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Postconstruction Report for the United Nuclear Corporation Disposal Site at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

Engineering drawings for this project are identified as GAPE- 3063
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Postconstruction Report for the United Nuclear Corporation Disposal Site at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
managing the

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Oak Ridge Y-12 Plant
Oak Ridge National Laboratory
under contract DE-AC05-84OR21400

Paducah Gaseous Diffusion Plant
Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-76OR00001

for the
U.S. DEPARTMENT OF ENERGY

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ACRONYMS

ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQA	Construction Quality Assurance
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FS	feasibility study
FUSRAP	Formerly Utilized Sites Remedial Action Program
MCL	maximum contaminant level
NPL	National Priorities List
ORR	Oak Ridge Reservation
PCBs	polychlorinated biphenyls
PVC	polyvinyl chloride
QC	quality control
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TDEC	Tennessee Department of Environment and Conservation
UNC	United Nuclear Corporation

PREFACE

This postconstruction report summarizes the remediation activities at the United Nuclear Corporation Site at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Specifically, this report provides documentation that this site was remediated as planned in the Record of Decision under the Comprehensive Environmental Response, Compensation, and Liability Act. Acceptance of this report by the Environmental Protection Agency's Region IV and the Tennessee Department of Environment and Conservation will demonstrate formal completion of remedial actions at the United Nuclear Corporation Site.

EXECUTIVE SUMMARY

Remedial actions conducted under the auspices of the Comprehensive Environmental Response, Compensation, and Liablility Act (CERCLA) were completed at the Y-12 United Nuclear Corporation (UNC) Disposal Site in August 1992. The purpose of this Postconstruction Report is to summarize numerous technical reports and provide CERCLA documentation for completion of the remedial actions. Other CERCLA reports, such as the Feasibility Study for the UNC Disposal Site, provide documentation leading up to the remedial action decision.

The remedial action chosen, placement of a modified RCRA cap, was completed successfully, and performance standards were either met or exceeded. This remedial action provided solutions to two environmentally contaminated areas and achieved the goal of minimizing the potential for contamination of the shallow groundwater downgradient of the site, thereby providing protection of human health and the environment. Surveillance and maintenance of the cap will be accomplished to ensure cap integrity, and groundwater monitoring downgradient of the site will continue to confirm the acceptability of the remedial action chosen.

1. INTRODUCTION AND SELECTION OF REMEDIAL ALTERNATIVE

1.1 INTRODUCTION

The United Nuclear Corporation (UNC) Disposal Site consists of a 1.3-acre excavation cut into the west of Chestnut Ridge, in the southern portion of the Oak Ridge Y-12 Plant, in Oak Ridge, Tennessee (Fig. 1). The UNC excavation depth ranged from 25 to 30 ft on the northern side to less than 5 ft on the southern side. Between June 1982 and November 1984, the UNC Site received waste from the decommissioning of a UNC uranium recovery facility in Wood River Junction, Rhode Island. This waste included 11,000 55-gal drums of sludge fixed in cement, 18,000 drums of contaminated soil, and 288 wooden boxes of contaminated building and process demolition materials. The drums were generally stacked ten high, following the contour of the excavation and tapering to the limits of the excavation. The wooden boxes were placed near the southern perimeter of the pit. The entire waste site was covered with polyvinyl chloride (PVC) sheeting (Fig. 2). Over time, the PVC sheeting and many of the drums and boxes deteriorated, allowing waste material to be exposed to the environment.

During 1985, extraction procedure toxicity testing on the drummed sludges and soils indicated the waste to be nonhazardous as defined by the Resource Conservation and Recovery Act (RCRA). However, ^{90}Sr and nitrates both tested above Safe Drinking Water Act (SDWA) maximum contaminant level (MCL) regulatory criteria (Tables 1 and 2). (Under CERCLA, SDWA was the only chemical-specific applicable or relevant and appropriate requirement for the UNC Site.)

Soil samples obtained in 1986 in the vicinity of the disposal site indicated that the wastes at the site had not leached significantly into the subsurface soil. Groundwater monitoring (1986–1990) also failed to indicate leakage of contaminants into the groundwater. However, based on the deteriorated condition of the waste containers, the estimated source inventory, and mobility of waste constituents present, the UNC Disposal Site was deemed a potential risk to human health and the environment. Accordingly, the major goal of the UNC Site response action was to prevent or minimize the contamination of shallow groundwater beneath and downgradient of the UNC disposal site.

In July 1990, the U.S. Environmental Protection Agency (EPA) directed the Department of Energy (DOE) Oak Ridge Operations office to comply with CERCLA requirements for the remediation of the UNC Disposal Site. EPA, Waste Management Branch, had approved a closure plan in December 1989 for the UNC Disposal Site; however, the Oak Ridge Reservation was placed on the National Priorities List in December 1989, which required compliance with additional regulatory requirements, namely the requirements of a Remedial Investigation/Feasibility Study (FS) process under CERCLA. Evaluation of existing documentation and preparation of a baseline risk assessment provided CERCLA Remedial Investigation equivalency. An FS, Proposed Plan, and Record of Decision (ROD) were prepared to fully satisfy the requirements for the selection of a remedial response for the UNC Disposal Site.

Table 1. Summary of analyses for RCRA constituents[a]

Chemical	Average	Minimum	Maximum	Number of analyses	Comparative standard[b]	Number above EP Tox
Mercury, mg/L	<0.001	<0.001	<0.001	82	0.2	0
Silver, mg/L	0.0062	<0.006	0.01	82	5	0
Barium, mg/L	0.06200	<0.001	9.3	82	100	0
Cadmium, mg/L	0.0072	<0.003	0.1	82	1	0
Chromium, mg/L	0.0123	<0.004	0.03	82	5	0
Lead, mg/L	0.05	<0.05	0.05	82	5	0
Arsenic, mg/L	0.0055	<0.005	0.01	82	5	0
Selenium, mg/L	2.05	<0.004	0.02	82	1	0
2,4-D, μg/L	0.021	<2	4	82	10,000	0
Lindane, μg/L	0.1	<0.02	0.07	81	400	0
Endrin, μg/L	2	<0.1	0.1	81	20	0
Toxaphene, μg/L	0.2	<2	2	81	500	0
2,4,5 TP-Silvex, μg/L	0.092	<0.2	0.2	81	1,000	0
Methoxychlor, μg/L		<0.08	1.08	81	10,000	0

[a]Samples taken from 66 representative drums.
[b]Regulatory criteria consist of levels 100 times drinking water standards.
Source: From analytical data reported by Kirkpatrick and McCall 1986.

1.2 SELECTION OF REMEDIAL ALTERNATIVE

Four remedial action alternative solutions were considered for the UNC Disposal site at the Y-12 Plant. The solutions, their descriptions, and the final course selected are described below and are more fully described in the FS for the UNC site.

1.2.1 No Action

The National Contingency Plan (which established CERCLA) requires that the no-action alternative be considered through the detailed alternatives analysis to provide a baseline for the comparison of other alternatives. Under this alternative, no source-control remedial measures would be undertaken at the site. However, groundwater monitoring, site monitoring and maintenance, and drainage maintenance and erosion control would be continued for a 30-year period. Appropriate warning signs would also be posted at the site. The no-action alternative would not eliminate any exposure pathways nor would it reduce the level of risks.

Table 2. Summary of analyses for non-RCRA constituents for EP toxicity extract generated for representative drums[a]

Chemical	Average	Minimum	Maximum	Number of analyses	Comparative standard	Percent above comp. stand.
Aluminum, mg/L	2.2300	<0.02	12	82		0
Nickel, mg/L	0.043	<0.01	0.48	82	20 mg/L[b]	0
P, mg/L	0.27	<0.2	2.4	82		0
Zr, mg/L	0.017	8.4	82		0	
Gross alpha, dpm/mL	0.47	<0.002	18.3	82	3 dpm/mL[c]	3
Gross beta, dpm/mL	0.92	0.01	5.54	82		0
Gross gamma, dpm/mL	<20	<20	20	82		0
^{237}Np	0.0092	<0.006	0.24	82	2 dpm/mL[d]	10
Strontium, dpm/mL	6.2	0.56	19	82		0
^{90}Sr, dpm/mL	0.18	<0.01	1.23	82	0.2 dpm/mL[d]	22[f]
^{137}Cs, dpm/mL	<20	<20	20	82	0.4 dpm/mL[d]	0
^{99}Tc, dpm/mL	2.88	<2	11.5	82	20 dpm/mL[d]	0
^{238}Pu, dpm/mL	0.006	<0.006	0.006	82	12 dpm/mL[d]	0
^{240}Pu, dpm/mL	0.006	<0.006	0.006	82	8 dpm/mL[d]	0
Uranium, μg/L	0.0101	<0.001	0.17	82	6 μg/L[d]	0
F, mg/L	2.88	0.06	11.3	82		0
Moisture, wt%	19.6	0.4	49.8	82		0
NO_3-N (soils), mg/L	17	<0.5	152	39	10 mg/L[e]	13
NO_3-N (sludge), mg/L	3252	35	8880	43		100
pH		3.7	12.3	82		0

[a]Samples taken from 66 representative drums.
[b]One hundred times Tennessee Superfund guidelines.
[c]One hundred times Safe Drinking Water Act maximum contaminant level (MCL).
[d]Equivalent dose rate of 4 mrem/year.
[e]Safe Drinking Water Act MCL.
[f]All values below detection limit.
Source: From analytical data reported by Kirkpatrick and McCall 1986.

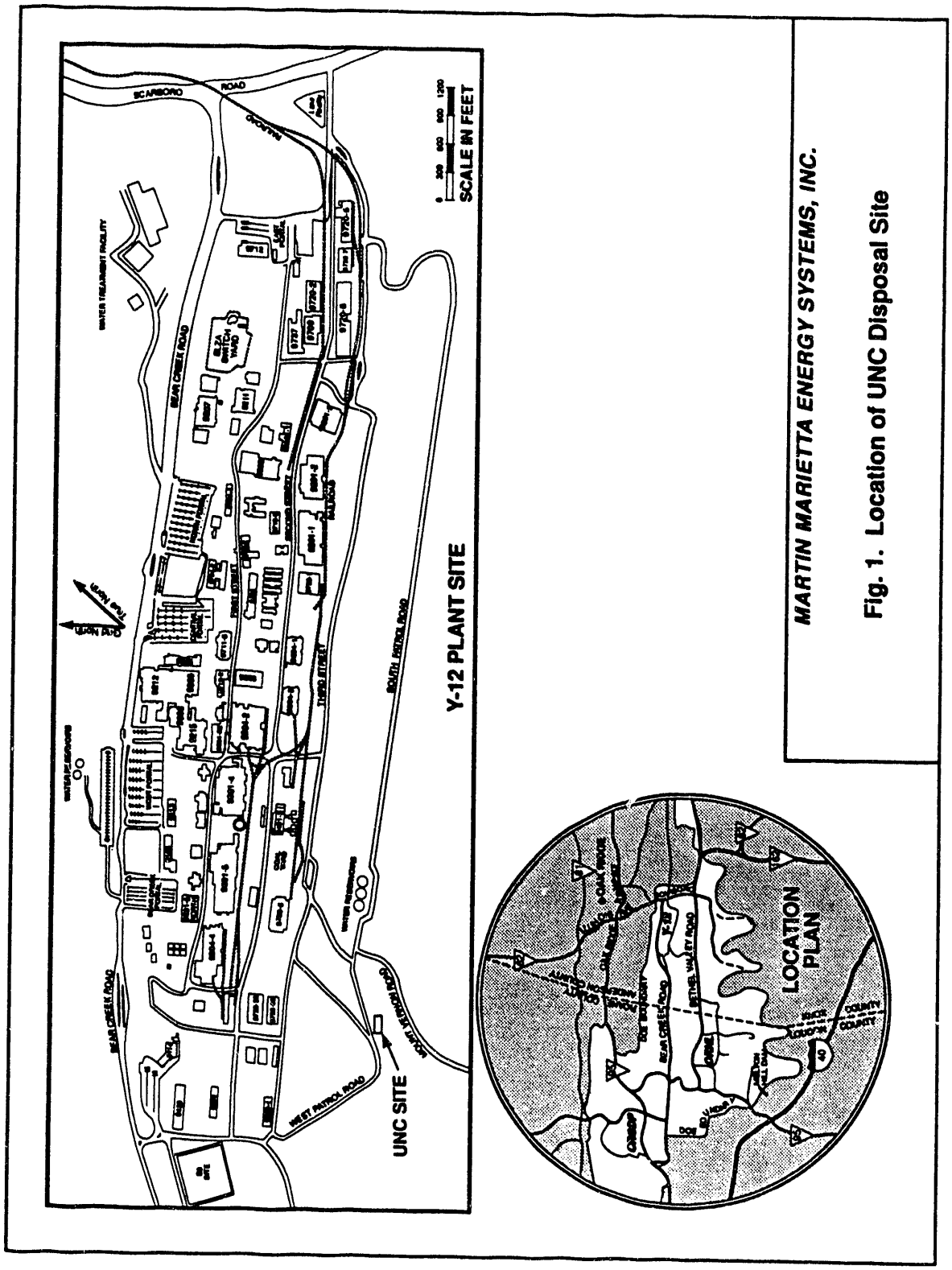


Fig. 1. Location of United Nuclear Corporation disposal site.

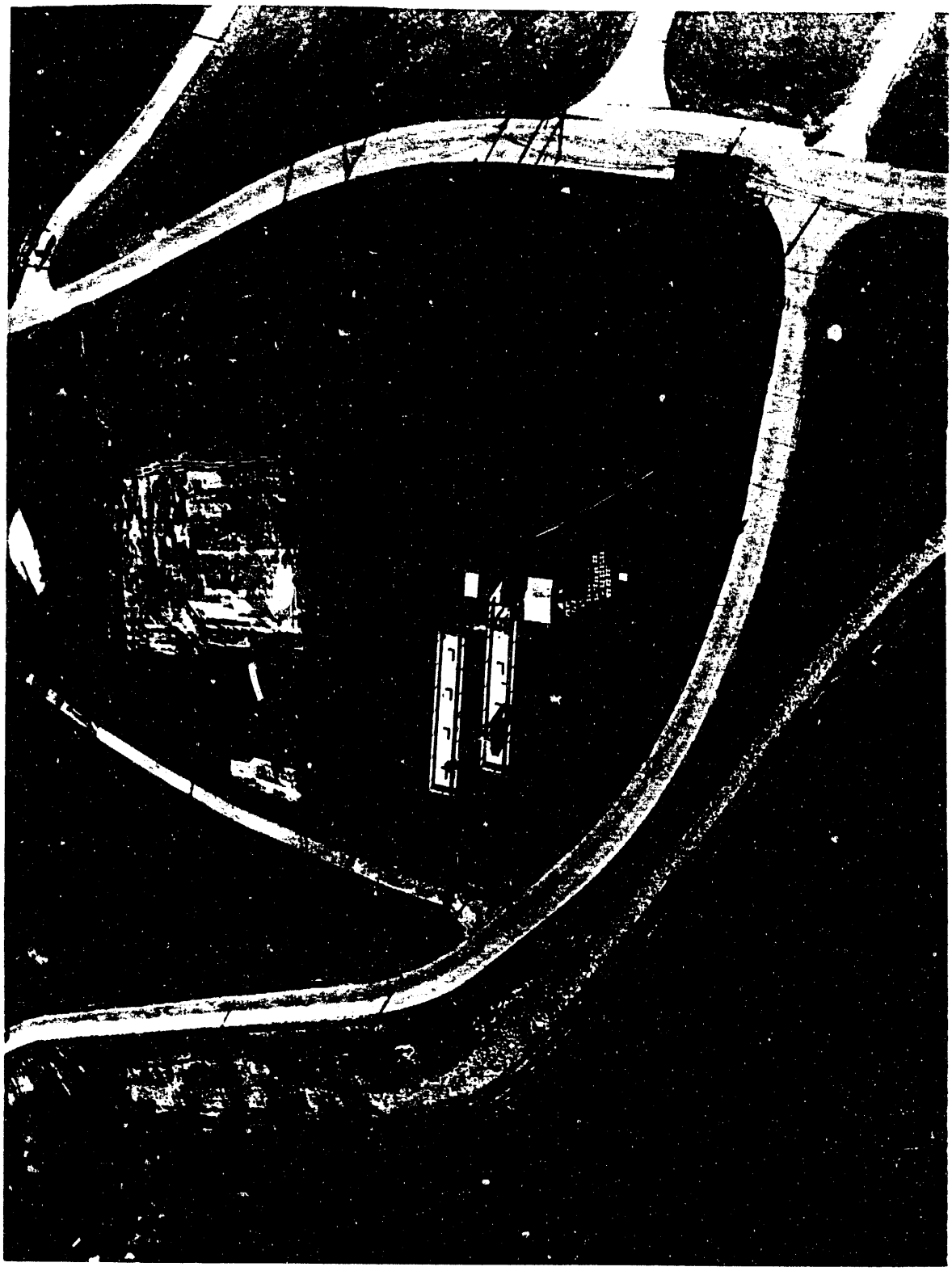


Fig. 2. United Nuclear Corporation Site prior to placement of Eliza Gate material (January 1990).

1.2.2 Multilayer Cover

This alternative involved covering the drummed soils/sludges and miscellaneous scrap (boxes) with a multilayer cover for long-term minimization of infiltration. Little site preparation would be required to construct the cover. Some movement of barrels and boxes may be necessary to facilitate grading. Additional site preparation with this design included only minor grading and minimal clearing and grubbing, because the land surface at the UNC disposal site had only sparse vegetation.

The multilayer cover would be composed of a minimum 24-in.-thick clay cover over the drummed soil/sludges and miscellaneous scrap boxes. The clay layer would be overlain by a minimum 30-mil synthetic liner, which is overlain by a polyethylene drainage geonet, overlain by a polypropylene filter fabric, overlain by a minimum 18-in.-thick vegetative layer. Additional soil would be backfilled over UNC waste prior to installation of the cover.

The time frame in which a cover could be placed is relatively shorter than alternatives that use treatment as the principal element. Treatment rates, disposal distances, and imposed limitations would be negligible or not applicable to this alternative.

1.2.3 Treatment and Multilayer Cover

This alternative proposed to treat only the 11,000 drums that contain sludges mixed with cement. The alternative involved four main processing steps: (1) solid waste processing of the drummed sludge; (2) leaching of the nitrate from the sludge; (3) treatment of the nitrate-bearing leachate; and (4) containment of the leached sludge, drummed soil, and miscellaneous boxed scrap. The rest of the waste would then be covered with a multilayer cover as described above. The 18,000 drums of soil would not be treated because they account for only 1% of the nitrate at the site.

1.2.4 Off-Site Disposal

Shipment and disposal of UNC wastes off Y-12 Plant grounds was considered to provide an alternative that involved minimal long-term oversight or maintenance. Disposal of the UNC wastes by this alternative involved handling and preparing the waste for shipping, transportation, and disposal at an appropriate facility. For decision making purposes, it was assumed that the wastes would be transported to U.S. Pollution Control's land disposal facility in Beatty, Nevada. Once the waste was removed, the site would be backfilled with clean soil and returned to a natural state.

1.2.5 Comparison of Alternatives

The no-action alternative was not considered to be protective of human health and the environment because it would not eliminate the direct contact/external radiation pathway posed by the boxed materials and would likely result in contamination of groundwater above safe drinking water standards in the future.

Capping with a multilayer cover was considered to offer the highest degree of protection to human health and the environment because it required minimal worker exposure to wastes and disruption of the site, eliminated the direct contact exposure pathway, and ensured the

future maximum nitrate concentration in groundwater would not exceed the safe drinking water standard.

Treatment and capping with a multilayer cover and off-site disposal provided less overall protection of human health and the environment than capping alone. This was because both required significant handling and processing of the waste and potentially exposed the environment to the wastes.

Consequently, based upon consideration of the requirements of CERCLA, a detailed analysis of the alternatives in the FS, and public comments on the proposed plan, DOE determined and documented in the ROD that capping with a multilayer cover alternative was an appropriate remedial action for the UNC Disposal Site. The goal of this remedy was not to clean up groundwater, but rather to prevent future groundwater contamination beyond a level deemed safe for drinking water. Accordingly, the remedy met the SDWA MCL for nitrates of 10 mg/L at the downgradient perimeter monitoring wells. The carcinogen risk level associated with ingestion of groundwater containing ^{90}Sr could reach a level of 8.3×10^{-5} if no action was assumed in modeling. Alternatively, the selected remedy should achieve a carcinogen risk level of 3.3×10^{-6}, assuming groundwater at the UNC Disposal Site is used for drinking water in the future. The remediation goals were established to be met at the downgradient boundary of the UNC Disposal Site.

During 1990 and early 1991, DOE's Formerly Utilized Sites Remedial Action Program (FUSRAP) explored alternatives for remediation of the Elza Gate site located in Oak Ridge. The contaminants in these wastes included radiological materials and polychlorinated biphenyls (PCBs) but no hazardous waste constituents (Table 3). The preferred alternative for Elza Gate remediation requested by FUSRAP was to remove the low-level, radiologically nonhazardous contaminated soils and transport them to the Oak Ridge Reservation (ORR) for disposal in a controlled facility. With EPA and TDEC approval, disposal of the Elza Gate material in the UNC Site was determined to be the most cost-effective disposal approach after a baseline risk assessment was conducted on the Elza Gate wastes.

Table 3. Summary of Elza Gate waste characteristics

Material	Contamination	Volume per calendar year[a,b]	Waste management technique
Soil	Radiological	3700	Bulk storage[c]
Rubble	Radiological	1900	Bulk storage[c]
Soil	Radiological/PCBs (25–50 ppm)	700	Bulk storage[c]
Soil	PCBs (25–50 ppm)	1200	Bulk storage[c]
Soil	Radiological/PCBs (>50 ppm)	None identified to date	Place in containers/store per TSCA[c]
Soil	PCBs (>50 ppm)	700	Place in containers and transport for commercial disposal[d]
Soil	PCBs (<25 ppm)	N/A	None[e]

[a]Volumes given are in situ and include a 20% constructability factor; swell factors of 25% for soil and 35% for concrete rubble must be applied to obtain haul volumes.
[b]All radiologically contaminated volumes are based on uranium cleanup guideline of 35 pCi/g.
[c]TSCA = Toxic Substance Control Act. Storage on the Oak Ridge Reservation is assumed.
[d]Material will be placed in containers on excavation and turned over to a shipping and disposal contractor for management per TSCA.
[e]Soil with <25 ppm PCBs will not be removed.

2. CHRONOLOGY OF EVENTS

June 1989. Before placement of the ORR on the National Priorities List (NPL), DOE submitted the closure plan for the UNC Site to the U.S. Environmental Protection Agency (EPA) for review and comment.

December 21, 1989. The ORR was placed on the NPL, and the UNC Site was listed as one of the sites in the Federal Facility Agreement negotiated between DOE, EPA, and the Tennessee Department of Health and Environment [now the Tennessee Department of Environment and Conservation (TDEC)].

June 28, 1991. The UNC Disposal Site ROD was issued which explained that a modified RCRA cap was selected as the preferred remedial alternative.

July 1, 1991. An agreement was reached with FUSRAP to place the Elza Gate wastes in the open portion of the UNC excavation.

September 1991. The final modeling report and baseline risk assessment on the Elza Gate material was transmitted to DOE (Weston 1991). The revised remedial design drawings were completed.

October 2, 1991. Public announcements were issued that the ROD for the UNC Site had been signed by DOE, EPA, and TDEC and that the Elza Gate materials would be included in the remedial action.

October 4, 1991. The placement of Elza Gate material in the UNC Site began (Fig. 3).

January 2, 1992. DOE requested TDEC concurrence to dispose of radiologically contaminated transite material from the Elza Gate site in the UNC Site. TDEC agreed with the disposal of the material at the UNC Site provided existing technical management requirements such as container labeling and daily cover requirements were followed.

January 7–31, 1992. The UNC Site was winterized by placement of erosion matting and temporary sheeting.

January 20, 1992. Twenty-three bags of radiologically contaminated transite board (containing asbestos) were brought to the UNC Site from the Elza Gate site and placed in the pit.

January 1992. A small quantity of Elza Gate waste with suspected mercury contamination was brought to the UNC Site. Testing confirmed that the material was below regulatory thresholds.

April 1992. Prior to resuming construction in the spring, it was decided to modify the design in the southwest corner to improve drainage.

May 21–22, 1992. The erosion matting and temporary sheeting were removed as construction resumed on the UNC Site.

May 27, 1992. Placement of the 24-in.-thick compacted clay soil layer began (Fig. 4).

June 1, 1992. EPA indicated it found the design package acceptable as submitted with the exception of a minor specification change and notification of the schedule for remaining activities.

June 25, 1992. The clay soil layer was completed.

June 30–July 2, 1992. The 30-mil-thick PVC liner was put in place.

July 2–8, 1992. The drainage layer, which consists of geonet and geotextile (filter) fabric connected to perimeter drainage piping, was installed (Fig. 5).

July 17–21, 1992. The grass layer was limed, fertilized, seeded, and mulched (Fig. 6).

August 17, 1992. The remaining items for construction completion such as cleanup and equipment removal were completed.

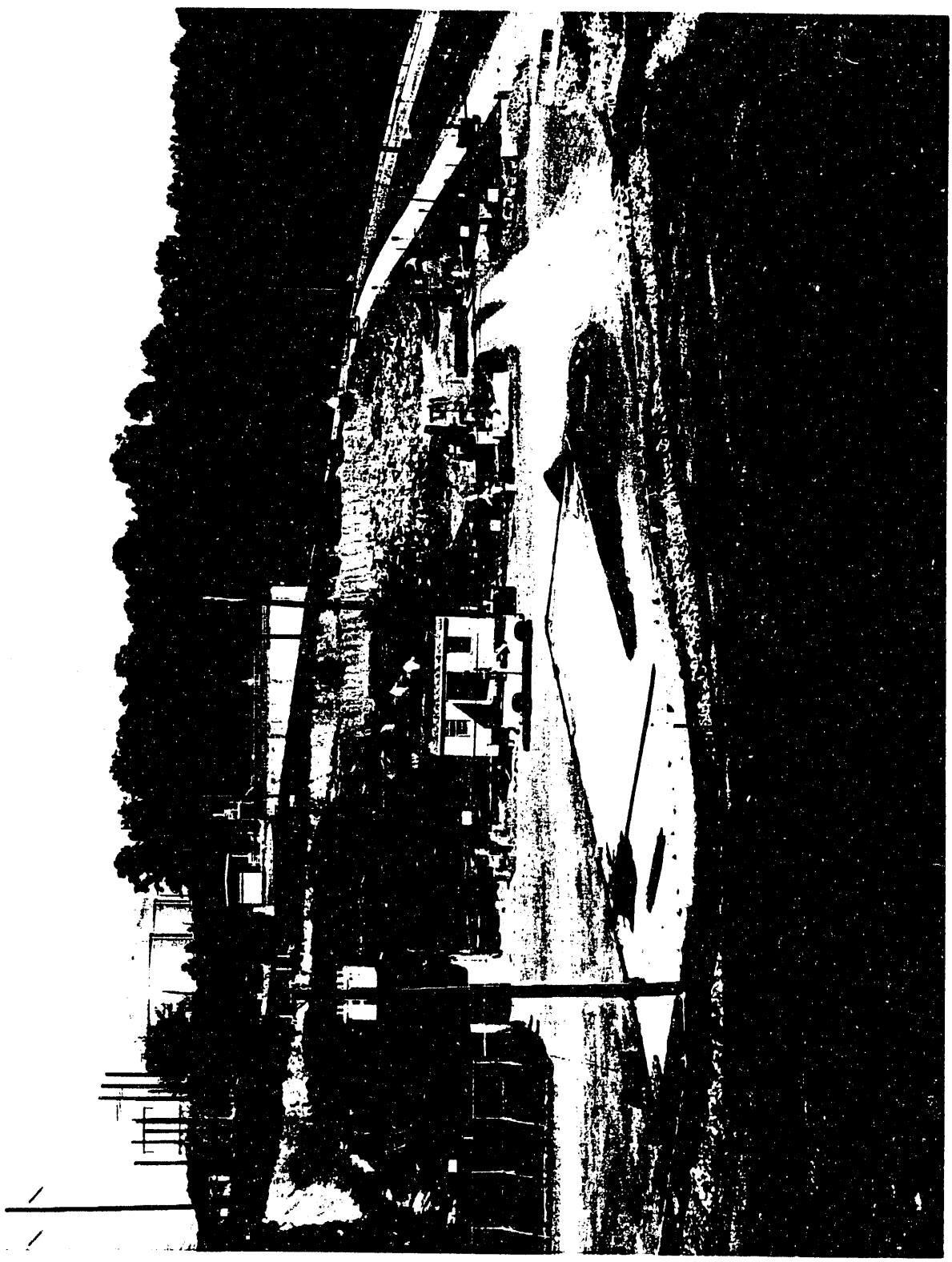


Fig. 3. United Nuclear Corporation Site (October 1991).

Fig. 4. Clay soil layer placement (June 22, 1992).

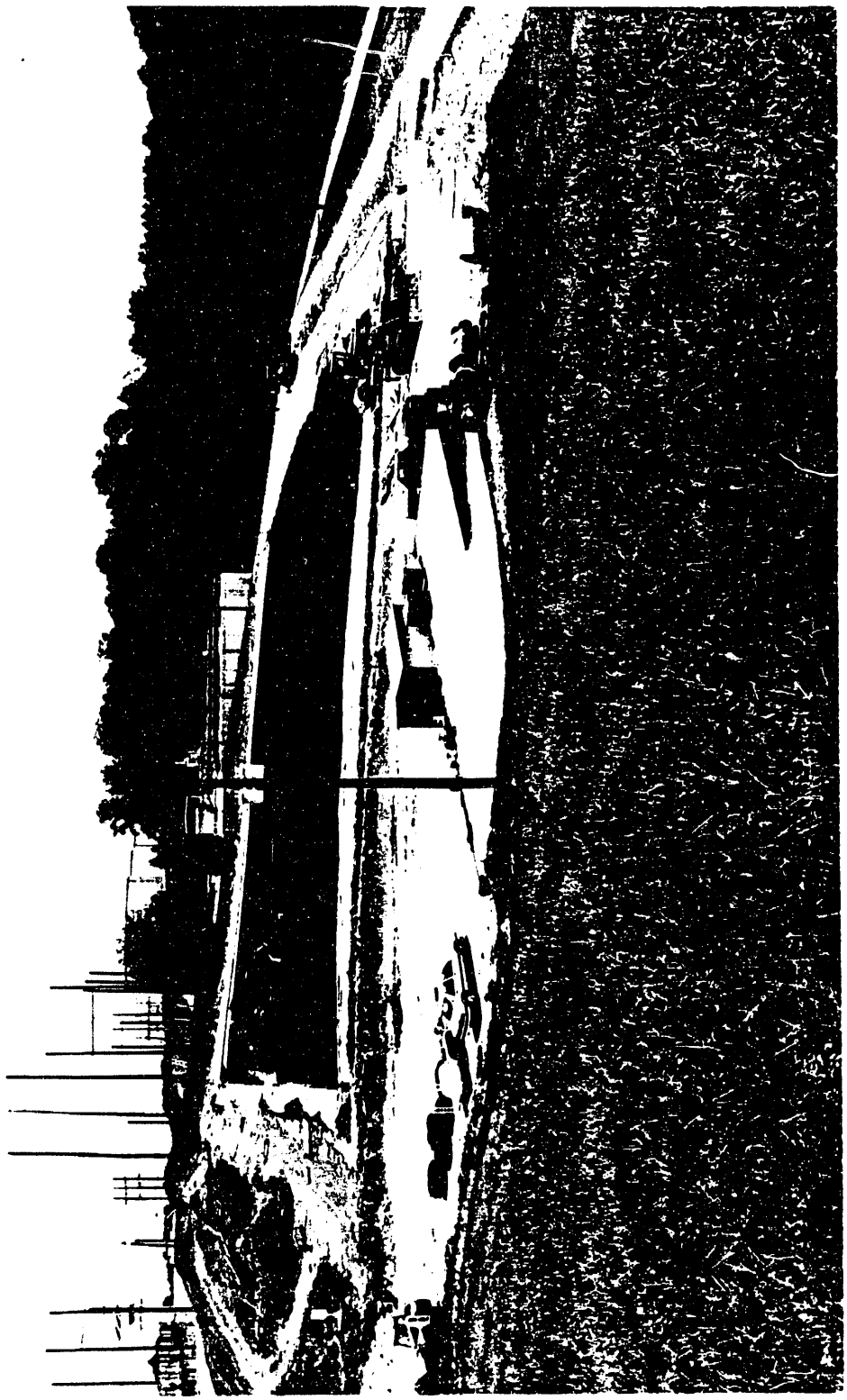


Fig. 5. Drainage layer placement (July 7, 1992).

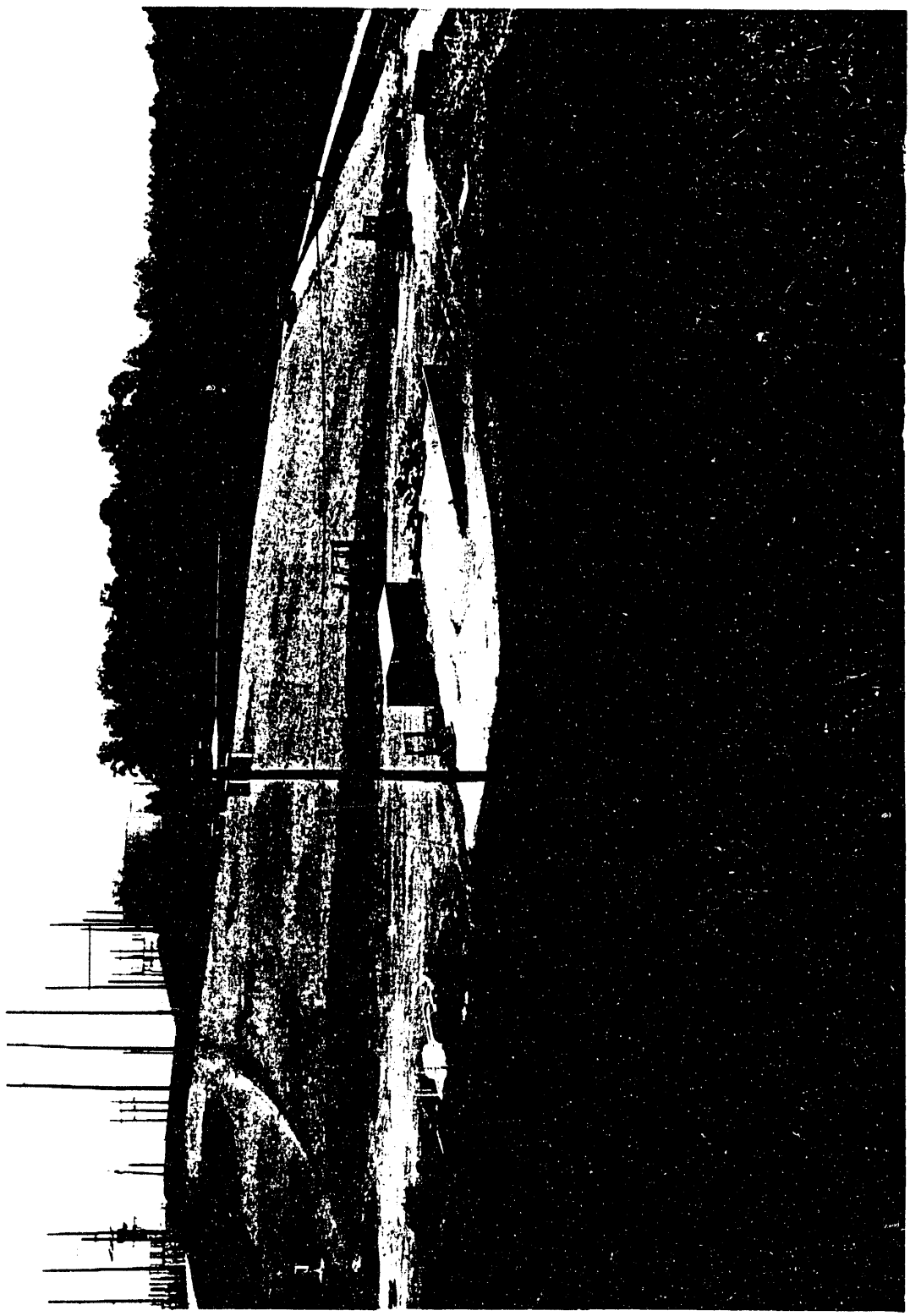


Fig. 6. Vegetative layer placement (July 22, 1992).

3. PERFORMANCE STANDARDS AND TEST RESULTS OF PERFORMANCE STANDARDS

Because the UNC remedial action did not clean up any contamination, site activities did not address cleanup standards. Instead, performance standards addressed specifications for completion of the various layers of the cap, specifications for the geomembrane liner, and waste acceptance criteria for the material from the Elza Gate Site. This section will sequentially describe the performance standards and assurances that these standards were met for each of the major activities in the UNC remediation.

3.1 PERFORMANCE STANDARDS

3.1.1 Cap Layers

Performance standards for the various layers of the multilayer cap included the percent of the compaction of maximum dry-density standards. These standards are described in Table 4.

Table 4. Performance standards for layers of multilayer cap

1.	Contouring fill	95% maximum dry density
2.	Impermeable clay	Within acceptance zones of the moisture/density curves for Type A and Type B soils
3.	Vegetative layer	
	a. First lift	No testing required
	b. Subsequent lifts	90% maximum dry density (ASTM D698)
4.	All other fill	95% maximum dry density (ASTM D698)

The soil was tested for the specified moisture content and density using the following field density test methods: The Nuclear Density Test Method [American Society of Testing and Materials (ASTM) D2922, D3017], the Drive Cylinder Test Method (ASTM D2937), or the Sand Cone Method (ASTM D1556). Field tests were conducted after each layer was placed at a frequency of one test per 5000 ft^2 of surface area of a compacted layer with a minimum of two tests performed per layer. The location of the density tests was selected randomly by the soils technician or as directed by the construction manager.

