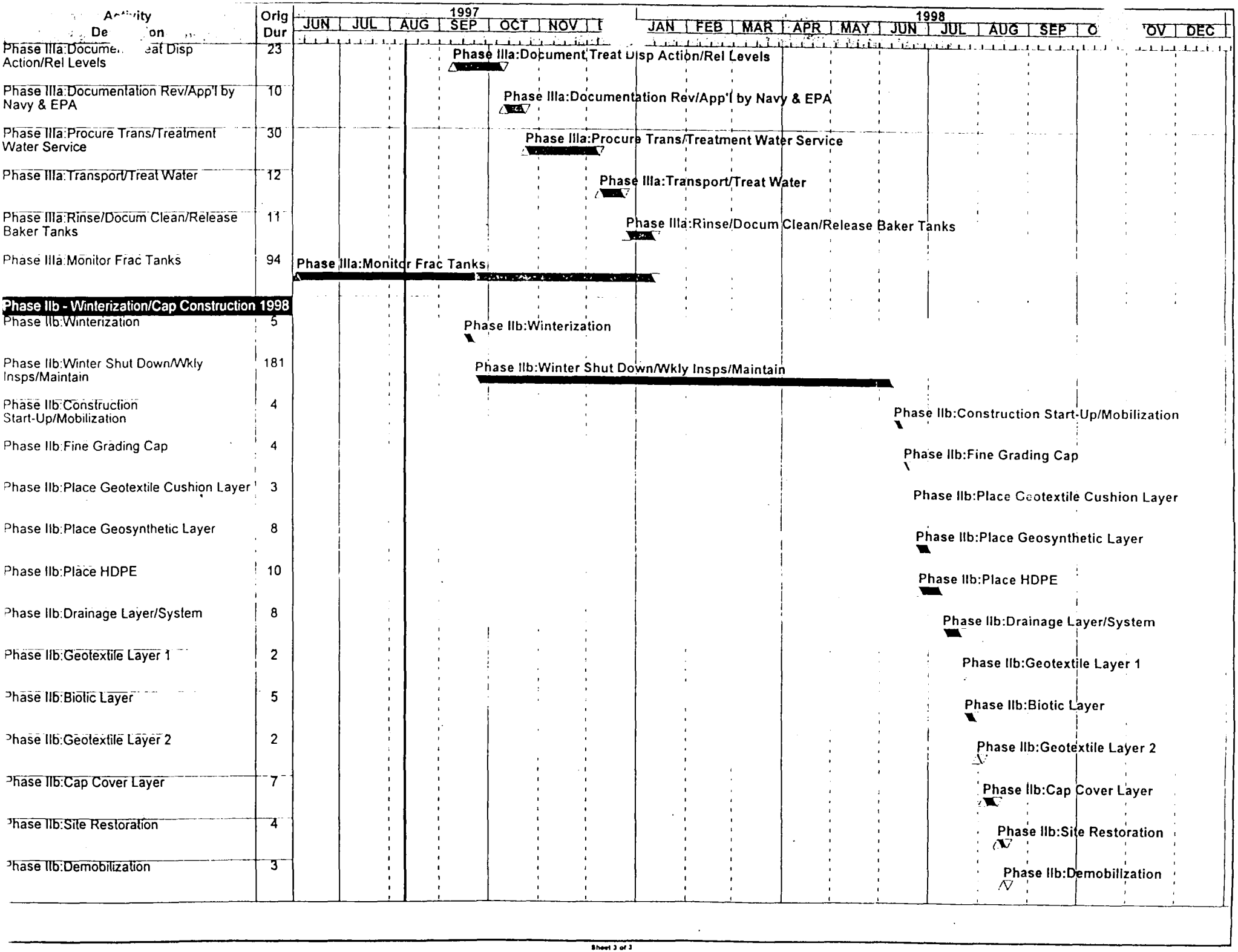
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Phase IIb:Fine Grading Cap 4
Phase IIb:Place Geotextile Cushion Layer 3
Phase IIb:Place Geosynthetic Layer 8
Phase IIb:Place HDPE 10
Phase IIb:Drainage Layer/System 8
Phase IIb:Geotextile Layer 1 2
Phase IIb:Biotic Layer 5
Phase IIb:Geotextile Layer 2 2
Phase IIb:Cap Cover Layer 7
Phase IIb:Site Restoration 4
Phase IIb:Demobilization 3
Phase IIIa:Document Treat Disp Action/Rel Levels
Phase IIIa:Documentation Rev/App'l by Navy & EPA
Phase IIIa:Procure Trans/Treatment Water Service
Phase IIIa:Transport/Treat Water
Phase IIIa:Rinse/Docum Clean/Release Baker Tanks
Phase IIIa:Monitor Frac Tanks
Phase IIb:Winterization
Phase IIb:Winter Shut Down/Wkly Insps/Maintain
Phase IIb:Construction Start-Up/Mobilization
Phase IIb:Fine Grading Cap
Phase IIb:Place Geotextile Cushion Layer
Phase IIb:Place Geosynthetic Layer
Phase IIb:Place HDPE
Phase IIb:Drainage Layer/System
Phase IIb:Geotextile Layer 1
Phase IIb:Biotic Layer
Phase IIb:Geotextile Layer 2
Phase IIb:Cap Cover Layer
Phase IIb:Site Restoration
Phase IIb:Demobilization

11.0
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Department Of The Navy, 1991. RFI Interim Measures Geophysical Investigation - SWMU 02/11, Dye Burial Grounds. Draft. Waterways Experimental Station. May 1991.

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Indiana Administrative Code. *Standards Applicable to Generators of Hazardous Waste.* 329 IAC 3.1-7.

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U.S. Environmental Protection Agency. *Land Disposal Restrictions.* 40 CFR 268.

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APPENDIX A

TASK-SPECIFIC SITE SAFETY AND HEALTH PLAN

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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 Navy's Remedial Action Contractor's (RAC) 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 RAC 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 one foot below adjacent grades. The RAC 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 standards 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 RAC will conduct and document a radiological screening of the surface soil within the cap construction area for the presence of Radium-226 and 228 (Ra-226/228). There was 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 QAPP.

The construction of the multi-layer cap will be completed as non intrusively as possible within the dye burial grounds. Materials used in the cap are essentially chemical inert materials such as construction sand, gravel, soils, and the various types of geotextile material.

Table A1 provides a summary on potential contaminants as compiled from NEESA, 1983, the list of standards of dye compounds used on the base, and a series of articles produced from a literature search for pyrotechnics. As identified in the literature, dyes are categorized by chemical structure and the dyes suspected to be present in the burial ground fall into four categories. The dyes in the table are separated into the categories of anthraquinone compounds, azo/aniline compounds, quinoline compounds, and inorganic or simple compounds.

The functional structure of an anthraquinone dye is anthracene or phenanthrene. The compounds are of low toxicity and unproven carcinogenicity.

The functional structure of an ano/aniline dye is a double nitrogen connector or an NH_2 group. The compounds are of low toxicity and unproven carcinogenicity.

The functional structure of an quinoline dye is quinolyl or quinolinyl. The compounds are of moderate toxicity and unproven carcinogenicity.

The inorganic or simpler compounds primarily are in commercial fireworks though they can have military applications such as the use of magnesium. These compounds are included for completeness but are not expected to be present. The organic compounds (e.g., nitroglycerine) would be present at low to trace levels. It is expected that these compounds will not be reactive but may present a health hazard.

Generally the compounds on the list are suspected or probable carcinogens for animals. As such, they are listed as potential carcinogens for humans. Until these compounds are tested, and due to the numerous compounds present, this plan is written with the basis that these chemicals pose a health hazard and the personnel protective equipment and other control methods will be used. Methods are specifically discussed in sections 6 and 10.

1.4 REFERENCES

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14. The following MK NAVFAC SouthDiv Project Procedures:
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    PHSP 02.1, Emergency Response, 3/15/96.
    PHSP 03.1, Spill Response, 3/15/96.
    PHSP 04.1, Incident Reporting, 3/15/96.
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2.0 SAFETY AND HEALTH HAZARDS SUMMARY

2.1 OVERVIEW

During remedial action 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 followed. Protection against excessive levels of airborne dust will be accomplished through engineering dust controls and a dust monitoring program as much as possible. However, respirators will be required when exhuming dye/relocating the dyes outside the cap footprint and when installing the leachate collection trench in areas where dyes exist. Risks from chemical exposures from polymer chemicals used in cap seaming and burns from heated surfaces will be controlled by implementation of the manufacturers' recommendations on equipment operation as determined during pre-use assessments completed by the RAC.

The highest health 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 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 analyses will be prepared as needed. A new or revised AHA worksheet shall be field prepared and reviewed by the SSHO before the activity takes place. A Plan-Of-The-Day (POD) meeting or the Pre-Entry Briefing meeting shall be utilized to review the AHA with all affected personnel.

2.3 CHEMICAL HAZARDS

The potential chemical contaminants considered the most significant in terms of safety and health are the buried chemical dyes. Precautions will be taken to eliminate or limit direct contact exposure potential. All work with dye-contaminated soil shall be performed using heavy equipment rather than hand digging unless absolutely necessary. All work with buried dyes shall be performed wetted to reduce the potential of airborne hazards. Wetting of the dye-contaminated material shall be accomplished in such a manner to eliminate dust

without causing runoff of potential contaminated water, such as by use of a mist or spray bar. Other minor sources of potential chemical contaminants are contact with groundwater which is not anticipated on this project. The chemical vapors generated during the liner seaming operations should present no or minimal risk with the open air ventilation. Exposure to acetone and acetone vapors during decontamination will be minimized through sound engineering controls and minimal PPE.

2.4 BIOLOGICAL HAZARDS

Potential hazards include insect, rodents, spider and snake bites, and irritating plants such as poison ivy and sumac. Of particular concern is the potential for tick bites and Lyme disease. All personnel shall be made aware of potential biological hazards and methods to controlling or mitigating exposure during 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 hand tools. 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 of year; 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, falls, cuts, contusions, 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. The PPE may by up-graded during or for select construction activities as necessary to protect personnel, including the use of hearing protection, leather leggings/apron, and a face shield when using hand held saws during clearing and grubbing. Where contact with dye is possible, PPE shall include rubber boots, chemical resistant coveralls, rubber or nitrile gloves, and respiratory protection. Table 3 provides a summary of the PPE requirements by task. The SSHO may also up or down grade PPE depending on site conditions, testing, and monitoring results.

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 SSHO will assess hearing protection needs in accordance with GSHP Section 2.5.2.

2.5.3 Heat and Cold Stress

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

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

2.5.4 Excavations

Open 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 is greater than 4 feet will be adequately barricaded. Adequate sloping, benching, or shoring will be performed prior to allowing any personnel entry into an excavation. The deepest excavation on this project is anticipated is to be approximately 6 feet for exhumation of the dyes on the north side of the cap area during remeditial action activities.

Positive identification of underground utilities and services is required at least 24 hours prior to any excavation, trenching, or penetrations. Other than the monitoring well, no other utilities are known to exist within the dye burial grounds area. An Excavation and Trenching Permit application must be submitted at least seven days prior to any excavation activities, through the NSWC Crane Construction Department (PWD). Regardless of the size of the trench, the RAC 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. 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.
- Seat belts 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 inspected by the SSHO prior to use on site. The SSHO reserves the right to reject any piece of construction equipment.
- A daily safety checklists shall be completed by heavy equipment operators. This checklist shall be based on the equipment manufacturers' recommended guidelines for daily checks.

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.I.

3.0 RESPONSIBILITIES AND AUTHORITIES SUMMARY

The RAC's SSHO shall be qualified to perform air monitoring to support the construction activities and provide a daily site safety report; this report shall be summarized on the Contractor Production Report for the Navy. 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 RAC 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 RAC personnel names and telephone numbers of responsible persons are presented in Table 2.

3.1 NEAREST EMERGENCY MEDICAL FACILITY

Figure 1 is a map showing the route to the nearest medical facilities.

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 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 is on right-hand side of the road.

4.0 TRAINING AND SAFETY MEETING REQUIREMENTS SUMMARY

This Section lists all regulatory driven and project specific health and safety 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 until all potential dye contaminated material is covered. 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 RAC employees shall receive initial site specific training prior to commencement of work. Site specific training will be performed by the 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 BLOOD BORNE PATHOGENS

The Contractor SSHO and at least one other 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 Blood borne Pathogens.

4.4 SAFETY MEETINGS

Weekly safety meetings shall be conducted by the RAC.

4.5 PLAN OF THE DAY (POD) MEETINGS

A 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 personnel attendance.

4.6 PRE-ENTRY BRIEFINGS (MEETING)

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

4.7 QUALITY CONTROL PREPARATORY INSPECTION PHASE MEETING

Whenever necessary, the RAC's 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 RAC. These records shall be made available to U.S. Navy and EPA personnel upon request.

5.0 MEDICAL PROGRAM SURVEILLANCE PROGRAM REQUIREMENTS

5.1 SUMMARY

Participation 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 will no longer be required.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.1 GENERAL REQUIREMENTS

The PPE level is initially planned as Level D (hard hat, 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 or C may be 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. The SSHO may also up or down grade PPE depending on site conditions, testing, and monitoring results.

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 of either personal or area samples. All air monitoring will be conducted by the RAC's 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 that 10 mg/m^3 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 annually. 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 that 1.0 mg/m^3 (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 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 annually. 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 to 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

8.1 GENERAL

Operations shall be conducted in a safe manner consistent with the policies and procedures outlined in the 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 RAC personnel assigned to this project are responsible for following the SSHP, for using safe practices, and for wearing the PPE specified. Project personnel shall report hazards and unsafe conditions and practices to the RAC. All federal, state, and local occupational health and safety regulations must be complied with by the RAC. Violations of project procedures may include disciplinary measures up to and including termination.

8.2 RULES AND PROCEDURES

The following are RAC general safety rules and procedures that the SSHO shall review as part of the site specific safety training:

- The RAC will provide first aid kits including CPR kit (Pocket Mask) and biohazards control kit at the site(s).

- A Work Zone Map including emergency phone numbers shall be post it at each work site. 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.

- Avoid direct contact with contaminated materials unless necessary for sample collection or required observation.

- Remove disposable clothing and follow decontamination procedures when leaving a exclusion zone.

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 RAC and coordinated with the Navy's site representatives as necessary to meet operational and safety objectives. These work zones will be depicted on Work Zone Maps that are field prepared by the RAC and to be posted near the entrance to the work area. In addition to the zones, these maps should show assembly points, evacuation routes, and location of emergency equipment. One copy of the work zone maps and all revisions shall be retained by the SSHO in Attachment B of the field master copy SSHP.

9.1.1 Exclusion Zone (EZ)

The 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 received the appropriate training.

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 and 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 use of a CRZ is anticipated only 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 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, i.e., 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 RAC 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 that may have come into contact with potentially dye contaminated material will be decontaminated and visually inspected prior to removal from the site Decontamination shall consist of a gross decontamination within the exclusion zone where any large pieces of contaminated material are removed, followed by a preliminary wash with a detergent solution and a high-pressure water rinse, if necessary, then an acetone wipe with a cloth treated with acetone, or acetone spray by lightly spraying the area to be decontaminated with acetone, followed by a final rinse with water. All water used during decontamination shall be contained until pumped into a designated holding tank, for storage. Decontamination water is to be stored until it is sampled, analyzed, and properly disposed. Decontamination water shall be changed as needed; at the end of the shift all used decontamination water shall be transferred from the CRZ to the designated holding tank.

10.4 SANITATION, PERSONNEL HYGIENE AND WASHING FACILITIES

As necessary, a hand and face washing facility consisting of water, towels, and soap for personnel, shall be made available near the Work Zones. 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 RAC in accordance with EM 385-1-1 Section 2.

10.5 DECONTAMINATION WASH WATER

All personnel and equipment decontamination water shall be collected at the end of each shift and pumped into the designated and labeled holding containers.

11.0 ON-SITE FIRST AID AND EQUIPMENT

11.1 FIRST AID AND MEDICAL FACILITIES REQUIREMENTS

At a minimum, the RAC shall maintain a 16-unit first aid kit. 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. At least one employee trained in First Aid/CPR is required to be on site when active work is being performed.

A spill control kit shall be available at each controlled work area. The RAC 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 RAC's prepared Work Zone Map.

11.2 REPORT OF FIRST AID CASES

All first aid cases, accidents, and incidents shall be promptly reported. The RAC shall immediately notify the Navy Technical Representative (NTR) or the Navy Resident Officer in Charge of Construction (ROICC) of all injuries even if only preliminary information is available. The RAC 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 should still 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 RAC 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 including notification of the ROICC or NTR.

12.2 PRE-EMERGENCY PLANNING

During mobilization activities for this project, the RAC 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.

- Emergency Response Coordinator. The RAC's 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.

- Evacuation Routes. Routes will be specified as needed. This 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 shall be evaluated.

- 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 the RAC 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.

12.3.2 Project Manager

The RAC's Project Manager is responsible for assuring adherence to the administrative elements and implementation of the Emergency Response Plan (this section of the SSHP). The Project Manager will evaluate the site's preparedness for emergency responses and identify special conditions which may require additional preparations. The Project Manager will ensure that necessary equipment and facilities are provided to support this plan.

12.3.3 RAC 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 SSHO. The CIH is the designated Health and Safety Manager.

12.3.4 RAC Site Safety and Health Officer (SSHO)

The SSHO is responsible for directing response actions to emergency situations. The SSHO 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 SSHO to keep them up to date and to ensure they are applicable and relevant to emergency response organizations.

12.3.5 Other RAC Site Personnel

All other RAC site 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 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 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. Once the appropriate Navy or Civil personnel arrive on the scene of the emergency, command and coordination of the emergency will be turned over. RAC personnel will provide support equipment and personnel until released or the emergency is over.

12.6 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.

12.7 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 medical facility shall be communicated with to establish a contact person for the necessary information.

12.8 COMMUNICATIONS

The RAC at each work site area shall be equipped with cellular telephone for communications during work activities.

12.9 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.

12.10 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number X1333, the Environmental Department (X1132, X3114, or X6160), and to the RAC SSHO at 812-854-6941. The RAC will assure that the Navy's designated authority is notified promptly and directing initial emergency response actions until the arrival of the NSWC Crane designated authority. The designated authority can include the 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 RAC personnel 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 NSWC Crane Security Desk at X 1333 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. The RAC designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. The RAC 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. The RAC notifies the NSWC Security Desk at X 1333, 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. The RAC shuts down operations, secures loose materials, parks and secures mobile equipment. Personnel is directed to a permanent building after completing decontamination procedures.

3. The RAC completes accountability and awaits clearance from Base Security to resume operations or take other action.

4. The RAC shall inspect all work site offices, trailers, mobile equipment, and 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. The RAC notifies the NSWC Security Desk at X 1333 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. The RAC designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. The RAC 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 until arrival of first responding medical unit. In either case, gross decontamination will be completed to the extent possible by removing 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. The RAC evacuates the immediate area around object to a safe distance and begin exposure assessment.

2. The RAC 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 by PID monitoring in the general area by the SSHO if determined to be necessary.

3. The RAC shall secure area and notify the Emergency Response Number X1333 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 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, and prepared equipment inspection sheets shall be maintained in file folders by the RAC.

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 SSHO.

13.3 FIELD MASTER COPY OF SSHP

The 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 this copy shall be sent to the RAC's PMO office in Charleston.

13.4 RECORDKEEPING

The 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.

The SSHO shall receive copies of all records for injuries and illnesses of RAC site personnel incidental to the work, including copies of the Worker's Compensation First Report of Injury. Injury and illnesses shall be recorded on an OSHA 200 Log. 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 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. Employees 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 SSHO shall complete a safety and health project completion report at the conclusion of the field work. The purpose of the report is a self assessment summarizing the 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 SPILL CONTAINMENT PLAN

15.1 GENERAL

Spill and release accident scenarios during remediation could occur and involve residue process material 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, any one or all of the following actions may be taken by RAC personnel as appropriate:

- 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.

15.2 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.

The RAC will cooperate with the base, other site contractors, and federal, state, and local Directors of Emergency Preparedness and Response with response plans that are compatible and integrated to ensure a coordinated effort in preparing for a spill emergency. Prior to the start of work, the RAC site personnel shall review PHSP 03.1 and meet with the Navy 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 both RAC and Navy personnel. The Base Fire Department will be notified of any spills classified above 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.

15.3 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.

15.4 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number X1333, the Environmental Department (X1132, X3114, or X6160), and to the MK SSHO at 812-854-6941. The RAC shall assure that the Navy's Technical Representative (NTR) or ROICC is notified promptly. The RAC is responsible for directing initial emergency response actions until the arrival of the NSWC Crane 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 the RAC site personnel at the work site for spill and release emergencies.

Response Actions:

1. Notify the NSWC Crane Security Desk at X 1333 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 upgrade from the spill.

3. The RAC shall designate one person to meet the emergency response units at the nearest road where the units will be approaching.

4. The RAC shall assume 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.

16.0 CONFINED SPACES

Not anticipated on this project.