Qualified soil technicians were employed by the facilities manager for the purpose of identifying soils, checking densities, and classifying soil materials during construction. These technicians immediately advised the construction manager and the contractor's superintendent of any density tests failing to meet the specified minimum requirements.

Ogden Environmental and Energy Systems Co., Inc., (Ogden) completed the soil moisture and density tests for the various layers of the cap. All the tests met or exceeded

performance standards as identified in Table 4. Test frequency was approximately one test per 2000 ft^2 of surface area for a compacted layer, exceeding performance standards. On days that in-place density tests were conducted, one test was checked with the Drive Cylinder Method (ASTM D 2937) to verify the nuclear gauge readings; variances between these verification tests were negligible.

3.1.2 Geomembrane Liner

Performance standards for the geomembrane liner characteristics are presented in Table 5. Construction quality assurance (CQA) for the liner was completed by SEC Donohue. SEC Donohue sent a representative to the fabricator's plant to perform the following duties:

- visually examine the geomembrane;
- monitor the seaming operation;
- monitor folding, packaging, and labeling panels for shipping;
- examine resin quality control (QC) certificates;
- examine manufacturer's QC certificates;
- examine fabricator's conformance testing results and seam QC certificates;
- monitor QC testing procedures; and
- confirm the acceptability of all materials prior to their shipment to the site.

Table 5. Performance standards for geomembrane

Property	Value	Test method
Mean thickness	>0.030	ASTM D1593 (o.1.3) embossed material
Minimum thickness	0.0285	ASTM D374/D1593 smooth material
Specific gravity	1.24–1.30	ASTM D792, Method A-1
Tensile strength	>2300 psi, 69 psi	ASTM D882 (A)
Elongation at break	>300%	ASTM D882 (A)
Modulus at 100% strain	>1000 psi, >30 psi	ASTM D882
Tear resistance	>8 lb	ASTM D1104 (C)
Water extraction	<0.25%	ASTM D3083 (as modified by NSF[a] 54, 1991)
Volatile loss	0.70% maximum	ASTM D1203 (A)
Brittleness temperature	<-20°F	ASTM D1790
Dimensional stability	5% maximum; 212°F 15 min.	ASTM D1204
Bonded seam strength	55.2 ppi	ASTM D3083 (as modified by NSF 54, 1991)
Peel adhesion	FTB[b] or 10 lb/in.	ASTM D413 (as modified by NSF 54, 1991)

[a]NSF = National Science Foundation
[b]FTB = film tear bond

In addition to the above inspections, an SEC Donohue representative was on site to observe activities during placement of the membrane. Part of these on-site responsibilities included testing of the field-constructed seams that connected the four liner panels. One seam per panel or one for each type of resin used to manufacture geomembrane rolls was destructively tested according to the standards identified in Table 5. Test results were considered successful if no more than one peel or shear specimen failed to meet the criteria listed in the table.

3.2 TEST RESULTS OF PERFORMANCE STANDARDS

Lockwood Greene provided overall CQA for site activities. In this role they inspected the site ten times during construction activities. These inspections were completed so that baseline conditions at the site could be determined and so that it could be verified that design requirements (e.g., depth of the impermeable layer) had been met. They also examined the quality assurance summary reports that described whether design specifications had been met. These reports were compared with daily logs and other project documentation to evaluate their agreement (Lockwood Greene 1992).

Following are the site inspection dates and the results of the inspections. Unless otherwise noted, all inspections passed project performance requirements. Completed work that did not meet performance requirements at the first inspection was repeated and then reinspected. All project work met performance requirements at the second inspection.

- October 1-3, 1991: This survey established the site topography prior to the completion of any work.
- October 23, 1991: This survey verified the grades over the barrels.
- October 28, 1991: This survey established the top of the Elza Gate materials and obtained grades outside of the site.
- November 27, 1991: This survey verified the inverts on the drainage pipes and the exclusion zone boundary.
- January 10, 1992: This survey established cut-and-fill information prior to site winterization.
- January 27, 1992: This survey completed a topographic survey of the site to determine "ground zero" for Phase II activities. It also established final grades for the site.
- May 26, 1992: This survey established the baseline and grid for Phase II.
- June 29, 1992: This survey verified that the impermeable layer was as thick as planned. Two areas were found to be less than the required 2 ft. These problems were addressed and the elevations checked to verify the work.
- July 2, 1992: This survey verified the coordinates of the liner were as planned.
- July 20, 1992: This survey verified the vegetative layer was the planned thickness. This survey indicated that five areas in the vegetative layer were too low. Vegetative layer material was added to these low spots.
- August 6, 1992: This survey verified that the work had been completed to match the design requirements.

Lockwood Greene also evaluated the quality assurance summary reports that were produced by Ogden and SEC Donohue. Ogden did the summary report on Phase I and Phase II work, and SEC Donohue did the summary report on the geomembrane liner. These documents summarized the results of tests conducted to ensure that performance standards had been met. Lockwood Greene reported that all three documents were in substantial agreement with daily logs and other project documentation. The results described in these summary reports are presented in the following sections.

3.2.1 Cap Layers

Ogden completed the soil moisture and density tests for the various layers of the cap. These results are presented below by phase of activity.

Phase I: Placement of Elza Gate Material

Manufactured Sand Layer. All but one of the 20 initial tests met the compaction standard. The first test failed the compaction standard, but the area was recompacted and passed the second time. Therefore, 21 of 22 tests passed the compaction standard. Testing was conducted at the specified frequency of at least one test per 5000 ft^2 for a compacted layer, with a minimum of two tests per layer.

Elza Gate Soil. All the compaction tests on the Elza Gate soil were conducted by the Drive Cylinder Method (ASTM D 2937-83); of 38 initial tests, 35 passed. The areas associated with the three failing tests were recompacted and retested twice. Both of the retests passed; therefore, the final test results all met or exceeded the specified minimum compaction requirement of 90% of the soil's maximum dry density as determined by the standard Proctor (ASTM 698-78, Method A). Testing was conducted at the specified frequency of at least one test per 5000 ft^2 for a compacted layer, with a minimum of two tests per layer.

Contouring Fill. All but one of the 16 initial tests on the contouring layer met the compaction standard. The area with the failing test was recompacted and retested; the second test met the compaction standard. The final test results met or exceeded the specified minimum compaction requirement of 95% of the soil's maximum dry density as determined by the standard Proctor (ASTM 698-78, Method A). Testing was conducted at the specified frequency of at least one test per 5000 ft^2 for a compacted layer, with a minimum of two tests per layer.

The QC results for Phase I activities are summarized in Ogden, *Closure of United Nuclear Corporation (UNC) Waste Disposal Site–Phase I Summary Report of Laboratory and Field Data, Contract No. 88B-99977V, Release No. C20* (Ogden 1992a).

Phase II: Placement of Soil Layers

Impermeable Clay Layer. All the tests met or exceeded performance standards as identified above. Test frequency was approximately one test per 2000 ft^2 of surface area for a compacted layer, exceeding performance standards. On days that in-place density tests were conducted, one test was checked with the Drive Cylinder Method (ASTM D 2937) to verify the nuclear gauge readings; variances between these verification tests were negligible.

Anchor Trenches/Membrane Liner. The specifications for trench backfill called for a minimum compaction of 95% of the soil's maximum dry density as determined by the standard Proctor. However, Ogden was further directed by Energy Systems to use the moisture/density curves for Type A and Type B soils for the in-place density tests. All tests results also met or exceeded these compaction standards.

Vegetative Layer. All test results met or exceeded the specified minimum compaction requirement of 90% of the soil's maximum dry density as determined by the standard Proctor.

These results are summarized in Ogden, *Closure of United Nuclear Corporation (UNC) Waste Disposal Site—Phase II Summary Report of Laboratory and Field Data, Contract No. 88B-99977V, Release No. C27* (Ogden 1992b).

3.2.2 Geomembrane Liner

SEC Donohue did the QC testing of the geomembrane, including visual inspection of the geomembrane during the fabrication and packing processes at the Palco Linings, Inc., facility in New Jersey; supervision of the geomembrane installation process at the UNC Site; destructive testing of four panel samples taken during the fabrication process; and destructive testing of three seam samples taken from seams made in the field. All visual inspections and laboratory tests indicated that the geomembrane met performance standards.

In addition to visual inspections and destructive tests, seams completed in the field were air-lance tested. All leaks and tabs were repaired immediately and retested when the glue was dry.

3.3 WASTE ACCEPTANCE CRITERIA FOR ELZA GATE MATERIAL

The Elza Gate site contained residual contamination from the segregated storage of uranium ore, processing residues, and electrical components. The concrete pads and the soil beneath the pads were residually contaminated with low levels of radioactivity (where the uranium ore and processing residuals were stored) and PCBs (where electrical components were stored).

The remedial action at the Elza Gate site called for the removal of all contaminated material from the site. Approximately 7000 yd^3 of radioactively contaminated soils and concrete were removed to the UNC site and substituted as fill. This reduced the volume needed for clean dirt fill at the UNC site prior to placement of the cap. The PCB-contaminated material was shipped to an existing commercial facility for disposal. At no time was PCB-contaminated material accepted at the UNC site. Determination of PCB-contaminated material was made on the basis of location at the Elza Gate Site and characterization testing of the material prior to shipment (Bechtel 1991).

The placement of Elza Gate soil in the UNC site was successfully accomplished according to all of the applicable performance standards and QC tests as described in Sect. 3.1 for Phase I.

4. CONSTRUCTION ACTIVITIES

The ROD for the UNC Site specified a multilayer cover over the waste and a protective cover consisting of low-maintenance vegetation to prevent erosional damage. Contaminant escape is minimized by a low-permeability cover controlling the infiltration of rainwater. Figure 7 illustrates the multilayer cover as revised for the Elza Gate material.

The primary remedial activities for the UNC Site were

- site preparation;
- placement of fill material for the unused pit area;
- installation of the manufactured limestone sand;
- installation of a compacted clay soil layer;
- installation of a synthetic membrane liner over the clay layer;
- installation of a drainage system; and
- installation of a vegetative cover.

The discussion below details the closure requirements and the actual remedial activities as they were performed. The Specifications section presents additional details about technical and construction specifications and also contains copies of the as-built drawings.

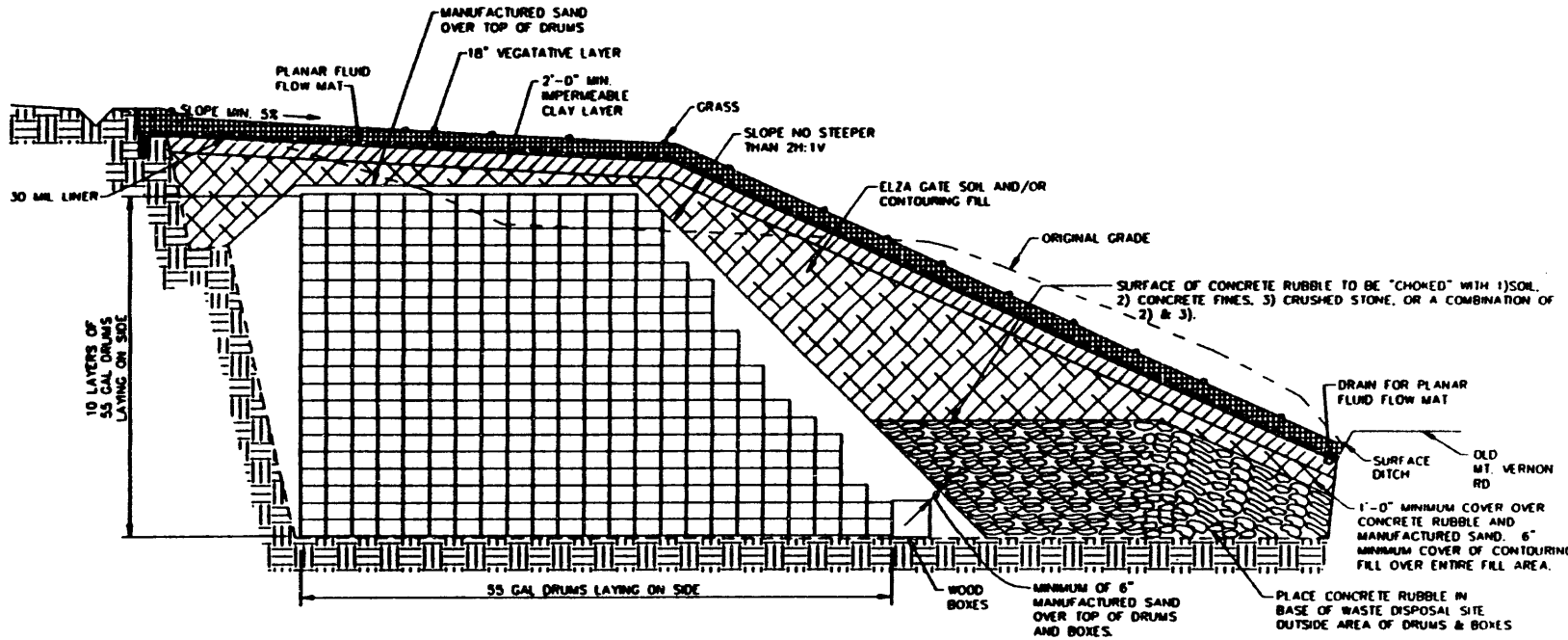
4.1 SITE PREPARATION

Closure Requirements. Site preparation activities included removing the PVC cover over the UNC drums and boxes; plugging and abandoning two auger holes and a surface drain located in the excavation; and repositioning the wooden boxes originally located along the perimeter of the excavation to a location adjacent to the drums.

Actual Remedial Activities. The two auger holes were plugged and sealed in 1989. In June 1990, the wooden boxes were repositioned. The surface drain on the southern portion of the site, which consisted of a corrugated metal pipe, was partially removed in early October 1991 to allow capping activities to proceed. It was fully removed by January 22, 1992, and the area was backfilled with concrete. Silt fencing, straw bales, and other controls were installed around the drain. The removed corrugated metal pipe was crushed and placed in the disposal area. The PVC cover over the drums and boxes was removed prior to placement of the manufactured limestone sand layer.

4.2 FILL MATERIAL

Closure Requirements. The UNC Site pit was designed and built to accommodate 38,000 drums. However, only 29,000 drums and 288 boxes were placed in the pit, leaving 3000 ft^2 of unused space. The unused pit area was to be filled with local clay soil removed during excavation of the pit. The soil was to be placed in 6-in. lifts and compacted using a sheepsfoot roller to 90% of standard Proctor maximum dry density.



LEGEND

- SAND-MANUFACTURED
- 18" VEGATATIVE LAYER
- 2'-0" IMPERMEABLE CLAY LAYER
- EXISTING GROUND
- ELZA GATE SOIL AND/OR CONTOURING FILL
- CONCRETE RUBBLE
- 30 MIL LINER
- PLANAR FLUID FLOW MAT
- EXISTING GRADE

UNC SITE CLOSURE
NO SCALE

Fig. 7. Typical cross section of United Nuclear Corporation disposal facility.

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Actual Remedial Activities. As described in Sect. 2, the materials from the Elza Gate site were used as fill material instead of the clay soil specified in closure requirements. Elza Gate materials (consisting of concrete chunks, rubble, and soil) were delivered to the UNC Site beginning on October 4, 1991 (Fig. 3). Concrete chunks and rubble were placed initially; soil was placed later. The soil was placed in loose 8-in.-thick layers that were then compacted with a sheepsfoot roller to a minimum of 90% of the materials standard Proctor maximum dry density. The layers were tested for specified moisture content and density. The compaction tests were conducted at the rate of one test per 5000 ft^2 of surface area, with a minimum of two tests per layer. Placement of the Elza Gate material was completed on January 6, 1992.

On January 20, 1992, 23 bags of radiologically contaminated transite board (containing asbestos) were brought to the UNC Site from the Elza Gate site and placed in the excavation. On January 21, 1992, bags of dirt from the Elza Gate site were buried in the south side of the excavation. In each case a hole was dug into the fill material layer, the bagged materials were placed into the hole, the hole was covered with additional borrow area soil, and the soil was re-compacted. A small quantity of material with mercury contamination below regulatory threshold levels was included in the Elza Gate material disposed in the UNC Site. This material was placed in the UNC Site with EPA and TDEC concurrence. Figure 8 is a sketch showing the location of the Elza Gate materials in the UNC Site.

4.3 LIMESTONE SAND LAYER

Closure Requirements. Ettringite expansion may cause drums to swell and split open. To minimize this possibility, the closure requirements specified a 6-in. minimum of limestone sand or fly-ash layer to cover the UNC drums. This layer provides a source of carbon dioxide to act as a buffer for the ettringite.

Actual Remedial Activities. While the Elza Gate material was being placed in the southern portion of the pit, the plastic sheeting covering the UNC materials at the northern portion of the pit was removed, folded, and placed in the southern portion. Some of the wooden boxes covered by this plastic sheet had deteriorated much more than was anticipated. Rather than risk moving them, the boxes were crushed and mixed with the fill prior to installing the manufactured limestone sand layer. The manufactured limestone sand was then placed over the drums and boxes in the pit. It was placed dry so the material would fill as much of the void space between the drums and the boxes as possible. To the degree possible, the manufactured limestone sand was spread in layers, shaped, and compacted to 90% of the materials standard Proctor maximum dry density. It was made thick enough to cover the drums and boxes to a minimum thickness of 6 to 12 in. when compacted. One field density was conducted per 5000 ft^2 of surface area of the manufactured limestone sand. A minimum of two tests per layer were conducted. The manufactured limestone sand cover was completed on November 12, 1991.

4.4 CLAY SOIL LAYER

Closure Requirements. A minimum 24-in.-thick compacted clay soil layer was to be placed over the manufactured limestone sand layer. The clay soil was to be contoured to maximize runoff from the cap in all directions and to minimize infiltration. Local clay soil removed during excavation of the pit was to be used for the construction of this layer. The soil was to be placed in 6-in. lifts and compacted using a sheepsfoot roller to 90% of standard Proctor.

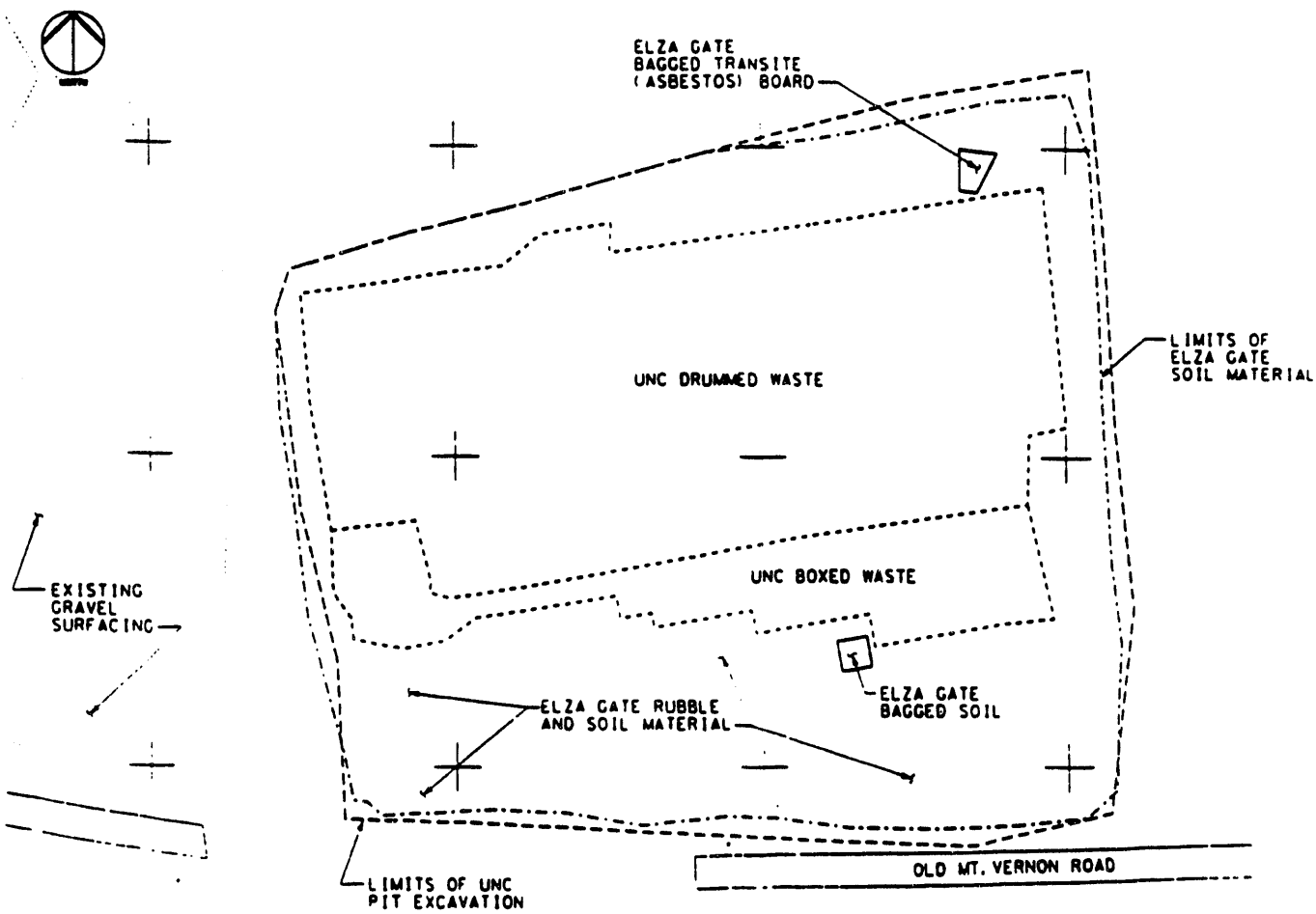

Fig. 8. Elza Gate materials location in the United Nuclear Corporation site.

Actual Remedial Activities. Following placement of the Elza Gate materials, capping activities were suspended at the UNC Site for the winter because of inclement weather. Inclement winter weather interferes with capping activities and may cause quality problems for the installation of the remaining layers.

Winterization consisted of several steps. First, a 12-in. clay soil layer was installed. The clay soil was obtained from the Y-12 East Borrow Area. The soil was compacted to a minimum 95% of standard Proctor density. Next, the clay layer was covered with a temporary polyethylene sheeting to prevent erosion of the contouring fill. Finally, the sheeting was anchored in place with sand bags and metal staples. Erosion matting was placed on top of the sheeting to help hold it down. The site was inspected periodically throughout the winter. The winterization of the site began on January 7, 1992, and was completed by January 31, 1992.

In April 1992, prior to resuming construction in the spring, the remedial design was revised to extend the cap to cover the southwest corner of the site. Originally, to avoid closing a portion of the Old Mount Vernon Road, the southwest corner was not to be covered by the liner. However, actual conditions at the site (in particular, a corrugated metal pipe near the southwest corner) presented a potential drainage problem and possible long-term contamination problems if the southwest corner was not capped. Therefore, the construction design was revised to extend the cap over the southwest corner. At the same time, changes were incorporated in the construction design to show the final Elza Gate fill dimensions. The revised construction design was transmitted to EPA and TDEC on April 15, 1992, and was later accepted by EPA. Subsequent to issuing the design to EPA and TDEC, the design was issued for construction (Lockwood Greene 1992).

Following the winter suspension, construction resumed on the UNC Site on May 21, 1992. The erosion matting and temporary sheeting were removed on May 21 and 22. The existing 12-in. clay layer was proof-rolled. On May 27, placement of the 24-in.-thick compacted clay soil layer began (see Fig. 4). The soil was obtained from the Y-12 East Borrow Area. The soil was placed and compacted in accordance with the construction specification to obtain 6-in. maximum compacted lifts having a permeability of $\leq 1 \times 10^{-7}$ cm/sec. Specified moisture content and density testing was performed on each lift, and each lift was scarified prior to placing the next lift over it. The final configuration of the clay soil layer was sloped to maximize runoff from the cap and to minimize infiltration. Additionally, during the installation of the clay soil layer, a 12-in. pipe on the southwest corner of the site was removed to salvage on June 8, 1992. The clay soil layer was completed on June 25, 1992.

4.5 SYNTHETIC LINER

Closure Requirements. A 30-mil-thick synthetic liner was to be installed to act as a low-permeability boundary to prevent water from reaching the waste. The installation of the liner was to be in accordance with the manufacturer's specifications. The surface on which the liner was placed was to be free of sharp objects or rocks that may puncture the liner. A bed of sand was to be used to provide even support for the sheeting.

Actual Remedial Activities. As with previous, similar cap constructions, the liner was placed directly onto the top of the impermeable clay layer, and no sand bedding layer was installed. Maximum rock size in the clay layer was limited to a 2-in. diameter. Prior to placement of the liner onto the clay layer, the clay surface was inspected, visible rocks were

removed, and the clay layer was steel-drum rolled. Placement of the 30-mil-thick PVC liner began on June 30, 1992, and was completed on July 2, 1992. The liner consisted of four panels placed in a north/south orientation which were seamed together using the liner manufacturer's seaming technique. Upon completion, seams were successfully tested in place using an air lance. Additionally, one sample coupon for each seam was taken from the extreme north or south end of the seams. The sample seam coupons were destructively tested to verify that seam specifications were met or exceeded.

When the liner was in place, it was discovered that the southwest portion of the western-most panel was too short to adequately overlap the drainage pipe (Fig. 9). Accordingly, a 2-ft-wide by 34-ft-long strip was taken from the end trimming of the adjacent panel and seamed to the panel that was too short. This strip provided additional flap to the liner so the liner would adequately overlap the drainage pipe. The construction drawings required that the liner overlap the drainage pipe by 2 ft. With the addition of the strip, a 5-ft overlap was achieved. This seam was successfully air-lance tested, but was not destructively tested. Destructive testing of the strip's seam was judged to be unnecessary because of the noncritical location of the flap and the extra length of seam overlap.

4.6 DRAINAGE LAYER

Closure Requirements. A drainage layer of synthetic filter fabric was to be placed over the synthetic liner. The drainage layer permitted water percolating through the vegetative, surface cover layer to discharge in a lateral direction away from the waste. All drainage collected from this system was to be routed to the sides and away from the site via surface drainage ditches constructed to reduce erosion.

Actual Remedial Activities. The drainage layer, which consists of geonet and geotextile (filter) fabric connected to perimeter drainage piping, was installed from July 2 through July 8, 1992. Connection of the drainage layer to the drainage piping systems was performed simultaneously with the start of the vegetative layer installation. The installation of the geonet and geotextile layers began as soon as the final seams on the synthetic liner were completed.

Geonet installation consisted of unrolling the geonet material so that the geonet covered the entire area of the liner to the perimeter drain trenches. Adjacent geonet strips were joined using tie-wraps at intervals along the geonet. Installation of the geotextile fabric over the geonet layer was performed in a similar manner. The geotextile was installed by unrolling 12-ft-wide rolls. Adjacent geotextile panels were field seamed together with a portable sewing machine. The fabric material was inspected and approved prior to installation.

Drainage piping installation consisted of placing semiperforated PVC piping in the drainage trenches along the western and southern perimeter of the site. The piping systems were joined into a single continuous system, with the low spot at the southwest corner. At the southwest corner, the drainage piping opens to a trench, which will convey drainage away from the site.

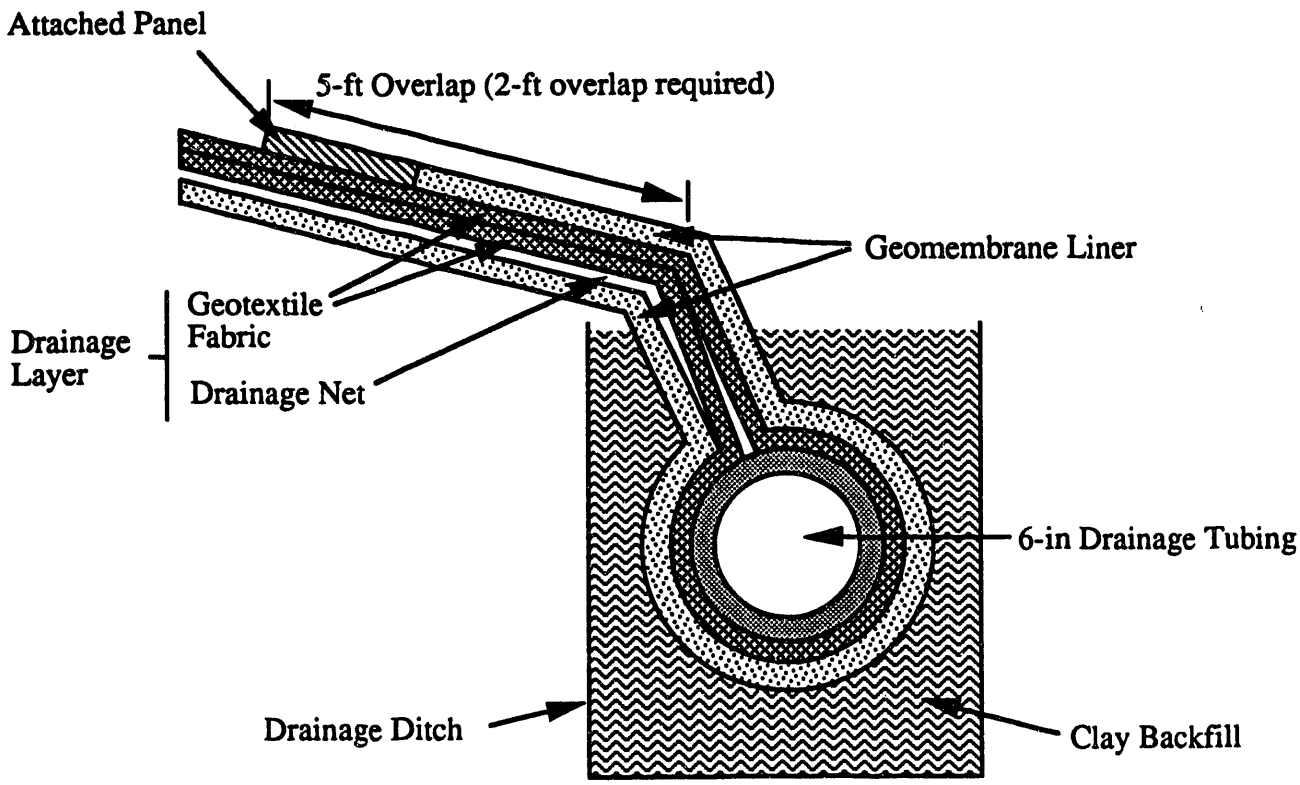

Fig. 9. Liner drain detail. This detail illustrates how the 2-ft-wide by 34-ft-long liner strip was seamed to the southwest corner of the western-most panel to permit adequate overlap of the drainage pipe.

Following the drainage piping installation, the drainage layer (with liner) was connected to the drainage piping. The connection was made by wrapping the liner, geonet, and geotextile fabric layers around the drainage piping. A continuous seam of the geotextile layer along the perimeter drains could not be made as specified, because a seam requires two free edges, but only one edge was exposed along the perimeter drain. The drainage layer connection to the drainage piping was secured by the placing the vegetative cover (see Sect. 4.7) on top of the liner overlap of the drainage piping.

4.7 VEGETATIVE COVER

Closure Requirements. An 18-in.-thick vegetative cover consisting of local, compacted soils and a grass cover was to be the final layer of the multilayer cap. The layer was to be fertilized, seeded, and mulched. Drainage ditches were to be constructed upgradient to prevent rainfall run-on. The top of the vegetative layer was to be prepared and seeded during the period from March to June or August to October to maximize vegetative growth potential.

Actual Remedial Activities. The placement of the vegetative layer began on July 8, 1992. It was installed in two lifts: one 12 in. thick and lightly rolled, and the other 6 in. thick and compacted. Both light rolling and compaction were performed using a smooth steel drum roller. In-place density tests were performed on the compacted soil layer. A third lift was installed to fill low areas as determined by an in-process survey. The vegetative layer surface was scarified prior to seeding. On July 17, the grass layer was limed, fertilized, and seeded. Mulching was completed on July 21 (Fig. 6). The remaining items for construction completion such as cleanup and equipment removal were completed on August 17, 1992.

During placement of the vegetative cover, the corrugated metal pipe that drained the site at the southwest corner beneath Old Mount Vernon Road was plugged in accordance with approved design requirements. Plugging was performed by filling the pipe with a flowable fill.

Drainage ditches were constructed upgradient on the north and east sides to prevent rainfall run on. A drainage ditch to divert run off was constructed on the southern portion of the site.

4.8 CONTRACTOR RESPONSIBILITIES AND FEDERAL AGENCY PARTICIPATION

To maximize the efficient use of resources and to tap into additional expertise, contractors were used for many of the activities on this project. Contractors and their roles are described below.

- Martin Marietta Energy Systems, Inc.
  - Project manager
  - Integrating contractor
- Lockwood Greene, Engineering
  - Design and Title III

- MK-Ferguson
  - Construction manager
  - Placement of Elza Gate material
  - Contouring fill
- Roehl Construction Company, Inc. (subcontractor to MK-Ferguson)
  - Construction of cap
- Palco Lining, Inc. (subcontractor to Roehl Construction)
  - Liner placement
- Ogden Environmental and Energy Services Co., Inc.
  - Soil compaction and moisture testing
- SEC Donohue
  - Liner testing

DOE was also involved in the planning and oversight of the UNC site remedial action.

5. FINAL INSPECTION

A final inspection was conducted, and the work completed on the UNC site remedial action was accepted. A Final Inspection and Acceptance Report was completed on August 21, 1992, formally indicating this decision. This report was signed by:

Jay A. Roehl, Roehl Construction, Subcontractor representative;
A. B. Fail, Construction Management Site Manager;
Boyd Hallman, Energy Systems, Facility Manager representative;
Martin Cooper, Lockwood Greene Engineering, Architect/Engineer representative; and
R. D. Oglesby, DOE Project Manager.

6. CERTIFICATION THAT THE REMEDY IS OPERATIONAL AND FUNCTIONAL

The remedial action chosen for the UNC Site was designed and constructed to protect human health and the environment. CQA was implemented to ensure that the capping activities met or exceeded all projected design criteria, plans, and specifications. Quality assurance requirements were documented in the applicable sections of each of the construction specifications.

The construction of the cap over the UNC Site is considered successful because construction was completed according to design. This conclusion is based on meeting or exceeding all QC testing during site activities. Furthermore, surveillance and monitoring activities will continue for the next 30 years to ensure that the cap is adequately containing the waste in the site. These activities are described in Sect. 7.

7. OPERATION AND MAINTENANCE

Following capping of the UNC disposal site, the Y-12 Plant will provide continued surveillance of the site through visual inspections of the cap and analysis of samples taken from monitoring wells placed around the area. Site inspections and sampling of monitoring wells will be documented and conducted at regularly scheduled times. The site inspections will be conducted on a quarterly basis during the first two years and semi-annually thereafter. The results of the inspections will be noted in the log book maintained for the site. Corrective actions will be noted following observation. The time frame for the implementation and completion of the actions will vary according to the severity of the deficiency. DOE will be notified of major deficiencies such as the collapse of the cap or major erosion problems at the site. However, minor deficiencies such as damaged drains or signs will only be noted in the log books and corrected.

The site inspections will continue for a period of 30 years following this remedial action. Routine maintenance will be performed and repairs made as required to maintain the integrity of the closed site. Routine maintenance will include mowing of the site and the replacement of any topsoil and vegetation that may have been washed from the site. If deemed necessary, other measures may also be taken to maintain the cap.

Groundwater monitoring of the site will be performed. Data from the monitoring wells will be analyzed and evaluated to detect trends that might be indicative of problems below the surface of the site. Any indication of problems or potential problems with the groundwater will receive remedial attention. If required, further remedial action will be provided as determined through approved CERCLA remedial action plans.

8. SUMMARY OF PROJECT COSTS

The projected costs identified in the ROD included:

Construction cost	$780,500
Annual operating and maintenance:	
1 year	$93,600
2-30 years	$69,800
Present worth (30-year)	$1,467,500

Treatment and capping of residuals would cost twice as much as the 30-year present worth of capping alone and would provide a comparable level of protection. Off-site disposal would cost ten times the cost of the selected remedy.

The actual costs for the UNC remedial action were:

Construction cost	$882,000
Design and Title III (Lockwood Greene)	$50,000
Soil testing (Ogden)	$33,000
Energy Systems construction management	$252,400
Total costs	$1,217,000

Only construction costs are directly comparable between the projected costs and the actual costs. Annual operating and maintenance costs identified in the projected costs have not been included in actual costs, because they had not begun to accrue when these figures were developed. The difference between the projected construction costs ($780,500) and the actual construction costs ($882,000) was $101,500. This difference represents increased costs as a result of the inclusion of the Elza Gate material. Although waste characterization and transportation costs were paid by FUSRAP, inclusion of this material did require design changes and additional personal protective equipment for site workers and increased the amount of area the cap covered and the time it took to complete the remedial action. Because of the increased time, winterization of the site was also required. All of the costs associated with these modifications were paid by the UNC remedial action project.

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SPECIFICATIONS

"As Built" Specifications and Construction Specifications

Phase I and Phase II Construction for Closure
of the United Nuclear Corporation Waste Disposal Site

MARTIN MARIETTA ENERGY SYSTEMS, INC.

September 25, 1992

J. K. Siberell; Build. 9983-58; MS 8248

As-Built Specifications for Closure of UNC Waste Disposal Site

Attached is a summary of revisions made to the technical specifications for Phase I and Phase II construction for the closure of the UNC Waste Disposal Site. These revisions were made through issuance of an addendum and construction interface documents (CID's) after release of the technical specifications "certified for construction". This summary, when combined with the technical specifications "certified for construction," will comprise the "as-built" technical specifications for the project. I understand that it has been requested that "as-built" drawings and specifications be included in the closure documentation package.

Please note that several more CID's were issued for the UNC closure; however, those CID's pertained to revisions to the drawings and will be incorporated into the "as-built" drawings where applicable.

If you have any questions regarding this correspondence, please call.

Sincerely,

John D. Long

John D. Long
Civil RED
Civil, Site &
Waste Management Design

Attachment: as stated

cc: W. E. Manrod, III
A. N. Wylie
W. D. Barton, III
J. W. Baker

SUMMARY OF REVISIONS TO TECHNICAL SPECIFICATIONS
AFTER CERTIFICATION FOR CONSTRUCTION
CLOSURE OF UNC WASTE DISPOSAL SITE
PHASE I AND PHASE II

PHASE I

1. SECTION 02200, 1.01D Elza Gate Soil

Delete: Elza Gate Soil shall consist of soil obtained from he Elza Gate Site. The soil shall be free of concrete debris and contain no rock fragments larger than 4 inches in any dimension. Rock fragments not meeting the criteria initially, shall be placed at the site as directed by the Construction Manager or shall be reduced in size by the Contractor to meet the aforementioned criteria.

Add: Elza Gate Soil shall consist of soil obtained from the Elza Gate Site. The soil shall generally be free of concrete and rock fragments larger than 4 inches in any dimension. Larger concrete and rock fragments can be utilized as directed by the Construction Manager provided the soil-rock-concrete mixture can be spread in 8-inch maximum loose lifts and can be compacted to the criteria specified in this section of the technical specifications.

2. SECTION 02610, 1.01B Tests

Delete: ... at least 3 tests shall be performed on each day's work on each course constructed. Additional tests shall be made as directed by the Facilities Manager.

Add: Field density tests shall be conducted after each layer is placed at a frequency of one test per 5,000 square feet of surface area of a compacted layer with a minimum of 2 tests performed on each layer. The locations for the density tests shall be selected randomly by the soils technician or as directed by the Construction Manager or Facilities Manager. Additional tests shall be made as directed by the Construction Manager or Facilities Manager.

3. SECTION 02052, 3.02

Add: Concrete fill can be substituted for backfill of the trench where the 15-inch-diameter CMP culvert is removed.

4. SECTION 02200, 3.04B.3 Concrete Rubble

Delete: Second paragraph referring to "choke" layer.

Phase II

1. SECTION 02200, 3.05B.4 Planar Fluid Flow Mat

Delete: Planar Fluid Flow Mat

Add: Planar Fluid Flow Mat and Geotextile Fabric
The planar fluid flow mat and geotextile fabric shall be as described on the drawings.

2. SECTION 02821, 2.02D

Replace: 20% English Rye with 20% perennial rye

Technical Specifications

United Nuclear Corporation
Waste Disposal Site
Oak Ridge Y-12 Plant

Division 2—Site Work

Transmittal number CAPCA E-143

September 19, 1991

TABLE OF CONTENTS

DIVISION 2 - SITE WORK

SECTION 02000

GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DEFINITIONS

A. Rock: Rock includes detached pieces of stone and boulders one-half cubic yard or more in volume, all solid rock in ledges, bedded deposits and conglomerate deposits so firmly cemented as to present the characteristics of solid rock, which may be best loosened for removal by drilling and blasting. Materials that can be removed on a production basis using a D-9 tractor with a No. 9 ripper or equivalent are not included for measurement as rock.

B. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck.

C. Traffic Control: Contractor shall be responsible for providing flagmen at all road crossings where construction traffic is required to travel.

1.02 MEASUREMENT

Unless otherwise shown on the plans or specified herein, measurement of all approximately horizontal units of work shall be done horizontally; measurement of all approximately vertical units of work shall be done vertically; measurement of dimensions for volumes of work shall be in the horizontal and vertical planes.

1.03 JOB CONDITIONS

A. Soils Conditions: Site topography shown on the plans are for the information of the Contractor, and the Construction Manager is not responsible for their accuracy, completeness or usefulness and meaning.

B. Existing Conditions: The Contractor is to investigate the site to determine the necessary data to bid the project and to perform the work required under the contract or in the specification sections of Division 2.

C. Protection of Monuments, Landscape Features, Work and Structures

1. Monuments: The Contractor is to prevent the destruction of all survey monuments, bench marks, property corners and all other survey points. Where the removal of such points is necessary for the accomplishment of the work, the Contractor is to inform the Construction Manager in writing, prior to the disturbance of any point, and is not to disturb the point until written permission to do so has been issued by the Construction Manager. Points where removal are allowed are to be permanently referenced prior to their disturbance. Clear notes and sketches of all reference points are to be furnished to the Contruction Manager, all affected property owners, Construction Manager bodies or utility companies. The Contractor shall be responsible for replacing any survey monuments disturbed or destroyed by him. The work is to be performed by a surveyor registered in the State of Tennessee.

2. Landscapes: Trees, shrubs, grass or other growth designated to remain in place, or outside of the limits of work, are to be protected during the accomplishment of the work, and are not to be damaged in any manner. Such growth damaged by the Contractor is to be repaired as directed by the Construction Manager at no cost to the Construction Manager. Lawn surfaces, embankments, cut slopes, ditches, or other surfaces disturbed by the Contractor are to be regraded to the original shape, and the grass or lawn surface replaced in kind, at no additional cost to the Construction Manager.

3. Structures: Structures outside of the limits of work or designated to remain in place are to be protected by the Contractor during the progress of the work. Any structure damaged in any manner is to be repaired or restored to its original condition as directed by the Contruction Manager and at no cost to the Construction Manager. Sidewalks, curbs, concrete or asphaltic pavement are to be replaced in kind in accordance with the applicable section of specifications or as directed by the Construction Manager.

4. Protection of Work: The Contractor is to be solely responsible for the work of his lower tier subcontractors in the area and the protection of his work. Such grading as is necessary to prevent damage to work by water will be solely the responsibility of the Contractor and will be at no additional cost to the Construction Manager. The Construction Manager may direct the Contractor to perform necessary grading and drainage to prevent surface run off from damaging the work.

D. Work Within Easements

All work shall be within the limits of the Oak Ridge Reservation.

1.04 QUALITY ASSURANCE

A. Applicable Standards

1. General: Current editions or revisions of the following specifications and standards shall apply unless specifically noted otherwise on the Drawings or specified herein. Modifications to standard specifications shall be noted within the Specification and will be noted as revisions to the standard specifications, but will not nullify unaffected portions of the Specifications.

2. American Society for Testing and Materials: Comparable standard specifications for the American Society for Testing and Materials, herein referred to as ASTM and the American Association of State Highway and Transportation Officials, herein referred to as AASHTO, are listed below. Where only one specification number is shown, the standard specification for that society shall apply.

ASTM	AASHTO	TITLE
D698	-	Moisture-Density Relations of Soils Using 5.5 Pound Rammer and 12 Inch Drop (Standard Proctor).
D1556	-	Density of Soil in Place by the Sand Cone Method.
D1557	-	Moisture-Density Relations of Soils Using 10 Pound Rammer and 18 Inch Drop (Modified Proctor)

D2167	-	Density of Soil in Place by the Rubber Balloon Method.
D2922	-	Test Methods for Density of Soil and Soil-Aggregate in place by Nuclear Methods.
D2937	-	Density of Soil In Place by the Drive Cylinder Method.
D3017	-	Test Method for Moisture Content of Soil and Soil-Aggregate in place by Nuclear Methods.

B. Soil Compaction Control: Qualified soils technicians will be employed by the Facilities Manager for the purpose of identifying soils, checking densities and classifying soil materials during construction. Charges for this service are to be paid for by the Facilities Manager.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The equipment required to perform the operations in conformity with these specifications will be the responsibility of the Contractor. However, any equipment that results in waste or damage of material, or inaccurate work, or which is otherwise objectionable is to be promptly replaced as directed by the Construction Manager.

B. No work shall be performed after daylight hours unless prior written approval has been obtained from the Construction Manager.

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

The Construction Manager will be solely responsible for all field engineering required for construction, furnishing all lines, grades, and control points necessary for construction, starting from control points and elevations furnished by the Facilities Manager or as shown on the plans.

3.02 SPECIAL SAFETY REQUIREMENTS

A. The Contractor must comply with all Federal, State and Local Safety Codes and Regulations at all times and is responsible for educating his supervisors and employees of the safety requirements and practices to be followed during the course of his work including, but not limited to OSHA and site specific hazard training. The Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Construction Manager to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

1. Barricades: The Contractor must barricade any open excavations and install adequate warning lights. The Contractor will provide a flagman as required for safety or as directed by the Construction Manager to maintain traffic controls and safety.

2. Access: The Contractor must provide safe access to the bottom of excavations as appropriate.

3. Side Slopes: Sides of excavations must be sloped or benched to maintain the stability of the wall or sides. Roads, streets, sidewalks, and traveled ways are to be kept clear of excavation material at all times. It is the Contractor's responsibility to ensure stability of excavation walls for the safety of personnel and the work.

4. Blasting: Will not be allowed.

5. Working Conditions: Nothing contained herein is to be construed to relieve the Contractor of his responsibility to provide and maintain safe and clean working conditions for his employees and others in the area of his work.

3.03 FIELD DRAWINGS

If changes to the design drawings are required due to field conditions and are approved by the Construction Manager, records of the changes will be kept and turned in to the Construction Manager before submitting the final invoice. Field drawings must show the change to size, location, and elevations and must be approved by the Construction Manager before approval of final payment.

3.04 COMPLETED WORK

Clean-Up: The Contractor will keep the area in which he is working free of debris, trash, garbage and other offensive waste material and keep all construction materials stockpiled in a neat, orderly manner at points designated by the Construction Manager, until ready for use on the job site.

During construction, traveled ways adjacent to the area of work are to be kept clean and open to vehicular and pedestrian traffic. Upon completion of any stage of work in any area, all debris, trash, litter, construction materials, and like materials are to be removed to the satisfaction of the Construction Manager, and the area left in suitable condition for the next stage of construction or for the use of the Construction Manager.

The Construction Manager may withhold payment of any funds due the Contractor under the following specifications, if in the opinion of the Construction Manager the Contractor has not maintained the work area covered by his contract. Such funds, less any retainage or other sums due the Construction Manager or others, shall be paid the Contractor when required clean-up has been completed to the satisfaction of the Construction Manager.

3.05 SITE WORK

A. The work to be done by the Contractor under Division Two, Site Work, is as shown on the drawings and specified in Division Two sections of the specifications, unless otherwise shown on the plans or specified.

B. If any work described on the plans conflicts with the specifications, the specifications shall govern.

END OF SECTION

SECTION 02052

REMOVAL OF CULVERTS AND BACKFILL

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes furnishing all labor, equipment, supplies, supervision and materials to remove existing culverts as shown on the contract drawings and to backfill the trenches created from removal of the culverts.

1.02 QUALITY ASSURANCE

A. Applicable Standards: The Contractor is to comply with Applicable Standards of Section 02000 and Section 02243.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

C. TESTS

1. Qualified soils technicians will be employed by the Facilities Manager for the purposes of identifying soils, checking densities and classifying soils materials during construction. Charges for this service will be paid for by the Facilities Manager.

2. Density tests are to be made in accordance with the Backfilling Procedures or as required by the soils technician or as may be directed by the Facilities Manager.

1.03 SUBMITTALS

A. The soils technicians will submit daily reports of all compaction tests and retests. The reports will be furnished to the Construction Manager as soon as possible upon completion of the required tests.

B. This report information is to include but not be limited to the following.

1. Date of the test and date submitted.

2. Location of test.

3. Wet density, moisture content and dry density of field sample.

4. Description of material.

5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

6. Ratio of field dry density to maximum lab dry density expressed as a percent.

7. Comments concerning the field density passing or failing the specified compaction.

8. Comments about recompaction if required.

C. The soils technician shall advise the Construction Manager and the Contractor's superintendent immediately of any density tests failing to meet the specified minimum requirements. A formal summary report of all test results will be submitted to the Facilities Manager.

PART 2 - PRODUCTS

A. Materials for backfill shall consist of suitable soils excavated during removal of the culverts or contouring fill. Elza Gate materials shall not be used as backfill for removal of the culverts.

B. Backfill beneath roads shall consist of mineral aggregate meeting the quality requirements of ASTM D692 and the gradation requirements for No. 57 stone as specified in Section 903 of the current edition of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction. No. 57 stone shall not be used as backfill for removal of culverts located within 3 feet of the limits of the final cap for the site since such could create a conduit for migration of contaminants after closure.

C. The existing asphaltic pavement and mineral aggregate base beneath Old Mt. Vernon Road shall be replaced with mineral aggregate base having the same thickness as the existing asphaltic pavement and mineral aggregate base courses. The mineral aggregate base shall conform to A Base, Grading D in accordance with Sections 303 and 903 of the current edition of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction.

PART 3 - EXECUTION

3.01 GENERAL

A. Any trench that is not backfilled at the end of a day's work shall be barricaded and marked. Materials obtained from excavation shall not be piled closer than 2 feet to the edge of the excavation. Along streets and roads, excavated material shall be kept clear of any traveled way.

B. Nothing contained herein relieves the Contractor of his responsibility to provide safe working conditions for the workmen in the area of construction. Special care shall be taken when backfilling. Any damage caused during removal and backfilling operations shall be promptly repaired to match existing work at no cost to the Construction Manager. All temporary protective and support systems installed shall remain in place until they can be supported and protected by the trench backfill.

C. The Contractor shall obtain advance approval from the Construction Manager for any work performed in the roadways and for any detouring of traffic. The Contractor shall provide all safety measures and devices required by the Construction Manager.

3.02 REMOVAL

A. The culverts shall be removed, flattened, and placed in the UNC Waste Disposal Area as directed by the Construction Manager.

B. In areas where culverts are removed beneath existing pavements, the pavement shall be saw cut by the Contractor. The pavement and mineral aggregate base courses shall be placed in the UNC Waste Disposal Area as

directed by the Construction Manager.

C. Soil excavated for removal of the culverts shall be stockpiled for reuse as backfill or shall be placed in the UNC Waste Disposal Area as directed by the Construction Manager.

D. The portion of the existing 15-inch-diameter CMP culvert beneath the limits of the final cap shall be removed prior to placing fill within the UNC Waste Disposal Site. Positive drainage shall be provided to the remaining in-place portion of the culvert until sufficient fill is placed to provide positive run off to the 12-inch-diameter CMP culvert at the southwestern corner of the site. At such time, the remaining portion of the 15-inch-diameter CMP culvert shall be removed and backfilled.

3.03 BACKFILL

A. General: Backfilling operations shall not proceed until the excavation has been observed and approved by the Construction Manager. All debris, rocks, broken pieces of culvert, loose "fall-in" materials, muck, and like materials shall be removed from the trench prior to the start of backfilling operations. All backfill materials shall be free of muck, rock, organic material, broken concrete, or other debris.

B. Excavated Materials and Contouring Fill: Backfill consisting of excavated soils or contouring fill shall be placed in uniform layers having a maximum thickness of 6 inches loose measure and compacted the full width of the trench to a minimum of 95 percent of maximum dry density as determined by ASTM D698, standard Proctor.

C. No. 57 Stone: Backfill consisting of No. 57 stone shall be placed in uniform layers having a maximum thickness of 12 inches loose measure and shall be compacted by tamping with the backhoe bucket.

D. Mineral Aggregate Base: Backfill consisting of mineral aggregate base shall be placed in uniform layers having a maximum thickness of 6 inches loose measure and compacted the full width of the trench to a minimum of 95 percent of maximum dry density as determined by ASTM D1557, modified Proctor.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DEFINITIONS

A. Materials: Where the terms approved, suitable, unsuitable and similar designations are used in this section, it means earth or materials designated as being approved, suitable or unsuitable for their intended use by the soils technicians, the Construction Manager or the Facilities Manager. Also suitable materials shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GM, GC, CL, SC, SM, ML, or as designated in other sections of these specifications.

B. Concrete Rubble: Concrete rubble shall consist of concrete debris obtained from demolition of the concrete pads at the Elza Gate Site. The concrete rubble shall have a maximum dimension of 3 feet and be well-graded. The concrete rubble shall be free of soil, organics, and any other deleterious materials.

C. Rock: Rock shall be as defined in Section 02000.

D. Elza Gate Soil: Elza Gate Soil shall consist of soil obtained from the Elza Gate Site. The soil shall be free of concrete debris and contain no rock fragments larger than 4 inches in any dimension. Rock fragments not meeting this criteria initially, shall be placed at the site as directed by the Construction Manager or shall be reduced in size by the Contractor to meet the aforementioned criteria.

E. Contouring Fill: Contouring fill shall consist of soil placed above the sand layer, Elza Gate Soil, or concrete rubble. Contouring fill shall be utilized to cover the site and to achieve the plan grade in the event that there is an insuffient quantity of Elza Gate materials to achieve the plan grade. The contouring fill shall be obtained from the Borrow Area to the immediate west of the work area or from the East Borrow Area.

The contouring fill shall consist of natural soil containing no rock fragments larger than 4 inches in any dimension. The soil shall be free of topsoil, organics, and any other deleterious materials.

F. Earthwork Debris: Earthwork debris shall consist of materials encountered during earthwork operations performed under this project that do not meet the criteria previously specified for suitable materials. Earthwork debris shall consist of materials such as, but not limited to asphalt pavement, muck, refuse, mulch, stumps, logs, metal, organic matter and any other combustible or non-combustible materials.

G. Borrow: All borrow materials for the construction of the fill areas shall come from the Elza Gate Site, the Borrow Area located to the immediate west of the work area, and/or from the East Borrow Area. The location and proximity of these areas are shown on drawing no. C2E900016A001. The Contractor shall be responsible for operating and maintaining the borrow areas and the haul road.

1.02 QUALITY ASSURANCE

A. Applicable Standards: The Contractor is to comply with Applicable Standards of Section 02000.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

C. Tests

1. Qualified soils technicians will be employed by the Facilities Manager for the purpose of indentifying soils, checking densities and classifying soil materials during construction. Charges for this service will be paid for by the Facilities Manager.

2. Density tests shall be made in accordance with the Installation Procedures or as required by the soils technician or as may be directed by the Facilities Manager.

1.03 SUBMITTALS

A. The soils technicians will submit daily reports of all compaction tests and retests. The reports will be furnished to the Construction Manager as soon as possible upon completion of the required tests.

B. This report information is to include but not be limited to the following:

1. Date of the test and date submitted.

2. Location of test.

3. Wet density, moisture content and dry density of field sample.

4. Description of material.

5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

6. Ratio of field dry density to maximum lab dry density expressed as a percent.

7. Comments concerning the field density passing or failing the specified compaction.

8. Comments about recompaction if required.

C. The soils technician shall advise the Construction Manager and the Contractor's superintendent immediately of any density tests failing to meet the specified minimum requirements. A formal summary report of all test results will be submitted to the Facilities Manager.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

Field engineering is the responsibility of the Contractor in accordance with the requirements of Section 02000.

3.02 CLEARING, GRUBBING AND STRIPPING

A. Clearing: The East Borrow Area will be cleared and grubbed by others. The Borrow Area to the immediate west of the work area will be cleared and grubbed by the Contractor. Clearing and grubbing is not required at the UNC Waste Disposal Site.

B. Stripping: Strip the gravel course of the existing parking area; all vegetable matter, sod and rubbish from the capped areas. Place the material in areas designated by the Construction Manager. Erosion control measures shall be installed prior to stripping.

3.03 EXCAVATION

A. Excavating: Excavate the borrow materials from the borrow areas as required for the construction of the fill sections shown on the drawings. The excavated materials shall be segregated into suitable and unsuitable materials and stockpiled for future use or disposal.

B. Stockpiling: The Contractor may stockpile materials from the East Borrow Area and materials from the Borrow Area to the immediate west of the site adjacent to the site for future use or disposal. The stockpiles shall be no greater than 4 feet in height and shall not obstruct proper drainage of the area. The Contractor shall seal the top of the stockpile after each day's operation to provide positive runoff. Materials from the Elza Gate Site shall not be stockpiled and must be placed upon delivery to the site.

3.04 FILLS

A. Preparatory Work

1. Areas requiring excavation for construction of ditches, both permanent and temporary, will be worked prior to placement of fill.

2. Areas to be occupied by fill will be surveyed by a land surveyor registered in the State of Tennessee under Title III services.

3. Measures for removal of surface water run off within the UNC Waste Disposal Site (Section 02243) shall be installed prior to fill placement.

B. Installation Procedures

1. General

No fill material shall be placed when weather conditions, condition of the subgrade, or condition of the fill material precludes obtaining the specified compaction. Frozen material shall not be used for fill, and fill materials shall not be placed on or against frozen surfaces. The surface of the fill shall be sloped to provide positive drainage to designated drainage areas. The surface of the fill shall be "sealed" at the end of each day's work by rolling the surface with a steel-drum roller or rubber-tired construction equipment. The upper inch of the surface of fills that are "sealed" shall be scarrified prior to placement of the next layer of fill. The surface of all fills and all fill materials during placement shall be maintained in a moist condition to reduce the potential for the formation of dust.

2. Manufactured Limestone Sand

Refer to Section 02610 for the installation procedures for the manufactured limestone sand.

3. Concrete Rubble

The concrete rubble shall be placed in the base of the southern portion of the waste disposal area as indicated on the contract drawings. The concrete rubble shall be placed in loose lifts having a maximum thickness of 2 feet. Larger particles shall be selectively placed by construction equipment and smaller particles shall be worked into the voids between the larger particles to create a dense-graded mass. Nesting of particles shall not be accepted. The concrete rubble shall be spread and compacted with tracked construction equipment.

Following completion of placement of the concrete rubble, the surface of the concrete rubble shall be "choked" as directed by the Construction Manager to reduce the potential for migration of the overlying finer-grained soils into the concrete rubble. The "choke" layer shall consist of concrete fines, crushed stone, or a combination of the previously mentioned and a geotechnical filter fabric. The method of "choking" shall be approved by the Facilities Manager prior to implementation.

4. Elza Gate Soil

Following placement of the concrete rubble layer and the manufactured sand layer, the Elza Gate Soil shall be placed. The soil shall be spread in loose layers having a maximum thickness of 8 inches prior to compaction. The soil shall be uniformly compacted to a minimum of 90% of the material's standard Proctor maximum dry density (ASTM D698). Moisture contents of the soil at the time of compaction shall be maintained within a range such that the soil remains stable under construction traffic (i.e. the soil does not rut or pump under construction traffic).

The soil shall be tested for specified moisture content and density utilizing the following field density test method: the Drive Cylinder Test Method (ASTM D2937), the Sand Cone Method (ASTM D1556), or another approved ASTM method for testing the moisture content and density of the soil. Field tests shall be conducted after each layer is placed at a frequency of one test per 5,000 square feet of surface area of a compacted layer with a minimum of 2 tests performed on each layer. The locations for the density tests shall be selected randomly by the soils technician or as directed by the Facilities Manager.

If the results of the field density tests or the performance of the fill material under construction traffic indicate the moisture content of the soil is not within the required range, additional compaction and/or drying, the addition of water and additional compaction shall be applied until the density and/or moisture content fall within the required range.

5. Contouring Fill

Following the placement of the Elza Gate Soil, contouring fill shall be placed in the areas to be filled as directed by the Construction Manager. A minimum thickness of 6 inches of contouring fill shall be placed over areas to be filled. The contouring fill shall be placed, compacted, and tested as specified for the Elza Gate Soil, except that it shall be compacted to a minimum of 95 percent of its standard Proctor maximum dry density (ASTM D698).

6. Completed Work

The Contractor shall be responsible until final acceptance by the Construction Manager for maintaining the stability of all fills made under the contract and shall bear the expense of replacing any portions which, in the opinion of the Construction Manager, have become displaced due to carelessness or negligence on the part of the Contractor, including failure to properly route or contain surface water runoff. Damage to embankments from natural causes and
through no fault or negligence of the Contractor shall be replaced and paid for at the contract unit price.

Specifically excluded from extra payment is replacement of slope material washed away by natural rainfall or runoff, which shall be at the expense of the Contractor.

3.05 FINISHED GRADING

A. Preparatory Work: Prior to finish grading of the area, all backfilling shall be completed. Any washouts or other similar irregularities shall be corrected.

B. Finish Grading: All exposed earth surfaces shall be flush graded to within ±0.10 foot of theoretical grade. Finish for grading slopes shall be that degree ordinarily obtainable for either blade-grade or scraper operations, or that obtainable by hand shovel operations. When directed or noted, the accuracy of finish obtained by using templates and stringline or hand raking methods is required in case of shoulders, gutters, and similar areas. All ditches shall be finished so they drain readily.

C. Protection: Maintain the finish grades until finally accepted. Repairs required resulting from negligence and/or repairs to replace slope material washed away by rainfall or runoff is at the Contractor's expense.

D. Alteration of Final Grade: If the quantities of Elza Gate materials exceed the volume of space available for these materials with the specified grading plan, the finished grade will be revised by the Facilities Manager to accommodate as much Elza Gate Materials as practical.

The Construction Manager shall keep the Facilities Manager informed as to the status of available space in the areas to be filled so that modification to the grading plan can be made, if necessary, without delaying construction.

3.06 DISPOSAL OF EARTHWORK DEBRIS

A. Disposal of Debris or Waste

1. Non-organic and/or non-combustible earthwork debris shall be deposited in the lower portions of the UNC Waste Disposal Site as directed by the Construction Manager.

2. Organic and/or combustible earthwork debris shall not be deposited at the UNC Waste Disposal Site unless authorized by the Construction Manager. Organic and/or combustible earthwork debris shall be deposited in designated disposal areas as directed by the Construction Manager.

3. The Contractor shall utilize all surplus material on site. All waste material shall be deposited in disposal areas so that adjacent property will not be adversely affected. Natural drainage shall be maintained or improved as directed by the Construction Manager to protect adjacent properties. In no case will waste materials be deposited in an unsightly or unsafe manner.

END OF SECTION

SECTION 02243

DEWATERING OF EXCAVATIONS AND FILL AREAS

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes furnishing all labor, equipment, supplies, supervision and materials to dewater excavations and all areas to be filled at the site during construction.

1.02 QUALITY ASSURANCE

A. Applicable Standards: The Contractor is to comply with Applicable Standards of Section 02000 and Section 02052.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 GENERAL

Surface water shall be diverted from the perimeter of the site to avoid running on to the site. Surface water within the site limits shall be contained and collected or diverted off site as directed by the Construction Manager or as specified in Section 02052.

3.02 EXCAVATION

The Contractor shall be responsible for dewatering excavations during construction. Water shall be collected and pumped from the excavation to a discharge area designated by the Construction Manager or shall be collected and transported to a disposal area as directed by the Construction Manager.

3.03 FILL AREAS

The Contractor shall be responsible for removing water from areas to be filled. The surface of areas to be filled shall be sloped to provide positive drainage to collection or discharge points as directed by the Construction Manager or as specified in Section 02052.

END OF SECTION

SECTION 02610

MANUFACTURED LIMESTONE SAND

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

A. Applicable Standards: Department of Transportation State of Tennessee "Standard Specifications for Construction of Roads and Bridges", Latest Edition (herein referred to as "Standard Specifications").

B. Tests: Field soil density tests shall be performed by the Facilities Manager's testing laboratory. The manufactured limestone sand shall be compacted to a minimum of 90% of its maximum dry density as determined by ASTM D698. At least 3 tests shall be performed on each day's work on each course constructed. Additional tests shall be made as directed by the Facilities Manager.

1.02 SUBMITTALS

A. The soils technicians will submit daily reports of all compaction tests and retests. The reports will be furnished to the Construction Manager as soon as possible upon completion of the required tests.

B. This report information is to include but not be limited to the following:

1. Date of the test and date submitted.
2. Location of test.
3. Wet density, moisture content and dry density of field sample.
4. Description of material.
5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

6. Ratio of field dry density to maximum lab dry density expressed as a percent.

7. Comments concerning the field density passing or failing the specified compaction.

8. Comments about recompaction if required.

C. The soils technician shall advise the Construction Manager and the Contractor's superintendent immediately of any density tests failing to meet the specified minimum requirements. A formal report of all test results will be submitted to the Facilities Manager.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate: The aggregate must be free of salt, vegetable matter and other extraneous matter and conform to the requirements of Section 903.01, Standard Specifications.

B. Gradation: The gradation shall conform to the requirements of Section 903.01, Standard Specifications.

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

The Construction Manager will be solely responsible for all field engineering required for construction, furnishing all lines, grades, and control points necessary for construction, starting from control points and elevations furnished by the Facilities Manager or shown on the plans.

3.02 PREPARATORY WORK

Prior to the start of work, the Contractor shall inspect the site to determine if the subgrade has been completed in accordance with Section 02200. Defects in the subgrade shall be repaired before placing sand.

3.03 INSTALLATION

A. After stabilization of the subgrade (Section 02200) has been achieved, manufactured limestone sand shall be placed over the existing waste pile to a minimum depth of 6 inches above the waste pile. The void spaces within the waste pile shall be filled with the sand to the maximum extent possible. The sand shall be deposited on top of the waste pile and shall be allowed to flow down into the voids between the drums and boxes. The moisture content of the sand shall be maintained sufficiently dry to enable the sand to flow into the void spaces. Moist or wet sand that would tend to bulk and clog in the void spaces shall not be permitted. The sand shall be placed at a rate that will allow observation of the filling of the voids to the maximum extent possible. The sand shall be placed in such a manner so as to avoid damage to the waste containers.

B. In areas large enough to accommodate compaction equipment, (including portable compaction equipment) the sand shall be spread in layers, shaped, and compacted to the specified criteria. Where compaction equipment is utilized, the moisture content of the sand at the time of compaction shall be maintained within a range that will allow the specified density to be achieved. Compacted layers of sand shall not exceed 12 inches in thickness and shall not exceed 6 inches in thickness where portable equipment is used. Density tests shall be made after each layer of sand is placed and compacted. Each layer shall be compacted to the specified criteria before material for the next successive layer is placed.

C. Sand shall not be placed when weather conditions, conditions of the subgrade, or conditions of the sand material precludes obtaining the specified compaction or precludes filling the void spaces within the waste pile to the maximum extent possible. Frozen material shall not be used for fill and fill materials shall not be placed on or against frozen surfaces.

D. After construction of the sand zone has been completed satisfactorily, it shall be maintained, under traffic, smooth and uniform until covered by the next stage of construction or until the project has been completed and accepted by the Construction Manager.

END OF SECTION

TESTING REQUIREMENTS SUMMARY

DISCIPLINE: CIVIL

Sheet 1 of 1

PROJECT	ESO NO.	PLANT/BUILDING	DATE ISSUED
UNC WASTE DISPOSAL SITE PLACEMENT OF MANUFACTURED LIMESTONE SAND AND ELZA GATE MATERIALS		Y-12	

APPLICABLE SPEC. OR DRAWING NO.	RED/SEC/DEPT. HEAD	CE
DIVISION 2 - SITE WORK		

DESCRIPTION OF ITEM TO BE TESTED	TYPE OF TEST	SPEC. SECTION	TEST NO.	TEST PERFORMED BY	•	TEST REPORT RECEIVED & RESULTS ACCEPTABLE ••
EARTHWORK	FIELD COMPACTION TESTS	02000	N/A	FMST(1)	X	
BACKFILL	FIELD COMPACTION TESTS	02052	N/A	FMST(1)	X	
MANUFACTURED LIMESTONE SAND	FIELD COMPACTION TESTS	02610	N/A	FMST(1)	X(2)	
EARTHWORK	FIELD COMPACTION TESTS	02200	N/A	FMST(1)	X	
(1) FMST - FACILITY MANAGER'S	SOIL TECHNICIAN/TESTING LABORATORY					
(2) PREPARATION OF FIELD SPECIMENS	TO BE WITNESSED BY RED.					

Test Results Reviewed and Approved: RED Date

DISTRIBUTION:

• Check Indicates Test is to be Witnessed by RED.

•• To be Initialed and Dated by Construction Engineer (CE). CE will Witness all Tests.

UCN-16332 (1235 7-87)

☆U.S. Government Printing Office: 1987—748-184/60072

Construction Specification for Closure of the United Nuclear Corporation Waste Disposal Site

Specification: S-23528-61

Transmittal number 92-0015

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TECHNICAL PROVISIONS

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DIVISION 1

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Location of Work

The work is located in the Y-12 Plant, a Government-owned facility, managed by Martin Marietta Energy Systems, Inc., for the Department of Energy (DOE), in Oak Ridge, Anderson County, Tennessee.

B. Scope of Work

The work described in this specification consists of furnishing labor, materials, tools, equipment, and services (except that specified to be furnished or performed by others) required to construct the united nuclear waste site closure complete and in strict accordance with this specification, drawings, and all the other provisions of the subcontract.

1.02 SECURITY

A. Clearance Requirements

Work requires "Q"-cleared personnel or uncleared personnel with Contractor-provided "Q"-cleared escorts.

B. Escort Requirements

1) Escorts shall have an active DOE "Q" clearance and Construction Manager provided security orientation.

2) Escorts shall be nonworking personnel and cannot perform construction activities.

3) An escort cannot escort more than five uncleared personnel. Additional escorts may be required depending on the work location, method of accomplishment, and access to the job site. Uncleared personnel shall remain within sight of an escort when in secured area.

1.03 SPECIFICATIONS AND DRAWINGS

A. Specifications

The work shall conform to the subcontract specifications listed in the table of contents and each subsequent division index.

B. Drawings

The work shall conform to the drawings, as listed in the index of drawings located on Drawing C2E900016A001.

C. Terminology

The following definitions provide clarification of terms that are found in the specifications Divs. 2-17 and on the drawings:

1) Construction Manager may also be referred to as the Company, Contracting Officer, or Construction Engineer.

2) The Contractor may also be referred to as the Seller or Subcontractor.

3) The Facilities Manager (FM) may also be referred to as the Operator, Energy Systems, or MM-ES.

1.04 WORKING AND STORAGE AREAS

Limit construction activities and storage to the area designated on Drawing C2E900016A001. Personnel shall enter and exit the plant through Portal 17 as shown on Drawing C2E900016A001. Limit travel to the main roads designated on the drawings. The Contractor is responsible for providing detailed instructions outlining the work area restrictions to its personnel and keeping its personnel within authorized limits. The FM's Plant Protection Department will remove personnel from the plant when found outside the designated areas.

1.05 PROJECT COORDINATION

A. The construction work area will be vacated during construction and will not be reoccupied until acceptance of beneficial occupancy.

B. Submit requests for outages a minimum of 4 d in advance of needed date. The Construction Manager will coordinate outages with the FM and provide an approved outage schedule. Outages shall be held to a minimum in number and duration.

C. Notify the Construction Manager no later than 24 h before performing specified tests and inspections. Tests and inspections shall be performed in a manner that allows observation by both the Construction Manager and FM.

1.06 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

Information submitted for approval in accordance with the Subcontract General Conditions Article GC25 will be returned to the Contractor within 20 calendar days of receipt of the submittal by the Construction Manager.

1.07 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall comply with instructions, recommendations, or requirements stated by the manufacturer or in the specifications for handling and storing of all items.

B. All items delivered to the site shall be identified with a weather-resistant tag or label. The tag or label shall have the following information:

1) Contractor's name, job title, and contract number.
2) Identify the internal contents for items in containers, boxes, or crates.
3) State indoor storage or heated indoor storage, if required.

C. With multiple items shipped, identify each container, box, or crate with a unique number and indicate the total items shipped. (Example: 1 of 4, 2 of 4, etc.).

D. Operators required to handle special handling or lifting equipment shall be trained or experienced in using the equipment.

1.08 UNUSUAL CONDITIONS

Not used.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 PREPARATION

The FM will provide a 2-h required orientation course at each site. Each site has a different training course that shall be attended.

The following is required by the Contractor:

A. Schedule the training of all personnel through the Construction Manager before starting work on-site.

B. Maintain personnel training records to verify personnel orientation is completed.

C. Ensure all personnel renew the orientation training annually.

3.02 INSTALLATION/APPLICATION/ERECTION

Not used.

END OF SECTION

SECTION 01110

SAFETY AND HEALTH

PART 1 - GENERAL

1.01 EVACUATION OF THE WORK AREA

A. The Contractor shall observe and participate in notices to evacuate the work area. The evacuation notices may be a drill or an actual event.

B. Before evacuating the work area, shut down or make safe equipment or processes which could become a safety or fire hazard if left unattended.

1.02 CONSTRUCTION SAFETY WORK PERMIT

The Contractor shall submit a request for a Construction Safety Work Permit 5 d before starting on-site work. The permit is required for field inspections involving access to the job site before starting on-site work. Post the permit at the job site.

1.03 HAZARDOUS WORK REQUIREMENTS

A. Hazardous Waste Operator Training

Contractor shall provide documentation to the Construction Manager that each of its workers, prior to performing any work on-site, has passed a 40-h hazardous waste operator training course consistent with the requirements of the Superfund Amendments and Reauthorization Act of 1986 and administered by the Occupational Safety and Health Act (OSHA).

B. Medical Surveillance

Prior to performing any work on-site, the Contractor's personnel shall have received a physical examination in accordance with 29 CFR 1910.120. The Contractor shall submit to the Construction Manager a form, signed by the attending physician, indicating the results of the physical examination.

C. Carcinogen control is a potential hazardous item on this project, depending on products brought on-site by the Contractor.

The following section addresses the requirements for this hazard.

Section 01160 - Confined Space Entry and Work.

D. Asbestos, nonasbestos fibrous insulation, radioactive and chemical contamination, and confined space entry are hazards NOT expected on this project. However, if these hazards are encountered during construction, the Contractor shall stop work on all hazardous work activities and notify the Construction Manager. The Construction Manager will evaluate the job site conditions and either issue additional requirements necessary to perform the hazardous work or will delete the hazardous work from the project.

E. Hazardous Wastes: The Contractor shall develop a site-specific Site Safety Plan in accordance with the requirements of the current health and safety guidelines established in the Standard Operating Safety Guides, prepared by the Environmental Protection Agency Office of Emergency and Remedial Response, Hazardous Response Support Division, September 1984, and the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985; and 29 CFR 1910.120 effective March 6, 1990. The Site Safety Plan shall be submitted to, and approved by, the Construction Manager prior to initiation of work.