TABLES

DYE COMPOUNDS POTENTIALLY PRESENT AT THE DYE BURIAL GROUND

ANTHRAQUINONE DYES	
1-amino anthraquinone	1,8-di-p-toluidinoanthraquinone
2-aminoanthraquinone	1-hydroxy-4-p-toluidinoanthraquinone
1-amino-2-bromo-4-p-toluidinoanthraquinone	1-methylaminoantraquinone (Celanthrene Red)
1-amino-8-chloroanthraquinone	1-methylamino-4-p-toluidinoanthraquinone
1-amino-2-methyl-4-p-toluidinoanthraquinone (Alizarin Sapphire, Blue R. Base)	HVT-yellow-GK Is Indanthrene Yellow GKA Powder
1,4-diaminoanthraquinone	Ind Gold Yel GKAC
1,4-diamino-2,3-dihydroanthraquinone (Disperse Violet 1)	Quinizarin
1,4-diamino-2-methoxyanthraquinone (Disperse Red 11)	Red Dye, Disperse 9, 1-methylaminoanthraquinone
1,4-dimethylaminoanthraquinone (Disperse Blue 14)	Red Dye, Disperse 9, Reference Standard , 99%, Para 6.5
1,4-di-p-toluidinoanthraquinone (Solvent Green 3) (Quinizarin Green)	Red Dye, Disperse 9, Reference Standard, 99%, Para 6.6
1,5-di-p-toluidinoanthraquinone	
AZO/ANALINE DYES	
Acid Blue 1	Dimethylaminoazobenzene
Acid Orange 10	N,n-dimethyl-p-phenylazoanaline
Acid Yellow 23	O-tolylazo-o-tolylazo-b-naphthol (Sudan Iv)
1-(4-dimethylaminophenylazo)-2-naphthol	Calco Oil Scarlet, 69493
1-methoxybenzenazo-2-naphthol (Solvent Red 1)	Calcozine Rhodamine BXP
1-(2-methoxyphenylazo)-2-naphthol	Disperse Red 5 2-chloro-2-methyl-4-nitro-4'-n,n-bis(2-hydroxyethyl)azobenzene
1-(4-nitrophenylazo)-2-naphthol	DuPont Oil Red, Ref. L4-a (5301), Ser.5211
1-(4-phenylazo)-2-naphthol (Sudan I)	DuPont Oil Yellow C-1904 (CI Solvent Yellow 12)
1-xylene-azo-2-naphthol (Orange 7)	Indigo
2-chloro-2-methyl-4-nitro-4'-n,n-bis(2-hydroxyethyl)azobenzene (Disperse Red 5)	Oil Scarlet 1370, Peerless Color
2,4-diaminoazobenzene (Chrysoidine G, Base)	Pyrazoleanthrone
9,10-dianilinoanthracene	Sudan Orange RRA
2-tolylyazoxylylazo-2-naphthol	Sudan Scarlet 6G Special

QUINOLINE DYES	
N-(P-dimethylaminophenyl)-1,4-naphtholquinonimine	2-(2-quinolyl)-1,3-indandione (Chinoline Yellow)
2-(2'-quinolinyl)-1,3-indandione (Solvent Yellow 33)	Quinophthalone (Quinoline Yellow, Base)
2-quinolyl-2-indandione-1,3 (Rhodamine B)	Vat Yellow 4, Dibenzo (A,h) Pyrene-7,14-dione or 3,4,8,9-dibenzpyrine-10-quinone
INORGANIC DYES	
Aluminum Compounds	Potassium Compounds
Barium Compounds	Sodium Compounds
Copper Compounds	Stearated Yellow Chrome, from MK12 Marine Location Marker
DuPont Oil Blue a (Copper Sulfate)	Strontium Compounds
Iron Compounds	Sulfur
Magnesium Compounds	
OTHER CLASSIFIED ORGANIC DYES OR COMPOUNDS	
Anthracene, 480 Lot # 63	Naccosol A
Auramine Hydrochloride	Nitroglycerine
Benzanthrenone RDA 451 Composite R5054	PBAN (Polybutadiene-acrylic Acid-acrylonitrile Terpolymer)
Benzanthrone; 1,9-benz-10-anthrone	Sugars (Sucrose, Lactose, Etc.)
Benzanthrone; Reference Standard Sample Dye, Para 6.4	Uranine (Disodium Fluorescein) (Fluorescent Green Dye)

UNCLASSIFIED COMPOUNDS	
9-diethylamino-phenyl-5-benzo (A) Phenazinone (9-diethlyamino Rosindone)	Oil Scarlet BL, Order # 1789
1-8 Diphenox Quinon Dry GRD	Orange Dye, g G. Spotting
Acid Fast Violet BG (Triphenyl Methane) (Ci 699) (Acid Blue 34)	Para M
Alphazurine B (Trimethylmethane Acid Blue) (Acid Blue 26)	Phthaloperinone
Azosol Brilliant Yellow 6GF Dry (Solvent yellow 44)	Red, 6820 00 624 3503, Spotting
Baghouse Test Dye	Smoke Yellow I is Anthrarufin Dry
Benzan Purf DGRD	Smoke Yellow B-10
Benzan Crude B Dry Ground	Smoke Yellow B-11
Blue Dye, Spotting	Std Red Dye, Spotting
Brombenzang GRD	Transketon Dry
Dye Signal Hi-viz 93%	Violet Dye, DuPont, RDA 435 R1184
Dye 146	Violet Dye Pa2491, 74.52% Pure
FEAA, Lot 22242583	Yellow Dye, Mix 2, Pep
Green 6820 00 625 3503	Yellow Dye RDA 446, 744-443-505 R1184
Green Dye, Spotting	Z4CRT07 Pigment
Helio Fast Yellow 6 GL (Yellow 23)	

Table A-2 Personnel Names and Telephone Numbers

Contact	Person or Agency	Telephone
Fire Department	**NSWC Fire Department (Base)**	**1333 emergency** **(812) 854-1235**
Ambulance Service	**NSWC Ambulance (Base)**	**1333 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 Dogal	MK Site Construction/ Operations Manager	Office: (812) 854-6941
Wayne Kanack	MK SSHO	Office: (812) 854-6941
Richard Spurgeon	MK Site Safety and Health Supervisor	Office: (812) 854-6941
Doug Albrethsen	MK Superintendent	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	SOUTHNAVFACENGCOM	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

Contact	Person or Agency	Telephone
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	1. Mobilization (a.l subtasks)	1. Level D, modify where necessary as determined by MK SSHO.
	2. Site Preparation a. Access Road Relocation b. Vegetation Removal (clearing and grubbing) c. Dye Contaminated soil excavation. d. Site Grading e. Equipment Decontamination	2.a. Level D 2.b. Level D, modify where necessary as determined by MK SSHO. 2.c. Level C 2.d. Level D 2.e. Modified Level D
	3. Cover System Construction a. Install appropriate layers per plan. b. site restoration c. testing/inspection	3.a. Level D, modified where necessary by the MK SSHO. 3.b. Level D 3.c. Level D.
	4. General Site Cleanup Activities and Demobilization	4. Level D, modify where necessary.

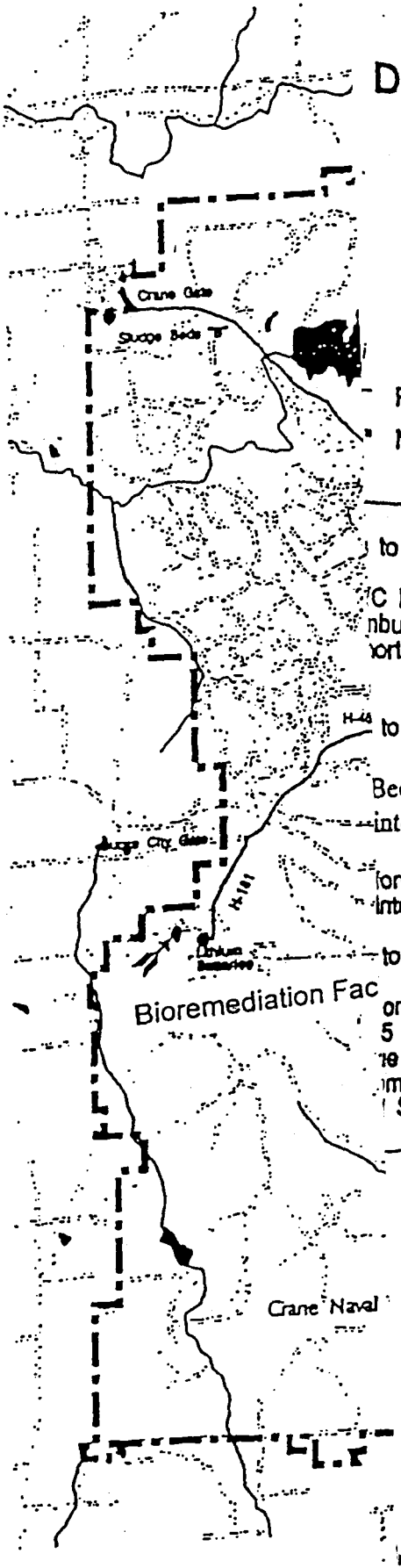
Table A-4 Air Monitoring and Sampling Requirements

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

Directions to the Nearest Medical Facility



Legend

Primary Route

Naval Reservation Boundary

to NSWC Medical Department on site:

C Medical Department manages and coordinates the nbulance service. Located in Building 12 off of orth of H-5.

to Bedford Medical Center:

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

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

to Bloomington Hospital:

on H5-45 through the Bloomington Gate, follow 5 North to Bloomington. At Highway 45 and Highway e going straight over the bypass (Bloomfield Road), mfield road north which turns into 2nd Street. Street and hospital is on your right.

1 inch = 1.5 miles

0 0.5 1 1.5 2 2.5 3 MILES

MORRISON KNUDSEN CORPORATION

ngineering, Construction
Environmental Group

Figure A-2 Meeting Signature Sheet

Type of Meeting:_____.

Topic:_____.

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

NAME	SIGNATURE	ORGANIZATION

_____

Printed Name of Meeting Chairman Signature Date

Figure A-3 SSHO Daily Logbook Report Page ___ of ___

Date _____ Report Number _____

Location(s) Work Activity and # Employees: _____

Weather: Wind speed _____ Wind direction _____

Temp. & Pressure _____ Precipitation _____

Amount sun _____

Monitoring conducted:

Location	Sampled for	Instrument used	Results	Sampled By/Time

Levels of Protection: _____

Problems or Unusual Situations: _____

Correspondence: _____

Other Comments: _____

MK SSHO Printed Name: _____ Signature _____ Date _____

Figure A-5 SSHP Weekly Inspection Checklist

Surveillance No. _____

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

ITEM NO	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
	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?						

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
11	PPE inspected per SSHP?						
12	PPE donning/doffing procedures in place?						
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?						
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						
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						

Inspection Performed By: _____ Date: _____

Abatement Accepted By: _____ 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
1. Walk area down, establish work zone and laydown areas.	1.a. Struck by and struck against physical objects during loading and unloading operations and setup. 1.b. Biological; weeds, snakes, spider's; other plant life. 1.c Contact by inhalation, direct contact or ingestion of chemical contaminants.	1.a. Preplan work layout (Work Zone Map completed and posted by Contractor). 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. 1.b. MK SSHO to discuss specific biological hazards awareness and communicate findings at POD and/or Pre Entry Briefs. 1.c. Level D PPE expected. MK SSHO to visual inspect area for evidence of contaminants.
2. Off load equipment and construction materials.	2a. Ergonomic type injuries during offloading of bag materials (e.g. rolls of material) 2b. Struck by and struck against physical objects during loading and unloading operations and setup.	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. 2.b. Insure competent person supervises all rigging and slinging operations during offloading.
3. Radiological surveying	3. Physical injuries handling equipment and heat stress. Potential for nonionizing radiation exposure is considered very low.	3. Surveying to be completed by specialty contractor certified for task.
EQUIPMENT TO BE USED: Heavy equipment for offloading and materials handling. Hand and power 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.		

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 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 Contractor). Backup alarms on all motorized heavy equipment. Design new road in accordance with EM 385-1-1 Section 21.I. High visibility vests for personnel working in heavy equipment traffic paths. MK SSHO 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 SSHO to visual inspect area for evidence of contaminants. Level C 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 recommended by manufacturer of equipment during chipping. Review MSDSs 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 SSHO and General Superintendent shall review material handling procedures and equipment placement to insure good practices and approved equipment is used. Decontamination: Modified Level D PPE with faceshield if high pressure wash, modify per MK SSHO 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
1. Install various liners and membranes. 2. Site Restoration.	Contact by inhalation, direct contact or ingestion of chemical materials used in liner sealing. Contact with hot surfaces of sealing equipment Nuisance dust exposure, noise and heat stress Ergonomic type injuries during placement of cap materials (e.g., rolls of material) Struck by and struck against physical objects during placement of cap materials. 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	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. 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. Insure competent person supervises all rigging and slinging operations during placement of cap materials. Work Zone Map completed and posted by Contractor. Backup alarms on all motorized heavy equipment. High visibility vests for personnel working near heavy equipment. 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.

EQUIPMENT TO BE USED: Heavy equipment, power and hand tools.

INSPECTION REQUIREMENTS: Daily, per manufacturer's recommendation.

TRAINING REQUIREMENTS: Site Safety and Health Plan (Project Kickoff), POD and OSHA Hazard Communication.

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
Non destructive seam testing to include vacuum testing and air pressure testing. Destructive seam testing.	Mechanical energy and/or electrical energy, air pressure.	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.

EQUIPMENT TO BE USED: Test equipment per ASTM standards

INSPECTION REQUIREMENTS: Daily, prior to use per manufacturer's recommendation.

TRAINING REQUIREMENTS: Site Safety and Health Plan (Project Kickoff), POD and OSHA Hazard Communication.

ATTACHMENT B

WORK ZONE MAPS

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

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
Drawing No.	C-08	Underdrain Drainage Plan
Drawing No.	C-09	Final Interim Cover Grading Plan

APPENDIX C

CONSTRUCTION SPECIFICATIONS

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 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:

Attribute	4"
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 to 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 recompacted.

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 ft²	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 ft²	see Note 2
	Visual Observation[1]	Continuous	N/A
Topsoil Cover Layer	Moisture and Density	1 per lift per 5000 ft²	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

☐ Approved ☐ 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 in 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 ft^2 (10,000 m^3) 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

Property	Qualifier[2]	Unit	Value	Test Method
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:
[1]4 psf (0.2 kPa).
[2]All properties are "minimum average roll values" as defined by FHWA.
[3]Fabric conditioned per ASTM D4355.
[4]Percent of minimum grab strength by ASTM D4632 after conditioning.

Table 2
Geotextile Cushion Type 2

Property	Qualifier[2]	Unit	Value	Test Method
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:
[1]4 psf (0.2 kPa).
[2]All properties are "minimum average roll values" as defined by FHWA.
[3]Fabric conditioned per ASTM D4355.
[4]Percent 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	Qualifier[1]	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]

[1]All properties are "minimum average roll values" as defined by FHWA.
[2]Fabric conditioned per ASTM D4355.
[3]Percent 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 Indiex 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

Property	Qualifier	Unit	Specified Value	Test Method	Testing Frequency*
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**

Property	Test Method	Modifications
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) and 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

Property	Qualifier	Unit	Required Value	Test Method
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

Property	Test Method	Modifications
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

Property	Qualifier	Value	Test Method
Hydraulic conductivity @ 2 psi confining pressure	Maximum	1×10^{-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 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 ¼ to ½ 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 manufactures 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

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

APPENDIX D

FIELD INSPECTION CHECKLISTS

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SOILS LAYERING BACKFILL AND COMPACTION Dye Burial Ground	DBF-003	NOV 95	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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
Soils Layering Backfill and Compaction Dye Burial Ground	DBF-01	NOV 95	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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-02	NOV 95	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	Delivery Order Number	Checklist Title	PAGE 1 OF 1
NSWC - Crane, Indiana	0009, Statement of Work #007	SITE PREPARATORY WORK, Dye Burial Ground DBP-02	

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
TOPSOIL PLACEMENT Dye Burial Ground	DBTS-01	Nov. 95	Page 1 of

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	Delivery Order Number	Checklist Title	PAGE 1 OF 1
NSWC - CRANE	0009, Statement of Work #007	TOPSOIL PLACEMENT DBTS-01	

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOSYNTHETIC CLAY LINER INSTALLATION Dye Burial Ground	GCL-01	NOV. 95	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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOSYNTHETIC CLAY LINER INSTALLATION Dye Burial Ground	GCL-02	NOV. 95	Page 1 of

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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FILTER FABRIC AND CUSHION INSTALLATION Dye Burial Ground	GEOTEX-01	NOV. 95	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 CORPORATION Engineering, Construction, & Environmental			FIELD INSPECTION CHECKLIST
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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

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:

MORRISON KNUDSEN CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
RUN ON/RUN OFF CONTROL Dye Burial Ground	DBRR-02	Nov. 95	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:

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-01	NOV 95	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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-02	NOV 95	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 the required grades and dimensions of the completed site preparation by survey.			
9	Note exposed contaminated materials during grading activities for the possibilities of equipment/personnel contamination.			
10	Verify completion of the site clearing activities is complete and in accordance with the approved work plan.			
11	See that corrective measures have been performed, verified, and documented if applicable.			

ADDITIONAL NOTES OR COMMENTS

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

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SOILS LAYERING BACKFILL AND COMPACTION Dye Burial Ground	DBF-02	NOV 95	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 CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SOILS LAYERING BACKFILL AND COMPACTION Dye Burial Ground	DBF-003	NOV 95	Page 1 of

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 approx. 1 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

APPENDIX E

QUALITY CONTROL PLAN

QUALITY CONTROL PLAN

FOR

INTERIM MEASURES CLEANUP

NSWC CRANE
Crane, Indiana

CONTRACT #N62467-93-D-1106
DELIVERY ORDER #0009
STATEMENT OF WORK #0007

August 11, 1997
Revision 1

Prepared for:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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Prepared by:

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

The construction Quality Control (QC) Plan presented herein covers activities associated with closure construction of a RCRA cap for the Dye Burial Ground, SWMU #02/11, in Crane, Indiana. The purpose of the QC Plan is to establish responsibilities and procedures necessary to achieve and maintain a consistently high level of quality in the closure construction activities and to verify the work is constructed as specified in the design. These will be accomplished through implementation of standardized written procedures, guidelines for inspection, and thorough documentation of work performed. Execution of this plan will assure that construction and component materials are assembled, installed, inspected and tested in accordance with applicable specifications, codes, standards, and contract documents.

This QC Plan is issued for use by Morrison Knudsen Corporation (MK) and its lower tier subcontractor(s), and it may be used as a model for subcontract construction organizations to follow in preparing their own quality control plan. This QC Plan is a working guideline and is intended to be flexible in its application. As conditions in the field may change and construction performance and schedules vary, it may become expedient to revise the requirements of this plan to fit the situation. However, any approved changes, whether being more or less restrictive, will still provide minimum necessary and acceptable criteria and procedures for assuring work is constructed in accordance with the project specifications and intent of the design. Changes to this QC Plan must be submitted to and approved by the MK Project Management Office in North Charleston, South Carolina.

1.2 Scope of Work Covered

1.2.1 Definable Features of Work

Definable features of work (DFOWs) to be controlled under this plan shall consist of all construction activities required to cap the Dye Burial site as follows:

- Removal of vegetative cover to existing ground surface on the closure site.
- Excavation and placement of designated dye impacted material.

- Placement and grading of subgrade materials to provide the required slopes and flowline for cap construction and cap foundation. Off-site soils from the NSWC designated borrow source will be provided as needed for grading.
- Proof rolling and compaction of imported materials to provide adequate bearing support for subsequent construction and future site usage.
- Installation of a geosynthetic clay liner (GCL) over the full extent of the designated cap, tied into remaining features as specified or shown on the drawings.
- Installation of a High Density Polyethlene (HDPE) geomembrane over the full extent of the cap.
- Placement of a granular drainage layer over the geomembrane for drainage and conveyance of surface water infiltration.
- Construction of a drainage collection system to transport water from the drainage layer out away from the cap.
- Placement of gravel and cobbler biotic barrier layer to protect the geosynthetic and geomembrane from biointruders, plant roots and burrowing animals.
- Placement of soil protective cover and topsoil layer to protect the HDPE, drainage, and biotic barrier layer and to support vegetation for erosion control.
- Construction of an access road using a geotextile and crushed stone.
- Construction of soil berms and drainage channels, as necessary, for conveyance of surface water.
- Relocation of waste water storage tanks.
- Placement of vegetative cover for permanent erosion control, along with temporary erosion protection and sediment control as necessary.

The primary areas of construction have been more thoroughly described in the Work Plan under separate cover, in which drawing and technical specifications are included.

1.2.2 QC Program

This QC Plan integrates the Navy's Quality Control system using the "Three Phases of Control". These phases, Preparatory, Initial, and Follow-up, represent a logical and systematic approach to assuring the control and quality of the construction and/or remediation work processes. Integration of the Three Phases of Control is accomplished by conducting meetings, inspections, and data collection/verification activities for representative points in the work process during each of the three phases.

MK will participate in and be responsible for the overall quality function during construction. Maximum coordination of effort is expected where quality requirements are involved. Quality control requirements will be followed by MK and all sub-contractors from receipt of materials through final acceptance by the Navy.

Procedures in Section 2.0 of this plan cover the organization, responsibilities, authority and qualifications of personnel to be involved in the quality control process for this project. Section 3.0 presents procedures for project coordination, including those for project meetings and official communications.

Details of quality control activities in accordance with the Three Phases of Control are contained in Section 4.0, "Inspection Systems", along with a general description of the systems used for inspection and documentation.

During all the control phases, quality control verification activities may involve detailed inspections and testing of a particular construction or installation activity. In these cases, specific observations, inspections, and testing will be performed at regular intervals or at critical junctures in the work progress. Field Inspection Checklists will be utilized, and a detailed Testing Plan will be followed, both of which are introduced in Section 4.0 and described more thoroughly in Section 5.0 of this QC Plan.

Section 6.0 presents procedures for documenting deviations and rework and resolution of nonconforming work items. Section 7.0 summarizes documentation procedures, including submittal and document control procedures, the anticipated inspection data to be collected documenting quality of construction, and a suggested outline for such a report. Qualifications for off-site laboratories are presented in Section 8.0. Section 9.0 provides references included in and used in the preparation of this QC Plan and which should be reviewed for other information regarding this project.

2.0 QC ORGANIZATION AND RESPONSIBILITIES

2.1 Project Organization and Responsibilities

This QC Plan identifies the contractor's organization for executing the plan. An organization chart is presented on Figure 2-1 showing the QC functions to be used and their lines of authority. Throughout this plan, reference is made to duties and responsibilities of the "QC Staff". The QC Staff is defined in paragraph 2.1.4 of this plan. It is acknowledged that QC staff shall conduct the inspections for all aspects of the work specified in accordance with this QC Plan. Each QC staff, including supervisory personnel, shall report and be responsible to someone higher in the contractor's organization, ultimately to the Contracting Officer. The QC organization described herein is consistent with MK's Quality Execution Procedures presented later.

The following sections define the positions identified on the QC Organization Chart and describe their duties, responsibilities, and authorities.

2.1.1 Contracting Officer's Representative

The owner's Contracting Officer's Representative (COR) will be the official owner's representative during the execution of this project. The responsibilities and authority of the COR will be as prescribed in the contract documents.

2.1.2 Contractor's Project Manager

The MK Project Manager (PM) represents the contractor's highest level of authority on the project and is directly responsible for the successful conduct of work in accordance with the contract documents. MK's PM is directly responsible to the owner via the COR. The qualifications and responsibilities of MK's Project Manager will be as prescribed in the contract documents.

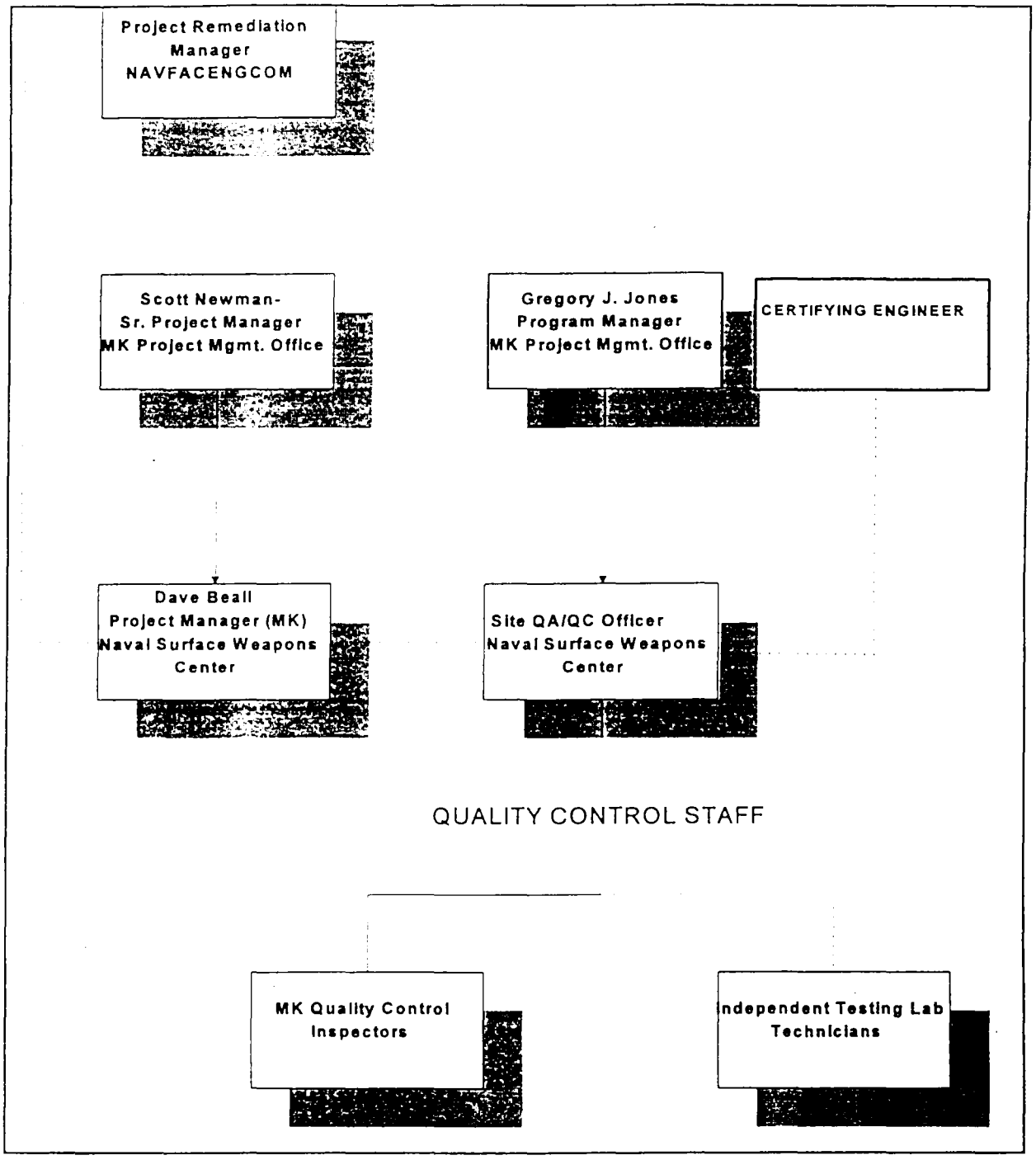

FIGURE 2-1 Organization Chart

2.1.3 Site QA/QC Officer (SQCO)

MK shall identify an individual, within its organization at NSWC Crane, who shall be responsible for execution of quality control for the landfill closure tasks and has the authority to act in all QC matters for MK. This individual, the SQCO, reports to the MK Program Quality Manager in the Project Management Office in North Charleston, SC. Depending on the scope, size and timing of tasks covered by this QC Plan and of others at NSWC Crane, MK may delegate responsibilities for other day-to-day inspection activities at the Dye Burial Ground Site; however, responsibility for the delegated activities remain those of the SQCO.