F. Appendix A is an outline of a generic Site Safety Plan for the Contractor's information. This outline may be used by the Contractor as a guide in preparing its site safety plan; however, the Contractor shall develop a complete and workable site safety plan without regard to the completeness or workability of the outline presented in Appendix A. The Contractor shall submit his Site Safety Plan to the Contracting Officer for approval prior to initiation of work. The Contractor shall be familiar with the site emergency evacuation route which is designated on Drawing C2E800490A035.

G. A draft of a Site Safety Plan for employees at a site is included as Appendix B. The Contractor should note that this Site Safety Plan is for information only and is not considered adequate for the work contemplated.

H. The Contractor shall provide a Health and Safety Officer to implement, monitor, and enforce the Site Safety Plan. The Health and Safety Officer shall have similar working experience in the industry. The Health and Safety Officer shall have sound working knowledge of federal and state occupational safety and health regulation and formal educational training in occupational safety and health. Submit qualifications of the Health and Safety Officer for approval prior to performing any work.

I. All equipment will be monitored for contamination when it arrives on the job site and before it is allowed to leave.

J. Hard hats and safety glasses shall be worn 100% of the time by all personnel on the work site.

K. The Contractor shall maintain a first aid kit on site at all times.

L. The Contractor shall control and minimize the dust created due to his operations. Use of a watering truck will be required.

M. On-site fuel oil storage tanks shall have double containment leak protection and be in full compliance with all state and federal regulations.

N. The Contractor shall maintain a telephone at the site.

O. High Voltage Danger

The Contractor shall maintain a minimum distance of 16 ft 9 in. from lines with any and all of his equipment and use extreme caution when using his high-profile equipment (cranes, hydraulic hoes, pile driving equipment, etc.). All high-profile equipment, in addition to all excavation equipment, shall be grounded during operations (i.e., backhoes, track hoes, etc.).

P. All temporary electrical sources shall be protected by ground fault interruptions.

Q. All excavations shall be sloped or shored in accordance with OSHA.

R. The Contractor shall at all times keep the construction area, including storage areas and premises, free from accumulation of waste material or rubbish. A dumpster may be utilized by the Contractor for this purpose.

S. All work must be done in accordance with the Best Management Practices Plan (Appendix C), the CAPCA Environmental Compliance Standard Operating Procedure (Appendix G), the Tennessee Clean Water Act, and all other state and federal regulations. It is up to the Contractor to use any and all measures necessary to prevent the migration of sediment and other pollutants off of the project. This includes silt fence, hay bales, erosion control fabric, rip rap structures, or temporary dikes deemed necessary by the Contractor.

All fines levied against the Government as a result of the Contractor's failure to comply with the above regulations and procedures will be deducted from the Contract.

T. Liquid waste shall not be dumped in Government sanitary, storm water systems, waterways, or drainage ditches without the written permission of the Construction Manager. All spills of liquid materials shall be immediately reported to the Construction Manager and the Contractor shall make every effort to contain the spill.

U. The Contractor shall comply with the State of Tennessee Underground Utility Damage Prevention Act.

V. The Contractor shall install and maintain 24-in. X 18-in. signs at all access points to the work site, which read "DANGER-ACCESS LIMITED TO AUTHORIZED PERSONNEL ONLY". The lettering and colors on the signs shall be in accordance with 1910.145 and ANSI Z53.1-1967.

W. The Contractor shall possess all Material Safety Data Sheets for hazardous material stored at the site during construction.

1.04 CONTAINMENT OF PETROLEUM PRODUCTS

All petroleum products (including gasoline, kerosene, etc.) stored in quantities greater than 100 gal shall have secondary containment capable of preventing any release to a drainage system.

1.05 OCCUPATIONAL SAFETY AND HEALTH ACT'S HAZARD COMMUNICATION STANDARD

Pursuant to the OSHA Hazard Communication Standard for construction, the following hazardous substances are present on this work site.

No known hazardous substances are present on this work site. A 6-in. clean layer of compacted clay soil has been placed over the site to ensure that no hazardous substances will be encountered.

1.06 PROTECTION OF THE WORK AREA

A. Furnish, post, erect, and install safety devices, equipment, signs, barricades, flagging, and any other item necessary to protect personnel having access to the area.

B. Storage areas and hazardous work areas shall be conspicuously flagged or barricaded.

1.07 WORKING NEAR ELECTRICAL LINES

Cranes, bucket trucks, or aerial lifts, not approved for electrical work, shall not be permitted to come within 15 ft of 100 V or greater electrical power lines.

1.08 TRANSPORT VEHICLES FOR FLAMMABLES

All flammable liquid tank trucks, Contractor-owned refueling vehicles, and all other vehicles transporting flammable liquids or gases may be inspected by the Construction Manager with assistance from the Facilities Manager's (FM) fire department and require escorts while on Government property.

1.09 VEHICLE CONTAMINATION SURVEYS

All vehicles are subject to inspection for contamination when both entering and exiting the Plant. Inspections will be made at the access portal.

1.10 ON-SITE SAFETY INSPECTION

The safety, health, fire, and environmental protection personnel of the Construction Manager, Government, and FM will inspect the Contractor's facilities and operations at the job site to ensure compliance with the hazardous communications, safety, health, fire prevention, and environmental protection requirements of the subcontract. All communication, except in cases of imminent danger, will be through the Construction Manager to the Contractor.

PART 2

Not used.

PART 3

Not used.

END OF SECTION

SECTION 01170

CARCINOGEN CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section provides the construction requirements for controlling carcinogenic materials on a project. Using or working with carcinogenic materials shall be in accordance with 29 CFR 1910, Subpart Z and additional requirements stated in this section. The Contractor is responsible for determining the most recent carcinogenic control requirements established by federal, state, and local government regulations. If conflicts exist between applicable requirements and this section, the most stringent provisions apply.

B. Carcinogen Identification

1) The following carcinogenic or suspected carcinogenic material is expected to be encountered while working at the existing facilities:

No known carcinogenic or suspected carcinogenic materials are expected to be encountered on this work site. This section is being provided to give requirements if any carcinogens are brought on-site by the Contractor.

2) If existing carcinogenic or suspect carcinogenic material, not previously identified, is encountered during renovations or demolition activities, immediately notify the Construction Manager. Within 10 d, the Contractor will be given further instructions.

3) The Contractor is responsible for proper identification of carcinogen substances brought on-site. The substances shall have an approved permit before delivery to the job site.

C. Definitions

The following definitions are in addition to those provided in Occupational Safety and Health Act (OSHA) 29 CFR 1910:

1) Carcinogen: A material or substance that, based on evaluated evidence, may cause cancer in man. Chemicals are considered as carcinogens if the carcinogen is present in concentrations of 0.1% or greater by volume. Appendix 2 is a list of known or possible human carcinogens.

2) **Regulated Area:** A posted, segregated space surrounding an operation where chemical carcinogens are used or stored and where entry and exit are restricted and controlled.

D. Attachments

1) Attachment 1: Carcinogen Safety Permit.

2) Attachment 2: Carcinogen Entry Log.

3) Attachment 3: List of Carcinogens.

1.02 REFERENCES

A. American National Standards Institute (ANSI) Z88.2-1980, Practices for Respiratory Protection.

B. OSHA, 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances Standard.

C. OSHA Construction Industry Standards, 29 CFR 1910.134, Respiratory Protection.

1.03 SUBMITTALS

A. High-efficiency particulate air (HEPA) filter certification.

B. Material Safety Data Sheets (MSDS) (for items listed in Part 3).

C. Medical Evaluation. A letter specifying a medical evaluation has been perform as required for all personnel.

D. Permits. Provide a Carcinogenic Safety Permit for each carcinogenic or suspected carcinogenic substance exposed to the workers.

E. Training program.

F. Trained personnel. Provide a list of training received by all personnel. State the employee's full name, job title, title of course(s), training date, training organization, and certification number (if applicable).

G. Visitors log book.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Shipments of carcinogenic material shall be in accordance with Department of Transportation regulations.

B. A regulated area shall be established, for all carcinogenic material stored on-site. Install barrier tape or flagging, post signs, and restrict entrance into the area.

C. Facilities storing carcinogenic material shall be well ventilated.

D. Identify all storage containers with weather-resistant labels. The labels shall name the carcinogenic substance and have the warning "CANCER-SUSPECT AGENT."

E. Place carcinogenic storage containers into a separate unbreakable container before transporting the material on-site.

F. Maintain a current inventory of all Contractor-owned carcinogens or suspect carcinogens on-site. The inventory shall include the quantity and location of the carcinogen substance. The inventory information shall be located on-site and available upon request.

PART 2 - PRODUCTS

2.01 MATERIALS

1) Use chemical carcinogens in only those situations where no other practical substitutes are available.

2) Notify the Construction Manager, for approval of use, if a noncarcinogenic material cannot be substituted for a carcinogenic substance.

3) HEPA filters shall provide an efficiency of not less than 99.97% when challenged with 0.3 micrometer particle-size aerosol. Provide a certification of all HEPA filters used on-site.

2.02 EQUIPMENT

A. All vacuum cleaners shall be equipped with a HEPA filter.

B. All signs shall be in accordance to 29 CFR 1910, Subpart Z and legible from 20 ft away.

PART 3 - EXECUTION

3.01 PREPARATION

A. Material Identification

1) Refer to the MSDS or other manufacturer information for all material brought on-site to determine if a carcinogenic substance is present. Attachment 3 is a list of carcinogens that shall be considered.

2) If the presence of a carcinogenic material cannot be determined, the Contractor shall notify the Construction Manager. The Construction Manager may arrange for a sample test of the material.

3) Submit an MSDS for the following items:

Any paints, solvents, glues, or epoxy materials, etc., brought on-site.

B. Permit Requirements

1) A Carcinogenic Safety Permit, Attachment 1, is required for the handling or storage of each carcinogen substance on-site. The Contractor shall complete Part I at least 10 d before the scheduled activity and submit the permit to the Construction Manager.

2) The Contractor shall have a complete approved permit before handling carcinogenic material.

C. Medical Evaluation

Before handling or working with carcinogenic material, the Contractor shall provide a medical evaluation of all workers possibly exposed to carcinogenic material. The evaluation shall be from a licensed physician.

D. Training

1) Submit a training program to the Construction Manager for approval. In addition to the training requirements in OSHA 29 CFR 1910, the training program shall include the following items:

a. nature of the hazard, including local and system toxicity;

b. control measures in place;

c. medical surveillance requirements;

d. environmental monitoring and decontamination techniques;

e. emergency procedures, including the employee's role; and

f. the location and availability of the MSDS.

2) Before handling or working with carcinogenic or suspected carcinogenic material, all workers shall be trained in accordance to the approved training program.

3) After the initial training, employees shall receive training on an annual basis.

3.02 INSTALLATION/APPLICATION/ERECTION

A. Establish Regulated Area

1) Immediately, establish a regulated area by installing barrier tape or flagging. Post sign(s) in accordance with 29 CFR 1910 at all possible entrances into the regulated area.

2) As a minimum, all carcinogenic signs shall have the following information:

CANCER-SUSPECT AGENT

AUTHORIZED PERSONNEL ONLY

B. Visitors Log Book

1) Maintain a written log book of all visitors, other than personnel identified on the permit, entering a regulated area.

2) Use the log form, Attachment 2, for log book information.

3) Submit the log book at the end of the project.

C. General Requirements

1) Immediately notify the Construction Manager of spills involving carcinogenic materials.

2) The MSDS of carcinogenic materials shall be available to all personnel upon request.

3) Eating, drinking, smoking, chewing gum or tobacco, applying cosmetics, taking medication, and storing food is not permitted in regulated areas.

4) Hand-washing and shower facilities shall be made available to the workers after handling carcinogenic material. These facilities shall be provided by the Contractor.

5) A Contractor-furnished emergency eye wash shall be located near each controlled work area.

6) If Contractor-provided mechanical ventilation is required (as stated in Part II of the permit), it shall be in place and operational before the carcinogenic substance is handled. If possible, supply air shall come from outside the regulated area. Discharge exhaust air to the outdoors clear of occupied buildings and air intakes.

7) To reduce the possibility of airborne carcinogenic material, occasionally wet mop or vacuum the regulated area. The use of dry sweeping, dry mopping or compressed air for cleaning is prohibited.

8) Quantities of chemical carcinogens present in the regulated work area shall not exceed the amount required for use in one day. Working quantities of carcinogens shall be in containers that identify the substance and have the warning "CANCER-SUSPECT AGENT."

9) Contaminated material leaving the regulated area shall be placed in a plastic bag or other suitable impermeable sealed primary container. The primary container shall be placed in a durable outer container before being transported. The outer container shall identify the carcinogenic substance and have the warning "CANCER-SUSPECT AGENT."

D. Disposal Requirements

1) A completed Form UCN-2109 (Request for Transfer, Storage, or Disposal of Wastes) shall be provided to the Construction Manager at least 10 d before scheduled disposal of carcinogen waste.

2) An appropriate MSDS shall be attached to Form UCN-2109.

3.03 FIELD QUALITY CONTROL

Monitor the regulated area for airborne exposure levels in accordance to Part 2 of the permit. Submit all monitoring results at the end of the activity or upon request.

3.04 PROTECTION

1) Required protective clothing, as stated on Part 2 of the permit, shall be worn by all personnel in the regulated areas when carcinogens are being handled.

2) Where chemical carcinogens are used or stored, cover all work surfaces with stainless steel, plastic trays, dry absorbent plastic backed paper, or other impervious material.

3) Respirator requirements will be identified in Part 2 of the permit. The use of respirators shall be in accordance with 29 CFR 1910.134 and ANSI Z88.2.

END OF SECTION

ATTACHMENT 1

CONSTRUCTION

CARCINOGEN SAFETY PERMIT

PART 1 (Contractor)

CONTRACTOR: _____ CONTRACT NUMBER: _____

PROJECT TITLE: _____

CARCINOGENIC SUBSTANCE: _____ BRAND NAME: _____ QUANTITY: _____

BRIEF DESCRIPTION OF CARCINOGEN USAGE: _____

_____

EXPECTED ARRIVAL DATE: _____ EXPECTED PERIOD OF USE: FROM _____ (DATE) TO _____ (DATE)

STORAGE LOCATION: BLDG. _____ ROOM: _____ OTHER: _____

PROCESS LOCATION: BLDG. _____ ROOM: _____ OTHER: _____

POTENTIAL EXPOSURE: ☐ DIRECT CONTACT; ☐ INHALATION; ☐ INGESTION; ☐ OTHER _____

WASTE TYPE: ☐ LIQUID ☐ SOLID ☐ GAS ☐ NEAT ☐ MIXED ☐ OTHER _____

ESTIMATED WASTE PER WEEK: VOLUME _____ WEIGHT _____

PERSONNEL AUTHORIZED TO ENTER CARCINOGENIC REGULATED AREA

PRINT NAME	BADGE NO.	PRINT NAME	BADGE NO.

MATERIAL SAFETY DATA SHEET ATTACHED ☐ YES ☐ NO

SIGNATURE _____ DATE _____

PART 2 (Construction Manager)

PERSONAL PROTECTIVE EQUIPMENT REQUIRED

☐ Head Cover; ☐ Tyvek Suit; ☐ Lab. Coat; ☐ Coveralls; ☐ Gloves - Specify type _____
☐ Eye Protection; ☐ No Respirator; ☐ Full-Face Respirator; ☐ Half-Face Respirator;
Canister/Cartridge Type _____ Maximum hours of usage _____
Other(s) _____

ENGINEER CONTROLS REQUIRED

☐ Laboratory Hood; ☐ Acid Hood; ☐ Walk-in Hood; ☐ Glove Box Only; ☐ Scrubber;
☐ Local Exhaust Fan - CFM ____ , ☐ Charcoal Filter, ☐ HEPA Filter; ☐ Vacuum; ☐ Other _____

MONITORING REQUIREMENTS

☐ Medical Surveillance. Specify _____
☐ Personnel Monitoring. Specify _____
☐ Atmosphere Monitoring. Specify _____

EXIT REQUIREMENTS

☐ Removal of Personal Protective Equipment; ☐ Decontaminate Personal; ☐ Decontaminate Equipment
Other/Comment _____

COMMENTS

_____
_____
_____

APPROVAL SIGNATURE _____ DATE _____

☐ COPY OF COMPLETED PERMIT SENT TO FACILITIES MANAGER. DATE _____

ATTACHMENT 2

CARCINOGEN ENTRY LOG

CONTRACTOR _____ CONTRACT NUMBER _____

PROJECT TITLE _____

CARCINOGEN MATERIAL _____

CONTRACTOR APPROVAL REQUIRED FOR ALL PERSONNEL ENTERING REGULATED AREA				TIME	
DATE	PRINT NAME	COMPANY	BADGE NUMBER	IN	OUT

ATTACHMENT 3

LIST OF CARCINOGENS

2-Acetylaminofluorene
Acrylamide - skin
Acrylonitrile - skin
Adriamycin
Aflatoxins
4-Aminodiphenyl - skin
Androgenic (Anabolic) Steroids
Antimony Trioxide Production
Arsenic
Arsenic Trioxide Production
Asbestos
Azathioprine
Benz(a)Anthracene
Benzene
Benzidine - skin
Benzidine-based Dyes
Benzo(a)pyrene
Beryllium and Compounds
Bis(chroromethyl)ether
Bischloroethyl Nitrosourea
Bis(2-chloroethyl)-2-napthulamine; N,N
1,3-Butadiene
1,4-Bitanediol Dimethylsulfonate
Cadmium and Compounds
Carbon Tetrachloride - skin
Chlorambucil
1-(2)Chloroethyl)-3-Cyclohexyl-1-Nitrosourea
1-(2-Chloroethyl)-3-(4-Methulcyclohexyl)-1-Nitrosoures
Chloromethyl Methyl Ether
Chloroform
Chromite Ore Processing
Chromium (VI), water
    insoluble compounds as listed:
    zinc chromate
    Calcium chromate
    Lead chromate
    Barium chromate
    Strontium chromate
    Sintered chromium trioxide
Chrysene
Cisplatin
Coal Tar Pitch Volatiles as benzene solubles
Coke Oven Emissions
Creosote
Cyclophosphamide
Dibenz(a,h)Anthracene
1,2-Dibromo-3-Chloropropane
3,3'-Dichlorobenzidine - skin
Diethylstilbestrol
Diethyl Sulfate
4-Dimethylaminoazobenzene
Dimethyl Carbamoyl Chloride
1,1-Dimethylhydrazine - skin
Dimethyl Sulfate - skin
Epichlorohydrin
Erionite
Estrogens
    Nonsteroidal
    Steroidal
Estrogen-Progestin Combinations
    Sequential Oral Contraceptives
    Combined oral contraceptives
Ethylene Oxide
Ethylene Dibromide - skin
Ethyleneimine
N-Ethyl-N-Nitrosourea
Formaldehyde
Hexachlorobutadiene
Hexamethyl Phosphoramide - skin
Hydrazine - skin
Lead Chromate
Melphalan
Methoxsalen with UV-A Therapy
5-Methoxypsoralen
Methylene Chloride
4,4'-Methylene Bis(2-Chloroaniline) - skin
4,4'-Methylene Dianiline
Mehtylhydrazine - skin
Methyl Iodide - skin

ATTACHMENT 3
(Continued)

N-Mehtyl-N'-Nitro-N-Nitrosoquanidine
N-Methyl-N-Nitrosourea
MOPP (Combined Chemotherapy)
Mustard Gas
B-Naphtyhlamine
a-Naphylamine
Nickel and Nickel Compounds
4-Nitrodiphenyl
Nitrogen Mustard
2-Nitropropane
Nitrosoimino Diethonol
Diethonol Nitrosamine
N-Nitrosodiethylamine - skin
N-Nitrosodimethylamine
Oxyretholone
Phenacetin
N-Phenyl-beta-haphthylamine
Phenylhydrazine - skin
Phenytoin
Polychlorineated Biphenyls
Procarbazine Hydrochloride
Propane Sultone - skin
Beta-Propiolactone
Propyleneimine - skin
Propylene Oxide
Refractory Ceramic Fibers
Silica, Crystalline
Silicon Carbide Whisker Fibers
Styrene Oxide
Talc Containing Asbestiform Fibers
Therium Dioxide
Tobacco Products, Smokeless
Tobacco Smoke
0-Tolidine - skin
o-Toluidine - skin
p-Toluidine - skin
Trecsulphan
Tris(1-Aziridinyl)Phosphine Sulfide
Tris(2,3-Dibromopropyl)phosphate
Vinyl Bromide
Vinyl Chloride
Vinyl Cyclohexene Dioxide - skin
Xylidine (mixed isomers) - skin
Zinc Chromate

NOTE

Listed substances followed by the designation "skin" refer to the potential contribution to the overall exposure by the cutaneous routes including mucous membranes and eyes either by airborne or, more particularly, by direct contact with the substance. Vehicles can alter skin absorption.

Section 01500
Date: January 10, 1992

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 TEMPORARY UTILITIES

The Contractor shall provide the required temporary lines to use existing plant utilities. All tie-ins and disconnects to existing systems are performed by the Facilities Manager (FM). The Contractor shall submit to the Construction Manager a written request 10 d in advance of the needed tie-in or disconnect service. The following pertain to this project.

A. Electrical

1) Electric power, 120 V, is available within the existing plant facility.

2) Electric power, 240 V and 480 V, is not available to the Contractor.

3) All temporary electrical lines shall have ground-fault interrupters.

B. Water

1) Water is available within the existing plant facility.

2) Temporary water lines shall have backflow preventers installed.

C. Sanitation Facilities

Provide chemical toilet facilities at locations approved by the Construction Manager. Maintain the toilets in a clean, safe, and sanitary condition for the duration of the project.

1.02 PARKING AREA

Parking facilities for the Contractor's employees are limited to the areas indicated on Drawing C2E900016A001. Parking along roads is prohibited.

1.03 DISPOSAL AREAS

All items shall be segregated when delivered to the disposal site. A 3-week delay may be required for items that are not segregated.

A. Spoil

Dispose of excavated earth (excluding stumps and wood) not used for fill on the job site at an area designated by the Construction Manager.

B. Waste

In accordance with the Subcontract General Conditions, Article 23, deliver the following materials to the Y-12 Centralized Sanitary Landfill II between the hours of 9 a.m. and 3 p.m. daily. Segregate into the following categories:

1) combustible waste;

2) noncombustible debris (including concrete, asphalt, etc.);

3) insulation (package before delivery), label containers with the type of insulation contained; and

4) glass and glass containers (broken and crushed before delivery).

C. Hazardous Materials

Hazardous materials as identified in Document 40 CFR 261.3, radioactive wastes, liquid waste materials, filled gas cylinders, and large containers such as metal drums and bulk metal shall be disposed of at a location designated by the Construction Manager.

D. Transportation

Provide complete containment for any spoil, waste, and salvable materials during transport.

E. Disposal Permit

1) All spoil and waste materials removed from the job site shall be accompanied by a Construction Manager-furnished permit. Request for approval of a permit shall be made 24 h in advance of waste removal operations.

2) The approved request (permit) may be required by the FM personnel at the landfill before disposing of waste.

1.04 BORROW

Borrow is available from the Government site as shown on Drawings C2E900016A001 and C2E900016A008.

PART 2

Not used.

PART 3

Not used.

END OF SECTION

DIVISION 2

SITE WORK

INDEX

SECTION 02000

GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DEFINITIONS

A. Rock: Rock includes detached pieces of stone and boulders one-half cubic yard or more in volume, all solid rock in ledges, bedded deposits and conglomerate deposits so firmly cemented as to present the characteristics of solid rock, which may be best loosened for removal by drilling and blasting. Materials that can be removed on a production basis using a D-9 tractor with a No. 9 ripper or equivalent are not included for measurement as rock.

B. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck.

C. Traffic Control: Contractor shall be responsible for providing flagmen at all road crossings where construction traffic is required to travel.

1.02 MEASUREMENT

Unless otherwise shown on the plans or specified herein, measurement of all approximately horizontal units of work shall be done horizontally; measurement of all approximately vertical units of work shall be done vertically; measurement of dimensions for volumes of work shall be in the horizontal and vertical planes.

1.03 JOB CONDITIONS

A. Soils Conditions: Site topography shown on the plans are for the information of the Contractor, and the Construction Manager is not responsible for their accuracy, completeness or usefulness and meaning. The Contractor shall make such additional investigations as required to acquaint himself adequately with the site topography, and the subsurface conditions for preparation of his bid, and for successful execution of the work.

B. Existing Conditions: The Contractor is to investigate the site to determine the necessary data to bid the

project and to perform the work required under the contract or in the specification sections of Division 2. Such investigation may include, but not be limited to, site visits, soil borings, chemical and physical tests, and research of public and private records.

C. Protection of Monuments, Landscape Features, Work and Structures

1. Monuments: The Contractor shall prevent the destruction of all survey monuments, bench marks, property corners and all other survey points. Where the removal of such points is necessary for the accomplishment of the work, the Contractor shall inform the Construction Manager in writing, prior to the disturbance of any point, and shall not disturb the point until written permission to do so has been issued by the Construction Manager. Points where removal are allowed shall be permanently referenced prior to their disturbance. Clear notes and sketches of all reference points shall be furnished to the Construction Manager, all affected property owners, Construction Manager bodies or utility companies. The Contractor shall be responsible for replacing any survey monuments disturbed or destroyed by him. The work shall be performed by a surveyor registered in the State of Tennessee.

2. Landscapes: Trees, shrubs, grass or other growth designated to remain in place, or outside of the limits of work, shall be protected during the accomplishment of the work, and shall not be damaged in any manner. Such growth damaged by the Contractor shall be repaired as directed by the Construction Manager at no cost to the Construction Manager. Lawn surfaces, embankments, cut slopes, ditches, or other surfaces disturbed by the Contractor shall be regraded to the original shape, and the grass or lawn surface replaced in kind, at no additional cost to the Construction Manager.

3. Structures: Structures outside of the limits of work or designated to remain in place shall be protected by the Contractor during the progress of the work. Any structure damaged in any manner shall be repaired or restored to its original condition as directed by the Construction Manager and at no cost to the Construction Manager. Sidewalks, curbs, concrete or asphaltic pavement shall be replaced in kind in accordance with the applicable section of specifications or as directed by the Construction Manager.

4. Protection of Work: The Contractor shall be solely responsible for the work of his lower tier subcontractors in the area and the protection of his work. Such grading as is necessary to prevent damage to work by water shall be solely the responsibility of the Contractor and shall be at no additional cost to the Construction Manager. The Construction Manager may direct the Contractor to perform necessary grading and drainage to prevent surface run off from damaging the work.

D. Scheduling: The Contractor is solely responsible for the scheduling of his work. The Contractor shall submit a detailed schedule of his work showing specific target dates and final completion dates as follows:

1. The first day that the Contractor is on the Project site.

2. The Contractor shall submit an updated schedule of work along with his invoice for partial payment. Failure to do so will cause the return of the invoice to the Contractor.

3. The Contractor shall schedule his work as may be directed by the Construction Manager to prevent conflicts in areas of work.

E. Work Within Easements

All work shall be within the limits of the Oak Ridge Reservation.

F. Location of Existing Utilities and Piping

1. The location of existing piping and underground utilities such as gas mains, water mains, electric duct lines, etc., as shown on the Drawings have been shown in an approximate way only. The Construction Manager does not assume responsibility for the possibility that during construction utilities other than those shown may be encountered or that actual location of those shown may be different from the locations designated on the Drawings.

2. At the location wherein detailed positions of these facilities become necessary to the new construction, the Contractor shall at his own expense furnish all labor and tools to either verify and substantiate the record drawing location or definitely establish the position of the facilities.

1.04 QUALITY ASSURANCE

A. Applicable Standards

1. General: Current editions or revisions of the following specifications and standards shall apply unless specifically noted otherwise on the Drawings or specified herein. Modifications to standard specifications shall be noted within the Specification and will be noted as revisions to the standard specifications, but will not nullify unaffected portions of the Specifications.

2. American Society for Testing and Materials: Comparable standard specifications for the American Society for Testing and Materials, herein referred to as ASTM and the American Association of State Highway and Transportation Officials, herein referred to as AASHTO, are listed below. Where only one specification number is shown, the standard specification for that society shall apply.

ASTM	AASHTO	TITLE
	M36	Zinc Coated Corrugated Iron or Steel Culverts and Underdrains.
C150	-	Portland Cement, Type II
C14-68T	M86-68	Concrete Sewer, Storm Drain and Culvert Pipe.
D698	-	Moisture-Density Relations of Soils Using 5.5 Pound Rammer and 12 Inch Drop (Standard Proctor).
D1556	-	Density of Soil in Place by the Sand Cone Method.
D1784	-	Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.
D2167	-	Density of Soil in Place by the Rubber Balloon Method.
D2216	-	Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.

D2321	-	Underground Installation of Flexible Thermoplastic Sewer Pipe, and as modified herein.
D2922	-	Test Methods for Density of Soil and Soil-Aggregate in place by Nuclear Methods.
D2937	-	Density of soil in place by the drive cylinder method.
D3017	-	Test Method for Moisture Content of Soil and Soil-Aggregate in place by Nuclear Methods.
D3034	-	Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, and the referenced specifications contained therein.

B. Soil Compaction Control: Qualified soils technicians will be employed by the Facilities Manager for the purpose of identifying soils, checking densities and classifying soil materials during construction. Charges for this service are to be paid for by the Facilities Manager.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The equipment required to perform the operations in conformity with these specifications shall be the responsibility of the Contractor. However, any equipment that results in waste or damage of material, or inaccurate work, or which is otherwise objectionable shall be promptly replaced as directed by the Construction Manager.

B. No work shall be performed after daylight hours unless prior written approval has been obtained from the Construction Manager.

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

The Contractor shall be solely responsible for all field engineering required for construction, furnishing all

lines, grades, and control points necessary for construction, starting from control points and elevations furnished by the Facilities Manager or as shown on the plans.

3.02 SPECIAL SAFETY REQUIREMENTS

A. The Contractor must comply with all Federal, State and Local Safety Codes and Regulations at all times and is responsible for educating his supervisors and employees of the safety requirements and practices to be followed during the course of his work including, but not limited to OSHA and site specific hazard training. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Construction Manager to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

1. Barricades: The Contractor must barricade any open excavations and install adequate warning lights. Temporary bridges shall be installed and maintained by the Contractor to maintain traffic and accessibility of facilities in the area of work during excavation operations. The Contractor shall provide a flagman as required for safety or as directed by the Construction Manager to maintain traffic controls and safety.

2. Access: The Contractor must provide safe access to the bottom of excavations as appropriate.

3. Side Slopes: Sides of excavations must be sloped, or benched, sheeted and shored to maintain the stability of the wall or sides. Roads, streets, sidewalks, and traveled ways shall be kept clear of excavation material at all times. It is the Contractor's responsibility to ensure stability of excavation walls for the safety of personnel and the work.

4. Blasting: Blasting will not be allowed.

5. Working Conditions: Nothing contained herein is to be construed to relieve the Contractor of his responsibility to provide and maintain safe and clean working conditions for his employees and others in the area of his work.

3.03 FIELD DRAWINGS

If changes to the design drawings are required due to field conditions and are approved by the Construction Manager, records of the changes will be kept and turned in to the Construction Manager before submitting the final invoice. Field drawings must show the change to size, location, and elevations and must be approved by the Construction Manager before approval of final payment.

3.04 COMPLETED WORK

Clean-Up: The Contractor shall keep the area in which he is working free of debris, trash, garbage and other offensive waste material and keep all construction materials stockpiled in a neat, orderly manner at points designated by the Construction Manager, until ready for use on the job site.

During construction, traveled ways adjacent to the area of work shall be kept clean and open to vehicular and pedestrian traffic. Upon completion of any stage of work in any area, all debris, trash, litter, construction materials, and like materials shall be removed to the satisfaction of the Construction Manager, and the area left in suitable condition for the next stage of construction or for the use of the Construction Manager.
The Construction Manager may withhold payment of any funds due the Contractor under the following specifications, if in the opinion of the Construction Manager the Contractor has not maintained the work area covered by his contract. Such funds, less any retainage or other sums due the Construction Manager or others, shall be paid the Contractor when required clean-up has been completed to the satisfaction of the Construction Manager.

3.05 SITE WORK

A. The work to be done by the Contractor under Division Two, Site Work, is as shown on the drawings and specified in Division Two sections of the specifications, unless otherwise shown on the plans or specified.

B. If any work described on the plans conflicts with the specifications, the specifications shall govern.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DEFINITIONS

A. Materials: Where the terms approved, suitable, unsuitable and similar designations are used in this section, it means earth or materials designated as being approved, suitable or unsuitable for their intended use by the soils technicians, the Construction Manager or the Facilities Manager. Also suitable materials shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GM, GC, CL, SC, SM, ML, or as designated in other sections of these specifications.

B. Rock: Rock shall be as defined in Section 02000.

C. Contouring Fill: Contouring fill shall consist of soil placed below the impermeable clay layer. Contouring fill shall be obtained from the Y-12 East Borrow Area. Contouring fill shall consist of natural soil containing no rock fragments larger than 4 inches in any dimension. The soil shall be free of topsoil, organics, and any other deleterious materials.

D. Impermeable Clay: Impermeable clay used in the impermeable clay layer described in this section shall consist of Type A or Type B soil as described in Appendix H. The soil shall be obtained from the Y-12 East Borrow Area. The soil shall be free of topsoil, organics, debris and any other deleterious materials and shall contain no rock fragments larger than 2 inches in any dimension.

E. Vegetative Layer: The vegetative layer shall consist of natural-occurring soil for support of vegetation. Soil for the vegetative layer shall be obtained from the Y-12 East Borrow Area. The soil shall be free of debris and other deleterious materials and shall contain no rock fragments larger than 3 inches in any dimension.

F. Earthwork Debris: Earthwork debris shall consist of materials encountered during earthwork operations performed under this project that do nct meet the criteria previously specified for suitable materials.

Earthwork debris shall consist of materials such as, but not limited to, rock fragments larger than specified herein, concrete, asphalt pavement, muck, refuse, mulch, stumps, logs, metal, organic matter and any other combustible or non-combustible materials.

G. Borrow: All borrow materials for the construction of the fill areas shall come from the Y-12 East Borrow Area. The location and proximity of the borrow area is shown on Drawing No. C2E900016A0001. The Contractor shall be responsible for operating and maintaining the borrow area and the haul roads.

1.02 QUALITY ASSURANCE

A. Applicable Standards: The Contractor shall comply with Applicable Standards of Section 02000.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

C. Tests

1. Qualified soils technicians will be employed by the Facilities Manager for the purpose of identifying soils, checking densities and classifying soil materials during construction. Charges for this service will be paid for by the Facilities Manager.

2. Density tests shall be made in accordance with Subsection 3.06, Soil Compaction Control, or as required by the soils technician or as may be directed by the Facilities Manager.

3. The testing requirements summary sheets located in Appendix E shall be used for all tests under this section.

1.03 SUBMITTALS

A. The soils technicians shall submit daily reports of all compaction tests and retests. The reports shall be furnished to the Construction Manager as soon as possible upon completion of the required tests.

B. This report information shall include but not be limited to the following:

1. Date of the test and date submitted.

2. Location of test.

3. Wet density, moisture content and dry density of field sample.

4. Description of material.

5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

6. Ratio of field dry density to maximum lab dry density expressed as a percent.

7. Comments concerning the field density passing or failing the specified compaction.

8. Comments about recompaction if required.

9. Comments about the density and moisture content of the impermeable clay layer being within the acceptable zone as depicted on the applicable Figure A or Figure B in Appendix H.

C. The soils technician shall advise the Construction Manager, the Title III Representative and the Contractor's superintendent immediately of any density tests failing to meet the specified minimum requirements.

D. A formal summary report of all test results shall be submitted to the Facilities Manager.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 FIELD ENGINEERING

Field engineering is the responsibility of the Contractor in accordance with the requirements of Section 02000.

3.02 CLEARING, GRUBBING AND STRIPPING

A. Clearing and Grubbing: The Y-12 East Borrow Area shall be cleared and grubbed as required for removal of borrow. Stockpile and storage areas shall be cleared by the Contractor.

B. Stripping: Strip all vegetable matter, pavement, aggregate base, sod and rubbish from within the capped areas and portions of the borrow area where borrow is to be obtained. Place the material in areas designated by the Construction Manager. Erosion control measures shall be installed prior to stripping.

3.04 EXCAVATION

A. Excavating: Excavate the areas designated on the Drawings to the elevations or depths shown, or as directed by the Construction Manager. The excavated materials shall be segregated into suitable and unsuitable materials and stockpiled for future use or disposal.

B. Dewatering: Refer to Section 02243 for dewatering requirements.

C. Stockpiling: The Contractor may stockpile materials from the borrow area adjacent to the site for use in fill sections as approved by the Construction Manager. Materials excavated at the site shall be placed in suitable and unsuitable stockpiles. All roots, stumps, rock fragments larger than specified in this section, refuse, and other deleterious materials shall be segregated from the excavated materials and disposed of as directed by the Construction Manager. Suitable excavated materials can be stockpiled adjacent to the excavation, but no closer to the bank than five feet. However, the Contractor is responsible for a safe excavation for the protection of the workmen and work. The stockpiled materials shall be no greater than four feet in height and shall not obstruct proper drainage of the area. It is the Contractor's responsibility to construct the stockpiles in such a manner to minimize damage from weather.