MK shall submit a letter of appointment to the COR, and the SQCO shall be approved by the COR. The letter of appointment will be attached in Appendix A, along with the SQCO's resume of qualifications and experience upon his/her appointment and approval.

The SQCO reports to MK's Program Quality Manager and interfaces at the work site with the MK Project Manager, and acts independently of the construction supervisors at the site. The SQCO will interact with the construction supervisors to relay results of quality control inspections and to advise them as to what improvements are required to conform to the project specifications. The SQCO will have direct authority over and responsibility for the QC Staff personnel and any outside QC testing laboratories subcontracted directly by MK as well as be the recipient and initial approver of all contractor and installer quality control submittals.
Typical QC management responsibilities of the SQCO include, but are not limited to the following:

- Supervision and execution of this QC Plan, including requests for amendment due to changes in field conditions or contractor's performance, and interfacing regularly with the Program Quality Manager in the Project Management Office.

- Understanding the scope of the construction and those definable features of work which require quality control and of the standards which apply;

- Assignment of QC staff for the execution of the QC Plan. Verification of the minimum qualifications of QC staff personnel, including their education, training, and experience. Responsible that adequate numbers and availability of required staff are maintained to keep pace with the construction work.

- Select and assign outside QC organizations such as off-site commercial testing laboratories. Collect documentation and/or perform site audits to confirm the qualifications of such organizations;

- Attend preconstruction conference and weekly QC progress meetings and meetings for resolving nonconformance;

- Maintain the field QC files, including copies of all contractor submittals, design drawings and specifications, this QC Plan, minutes of meetings, field changes, field inspection sheets and logs, laboratory reports, and as-built information, and so forth. A comprehensive list of items to maintain is presented in Table 7-1;

- Review the preconstruction survey information and verify that horizontal and vertical control information is adequate for delineating subsequent construction and quality control activities;

- Prepare or review daily Contractor Quality Control Reports

- Collect or verify collection of preparatory phase control submittals and inspection results to be in conformance with the project specifications or as prescribed in this QC Plan.

- Prepare weekly summary reports of QC activities and results to be forwarded to MK's Project Manager or owner, as required by the contract;

- Perform audits to verify field compliance with this QC Plan; and

- Collect all inspection records, submittals, field reports, and record drawings, organize and summarize them, and prepare a construction documentation report to be issued to the Project Manager.

The SQCO will also be responsible to perform or delegate specific lead inspection and supervisor responsibilities for certain definable features of work or for the entire Dye Burial Ground cap project. Apart from the administrative responsibilities and activities listed above, the SQCO will exercise or delegate the following specific technical responsibilities:

- Attend preconstruction conferences, daily and weekly QC meetings, all resolution meetings for nonconformance, and other contractor meetings as invited and needed to be aware of relevant issues discussed; prepare minutes for the QC meetings and distribute them to the appropriate parties.

- Perform or participate in initial phase inspection activities to confirm successful performance of the construction/installation work, to confirm planned inspections are adequate to verify such successful performance and to adequately identify deviations and nonconformance.

- Participate directly and/or review results from follow-up inspection phase inspection activity, including periodic review of daily QCRs and attached test results. Confirm that such results continue to demonstrate conformance with the project specifications and that inspections and testing activities remain adequate;

- Verify that inspection instrumentation is calibrated on schedule as recommended by the manufacturer or as need dictates in the field and to maintain the calibration log;

- Conduct daily meetings with QC staff personnel to verify their inspection assignments and to provide guidance as may be needed to attain adequate levels of observation and testing;

- Review test inspection results generated by QC Staff personnel to verify the validity of the test results and the location they describe;

- Perform detailed observations and notes in accordance with quality control checklists;

- Participate directly and thoroughly during initial inspection phases of control, particularly with regard to installation of geosynthetic materials and soil materials placed over them;

- Report the findings of inspections and test results to the construction superintendent or foreman. Exercise authority to require rework or to stop work, as needed, in the event of deviations. Verify that work progress on the nonconforming item does not continue until any deviations are corrected;

- Initiate Nonconformance Reports for those items requiring a higher level of authority, more than one organization, or formal engineering review to resolve.

- Coordinate with off-site testing laboratories for submittal of samples and receipt of results. Initiate chain-of-custody for samples to be tested by off-site laboratories. Also coordinate services of subcontract testing laboratories for routine use of inspection personnel.

- Prepare daily Contractor's Quality Contro' Reports (CQCRs), submitting them daily to the Contracting Officer Representative, with copies sent to the Project Management Office in North Charleston daily.

2.1.4 QC Staff

QC Staff includes other inspection personnel, including engineers, technicians and other assistants who will perform the routine and repetitive inspections and testing at the site. The QC Staff will normally report to the highest ranking QC person who is on site on a daily basis.

The QC Staff, including subcontract staff from testing laboratories, will be qualified by training and experience related to the items they are assigned to inspect. For this project, staff inspecting soil components will have at least one year of construction and/or materials testing experience involving soil materials placement, unless he/she is overseen by another staff person with such experience. Soil inspectors will be judged beyond that by the SQCO .

The duties and responsibilities of the QC Staff will be to perform the routine inspection activities during the initial and follow-up phases of control, including the following:

- Conducting routine calibration of field or lab instrumentation for which he/she is responsible;
- Conducting inspections, sampling, and testing as assigned by the SQCO;
- Conducting field tests and measurements, such as moisture-density measurements with a nuclear gauge, moisture tests performed in a field laboratory, or measuring the overlap of geosynthetic material panels;
- Making quantitative observations such as counting the number of passes of a soil compactor or measuring the number and length of geosynthetic rolls and panel;
- Sampling materials for preconstruction material evaluation testing; and
- Reporting test results to the SQCO, making the results also known in a timely fashion to the construction supervisor.

2.2 Outside Organizations

2.2.1 Testing Laboratories

Outside organizations will be involved during the course of QC activities. In general, subcontracted quality control personnel shall come under the direction of the SQCO unless such personnel are contracted directly by the lower tier subcontractor. Subcontracted personnel used on-site will be required to have the same or higher training and experience qualifications.

Off-site testing laboratories may be used for testing of soils, including borrow soils, drainage material, and topsoil/protective cover soil and for the geosynthetic materials. The testing laboratories should have their own internal QC plan to ensure that laboratory procedures conform to the appropriate American Society of Testing Materials (ASTM), Geosynthetic Research Institute (GRI) or other applicable testing standards.

Specific laboratory qualifications, if necessary, will be developed and presented in Section 9.0 of this QC Plan, as amended for this purpose.

2.2.2 Geosynthetic Manufacturer

The manufacturer is responsible for the manufacture of its materials and for quality control during the manufacturing process. The manufacturer is responsible for certifying those materials and products to be used on this project conform to those properties it says the material has, including those of the raw materials involved. Confirmation that the material properties conform to the project specifications remains the responsibility of the SQCO.

As part of the requirements of this QC Plan, the manufacturer, either directly or through the Installer's representative, shall provide quality control certificates representative of the actual rolls of product to be used on-site. The certificates should contain either actual test results or minimum values from tests performed on samples of the rolls from a particular manufacturing lot

or at the minimum frequency specified in this QC Plan.

If requested, the manufacturer should provide information to the SQCO or his/her designate regarding the quality control process during manufacturing of the product. The manufacturer should also be willing to permit a plant inspection to observe the manufacturing and quality control process.

The manufacturer shall designate a representative associated with the quality control process to whom questions can be directed and through whom plant visits can be arranged.

2.2.3 Geosynthetic Installer

The Geosynthetic Installer (Installer) will be subcontracted by MK for the specific purposes of handling, storing, and installing the GCL, HDPE, and geotextile filter fabric. The Installer generally exercises its own quality control in the field. The Installer's quality control program will be independent of the general contractor's QC inspection process. However, the SQCO may allow all or certain aspects of the Installer's own quality control inspection process to substitute for his own, provided that:

1. The Installer submits a copy of its quality control plan to be verified by the SQCO that its requirements for inspection and testing are no less stringent than those stated in this QC Plan;

2. The Installer's inspection forces are no less qualified than those required of the contractor's QC personnel as prescribed in this QC Plan;

3. Sufficient oversight is maintained over Installer's quality control forces to verify that Installer's documentation is accurate, representative, and conforms to the requirements for documentation prescribed in this QC Plan; and

4. It can be shown to the Project Manager and COR that a cost savings can be realized.

3.0 PROJECT QUALITY COORDINATION

3.1 Project Meetings

Periodic meetings will be held throughout the project to strengthen responsibility and authority by enhancing communication among personnel responsible for designing, inspecting and constructing the landfill caps. Project meetings will benefit those involved with the project by ensuring familiarity with facility design, construction procedures, any design changes and construction quality control requirements.

3.1.1 Preconstruction and Coordination and Mutual Understanding QA/QC Meetings

To ensure that all parties performing work at NSWC Crane fully understand the quality requirements established for this Delivery Order, a Pre-Construction Meeting will be held before the start of interim measures cleanup activities. Attendees at the meeting include the Resident Officer in Charge of Construction (ROICC), the NSWC Site Representative, the MK Project Manager (PM), the MK Project Superintendent, and the MK SQCO (SQCO). Minutes of the meeting shall be prepared by the SQCO and signed by all meeting attendees. A copy of the meeting minutes is then provided to the Navy and the MK Project Management Office (PMO) QA Manager.

Supplementary preconstruction/coordination QA/QC meetings and preparatory inspection shall be held before the beginning of each new definable work task. This is especially critical when a new subcontractor comes "on board" or there is significant changes in ongoing activities. Personnel to attend this meeting will include as a minimum, the construction engineer, the affected foreman or subcontractor field manager, and the SQCO.

The topics of the preconstruction Coordination and Mutual Understanding QA/QC meeting(s) include but are not limited to:

- Provide each organization with all relevant QA/QC documents and supporting information;

- Familiarizing each organization with the site-specific and project-specific QC Plan and its role relative to achieving conformance with plans and specifications;
- Determining any changes to the QC Plan which are needed to ensure the landfill closures will be constructed to meet or exceed the specifications;
- Reviewing the responsibilities of each organization;
- Reviewing lines of authority and communication for each organization;
- Discussing the established procedures or protocol for observations and tests;
- Discussing the established procedures or protocol for handling construction deficiencies, repairs and re-testing;
- Reviewing methods for documenting and reporting inspection data
- Reviewing methods for distributing and storing documents and reports;
- Discussing procedures for the location and protection of construction materials and for prevention of damage of the materials from inclement weather or other adverse events; and
- Conducting a site walk-around to review construction material and inspection material storage location.

3.1.2 Daily Progress/Coordination Meetings

A daily progress/coordination meeting should be held at the work area just prior to beginning or following completion of work. At a minimum, the meeting should be attended by the field construction manager or his representative, construction superintendent, subcontractor supervisor (as involved) and the SQCO or his/her designee. This meeting will be documented by a member of the QC staff, and the minutes will be issued as part of the Daily QC Report.

The purpose of the daily progress/coordination meetings will be to:

- Review the previous day's activities and accomplishments;
- Review the current work locations and activities;
- Identify the contractor's personnel and equipment assignments for the ongoing tasks and the following two days; and
- Discuss any potential construction problems.

3.1.3 Problem or Work Deficiency Meetings

A special meeting may be held when and if a problem or deficiency is present or likely to occur. A deficiency meeting will always be held prior to the issuance of a Non- Conformance Notification. At a minimum, the meeting should be attended by the construction contractor, the SQCO and the affected QC staff person. The purpose of the meeting is to define and resolve a problem or recurring work deficiency in the following manner:

- Define and discuss the problem or deficiency;
- Review alternative solutions; and
- Implement a plan to resolve the problem or deficiency.

The meeting will be documented by the SQCO and be included as part of the Daily QC Report, the Rework Items List, or Non-Conformance Report as appropriate.

3.2 Communications and Distribution

Minutes of QC meetings and/or records of conversations that indicate agreement, set guide lines or establish action items and schedules will be distributed to all participants within five work days of the actual communication.

A preliminary verbal notice of nonconformance will be made prior to issuing a written non-conformance. Such verbal notice will be issued within 24 hours of expected issuance of the formal written non-conformance report.

4.0 INSPECTION SYSTEMS

An overall system of observations, inspections, and tests shall be used to monitor and control quality to assure that the remediation and construction work is conducted in conformance with the applicable drawings and technical specifications of the project as described in the Closure Plan and supplementary construction drawings and specifications. Inspection systems for this project have been developed generally based upon EPA, NAVFAC Southern Division, and MK's Quality Execution Procedures, each referenced in Section 9.0 of this plan. The inspection systems described in the following sections are more specifically consistent with MK's Quality Execution Procedure, QEP 8.1, entitled "Conduct and Control of Inspections", included in Appendix B.

4.1 QC Personnel

QC personnel are responsible for conducting assigned observations, inspections and tests in accordance with the provisions of this plan. Such personnel shall have the appropriate training and experience to competently and accurately perform each quality control activity as assigned. In general, QC personnel will follow specific procedures referenced or described in this QC Plan. Where this plan does not address a construction issue or reference a specific procedure or acceptance criterium, or where professional judgment is required, only those QC personnel having the appropriate credentials (by training or experience and authorizations), as pre-determined by the SQCO, shall make decisions or exercise judgement regarding such matters.

4.2 Inspection/Test Points

An Inspection of Test Point is that point in a work process where an observation, inspection or test is to be performed. Predetermined inspection and test points are designated in the Testing Plan contained in this QC Plan. Other observations, performed on a continual, ntermittent, or incidental basis, reflecting the workmanship and consistency of the work product have been described in the text of this plan.

4.3 Conduct of Inspections and Tests

Standard inspections and tests shall be performed to qualitatively assess or quantitatively measure the performance and acceptability of the work. Critical observations are to be verified and tracked on Field Inspection Checklists. Selected checklists have been developed for the work elements related to the construction of the cap for the landfills. These are presented in Appendix C. Note that Field Inspection Checklists may be modified or added to include other inspections or to subdivide the inspection into more distinct elements.

Specific tests, whether conducted in the field or laboratory, will be performed in accordance with institutionally recognized standard methods (e.g. ANSI, ASTM, EPA, USACE, et. al.) or other methods specifically approved for this project. The methods for this project, primarily ASTM methods, are referenced in the Testing Plan and Log described more thoroughly in Section 5.0 of this QC Plan and presented in Appendix D.

4.4 Preparatory Inspections

In accordance with the Three Phases of Control, preparatory phase inspections shall be performed prior to beginning any work on any definable feature of work. The purpose of the preparatory inspections is to ensure all requirements are clearly understood, all equipment and materials are appropriate, ready, and available, and all parties understand the initial schedules for a given definable feature of work. Preparatory phase inspections may be as simple as providing resumes for key Installer personnel to providing the results of a soil borrow source investigation, including laboratory findings and certifications.

The COR shall be notified at least two working days in advance of each preparatory phase inspection. The preparatory phase inspection shall be conducted along with the construction superintendent and foreman responsible for the definable feature of work. Items to be reviewed or inspected prior to beginning work on each definable feature of work may include, but not be limited to, the following:

- Review the elements of the definable feature of work, particularly those items that requiring inspection and testing;
- Review the contract drawings and technical specifications to verify that the scope and performance objectives of the work are understood;
- Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved;
- Verify receipt of material supplier's quality control results, including approved factory tests results and manufacture's certificates, when required;
- Review the testing plan and ensure that provisions have been made to provide or accommodate the required QC testing;
- Examine the work area to ensure that the required preliminary work has been completed;
- Examine the equipment and materials delivered for use, and sample and test materials on hand to ensure that they conform to the specifications or to the shop drawings and submitted data;
- Discuss the construction methods;

- Confirm that initial survey control is established and certified;
- Confirm that applicable permits have been obtained; and
- Verify that inspection personnel to be used on the work feature have the appropriate qualifications or will have suitable supervision.

Preparatory phase inspection actions shall be documented in the Field Inspection Checklists, where appropriate, and/or the results should be elaborated on in the daily Contractor Quality Control Report, a copy of which can be found in Appendix E.

4.5 Initial Inspection

At initiation of a representative sample of the given feature of work, the SQCO will verify the work meets the applicable quality requirements for materials and workmanship. This initial inspection shall be generally performed at the onset of work and will continue until the QC Supervisor has determined, by evidence of his/her observations and initial QC test results, subsequent work will be acceptable, and subsequent routine testing will be adequate to control the quality of work. If, at this time, the QC Supervisor determines that work quality may be suspect or cannot be adequately controlled using the current Testing Plan, then he/she shall have authority to increase or modify the testing and inspection requirements. The Initial Inspection will verify the following:

- The workmanship meets the established quality requirements, including tolerances in grading, uniformity of placement of soils and geosynthetic materials, stockpiling, on-site hauling, roadway maintenance and dust control, etc.;
- Configuration and construction methods, equipment and tools appear to be effective in achieving grades and thickness of placed materials and compaction of earthen material;
- Calibration of measurement and test equipment is being done and such equipment calibration falls within acceptable limits of control, including those for soil moisture and density measurements, laboratory scales and ovens, field tensiometer, thickness gauges, etc.;
- Materials and articles used are as specified, including off-site fill, geosynthetic clay liners

(GCLs), soil drainage material and topsoil, concrete and grout mixes, etc.;

- The adequacy of inspection and testing methods, including the appropriateness of the method, the frequency of testing, and the experience and number of personnel conducting the tests and observations;
- The adequacy of applicable drawings, particularly whether adequate detail is provided or if flexibility is allowed for difficult construction items; and
- Adequacy of construction safety and environmental precautions. Safety adequacy may include the need for flagmen, safety equipment and clothing, and safe operating clearance during inspection activities. Environmental precautions may include issues related to contaminated materials within the landfill work area, the creation of contamination due to fuel spills or engine oil leaks, excessive erosion, and dusting due to construction activities.

The results of the initial phase inspection actions shall be documented in the daily Contractor Quality Control Report, the Field Inspection Checklists, and the Testing Plan and Log (or on specific test or inspection forms, if appropriate).

4.6 Follow-up Inspection and Observations

QC inspection and observations activities will be performed on a scheduled and/or intermittent basis during the course of the work to ensure that the work continues to be constructed and is completed in accordance with the drawings and specifications. The follow-up inspections will be performed no less frequently than daily on those days that a definable feature of work is accomplished. Generally, construction items involving significant quantities of similar materials will be inspected repetitively, based on a frequency that is representative of the whole item of work. Follow-up inspections shall be performed to ensure that:

- The constructed work is in compliance with contract requirements, including material and performance specifications and to the lines and grades indicated on the drawings;
- The quality of workmanship required is maintained throughout construction, problems are identified, and corrective measures are performed;
- The required tests and observations are performed; and
- Rework items are being corrected and completed satisfactorily in accordance with the project specifications.

The results of the follow-up phase inspection actions shall be documented in the daily Contractor Quality Control Report, on Field Inspection Checklists, and noted in the Testing Plan and Log (or on specific test and inspection forms, if appropriate). In the event that no activity progresses during a period of time such as for an extended weather delay or authorized stoppage of work, follow-up inspections shall be performed and documented on the Contractor Quality Control Reports no less than once weekly to document the current condition of completed work prior to the delay.

4.7 Quality Control Plan Inspections

The SQCO will perform follow-up inspections based on the Testing Plan and Log in Section 5.0 of this QCP. The SQCO will document the results of each day's inspection on the CQCR. Completed CQCRs shall be submitted to the PMO QA Manager as a record.

4.8 Calibration of Field Equipment

All geotechnical measuring and test equipment to be used in the field by MK or its subcontractors in the course of QC inspections will be calibrated and maintained to industry standards. Calibrations shall be performed no less frequently than as recommended by the manufacturer or as prescribed by the standard test methods being performed. Records of manufacturer's calibration certifications and routine on-site calibration records will be maintained by the QC staff and made available for inspection, as the calibration and maintenance history of the project-specific field and laboratory instrumentation is important to the overall QA/QC program. The following general guidelines should be followed regarding equipment calibration:

- Each instrument will be plainly and permanently numbered or coded,
- The instrument will be operated only be trained personnel directly responsible for the equipment or personnel under their supervision,
- Each piece of equipment will be checked for accuracy at the frequency of calibration recommended by the manufacturer (or EPA specification, if applicable), such calibration to be conducted by QC staff or a certified laboratory, and
- Measuring and test equipment dropped, damaged, or believed to be inaccurate will be removed from service and re-calibrated.

The calibration and general maintenance of field instrumentation will be the responsibility of the QC staff. All documentation pertinent to the calibration and maintenance of field equipment will be maintained in an active field log book or on specified forms and kept in the QC files. Entries made in the calibration and maintenance logbook or forms shall contain, but are not necessarily limited to, the following information:

- Date and time of calibration or maintenance activity,
- Name of person conducting the service,
- Type of equipment being serviced and identification number (e.g. serial number or other permanent and unique equipment number).

- Reference standard used for calibration,
- Specific calibration and maintenance procedure used (may be referenced to standard test method or manufacturer's method, a copy of which should be available on-site and ultimately submitted to the record documents), and
- Other pertinent information, as necessary.

Equipment that fails calibration or becomes otherwise inoperable during construction will be removed from service and stored separately to prevent its inadvertent use. Such equipment should be tagged to indicate that it should not be used until the nature of the problem can be assessed and the problem rectified. Any equipment requiring re-calibration (other than routine daily standardization) or repairs must be approved for use by the SQCO prior to being placed back into service.

4.9 Documentation

CQCRs are required for each day that work is performed and for every seven consecutive calendar days of no work, on the last day of that no-work period. Account for each calendar day throughout the life of the project. The reporting of work shall be identified by terminology consistent with the interim measures cleanup activities. CQCRs are to be prepared, signed, and dated by the SQCO and shall contain the following information:

1. Identify the control phase and the definable feature of work (DFW).

2. Results of the preparatory phase meetings held, including the location of the DFW and a list of personnel present at the meeting. Verify in the report the drawings and specifications for this DFW have been reviewed and work methods and schedule have been discussed.

3. Results of the initial phase meetings held including the location of the DFW and a list of personnel present at the meeting. Verify in the report that for this DFW the preliminary work was done correctly, samples have been prepared and approved, the construction is satisfactory, test results are acceptable, work complies with contract requirements, and the

required testing has been performed. Include a list of who performed the tests.

4. Results of the follow-up phase inspections held including the location of the DFW. Verify in the report for this DFW that the work complies with the contract as approved in the initial phase, and that required testing has been performed. Include a list of who performed the tests.

5. Results of the three phases of control for off-site work, if applicable, including actions taken.

6. List rework items identified, but not corrected by close of business.

7. As rework items are corrected, provide a revised rework items list along with the corrective action taken.

8. Include a "Remarks" section in this report which will contain pertinent information such as directions received, QC problem areas, deviations from the QCP, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the SQCO, and corrective action taken by the Contractor.

9. Contractor quality control report certification.

10. Ensure all manifests are sent to NSWC Crane for signature and a file of all manifests is kept.

4.10 QC Plan Audits

The MK Quality Program Manager will conduct field audits of the project for compliance with project procedures to verify that established requirements for the project are being met and properly documented, and if necessary, to provide guidance on how to improve the particular tasks or procedures referenced in this plan. The audit performance may be delegated to the SQCO or another qualified MK Quality Control person. Field audits may be scheduled or unscheduled but will generally be performed at specified intervals during the progress of work or at times associated with critical milestones in the work or with critical submittals.

Specifically, the auditor(s) will review procedures and record keeping and perform additional observations and inspections as the case warrants for the following issues:

1. Document control and filing for including engineering documents, plans and specifications, quality control plan and procedures, contractor submittals, the submittal register, QC preconstruction test reports, and record drawings, verifying completeness of files and adequacy of the document control system.

2. Field Calibrations, including observation of routine calibration procedures for field measuring equipment, verifying documentation for such calibrations as required by this plan, verification that scheduled laboratory or manufacturer's maintenance and calibrations of field equipment has not exceeded the allowable intervals, and verification that equipment deficiencies have been rectified.

3. Geosynthetic laboratories, including those used to test GCL, HDPE, or geotextile components, verifying that documentation has been received or that the QC laboratory and the manufacturer's laboratory warrants that it has followed prescribed standard methods as may be required in this plan or the construction specifications.

4. Geotechnical laboratories, including those used to evaluate borrow soil sources and those soil materials placed on the project site, verifying that documentation has been received or that the laboratory warrants that prescribed ASTM test methods are being used without modification, unless specifically allowed by this QC Plan.

5. Construction QC, including observation of construction procedures, field test procedures and documentation, field reporting, and record keeping, verifying that the requirements of this plan are being fulfilled and confirming that those QC activities being performed are adequate to ensure the quality of the work.

5.0 TESTING PLAN & LOG

This section presents specific QC inspection activity, including observations, tests and required submittals related to each definable feature of work or project component.

5.1 Preconstruction Material and Procedural Evaluations

Preconstruction inspections shall be performed in accordance with the preparatory phase of control to verify that materials of construction planned for use meet the project specifications. These preconstruction material evaluations shall include, at a minimum, collection and review of the following:

Soils

1. Identification and location of proposed on-site and off-site borrow sources for off-site soil materials.
2. Index properties of soil fill obtained off-site or on-site at a minimum frequency of one test per 10,000 cubic yards of material anticipated for use per Technical Specification 02220, including:

    - Atterberg Limits (liquid and plastic limits) by ASTM D4318,
    - Percent passing No. 200 Sieve by ASTM D1140,
    - Soil description and USCS classification by ASTM D2487, and
    - Standard Proctor moisture-density relationship by ASTM D698.

GCL/HDPE Geotextile Filter Fabric Manufacturer Quality Control Certifications

1. Manufacturer's quality control certificates related to raw materials and manufacturing for the geosynthetic clay liner (GCL) per Technical Specification No. 02253 representing no less than one series of manufacturer's quality control tests for each lot of finished GCL product and the "paper trail" beginning with raw products used in its manufacture.

2. Manufacturer's quality control certificates related to raw materials and manufacturing for the HDPE geomembrane per Technical specifications No. 02250 representing no less than one series of manufacturer's quality control test for each lot of geomembrane.

3. Manufacturer's quality control certificates related to raw materials and manufacturing for the geotextile filter fabric per Technical Specification No. 02249representing no less than one series of manufacturer's quality control tests for each lot of geotextile. Manufacturer's certificates should include, at a minimum, the following reported properties:

   - Mass per Unit Area per ASTM D5261;
   - Grab Tensile Strength per ASTM D4632;
   - Trapezoidal Tear Strength per ASTM D4533;
   - Puncture Strength per ASTM D4833;
   - Thickness per ASTM D5199; and
   - Permittivity per ASTM D4491.

GCL/HPDE Geotextile Filter Fabric: Preconstruction Material Conformance Testing

1. Obtain GCL materials for in-place material conformance evaluation at the minimum rate of one sample for each lot or per 10,000 square feet installed, whichever is more frequent, tested for the following:

   - Mass per Unit Area by ASTM D5261 and ASTM D2216 calculated for manufacturer's reference moisture content at one test per 10,000 square feet,
   - Free Swell of Clay by USP-NF-XVII at one test per 10,000 square feet,

2. Obtain HPDE geomembrane materials for preconstruction material conformance evaluation at the minimum rate of one sample for every 100,000 square feet or one per lot, whichever is more frequent, tested for the following:

   - Thickness per ASTM D5199 or ASTM D751;
   - Density per ASTM D1505 or ASTM D792;
   - Malt index (resin) per ASTM D1238;
   - Tear strength per ASTM D1004;

- Puncture resistance per ASTM D4833;
- Carbon black content per ASTM D1603;
- Carbon black dispersion per ASTM D3015; and
- Environmental Stress crack ASTM D1693.

3. Obtain geotextile filter fabric materials for preconstruction material conformance evaluation at the minimum rate of one sample for every 100,000 square feet or one per lot, whichever is more frequent, tested for the following:

- Mass per Unit Area per ASTM D5261,
- Grab Tensile Strength per ASTM D4632,
- Trapezoidal Tear Strength per ASTM D4533,
- Burst Strength per ASTM D3786,
- Puncture Strength per ASTM D4833,
- Thickness per ASTM D5199,

Additional Preconstruction Information

Additional preconstruction information shall be submitted for evaluation by the QC staff as they pertain to the quality of work and may include the following:

1. Proposed schedule with critical activities identified, showing anticipated starting and completion dates and milestones for construction activities.
2. Survey control survey, closed within acceptable limits, including stakeout of temporary horizontal and vertical control references.
3. Resumes and qualifications of lead installation personnel and supervisors as required in the Technical Specifications for all major components of work.

4. Panel layout drawings for GCL and geotextile filter fabric, showing proposed panel numbers, dimensions, and orientations.

5. Written plan or procedure from Installer detailing how the installation of the GCL and geotextile filter fabric will be accomplished, including use of other materials, tools, equipment and manpower.

5.2 Progress and Workmanship Observations

During the course of construction and installation of the definable features of work, QC Staff personnel will perform observations of the work in progress in addition to specified testing. Observations will be performed to obtain both measurable and qualitative assessment and evaluations of the work being performed during the initial and follow-up phases of control. Specifically, these observations will verify that procedures and work scope prescribed in the Technical Specifications are being performed.

Such observations will be more intense during the initial phase of control in order to assess whether the construction methods, equipment, and personnel, along with the specified materials of construction appear effective in achieving the quality objectives of the work. In the subsequent follow-up phase of control, the same observations, along with any prescribed testing, will be used to verify that the construction continues to meet the quality objectives. Those items described in the "Execution" section of the Technical Specifications, as a minimum, should be observed and confirmed to be in conformance with the specifications and quality workmanship. Field Inspection Checklists may be used to document these observations as well as providing elaboration in the Daily Quality Control Report.

5.3 Testing Plan and Log

A Testing Plan and Log has been prepared to delineate the required tests and inspections applicable to a definable feature of work during the initial and follow-up phases of control. The Testing Plan and Log which is presented in Appendix D identifies the project components to be inspected, the specific inspection or test to be performed, the frequency of such testing or inspection, and it lists the governing standard which governs the methodology to be employed. Qualitative and quantitative acceptance criteria is provided, either through an actual listing of the criteria or be reference to the specific Technical Specification or section of this QC Plan.

The Testing Plan and Log is intended to serve as a living document and be utilized to record in the field the status of inspection performed in support of the Delivery Order work. The Log contains columns for entry of specific test numbers or observation dates, when appropriate, or for reference to a separate set of test results or inspection forms to be found in the project record documents. It is the responsibility of the SQCO to ensure that these required entries are made, and that the Testing Plan and Log is maintained current.

6.0 REWORK AND CORRECTIVE MEASURES PROCEDURES

6.1 Deviation Identification and Rework

The SQCO is responsible for ensuring that deviations from the specifications or work as described on the drawings are reported, tracked and solved. MK Quality Execution Procedure (QEP) 13.1, entitled "Identification and Control of Deviations," presented in Appendix B, establishes the requirements and responsibilities associated with the identification, reporting, and correction of deviating items. A deviating item is a departure from established requirements and may be corrected through rework of the item or may result in a more formally documented solution requiring engineering evaluation. Deviations are usually identified by inspectors during the conduct of routine inspections or tests; however, deviations may be identified at any time by anyone involved with the work and reported to the applicable inspector or QC Supervisor.

Notable deviations shall be identified on the Rework Items List or equivalent form. The Rework Items List form is provided in Appendix E, and it shall be maintained current throughout the work process.

One exception to use of the Rework Items List will be for the routine inspection of earthwork placement involving moisture and density testing of the placed materials. In such case, failure to meet either the moisture or density requirements (compaction criteria) will be noted on the field test forms, and the field construction foreman responsible for that item of work will be notified immediately. The QC inspector will delineate the area or locations that non-conformance occurred and advise the construction foreman to rework the area as needed. The reworked area will be noted on the inspector's test sheet. When completed, the reworked areas will be re-tested with the new test data and results being referenced to the reworked area and cross-referenced to the failed test identification. If the work then conforms to the specifications, no additional documentation will be necessary. If the specifications are not met after the initial rework, then the deviation will be noted on the Rework Items List.

6.2 Non-conformance and Corrective Action

A non-conformance is a deviation of such nature or magnitude that its resolution involves the

coordination of multiple organizations or requires a formal engineering review. Generally, any deviation that cannot be resolved by performance of rework is considered a non-conformance. In such cases, a "Non-conformance Report" (MK Form QEP 15.1-1), included in Appendix B, shall be issued and logged on a Non-conformance Report Log. Conditions for which a Non-conformance Report (NCR) will be issued and the procedures to be followed are outlined in QEP 13.1, also included in Appendix B. Non-conformance shall be noted on that day's Contractor's Quality Control Report.

After assessment of the Non-conformance, a proposed disposition shall be developed and submitted to the field for implementation, including possible redesign and/or revision to the specifications or providing specified direction to the construction team. After the corrective action work has been completed, it will be re-inspected in accordance with the original specifications or in accordance with new inspection requirements proposed and approved. Upon acceptable results, the SQCO shall close out the NCR.

7.0 DOCUMENTATION

7.1 Submittals and Document Control

Submittals and document control are a function of the over all project management This function starts with the initiation of the contract and ends at the issuance of the final closure/completion Report. A formal submittal process is discussed in this section for those submittals to be provided by the construction organization for approvals or for inclusion in the record documents.

Submittals relating to this Delivery Order will be processed in accordance with MK Quality Execution Procedure (QEP) 4.1. This procedure is presented in Appendix B of this QC Plan and includes requirements for document control and using the Project Submittal Register.

The SQCO will be responsible for receiving and quality control submittals required by the specifications or in accordance with this QC Plan. He/she will monitor and respond to field submittal requirements as covered in the Project Submittal Register. He/she will review the submitted documents for conformance with the project plans and specifications. If such documents are to submitted for approval per the Project Submittal Register, then the SQCO becomes the originator of the submittals. The SQCO will also maintain a field register of contractor quality control submittals, including both contractor and supplier submittals and field-generated quality control sampling and testing information.

7.2 Field Documentation

This section of the QC Plan identifies the required quality control information that is to be generated to verify quality of construction for the Dye Burial Ground. Furthermore, this section identifies the information proposed for inclusion in a final construction report to be submitted as final documentation to the EPA and TNRCC regarding closure of these units.

At a minimum, the list of forms, reports and data packages listed in Table 7.1 shall be generated during quality control activities associated with these projects and maintained in the project record.

Documentation supporting the construction and QC activities shall be assembled and prepared in the form of a Construction Documentation Report, otherwise referred to as a Certification Report. This report should generally include information regarding all aspects of construction to be controlled pursuant to this QC Plan. The format of the report is arbitrary but should be in a logical order and be representative of the work performed. A suggested outline for the Construction Documentation Report, along with the items anticipated to be included therein, are listed in Table 7.2.

It is not necessary that all field documentation be included in the report; however, all measurements, surveys, test results, and key observations should be presented. Voluminous and repetitive data should be summarized when possible. Copies of original field test sheets may be used to present such results where the condition, clarity and number of the field sheets is suitable.

Reported photographic documentation should be limited to that which is representative of the work performed, including examples of complicated situations or problems. Photographic documentation should be presented using color reproductions.

Since the areas involved are significant, maps and drawings intended to represent as-built conditions may be presented on full-size D or E size sheets or multiple sheets of the smaller B - size sheets, using standard engineering scales. Photographically and xeroxgraphically reduced drawings or maps should remain at measurable scales when possible.

Original field data shall be collected, assembled and filed in a logical and organized manner and maintained by the SQCO and turned over to the Contracting Officer's Representative in accordance with project submittal procedures in the contract.

Table 7.1: Field Documentation List

Document Name	Document Number	Completed By
Quality Control Inspection Documents		
Contractor Production Report	Form 01400-1	Production Supervisor
Daily Contractor Quality Control Reports	Form 01400-2	MK QC Supervisor
Field Test/Sample Location Map	Surveyor's Form	MK QC Supervisor
Rework Items List	Generic	MK QC Supervisor
Field Inspection Checklists	DFOW Specific	MK QC Supervisor
Non-conformance Report	QEP 15.1-1	MK QC Supervisor
Test Plan and Log	Per QC Plan	MK QC Supervisor
Equipment Calibration Sheets	Generic	MK QC Supervisor
Equipment Calibration Log	Generic	MK QC Supervisor
Chain of Custody Record	MK Form	MK QC Supervisor
Field Audit Form	MK Form	MK QC Supervisor
Minutes of QC Meetings	Generic	MK QC Supervisor
Quality Control Documents Provided by Others		
Borrow Source Soil Report (Precon)	Generic	Subconsultant or MK SQCO
Preconstruction Soil Evaluation Results	Lab Specific	Off-site Soils QC Laboratory
GCL Manufacturer's QC Certificates	Mfr's Form	Mfr's QC Manager
HDPE Manufacturer's QC Certificates	Mfr's Form	Mfr's QC Manager
Geotextile Manufacturer's QC Certificates	Mfr's Form	Manufacturer's QC Lab Manager
Geosynthetic Materials Inventory Record	Generic	SQCO
Geosynthetic Preconstruction Conformance Test Sampling Log	Generic	SQCO
Geosynthetic Test Assignment Forms	Generic	SQCO
GCL Conformance Test Results/Report	Lab Specific	Off-site Geosyn. QC Laboratory
Geotextile Conformance Test Results/Report	Lab Specific	Off-site Geosyn. QC Laboratory
Field Compaction Test Sheets/Results	Generic	SQCO
Follow-up Construction Soil Test Results	Lab Specific	Off-site Soils QC Laboratory
Soil Sample Test Assignment Forms	Generic	SQCO
Topsoil Compaction/Moisture Test Sheets	Generic	SQCO
Grading/Cap Foundation Test Sheets	Generic	SQCO

Table 7.1: Field Documentation List (Cont')

Document Name	Document Number	Completed By
Supporting Documents for Closure Report		
Subgrade As-Built Survey	Surveyor's Form	Surveyor
Subgrade Acceptance Certificate	Installer's Form	Installer's Super-intendent and SQCO
GCL Panel Placement/Deployment Sheets	Generic	SQCO
GCL Seam Inspection/Test Sheets	Generic	SQCO
GCL As-Built Survey	Surveyor	Surveyor
HPDE Panel Placement/Deployment Sheets	Generic	SQCO
HPDE Seam Inspection/Test Sheets	Generic	SQCO
HPDE As-Built Survey	Surveyor	Surveyor
Initial and Follow-up Drainage Soil Test Results	Lab Specific	Off-site Soil QC Laboratory
Drainage Soil As-built Survey	Surveyor's Form	Surveyor
Geotextile Panel Placement/Deployment Sheets	Generic	SQCO
Geotextile Seam Inspection/Test Sheets	Generic	SQCO
Initial and Follow-up Final Cover Soil/Topsoil Test Results	Lab Specific	Off-site Soil QC Laboratory
Field Orders	Per Contract	MK Project Manager
Topsoil As-built Survey	Surveyor's Form	Surveyor
Construction/Installation Schedules	Generic	Const. Superintendent
Horizontal and Vertical Control Survey and Grid Layout	Surveyor's Form	Surveyor
Geosynthetic Installer's Key Personnel Resume/Qualifications	Installer's Form	Installer
Geosynthetic Panel Layout Drawings	Installer's Form	Installer
Geosynthetic Installation Procedures	Installer's Form	Installer

Note that generic form implies any suitable form having the required information contained. It may be a company specified form or one developed in the field. When using forms from other companies such as those of subcontractors, the form should be submitted and reviewed by the SQCO for appropriateness. Surveyor's forms should be in accordance with surveying practices in the area, to an engineering scale, and sealed by the surveyor. Final reports (i.e. not including

preliminary results) from off-site testing laboratories shall be reviewed by and contain the seal of a registered engineer representing the testing firm.

Table 7.2 - Suggested Outline for Construction Documentation Report

Cover Page

Statement of Certification

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Attachments or Exhibits

INTRODUCTION

- General
- Description of Project (DFOWs)
- Field Changes

DESCRIPTION OF CONSTRUCTION/INSTALLATION ACTIVITIES

- Summary and Sequence of Construction Work Items (Chronological Summary of major construction and QC events)
- Demolition and Site Preparation Activities
- Subgrade Placement and Proof-Rolling
- General Fill Placement
- Geosynthetic Materials Handling and Storage
- GCL Installation
- Drainage Layer Placement
- Geotextile Filter Fabric Installation
- Topsoil/Protective Cover Placement
- Installation of Settlement Markers
- Erosion Protection Measures

Table 7.2 - Suggested Outline of Information to be Included
Construction Documentation Report (Cont')

CONSTRUCTION QUALITY CONTROL PROGRAM

- Summary of QC Program and Inspection Systems
- Preparatory Phase Control Activities and Documentation
  - ◊ Preconstruction Soil Material Evaluation
  - ◊ Geosynthetic Manufacturer's QC Certificates
  - ◊ Installer Qualification Submittals
  - ◊ Geosynthetic Material Conformance Testing
- Initial and Follow-up Phase Control Activities and Documentation
  - ◊ Subgrade Control and Acceptance
  - ◊ General Fill Control and Acceptance
  - ◊ GCL Deployment and Seaming Control
  - ◊ Drainage Material Placement Control
  - ◊ Geotextile Deployment and Seaming Control
  - ◊ Topsoil/Protective Cover Control
  - ◊ Erosion Protection Control
  - ◊ Settlement Marker Installation

ATTACHMENTS AND APPENDICES

- Daily Contractor Quality Control Reports
- Preconstruction Soil Material Evaluation Data
- Geosynthetic Manufacturer's QC Certificates
- Geosynthetic Installer's Key Personnel Resumes and Qualifications
- Summary of Geosynthetic Conformance Test Results
- Summary of Subgrade and General Fill Compaction Results (if done)
- GCL Panel Placement
- HPDE Panel Placement and Seaming Logs
- HPDE Non-Destructive Test Results

Table 7.2 - Suggested Outline of Information to be Included Construction Documentation Report (Cont')

- HPDE Destructive Test Results
- Geotextile Panel Placement and Seaming Logs
- Geotextile Non-destructive Test Results (if done)
- Geotextile Destructive Test Results (if done)
- Summary of Drainage Soil Frequency Test Results
- Summary of Topsoil/Protective Cover Test Results
- Photographic Documentation
- Key Map(s) showing Inspection and Test Locations
- As-built GCL Panel Layout Drawing
- As-built HPDE Panel Layout Drawing
- As-built Geotextile Layout Drawing
- As-built Survey Map (showing elevations for top of subgrade/general fill, top of drainage soil layer, and top of protective cover.

8.0 LABORATORY QUALIFICATION PACKAGE

At the time of generation of the QC Plan, off-site laboratories to be used for earth science/geotechnical (soils and geosynthetics) or chemical analyses, if any, had not been selected. Laboratory services will be procured on a competitive basis, and work awarded only to those labs that meet the qualification requirements.

Laboratories selected for testing of soils and/or geosynthetic materials, including off-site material testing and subcontracted field QC inspection, will be required to submit evidence of qualifications to MK. Independent Testing Labs which are accredited shall provide a copy of the applicable certificate of accreditation, the scope of accreditation, and the latest directory of the accrediting organization to the Site Quality Control Supervisor. The scope of an independent lab's accreditation shall include the test methods required by contract and specification requirements. Acceptable accreditation includes the National Institute of Standards and Technology (NIST), the National Voluntary Laboratory Accreditation Program (NVLAP), or the American Association for Laboratory Accreditation (AALA) Program.

Independent testing laboratories that are not accredited as per the preceding section shall prepare certified statements, signed by an official of the testing laboratory, and shall be submitted to the Navy Contracting Officer for approval and attest that the proposed laboratory meets or conforms to the following requirements:

1. Sampling and testing shall be under the technical direction of a registered professional engineer (P.E.) with at least 5 years of experience in sampling and testing;

2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C 1077, 1990;

3. Laboratories engaged in testing of soil and rock, as used in engineering design and construction,shall meet the requirements of ASTM D 3740, 1988;

Prior to utilization of any non-accredited testing laboratory, the Contracting Officer shall be notified and afforded the opportunity to inspect the proposed testing laboratory's facilities and

records. Records subject to inspection include equipment inventory, equipment calibration dates and procedures, library of test procedures, audit and inspection reports by agencies conducting laboratory evaluations and certifications, testing and management personnel qualifications, test report forms, and the laboratory's internal QC procedures.

The Navy Contracting Officer has the right of access to testing laboratories performing work in support of the SOUTHDIV ERAC. This includes the right to check laboratory equipment in the laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for the purpose of ensuring compliance to testing requirements established in the contract.

Final laboratory reports shall be reviewed by and sealed by a professional registered engineer in charge of the testing program for this project at the laboratory. In lieu of a registered professional engineer, review by a senior engineering technician with a NICET Level III certification in soils or geosynthetics, whichever was tested.

Although chemical analytical services are not anticipated directly under this QC Plan, such services could conceivably be required during the course of the project. For any such analytical services, the selected laboratory must meet, as a minimum, NEESA 20.2-047B requirements and shall have obtained NEESA approval as detailed in the subject document. The selected laboratory will be required to submit their laboratory QA/QC plan to MK for review to ensure that it meets or exceeds those laboratory quality standards required for the project. Additionally, the selected analytical laboratory will be required to submit deliverables to support the data validation process.

9.0 REFERENCES

This QC Plan, relating to construction of the Dye Burial Ground cap has been developed to incorporate the requirements and guidelines of USEPA documents along with standard procedures and methods utilized specifically by the contractor and industry for this type work. Regulatory and governmental references include the following:

1. "Design, Construction, and Evaluation of Clay Liners for Waste Management Facilities " USEPA Office of Solid Waste and Emergency Response, EPA/530-SW-86-007-F, November, 1988.

2. "Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities," USEPA Office of Research and Development, Risk Reduction Engineering Laboratory, EPA/600/R-93/182, September, 1993.

3. "Technical Guidance Document: Construction Quality Management for Remedial Action and Remedial Design Waste Containment Systems", EPA/540/R-92/073, October 1992.

4. "Seminars: Construction Quality Assurance/Construction Quality Control (CQA/CQC) for Waste Containment Facilities, Hydrologic Evaluation of Landfill Performance (HELP) Model", EPA/625/K-94/001, May 1994.

5. " Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams", EPA/530/SW-91/051, May 1991.

6. "A Guide to Effective Contractor Quality Control (QC)," US Army Corps of Engineers, EP 715-1-2, February, 1990.

7. "Suggested QC Supplemental Specifications for Construction Contracts," Appendix A of Change No. 1 to Contract - CONSTRUCTION QUALITY MANAGEMENT, US Army Corps of Engineers, ER 1180-1-6, October, 1984.

8. Contract No. N62467-93-D-1106, Environmental Response Action Contract Document between Naval Facilities Engineering Command-Southern Division and Morrison Knudsen Corporation.

Copies of the Morrison Knudsen Corporation (MK) Quality Execution Procedures (QEPs) referenced in the QC Plan and as presented in Appendix B are listed below:

- QEP 4.1, "Submittals"
- QEP 8.1, "Conduct and Control of Inspections"
- QEP 13.1, "Identification and Control of Deviations"

APPENDICES

APPENDIX A - Rework Items List/Deficiency Tracking System

APPENDIX B - Referenced Procedures and Standards

APPENDIX C - Field Inspection Checklists

APPENDIX D - Testing Plan and Log

APPENDIX A

Rework Items List/Deficiency Tracking System

REWORK ITEMS LIST/DEFICIENCY TRACKING SYSTEM

CONTRACT NO./TITLE: MK SOUTHDIV ERAC- Dye Burial Ground SWMU 02/11

DELIVERY ORDER NO: NSWC Crane - Delivery Order 0009

Crane, Indiana

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para. No.; Drwg. No., etc.)	Action Taken	Resolution	Date Completed	Remarks

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para. No.; Drwg. No., etc.)	Action Taken	Resolution	Date Completed	Remarks

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para. No.; Drwg. No., etc.)	Action Taken	Resolution	Date Completed	Remarks

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para. No.; Drwg. No., etc.)	Action Taken	Resolution	Date Completed	Remarks

APPENDIX B

Referenced Procedures

1.0 SCOPE

This procedure describes the requirements for preparation and control of submittals developed for approval by the Navy Contracting Officer. This procedure describes the MK SOUTHDIV ERAC submittal origination, review, control and distribution process to be utilized in the execution of the work.