3.05 FILLS

A. Preparatory Work

1. Placement of Fill Over Existing Grade.

a. Prior to mobilization to the site by the Contractor, the site will be inspected and proof-rolled by the Facilities Manager and Construction Manager. Any areas of the subgrade damaged by weather or by other means, or identified as unstable during proof-rolling, will be repaired by the Construction Manager at his expense. After mobilization to the site, it is the Contractor's

responsibility to protect the subgrade from weather or construction activities. The Contractor shall not penetrate the existing subgrade, nor shall the Contractor perform any earthwork below the elevation of the existing subgrade except as described in this section of the specifications, or indicated on the Drawings, or as directed by the Construction Manager. Any repairs to the subgrade as a result of the Contractor's negligence shall be at the Contractor's expense.

b. Prior to fill construction, demolition and stripping shall be completed as specified in this section.

c. Areas requiring excavation for construction of ditches, both permanent and temporary, shall be worked prior to placement of fill.

d. Areas to be occupied by fill shall be surveyed by a land surveyor registered in the State of Tennessee under Title III services.

e. All existing cavities or depressions and other irregularities resulting from the stripping operations within the fill construction shall be enlarged to permit use of proper compaction equipment, and backfilled with contouring fill or impermeable clay as appropriate. The material shall be compacted to the criteria indicated in the Subsection 3.06, Soil Compaction Control.

f. Areas to be occupied by fill shall be scarrified with a disc to a minimum depth of one inch to provide good bonding between lifts. Scarrification of areas covered by existing fill shall extend no deeper than 2 inches below the existing fill surface.

g. Temporary ditches or other means of diverting surface runoff shall be constructed prior to fill construction.

2. Placement of the Impermeable Clay Layer.

Areas to be occupied by the impermeable clay layer shall be surveyed by a land surveyor registered in the state of Tennessee under Title III services prior to placement of any impermeable clay.

3. Placement of the Vegetative Layer.

Placement of the planar fluid flow (PFF) mat and flexible membrane liner (FML) shall be approved by the Construction Manager prior to the placement of fill material for the vegetative layer.

B. Installation Procedures

1. General

No fill material shall be placed when weather conditions, condition of the subgrade, or condition of the fill material precludes obtaining the specified compaction. Frozen material shall not be used for fill, and fill materials shall not be placed on or against frozen surfaces. The surface of the fill shall be sloped to provide positive drainage to designated drainage areas. The surface of the fill shall be "sealed" at the end of each day's work by rolling the surface with a smooth, steel-drum roller. The upper inch of the surface of fills that are "sealed" shall be scarified prior to placement of the next layer of fill.

The surface of all fills and all fill materials during placement shall be maintained in a moist condition to reduce the potential for the formation of dust.

2. Contouring Fill

The contouring fill shall be spread in loose layers having a maximum thickness of 6 inches after compaction. The soil shall be uniformly compacted to a minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698). Moisture content of the material at the time of compaction shall be maintained within a range such that the soil remains stable under construction traffic (i.e. the soil does not rut or pump under construction traffic).

3. Impermeable Clay Layer

The fill material from the borrow area shall be blended, placed, and compacted such that the moisture content and density are maintained. The following method of accomplishment describes how the above shall be performed in the field.

Method of Accomplishment:

Borrow soil shall be blended and stockpiled (unless otherwise directed by the Facility Manager's soil testing lab or the Construction Manager) to provide a uniform soil mass. Stockpiled soil shall be sampled, the soil type determined by the Facility Manager's testing lab, and the soil type correlated to the appropriate figure (See Appendix H for Figures A and B). When the soil is placed, the moisture content shall be determined. At this moisture content, compaction shall be required to bring the material to a density within the acceptable zone. Soil shall be place in lifts that are a maximum of six inches thick after compaction. Rock fragments larger than 2 inches in any dimension shall be removed from the soil layer prior to compaction. Soil shall be compacted utilizing a footed roller with feet that have a minimum length of six inches. The roller shall have a minimum static weight of 30,000 pounds. A minimum of six passes of the equipment shall be made over all soil fill layers.

Field compaction tests shall verify that the moisture and density produce points which lie within the acceptable zone. In addition to rolling at the end of each day's work, each lift of the low-permeability soil barrier shall be rolled with a smooth, steel-drum roller to seal the surface as dictated by the weather conditions or as directed by the Construction Manager to prevent drying and cracking of completed soil lifts. If necessary, water should periodically be sprayed onto the completed lift to prevent drying. Prior to placing the next lift of soil, the surface of the previously compacted lift shall be scarified with a disc to a minimum depth of one inch to provide good bonding between lifts. The surface of the final compacted layer of the impermeable clay layer shall be rolled with a smooth, steel-drum roller to "seal" the surface and to help embed any protruding rock fragments. Any rock fragments protruding after rolling shall be removed.

3. Flexible Membrane Liner

The flexible membrane liner (FML) shall be as described in Section 02598.

4. Planar Fluid Flow Mat

The planar fluid flow (PFF) mat shall be as described on the Drawings.

5. Vegetative Layer

Unless otherwise directed by the Construction Manager, the material shall be stockpiled at the site and broken up and homogenized using disc harrows, rotary tillers, or other equipment capable of reducing the size of clods to facilitate moisture control operations, compaction, and to facilitate the placement of the material on the PFF mat. The material must be spread in the direction of the PFF mat overlap to minimize wrinkles. The first lift shall be placed with a loose measure thickness of between 8 and 12 inches. The material shall be rolled with a smooth, steel-drum roller to prevent damage to the PFF mat. The second lift, consisting of 4 to 6 inches of compacted thickness, shall be compacted to a minimum of 90 percent of standard Proctor density. The final lift shall be placed so that a total minimum thickness of 18 inches is constructed for the vegetative layer. If seeding does not occur immediately after placement, the final lift shall be compacted to the same criteria as the second lift and sealed with a smooth, steel-drum roller. The top six inches shall be disked and scarified when seeding operations begin.

6. Completed Work

The Contractor shall be responsible until final acceptance by the Construction Manager for maintaining the stability of all fills made under the contract and shall bear the expense of replacing any portions which, in the opinion of the Construction Manager, have become displaced due to carelessness or negligence on the part of the Contractor, including failure to properly route or contain surface water runoff. Damage to embankments from natural causes and through no fault or negligence of the Contractor shall be replaced and paid for at the contract unit price.

Specifically excluded from extra payment is replacement of slope material washed away by natural rainfall or runoff, which shall be at the expense of the Contractor.

3.06 SOIL COMPACTION CONTROL

A. Compaction Requirements

The percent compaction of maximum dry density as specified herein, and required for fill and embankment areas within the scope of the project, unless otherwise defined in other sections, shall be as follows:

	Material	Minimum Compaction Requirement
1.	Contouring Fill	95% maximum dry density (ASTM D698)
2.	Impermeable Clay	Within acceptable zone of the applicable Figure A or Figure B of Appendix H
3.	Vegetative Layer	
	a. First lift	No testing required
	b. Subsequent lifts	90% maximum dry density (ASTM D698)
4.	All Other Fill	95% maximum dry density (ASTM D698)

B. Compaction Testing

The soil shall be tested for the specified moisture content and density utilizing the following field density test method: The Nuclear Density Test Method (ASTM D2922, D3017), the Drive Cylinder Test Method (ASTM D2937), the Sand Cone Method (ASTM D1556), or another approved ASTM method for testing the moisture content and density of the soil. Field tests shall be conducted after each layer is placed at a frequency of one test per 5,000 square feet of surface area of a compacted layer with a minimum of 2 tests performed on each layer. The locations for the density tests shall be selected randomly by the soils technician or as directed by the Construction Manager.

If the results of the field density tests indicate the density and/or moisture content of the soil is not within the required range, additional compaction and/or drying, the addition of water and additional compaction shall be applied until the density and/or moisture content fall within the required range. No fill shall be placed on layers where the results of field density tests fail to meet the minimum specified criteria.

C. Compaction Results

1. The soils technician shall advise the Construction Manager, the Title III Representative and the Contractor's superintendent immediately of any compaction tests failing to meet the specified minimum requirements.

The Construction Manager will inform the soils technician of any retesting required.

A formal report summary of all test results shall be submitted to the Facilities Manager.

2. No additional lift shall be placed on a lift with any portion failing to meet the specified minimum criteria until all compaction tests have met the specified minimum requirement.

3.07 FINISHED GRADING

A. Preparatory Work: Prior to finish grading of the area, all backfilling shall be completed. Any washouts or other similar irregularities shall be corrected.

B. Finish Grading: All exposed earth surfaces shall be flush graded to within ±0.10 foot of theoretical grade. Finish for grading slopes shall be that degree ordinarily obtainable for either blade-grade or scraper operations, or that obtainable by hand shovel operations. When directed or noted, the accuracy of finish obtained by using templates and stringline or hand raking methods is required in case of shoulders, gutters, and similar areas. All ditches shall be finished so they drain readily.

C. Protection: Maintain the finish grades until finally accepted. Repairs required resulting from negligence and/or repairs to replace slope material washed away by rainfall or runoff is at the Contractor's expense.

3.08 DISPOSAL OF EARTHWORK DEBRIS

A. Disposal of Debris or Waste

1. Non-organic and/or non-combustible earthwork debris shall be deposited in designated disposal areas as directed by the Construction Manager.

2. Organic and/or combustible earthwork debris shall be deposited in designated disposal areas as directed by the Construction Manager.

3. Dispose of all surplus excavated material as directed by the Construction Manager. The Contractor shall utilize all surplus material on site, upon written approval and as directed by the Construction Manager. Use surplus material to widen embankments uniformly, flatten slopes, or deposit as directed by the Construction Manager. All waste material shall be deposited in disposal areas so

that adjacent property will not be adversely affected. Natural drainage shall be maintained or improved as directed by the Construction Manager to protect adjacent properties. In no case shall waste materials be deposited in an unsightly or unsafe manner.

END OF SECTION

SECTION 02221

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SCOPE

This section includes furnishing all labor, equipment, supplies, supervision and materials to excavate and backfill trenches for the flexible membrane liner anchorage system and all underground pipes within the construction limits.

1.02 QUALITY ASSURANCE

A. Applicable Standards: The Contractor shall comply with Applicable Standards of Section 02000.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

C. Tests

1. Qualified soils technicians will be employed by the Facilities Manager for the purpose of identifying soils, checking densities and classifying soil materials during construction. Charges for this service will be paid for by the Facilities Manager.

2. Density tests shall be made in accordance with the Backfilling Procedures or as required by the soils technician or as may be directed by the Construction Manager. The method of density testing shall be as specified in Section 02200, Earthwork.

3. The testing requirements summary sheets located in Appendix E shall be used for all tests under this section.

1.03 SUBMITTALS

A. The soils technicians shall submit daily reports of all compaction tests and retests. The reports shall be furnished to the Construction Manager, as soon as possible upon completion of the required tests.

B. This report information shall include but not be limited to the following.

1. Date of the test and date submitted.

2. Location of test.

3. Wet density, moisture content and dry density of field sample.

4. Description of material.

5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

6. Ratio of field dry density to maximum lab dry density expressed as a percent.

7. Comments concerning the field density passing or failing the specified compaction.

8. Comments about recompaction if required.

C. The soils technician shall advise the Construction Manager, the Title III Representative and the Contractor's superintendent immediately of any density tests failing to meet the specified minimum requirements.

D. A formal summary report of all test results shall be submitted to the Facilities Manager.

PART 2 - PRODUCTS

Materials for backfill shall be as defined in Section 02200.

PART 3 - EXECUTION

3.01 SPECIAL SAFETY REQUIREMENTS

A. Not more than 125 linear feet of trench shall be opened ahead of the installation of the flexible membrane liner anchorage and liner drain system. Not more than a total of 275 linear feet of trench shall be open at any one time. Any trench that is not backfilled at the end of day's work shall be barricaded and marked. Materials obtained from excavation shall not be piled closer than 2 feet to the edge of the excavation. Along streets and roads excavated material shall be kept clear of any traveled way.

B. Nothing contained herein relieves the Contractor of his responsibility to provide safe working conditions for the workmen in the area of construction. Special care shall be taken when backfilling. Any damage caused during backfilling operations shall be promptly repaired at no cost to the Construction Manager. All temporary protective and support systems installed shall remain in place until they can be supported and protected by the trench backfill.

All workmen shall be out of the trench in the areas where backfill material is being placed in the trench. Under no circumstances shall backfill material be transported to the trench over workmen.

3.02 EXCAVATION

A. General Excavation: Excavation for trenches shall be for the proper installation or removal of the utility. Trench walls for the installation of new utilities shall be maintained as nearly vertical as possible.

B. If suitable bearing for the pipe is not encountered at the depth indicated for trench bottom due to wet or unstable material, such material shall be excavated to depth required and refilled and compacted to proper grade with coarse sand, fine gravel, or other suitable approved material approved by the Construction Manager.

C. Excavation shall be open cut, and the width of the trench shall be as shown on the Drawing.

D. Bedding: The bottoms of trenches shall be shaped in undisturbed soil unless otherwise noted. The entire bottom of the excavation shall be firm, stable, at a uniform density, and left undisturbed.

3.03 BACKFILL

A. General: Backfilling operations shall not proceed until all necessary tests, inspections or observations have been performed as required by the applicable utility specification, or unless directed by the Construction Manager. All debris, rocks, broken concrete, formworks, etc., shall be removed from the trench and backfill material prior to the start of backfilling operations. Backfill shall be placed in uniform layers having a maximum thickness of 6 inches, loose measure, and compacted the full width of the trench to a minimum of

95 percent of maximum dry density as determined by ASTM Specification D698, standard Proctor. This procedure shall be carried out for the full height. All backfill material shall be free of muck, rock fragments larger than specified, organic material, broken conrete or other debris.

Each compacted layer of backfill shall be tested for the specified density and moisture content at a minimum frequency of one test per 100 linear feet of backfill with a minimum of two tests for each compacted layer. The locations for the density tests shall be selected randomly by the soils technician or as directed by the Construction Manager.

If the results of the field density tests indicate the density and/or moisture content of the soil are not within the required range, additional compaction and/or drying, the addition of water and additional compaction shall be applied until the density and/or moisture content fall within the required range. No backfill shall be placed on layers where the results of field density tests fail to meet the minimum specified requirements.

All backfill material shall be free of muck, rock, organic material, broken concrete or other debris.

B. Placing Backfill Material: Backfill material shall be placed in the trench in such a manner so as not to disturb the alignment of the utility. Under no circumstances shall a bulldozer or other equipment be allowed to push fill material into the trench.

The material shall not be dropped on the pipe, but placed in a manner as to allow the pipe to remain in place and to allow for the uniform spreading and compaction of the material. Material shall be placed on both sides of the utility so that the backfill will have the same elevation on each side during compaction operations.

No backfill material shall be placed when weather conditions, condition of the subgrade, or condition of the fill material precludes obtaining the specified compaction. Frozen material shall not be used as backfill, and backfill materials shall not be placed on or against frozen surfaces.

END OF SECTION

SECTION 02222

DEVELOPMENT OF BORROW AREA

PART 1 - GENERAL

1.01 DESCRIPTION

This section describes the responsibilities of the Contractor and rules and regulations that the Contractor shall follow during use of the Y-12 East Borrow Area.

1.02 RELATED WORK

A. Section 02000, General Provisions

B. Section 02200, Earthwork

C. Section 02243, Dewatering of Excavations and Fill Areas

D. Section 02821, Grassing

E. Section 02932, Remedial Grassing

1.03 QUALITY ASSURANCE

A. Applicable Standards: The Contractor shall comply with applicable standards of Section 02000.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

C. TESTS

Qualified soils technicians will be employed by the Facilities Manager for the purpose of identifying soils, checking densities and classifying soil materials during construction. Charges for this service will be paid for by the Facilities Manager.

PART 2 - PRODUCTS

2.01 EQUIPMENT

Equipment used to accomplish the work shall comply with requirements of Section 02000.

PART 3 - RULES, GUIDELINES AND RESPONSIBILITIES

3.01 The Contractor shall coordinate his work with the Construction Manager and others using the borrow area.

3.02 The Contractor shall obtain all borrow fron the area designated as Phase I on Drawing No. C2E900016A008.

3.03 The area designated as Phase II on Drawing No. C2E900016A008 can be utilized for staging operations, spreading and manipulating soils, and like operations as approved by the Construction Manager. These operations shall not interfere with other ongoing work in the borrow area. The Contractor shall return the Phase II Area to its original condition after use.

3.04 The new contours shown on Drawing No. C2E900016A008 represent the final design grade for the borrow area prior to closure. Excavation shall not be made below the elevations indicated for the new contours. Any udercutting below the new contour elevations shall be repaired by the Contractor at the Contractor's expense.

3.05 As much as practical, excavation within the borrow area shall be made over the full width of the Phase I Area using uniform slopes. Positive drainage of the borrow area to the existing detention pond shall be maintained at all times.

3.06 Access to the borrow area shall be from the existing haul road. It is the Contractor's responsibility to maintain the haul road and to maintain dust control in the borrow area and on the haul road.

3.07 Temporary side slopes for excavations shall be no steeper than one horizontal to one vertical.

3.08 Positive drainage of the borrow area to the existing detention pond shall be maintained at all times. A minimum slope of 1% shall be maintained within the base of the borrow area for drainage.

3.09 The Contractor shall muck the existing detention pond as directed by the Construction Manager before beginning construction and after every run-off producing rainfall event.

3.10 All existing grassed areas outside the areas to be graded which are disturbed by grading shall have a 4 inch minimum layer of suitable topsoil. Topsoil shall be obtained from the borrow area. The areas shall all be limed, fertilized, seeded and mulched in accordance with

Section 02821, Grassing. Similarly, new side slopes of the borrow area shall be treated similarly.

3.11 The Contractor shall maintain all existing silt fences and replace any damaged silt fences as directed by the Construction Manager.

3.12 Any surveying required shall be provided by the Contractor. All surveying shall be performed by a land surveyor registered in the State of Tennessee. The Contractor shall survey the borrow area upon completion of this work and provide an "as-built" topographic map of the borrow area similar to Drawing No. C2E900016A008. The topographic map drawing shall be sealed by a land surveyor registered in the State of Tennessee. The drawing shall be submitted to the Facility Manager on CAD. The drawing format shall be directly compatible with CADAM or shall be translated into neutral format, either IGES or DXF.

3.13 Clearing and grubbing and stripping of topsoil shall be performed by the Contractor as required to obtain borrow soils. Clearing and grubbing and stripping shall be in accordance with Section 02200, Earthwork.

3.14 Topsoil shall be stockpiled in the area of the existing topsoil storage area in the Phase II area of the borrow area.

3.15 Flagmen, if required shall be provided by the Contractor. Traffic control shall be in accordance with Section 02000, General Provisions.

3.16 Additional access and haul roads may be constructed as necessary within the silt fence boundaries. Any roads not shown on Drawing No. C2E900016A008 but deemed necessary by the Contractor may be built with the approval of the Construction Manager at the Contractor's expense.

3.17 It is the Contractor's responsibility to maintain the borrow area and all haul roads.

3.18 The Contractor shall comply with the "East Borrow Area - Y-12 Plant Best Management Practices (BMP) Plan".

END OF SECTION

SECTION 02243

DEWATERING OF EXCAVATIONS AND FILL AREAS

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes furnishing all labor, equipment, supplies, supervision and materials to dewater excavations and all areas to be filled at the site or borrow area during construction.

1.02 QUALITY ASSURANCE

A. Applicable Standards: The Contractor shall comply with Applicable Standards of Section 02000.

B. Other methods will be considered upon written request to the Construction Manager. The request must demonstrate a correlation with the above standards. The final approval is the responsibility of the Construction Manager.

1.03 EQUIPMENT

Equipment used to accomplish the work shall comply with requirements of Section 02000.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall be responsible for selecting, furnishing, installing, maintaining, operating, and removing the dewatering system as necessary in performance of the work specified herein and as related to other sections of the specifications, and as shown on the plans. If well-point system is used, Contractor shall submit plans to the Construction Manager for review.

B. Surface water shall be diverted from the perimeter of the site to avoid running on to the site. Surface water within the site limits shall be contained and collected

or diverted off site as directed by the Construction Manager.

3.02 EXCAVATIONS

The Contractor shall be responsible for dewatering excavations during construction. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The area excavated at any one time shall be limited to that which can be properly dewatered by the equipment or system in use. Slope the surface of the ground away from the excavation, or provide berms or piping to prevent surface water from entering the excavation. Continue to operate system until backfilling of the structure or pipe system is complete or as directed by the Construction Manager. Water shall be collected and pumped from the excavation to a discharge area designated by the Construction Manager or shall be collected and transported to a disposal area as directed by the Construction Manager.

3.03 FILL AREAS

The Contractor shall be responsible for removing water from areas to be filled. The surface of areas to be filled shall be sloped to provide positive drainage to collection or discharge points as directed by the Construction Manager.

3.04 DISPOSAL OF WATER

Disposal of the water resulting from the dewatering system operation in a manner that will not injure or interfere with normal drainage in the area. In addition, protect from injury any portion of the work completed or in progress, surfaces of streets, and private property. All gutters, drains, culverts, storm sewers, and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. Do not direct water across or over pavement except by methods approved, in writing, by the Construction Manager. The Contractor shall be responsible for repairing all damage resulting from this operation at no cost to the Construction Manager.

END OF SECTION

SECTION 02598

GEOMEMBRANE LINERS

PART 1 - GENERAL

1.00 TERMINOLOGY

Contractor	The general contractor for the entire construction project.
Manufacturer	The manufacturer of the rolls of geomembrane.
Fabricator	The company that seams the rolls in a controlled factory environment. The Fabricator may also be the Manufacturer.
Installer	The company that installs the geomembrane rolls or panels in the field. Most probably this is also the Fabricator.
CQA Inspector	The company that performs manufacturing, fabrication and field installation quality assurance. The CQA Inspector shall be employed and paid by the Contractor but report to the Construction Manager.
Construction Manager	M-K Ferguson is the Construction Manager for construction projects on the Oak Ridge Reservation.
Facilities Manager	Martin Marietta is the Facilities Manager responsible for the operation of the facilities on the Oak Ridge Reservation. The Facilities Manager and the Construction Manager are both representatives of the Department of Energy.

1.01 QUALITY ASSURANCE (CQA)

A. Applicable Standards: Conform to the following standards:

ASTM D4437-84	Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
ASTM D413	Test Methods for Rubber Property - Adhesion to Flexible Substrate
ASTM D618	Methods of Conditioning Plastics and Electrical Insulating Materials for Testing.
ASTM D715-79	Method for Specific Gravity and Density of Plastics by Displacement.
ASTM D792	Tests for Specific Gravity And Density of Plastics by Displacement.
ASTM D816	Methods of Testing Rubber Cements.
ASTM D882	Tests for Tensile Properties of Thin Plastic Sheeting.
ASTM D1004	Tests for Initial Tear Resistance of Plastic Film and Sheeting.
ASTM D1204	Test for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
ASTM D1593	Specifications for Nonrigid Vinyl Chloride Plastic Sheeting.
ASTM D1790	Test for Brittleness Temperature of Plastic Film by Impact.
ASTM D3083-89	Specifications for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining.
ASTM D374-88	Standard Test Methods for Thickness of Solid Electr'cal insulation.
NSF 54-1991	National Sanitation Foundation International Standard 54, "Flexible Membrane Liners."

1.02 SUBMITTALS

A. The Contractor shall submit the following in accordance with the General Conditions:

1. Manufacturer's and Fabricator's literature: Materials description, including raw resin, and materials properties. Details of the Manufacturer's and Fabricator's Quality Control Plans including sampling procedures, acceptance criteria, and an example of a certificate of compliance.

A graph of field seam peel strength as a function of time of accelerated curing at a temperature between 50° and 60°

A statement on the type and amount of any recycled material used to manufacture the geomembrane.

2. Samples: Samples of the liner material, plant seams, and field seams to be used on the project.

3. Shop Drawings: Submit shop drawings showing panel sizes and the locations of factory seams and field seams and any QC test samples. The drawings will show details of penetrations and anchoring not included on the project drawings. The drawings will show where pallets should be placed for unfolding the geomembrane so that it requires minimum handling on deployment.

B. The Contractor shall have the responsibility to ensure the FM receives completed exhibits 2.03-1a, 2.02-2a, 3.01-3a, 3.01-3b, 3.03-1a.

1.03 SHIPPING, HANDLING AND STORAGE

A. Shipping

1. Ship in rolls or accordion folded on pallets protected from the environment and UV radiation. The protection must be such that it will continue to protect the geomembrane when it is stored on-site.

2. Each roll and pallet will be labelled with the following information:

Name of Manufacturer/Fabricator.
Product type and thickness.
Physical dimensions (length and width).
Panel number of placement according to the design layout pattern.

Direction for unrolling or unfolding the membrane.

B. Handling

1. When the geomembrane is delivered to the construction site, it shall be inspected to confirm that it is the material that was specified, (visually compare to samples) and that it is not damaged. Inspection activities will ensure, with a reasonable degree of certainty, that the completed facility meets or exceeds design criteria, plans, and specifications by preventing, detecting, and correcting the following:

   Puncture from nails or splinters.
   Tears from operation of equipment or inadequate packaging.
   Exposure to temperature extremes resulting in unusable material.
   Blocking: the bonding together of adjacent membrane layers, which may be caused by excessive heat.
   Crumpling or tearing from inadequate packaging support.

2. These types of damage may be avoided by careful handling of the geomembrane during preparation for shipment and of the packaged crates and rolls of material.

3. When damage to a crate or roll cover has occurred, careful examination of the underlying material by the CQA Inspector is required. If damage is found, the inspector shall carefully examine the entire shipment for damage.

C. Storage

1. The geomembrane shall be stored in its shipping cover in a dry, cool, secure area, preferably close to the construction area to minimize handling. Pallets will not be stacked on top of each other. Pallets and rolls will be placed on a smooth, level area.

PART 2 - PRODUCTS

2.01 LINER CHARACTERISTICS

TABLE 2.01 PVC LINER SPECIFICATIONS

Property	Value	Test Method
Mean thickness	>0.030 in.	ASTM D1593(9.1.3) Embossed material

Minimum thickness	0.0285 in.	ASTM D374/D1593 Smooth material
Specific Gravity	1.24 - 1.30	ASTM D792, MTD A-1
Tensile Strength	>2300 psi, 69 ppi	ASTM D882(A)
Elongation at Break	>300%	ASTM D882(A)
Modulus at 100% Strain	>1000 psi, >30 ppi	ASTM D882
Tear Resistance	>8 lb	ASTM D1104(C)
Water Extraction	<0.25%	ASTM D3083 (as modified by NSF 54, 1991)
Volatile Loss	0.70% maximum	ASTM D1203(A)
Brittleness Temperature	<-20 deg F	ASTM D1790
Dimensional Stability	5% maximum 212°F 15 minutes	ASTM D1204
Bonded Seam Strength	55.2 ppi	ASTM D3083 (as modified by NSF 54, 1991.)
Peel Adhesion	FTB or 10 lb/in	ASTM D413 (as modified by NSF 54, 1991.)

2.02 FABRICATION

A. The geomembrane shall be suitably formulated from a homopolymer vinyl chloride resin of Type GP in accordance with ASTM D1755 to impart durability. Use of water soluble compounding ingredients is prohibited. Plasticizers that are resistant to migration, mildew, and bacterial degradation shall be used. The geomembrane shall be pigmented to produce a uniform color.

B. The compounding ingredients used in producing membrane liners should be first quality, virgin material meeting specific public health and safety requirements as well as

providing durable and effective formulations for liner applications.

Reprocessed or reground materials are not acceptable, except for clean rework (edge trim) of the same virgin ingredients generated from the manufacturer's own production, to a maximum of 15%.

C. The fabricator must certify that all rolls of geomembrane supplied for the project meet the Manufacturer's and project specifications. The Fabricator will supply Quality Control certificates covering each roll of geomembrane to the CQA project manager before material is shipped from the plant. The QA certificates must, at a minimum include the following:

Thickness
Tensile strength, elongation, and modulus to 100% strain
Tear resistance
Dimensional stability
Brittleness temperature

The Fabricator must also supply QC certificates supplied by the resin manufacturer for each lot of resin used to manufacture geomembrane for the project. The certification for in Exhibit 2.03-1a should be completed by the geomembrane Manufacturer.

D. Blankets or panels should be assembled from roll goods according to the Fabricator's field layout. Any changes must be approved by the Construction Manager.

E. All factory seams will be 100 percent visually inspected and the inspection form shown in Exhibit 2.03-2a will be completed.

F. On each field panel two adjacent rolls will be seamed by the factory seaming technique for a distance of 3 ft outside the normal boundary of the panel. This section of the seam will be destructively tested by the Fabricator's QC testing laboratory for compliance with the specifications in Table 2.01. The seam soil burial test need only be performed once for each project for each combination of raw resin and factory seaming technique.The geomembrane from this extra section of the field panel shall be divided into two parts. One part shall be supplied to the CQA Inspector for conformance testing as follows:

Thickness
Tensile strength, elongation, and modulus to 100% strain

Tear resistance
Dimensional stability
Brittleness temperature

The second part will be supplied to the Construction Manager for archive storage.

The QC certificate supplied by the Fabricator will show the results of seam testing and will identify the number of each roll used to fabricate the field panel.

PART 3 - EXECUTION

3.01 PREWORK

A. The Installer and CQA Inspector should jointly examine the quality and nature of the subgrade to determine its suitability for deploying geomembrane. The surface will be examined for foreign debris, compaction quality, and the existence of burrowing animals. If the presence of animals is evident, the Construction Manager shall be contacted for the appropriate action.

B. Subgrade material shall be free from angular rocks, roots, grass, vegetation, and other debris. Foreign materials and protrusion shall be removed and all cracks and voids shall be filled and the surface made level, or uniformly sloping as indicated on the drawings. The prepared surface shall be free from loose earth, rocks, rubble and other foreign matter.

C. The base shall be compacted according to project specifications after the surface has been prepared.

D. The checklist shown in Exhibit 3.01-3a should be completed by the CQA Inspector and the Acceptance Certificate (Exhibit 3.01-3b) signed by the Installer.

3.02 INSTALLATION

A. Deployment

1. Only that amount of material that can be seamed in one day shall be deployed at any one time.

2. No seams, unless they are unavoidable, shall be placed or made horizontally on side slopes. All slope seams shall run up and down the slope. If horizontal seams are

unavoidable the higher sheet shall be overlapped on top of the lower sheet.

3. There shall be no seam running parallel to the toe of a slope closer than 5 ft to the toe of the slope.

4. Folded geomembrane shall not be unfolded at temperatures lower than 10° C due to the danger of cracking.

5. The geomembrane shall be deployed so that at the time of covering it will contain a minimum of wrinkles and be under minimum stress. This may require that a specific amount of wrinkling be installed in the liner at elevated temperatures to allow for contraction at lower temperatures when the liner is covered.

B. Seaming

Adhesives for field seaming shall be recommended and supplied by the Manufacturer, Fabricator, and Installer. They shall be in their original clearly labelled containers. Labels shall indicate storage conditions and shelf life, all of which must be observed.

1. PVC to PVC Adhesive

Both surfaces to be seamed must be clean. Washing and thoroughly drying may be necessary.

Place a suitably sized board or conveyor belt underneath the overlapped 6 inch seams at the center of the two panels to be seamed. Fold back the top overlap and apply an even coat of adhesive, (use 4 inch brushes) 4 inches wide, to BOTH surfaces. Adhesive shall be applied smoothly in such a way as to minimize trapped air bubbles.

Wait until the adhesive "sets up" to where if will not stick to your clean knuckle. Press the two surfaces together, avoiding wrinkles, and roll the seam with a hand roller toward the edges of the seam to expel trapped air and in a way such that adhesive can be seen at the exposed edge of the seam. Excess adhesive shall be wiped off the geomembrane.

2. Solvent Seaming

Again surfaces must be clean and dry. Following the same procedures as above, apply solvent with plastic squeeze bottle to bottom lap only. Do not fold top lap back.

Immediately wipe up excess solvent with rags after the seam is rolled.

Neoprene gloves and eye protection should be worn by seaming crews. Observe all precautions on labels. Avoid prolonged breathing of adhesive or solvent vapors, and avoid contact with eyes or skin. Immediately rinse with water if solvent comes in contact with eyes or skin.

Extra attention shall be given to areas where seams overlap. adhesive must be apparent at the edge of the bottom seam or the free flap at the edge of the seam must be cut back to the edge of the bond.

3. Hot Wedge Seaming

If field seams are made using the hot wedge thermal fusion technique a test seam, approximately 6 ft long shall be made prior to production seaming. The test seam shall be tested according to the methods listed in Table 2.01 and at least four peel specimens and four shear specimens shall meet the criteria listed in Table 2.01 for the test seam to be considered acceptable. Production seaming shall then be performed using the same machine settings as for the test seam.

Test seams shall be made at least twice per day or whenever there is a major change in the weather conditions. Test seams shall be made by each seamer prior to using each seaming machine, or whenever a machine has been shut down and restarted.

At intersecting seams made by the thermal fusion technique it is imperative that any unbonded flap on the bottom seam be cut back to the edge of the bonded seam prior to making the intersection. All intersecting thermal fusion seams shall be vacuum tested.

When fishmouths occur the wrinkle shall be cut along its peak, the edges overlapped and adhesively seamed. Where there is insufficient overlap to prepare a seam, a patch shall be placed over the cut edges.

Seaming shall not be done at geomembrane temperatures below 10° C or higher than 40° C unless the Installer can demonstrate that trial seams can successfully be made. More frequent destructive samples may be taken outside this temperature range.

Seams shall be made right to the edge of the geomembrane, including into the anchor trenches.

C. The lining shall be placed over the prepared surface in such a manner as to assure minimum handling. The panels shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming.

D. In areas where wind is prevalent, lining installation shall be started at the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags or other means sufficient to hold it down during high winds.

E. Sandbags or rubber tires (without exposed reinforcement) may be used as required to hold the lining in position during installation. Materials, equipment or other items shall not be dragged across the surface of the liner, or be allowed to slide down slopes on the lining. All persons walking or working upon the lining material shall wear soft-sole shoes.

F. Lining panels shall be closely fit and sealed around inlets, outlets and other projections through the lining. Lining to concrete seals shall be made with a mechanical anchor, or as shown on the drawings. All piping structures and other projections through the lining shall be sealed with approved sealing methods.

G. All joints, on completion of the work, shall be tightly bonded. Any lining surface showing injury due to scuffing, penetration by foreign objects, or distress from rough subgrade, shall as directed by the Construction Manager, be replaced or covered, and sealed with an additional layer of lining of the proper size, in accordance with the patching procedure.

H. Repairs to the liner shall be made with patches of the same geomembrane material. The patch shall have rounded corners, a minimum of 3 in radius, and shall extend at least 6 in beyond the edges of the damaged area. All repairs shall be numbered, logged, and nondestructively tested.

I. Seam repairs or seams which are questionable shall be cap stripped with a minimum 12 in wide strip of the liner material. The requirements of Section 3.02 (J) apply to this cap stripping.

J. Cap Stripping Repaired Seams

1. PVC to PVC Adhesive: both surfaces to be seamed must be clean. Washing and thoroughly drying may be necessary.

Apply an even coat of adhesive to cap strip and to both sides of seam to be capped. Wait until the adhesive "sets up" to where if will not stick to your clean knuckle. Press the two surfaces together, avoiding wrinkles, and roll the seam with a hand roller to remove any air bubbles and to ensure a strong bond. Extra attention shall be given to areas where cross seams overlap (see Section 3.02.B.2).

2. Again surfaces must be clean and dry. Following the same procedures as above, apply solvent with plastic squeeze bottle to bottom lap only. Do not fold top lap back. Immediately wipe up excess solvent with rags after the seam is rolled.

3.03 INSPECTION AND TESTING

An independent, qualified geosynthetics construction quality assurance (CQA) Inspector will be employed by the Contractor to monitor all phases of geomembrane fabrication, QC testing, shipping, on-site deployment, field seaming, seam testing, and covering. Charges for this service will be paid by the Contractor.

The CQA Inspector shall have at least five years of geomembrane laboratory testing/CQA experience. Information on the qualifications and experience of the CQA Inspector shall be submitted to the Construction Manager for approval.

A. Plant Inspection and Testing

1. The CQA Inspector shall send a representative to the Fabricator's plant to perform the following duties:

Visually examine the geomembrane
Monitor the seaming operation
Monitor folding, packaging, and labelling panels for shipment

Examine resin QC certificates
Examine manufacturer's QC certificates
Examine Fabricator's conformance testing results and seam QC certificates.
Monitor QC testing procedures
Confirm the acceptability of all materials prior to their shipment to the site

2. One seam sample per panel, or one for each type of resin used to manufacture geomembrane rolls shall be destructively tested according to the methods specified in Table 2.01. The test results will be considered acceptable if no more than one peel and/or one shear specimen fail to meet the criteria listed in Table 2.01.

   All factory seams will be 100% nondestructively tested according to the procedures in Section 3.03 E.

3. A summary report describing the factory inspection and testing shall be submitted by the CQA Inspector to the Construction Manager and forwarded to the Facilities Manager. The report shall include a description of all phases of the membrane Fabricator's procedures, seaming methods, folding and packaging of the membrane, package labeling, and test results. The test results shall include panel number, seam number, test type, failure description (ftb, etc.), and a statement of the acceptance/failure of the seam.

B. Field Inspection and Testing

1. Inspection activities that are necessary before and during liner placement are as follows:

   Log materials delivered to the site and ensure they meet project specifications.

   Ensure that all materials are properly stored.

   Monitor condition of subgrade and anchor trenches and obtain copies of Installer's subgrade acceptance form.

   Ensure that geomembrane placement plan is followed.

   Ensure that weather conditions are appropriate for geomembrane deployment and seaming.

   Monitor all geomembrane surfaces for defects and make spot checks of thickness during deployment.

   Ensure that correct panel overlaps are made and that proper temporary anchorage is used (sand bags, tires without exposed steel reinforcement).

   Ensure that correct seaming adhesive and procedures are used, and that samples are removed for destructive testing. Ensure that the CQA Inspector's and Installer's QC test results are acceptable.

Monitor thermal fusion seaming equipment temperature settings and speed of travel settings.

Ensure that all field seams are nondestructively tested.

Examine all factory seams for apparent defects.