2.0 RESPONSIBILITIES

2.1 MK Program Manager (PM)

The PM is responsible for ensuring that adequate resources are provided to enable implementation of this procedure, and for ensuring that the program is effectively implemented.

2.2 MK Program Quality Manager (PQM)

The PQM is responsible for effectively implementing this procedure, for management of the submittal/document control process, for certification of submittals as required, and for approval of submittals as required.

2.3 Project Managers (PjM)

Responsible for identifying the types of submittals to be generated for execution of Delivery Order work, and for assignment of personnel to carry out the generation of submittals.

2.4 Submittal Originators

Responsible for the origination of submittals necessary to support Delivery Order execution, such as Work Plans, Sampling and Analysis Plans, and QC Plans. Originators shall prepare submittals suitable for the performance of work in the format specified in Section 4.4 "Submittal Format."

2.5 Document Control Supervisor (DCS)

Responsible for maintenance of the Submittal Register through regular database input and statusing, and for the distribution of controlled documents in accordance with this procedure.

3.0 DEFINITIONS

3.1 Submittal

Submittals are shop drawings, product data, samples, and administrative documents that require review, approval, and distribution. A detailed categorization and description of submittal types is provided in ATTACHMENT A. Submittal types include:

a. Shop Drawings. As used in this section, drawings, schedules, diagrams, and other data prepared specifically for this contract, by the Contractor or through the Contractor by way of a subcontractor, manufacturer, supplier, distributor, or other lower tier Contractor, to illustrate a portion of the work.

b. Product Data. Preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate a portion of the work, but not prepared exclusively for this contract.

c. Samples. Physical examples of products, materials, equipment, assemblies, or workmanship, physically identical to a portion of the work, illustrating a portion of the work or establishing standards for evaluating the appearance of the finished work or both.

d. Administrative Submittals. Submittals of data for which reviews and approval will be required to ensure that the administrative requirements of the project are adequately met but not to ensure directly that the work is in accordance with the design concept and in compliance with the contract documents.

3.2 Document

As used in this procedure, the term "document" is the general term applied to submittals.

3.3 Controlled Document

A Controlled Document is a document that is used to control/perform activities associated with design or construction where it is essential that these activities be carried out in accordance with the latest approved document. Controlled designation may be applied to other documents at the discretion of the PjM. Determination as to whether or not a document is to be released as "Controlled" is made when the document status as defined in Section 3.6 is designated as "Approved."

3.4 Document Control/Document Control Center

For the purposes of this procedure, the terms Document Control/Document Control Center apply to the Contractor's Document Control operations located on site. This is the prime point of entry for all information entering the project.

3.5 Contract Documents

Contract Documents are the contract and contract specified design/construction affecting documents.

3.6 Document Status

The Document Status is assigned by the DCS to a submittal or a controlled document to indicate the state or condition of that item. Status options are as follows:

a. "Approved" or "Approved as Submitted" - Use of this document is unrestricted;

b. "Approved as Noted" - Use of document is unrestricted provided exception is not taken to noted comments.

c. "Disapproved" or "Revise and Resubmit"- A status of submittals that indicates the submittal is incomplete or does not comply with the design concept or contract documents and requires resubmittal after appropriate changes.

d. "Not Reviewed"- A status of submittals that indicates that the submittal has been previously reviewed and approved, is not required as a submittal, lacks review and approval by Mk, or is not complete. Submittals returned by the Navy marked "Not Reviewed" because of lack of review by MK or because of incompleteness shall be resubmitted to the Navy with appropriate action, change, or coordination.

e. "Preliminary Release for Information"- A document status that indicates the document is in the process of being finalized but is being released for use in preliminary planning efforts. This status may also be used for documents that are routed internally for review, comment, or approval.

f. "Information Only"-A document status that indicates the document may only be used for informational purposes and are not of controlled status. Information Only documents are not to be used as a source of design basis information or used as a reference in the completion or inspection of work.

3.7 Set Identification Number (Set I.D. No.)

The Set Identification Number is used in conjunction with the Controlled Document Standard Distribution List (SDL) system. Each individual or location that will receive Controlled Documents is assigned a Set Identification Number. This number is listed in red on the Controlled Document to indicate that the document is controlled and to whom or where it has been issued.

3.8 Standard Distribution List

3.8.1 A "Standard Distribution List" (Form QEP 8.1-3) of documents and Controlled Documents shall be maintained for the project by the DCS. It shall be updated as necessary and revision controlled by date. This list shall identify the individual(s) or organization(s) which shall receive the listed documents, the number of copies they receive, and any "Set I.D. Number" assigned to the copy.

3.8.2 The Standard Distribution List may be generated manually or by sorting a computer database.

3.9 Navy

The use of the term "Navy" in this procedure refers to the U.S. Navy Southern Division Naval Facilities Engineering Command located in Charleston, South Carolina.

4.0 SUBMITTALS

4.1 Planning

4.1.1 Project Management performs the following steps upon receipt of a new Delivery Order.

a. Defines a scope of work.

b. Identifies a list of submittals required and the planned submittal date based on the scope of work.

c. Prepares a cost summary sheet by cost code for each submittal.

d. Transmits the submittal list with a Submittal Register (Part A) to the Navy for completion of Items (a) through (e).

e. Upon receipt of the completed Submittal Register from the Navy, Project Management will assign an Originator to each of the submittals.

f. The Submittal Register is forwarded to the DCS and is logged into the Document Control database.

g. Management identifies and forwards to the DCS, a list of individuals who are to be on standard distribution for each submittal or group of submittals associated with the Delivery Order. This includes internal routing for review and comment prior to submittal to PQM for approval (e.g., Originator's department manager, Environmental Manager, Site Project Manager, Project Engineer, Project Controls Manager, Safety Supervisor, etc.).

4.2 Scheduling

4.2.1 Submittal originators shall coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.

4.2.2 Except as specified otherwise, allow a review period, beginning with receipt by the approving authority, that includes at least 15 working days for submittals for QC manager

approval and 20 working days for submittals for Contracting Officer approval. The period of review for submittals with Contracting Officer approval begins when the Government receives the submittal from the Contractor. The period of review for each resubmittal is the same as for the initial submittal.

4.3 Submittal Register

4.3.1 A Submittal Register will be used to track progress of submittals as they are processed. Users may arrange Parts A and B side-by-side in a notebook; however, submittal status will be maintained on a computer database by the DCC.

4.3.2 The Government will complete Sections (a) through (e) of the Submittal Register. These sections are described as follows:

a. Column (a): Lists each specification section in which a submittal is required.

b. Column (b): Lists each submittal description (SD number and type -- e.g., SD-04, Drawings) required in each specification section. Follow each submittal description with a list of material or products associated with that submittal.

c. Column (c): Lists one principal paragraph in the specification section where a material or product is specified. This listing is only to facilitate submittal reviews. Do not consider entries in column (c) as limiting project requirements; do not consider that a blank must be filled in by Contractor or the Government.

d. Column (d): Indicates approving authority for each submittal. A "G" indicates approval by Contracting Officer; a blank indicates approval by PQM.

e. Column (e): Indicates, for submittals to be approved by Contracting Officer, specific reviewers other that QC organization. This column may or may not be filled out on the copy supplied by the Government.

4.3.3 Columns (f) through (i) will be used by the Contractor, QC organization, and Government on their own copies to record data established by the Contractor.

a. Column (f): As submittals are processed, list a consecutive number assigned by Contractor for each group of submittals. Place this same number in the appropriate block of "Submittal Transmittal Form". Note: For a resubmission, repeat the same transmittal control number as used for the original submittal with a suffix beginning with "A". Subsequent resubmittals utilize the same control number with the next sequential suffix. For example, submittal #10 becomes 10A, 10B, 10C, etc.

b. Column (g): List dates scheduled for approving authority to receive submittals. These dates are the scheduled beginnings of the submittal review period. the Contractor

proposes these dates and the Contracting Officer approves them to establish the approved submittal register.

c. Columns (h) and (i): Use to record Contractor's review when forwarding submittals to the QC organization.

4.3.4 Columns (j) through Column (o) will be used by Contractor, QC Organization and Government on their own copies.

a. Column (j): Enter date submittal is transmitted to QC organization for PQM approval.

b. Columns (k) and (l): If approving authority is Contracting Officer, enter date DCC transmits certified submittal to Contracting Officer; otherwise, no entries are required.

c. Columns (m) and (n): If approving authority is Contracting Officer, enter the Government action and date of action as shown on returned submittal. If approving authority is PQM, enter QC action and date of action.

d. Column (o): Enter date Contractor receives acted-on submittal.

4.4 Submittal Format

4.4.1 Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction contract number and delivery order.

c. The section and part number of the section by which the submittal is required.

d. The submittal description (SD) number of each component of the submittal.

e. If a resubmission to Contracting Officer, an alphabetic suffix on the submittal description, for example, SD-10A, to indicate the resubmission.

f. The name, address, and telephone number of the subcontractor, supplier, manufacturer and any other second tier Contractor associated with the submittal.

g. Product identification and location in project.

4.4.2 Format for Shop Drawings:

a. Shop drawings shall be not less than 8-1/2 x 11" nor more than 30 x 42".

b. Present 8-1/2 x 11-inch shop drawings as a part of the bound volume for the submittals required by the section. Present larger drawings in the sets.

c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to the information required in Paragraph 4.4.1.

d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Identify materials and products for work shown.

4.4.3 Format for Product Data:

a. Present product data submittals for each section as a complete, bound volume. Include a table of contents listing page and catalog item numbers for product data.

b. Indicate, by prominent notation, each product which is being submitted; indicate the specification section number and paragraph number to which it pertains.

c. Supplement product data with material prepared for the project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for the project.

4.4.4 Format of Construction Material Samples:

a. Furnish samples in the sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

(1) Sample of equipment or device: Full size.

(2) Sample of materials less than 2" x 3": Built up to 8-1/2 x 11".

(3) Sample of materials exceeding 8-1/2 x 11": Cut down to 8-1/2 x 11" and adequate to indicate color, texture, and material variations.

(4) Sample of linear devices or materials, such as conduit and handrails: 10-inch length or length to be supplied, if less than 10".

(5) Sample of non-solid materials (e.g., sand, paint, etc.): One pint, unless specified otherwise in technical sections.

(6) Sample panel: 4' x 4'.

(7) Sample installation: 100 square feet.

b. Samples showing range of variation: Where unavoidable variations must be expected, submit sets of samples of not less than three units showing the extremes and middle of the range.

c. Reusable samples: Incorporate returned samples into the work only if so specified or indicated. Incorporated samples shall be in undamaged condition at the time of use.

d. Recording of sample installation: Note and preserve the notation of the area constituting the sample installation but remove the notation at the final cleanup of the project.

e. When a color, texture, or pattern is specified in naming a particular manufacturer and style, include one sample of that manufacturer and style for comparison.

4.4.5 Format of Administrative Submittals:

Submittals shall be in report form and comply with Paragraph 4.4.1.

4.5 Quantity of Submittals

4.5.1 Quantity of Shop Drawings:

a. For shop drawings presented on sheets larger than 8-1/2" x 14", submit one reproducible and three prints of each shop drawing prepared for this project.

(1) Transmit reproducible rolled in mailing tubes.

(2) After review, the approving authority will retain the prints and return only the reproducible with notations resulting from the review.

b. For shop drawings presented on sheets 8-1/2" x 14" or less, conform to the quantity requirements for product data.

4.5.2 Quantity of Product Data:

a. Submit six copies of submittals of product data requiring review and approval only by the QC organization and seven copies of product data requiring review and approval by the Contracting Officer.

4.5.3 Quantity of Samples:

a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.

b. Submit one sample panel. Include components listed in the technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of non-solid materials.

4.5.4 Quantity of Administrative Submittals:

a. Unless otherwise specified, submit administrative submittals which are 8-1/2" x 14" or smaller in the quantity required for product data.

b. Unless otherwise specified, submit administrative submittals larger than 8-1/2" x 14" in the quantities required for shop drawings.

4.6 Submittal Origination

4.6.1 Originators of submittals prepare, format, and provide in the necessary quantities the submittal types detailed in Section 4.4, 4.5 and Attachment A.

4.6.2 Originators determine and verify field measurements, materials, and field construction criteria. Originator checks and coordinates each submittal with requirements of the work and contract documents.

4.6.3 Originator reviews submittal for conformance with project design concepts and compliance with the contract documents.

4.6.4 Originators ensure no work begins until submittals for that work have been returned as "approved," or "approved as noted" except to the extent that a portion of the work may be performed to generate the basis for the submittal.

4.6.5 Originator transmits submittal to the DCC to begin the review process.

4.7 Submittal Review Process

4.7.1 DCC updates the Submittal Register and transmits submittal for internal Review/Approval to standard distribution as indicated by project management. DCC uses MK Document Transmittal (Form QEP 8.1-1) and attaches Comment Submittal Form ((QEP 8.1-2). Reviewer checks an "Action Taken" box on the transmittal and returns it to the DCC by response-due date. DCC tracks transmittal responses.

4.7.2 If internal review results in approval, DCC updates Submittal Register and transmits submittal to PQM for approval.

4.7.3 If internal review or review by PQM results in an status other than "Approved" or "Approved as Noted", DCC transmits submittal with returned Comment Submittal Form to originator for correction.

4.7.4 Originator corrects and forwards submittal to DCC. DCC retransmits to standard distribution to continue review process.

4.7.5 When submittal is approved by PQM as final approving authority, DCC assigns a SDL Number and transmits approved submittal to the standard distribution as a controlled document.

4.7.6 When Contracting Officer is final approving authority, the PQM or QC organization member specified in writing by MK as having that authority, signs the following certification. The signatures shall be in original ink. Stamped signatures are not acceptable.

4.7.7 Stamp each sheet of each submittal with the Contractor's certification stamp, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____,Date
(signature when applicable)

Certified by QC Manager _____,Date
(signature)

4.7.8 When the approving authority is the PQM, the PQM will use the following approval statement when annotating submittals as "Approved" or "Approved as Noted".

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is approved for use.

Certified by Submittal Reviewer _____,Date
(signature when applicable)

Certified by QC Manager _____,Date
(signature)

4.7.9 Submittal is then forwarded to DCC for transmittal to Contracting Officer for approval.

4.7.10 If Contracting Officer returns submittal as other than approved, DCC returns submittal to Originator for disposition.

4.7.11 Originator revises the submittal and modifies the submittal number beginning with an "A" for each resubmittal to the Contracting Officer (e.g., 10A, 10B, 10C, etc.) Note that the number modification begins upon first resubmittal to Contracting Officer.

4.8 Submittal Implementation

4.8.1 The DCC maintains a current status of submittals by updating the Submittal Register as submittal actions occur until final acceptance of work by the Contracting Officer.

4.8.2 When submittal is approved by Contracting Officer, DCC assigns a SDL Number and distributes the submittal as a controlled document.

4.8.3 A copy of approved submittals is retained at the project site, including MK's copy of approved samples.

4.8.4 When the approving authority is the QC manager, forward two copies of each approved submittal, except "samples", where one set is required, to the Contracting Officer.

5.0 REFERENCED FORMS

Standard Distribution List (QEP 8.1-3)
Document Transmittal (QEP 8.1-1)
Comment Submittal Form (QEP 8.1-2)

6.0 ATTACHMENTS

a. Attachment A: Categories and Descriptions of Submittal Types

ATTACHMENT A: Categories and Description of Submittal Types

SD-01, Data

Submittals which provide calculations, descriptions, or other documentation regarding the work.

SD-02, Manufacturer's Catalog Data

Data composed of catalog cuts, brochures, circulares, specifications, and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. A type of product data.

SD-03, Manufacturer's Standard Color Charts

Preprinted illustrations displaying choices of color and finish for a material or product. A type of product data.

SD-04, Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, detail of fabrications, layout of particular elements, connections, and other relational aspects of the work. A type of shop drawing.

SD-05, Design Data

Design calculations, mix designs, analyses, or other data, written in nature and pertaining to a part of the work. A type of shop drawing.

SD-06, Instructions

Preprinted material describing installation of a product, system, or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions. A type of product data.

SD-07, Schedules

A tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work. A type of shop drawing.

SD-08, Statements

A document, required of the Contractor, or through the Contractor by way of a supplier, installer, manufacturer, or other lower tier Contractor, the purpose of which is to further the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verification of quality. A type of shop drawing.

SD-09, Reports

Reports of inspection and laboratory test, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-10, Test Reports

A report signed by an authorized official of a testing laboratory that a material product, or system identical to the material, product, or system to be provided has been tested in accordance with requirements specified by naming the test method and material. The test report must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. Testing must have been within 3 years of the effective date of award of the delivery order. Analytical laboratory testing must have been completed within established sample holding times. A type of product data.

SD-11, Factory Test Reports

A written report which includes the findings of a test made at the job site, in the vicinity of the job site, or on a sample taken from the job site, or on a portion of the work, during or after installation. The report must be signed by an authorized official of a testing laboratory or agency and must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. A type of shop drawing.

SD-13, Certificates

Statements signed by responsible officials of a manufacturer of a product, system, or material attesting that the product, system, or material meets specified requirements. The statements must be dated after the award of this contract, name the project, and list the specific requirements which it is intended to address. A type of shop drawing.

SD-14, Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work. A type of sample.

SD-15, Color Selection Samples

Samples of the available choice of colors, textures, and finishes of a product or material, presented over substrates identical in texture to that proposed for the work. A type of sample.

SD-16, Sample Panels

An assembly constructed at the product site in a location acceptable to the Contracting Officer and using materials and methods to be employed in the work; completely finished; maintained during construction; and removed at the conclusion of the work or when authorized by Contracting Officer. A type of sample.

SD-17, Sample Installations

A portion of an assembly or material constructed where directed and, if approved, retained as a part of the work. A type of sample.

SD-18, Records

Documentation to ensure compliance with an administrative requirement or to establish an administrative mechanism. A type of administrative and closeout submittal.

SD-19, Operation and Maintenance Manuals

Data intended to be incorporated in an operations and maintenance manual. A type of administrative and closeout submittal.

APPROVALS

Health and Safety Manager William Piispanen Date 14 Jul 95

Program Quality Manager _____ Date 13-July-95

Sr. Project Manager _____ Date 13 Jul 95

Program Manager _____ Date 13 July 95

Effective Date: **7/14/95**

TABLE OF CONTENTS

1. PURPOSE

This Quality Execution Procedure (QEP) establishes a standard method for conducting and reporting the results of inspections and tests that are performed in support of the project requirements.

2. SCOPE

This QEP applies to in-process and final inspections, tests, and Quality Control reporting conducted by both MK and Subcontractor personnel. This QEP also addresses MK surveillance of Subcontractor quality activities. Specific inspection and test methods and acceptance criteria are obtained from the applicable drawings, specifications, and procedures.

3. REFERENCES

3.1. Contract Requirements

The basic Quality Control program requirements contained in this procedure are derived from Contract N62467-93-D-1106, between Morrison Knudsen Corporation and Naval Facilities Engineering Command, Southern Division.

3.2. Quality Assurance Program Requirements

This procedure provides implementing details that support the Morrison Knudsen NAVFAC SOUTHDIV Quality Assurance Program Plan, Issue Date 15-April-1994.

4. DEFINITIONS

4.1. Definable Feature of Work

A definable feature of work is defined as "a task which is separate and distinct from other tasks and requires separate control requirements". Typical examples of definable features of work may include excavation, underground storage tank removal, sampling, backfilling operations, well

installation and development, seeding and site restoration, etc. Definable features of work are described in the Work Plan/Quality Control Plan written for a specific Delivery Order. Each definable feature of work is subject to the performance of the preparatory, initial, and follow-up phases of inspection unless otherwise specified in the Work Plan/Quality Control Plan.

4.2. Inspection/Test Point

An Inspection or Test Point is that point in a work process where an inspection or test is to be performed. Inspection and Test Points are designated in the Testing Plan and Log contained in QC Plans.

4.3. Three Phases of Control

The Three Phases of Control is the Quality Control system established for the MK SOUTHDIV ERAC contract, and is implemented on all Delivery Order work. This system consists of inspections performed at three primary points in the work process: Preparatory, Initial, and Follow-up phases. Details of the inspections are provided in this procedure.

4.4. Lead

As used in this procedure, the "Lead" refers to the individual charged with the work supervision and direction. The Lead may be a subcontractor supervisor or an MK Superintendent, as examples.

5. RESPONSIBILITIES

5.1. Program Quality Manager (PQCM)

The Program Quality Control Manager is responsible for assuring the implementation of the Three Phases of Control quality control system on MK delivery order projects, for ensuring observation by MK inspection personnel of designated Inspection/test point, for coordinating Client Inspection/test points, and for verifying Subcontractor compliance with the requirements of this QEP.

5.2. Site Quality Control Supervisor (SQCS)

The Site Quality Control Supervisor is responsible for implementing the Quality Control Plan requirements established for a delivery order. The SQCS supports the PQCM by implementing directly the Three Phases of Control quality control system on the project, identifying and tracking rework items, coordinating testing and inspection requirements, and for assuring subcontractor compliance with quality requirements established for the project. The SQCS is responsible for maintaining the Subcontractor Submittal Register.

5.3. Project Manager (PjM)

The Project Manager is responsible for ensuring that Project Superintendents and/or the Subcontractors are provided with complete information regarding the requirements for their applicable Scope of Work. The PjM is responsible for delivering a product which meets the quality requirements of the approved documents.

5.4. Project Superintendents

Project Superintendents are responsible for directing MK's remediation/construction work forces (General Superintendent / Area Superintendents). These individuals are responsible for ensuring that MK's workers are qualified to perform the work to which they are assigned, for providing adequate notice when Inspection/test point are approaching, and for ensuring that work does not proceed beyond a point such that a required verification can not be performed.

5.5. Subcontractors

Subcontractors are responsible for ensuring the quality of their work. This responsibility includes providing qualified personnel and adequate equipment for the conduct of the work as well as any inspections and tests that the Subcontractor may be required to perform, providing adequate notification to MK when established Inspection/test point are approaching, ensuring that work does not proceed beyond a point such that a required verification cannot be performed, and documenting the results of inspections

and tests the Subcontractor has been required to perform in accordance with this QEP.

5.6. QC Personnel

QC Personnel are responsible for conducting assigned inspections in accordance with the technical requirements provided in the applicable Work Plan, Quality Control Plan, specifications and drawings. QC Personnel are responsible for documenting the results of these inspections, tests, and observations in accordance with this QEP.

6. CONDUCT OF INSPECTIONS

6.1. Extent of Inspection

6.1.1. The extent of inspection shall be detailed in individual QC Plans developed for a Delivery Order. Specific types and frequencies of tests will be detailed in the Testing Plan and Log contained within the QC Plan. Analytical testing, typically performed by an Environmental or Project Engineer (or designee), is accomplished per the requirements set forth in the project specific Sampling and Analysis Plan and/or Chemical Data Acquisition Plan.

6.1.2. Inspections may be performed utilizing inspection checklists as specified in QC Plans. The purpose of the checklists is to provide a detailed listing of inspection requirements.

6.2. Preparatory Inspection

6.2.1. The party having the lead for the definable feature of work (i.e. subcontractor supervisor or MK Superintendent) will advise the Site QC Supervisor in writing when ready to perform the Preparatory inspection. This notification will take place a minimum of one week prior to the planned inspection. The Site QC Supervisor will advise the contracting officer representative of the scheduled Preparatory inspection. At the Preparatory inspection meeting, the lead will perform or demonstrate compliance plans and procedures for the

respective definable feature of work, including accomplishment of the following:

- Review each paragraph of the applicable specification sections;
- Review the contract drawings;
- Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required;
- Review the testing plan and ensure that provisions have been made to provide the required QC testing;
- Examine the work area to ensure that the required preliminary work has been completed;
- Examine the required materials and equipment, and sample work to ensure that materials and equipment are on hand and conform to the approved shop drawings and submitted data;
- Review the Safety Plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required material safety data sheets (MSDS) are submitted. (Note: This attribute may be accomplished by ensuring a briefing by the Site Health and Safety Officer.) Verify demonstrated compliance with Hazard Communication program including approvals of materials proposed for use, and up to date and accurate MSDS file, provisions for safe storage and handling, and worker training documentation; and,
- Verify training of workers proposed for the project, including any HAZWOPER training, certificates of competency, and equipment operator training when required by OSHA. (Note: This attribute may be accomplished by ensuring a review is performed by the Site Safety and Health Officer.
- Discuss construction methods.