C. The overall quality of a geomembrane installation can be affected by the weather conditions during which it is installed. The Inspector shall be aware of all of these factors and the effects they may have on the specific geomembrane type and seaming procedures. If the weather becomes unacceptable for installation of the liner, the Inspector shall stop the geomembrane installation until conditions again become favorable, thus minimizing the potential for unacceptable installation.

D. Inspection activities during geomembrane placement will help ensure, with a reasonable degree of certainty, that the completed facility meets or exceeds all design criteria, plans, and specifications, by preventing, detecting, and correcting the following:

Liner damage from adverse weather conditions, inadequate temporary anchoring, or rough handling.

Improper liner placement (if the placement plan is not followed) and, as a result, inadequate coverage with the available materials or an excess number of field seams.

Inadequate sheet overlap, possibly resulting in poor quality seams.

Nonwelded or nonseamed sections.

Inadequate seam strength.

Seam gaps or weak spots resulting from the presence of dirt or dust.

Less-than-specified seam strength resulting from the use of unspecified materials, improperly operating equipment, insufficient pressure, ambient temperature extremes, or insufficient dwell time.

Liner damage caused by cleaning or bonding solvents and seaming equipment. Liner damage may also result from walking on the geomembrane while wearing improper footwear or from improper disposal of cigarette butts. Smoking will not be allowed on the geomembrane.

E. Nondestructive Testing

1. After field seams are installed, they shall be inspected to ensure that an adequate bond was formed. Nondestructive tests shall be performed on 100 percent of the field seams.

2. All field seams shall be tested using the Air Lance Method. A compressed air source shall deliver 50 psi minimum through a 3/16 inch nozzle. The nozzle shall be directed to the lip of the field seam in a near perpendicular direction to the length of the field seam. The nozzle shall be held 2 inches maximum from the seam and travel at a rate not to exceed 15 feet per minute. Any loose flaps of 1/8 inch or greater shall require repair. Following OSHA requirements for the protection of personnel during this and all field tests.

3. Failed seams shall be recorded as to location and seaming crew. The data shall be reviewed for possible patterns. Repairs shall be made in accordance with approved techniques and retested to verify their integrity. Any doubtful areas shall be tested with a vacuum seam tester or other device as directed by the Construction Manager.

4. All single track thermal fusion seams shall be 100 percent vacuum tested. Special attention shall be paid to intersecting seams. When vacuum testing is performed a vacuum of 5 psi shall be drawn on each section of the seam for 15 seconds without the appearance of bubbles or frothing.

F. Destructive Testing

1. For every 500 ft of field seam one coupon shall be removed for destructive testing. At least one coupon shall be taken for each geomembrane panel. The sample shall be taken at a location determined solely by the CQA Inspector. The sample shall be approximately 45 in long by 12 in wide with the seam centered along the length direction (should be 45 inches of seam). The seam shall be divided into three equal parts: one for the CQA Inspector's laboratory, one part for the Installer's QC laboratory, and one part for the Facility Manager's archives.

2. Chemically bonded CQA samples shall be tested according to the methods listed in Table 2.01. The results shall be forwarded to the Construction Manager within 48 hr of the sample leaving the site. Prior to testing the sample

shall be given an accelerated curing treatment at 50° to 60° C for 16 hours or according to the specific treatment submitted by the Installer with his qualification data. When removed from the curing oven the specimens shall be allowed to cool in the Standard Laboratory Atmosphere for at least 15 minutes. Acceptance criteria for each peel and shear specimen shall be 80% of the values listed in Table 2.01. If more than one peel and/or shear specimen fail the complete sample shall be rejected.

3. Procedure after Failing Tests

In the event that both, or either, of the samples at the CQA Inspector's laboratory or the Installer's laboratory fail the seam tests either of the following may be performed:

Reconstruct the seam between the nearest passing sample locations on each side of the test location.

Remove additional test samples 10 ft away from the failing test location and on each side of the failing test location. If these samples pass the seam test the seam shall be reconstructed between these locations. If one, or both of these samples fail the seam test, additional samples shall be taken until the limits of the defective area are defined by passing samples on each side of the original failed sample. The seam shall be reconstructed between the two passing samples.

All repair seams shall be nondestructively tested if the patch involves more than 250 ft of seam it shall also be destructively tested.

G. Exhibit 3.03-1a shall be completed by the CQA Inspector, forwarded immediately to the Construction Manager, and a copy included in the CQA summary report.

H. Placement of materials over the geomembrane shall be performed in such a manner that the geomembrane is not damaged or unduly stressed. The CQA Inspector shall monitor the placement of materials, be they other geosynthetics or soils, on top of the geomembrane to ensure that placement does not damage the geomembrane.

I. A summary report describing the field inspection and testing shall be submitted by the CQA Inspector to the Construction Manager and forwarded to the Facilities Manager. The report shall include a description of all phases of the membrane installation, weather conditions, suitability of the subgrade, overlap, visual inspection

of the liner, seaming methods, and test results. The report shall include a description of all nondestructive testing and the results of all destructive seam testing. It shall include details of panel deployment, visual observations, defects found, repairs made, and spot checks on geomembrane thickness. The report shall also include a record drawing showing the layout and numbering of all panels and seams. The locations and numbers of all destructive samples and repairs shall be defined. The drawing may be generated by the CQA Inspector or may be generated by the Installer and approved by the CQA Inspector.

END OF SECTION

SECTION 02821

GRASSING

PART 1 - GENERAL

1.01 SCOPE

This section covers furnishing of all labor, materials, equipment, tools, supervision, and incidentals necessary for grassing as herein specified. The Contractor shall deliver a satisfactory stand of perennial grass which is defined as a full cover of grass that is alive and growing with no bare spots. Areas to be grassed shall be as indicated on the Drawings.

1.02 METHOD OF MEASUREMENT AND PAYMENT

Lump Sum Contracts: Measurement is not required for the lump sum pay item. Payment includes all items of work shown on the Drawings or specified herein.

PART 2 - PRODUCTS

2.01 EQUIPMENT

Equipment shall comply with the requirements hereinafter specified.

2.02 MATERIALS

A. Lime shall be ground or pulverized limestone passing the requirements of the U.S. Department of Agriculture, Agriculture Conservation and Production Administration, for use on farms of the vicinity.

B. Fertilizer shall be a mixed, commercial, non-acid forming fertilizer, containing percentages of available nitrogen, phosphoric acid and potash of 19-19-19. Fertilizer shall be dry in granular or powdered form, shall be delivered to the site in the manufacturer's original bag or container which shall be plainly marked as to formula and non-acid reaction and shall comply with the state fertilizer laws.

C. Ammonium nitrate shall conform to the requirements for commercial fertilizers as listed above and shall have a minimum of 33-1/2% nitrogen. No more than 1,000 pounds of ammonium nitrate shall be stored in any one location and no more than any one day supply shall be transported on site. Hauling and storage with oil based materials is prohibited.

D. Grass seed shall meet the requirements of Section 918.14 of the current edition of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction.

Seed Mixtures: Seeding mixtures shall be applied at 70 pounds per acre.

Seed	Quantity Per Cent by Weight	Seeding Dates
Kentucky 31 Fescue	80	February 1 - July 15
English Rye	5	
Korean Lespedeza	15	
Kentucky 31 Fescue	60	July 16 - December 1
English Rye	20	
White Clover	10	
Annual Rye	10	
Seeding not allowed		December 2 - January 31

Sericea Lespedeza shall be over-seeded on the above mixtures at the rate of 15 pounds per acre on slopes 3:1 and steeper. Scarified Sericea Lespedeza shall be used with an additional 2 pounds per acre of Weeping Lovegrass on over-seeding performed between February 1 and July 15. Between July 16 and December 1 unhulled Sericea Lespedeza shall be used.

E. Water: Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass.

F. Mulch: Mulch shall be dry grain straw, hay sedge grass or other locally harvested vegetation obtained from approved sources, free of noxious weeds, particularly Johnson grass. All such material shall be thoroughly "cured" and dry before spreading.

PART 3 - EXECUTION

3.01 PREPARATORY WORK

A. Liming shall be done immediately after grading has reached the final "smoothing" stage, even though actual seeding may not be done until several months later. Lime shall be used at 2 tons per acre and shall be spread evenly by means of approved mechanical spreaders, sprayers, or distributors. Lime shall be incorporated in the top 4 to 6 inches of soil by harrowing, disking, or other means approved by the Construction Manager.

B. Fertilizer shall be spread not more than two weeks in advance of seeding. Fertilizer shall be spread at a rate of 600 pounds to the acre. Fertilizer shall be protected from damage by weather or otherwise until used. Lumpy fertilizer shall be thoroughly pulverized before placing in the distributor. Even distribution shall be accomplished with mechanical spreaders, sprayers, or distributors approved by the Construction Manager, by spreading half of the rate in one general direction, and the other half at right angles to the first. Within 24 hours after spreading, the fertilizer shall be incorporated into the top 4 to 6 inches of soil by disking, harrowing or other methods approved by the Construction Manager.

C. Tillage: Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition, and shall be approved by the Construction Manager before the work is started. The ground surface shall be cleared of all vegetation, debris, stone, roots, grade stakes, and any other materials which might hinder proper grading, tillage, or subsequent maintenance operations. The areas to be planted shall be thoroughly tilled to a depth of at least 4 inches by plowing, disking, harrowing, or other operations approved by the Construction Manager. The work shall be performed only during periods when beneficial results are likely to be obtained. No work shall be done during periods of drought, excessive moisture or other factors, that satisfactory results are not likely to be obtained. Grades on the areas to be seeded shall be maintained in a true and even condition and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand.

3.02 PLACEMENT

A. Seed shall be sown in accordance with the applicable sections of the current edition of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction. Hydroseeding shall be permitted when equipment approved by the Construction Manager is used and all mixtures are constantly agitated from time of mixing until final application on the seed bed. All such mixtures shall be used within 8 hours from the time of mixing, unless the mixture contains fertilizers, at which time shall be reduced to 30 minutes. Nozzles or spray shall not be directed toward the ground in such a manner as to cause erosion or runoff.

B. Mulching: Mulch shall be spread uniformly at the rate of 80 to 100 bales per acre. Mulch shall be held in place by a polymer based mulch tack applied according to the manufacturer's recommendation.

C. Subsequent Nutriment: 60 days after grass is planted or when grass is 2 inches high, 100 pounds of ammonium nitrate per acre shall be applied to the grass area, unless this condition occurs in the fall or winter, in which case the ammonium nitrate shall be applied the next spring when the grass begins to grow.

D. Watering: Immediately following seeding, or when necessary to maintain growth of grass, and in any case when planting is permitted in dry weather, planted areas shall be watered. Each watering shall be in sufficient quantities to obviate rapid drying out, an at a rate which will not cause erosion. The watering equipment shall be of a type which will not damage finished surfaces.

3.03 COMPLETED WORK

A. Protection: All seeded or mulched areas shall be protected from traffic damage by barricades, signs, or other appropriate means. Any damage occurring before acceptance of the areas shall be repaired at the Contractor's expense.

B. **Acceptance:** Areas to be planted will be accepted by the Construction Manager when all work of seeding and liming and fertilizing is completed, and all work on adjacent areas which might result in damage to the planted area is also completed. Planted areas shall be watered and mowed as necessary to maintain a healthy maximum plant height growth of 8 inches until accepted.

END OF SECTION

SECTION 02932

REMEDIAL GRASSING

PART 1 - GENERAL

1.01 SCOPE

This section covers furnishing of all labor, materials, equipment, tools, supervision, and incidentals necessary for repairing/reseeding areas which have failed to successfully establish a stand of acceptable grass. The Contractor shall deliver a satisfactory stand of perennial grass which is defined as a full cover of grass that is alive and growing with no bare spots. Areas to be repaired/reseeded shall be as designated by the Construction Manager.

1.02 METHOD OF MEASUREMENT AND PAYMENT

Remedial seeding shall be included in the price for grassing Section 02821. Payment includes all items of work specified herein.

PART 2 - PRODUCTS

2.01 EQUIPMENT

Equipment shall comply with the requirements hereinafter specified.

2.02 MATERIALS

A. Lime shall be ground or pulverized limestone passing the requirements of the U.S. Department of Agriculture, Agriculture Conservation and Production Administration, for use on farms of the vicinity.

B. Fertilizer shall be a mixed, commercial, non-acid forming fertilizer, containing percentage of available nitrogen, phosphoric acid and potash of 19-19-19. Fertilizer shall be dry in granular or powdered form, shall be delivered to the site in the manufacturer's original bag or container which shall be plainly marked as to formula and non-acid reaction and shall comply with the state fertilizer laws.

C. Ammonium nitrate shall conform to the requirements for commercial fertilizers as listed above and shall have a minimum of 33-1/2% nitrogen. No more than 1,000 pounds of ammonium nitrate shall be stored in any one location and no more than any one day supply shall be transported on site. Hauling and storage with oil based materials is prohibited.

D. Grass seed shall meet the requirements of Section 918.14 of the current edition of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction.

Seed Mixtures: Seeding mixtures shall be applied at 70 pounds per acre.

Seed	Quantity Per Cent by Weight	Seeding Date
Kentucky 31 Fescue	80	February 1 - July 15
English Rye	5	
Korean Lespedeza	15	
Kentucky 31 Fescue	60	July 16 - December 1
English Rye	20	
White Clover	10	
Annual Rye	10	
Seeding not allowed		December 2 - January 31

Sericea Lespedeza shall be over-seeded on the above mixtures at the rate of 15 pounds per acre on slopes 3:1 and steeper. Scarified Sericea Lespedeza shall be used with additional 2 pounds per acre of Weeping Lovegrass on over-seeding performed between February 1 and July 15. Between July 16 and December 1 unhulled Sericea Lespedeza shall be used.

E. Water: Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass.

F. Mulch: Mulch shall be dry grain straw, hay sedge grass or other locally harvested vegetation obtained from approved sources, free of noxious weeds, particularly Johnson grass. All such material shall be thoroughly "cured" and dry before spreading.

PART 3 - EXECUTION

3.01 PREPARATORY WORK

A. Mowing: If growth of areas to be reseeded is 6 inches or more in height, mow to approximately 3 inches or less. The existing ground surface shall be cleared of all debris, stone, and any other materials which might hinder the mowing operations. Mowing equipment shall be in good condition and shall be approved by the Construction Manager before the work is started.

B. Liming shall be done following any mowing operations. Lime shall be used at 2 tons per acre and shall be spread evenly by means of mechanical spreaders, sprayers, or distributors approved by the Construction Manager. Lime shall be incorporated in the top 4 to 6 inches of soil by harrowing, disking, or other means approved by the Construction Manager.

C. Fertilizer shall be spread not more than two weeks in advance of seeding. Fertilizer shall be spread at a rate of 300 pounds to the acre. Fertilizer shall be protected from damage by weather or otherwise until used. Lumpy fertilizer shall be thoroughly pulverized before placing in the distributor. Even distribution shall be accomplished with mechanical spreaders, sprayers, or distributors, approved by the Construction Manager by spreading half of the rate in one general direction, and the other half at right angles to the first. Within 24 hours after spreading, the fertilizer shall be incorporated into the top 4 to 6 inches of soil by disking, harrowing or other approved methods approved by the Construction Manager.

D. Tillage: Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition, and shall be approved by the Construction Manager before the work is started. The ground surface shall be cleared of all debris, stone, roots, grade stakes, and any other materials which might hinder proper grading, tillage, or subsequent maintenance operations. The areas to be planted shall be thoroughly tilled to a depth of at least 4 inches by plowing, disking, harrowing, or other operations approved by the Construction Manager. The work shall be performed only during periods when beneficial results are likely to be obtained. No work shall be done during periods of drought, excessive moisture or other factors, that satisfactory results are not likely to be obtained.

Grades on the areas to be seeded shall be maintained in a true and even condition and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand.

3.02 PLACEMENT

A. Seed shall be sown in accordance with the applicable section of the current edition of the Tennessee Department of Transportation Standards Specifications for Road and Bridge Construction. Hydroseeding shall be permitted when equipment approved by the Construction Manager is used and when all mixtures are constantly agitated from the time of mixing until final application of the seed bed. All such mixtures shall be used within 8 hours from the time of mixing, unless the mixture containers fertilizer, at which the time shall be reduced to 30 minutes. Nozzles or spray shall not be directed toward the ground in such a manner as to cause erosion or runoff.

B. Mulching: Mulch shall be spread uniformly at the rate of 80 to 100 bales per acre. Mulch shall be held in place by a polymer based mulch tack applied according to the manufacturer's recommendation.

C. Subsequent Nutriment: 60 days after grass is planted or when grass is 2 inches high, 100 pounds of ammonium nitrate per acre shall be applied to the grass area, unless this condition occurs in the fall or winter, in which case the ammonium nitrate shall be applied the next spring when the grass begins to grow.

D. Watering: Immediately following seeding, or when necessary to maintain growth of grass, and in any case when planting is permitted in dry weather, planted areas shall be watered. Each watering shall be in sufficient quantities to obviate rapid drying out, and at a rate which will not cause erosion. The watering equipment shall be of a type which will not damage finished surfaces.

3.03 COMPLETED WORK

A. Protection: All seeded or mulched areas shall be protected from traffic damage by barricades, signs, or other appropriate means. Any damage occurring before acceptance of the areas shall be repaired at the Contractor's expense.

B. **Acceptance:** Areas to be planted will be accepted by the Construction Manager when all work of seeding and liming and fertilizing is completed, and all work on adjacent areas which might result in damage to the planted area is also completed. Planted areas shall be watered and mowed as necessary to maintain a healthy maximum plant height growth of 8 inches until accepted.

END OF SECTION

SECTION 02938

SODDING

PART 1 - GENERAL

1.01 SCOPE

Sodding shall consist of furnishing and placing sod at all locations indicated on the Drawings and preparation of the subgrade for sodding. The Contractor shall deliver a satisfactory stand of perennial grass that is alive and growing with no bare spots. Areas to be sodded shall be as indicated on the Drawings.

1.02 DEFINITIONS

Weeds: Weeds shall include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perrenial Sorrel, Brome Grass, or any other obnoxious grasses or weeds that would inhibit the growth of sod.

1.03 METHOD OF MEASUREMENT AND PAYMENT

Lump Sum Contracts: Measurement is not required for lump sum pay item. Payment includes all items of work shown on the Drawings or specified herein.

1.04 RELATED WORK

Section 02200, Earthwork.

1.05 QUALITY ASSURANCE

A. Sod Producer: Manufacturer specializing in sod production and harvesting with a minimum of five years experience and certified by the State of Tennessee.

B. Sod: Minimum age of 18 months with root development that will support its own weight, without tearing, when suspended vertically by holding the upper two corners.

1.06 REFERENCES

Tennessee Department of Transportation (TDOT), Bureau of Highways, Standard Specifications for Road and Bridge Construction, Section 803, Sodding.

1.07 SUBMITTALS

A. Submit sod certification for grass species and manufacturer of sod.

1.08 DELIVERY, STORAGE AND HANDLING

Sod shall be delivered on pallets. Protect exposed roots from dehydration. Sod shall be stacked in piles and be kept moist until reset. Sod shall be reset within 7 days after harvesting and within 48 hours after delivery to the site unless otherwise approved by the Construction Manager. Sod shall be maintained in a moist condition throughout delivery and storage to prevent dehydration.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Equipment shall comply with the requirements hereinafter stated.

B. All equipment necessary for satisfactory performance of this work shall be on the project and approved by the Construction Manager before work will be permitted to begin.

2.02 MATERIALS

A. Sod: Sod shall conform to the requirements of TDOT Specification, Subsection 803.03, Sod. The sod shall be free of weeds as defined previously in this section.

All sod shall be cleanly cut in strips having a reasonably uniform thickness of not less than 2 1/2 in., a reasonably uniform width of not less than 8 in., and a length of not less than 12 in.

B. Fertilizer: Fertilizer shall be a mixed, commercial, non-acid forming fertilizer, containing percentages of available nitrogen, phosphoric acid and potash of 19-19-19. Fertilizer shall be dry in granular or powdered

form, shall be delivered to the site in the manufacturer's original bag or container which shall be plainly marked as to formula and non-acid reaction and shall comply with the state fertilizer laws.

C. Lime: Lime shall be ground or pulverized limestone passing the requirements of the U.S. Department of Agriculture, Agriculture Conservation and Production Administration, for use on farms in the vicinity.

D. Ammonium Nitrate: Ammonium nitrate shall conform to the requirements for commercial fertilizers as listed above and shall have a minimum of 33-1/2% nitrogen. No more than 1,000 pounds of ammonium nitrate shall be stored in any one location and no more than any one day supply shall be transported on site. Hauling and storage with oil based materials is prohibited.

E. Water: Water shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass.

F. Herbicide: Any herbicide shall comply with regulatory agencies for herbicide composition.

G. ACCESSORIES: Wooden pegs for anchoring sod on slopes shall consist of softwood of sufficient size and length to ensure anchorage.

PART 3 - EXECUTION

3.01 INSPECTION

Verify that prepared subgrade is ready to receive the work of this section.

3.02 WEATHER LIMITATIONS

Sod shall be set or reset only when the soil is moist and favorable to growth. No setting or resetting shall be done between December 1 and February 1, unless weather and soil conditions are considered favorable by the Construction Manager. No work shall be done during periods of drought, excessive moisture or other factors, that satisfactory results are not likely to be obtained.

3.03 PREPATORY WORK

A. The surface of the ground to be sodded shall be loosened to a depth of not less than two inches with a rake or other device.

B. After loosening the ground surface, apply fertilizer at a rate of 350 pounds per acre and lime at a rate of 2 tons per acre uniformly to the upper two inches of the ground surface. The fertilizer and lime shall be applied no more than 48 hours before placing sod. Thoroughly mix the fertilizer and lime into the upper two inches of the ground surface. Lightly water to aid the dissipation of the fertilizer and lime.

C. Moisten the prepared subgrade immediately prior to placing sod. The subgrade shall be sprinkled until saturated for a minimum depth of two inches and shall be kept moist until the sod is placed.

3.04 PLACEMENT

A. Sod shall be placed as soon as practical after removal from the point of origin, and shall be kept in a moist condition during the interim.

B. The sod shall be carefully placed by hand on the prepared subgrade with the edges in close contact and, as far as possible, in a position to break joints. Do not stretch or overlap sod pieces. Sod shall be laid smooth and aligned with adjoining grassed areas.

C. Each strip of sod laid shall be fitted and pounded into place using 10-inch by 10-inch wood tamps, or other satisfactory implements.

D. Immediately after placing, the sod shall be thoroughly wetted and rolled with an approved roller or hand-tamped, as approved by the Construction Manager.

E. On slopes 2 horizontal: 1 vertical or steeper, the sod shall be held in place by pinning or pegging.

F. Subsequent Nutriment: Fourteen days after sodding, 100 pounds of ammonium nitrate per acre shall be applied to the sodded area, unless this condition occurs in the fall or winter, in which case the ammonium nitrate shall be applied the next spring when the grass begins to grow.

3.05 MAINTENANCE

A. Watering: Sodded areas shall be watered as necessary to maintain a healthy, vigorous plant growth or as directed by the Construction Manager. Each watering shall be in

sufficient quantities to obviate rapid drying out, and at a rate which will not cause erosion. The watering equipment shall be of a type which will not damage finished surfaces.

B. Mowing: Sodded areas shall be mowed as necessary to maintain a healthy maximum plant height growth of 8 inches. Immediately remove clippings after mowing and trimming.

C. The Contractor shall control the growth of weeds. Apply herbicides in accordance with manufacturer's instructions or as directed by the Construction Manager. Application of herbicides shall be in accordance with local, state, and/or national requirements.

D. Replacement: Immediately replace sod to areas which show deterioration or bare spots.

3.06 COMPLETED WORK

A. Protection: All sodded areas shall be protected from traffic damage by barricades, signs, or other appropriate means. Any damage occurring before acceptance of the areas shall be repaired at the Contractor's expense.

B. Acceptance: Areas to be sodded will be accepted by the Construction Manager when all work of sodding and liming and fertilization is completed, and all work on adjacent areas which might result in damage to the sodded area is also completed.

END OF SECTION

APPENDIX A

GENERIC SITE SAFETY PLAN

NOTE: This attachment provides a generic plan based on a plan developed by the U.S. Coast Guard for responding to hazardous chemical releases (Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities; National Institute for Occupational Safety and Health; Occupational Safety and Health Administration; U.S. Coast Guard; U.S. Environmental Protection Agency; October 1985). This generic plan can be adapted for designing a Site Safety Plan for hazardous waste site cleanup operations. It is not all-inclusive and should only be used as a guide, not a standard.

APPENDIX A
GENERIC SITE SAFETY PLAN

A. SITE DESCRIPTION

Date _____ Location _____

Hazards _____

Area Affected _____

_____

Surrounding Population _____

Topography _____

Weather Conditions _____

_____

_____

Additional Information _____

_____

_____

_____

_____

B. ENTRY OBJECTIVES

The objective of the initial entry to the contaminated area is to (describes actions; tasks to be accomplished, i.e., identify contaminated soil; monitor conditions; etc.):

C. ONSITE ORGANIZATION AND COORDINATION

The following personnel are designated to carry out the stated job functions onsite. (Note: one person may carry out more than one job function.)

PROJECT TEAM LEADER _____

SCIENTIFIC ADVISOR _____

SITE SAFETY OFFICER _____

PUBLIC INFORMATION OFFICER _____

SECURITY OFFICER _____

RECORDKEEPER _____

FINANCIAL OFFICER _____

FIELD TEAM LEADER _____

FIELD TEAM MEMBERS _____

FEDERAL AGENCY REPS (i.e., EPA, NIOSH) _____

STATE AGENCY REPS _____

_____

_____

_____

_____

LOCAL AGENCY REPS _____

_____

_____

_____

_____

CONTRACTORS _____

_____

_____

_____

_____

All personnel arriving or departing the site should log in and out with the recordkeeper. All activities onsite must be cleared through the project team leader.

D. ONSITE CONTROL

_____ has been designated to coordinate access control and
(Name of individual or agency)
security onsite. A safe perimeter has been established at _____

_____
(distance or description of controlled area)

_____

No unauthorized person should be within this area. The onsite command post and staging area have been established at _____

The prevailing wind conditions are _____. This location is upwind from the exclusion zone.

Control boundaries have been established, and the exclusion zone (the contaminated area), hotline, contamination reduction zone, and support zone (clean area) have been identified and designated as follows (describe boundaries and/or attach map of controlled area):

These boundaries are identified by (marking of zones, i.e., red boundary tape - hotline, traffic cones - support zone, etc.):

E. HAZARD EVALUATION

The following substance(s) are known or suspected to be onsite. The primary hazards of each are identified.

Substances Involved (Chemical Name)	Concentrations (If Known)	Primary Hazards (e.g., toxic on inhalation

The following additional hazards are expected onsite (i.e., slippery ground, uneven terrain, etc.):

_____

_____

Hazardous substance information form(s) for the involved substance(s) have been completed and are attached.

F. PERSONAL PROTECTIVE EQUIPMENT

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work area or tasks:

Location	Job Function	Level of Protection
Exclusion Zone	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other
Contamination Reduction Zone	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other

Specific protective equipment for each level of protection is as follows:

Level A	Fully encapsulating suit	Level C	Splash gear (type)
	SCPA		Full-face canister
	(disposable coveralls)		resp.
	_____		_____
	_____		_____
	_____		_____
Level B	Splash gear (type)	Level D	_____

SCBA _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Other _____

_____

_____

The following protective clothing materials are required for the involved substances:

Substance (Chemical Name)	Material (Material Name, e.g., Viton)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

If air-purifying respirators are authorized, filtering medium is the appropriate canister for use with the involved substances and concentrations. A competent individual has determined that all criteria for using this type of respiratory protection have been met.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE SITE SAFETY OFFICER AND THE PROJECT TEAM LEADER.

G. ONSITE WORK PLANS

Work party(s) consisting of _____ persons will perform the following tasks:

	Name	(Function)
Project Team Leader	_____	_____

Work Party #1	_____	_____
		_____
		_____
		_____
Work Party #2	_____	_____
Rescue Team (required for entries to IDLH environments	_____	_____
		_____
		_____
Decontamination Team	_____	_____
		_____
		_____
		_____

The work party(s) were briefed on the contents of this plan at:

_____

H. COMMUNICATION PROCEDURES

Channel _____ has been designated as the radio frequency for personnel in the exclusion zone. All other onsite communications will use Channel _____.

Personnel in the exclusion zone should remain in constant radio communication or within sight of the project team leader. Any failure of radio communication requires an evaluation of whether personnel should leave the exclusion zone.

(Horn blast, siren, etc.) is the emergency signal to indicate that all personnel should leave the exclusion zone. In addition, a loud hailer is available if required.

The following standard hand signals will be used in case of failure of radio communications:

Hand gripping throat	Out of air, can't breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK; I am all right; I understand
Thumbs down	No; negative

Telephone communication to the command post should be established as soon as practicable. The phone number is _____.

I. DECONTAMINATION PROCEDURES

Personnel and equipment leaving the exclusion zone shall be thoroughly decontaminated. The standard level _____ decontamination protocol shall be used with the following decontamination stations:

(1) _____ (2) _____ (3) _____

(4) _____ (5) _____ (6) _____

(7) _____ (8) _____ (9) _____

(10) _____ Other _____

Emergency decontamination will include the following stations:

_____

_____

_____

The following decontamination equipment is required:

_____

_____

_____

Normally detergent and water will be used as the decontamination solution.

J. SITE SAFETY AND HEALTH PLAN

1. _____ _____ is the designated site safety officer and is directly
(name)
responsible to the project team leader for safety recommendations onsite.

2. Emergency Medical Care

_____ are the qualified EMTs onsite.
(names of qualified personnel)

_____, at _____,
(medical facility names) (address)

phone _____ is located _____ minutes from this location.

_____ was contacted at _____ and brief on the situation,
(name of person) (time)

the potential hazards, and the substances involved. A map of alternative routes to

this facility is available at _____. Local ambulance service
(command post)

is available from _____ at phone _____ _____.

Their response time is _____ minutes. Whenever possible, arrangements

should be made for onsite standby. First-aid equipment is available onsite at

the following locations:

First-aid kit _____

Emergency eyewash _____

Emergency shower _____

Other _____

Emergency medical information for substances present:

Substance	Exposure Symptoms	First-Aid Instructions

List of emergency phone numbers:

Agency/Facility	Phone	Contact
Police		
Fire		
Hospital		
Airport		
Public Health Advisor		

3. Environmental Monitoring

The following environmental monitoring instruments shall be used onsite (cross out if not applicable) at the specified intervals.

Combustible Gas Indicator	- continuous/hourly/daily/other	
O2 Monitor	- continuous/hourly/daily/other	

Calorimetric Tubes	- continuous/hourly/daily/other	_____
_____ (type)	_____	
_____	_____	
_____	_____	
HNU/OVA	- continuous/hourly/daily/other	_____
Other _____	- continuous/hourly/daily/other	_____
_____	- continuous/hourly/daily/other	_____

4. Emergency Procedures (should be modified as required for incident)

The following standard emergency procedures will be used by onsite personnel. The site safety officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone: Upon notification of any injury in the exclusion zone, the designated emergency signal _____ shall be sounded. All site personnel shall assemble at the decontamination line. The rescue team will enter the exclusion zone (if required) to remove the injured person to the hotline. The site safety officer and project team leader should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the support zone. The onsite EMT shall initiate the appropriate first-aid, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall re-enter the exclusion zone until the cause of the injury or symptoms is determined.

Personnel Injury in the Support Zone: Upon notification of an injury in the support zone, the project team leader and site safety officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, with the onsite EMT initiating the appropriate first-aid and necessary follow-up as stated above. If the injury increases the risk to others, the designated emergency signal _____ shall be sounded, and all site personnel shall move to the decontamination line for further instructions. Activities onsite will stop until the added risk is removed or minimized.

Fire/Explosion: Upon notification of a fire or explosion onsite, the designated emergency signal _____ shall be sounded, and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Personal Protective Equipment Failures: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the exclusion zone. Re-entry shall not be permitted until the equipment has been repaired or replaced.

Other Equipment Failure: If any other equipment onsite fails to operate properly, the project team leader and site safety officer shall be notified and then determine the effect of this failure on continuing operations onsite. If the failure affects the safety of personnel or prevents completion of the work plan tasks, all personnel shall leave the exclusion zone until the situation is evaluated and appropriate actions taken.

The following emergency escape routes are designated for use in those situations where egress from the exclusion zone cannot occur through the decontamination line (describe alternate routes to leave area in emergencies):

_____

_____

_____

_____

_____

In all situations, when an onsite emergency results in evacuation of the exclusion zone, personnel shall not re-enter until:

a. the conditions resulting in the emergency have been corrected;

b. the hazards have been reassessed;

c. the site safety plan has been reviewed;

d. site personnel have been briefed on any changes in the site safety plan.

5. Personal Monitoring

The following personal monitoring will be in effect onsite:

Personal Exposure Sampling: (Describe any personal sampling programs being carried out on site personnel. This would include use of sampling pumps, air monitors, etc.)

Medical Monitoring: The expected air temperature will be _____ (degrees F). If it is determined that heat stress monitoring is required (mandatory if over 70 degrees F), the following procedures shall be followed (describe procedures in effect, i.e., monitoring body temperature, body weight, pulse rate):

_____

_____

_____

_____

All site personnel have read the above plan and are familiar with its provisions.

Site safety officer	_____ (name)	_____ (signature)
Project team leader	_____ (name)	_____ (signature)
Other site personnel	_____ (name)	_____ (signature)
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

APPENDIX B

CONSTRUCTION MANAGER'S SITE SAFETY PLAN

APPENDIX B
CONSTRUCTION MANAGER'S SITE SAFETY PLAN

A. HEALTH AND SAFETY PLAN

1. GENERAL INFORMATION

a. Client: U.S. Department of Energy

b. Contracting Officer: To Be Determined

c. Site Manager: To Be Determined

d. Site Safety Coordinator: To Be Determined

e. Site Location: Y-12 Burial Ground, Oak Ridge, TN

f. Background Information: Information is available from U.S. Department of Energy Y-12 Plant, U.S. EPA

2. SITE CHARACTERISTICS

a. Facility Description:

Waste oils and solvents disposed in trenches and covered with soil. Leachate from the burial grounds area was collected and stored in two ponds.

b. Status (active, inactive, unknown):

Active.

c. Principal Disposal Method (type and location):

Waste oils and solvents disposed in trenches in Burial Ground A.

d. Features and Unusual Conditions (power lines, gas lines, geographical setting, water mains, terrain, etc.):

Above-ground power lines. The terrain is hilly on the east and west sides of both ponds. The drainage area (Tributary No. 7) upstream and downstream from the pond is densely covered with trees and brush.

e. History (worker or non-worker injury; complaints from public; previous Agency action:

3. SCOPE OF WORK

a. Summarize Previous Site Activities:

b. Planned Site Activities and Dates:

c. Number of People on Site:

d. Number of Days to Complete Work:

4. WASTE CHARACTERISTICS

a. Waste Type(s)

Liquid	X	Solid	X	Sludge	
Gas		Other			

b. Waste Characteristics

Corrosive	X	Ignitable	X	Radioactive	X
Volatile		Toxic		Reactive	
Unknown		Other (Name)			

5. HAZARD EVALUATION

a. Chemical Hazards (includes known concentration data, TLVs, PELs, etc.)

1) Respiratory

2) Dermal

b. Physical Hazards

c. Hazards Posed by Site Activities

d. Unusual Hazards

e. Overall Hazard Level (low, moderate, high; include brief justification)

6. PROCEDURES

a. Training Requirements

All personnel who will be engaged in site activities must present, to the Site Safety Coordinator, certification of completion, within the 12 months prior to the beginning of site activities, of a hazardous waste site investigation training course or refresher course. The training must comply with EPA Order 1440.2 and OSHA regulations found at 29 CFR 1910.120 et. seq. The certification must be presented before site activities begin.

b. Medical Monitoring Requirements

All personnel who will be engaged in site activities must present, to the Site Safety Coordinator, certification of completion, within the 12 months prior to the beginning of site activities, of a comprehensive medical monitoring examination. The examination must comply with OSHA regulations found at 29 CFR 1910.12 et. seq. The certification must be signed by a medical doctor and indicate any work limitations placed on the individual. The certification also must specify that the individual is capable of working while wearing respiratory protective equipment. The certification must be presented before site activities begin.

c. Personnel Protective Equipment

Level of Protection

A ____ B ____ C ____ D ____

Modifications (include action levels):

Monitoring Requirements

Ambient air monitoring will be conducted continuously while site activities are in progress. Monitoring instruments will include the following:

- HNU (PID) or OVA (FID) for organic vapors
- O_2/LEL meter
- Radiation detector
- Draeger pump and tubes for cyanide (other species as required)
- Noise meter
- Dust meter (as required)

The Site Safety Coordinator will record instrument readings every 15 minutes. Upgrade/downgrade decisions will be based on monitoring results in the breathing zone and the action levels listed above. Calibration and maintenance of monitoring equipment will be the responsibility of the Site Safety Coordinator and will be conducted in accordance with manufacturer's requirements as listed in the appropriate manual.

d. Site Organization and Control

Map/Sketch Attached? _____
Site Secured? _____
Perimeter Identified? _____
Zone(s) of Contamination Identified? _____

Note: Work zones within the site (exclusion area, contamination reduction area, support area) should be established so that the support area is upwind of the exclusion area.

e. Team Organization

Team Member	Responsibility

f. Initial Procedures

- Locate nearest available telephone
- Confirm and post emergency telephone numbers and route to hospital
- Designate at least one vehicle for emergency use
- Determine prevailing wind location, establish preliminary work zones (support area, contamination reduction area, exclusion area)
- Perform initial site reconnaissance for RI
- Other (specify)

g. Work Limitations

- No eating, drinking, or smoking onsite.
- No contact lenses to be worn onsite.
- Work restricted to daylight hours only.
- Buddy system is use at all times in exclusion zone.
- Personnel to wear TLD badges at all times when on or near the site.
- Work to stop during thunderstorms or electrical storms.
- No facial hair that would interfere with respirator fit.
- Continuous air monitoring to occur while site activities are in progress.
- Other (specify).

h. Decontamination Procedures (Specify equipment and organization.)

1) For Personnel:

2) For Equipment:

3) For Vehicles:

i. Disposal Procedures

1) Contaminated Liquids:

2) Contaminated Clothing:

j. Safety Equipment (Specify required equipment.)

7. EMERGENCY INFORMATION

a. Emergency Routes

b. Contingency Plan

Specify the following:

1) Pre-emergency planning

2) Personnel roles, lines of authority, training and communication

3) Emergency recognition and prevention

4) Safe distances and places of refuge

5) Site security and control

6) Evacuation routes and procedures

7) Decontamination

8) Emergency medical treatment and first aid

9) Emergency alerting and response procedures

10) Critique of response and follow-up

11) PPE and emergency equipment

c. Emergency Contacts (B&V)

1) Dale S. Suffala/B&V Field Services Manager
Phone: 913/661-6421 (w)
816/361-9650 (h)

2) Dr. Carolyn Parsons, MD/Business & Industry Health Group
Phone: 913/894-6600 (w)

3) Ruth A. Case/B&V Workman's Compensation Administrator
Phone: 913/339-3106

NOTE: If a work-related injury or exposure occurs, notify the Workman's Administrator as soon as possible after obtaining medical attention for the injured party. Notification must be made within twenty-four hours of the injury.

d. Local Emergency Contacts (specify)

8. PLAN PREPARATION

PREPARED BY: _____ Date: _____

REVIEWED BY: _____ Date: _____

APPROVED BY: _____ Date: _____

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NOTICE

This safety plan is produced for the use of Black & Veatch on the specific Project indicated herein. This safety plan is not intended or represented to be suitable for use by others on the Project, or for reuse on extensions of the Project, or for use on any other project. Any use without written verification or adaptation by Black & Veatch will be at the user's sole risk and without liability or legal exposure to Black & Veatch.

9. PLAN DISTRIBUTION (Specify.)

10. CERTIFICATIONS

(Note: This page should be retained by the Site Safety Coordinator and incorporated into the project file.)

By my signature, I certify that:

1. I have read,

2. I understand, and

3. I will be abide by

the Site Safety Plan for the _____ site.

Printed Name	Signature	Date	Affiliation

APPENDIX C1

UNC SITE CLOSURE BEST MANAGEMENT PLAN (BMP)

UNITED NUCLEAR CORPORATION SITE CLOSURE BEST MANAGEMENT PRACTICES (BMP) PLAN

Prepared by:

Martin Marietta Energy Systems, Inc.
Oak Ridge, Tennessee 37831

March 13, 1990

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UNC Site Closure - Y-12 Plant
Best Management Practices (BMP) Plan

Introduction

The purpose of this document is to provide a site specific Best Management Practices (BMP) plan for the closure of the United Nuclear Corporation (UNC) waste disposal site at the Y-12 Plant. This BMP is incorporated by reference to the plant-wide baseline document, *Y-12 Best Management Practices*[1] (Y/TS-135) of December 1985.

Section 304(e) of the Clean Water Act enables the Administrator of the Environmental Protection Agency to control point source releases of pollutants. The National Pollutant Discharge Elimination System (NPDES) requires that facilities with the potential for releasing pollutants to the waters of the United States submit a Best Management Practices Plan specified in 40 CFR 125, Subpart K as a part of the discharge permit application.

According to the Martin Marietta Energy Systems, Inc. Environmental and Waste Management Policy[2] (ESH-14), "It is company policy to establish and to maintain waste management, pollution control, and surveillance programs which are consistent with company and Department of Energy (DOE) policy and which meet the requirements of federal, state, and local regulations to assure that installation personnel, the general public, and the environment are protected against hazardous pollutants."

Implementation of the BMP will be initiated by providing the plan to all parties involved in UNC closure activities. Recurring formal site inspections will be made and recorded to assure compliance with the provisions of this plan.

Site Description

The Y-12 Plant site (Figs. 1 and 2) occupies 811 acres on the 37,000 acre Oak Ridge Reservation. The plant is located three miles south of the City of Oak Ridge in eastern Bear Creek Valley between Chestnut Ridge to the south and Pine Ridge to the north. Further general information concerning the plant is available in the plant-wide baseline BMP.

The existing UNC waste disposal site will be closed through the application of a multi-layer cap as discussed in document Y/IA-200, "Closure Plan for the United Nuclear Corporation Waste Disposal Site." Containers were placed in the disposal area according to instructions contained in the Criticality Safety Approval issued in response to request 13193, submitted on June 11, 1982. The waste was shipped from the Wood River Junction, Rhode Island UNC Plant beginning in June 1982 and continuing through 1985, with 90% of the waste shipped prior to August 1983. The present project requires placing a cover over the containers in order to close the site.

The burial site was designed to contain 38,000 drums with an approximate volume of 27,000 cubic yards. The dimensions of the facility measure 233 ft along the north and south boundaries, 196 ft along the east boundary, and 166 ft along the west boundary. The depth of the pit varies from a maximum of 30 ft at the northeast corner to 6 ft at the northwest and southwest corners.

Of the containers at the site, 18,000 contain soil and 11,000 contain sludge fixed in concrete for a total of 29,000. Using the information provided on the UCN-741s used to transfer the accountability of uranium from UNC to Y-12, ~20,000 drums of the waste contained <1 g per container and if this information is used to determine the uranium shipped, the total uranium shipped was 17 kg of 97% U-235 material and an average of 2 ppm per container.

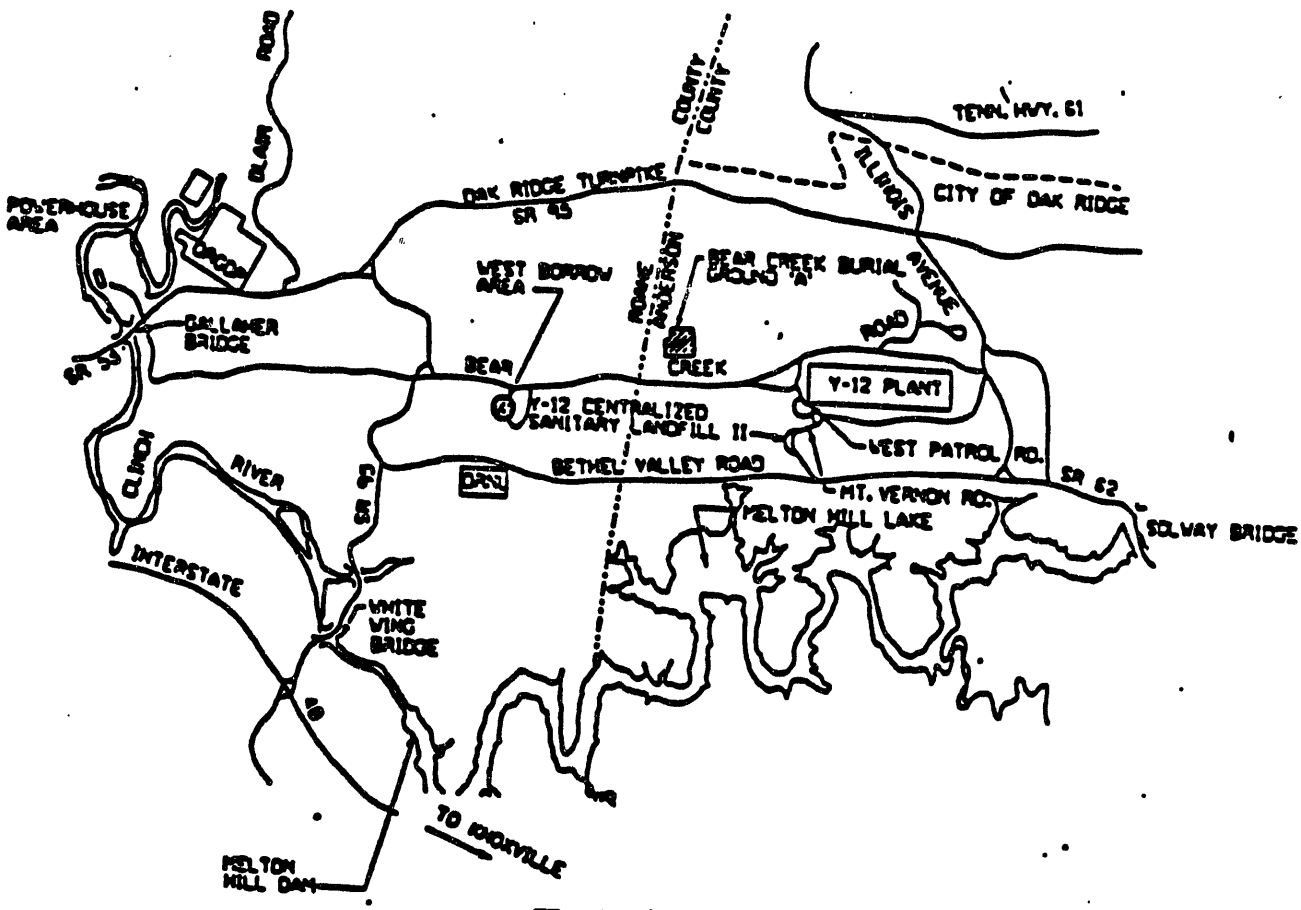
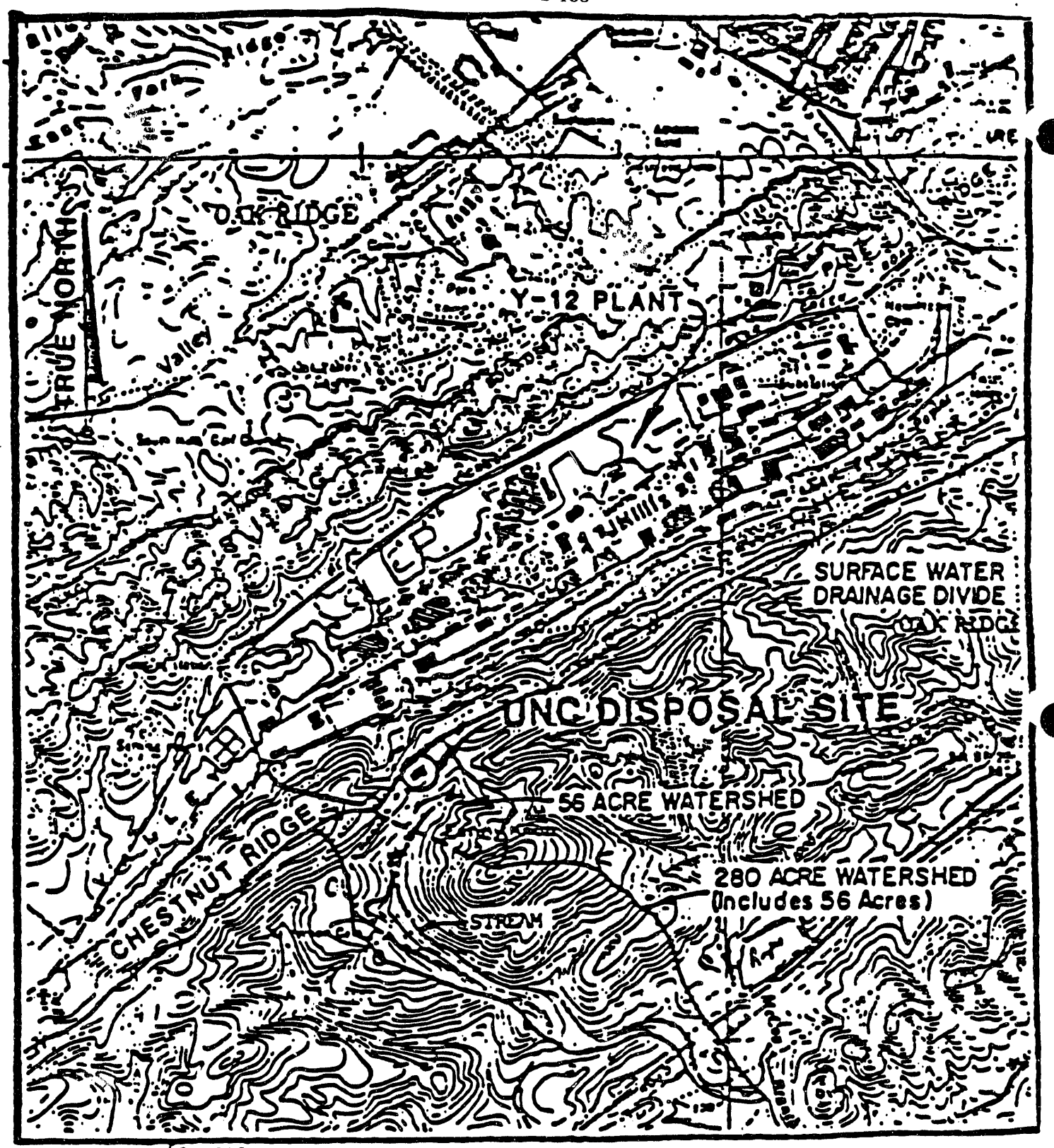
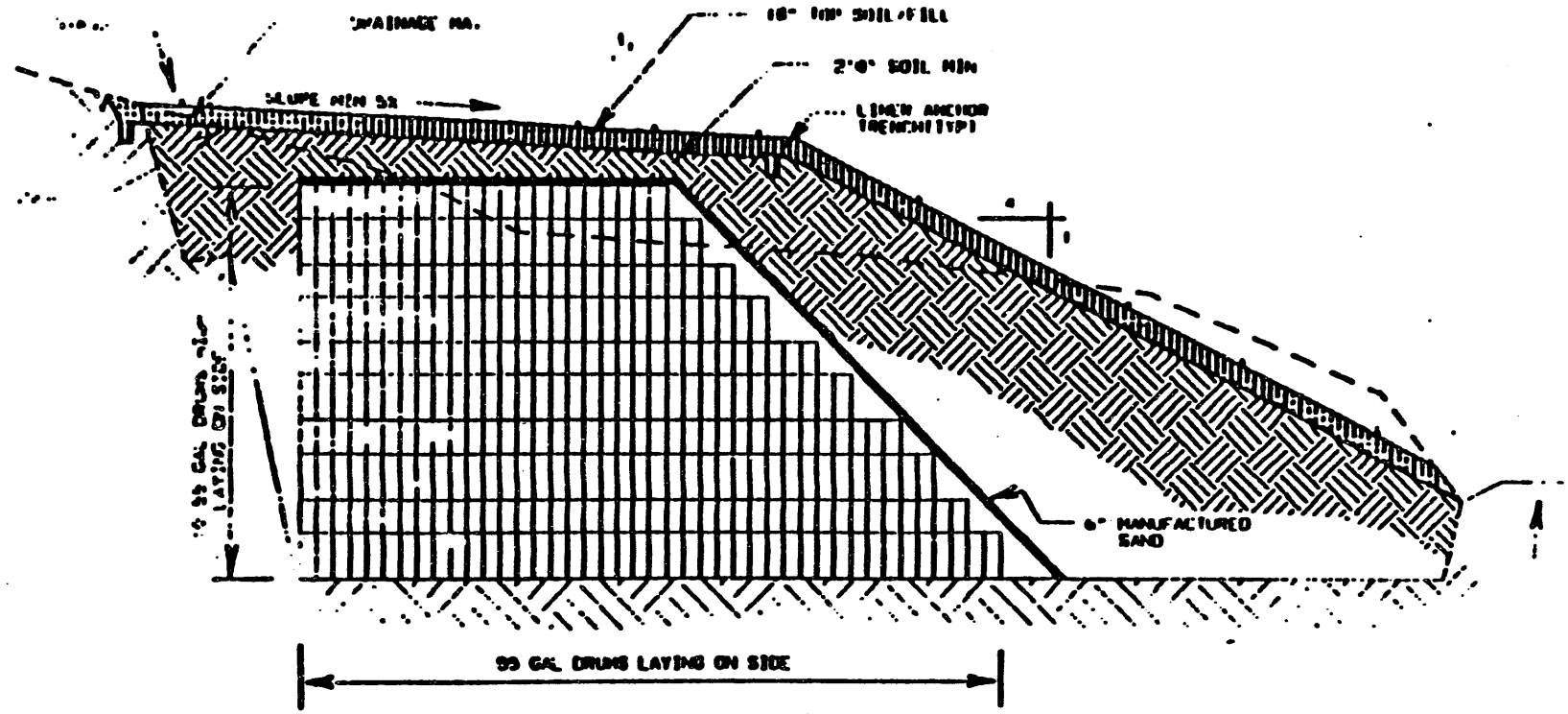


Fig. 1. Area map.



Sources: U.S.G.S. Quads- 130-NE, 138-NW, 137-SW, and 129-SE
Scale: 1" = 2000'

Fig. 2. Study Area Watersheds and Drainage Divides



LEGEND

UNC SITE CLOSURE

SCALE: 1"=20'0" HZ 1"=0'3" VT

The multi-layer cover will be placed over the entire area in the following order: (1) a minimum of 6 in. of limestone sand; (2) a minimum of 24 in. of compacted soil; (3) a 30-mil thick synthetic membrane; (4) a synthetic drainage layer; (5) an 18-in. vegetative cover. All soil layers in the cover will be installed with a minimum slope of 3% to minimize water infiltration. An engineering contractor will install the cover at the site following completion of safety and environmental documentation and receipt of instruction to proceed.

In addition to the 29,000 drums of waste, 238 boxes from UNC containing contaminated hoods, piping, equipment, and debris, were also placed in the disposal site. Some of these boxes, located near the southern perimeter of the site, will be relocated closer to the drums and remaining boxes prior to closure.

Following closure the Y-12 Plant will provide continued surveillance through visual inspections of the cap and analysis of samples taken from monitoring wells placed around the area. Site inspections and routine maintenance will be performed by Waste Management Department personnel and sampling of monitoring wells will be performed by Environmental Management Department personnel.

Employee Training

Employees of the Y-12 Plant receive a broad range of environmental, health, and safety training based on their job requirements. Rust direct hire labor force and Martin Marietta personnel working on the UNC closure project received site specific training in accordance with OSHA/SARA Hazard Communication Procedure 1910.1200. A more detailed description of training is provided in the baseline BMP. Environmental awareness is raised by issuing periodic bulletins concerning topics such as spill control. Supervisors are responsible for providing on-the-job training with respect to hazardous materials handling and company environmental policy.

Contractors/subcontractors performing work in the UNC closure project are required to comply with Martin Marietta/DOE Environmental Policy including the provisions of this BMP and 29 CFR 1926 (Occupational Safety Health Standards for the Construction Industry). Contractor foremen are responsible for their employees. All site personnel are to perform the work as specified in the drawings, specifications, or as directed by the construction engineer.

Spill Prevention and Control

The Spill Prevention Control and Counter-Measures for the Y-12 Plant[3] (SPCC Plan) provides the details concerning roles and responsibilities of employees. This document is incorporated in the plant-wide baseline BMP and only that portion directly related to closure and operations at the UNC closure site are summarized here.

Y-12 has a Spill Control Committee as required by Section 402 of the Clean Water Act. The committee is composed of representatives from all plant functions and is charged with the responsibility for development and oversight of the Spill Prevention Program.

"General Guidelines for Responding to Hazardous Materials Releases," dated August 26, 1985, is provided in the Appendix. UNC closure company, contract, and subcontractor personnel are required to call the Plant Shift Superintendent's (PSS) Office by phone at 574-7172 or by radio and report any incident with potential adverse environmental, health, or safety effects. The same information is provided to the Plant Environmental Coordinator (EC) at 574-3647 or by radio. The employee discovering/ causing the incident has the responsibility to report it to the PSS and his supervisor immediately. The "Guidelines" must be communicated to all employees working at the UNC closure site so that Y-12 Spill Response Procedures are understood.

The Y-12 Spill Prevention Program requires that all possible precautions be taken to minimize the likelihood of a spill. Guidelines for design and construction of hazardous

material storage tanks and secondary containment are specified in *Design Standards for Hazardous/Toxic Waste and Material Storage Tanks, Dikes, and Transfer Stations*,[4] Y/TS-104.

At the UNC closure site, any fuel storage tank(s) with greater than 100 gallon capacity are required to be diked to minimize the probability of any release to the watershed. All tanks over five gallons are required to be labeled with the appropriate Hazardous Identification Label (diamond) as identified in the National Fire Protection Associates Code[5] (NFPA-704). Tanks, drums, or other containers of hazardous/toxic material such as cleaning solvents, some detergents, degreasers, etc., will require secondary containment while stored on-site.

All heavy and mechanical equipment will be maintained in good repair so as to minimize the release of engine, transmission, or other oils through slow leaks. Idle equipment will be parked as far away from streambeds as practical. A drip pan provided by the contractor will be used under equipment leaking excessively.

Fueling operations will be performed with care to prevent inadvertent small releases. Spilled material, if any, will be cleaned up daily, placed in appropriate containers, and disposed in accordance with Y-12 waste operations procedures via the construction engineer.

There is a plant-wide contingency plan in the event of an emergency evacuation of the plant. It is the employer's responsibility to provide emergency signal and procedure information to his employees.

If a spill occurs in the UNC closure site, all safe and practical methods available should be used to prevent material from entering streams, creeks, or springs. Spill response kits containing sorbent material will be provided by the company at the site. Sorbent pillows, temporary earth dikes, or other readily available means should be employed, if possible, without risk of personal safety.

Additionally, should waste drums or boxes rupture while being moved, the Health Physics Department should be contacted immediately so that we can determine the extent of any contamination or exposure to personnel which may occur. In addition, all personnel working on the site must wear dosimeters, and there should be no eating, drinking, smoking, chewing, etc., while in the site area.

During construction activities, construction personnel are to wear normal company clothing and company shoes. (The contractor furnished his own clothing and shoes.)

Good Housekeeping Practices

Good housekeeping practices will be observed by all personnel present in the UNC closure site at all times. Paper trash and refuse will be contained, collected, and disposed of at an appropriately permitted facility. Portable toilets will be maintained in such a manner that their contents remain contained. No waste water of any type will be discharged on-site. All rinse water containing additives of any sort (i.e., soap, degreasers, cleaning agents) will be collected, contained, and disposed of in accordance with the appropriate Y-12 Plant waste disposal procedure. Trucks hauling material on and off site will not be overfilled. Loose debris will be contained within the vehicle to prevent littering of highways and haul roads. Brush, construction debris, and trash will be removed from drainage paths and creeks. Burning of construction debris and brush will not be done in drainways. This is to prevent residue from burning from entering the creek.

Fueling operations will be conducted so that small (de minimis) fuel/oil releases are contained and cleaned up daily. All possible precautions are to be taken to minimize discharge of fuel, oil, lubricants, grease, and other hydrocarbons.

Inspections for Environmental Compliance

Periodic site inspections will be made by the construction engineer to confirm compliance with all environmental regulations and policies including those set forth in this BMP. A written record including the date and findings of the inspection and notification of appropriate party for discrepancies will be kept in the office of the construction engineer.

Items to be inspected include, but are not limited to:

- condition of erosion control structures
  - silt fence
  - drainageways
  - gulley formation
  - areas needing seeding
  - replacement of bales
- general housekeeping on-site
- evidence of poor fueling practices
- evidence of leaking tanks or equipment
- inspection of creek headwaters for oil sheen, debris, siltation, or other disturbance
- inspection of contractor records including types and quantities of hazardous/ toxic materials on-site
- inspection of safe (i.e., material compatible, diked if required) storage of above materials
- earth-moving and handling equipment.

Sediment and Erosion Control Measures

The primary concern of this BMP is to provide effective erosion and hazardous material control. Several excellent references on erosion control are available,[6-8] however, this chapter of the BMP follows guidance provided by the U.S. Department of Transportation (DOT) *Best Management Practices for Erosion and Sediment Control.*[9] Due to the interaction of various sediment and erosion control features within the construction area, it is important that all site work conform to the design drawings and specifications. Deviations from the design require prior authorization. The sequence in placing various control features will be specified in the design package. The construction sequence must follow the order as specified.

Erosion is a natural phenomenon that is greatly increased by the removal of existing vegetation and the introduction of cuts and fills. Excessive erosion causes physical damage in the watershed due to increased water velocity. Unchecked sediment can increase turbidity and suffocate stream bed flora and fauna under a blanket of silt. Erosion controls placed during the construction phase will minimize soil movement while the lagoon will remove suspended particles.

Several actions to lessen the environmental impact due to erosion will be taken during the construction phase at the UNC closure site:

- Paved drainage ditches with energy dissipators (where velocities exceed six feet per second) will be installed to drain the cap areas.

- On steep slopes, erosion control matting will be placed to reduce the potential for erosion.

- In accordance with the DOT guidance, silt fences, sediment traps, and ditches will be installed immediately following tree clearing and before grubbing, scalping, and filling.

- Periodic inspections will be made to verify silt fencing is in operational condition.

- Hay/straw bales will be replaced as needed.

- Seeding and mulching will immediately follow the development of each construction segment.

During operation, it will be necessary to maintain permanent structures, if any, installed in the construction phase:

- Ditches and drainways will periodically be cleared of brush/debris. Habitat disturbance will be minimized during cleaning.

- Permanent silt fences and hay bales, if any, will be maintained in operational condition.

- Vegetative cover will be maintained so that bare spots are minimized.

Closure of the UNC site will include repositioning (as needed) waste containers and installation of a multi-layered cap over the trench/pit areas and conclude with final grading for contour and establishing of vegetative cover.

References

1. Martin Marietta Energy Systems, Inc., *Y-12 Plant Best Management Practices (BMP) Plan.* December 1985. 263 pp.

2. Martin Marietta Energy Systems, Inc., "Environmental and Waste Management Policy," ESH-14. May 1985. 6 pp.

3. Martin Marietta Energy Systems, Inc., *Spill Prevention Control and Countermeasures Plan for the Y-12 Plant.* H&R 250-1. August 1985. 43 pp.

4. Martin Marietta Energy Systems, Inc., *Design Standards for Hazardous/Toxic Waste and Materials Storage Tanks, Dikes, and Transfer Stations.* Y/TS-104. 1985.

5. National Fire Protection Association, "Standard System for the Identification of the Fire Hazards of Material." NFPA-704. 1961.

6. U.S. Environmental Protection Agency, *Comparative Costs of Erosion and Sediment Control, Construction Activities.* EPA 430/9-73-016. July 1973. 205 pp.

7. U.S. Environmental Protection Agency, *Guidelines for Erosion and Sediment Control Planning and Implementation.* EPA-R2-72-015. August 1972. 227 pp.

8. U.S. Department of Agriculture, *Erosion and Sediment Control Handbook for Urban Areas and Construction Sites in Tennessee.* 1974.

9. U.S. Department of Transportation, *Best Management Practices for Erosion and Sediment Control.* December 1978. 90 pp.

Appendix

GENERAL GUIDELINES FOR RESPONDING TO HAZARDOUS MATERIALS RELEASES
8/26/85

General

Rigid guidelines cannot be issued for handling all hazardous materials releases. Each incident has to be specifically evaluated and appropriately responded to. Personnel safety must be the primary concern. Environmental concerns and property damage are secondary.

The Plant Shift Superintendent must be immediately notified of all releases. The PSS is in charge of all emergency activities and may delegate responsibility as deemed necessary. The PSS will determine whether or not the Plant Emergency Squad responds to any incident.

The following guidelines may be used in responding to spills. A full blown response is not necessary for all releases. However, the PSS, Environmental Coordinator, and Environmental Compliance Department Head must be notified of all releases. All telephone numbers are presented in the Y-12 Emergency Directory.

1. Receive report that spill has occurred. Obtain all available information.

    a. Time
    b. Name and telephone number of person reporting spill
    c. Exact location
    d. What was spilled
    e. How much was spilled
    f. Current status of spill
    g. Has material entered drain
    h. Has PSS been notified (574-7172)

2. Make the following initial notifications if they have not been made:

    a. PSS (574-7172)
    b. Environmental Compliance Secretary

3. Evaluate available information and request any necessary organizations to respond to the scene. (This may be done after arrival at the site.)

    a. Waste Transportation, Storage and Disposal's Spill Response Crew (Clyde Drummond or Dallas Fritts)
    b. Radiation Safety
    c. Industrial Safety
    d. Industrial Hygiene

e. Environmental Monitoring
f. Others as deemed necessary.

4. Respond to site with mobile telephone pager (or radio) and any necessary protective gear [rubber boots, rubber gloves, rubber rain suit, half-face respirator with "GMCH" combination cartridges, monogoggles, and face shield (a full-face mask respirator with GMCH cartridges will replace the half-face respirator, monogoggles, and faceshield)].

5. Approach the site from the upwind side and:

a. Report presence to the PSS.
b. Determine what has happened.
c. Determine the materials and contaminants involved.
d. Determine hazards and potential hazards.
e. Determine whether or not leak has stopped.
f. Determine the spread of the materials.
g. Determine location of storm drains and, if any, materials that entered the drains.
h. Determine any other site specific information.

6. Obtain any necessary personnel protective equipment and safety equipment requirements for anyone working in the contaminated areas from Radiation Safety, Industrial Hygiene, Safety, etc.

7. Consider the following factors:

a. Toxic gases and vapors,
b. Chemical reactions,
c. Flammability (sparks and electrical equipment),
d. Criticality,
e. Proper clean up and transfer of equipment and containers for the spilled materials,
f. Crowd and traffic control (barricading contaminated areas), and
g. Creation of dust containing toxic materials during clean up.

8. Make appropriate recommendations to the PSS on:

a. Stopping leaks,
b. Containing spilled materials,
c. Absorbing and/or neutralizing spilled materials,
d. Transferring large volumes of spilled materials,
e. Proper clean up, and
f. Take no action.
g. Factors in Item 7.

PSS should issue appropriate instructions (he may tell you to have it done).

9. Verify with Environmental Monitoring (EM) that sufficient sampling of spilled material and East Fork Poplar Creek (or other body of water) is being performed. Notify EM of possible contaminants that might be in spilled material and that should be considered in laboratory analysis.

10. Make sure the following information is obtained:

    a. What happened?
    b. Names and quantities of materials and contaminants.
    c. Who is the generator/spiller?
       Name _____, Department No. _____, and
       Telephone No. _____.
    d. Where the spilled material went?
    e. What time did the incident occur?
    f. Have violations of discharge permits possibly occurred or reportable quantities of hazardous materials been involved?

11. Notify the Generator/Spiller of the following responsibilities:

    a. He should request disposal/treatment of wastes generated by the clean up.
    b. He may be required to complete an "Environmental Incident Report."
    c. Response crews may request a charge number for clean up expenses.
    d. He should develop and implement appropriate corrective actions to prevent incident reoccurrence.

12. After situation is brought under control, provide full details of incident to Environmental Coordinator and Environmental Compliance Department head. PSS should be provided with any necessary status reports.

APPENDIX C2

East Borrow Area - Y-12
Best Management Practices (BMP) Plan

EAST BORROW AREA - Y-12 PLANT
BEST MANAGEMENT PRACTICES (BMP) PLAN

Prepared for:

Martin Marietta Energy Systems, Inc.
Oak Ridge, Tennessee 37831

Prepared by:

Lockwood Greene Engineers, Inc.
Oak Ridge, Tennessee 37831

June 26, 1988

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Best Management Practices (BMP) Plan

Introduction

The purpose of this document is to provide a site specific Best Management Practices (BMP) plan for East Borrow Area at the Y-12 Plant. This BMP is incorporated by reference to the plant-wide baseline document, Y-12 Best Management Practices (BMP) Plan [1] (Y/TS-135) of December 1985.

Section 304 (e) of the Clean Water Act enables the Administrator of the Environmental Protection Agency to control point source releases of pollutants. The National Pollutant Discharge Elimination System (NPDES) requires that facilities with the potential for releasing pollutants to the waters of the United States submit a Best Management Practices Plan specified in 40 CFR 125, Subpart K as a part of the discharge permit application.

According to the Martin Marietta Energy Systems, Inc. Environmental and Waste Management Policy [2] (ESH-14), "It is company policy to establish and to maintain waste management, pollution control, and surveillance programs which are consistent with company and DOE policy and which meet the requirements of federal, state, and local regulations to assure that installation personnel, the general public, and the environment are protected against hazardous pollutants."

Implementation of the BMP will be initiated by providing the plan to all parties involved in East Borrow Area activities. Recurring formal site inspections will be made and recorded to assure compliance with the provisions of this plan.

Site Description

The Y-12 Plant site (Figure 1) occupies 811 acres on the 37,000 acre Oak Ridge Reservation. The plant is located three miles south of the City of Oak Ridge in eastern Bear Creek Valley between Chestnut Ridge to the south and Pine Ridge to the north. Further general information concerning the plant is available in the plant-wide baseline BMP.

The East Borrow Area is a 20-acre site (Figure 2) east of the Y-12 Plant. It is south of Bear Creek Road and the eastern boundary is Scarboro Road. the purpose of the East Borrow Area is to provide fill and a "clean" construction spoil area in support of the Resource Conservation and Recovery Act (RCRA) remedial action program called Closure and Post Closure Activities (CAPCA). Material from East Borrow Area is to be used as fill for New Hope Pond, Chestnut Ridge Sediment Basin and Chestnut Ridge

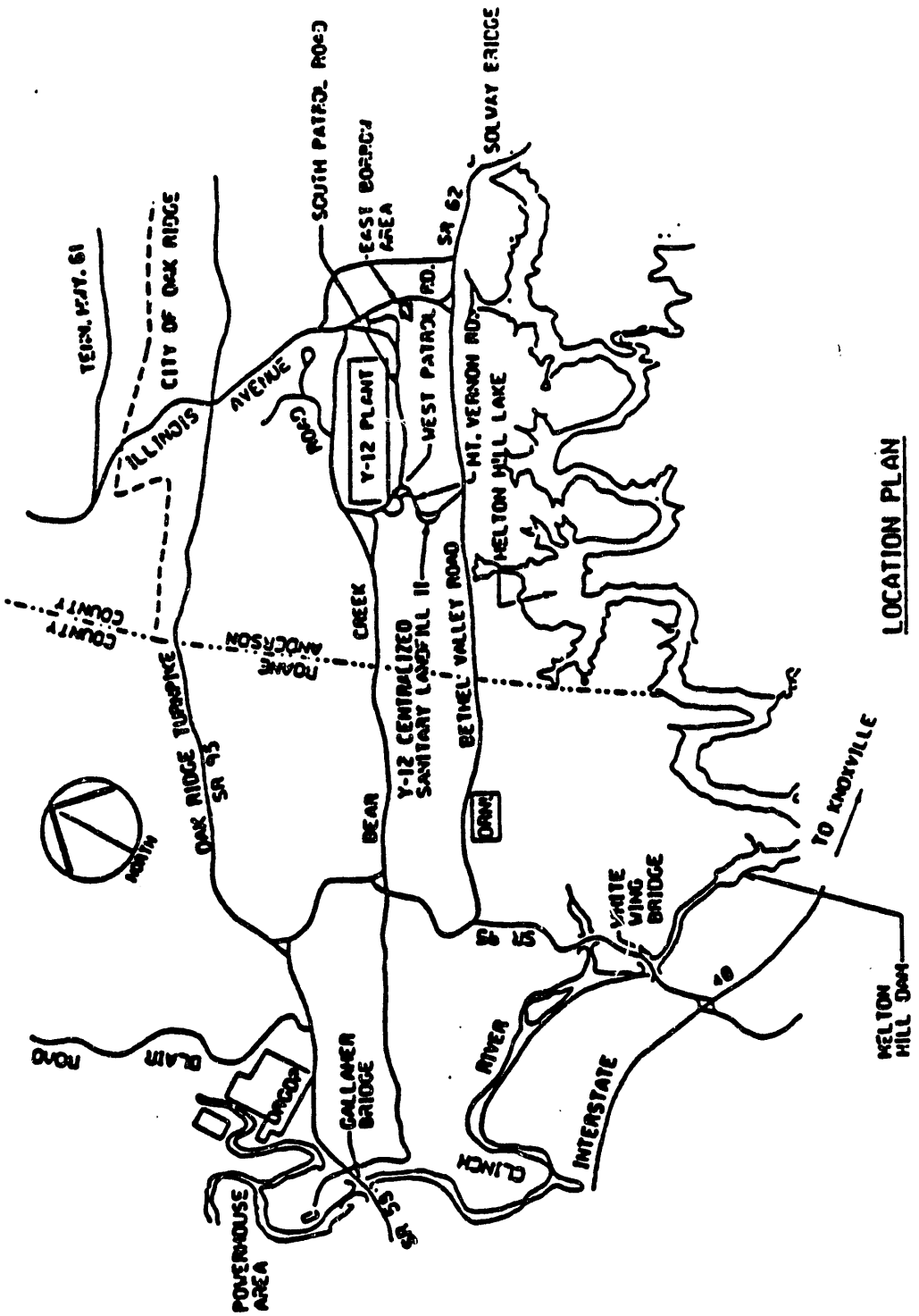

Figure 1. Area Map

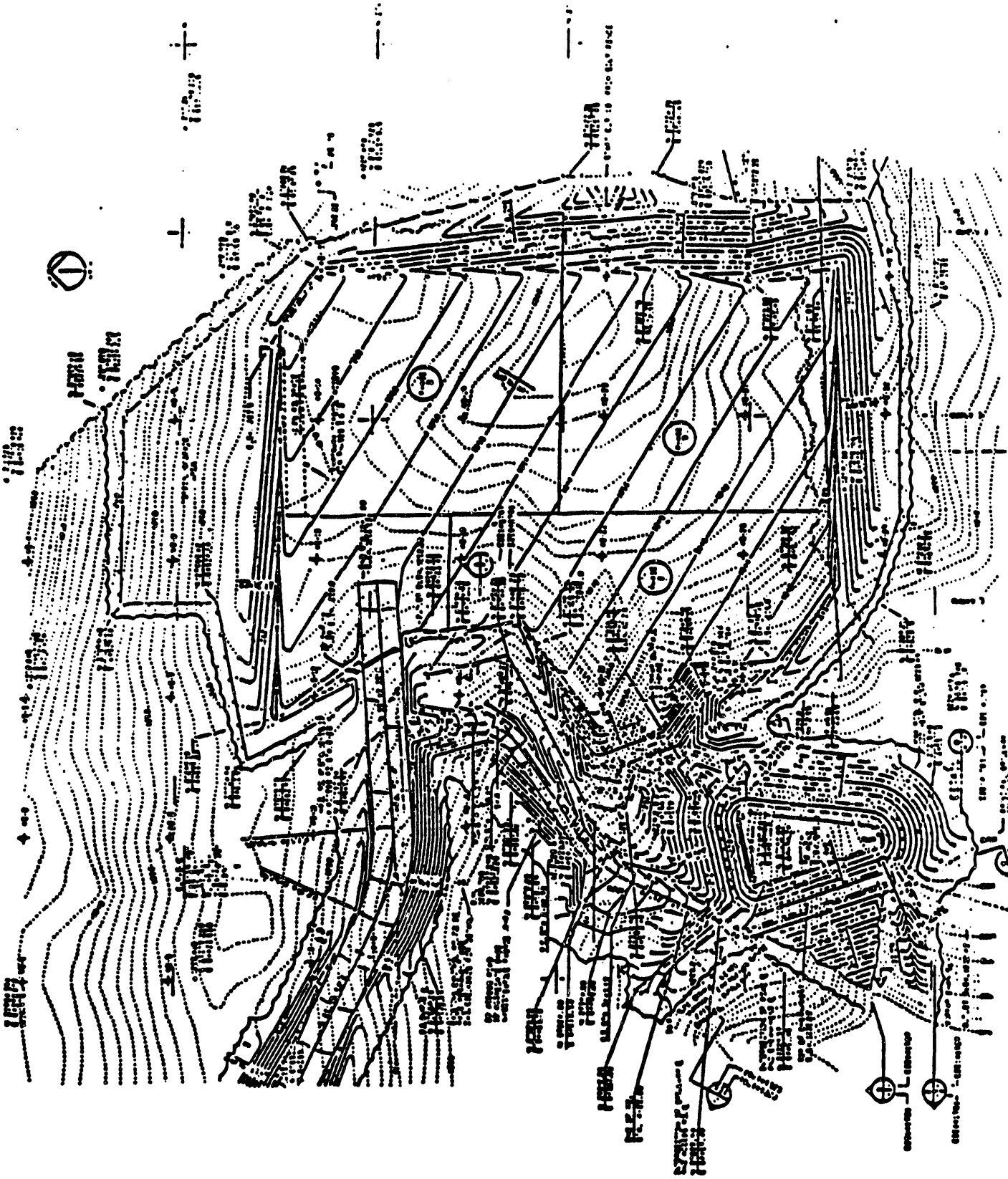

Figure 2. Site Map

Security Pits. No hazardous or radioactively contaminated soil is known to exist on site. the active (disturbed) portion of the site will be approximately nine acres with the balance of the area covered by a second growth hardwood forest. Of the nine acres, approximately two acres will be open at a time.