6.3. **Initial Inspection**

6.3.1. Upon initiation of a representative sample of the definable feature of work, the lead will request an Initial inspection, in writing, from the Site QC Supervisor.

6.3.2. The following items will be verified during Initial Inspection:

- the workmanship meets the established quality requirements;
- configuration and construction methods, equipment, and tools appear to be effective;
- calibration of measurement and test equipment;
- materials and articles used are as specified;
- adequacy of inspection / testing methods;
- adequacy of applicable drawings; and,
- adequacy of safety and environmental precautions.
- Substitutions of hazardous materials or dangerous chemicals are approved by the Site Safety and Health Officer, Project Superintendent, or other on-site appropriate authority.
- All vehicles, equipment, tools, and safety equipment have been inspected by the Site Safety and Health Officer prior to use.

6.4. **Follow-Up Inspection and Surveillance**

6.4.1. Following the acceptable completion of the Initial inspection, the Site QC Supervisor will perform the following Follow-up inspection attributes for on-going work daily, or more frequently as necessary until the completion of each definable feature of work. Follow-up

inspections will be documented in the daily Contractor Quality Control Report:

- Ensure the work is in compliance with contract requirements;
- Maintain the quality of workmanship required;
- Ensure that testing is performed; and,
- Ensure that rework items are being corrected.

6.5. Final Inspections/Punchlisting

6.5.1. When a definable feature of work is nearing completion, the lead will request, in writing, that the Site QC Supervisor perform a punchlisting of open/deficient items requiring completion/resolution. The lead will identify those items known to remain open/deficient at the time of the request. The Site QC Supervisor will perform an inspection of the definable feature of work, and punchlist items identified as open/deficient. The punchlist will then be provided to the lead.

6.5.2. The lead will provide resolution of the punchlisted items. Following correction of the punchlisted items, the lead will request inspection and acceptance of the noted item by the Site QC Supervisor. The Site QC Supervisor will maintain a status of accepted punchlist items. Clearance of all punchlist items, including those subsequently identified after the initial punchlisting inspection, constitutes final inspection. Typically, the Resident Officer in Charge of Construction (ROICC) is invited to perform a final inspection.

6.6. QC Plan Inspections

6.6.1. The Site QC Supervisor will document the results of each day's inspection on the Contractor Quality Control Report.

6.6.2. Completed Contractor Quality Control Reports shall be submitted to the Contracting Officer Representative on a daily basis.

6.7. **Contractor Quality Control Report**

Reports are required for each day that work is performed and for every seven (7) consecutive calendar days of no-work, on the last day of that no-work period. An account will be made for each calendar day throughout the life of the project. The reporting of work shall be identified by terminology consistent with the construction schedule. Contractor Quality Control Reports are to be prepared, signed, and dated by the MK Site QC Supervisor and shall contain the following information:

- The control phase and the definable feature of work.
- Results of the preparatory phase meetings held, including the location of the definable feature of work and a list of personnel present at the meeting. Verify in the report that for this definable feature of work, the drawings and specifications have been reviewed, and work methods and schedule have been discussed.
- Results of the initial phase meetings held, including the location of the definable feature of work and a list of personnel present at the meeting. Verify in the report that for this definable feature of work the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the contract, the required testing has been performed, and include a list of who performed the tests.
- Results of the follow-up phase inspections held, including the location of the definable feature of work. Verify in the report for this definable feature of work that the work complies with the contract as approved in the initial phase, and that required testing has been performed, and include a list of who performed the tests.
- Results of the three phases of control for off-site work, if applicable, including actions taken.

- List rework items identified and not corrected by close of business.
- As rework items are corrected, provide a revised rework items list along with the corrective action taken.
- Include a "Remarks" section in this report which will contain pertinent information including directions received, QC problem areas, deviations from the QC plan, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the QC manager, and corrective action taken by the Contractor.
- Contractor quality control report certification.

6.8. Testing Plan and Log

6.8.1. As tests are performed, the Site QC Supervisor shall record on the testing plan and log the date the test was conducted, the date the test results were forwarded to the Contracting Officer, and any remarks and acknowledgment that an accredited or Contracting Officer approved testing laboratory was used. Attach a copy of the updated testing plan and log to the last daily Contractor quality control report of each month.

6.9. Rework Items List

6.9.1. The MK QC manager shall maintain a list of work that does not comply with the contract, identifying what items need to be reworked, the date the item was originally discovered, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the Contractor rework items list to the last daily Contractor Quality Control Report of each month. The Contractor shall be responsible for including on this list items needing rework including those identified by the Contracting Officer Representative.

6.10. As-Built Records

6.10.1. The Site QC Supervisor is required to review the as-built records required by contract to ensure that as-built records are kept current on a daily basis and marked to show deviations which have been made from the contract drawings. The Site QC Supervisor shall initial each deviation or revision. Upon completion of work, the Site QC Supervisor shall certify the accuracy of the as-built drawings and submit them to the Program QC Manager, unless otherwise specified in the Delivery Order. *Two copies of as-builts are required to maintained on site per contract requirements.*

6.11. Report Forms

6.11.1. Inspection and test results will be summarized daily on the "Contractor Quality Control Report", and supported by completed inspection/test checklists for the activity. Completed checklists are to be attached to the Contractor Quality Control Report, unless the Contracting Officer Representative elects not to have them submitted.

6.11.2. Reports shall be submitted daily to the Contracting Officer, with a copy sent to the Program Quality Control Manager in the Project Management Office.

7. RECORDS

7.1. **Quality Records**

- Contractor Quality Control Report
- Rework Items List

8. EXHIBITS

8.1. **Exhibit 1:** Contractor Quality Control Report
8.2. **Exhibit 2:** Rework Items List (typical)

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE

Y - YES N - NO. SEE REMARKS
BLANK - NOT APPLICABLE

IDENTIFY DEFINABLE FEATURE OF WORK. LOCATION AND LIST PERSONNEL PRESENT

PREPARATORY

THE PLANS AND SPECS HAVE BEEN REVIEWED	
THE SUBMITTALS HAVE BEEN APPROVED	
MATERIALS COMPLY WITH APPROVED SUBMITTALS	
MATERIALS ARE STORED PROPERLY	
PRELIMINARY WORK WAS DONE CORRECTLY	
TESTING PLAN HAS BEEN REVIEWED	
WORK METHOD AND SCHEDULE DISCUSSED	

INITIAL

PRELIMINARY WORK WAS DONE CORRECTLY	
SAMPLE HAS BEEN PREPARED/APPROVED	
WORKMANSHIP IS SATISFACTORY	
TEST RESULTS ARE ACCEPTABLE	
WORK IS IN COMPLIANCE WITH THE CONTRACT	

TESTING PERFORMED & WHO PERFORMED TEST

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE	

TESTING PERFORMED & WHO PERFORMED TEST

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)

REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

REMARKS

On behalf of the contractor I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE — DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

GOVERNMENT QUALITY CONTROL MANAGER — DATE

FORM 01400-1 6/91

(Back)

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CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

CONTRACT NO.

REPORT NO.

PHASE

Y - YES, N - NO, SEE REMARKS.
BLANK - NOT APPLICABLE

IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION AND *LIST PERSONNEL PRESENT*

PREPARATORY

THE PLANS AND SPECS HAVE BEEN REVIEWED	
THE SUBMITTALS HAVE BEEN APPROVED	
MATERIALS COMPLY WITH APPROVED SUBMITTALS	
MATERIALS ARE STORED PROPERLY	
PRELIMINARY WORK WAS DONE CORRECTLY	
TESTING PLAN HAS BEEN REVIEWED	
WORK METHOD AND SCHEDULE DISCUSSED	

PHASE

Y - YES N - NO SEE REMARKS
BLANK - NOT APPLICABLE

IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION AND *LIST PERSONNEL PRESENT*

INITIAL

PRELIMINARY WORK WAS DONE CORRECTLY	
SAMPLE HAS BEEN PREPARED/APPROVED	
WORKMANSHIP IS SATISFACTORY	
TEST RESULTS ARE ACCEPTABLE	
WORK IS IN COMPLIANCE WITH THE CONTRACT	

TESTING PERFORMED & WHO PERFORMED TEST

FORM 01400-2 6/91

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

CONTRACT NO

REPORT NO

PHASE	Y - YES, N - NO, SEE REMARKS. BLANK - NOT APPLICABLE	IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION AND *LIST PERSONNEL PRESENT*	TESTING PERFORMED & WHO PERFORMED TEST
FOLLOW-UP	WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE		

REWORK ITEMS LIST/DEFICIENCY TRACKING SYSTEM **(SAMPLE)**

CONTRACT NO./TITLE: **N62467-93-1106/MK SOUTHDIV ERAC**
DELIVERY ORDER NO: **NAS Chase-Delivery Order 0001**
Beeville, Texas

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para.No.; Drwg. No., etc.)	Action Taken by QC Manager	Resolution	Date Completed	Remarks

EXHIBIT 2 TO QEP 08.1

APPROVALS

Health and Safety Manager William Piispanen Date 01 Aug 95

Program Quality Manager [signature] Date 01 Aug 95

Contract Administration Manager [signature] Date 01 Aug 95

Sr. Project Manager [signature] Date 01 Aug 95

Program Manager [signature] Date 1 Aug 95

Effective Date: 8/01/95

TABLE OF CONTENTS

1. PURPOSE

This Quality Execution Procedure (QEP) establishes the requirements and responsibilities associated with identifying, reporting, controlling, dispositioning, and correcting deviations identified in the execution of work on the U.S. Navy Southern Division NAVFAC Environmental Response Action Contract.

2. REFERENCES

Contract N62467-93-D-1106, between MK and U.S. Navy Naval Facilities Engineering Command Southern Division.

3. DEFINITIONS

3.1. Deviation

A Deviation is any departure from established requirements. Deviations may result in defects that may be corrected through rework or that may result in nonconformances that require engineering evaluation in order to be resolved.

3.2. Nonconformance (NCR)

A Nonconformance is a deviation of such a nature that its resolution involves the coordination of multiple organizations or requires a formal engineering review. Generally, any deviation that cannot be resolved by performance of rework is considered a nonconformance.

4. RESPONSIBILITIES

4.1. Program Quality Control Manager (PQCM)

The PQCM is responsible for ensuring that a system of identification and resolution of deficient items is established for execution of the work. The PQCM is also responsible for the reporting of adverse trends and programmatic problems to the MK Program Manager.

4.2. Project Manager (PjM)

The Project Manager is responsible for coordinating the resolution of items appearing on the Rework Items List and conditions reported on NCR's.

4.3. Site Remediation/Construction Supervision

Remediation/Construction Supervision is responsible for assuring that identified deviations are controlled and corrected. If a Nonconformance Report (NCR) is issued, the actions specified in the NCR disposition are implemented by the Site R_ iediation/Construction Supervision.

4.4. Site Quality Control Supervisor (SQCS)

The MK Site Quality Control Supervisor is responsible for identifying, documenting, and reporting deviations and for re-inspecting corrected deviations in accordance with this QEP.

4.5. Subcontractors

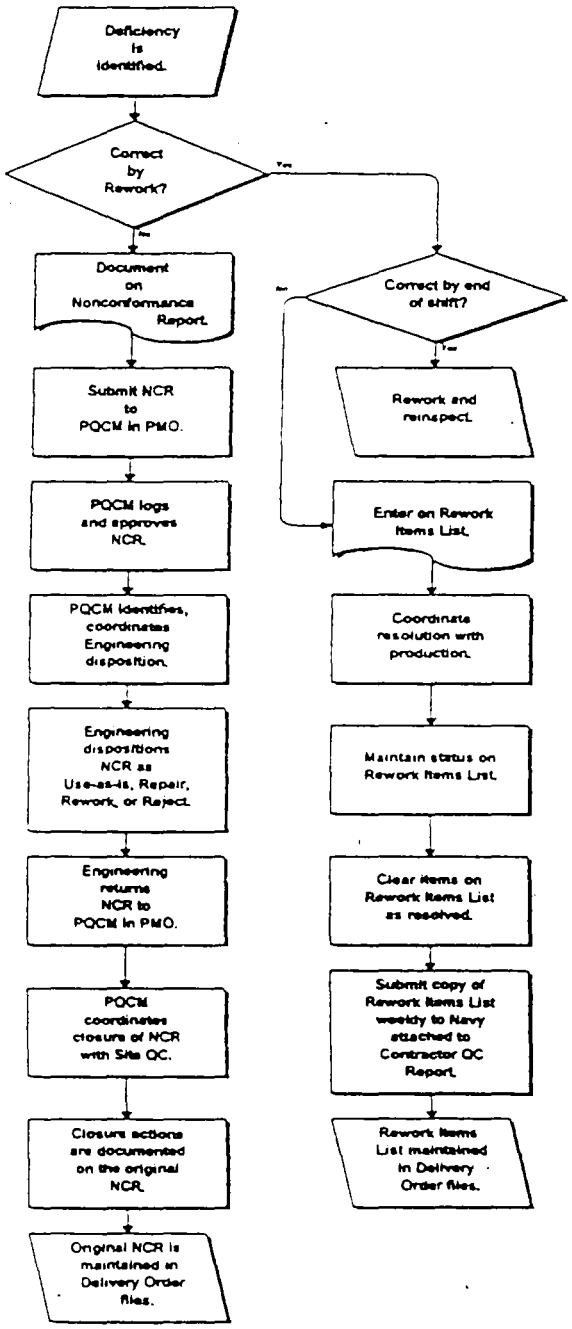
For work performed by subcontractors, the subcontractors are responsible for assuring that deviations are identified, controlled, documented, reported, corrected, and re-inspected. If a Nonconformance Report (NCR) is issued, subcontractors are responsible for implementing dispositions to NCR's applicable to the subcontractor statement of work.

5. PROCEDURE

5.1. Identification of Deviations

5.1.1. Deviations are usually identified by inspectors during the conduct of routine inspections or tests. However, deviations may be identified at any time by anyone involved with the work and reported to the applicable inspector or to the SQCS.

Fig. 1: Basic Deviation Resolution



5.1.2. Figure 1 depicts the basic process of resolving identified deficiencies. Many deviations involve situations where the condition can be corrected by re-performing operations that have already been specified without obtaining additional information or approvals. Examples include: depth of excavation insufficient; failure to achieve specified level of compaction, etc.

5.1.3. Items requiring rework shall be entered on the Rework Items List, **Exhibit 1**. Deficient items that can be resolved by reworking by the end of the shift need not be recorded on the Rework Items List.

5.1.4. A copy of the Rework Items List shall be provided to the Project Manager or designee who is responsible for correction of the deficient item.

5.1.5. A copy of the Rework Items List shall also be submitted to the Navy Contracting Officer Representative (typically, the Resident Officer in Charge of Construction at the subject base) on a weekly basis.

5.1.6. The SQCS shall maintain a current status of the resolution of items on the Rework Items List, and update the list as deficient items are reworked.

5.1.7. When all deviations on a Rework Items List are closed, the list shall be maintained for record purposes.

5.2. Issuance of Nonconformance Reports

5.2.1. A "Nonconformance Report" (NCR), **Exhibit 2**, shall be issued by the SQCS to track the resolution of major deviations for the following conditions:

- In the event resolution of a deviation requires engineering input because design requirements cannot be met by re-working the item;
- Resolution requires the coordination of multiple organizations; or,
- The Navy stipulates the use of this more formal deviation reporting method.

5.2.2. NCR's are sequentially numbered, with the next number being assigned by the SQCS from a log maintained for tracking NCR's at each Delivery Order site.

5.2.3. The SQCS shall fully describe the nonconforming condition on the NCR form and consult with the PQCM and the PjM regarding any proposed corrective action.

5.2.4. The NCR shall be forwarded to the PQCM, who will coordinate disposition of the NCR with the applicable engineering authority.

5.2.5. A copy of any NCR shall also be submitted to the Contracting Officer Representative (i.e. the Resident Officer in Charge of Construction) within one day of the issue date.

5.3. Engineering Disposition of NCR

5.3.1. Upon receipt of an NCR from the PQCM, the dispositioning Engineer shall review the reported condition and determine the proper disposition from the following categories:

- **Rework**-Under the engineering disposition, the reported deficient condition is to be is to be re-worked as specified in the disposition.

- **Repair**-Under this disposition, the reported deficient condition is to be "repaired" using a specific procedure provided in the disposition. The repair may require a custom approach to be utilized only for the reported condition. **Note: Under this disposition, the condition must be reflected accurately on as-built drawings.**

- **Use-as-Is**-Under this disposition, the engineering evaluation indicates that it is acceptable to use the subject item or condition "as-is", and requires no further correction. A detailed engineering justification will be provided in the disposition for using the item "as-is". **Note: Under this disposition, the condition must be reflected accurately on as-built drawings.**

- **Reject**-Under this disposition, the reported condition has been evaluated to be rejectable and the item should be discarded. This disposition is typically utilized for materiel problems and not programmatic errors.

5.1.4. A copy of the Rework Items List shall be provided to the Project Manager or designee who is responsible for correction of the deficient item.

5.1.5. A copy of the Rework Items List shall also be submitted to the Navy Contracting Officer Representative (typically, the Resident Officer in Charge of Construction at the subject base) on a weekly basis.

5.1.6. The SQCS shall maintain a current status of the resolution of items on the Rework Items List, and update the list as deficient items are reworked.

5.1.7. When all deviations on a Rework Items List are closed, the list shall be maintained for record purposes.

5.2. Issuance of Nonconformance Reports

5.2.1. A "Nonconformance Report" (NCR), **Exhibit 2**, shall be issued by the SQCS to track the resolution of major deviations for the following conditions:

- In the event resolution of a deviation requires engineering input because design requirements cannot be met by re-working the item;
- Resolution requires the coordination of multiple organizations; or,
- The Navy stipulates the use of this more formal deviation reporting method.

5.2.2. NCR's are sequentially numbered, with the next number being assigned by the SQCS from a log maintained for tracking NCR's at each Delivery Order site.

5.2.3. The SQCS shall fully describe the nonconforming condition on the NCR form and consult with the PQCM and the PjM regarding any proposed corrective action.

5.4. Implementation of NCR Dispositions

5.4.1. The NCR form with the proposed disposition shall be returned to the PQCM upon completion of disposition by the Engineering authority.

5.4.2. The PQCM and the Sr. PjM in the Project Management Office shall review the proposed Engineering disposition to verify that it can be implemented as proposed and that it does not violate any contract requirements.

5.4.3. The PQCM forwards the NCR to the SQCS for implementation of the disposition.

5.4.4. The Project Manager or subcontractor is provided with the approved NCR disposition and performs the corrective action as specified.

5.4.5. The MK Site Quality Control Supervisor verifies that the disposition was performed as stipulated and documents the re-inspection on that day's Contractor Quality Control Report, noting the NCR number.

5.4.6. The SQCS shall close out the Nonconformance Report and its entry on the Nonconformance Report Log.

6. RECORDS

6.1. Rework Items List
6.2. QEP 13.1-1 – "Nonconformance Report"

7. EXHIBITS

7.1. Exhibit 1: Rework Items List
7.2. Exhibit 2: Nonconformance Report

EXHIBIT 1: REWORK ITEMS LIST/DEFICIENCY TRACKING SYSTEM

CONTRACT NO./TITLE: MK SOUTHDIV ERAC
DELIVERY ORDER NO:

Number	Date Identified	Description	Contract Requirement (Spec. Section and Para.No.; Drwg. No., etc.)	Action Taken by QC Manager	Resolution	Date Completed	Remarks

MORRISON KNUDSEN CORPORATION

Naval Facilities Engineering Command-Southern Division
Environmental Response Action Contract-District II

Form Title

NONCONFORMANCE REPORT

Contract No.	Form Page 1 of 1
4324	
Form No.	Form Revision Date
QEP 13.1-1	12-July-95

Description of Affected Item or System	Nonconformance Report No.		
		Sheet of	
	Responsible Organization		
Subcontractor	Prob. Cause Code	Inspection Code	Const. Seq. Code
Source of Requirement Not Met	Event Type	Corrct. Action Code	Deviation Impact Lev.
	Issue Date	Disposition Date	Close Date

CONDITION DESCRIPTION

Issued By: Continued Sheets thru

PROPOSED FIELD DISPOSITION

Issued By: Continued Sheets thru

APPROVAL OF PROPOSED FIELD DISPOSITION ☐ Approved as Proposed ☐ Revised - See Sheets thru

Engr. Organization:			Morrison Knudsen Concurrence		
TITLE	SIGNATURE	DATE	TITLE	SIGNATURE	DATE

REINSPECTION RESULTS ☐ Accept ☐ Reject - Give Explanation

CLOSURE MK QC Inspection			Sr. PjM Review		
Quality Review			(Other, if required)		
	SIGNATURE	DATE		SIGNATURE	DATE

APPENDIX C

Field Inspection Checklists

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
Soils Layering Backfill and Compaction Dye Burial Ground	DBF-01	NOV 95	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 CORPORATION
Engineering, Construction, & Environmental

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-02	NOV 95	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	Delivery Order Number	Checklist Title	PAGE 1 OF 1
NSWC - Crane, Indiana	0009, Statement of Work #007	SITE PREPARATORY WORK, Dye Burial Ground DBP-02	

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
TOPSOIL PLACEMENT Dye Burial Ground	DBTS-01	Nov. 95	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 CORPORATION Engineering, Construction, & Environmental			FIELD INSPECTION CHECKLIST
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 CORPORATION Engineering, Construction, & Environmental			FIELD INSPECTION CHECKLIST
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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

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

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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
GEOTEXTILE FABRIC INSTALLATION Dye Burial Ground	GEOTEX-02	NOV. 95	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 some 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	Delivery Order Number	Checklist Title	PAGE 1 OF 1
NSWC - CRANE	0009, Statement of Work #007	Geosynthetic Clay Liner Installation GEOTEX-02	

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

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:

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental			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:

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-01	NOV 95	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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SITE PREPARATORY WORK Dye Burial Ground	DBP-02	NOV 95	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 the required grades and dimensions of the completed site preparation by survey.			
9	Note exposed contaminated materials during grading activities for the possibilities of equipment/personnel contamination.			
10	Verify completion of the site clearing activities is complete and in accordance with the approved work plan.			
11	See that corrective measures have been performed, verified, and documented if applicable.			

ADDITIONAL NOTES OR COMMENTS

MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental			FIELD INSPECTION CHECKLIST
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 CORPORATION Engineering, Construction, & Environmental	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist Number	Revision Date	Checklist
SOILS LAYERING BACKFILL AND COMPACTION Dye Burial Ground	DBF-003	NOV 95	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

APPENDIX D

Testing Plan and Log

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Site Preparation	Throughout task	EM 385-1-1, Section 21.I and 25 (Safety and Health Requirements Manual, USACE 10/92)	MK		N/A		Refer to Work Plan

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Backfill/compaction of excavated areas	Every 500 square feet of material placed	ASTM Standards	SUB		Density per site specific requirements or design specs and drawings		Document on Field Inspection Checklist (FIC) SO-01 Refer to Work Plan, for other requirements

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Characterization for off-site disposal	Per SWMU-specific Work Plan sections	40 CFR, Part 261, TCLP (volatiles, semi-volatiles, and metals) and 40 CFR Part 264.314 (paint filter test) (Additional tests may be required, refer to individual SWMUs below.)	LAB		Less than TCLP criterion. Paint filter test results as specified in 40 CFR Part 264.314.		Refer to SWMU-specific sections of Work Plan

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Construct Decontamination Pad	One Per SWMU		Sub				Refer to Work Plan
Photographs	Daily		MK				
Environmental Report	One Per SWMU		MK				

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Site Restoration	Throughout activity		MK		Ensure that topsoil and vegetative cover are placed per Work Plan and technical specifications		Refer to Work Plan

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Cap foundation material specifications and placement	Moisture and density tests: per lifts per 5000 square feet of material placed	Material specifications per specs and drawings Installation per specs and drawings	SUB		Per design drawings and technical specifications		Refer to Work Plan, Document on FIC CAP-01
Synthetic Clay Liners	As per requirements	Requirements for Hazardous Waste Landfill Design, Construction, and Closure.	MK		Per specification		Document on FIC CAP-01

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Installation of geomembrane	As per requirements	Construction Quality Management for RA and RD Waste Containment Systems (EPA/540/R-92/073)	SUB		Per specifications		Document on FIC CAP-01
Installation of drainage layer and biotic barrier layer	Thickness verification 1 per lift per 5000 square feet placed	Technical Specifications	SUB		Per specifications		Document on FIC CAP-01

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Testing of perimeter drain backfill	Thickness verification per lift every 5000 square feet of material placed	As per design drawings and specifications or ASTM Standards	SUB		Design drawings and specifications		Document on FIC CAP-01

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Placement of geotextile filter fabric		Manufacturers recommendations	SUB		Per specifications provided by WES and Manufacturer		Document on FIC CAP-01

TESTING PLAN AND LOG

CONTRACT NO./TITLE: MK SOUTHDIV ERAC

DELIVERY ORDER NO: 0009 (SOW #0007) NSWC Crane

Activity	Frequency	Governing Standard	Performed or Sampled By	Sample or Test Number / Date	Acceptance Criteria	Results and/or Remarks	Comments
Placement of cover soil	Per lift, moisture and density every 5000 square feet of material placed	Material specifications as per design drawings and specifications	SUB		Design drawings and specifications		Document on FIC CAP-01

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 Corp' 'ation 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 supplies 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.