The East Borrov Area is primarily drained by East Fork Poplar Creek (EFPC), a secondary tributary to the Clinch River. EFPC stream flow is nov regulated by Nev Hope Pond (NHP) which will be replaced by East Fork Basin by the CAPCA project. Discharge at the Basin will be approximately 9 million gallons per day. The stream flovs from NHP into an 8 foot deep rip rapped channel. As the creek flovs northvest, it passes through a broad flood plain characterized by dense stands of secondary grovth hardvoods. The stream bed varies from fine silt in backvaters to exposed rock of a vide variety of sizes in faster flowing reaches. Stream width varies from 10 to 25 feet and the gradient is a gently sloping 1:250. Evidence of limestone solution channels is provided by thrust faulted bedding planes, losing and gaining reaching of the creek, and numerous small springs. As the creek turns southvest it passes through several large pastures. EPFC then passes through another forested flood plain before joining Poplar Creek near K-25.

The East Borrov Area is within the controlled access boundary and site security is maintained by a 24-hour per day patrol. Security guards are equipped with two-vay radios for direct communication with the Plant Shift Superintendent, Fire Department, Spill Response Team, etc. The presence of the security force enchances the probability of detecting and quickly mitigating potential environmental incidents.

Employee Training

Employees of the Y-12 Plant receive a broad range of environmental, health, and safety training based on their job requirements. A more detailed description of training is provided in the baseline BMP. Environmental avareness is raised by issuing periodic bulletins concerning topics such as spill control. Supervisors are responsible for providing on-the-job training with respect to hazardous materials handling and company environmental policy.

Contractors/subcontractors performing vork in the East Borrov Area are required to comply vith Martin Marietta/DOE Environmental Policy including the provisions of this BMP. Contractor foremen are responsible for their employees. All site personnel are to perform the vork as specified in the dravings, specifications, or as directed by the construction engineer.

Spill Prevention and Control

The Spill Prevention Control and Counter-Measures for the Y-12 Plant [3] (SPCC Plan) provides the details concerning roles and responsibilities of employees. This document is incorporated in the plant-vide baseline BMP and only that portion directly related to construction and operation of the East Borrov Area is summarized here.

Y-12 has a Spill Control Committee as required by Section 402 of the Clean Water Act. The committee is composed of representatives from all plant functions and is charged with the responsibility for development and oversite of the Spill Prevention Program.

"General Guidelines for Responding to Hazardous Materials Releases" dated August 26, 1985 is provided in the Appendix. East Borrov Area Company contract, and subcontractor personnel are required to call the Plant Shift Superintendent's Office (PSS) at 574-7172 or by radio and report any incident with potential adverse environmental, health, or safety effects. The same information is provided to the Plant Environmental Coordinator (EC) at 574-3647 or by radio. The employee discovering/causing the incident has the responsibility to report it to the PSS and his supervisor immediately. The "Guidelines" must be communicated to all employees working in the East Borrov Area so that Y-12 Spill Response Procedures are understood.

The Y-12 Spill Prevention Program requires that all possible precautions be taken to minimize the likelihood of a spill. Guidelines for design and construction of hazardous material storage tanks and secondary containment are specified in Design Standards for Hazardous/Toxic Waste and Material Storage Tanks, Dikes, and Transfer Stations, [4] Y/TS-104.

At the East Borrov Area any fuel storage tank(s) of greater than 100 gallons are required to be diked to minimize the probability of any release to the watershed. All tanks over five gallons are required to be labeled with the appropriate Hazardous Identification Label (diamond) as identified in the National Fire Protection Association Code [5] (NFPA-704). Tanks, drums, or other containers of hazardous/toxic material such as cleaning solvents, some detergents, degreasers, etc., will require secondary containment while stored on-site.

All heavy and mechanical equipment will be maintained in good repair so as to minimize the release of engine, transmission, or other oils through slov leaks. Idle equipment will be parked as far away from streambeds as practical. At the request of the construction engineer, a drip pan provided by the contractor will be used under equipment leaking excessively.

Fueling operations will be performed with care to prevent inadvertent small releases. Spilled material will be cleaned up daily, placed in appropriate containers, and disposed in accordance with Y-12 waste operations procedures via the construction engineer.

There is a plant-wide contingency plan in the event that an emergency evacuation of the plant is required. It is the employer's responsibility to provide emergency signal and procedure information to his employees.

If a spill occurs in the East Borrow Area, all safe and practical methods available should be used to prevent material from entering streams, creeks, or springs. Spill response kits containing sorbent material will be provided by the company at the site. Sorbent pillows, temporary earth dikes, or other readily available means should be employed, if possible without risk of personal safety.

Water Quality Monitoring

The sediment basin in the East Borrow Area will be grab sampled quarterly. Temperature, pH, total suspended solids (TSS) and oil and grease analyses will be performed. The data will be recorded and available for environmental audit at the office of Environmental Assessment and Monitoring. Data will be reported quarterly in the Discharge Monitoring Report.

Good Housekeeping Practices

Good housekeeping practices will be observed by all personnel present in the East Borrow Area at all times. Paper trash and refuse will be contained, collected and disposed of at an appropriately permitted facility. Portable toilets will be maintained in such a manner that their contents remain contained. No wastewater of any type will be discharged on-site. All rinse water containing additives of any sort (ie., soap, degreasers, cleaning agents) will be collected, contained and disposed of in accordance with the appropriate Y-12 plant waste disposal procedure. Trucks hauling material on and off site will not be overfilled. Loose debris will be contained within the vehicle to prevent littering of highways and haul roads. Brush, construction debris, and trash will be removed from drainage paths and creeks. Burning of construction debris and brush will not be done in drainways. This is to prevent residue from burning from entering the creek.

Fueling operations will be conducted so that small (de minimis) fuel/oil releases are contained and cleaned up daily. All possible precautions are to be taken to minimize discharge of fuel, oil, lubricants, grease, and other hydrocarbons. When changing oil or cleaning up small releases in the East Borrow Area, the waste oil and filter will be disposed of through the Y-12 plant waste disposal system. The point of contact to arrange disposal is the construction engineer.

Inspections for Environmental Compliance

Periodic site inspections will be made by the construction engineer to confirm compliance with all environmental regulations and policies including those set forth in this BMP. A written record including the date and findings of the inspection and notification of appropriate party for discrepancies will be kept in the office of the construction engineer.

Items to be inspected include, but are not limited to:

- condition of erosion control structures
  - silt fence
  - sediment basin
  - drainageways
  - gulley formation
  - areas needing seeding
  - replacement of bales
- general housekeeping on-site
- evidence of poor fueling practices
- evidence of leaking tanks or equipment
- inspection of creek for oil sheen, debris, siltation, or other disturbance
- inspection of contractor records including types and quantities of hazardous/toxic materials on-site
- inspection of safe (i.e., material compatible, diked if required) storage of above materials.

Sediment and Erosion Control Measures

The primary concern of this BMP is to provide effective erosion and sediment control. Several excellent references are available (6, 7, 8), however, this chapter of the East Borrow Area BMP follows guidance provided by the U.S. Department of Transportation Best Management Practices for Erosion and Sediment Control (9). Due to the interaction of various sediment and erosion control features within the borrow area, it is important that all site work conform to the design drawings and specifications. Deviations from the design require prior authorization. The sequence in placing various control features will be specified in the design package. The construction sequence must follow the order as specified.

The useful life of East Borrow Area is anticipated to be less than ten yards. Work will be conducted in three phases: construction, operation, and closure. Each phase will have similar sediment and erosion control needs.

Erosion is a natural phenomenon that is greatly increased by the removal of existing vegetation and the introduction of cuts and fills. Excessive erosion causes physical damage in the watershed due to increased water velocity. Unchecked sediment can increase turbidity and suffocate stream bed flora and fauna under a blanket of silt. Erosion controls placed during the construction phase will minimize soil movement while the sediment basin will remove suspended particles.

Several actions to lessen the environmental impact due to erosion will be taken during the construction phase at the East Borrow Area:

- Creek crossing (fording) by heavy equipment will be minimized and limited to specific locations where mats or other protective measures have been installed to reduce disturbance of the creek bed.
- In accordance with the DOT guidance, silt fences, sediment traps and, ditches will be installed immediately following tree clearing and before grubbing, scalping.
- Periodic inspections will be made to verify silt fencing is in operational condition.
- Hay/straw bales will be replaced as needed.
- Stream diversion channels will be lined with membrane or similar suitable material.
- Culvert entrances and exits will be protected with rip rap.
- Sediment basin placement will occur as early as possible in the construction sequence.
- Seeding and mulching will immediately follow the development of each construction segment.
- Topsoil will be segregated, stockpiled, seeded and mulched in an area that has adequate erosion control.
- Topsoil stockpile will be placarded with a sign reading "topsoil - do not disturb."
- During construction of the haul road, the fill portion of the roadbed will be protected by geotextile to minimize erosion and prevent the stone from working into the fill.
- The cut portion of the haul road roadbed will be naturally consolidated native soil which will be seeded and mulched in a timely manner to provide erosion protection.

During operation, it will be necessary to maintain permanent structures, installed in the construction phase:

- Ditches and drainways will periodically be cleared of brush/debris. Habitat disturbance will be minimized during cleaning.
- Permanent silt fences and hay bales, if any, will be maintained in operational condition.
- The sediment basin silt will be removed as needed and disposed of at an approved disposal site.

- Vegetative cover will be maintained so that bare spots are minimized.

- The haul road will be maintained by grading, seeding banks, and replacing stone so that erosion is minimized.

Closure of the East Borrow Area will include final grading for contour and establishing of vegetative controls. The sediment basin will be closed and filled at the conclusion of the CAPCA projects.

References

1. Martin Marietta Energy Systems, Inc., Y-12-Plant Best Management Practices (BMP) Plan. December 1985. 263 pp.

2. Martin Marietta Energy Systems, Inc., "Environmental and Vaste Management Policy" ESH-14. May 1985. 6 pp.

3. Martin Marietta Energy Systems, Inc., Spill Prevention Control and Countermeasures for the Y-12 Plant. H&R 250-1. August 1985. 43 pp.

4. Martin Marietta Energy Systems, Inc., Design Standards for Hazardous/Toxic Vaste and Materials Storage Tanks, Dikes and Transfer Stations. Y/TS-104. 1985.

5. National Fire Protection Association. "Standard System for the Identification of the Fire Hazards of Material. NFPA-704. 1961.

6. U.S. Environmental Protection Agency. Comparative Costs of Erosion and Sediment Control, Construction Activities. EPA 430/9-73-016. July 1973. 205 pp.

7. U.S. Environmental Protection Agency. Guidelines for Erosion and Sediment Control Planning and Implementation. EPA-R2-72-015. August 1972. 227 pp.

8. U.S. Department of Agriculture. Erosion and Sediment Control handbook for Urban Areas and Construction Sites in Tennessee. 1974.

9. U.S. Department of Transportation. Best Management Practices for Erosion and Sediment Control. December 1978. 90 pp.

APPENDIX

GENERAL GUIDELINES FOR RESPONDING TO HAZARDOUS MATERIALS RELEASES
8/26/85

General

Rigid guidelines cannot be issued for handling all hazardous materials releases. Each incident has to be specifically evaluated and appropriately responded to. Personnel safety must be the primary concern. Environmental concerns and property damage are secondary.

The Plant Shift Superintendent must be immediately notified of all releases. The PSS is in charge of all emergency activities and may delegate responsibility as deemed necessary. The PSS will determine whether or not the Plant Emergency Squad responds to any incident.

The following guidelines may be used in responding to spills. A full blown response is not necessary for all releases. However, the PSS, Environmental Coordinator, and Environmental Compliance Department Head must be notified of all releases. All telephone numbers are presented in the Y-12 Emergency Directory.

1. Receive report that spill has occurred. Obtain all available information.
   a. Time:
   b. Name and telephone number of person reporting spill:
   c. Exact location:
   d. What was spilled:
   e. How much was spilled:
   f. Current status of spill:
   g. Has Material entered drain:
   h. Has PSS been notified: 574-7172
2. Make the following initial notifications, if they have not been made:
   a. PSS 574-7172
   b. Environmental Compliance Secretary
3. Evaluate available information and request any necessary organizations to respond to the scent. (This may be done after arrival at the site.)
   a. Waste Transportation, Storage and Disposal's Spill Response Crew (Clyde Drummond or Dallas Fritts)
   b. Radiation Safety

c. Industrial Safety

d. Industrial Hygiene

e. Environmental Monitoring

f. Others as deemed necessary.

4. Respond to site with mobile telephone pager (or radio) and any necessary protective gear (rubber boots, rubber gloves, rubber rain suit, half face respirator with "GMCH" combination cartridges, monogoggles, and face shield (a full face mask respirator with GMCH cartridges will replace the half face respirator, monogoggles, an faceshield.))

5. Approach the site from the upwind side and:

a. Report presence to the PSS.

b. Determine what has happened.

c. Determine the materials and contaminants involved.

d. Determine hazards and potential hazards.

e. Determine whether or not leak has stopped.

f. Determine the spread of the materials.

g. Determine location of storm drains and if any materials entered the drains.

h. Determine any other site specific information.

6. Obtain any necessary personnel protective equipment and safety equipment requirements for anyone working in the contaminated areas from Radiation Safety, Industrial Hygiene, Safety, etc.

7. Consider the following factors:

a. Toxic gases and vapors,

b. Chemical reactions,

c. Flammability (sparks and electrical equipment),

d. Criticality,

e. Proper clean up and transfer equipment and containers for the spilled materials,

f. Crowd and traffic control (barricading contaminated areas), and

g. Creation of dust containing toxic materials during clean up.

8. Make appropriate recommendations to the PSS on:

   a. Stopping leaks,

   b. Containing spilled materials,

   c. Absorbing and/or neutralizing spilled materials,

   d. Transferring large volumes of spilled materials,

   e. Proper clean up, and

   f. Take no action.

   g. Factors in Item 7.

   PSS should issue appropriate instructions (he may tell you to have it done.)

9. Verify with Environmental Monitoring (E.M.) that sufficient sampling of spilled material and East Fork Poplar Creek (or other body of water) is being performed. Notify E.M. of possible contaminants that might be in spilled material and that should be considered in laboratory analysis.

10. Make sure the folloving information is obtained:

    a. What happened?

    b. Names and quantities of materials and contaminates.

    c. Who is the generator/spiller?
       Name _____, Department No. _____, and
       Telephone Number _____.

    d. Where the spilled material vent?

    e. What time did the incident occur?

    f. Have violations of discharge permits possibly occurred or reportable quantities of hazardous materials been involved?

11. Notify the Generator/Spiller of the folloving responsibilities:

    a. He should request disposal/treatment of vastes generated by the clean up.

    b. He may be required to complete an "Environmental Incident Report."

    c. Response crevs may request a charge number for clean up expenses.

    d. He should develop and implement appropriate corrective actions to prevent incident recurrence.

12. After situation is brought under control, provide full details of incident to Environmental Coordinator and Environmental Compliance Department Head. PSS should be provided with any necessary status reports.

APPENDIX E

TESTING REQUIREMENTS SUMMARY

TESTING REQUI[illegible]EMENTS SUMMARY

DISCIPLINE: CIVIL

Sheet ____ of ____

PROJECT	ESO NO.	PLANT/BUILDING	DATE ISSUED
UNC Waste Disposal Site		Y-12	
APPLICABLE SPEC. OR DRAWING NO.	RED/SEC/DEPT. HEAD		CE
UNC Waste Disposal Site			

DESCRIPTION OF ITEM TO BE TESTED	TYPE OF TEST	SPEC. SECTION	TEST NO.	TEST PERFORMED BY	*	TEST REPORT RECEIVED & RESULTS ACCEPTABLE **
Earthwork	Field Compaction Tests	02000	N/A	FMST (1)	X	
Earthwork	Field Compaction Tests	02200	N/A	FMST (1)	X	
Backfill	Field Compaction	02221	N/A	FMST (1)	X	
Flexible Liner	Manufacturer's/Fabricator's Certification (See Exhibit 2.03-1a) for Requirements	02598	N/A	Contractor		
Flexible Liner	Factory Seam Inspection Report (See Exhibit 2.03-2a for Requirements)	02598	N/A	Contractor		
Flexible Liner	Subgrade Inspection (See Exhibits 3.01-3a & 3b for Requirements)	02598	N/A	Contractor	X	
Flexible Liner	Geomembrane Installation Inspection (See Exhibit 3.03-1a for Requirements)	02598	N/A	Contractor	X(2)	

(1) FMST-Facility Manager's Soil Technician/Testing Laboratory

(2) Preparation of Field Specimens to be witnessed by RED.

Test Results Reviewed and Approved: RED ____ Date ____

DISTRIBUTION: ____

* Check Indicates Test is to be Witnessed by RED.

** To be Initialed and Dated by Construction Engineer (CE). CE will Witness all Tests.

UCN 16332 (1235 7-87)

S-207

EXHIBIT 2.03-1a

MANUFACTURER'S/FABRICATOR'S CERTIFICATION

Date _____

Project _____

Location _____

Installer _____

Geomembrane Type and Manufacturer _____

The rolls/panels of _____ membrane listed below were supplied to _____ for use in the subject project; _____. All rolls/panels supplied meet our published specifications for this project and the project specifications. All raw materials are original, first quality.

Signed:

_____

Position:

Roll Numbers and Panel Numbers:

EXHIBIT 2.03-2a

FACTORY SEAM INSPECTION REPORT

Date _____ Project _____

Geomembrane Type and Manufacturer _____

Panel No. _____

Panel Size _____

Roll Numbers _____

Seam Type _____

	Seam No./ Width	Seamer	Temp/ Humidity	Visible Bead	Loose Flaps
1.	__/____	_____	__/____	_____	_____
2.	__/____	_____	__/____	_____	_____
3.	__/____	_____	__/____	_____	_____
4.	__/____	_____	__/____	_____	_____
5.	__/____	_____	__/____	_____	_____

Seam Test Results:

	Panel/ Seam no.	Shear Strength	Peel Strength	Shear Failure	Peel Failure	Sample Pass/Fail
1.	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____	_____

Inspector _____ Date _____

EXHIBIT 3.01-3a

SUBGRADE INSPECTION CHECKLIST

Date _____

Project _____

Location _____

Area Examined _____

	Acceptable	Not Acceptable Comments
Rodents	_____	_____
Soil Type	_____	_____
Soil Moisture	_____	_____
Density	_____	_____
Uniformity	_____	_____
Grading	_____	_____
Rocks	_____	_____
Roots	_____	_____
Vegetation	_____	_____
Rubble	_____	_____
Protrusion	_____	_____
Cracks	_____	_____

_____ _____

Inspector Date

EXHIBIT 3.01-3b

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE BY INSTALLER

Name _____

Project _____

Location _____

Area Accepted _____

Authorized Representative _____

I the Undersigned, duly authorized representative of _____ do hereby accept the soil subgrade as being acceptable for the placement of a geomembrane liner.

_____ _____
Name Title

_____ _____
Signature Date

Certificate Accepted by CQA Inspector and Construction Manager

CQA Inspector:

_____ _____
Name Title

_____ _____
Signature Date

Construction Manager:

_____ _____
Name Title

_____ _____
Signature Date

EXHIBIT 3.03-1a

GEOMEMBRANE INSTALLATION INSPECTION

Date _____

Project _____

Location _____

Installer _____

Geomembrane Type and Manufacturer _____

	Acceptable	Not Acceptable Comments
Weather	_____	_____
Panel Markings	_____	_____
Shipping Protection	_____	_____
Panel Placement	_____	_____
Panel Fit	_____	_____
Field Seam Samples		
Numbered	_____	_____
Lab Results	_____	_____
Air Lance Test		
Pressure	_____	_____
Nozzle Diameter	_____	_____
Results	_____	_____
Vacuum Test		
Pressure	_____	_____
Time	_____	_____
Results	_____	_____
Repairs		
Numbered	_____	_____
Mapped	_____	_____
Penetrations		
Location	_____	_____
Air Lanced	_____	_____
Anchors		
Location	_____	_____
Depth	_____	_____
Compaction	_____	_____

Inspector _____

APPENDIX G

CAPCA Environmental Compliance Standard Operating Procedure

CAPCA ENVIRONMENTAL COMPLIANCE STANDARD OPERATING PROCEDURE

The purpose of this procedure is to ensure that soil erosion and sedimentation will be kept to as lov a level as reasonably possible wherever earth work is taking place. Erosion control measures will be taken to ensure that sediment is maintained on site. No sediment should be alloved to migrate into permanent tributaries or streams at any time. Sediment deposited in drainage features will be removed as needed to prevent buildup and further migration.

Strict compliance with contract dravings, BMP's and all federal and state requirements regarding erosion control and spill prevention is expected of all persons working on site. In addition erosion control measures must be maintained and where appropriate, improvements made beyond those called for in the documents referenced above, to insure protection of the environment.

PREVENTIVE MEASURES

The following preventive measures will be employed at all sites:

1. Each team member will continually look for and propose erosion control enhancements.

2. Each team member will include in his/her review of future project drawings the adequacy of erosion control features.

3. Erosion control materials will be strategically stockpiled throughout the sites (rip rap, hay bales, silt fence, etc.).

4. Each Contractor and the Title III Engineer shall conduct ongoing inspection of erosion control features.

5. Ongoing inspections of erosion control measures will be made by the MMES Construction Engineer.

6. All Contractors shall make inspections of the site during inclement weather.

7. Each Contractor shall provide a list of personnel to be contacted in the event of an environmental insult or when immediate corrective action needs to be taken.

8. Rust will set up an inspection roster to monitor Contractors inspection of all sites during inclement weather (daylight hours). In the event of non-forecasted inclement weather, an environmental insult, etc., the Plant Shift Superintendents office will notify the appropriate individual off the CAPCA Inclement Weather Response Team list. The Plant Shift Superintendent's office is responsible for investigating reported insults to the environment during non daylight hours and contacting the appropriate parties.

9. A checklist will be employed to inspect each site immediately when inclement weather is predicted and before leaving for the weekend. The checklist is to be accomplished and signed by a representative of the Contractor and submitted to the Title III Engineer.

10. No work will be performed in a creek or in known tributaries in creeks without an approved work method. The method will be submitted in writing to Rust for approval.

11. Erosion control will be in place where practical (temporary and/or permanent) prior to the start of any earthwork.

12. Where item 11 is not practical, excavation and backfill operations will not proceed beyond erosion control measures when inclement weather is forecasted or by more than twenty-four (24) hours during fair weather.

13. The Contractor is responsible for inspecting his work areas prior to the close of business each day to ensure that erosion controls are in place and not damaged from the days activities.

14. Equipment staging areas will be located in such a manner so rain water that may wash off quantities of petroleum wastes from machinery will not concentrate and be directed immediately into water ways. If this is impossible, preventative methods will be taken daily to ensure that an insult to the environment does not occur.

15. Good housekeeping will be ensured daily.

16. Location and conduct of fueling and maintenance activities will ensure that no insult to the environment will occur.

17. In the event of a potential insult to the environment that must be acted upon immediately (i.e., an oil spill), the Plant Shift Superintendents office (574-7172) will be notified and if Plant Shift Supervisor deems necessary, will dispatch MMES Hazardous Spill Response Team.

CAPCA ENVIRONMENTAL COMPLIANCE CHECKLIST

INIT.

To be done weekly or prior to inclement weather whichever comes first.

1. Silt fencing is installed in accordance with contract dravings.
2. Adequate temporary silt fencing is installed down grade of all disturbed earth.
3. Rip rap is installed at inlets and outlets of all drainage pipe as shown on dravings.
4. Velocity checks/sediment traps are installed in drainage vays (rip rap, hay bales) as needed.
5. Stream diversion channels are lined with membrane and in satisfactory condition.
6. Erosion control matting is installed as shown on dravings.
7. Ditches and drainvays are free of debris.
8. Previous silt accumulation has been removed, if necessary.
9. Equipment is parked in a manner to contain run-off of leaking fluids.
10. Equipment has been inspected for oil or fuel leaks and appropriate action taken (drip pans).
11. All spills have been cleaned up and properly disposed of.
12. Fuel tanks have been checked for leaks.
13. All fuel tanks have been diked/lined as required.
14. All containers of hazardous/toxic material have been checked for leaks and stored in an appropriate manner.
15. Spill response kit is on site.
16. Adequate amounts of rip rap, silt fence and hay bales, etc., are stored on site and strategically placed to effect immediate repair as needed during inclement weather.
17. Emergency notifications signs are posted on site as required.
18. List of personnel/emergency contact phone numbers has been provided to Rust.

19. Arrangements have been made to check site during inclement weather.

20. All personnel knov the Plant Shift Superintendent's phone number (574-7172).

21. Additional precautions have been taken in event that inclement weather has been forecast.

22. General housekeeping is in order.

SAMPLE

Rust Inclement Weather Response Team

TITLE	NAME	PHONE
Construction Manager	Tom Schietinger	966-3988
Subcontract Coordinator	Charles Bird	588-1065
Subcontract Field Superintendent	John Keane	481-0947
B & D Equipment (New Hope Pond Replacement)	Bobby Leach David Cofer Dennis Coday	584-7425 435-6674 426-7621
CMC Construction Co. (S-3 Ponds)	Tom Miller Terry Keathley	482-4509 457-5785
Conner Bros. (West Borrow Area)	Bill Conner	690-8690
Roehl Construction (Chestnut Ridge Sites)	Wayne Vaughn Ken Gibson	966-8594 453-8191
Avisco, Inc. (East Borrow Area) (Bear Creek Burial Grounds)	Jerry Hampton Mike Lail Rick Irons	983-3961 448-6739 679-3649
Rust Field Superintendent	Ken Brown	691-6322
Rust Craft Heads		
Laborers	Bob Ivey J. Jackson Roy Dennis	376-5469 435-6425 376-5197
Teamsters	Dale King	688-0956
Operators	Quinn Jones	694-9948 or 522-2671
Teamsters	J. Roger Brown	690-0491
Pipefitters	Bob Mathison John Floyd Tommy Wyatt	457-5709 457-1692 584-5167
Carpenters	Bob Collier Guy Monger Johnny Jobe	947-7848 986-5798 426-6322

Electricians	R. J. Overton	566-1344
	Ray Day	775-2755
Iron Workers	Larry Bryson	376-7824
	Ray Bradley	482-3190

SAMPLE

PERSONNEL	DAY	6 A.M.	9 A.M.	12 P.M.	3 P.M.	6 P.M.	9 P.M.
	FRI						
	SAT						
	SUN	X		X			
	FRI						
	SAT						
	SUN		X		X		
	FRI						
	SAT	X	X	X	X	X	
	SUN						
	FRI						X
	SAT						X
	SUN						X
	FRI					X	
	SAT						
	SUN						
	FRI						
	SAT						
	SUN					X	

INCLEMENT WEATHER INSPECTION ROSTER

SUGGESTED LIST: SPILL RESPONSE EQUIPMENT

SUPPLIES	QUANTITY
BARRIER TAPE - "Caution Do Not Enter"	Standard roll not less than 100 ft.
Batteries, extra for flashlight (D-cell)	1 Doz.
*Booms, cotton (10 ft. long)	
Buckets, Galvanized	2 each
*Pads, Absorbent	12 each
Flashlight (hand held) D-cell	3 each
*Gloves, Acid type (long) (short)	1 doz.
Light, Caution (flashing)	1/2 doz.
Light, Caution - Batteries (6 volt)	1/2 doz.
Monogoggles	1 doz.
Pan, Catch (5 gal. - open)	2 each
Plastic Bag (large - 40" x 65")	20 each
Plastic Sheeting (20' x 100' x 6 mils)	2 rolls each
Silt Fence (temporary/with stakes)	100 ft. roll minimum
Stakes 5' long	12 each
Sandbags (general storage)	1 pallet (25)
Sandbags (empty)	100 each
Sorbal (50# bags)	2 each
Straw Bales	12 each
Tape, masking (2")	6 rolls
Vest, Reflector (orange)	12 each

APPENDIX H

MOISTURE/DENSITY CURVES FOR TYPE "A" AND TYPE "B" SOILS

TYPE "A" SOIL

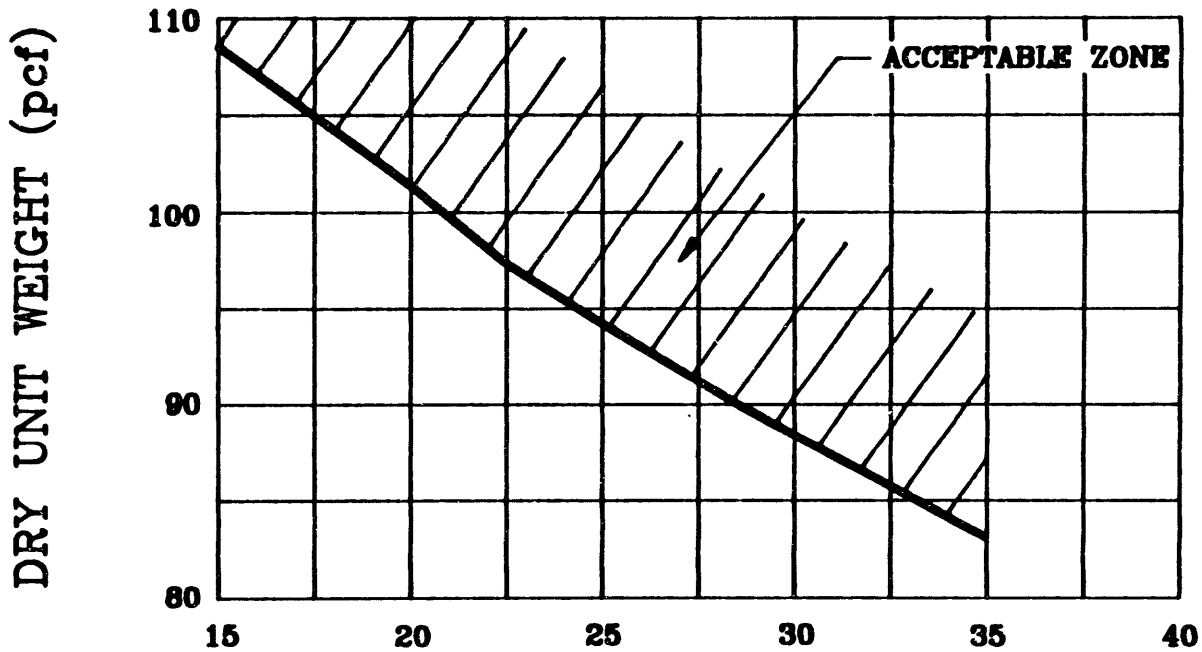

FIGURE A

TYPE "B" SOIL

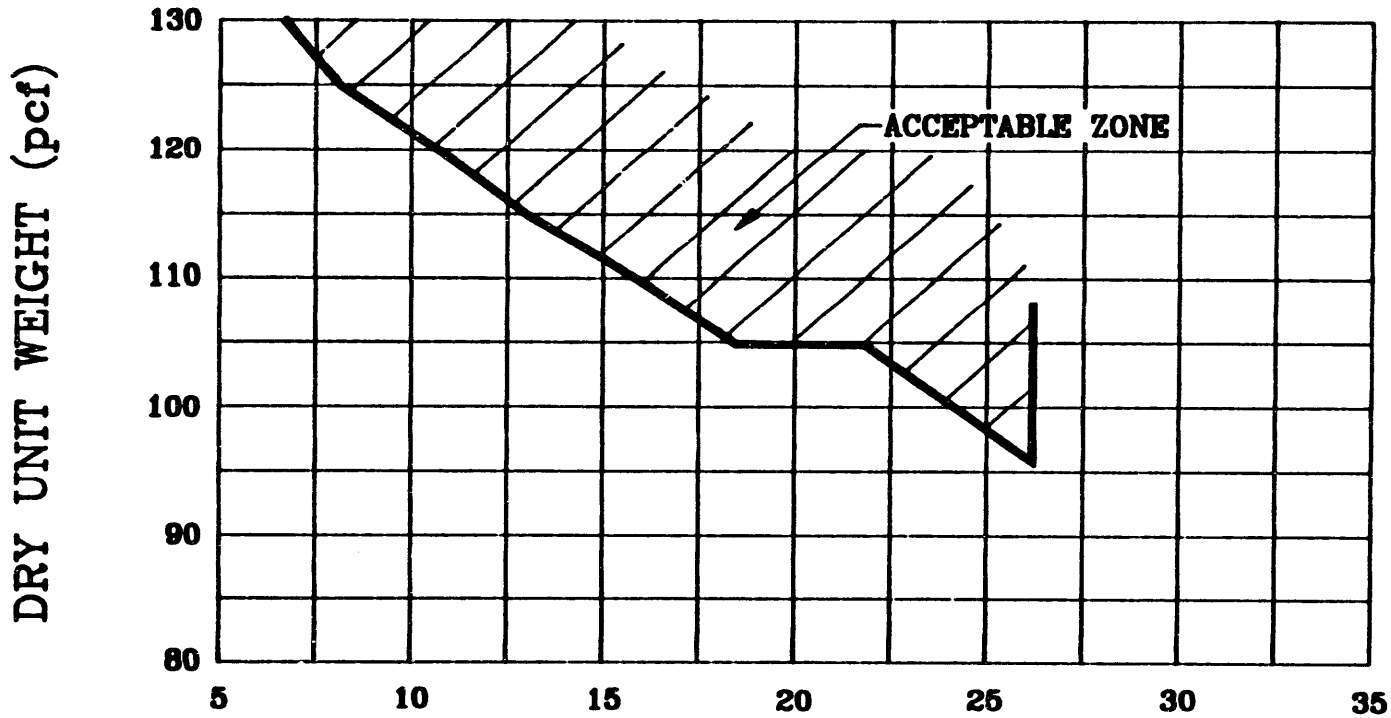

FIGURE B

APPENDIX I

See the *Federal Register*, Monday, March 5, 1989, Part III, Department of Labor, Occupational Safety and Health Administration, Final Rule 29 *Code of Federal Regulations* Part 1910, "Hazardous Waste Operations and Emergency Response; Final Rule"

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EXECUTIVE SUMMARY

Remedial actions conducted under the auspices of the Comprehensive Environmental Response, Compensation, and Liablility Act (CERCLA) were completed at the Y-12 United Nuclear Corporation (UNC) Disposal Site in August 1992. The purpose of this Postconstruction Report is to summarize numerous technical reports and provide CERCLA documentation for completion of the remedial actions. Other CERCLA reports, such as the Feasibility Study for the UNC Disposal Site, provide documentation leading up to the remedial action decision.

The remedial action chosen, placement of a modified RCRA cap, was completed successfully, and performance standards were either met or exceeded. This remedial action provided solutions to two environmentally contaminated areas and achieved the goal of minimizing the potential for contamination of the shallow groundwater downgradient of the site, thereby providing protection of human health and the environment. Surveillance and maintenance of the cap will be accomplished to ensure cap integrity, and groundwater monitoring downgradient of the site will continue to confirm the acceptability of the remedial action chosen.

END

DATE FILMED

10/13/93