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.

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 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.

SWMU # 02/II

DYE BURIAL GROUND INTERIM MEASURES CAP

AT

EASTERN SECTION

OF

NSWC, CRANE DIVISION
INDIANA

DRAWINGS LIST

DRAWING NUMBER	DRAWING TITLE
PHASE I	
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
PHASE II TO BE SUBMITTED LATER	
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 THE U.S. EPA AND CORPS OF ENGINEERS WES.

REVISIONS

REV.	DATE	DESCRIPTION	BY	ENG MGR	QA/QC
A	6/19/97	ISSUED FOR DOD AND REVIEW			
0	9/25/97	ISSUED FOR CONSTRUCTION			

NOTES

SWMU #02/II
DYE BURIAL GROUND
INTERIM MEASURES CAP

NSWC, CRANE DIVISION
EASTERN SECTION
TITLE SHEET

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

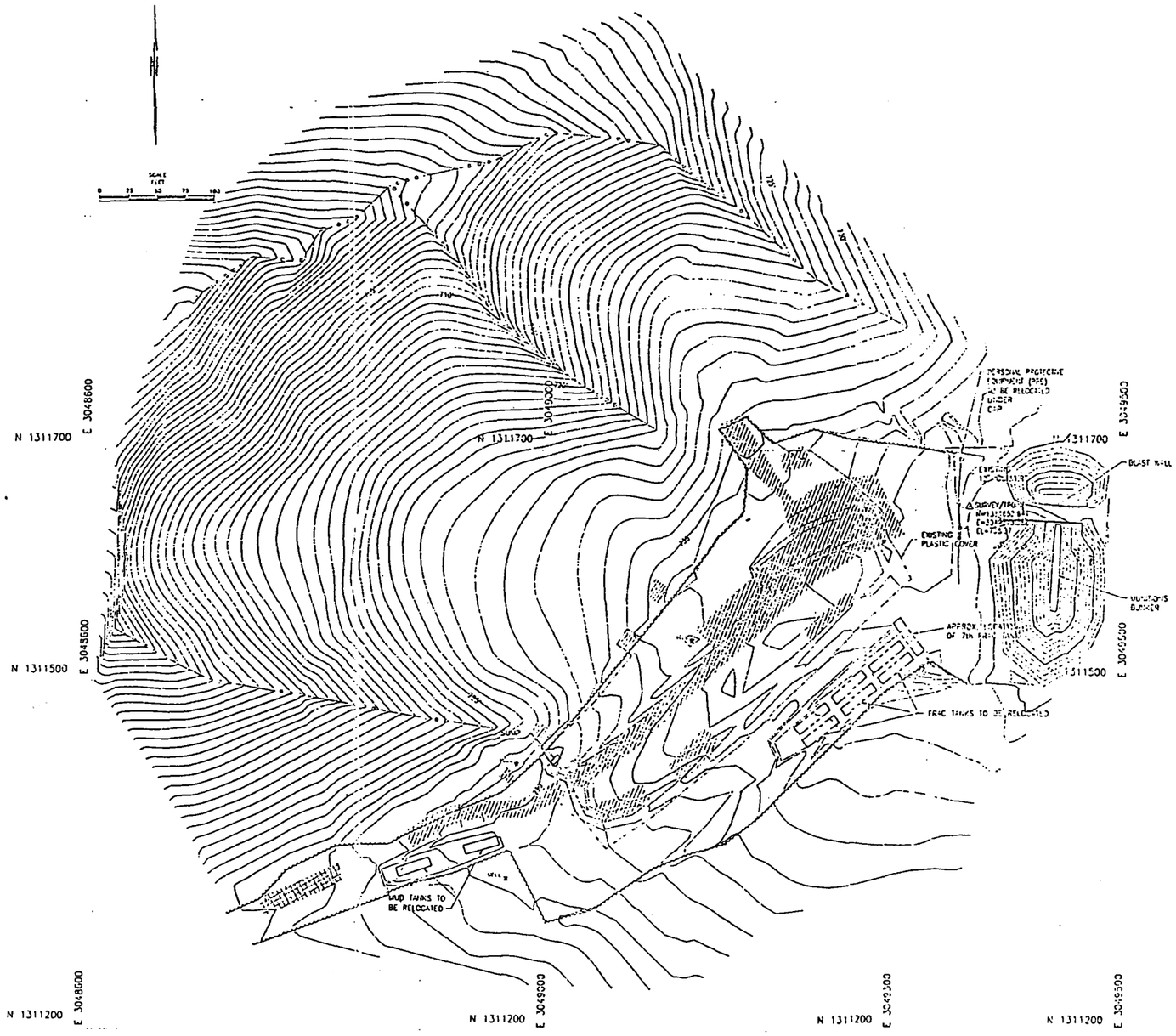
	DSGN	DRWN	CHKD	QUAL	APPVD	DATE	BY
INIT							
DATE							

SCALE: NTS
DRAWN: R. EVANS 9/16/97
DESIGNED: C. WAITE
CHECKED:
VERIFIED:
APPROVED:
AUTOCAD FILE NAME: 4324-01

WORK ORDER NUMBER
4324

DRAWING NUMBER
C-01

C-02



REVISIONS

REV.	DATE	DESCRIPTION	BY	LEAD ENGR	PROJ MGR	PM
A	4/19/97	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 FAAC 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

DES	APP	SPEC	MECH	ELEC	PROJ	MGR	EA	ENG REC	PM	
AE										
DATE										

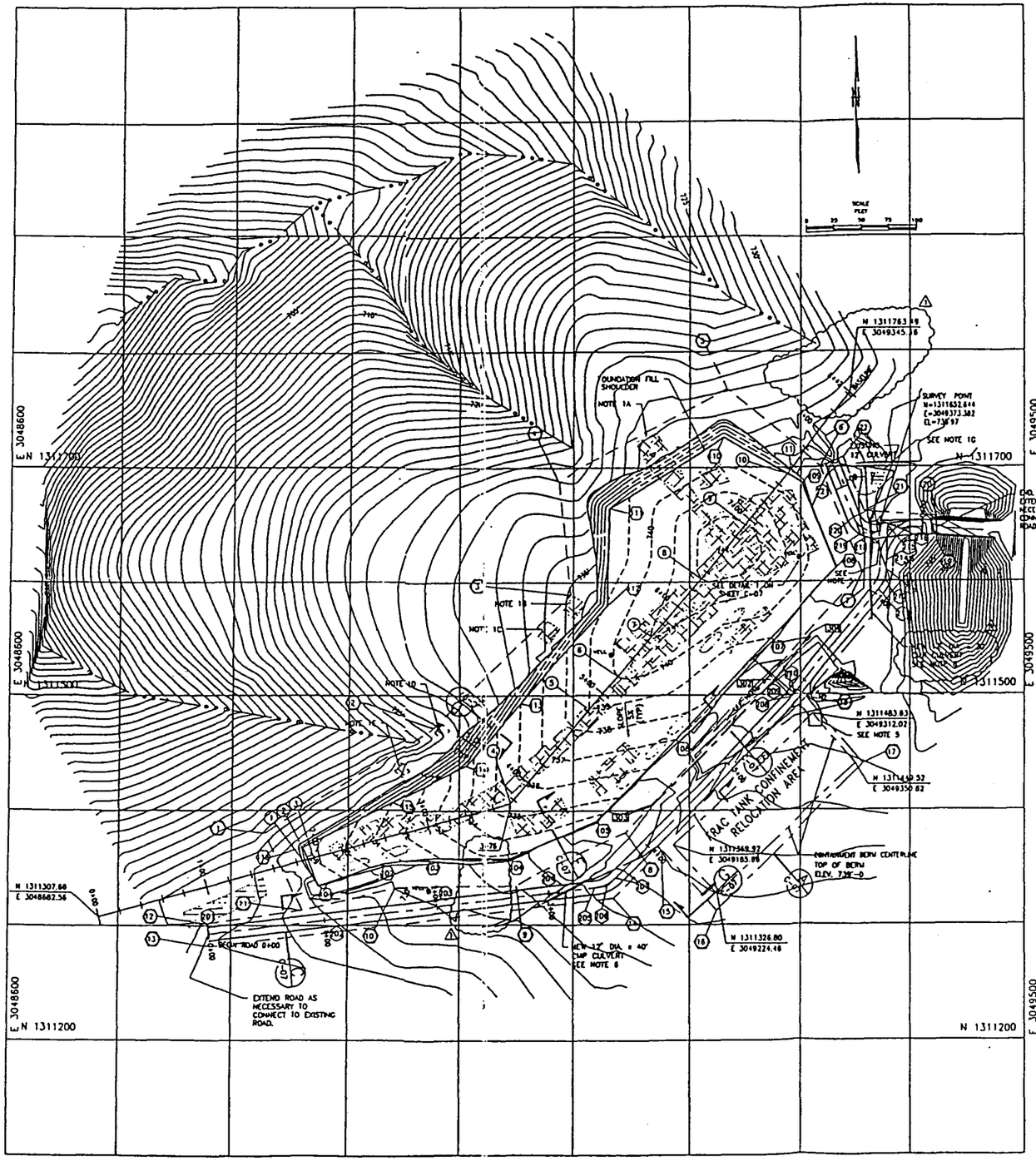
SCALE: 1"=50'-0"
DRAWN: R. EVANS 6/16/97
DESIGNED: C. WAITE 6/17/97
CHECKED:
VERIFIED:
APPROVED:
AUTOCAD FILE NAME: 4324-02.DWG

WORK ORDER NUMBER
4324

DRAWING NUMBER
C-02

REV
C

C-03



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	1311518.61	740
7	3049168.27	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
01	3048874.86	1311334.89	728.25
02	3048929.70	1311353.49	730.5
03	3048970.37	1311358.46	731.75
04	3049044.43	1311358.14	732.8
05	3049119.55	1311390.61	733.75
06	3049188.15	1311461.85	737
07	3049272.92	1311549.89	739
08	3049333.73	1311612.74	739
09	3049301.67	1311686.45	739
10	3049230.46	1311725.04	739
11	3049130.81	1311664.65	738.25
12	3049130.33	1311580.49	739
13	3049053.59	1311493.21	736
14	3049005.71	1311439.44	733.75
15	3048939.83	1311406.72	731
16	3048861.49	1311368.01	728.5

CLEARING LINE CONTROL POINTS

PT #	EASTING	NORTHING
1	3048829	1311380
2	3048978	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	3049178	1311365
16	3049224	1311312
17	3049357	1311440
18	3049306	1311498
19	3049423	1311835
20	3049423	1311657
21	3049359	1311681
22	3049339	1311708

CENTER LINE OF SWALE CONTROL POINTS

PT #	EASTING	NORTHING
SW1	3049311	1311554
SW2	3049278	1311512
SW3	3049187	1311404

DYE BURIAL ACCESS ROAD CENTER LINE CONTROL POINTS

PT #		STATION	EASTING	NORTHING	DESCRIPTION
SECTION ONE					
20		0+00	3048781.30	1311292.70	BEGIN CONSTRUCTION ROAD SECTION ONE
02		1+00	3048880.82	1311304.34	
03		2+00	3048979.94	1311315.99	
04		3+00	3049079.28	1311327.64	
05	CURVE 1	3+39.47	3049118.48	1311332.23	P.C. R=30'-0", Δ=38.7°
06			3049128.92	1311333.48	P.I.
07		3+59.73	3049138.31	1311340.95	P.T.
08	CURVE 2	5+80.16	3049281.21	1311497.78	P.C. R=30'-0", Δ=4.2°
09			3049292.49	1311499.08	P.I.
10		5+83.83	3049293.87	1311500.46	P.T.
11	CURVE 3	7+05.99	3049371.77	1311592.02	P.C. R=30'-0", Δ=39.2°
12			3049378.70	1311600.14	P.I.
13		7+28.52	3049378.94	1311810.82	P.T.
14	CURVE 4	7+33.82	3049379.10	1311817.82	P.C. R=30'-0", Δ=91.9°
15			3049379.78	1311848.91	P.I.
16		7+81.74	3049410.74	1311847.21	P.T. END CONSTRUCTION, CONNECT TO EXISTING
SECTION TWO					
16		0+00	3049410.74	1311847.21	BEGIN CONSTRUCTION ROAD SECTION TWO
18	CURVE 5	0+40.18	3049370.80	1311842.86	P.C. R=21'-0", Δ=73.9°
19			3049355.09	1311841.16	P.I.
20		0+67.27	3049334.10	1311855.77	P.T.
21		1+15.22	3049329.52	1311703.50	END CONSTRUCTION

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

REVISIONS

REV.	DATE	DESCRIPTION	BY	LEAD CHECK	QC
A	1/19/97	ISSUED FOR BID AND REVIEW			
B	1/25/97	ISSUED FOR CONSTRUCTION			
1	2/17/97	REISSUED FOR CONSTRUCTION			

NOTES

LEGEND

- ACCESS ROAD CENTERLINE
- FILL CONTOUR
- CLEARING LINE
- SWALE CENTERLINE
- FRAC TANK RELOCATION AREA CONTAINMENT BERM CENTERLINE
- EXISTING MONITORING WELL
- (8) FILL BASE LINE POINTS
- (10) FILL SHOULDER POINTS (100 SERIES)
- (20) ROAD CENTERLINE CONTROL POINTS (200 S
- (1) CLEARING LINE CONTROL POINTS
- SW1 SWALE CONTROL POINTS
- GENERAL WASTE AREAS
- ISOLATED AREAS OF BERMS TO BE LOW SEE NOTE 1H
- PERSONAL PROTECTIVE EQUIPMENT TO BE RELOCATED UNDER FILL, SEE NOTE
- AREAS OF WASTE PREVIOUSLY EXCAVA 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 REL 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 B 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 DIR BY CONTRACTOR.
5. EXTEND ACCESS ROAD TO FRAC TANK CONFINEMENT REL AREA AND AT INTERSECTION OF SECTIONS ONE AND TWO 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 CORPORA
ENVIRONMENTAL SERVICES

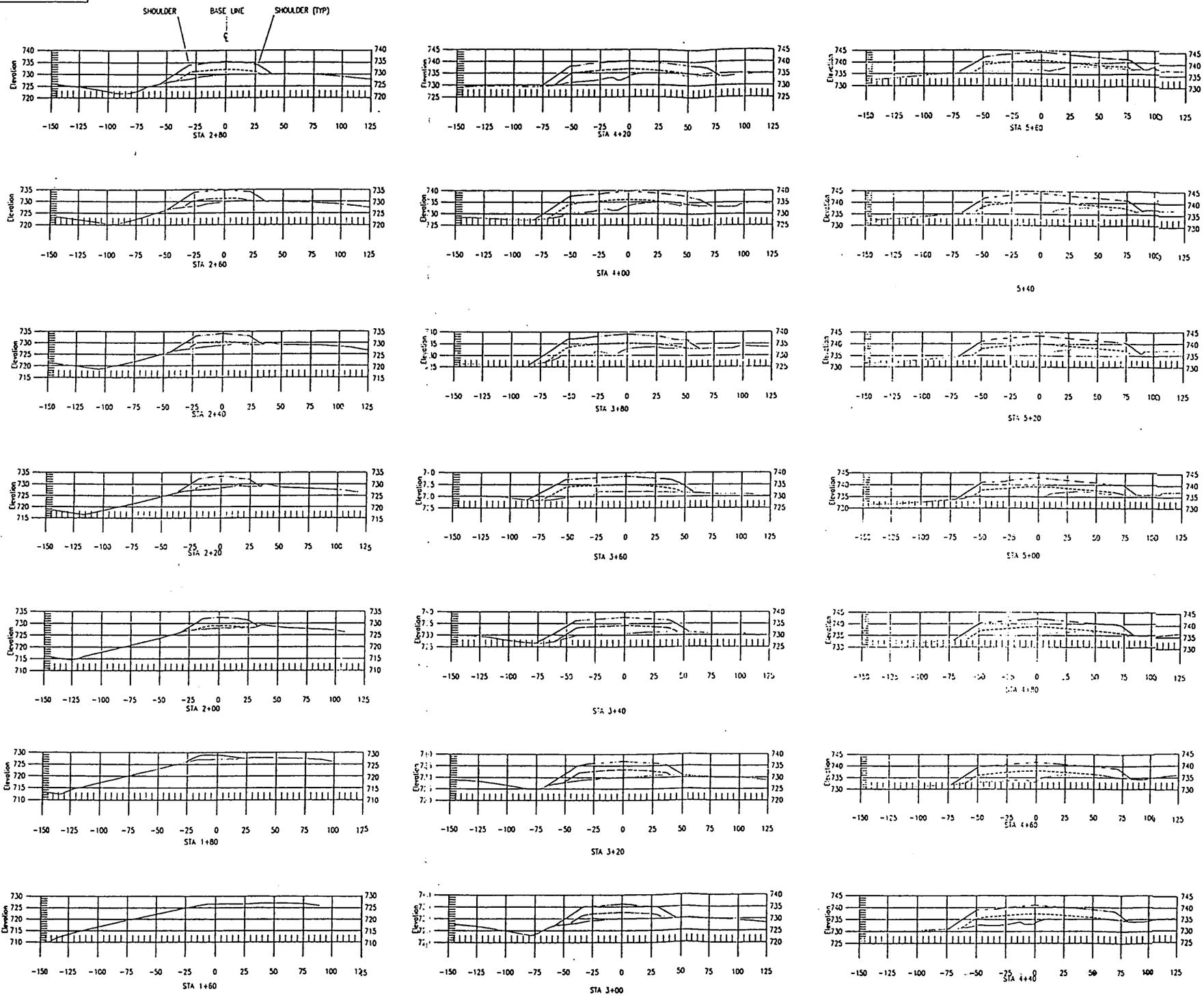
	DSGN	DRWN	CHKD	QA/QC	PROJ. MGR	DATE	APP'D	DATE
INIT								
DATE								

SCALE: 1"=50'-0"
DRAWN: R. EVANS 2/18/97
DESIGNED: C. WAITE 2/18/97
CHECKED:
VERIFIED:
APPROVED:

WORK ORDER NUMBER 4324

DRAWING NUMBER C-03

C-04



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

REVISIONS

REV.	DATE	DESCRIPTION	BY	CAD LNCH	DEPT MGR
A	5/19/97	ISSUED FOR BID AND PERMIT			
B	8/25/97	ISSUED FOR CONSTRUCTION			

NOTES

LEGEND

- - - - - - TOP OF CAP (PHASE TWO CONSTRUCTI
---------- 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 CORPORATIO
ENVIRONMENTAL SERVICES

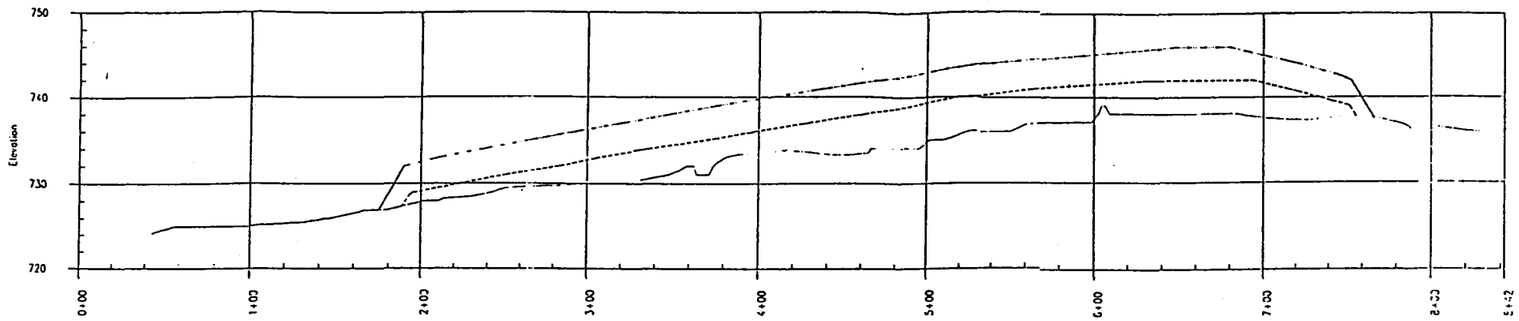
SCALE:	1"=40'-0 HOR.	
DRAWN:	R. EVANS	6/26/97
DESIGNED:	C. WHITE	6/26/97
CHECKED:		
VERIFIED:		
APPROVED:		

WORK ORDER NUMBER
4324

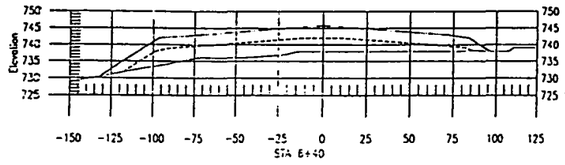
DRAWING NUMBER
C-04

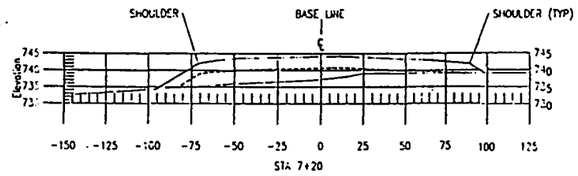
PLOTTED FILE NAME: 4324-04.DWG

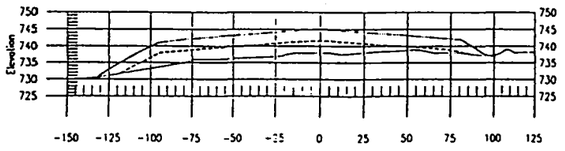
C-05

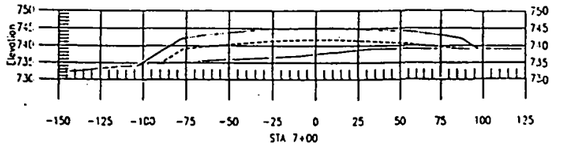


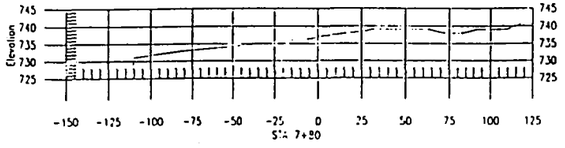
SCALE 1" = 40'-0 HORIZONTAL
SCALE 1" = 20'-0 VERTICAL
PROFILE ALONG BASE LINE

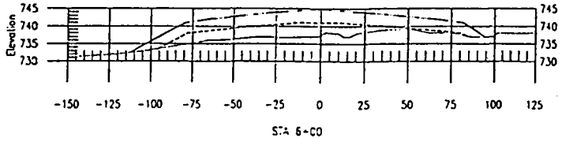


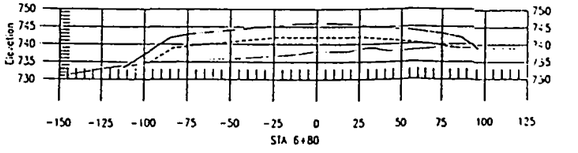


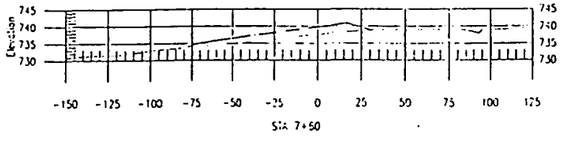


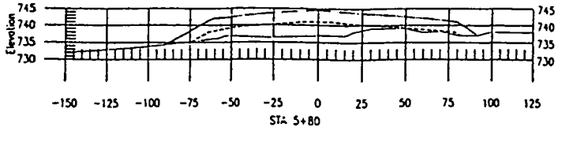


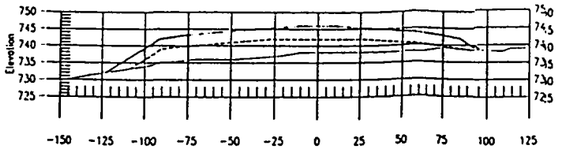


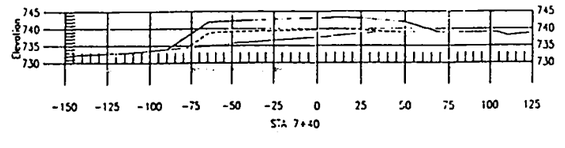












SCALE 1" = 40'-0 HORIZONTAL
SCALE 1" = 20'-0 VERTICAL

REVISIONS

REV.	DATE	DESCRIPTION	BY	CAD MGR	ESPT LDR	PROJ MGR
A	5/19/97	ISSUED FOR BID AND REVIEW				
0	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

ITEM	ORIG	STR/CH	MECH	ELECT	PIPING	INST	S/A			
AS										
DWG										

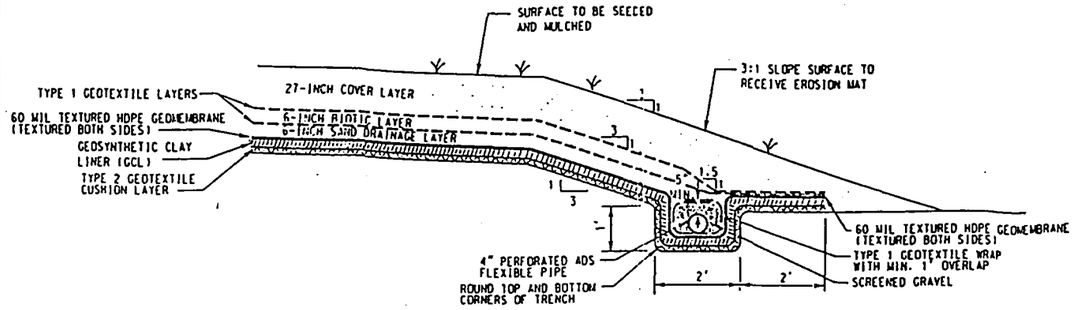
SCALE: 1"=40'-0 HORIZ.
DRAWN: R. EVANS 6/20/97
DESIGNED: C. WAITE 6/20/97
CHECKED:
VERIFIED:
APPROVED:
AUTOCAD FILE NAME: 4324-05.DWG

WORK ORDER NUMBER
4324

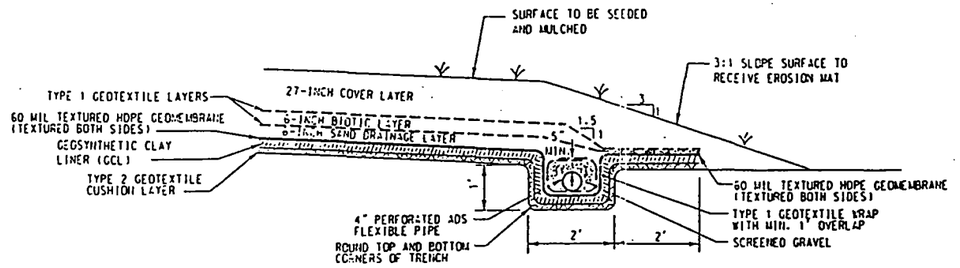
DRAWING NUMBER
C-05

REV
0

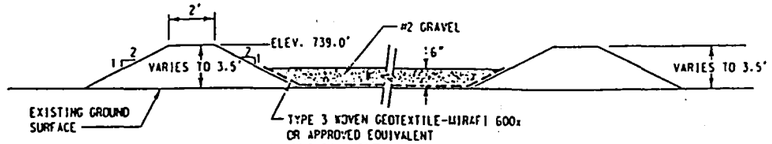
C-07



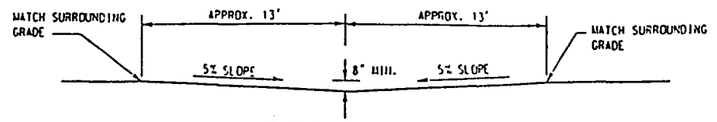
TYPICAL COVER (D / 03)
N.T.S.



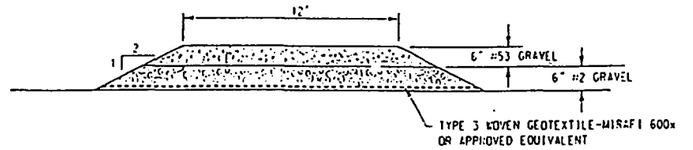
TYPICAL COVER (E / 03)
N.T.S.



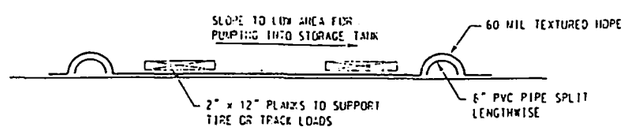
SECTION-FRAC TANK SECONDARY CONTAINMENT AREA BERM (A / 03)
N.T.S.



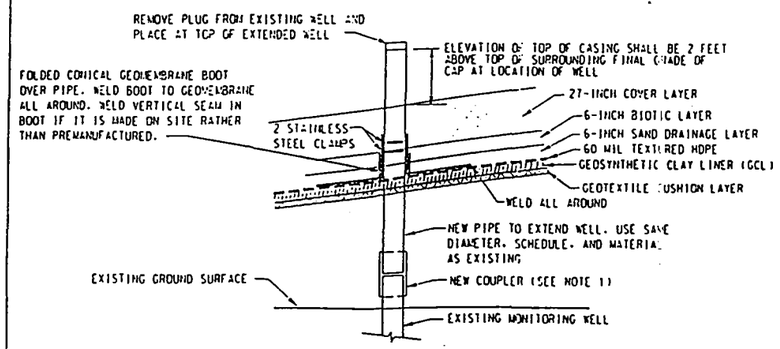
SECTION-SWALE TO RESTORE DRAINAGE ALONG SOUTHEAST SIDE OF CAP (B / 03)
N.T.S.



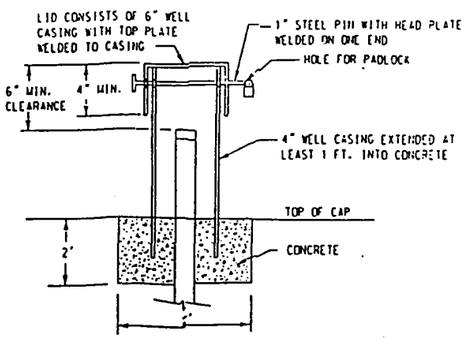
SECTION-RECONSTRUCTED ACCESS ROAD (C / 03)
N.T.S.



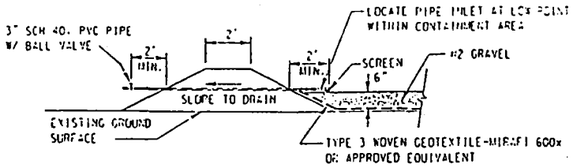
TEMPORARY DECONTAMINATION STATION DETAIL
N.T.S.



TYPICAL DETAIL OF EXTENSION OF EXISTING MONITORING WELL THROUGH CAP (1 / 03)
N.T.S.



DETAIL-WELL PROTECTIVE CASING
N.T.S.



SECTION-FRAC TANK SECONDARY CONTAINMENT AREA (G / 03)
N.T.S.

REVISIONS

REV.	DATE	DESCRIPTION	BY	ADD INCR	DEL INCR	PRT PAGE
A	06/19/98	ISSUE FOR REVIEW AND BID				
0	06/25/98	ISSUE FOR CONSTRUCTION				

NOTES

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

SWMU#02/11
DYE BURIAL GROUND INTERIM MEASURES CAP

NSWC, CRANE DIVISION
EASTERN SECTION
TYPICAL CAP CROSS SECTIONS AND DETAILS

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

DSGN	APP'D	DRAWN	WDR	CHKD	PIPING	ELEC	CIVIL	STR	MECH	
ENG										
MGR										

SCALES:	AS NOTED	
DRAWN:	B. HARPER	06/24/98
DESIGNED:	C. WHITE	
CHECKED:		
QUALITY:		
APPROVED:		

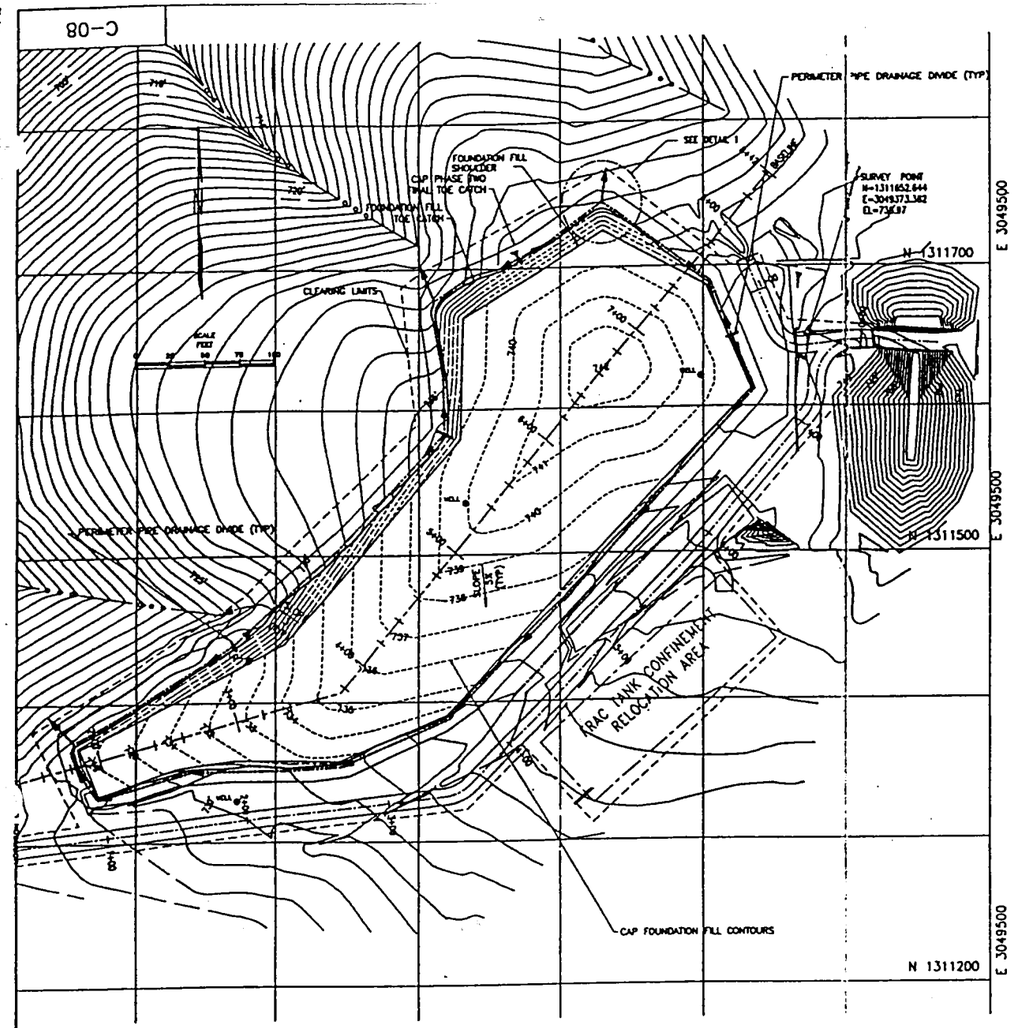
FILE: N:\DYE\CAP\DETAILS.DGN

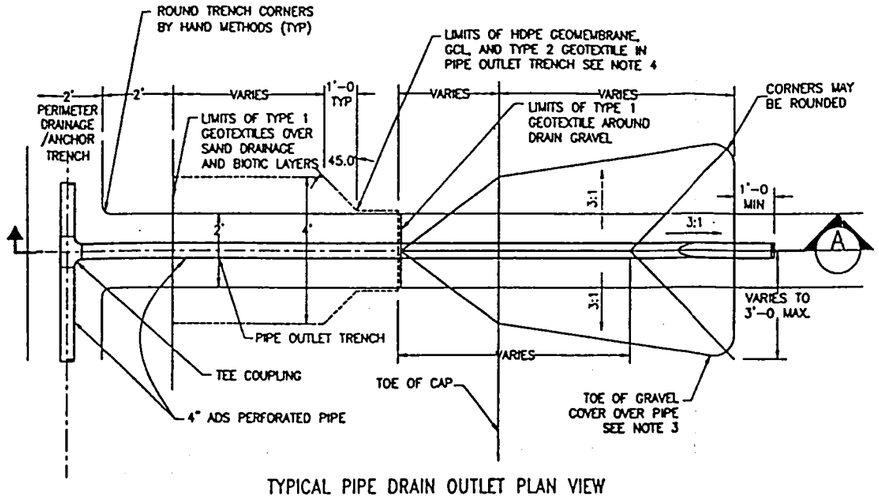
CONTRACT NUMBER 4324

DRAWING NUMBER C-07

REV A

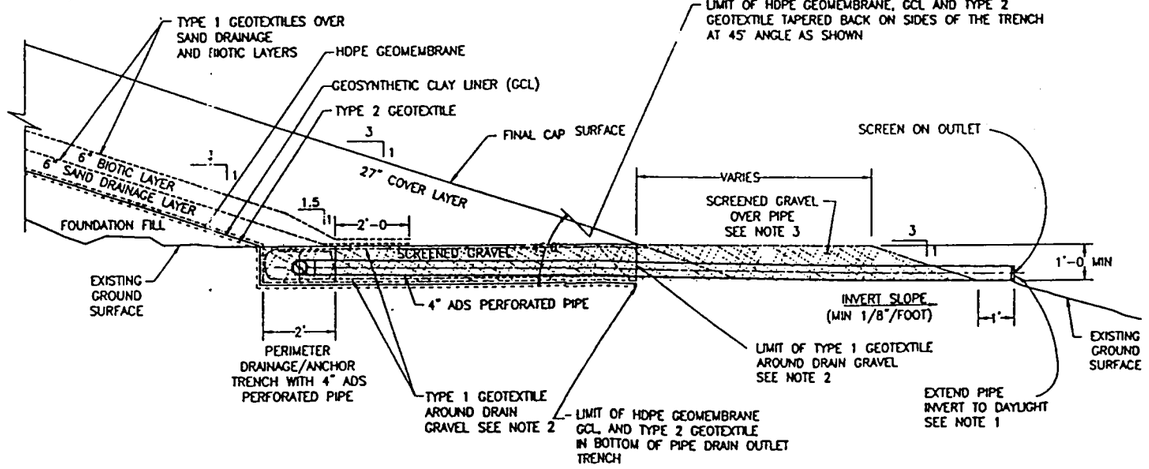
C-08





TYPICAL PIPE DRAIN OUTLET PLAN VIEW

DETAIL 1 — 1/2"=1'-0



SECTION A — 1/2"=1'-0

REVISIONS

REV.	DATE	DESCRIPTION	BY	LEAD ENGR	DEPT MGR.	PROJ MGR
A	7/1/97	ISSUED FOR REVIEW				
0	7/21/97	ISSUED FOR CONSTRUCTION				

NOTES

LEGEND

- DIRECTION OF PERIMETER PIPE FLOW
- ACCESS ROAD CENTERLINE
- CAP FOUNDATION FILL CONTOUR
- CLEARING LINE
- SWALE CENTERLINE
- FRAC TANK RELOCATION AREA CONTAINMENT BERM CENTERLINE
- EXISTING MONITORING WELL
- HDPE GEOMEMBRANE
- GEOSYNTHETIC CLAY LINER (GCL)
- TYPE 1 GEOTEXTILE
- TYPE 2 GEOTEXTILE

NOTES:

1. FIELD ADJUST HORIZONTAL ALIGNMENT OF PIPE DRAIN OUTLET TO DISCHARGE INTO EXISTING SURFACE DRAINAGE CHANNEL.
2. OVERLAP TYPE 1 GEOTEXTILE A MINIMUM OF 1'-0 AROUND DRAIN GRAVEL.
3. DO NOT SEED OR MULCH GRAVEL COVER OVER PIPE.
4. SEAM /OVERLAP HDPE GEOMEMBRANES, GCLS, AND TYPE 2 GEOTEXTILES IN PIPE DRAIN OUTLET TRENCH TO CORRESPONDING MATERIALS IN THE PERIMETER DRAINAGE/ANCHOR TRENCH IN

SWMU #02/11
DYE BURIAL GROUND INTERIM MEASURES CAP

NSWC, CRANE DIVISION
EASTERN SECTION
UNDERDRAIN DRAINAGE PLAN

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

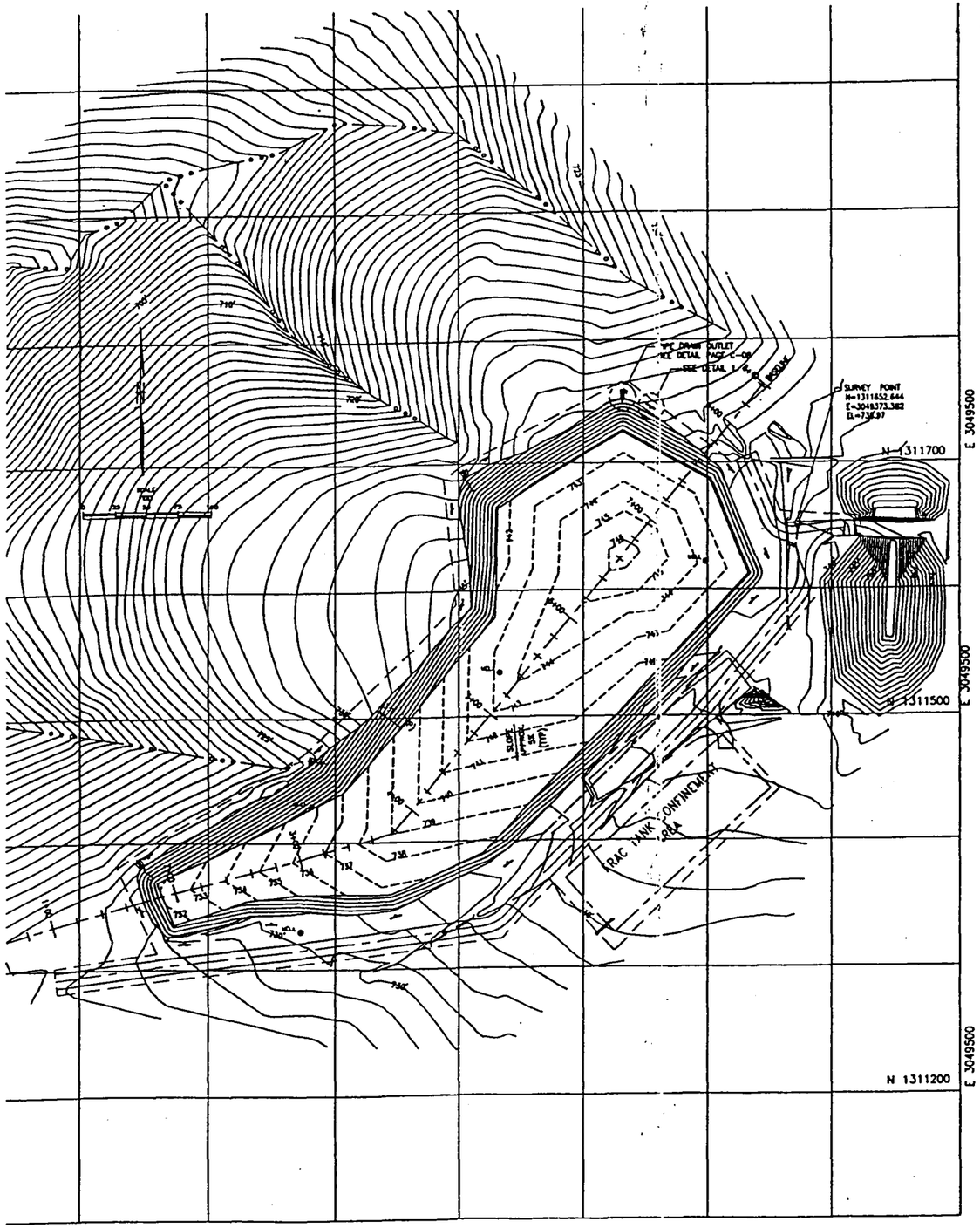
DEPT	ARCH	ENG/CHK	MECH	ELECT	PIPING	INST	C/A	CIVIL	PROJ MGR
NO										
DATE										

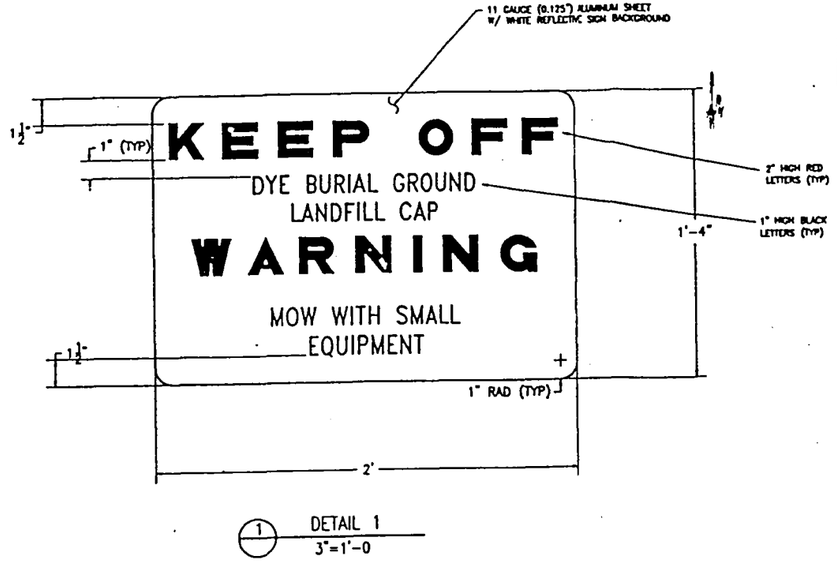
SCALE:	1"=50'-0	
DRAWN:	R. EVANS	7/1/97
DESIGNED:	K. OHSICK	7/1/97
CHECKED:		
VERIFIED:		
APPROVED:		

WORK ORDER NUMBER: 4324

DRAWING NUMBER: C-08 REV: 0

C-09





1 DETAIL 1
3"=1'-0

REVISIONS						
REV.	DATE	DESCRIPTION	BY	LEAD CHECK	DEPT MGR	PROJ MGR
A	7/6/97	ISSUED FOR REVIEW				
0	7/21/97	ISSUED FOR CONSTRUCTION				

NOTES

LEGEND

— WARNING SIGN LOCATION SYMBOL

NOTE

SIGNS DESIGNATING THE EXTENT OF THE CAP SHALL BE INSTALLED IN THE APPROXIMATE LOCATIONS SHOWN, FACING AWAY FROM CAP CENTER. SIGNS SHALL BE MOUNTED ON STANDARD METAL TRAFFIC SIGN POSTS INSTALLED TO D.O.T. STANDARDS. CARE SHOULD BE TAKEN SO THAT THE SIGN POSTS DO NOT PUNCTURE THE COVER SYSTEM.

SWMU #02/II
DYE BURIAL GROUND
INTERIM MEASURES CAP

NSWC, CRANE DIVISION
EASTERN SECTION
FINAL INTERIM COVER GRADING PLAN

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

SCALE:	1"=50'-0
DRAWN:	R. EVANS 7/9/97
DESIGNED:	C. WHITE 7/9/97
CHECKED:	
VERIFIED:	
APPROVED:	

WORK ORDER NUMBER
4324

DRAWING NUMBER C-09 REV 0