Schnabel ENGINEERING

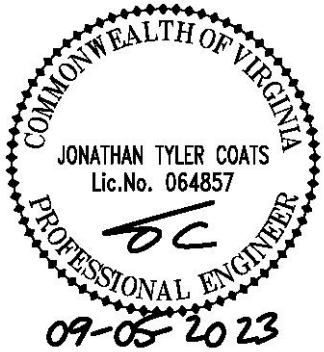
DAM IMPROVEMENTS
BEAUTIFUL RUN WATERSHED DAM NO. 1B
MADISON COUNTY, VIRGINIA

CONSTRUCTION SPECIFICATIONS

SPONSORED BY:

CULPEPER SOIL AND WATER CONSERVATION DISTRICT

SEPTEMBER 2023



INDEX OF SPECIFICATIONS
DAM IMPROVEMENTS TO
BEAUTIFUL RUN WATERSHED DAM NO. 1B

There are two types of specifications in this contract: (1) Construction Specifications and (2) Material Specifications. The construction specifications are composed of two parts. The first part is called the closed specification and is the standard NRCS construction specification that begins with the SCOPE and ends with MEASUREMENT AND PAYMENT or PAYMENT. The second part is called the open specification and consists of the ITEMS OF WORK AND CONSTRUCTION DETAILS that are written specifically for this job.

Construction Specification 2—Clearing and Grubbing

1. Scope

The work consists of clearing and grubbing and disposal of trees, snags, logs, brush, stumps, shrubs, and rubbish from the designated areas.

2. Protection of existing vegetation

Trees and other vegetation designated to remain undisturbed shall be protected from damage throughout the duration of the construction period. Any damages resulting from the contractor's operations or neglect shall be repaired by the contractor.

Earthfill, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the drip line of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species, similar condition, and like size unless otherwise approved by the contracting officer.

Any cuts, skins, scrapes, or bruises to the bark of the vegetation shall be carefully trimmed and local nursery accepted procedures used to seal damaged bark.

Any limbs or branches 0.5 inch or larger in diameter that are broken, severed, or otherwise seriously damaged during construction shall be cut off at the base of the damaged limb or branch flush with the adjacent limb or tree trunk. All roots one (1) inch or larger in diameter that are cut, broken, or otherwise severed during construction operations shall have the end smoothly cut perpendicular to the root. Roots exposed during excavation or other operations shall be covered with moist earth or backfilled as soon as possible to prevent the roots from drying out.

3. Marking

The limits of the area(s) to be cleared and grubbed will be marked by stakes, flags, tree markings, or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunk about six (6) feet above the ground surface.

4. Clearing and grubbing

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs, rubbish, and similar materials shall be cleared from within the limits of the designated areas. Unless otherwise specified, all stumps, roots, and root clusters that have a diameter of one (1) inch or larger shall be grubbed out to a depth of at least two (2) feet below subgrade for concrete structures and one (1) foot below the ground surface at embankment sites and other designated areas.

5. Disposal

All materials cleared and grubbed from the designated areas shall be disposed of at locations shown on the drawings or in a manner specified in Section 7. The contractor is responsible for complying with all local rules and regulations and the payment of any and all fees that may result from disposal at locations away from the project site.

6. Measurement and payment

Method 1 — For items of work for which specific units prices are established in the contract, the cleared and grubbed area is measured to the nearest 0.1 acre. Payment for clearing and grubbing is made for the total area within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2 — For items of work for which specific unit prices are established in the contract, the length of the cleared and grubbed area is measured to the nearest full station (100 feet) along the line designated on the drawing or identified in the specifications. Payment for clearing and grubbing is made for the total length within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 3 — For items of work for which specific unit prices are established in the contract, each tree, stump, and snag having a diameter of 4 inches or larger and each log having a diameter of 4 inches or larger and a length of 10 feet are measured before removal. The size of each tree and snag is determined by measuring its trunk at breast height above the natural ground surface. The size of each log is determined by measuring the butt and by measuring its length from butt to tip. The size of each stump is measured at the top. Diameter is determined by dividing the measured circumference by 3.14.

Payment for clearing and grubbing of each tree, stump, and snag having a diameter of 4 inches or larger and each log having a diameter of 4 inches or larger and a length of 10 feet or larger is made at the contract unit price for its size designation as determined by the following schedule:

Measured diameter (in)	Size designation (in)
4 to 8	6
8 to 12	10
12 to 24	18
24 to 36	30
36 to 60	48
Over 60	60

The sum of such payments shall constitute full compensation for clearing and grubbing (including the clearing and grubbing of smaller trees, stumps, snags, logs, brush, shrubs, and roots), applicable permits and associated fees, and rubbish removal. Such payment shall constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 4 — For items of work for which specific lump sum prices are established in the contract, payment for clearing and grubbing is made at the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

All Methods — The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule will be

included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7.

7. Items of work and construction details

In Section 4, Clearing and Grubbing, all stumps, roots, and root clusters greater than 2 inches in diameter within 1 vertical foot of the ground surface shall be removed.

In section 5, Disposal, all materials removed from the cleared and grubbed areas shall be hauled away, or mulched on-site at areas designated as approved by the SWCD. All disposal methods shall be in accordance with state and local regulations. Burning and/or burying cleared & grubbed materials will not be permitted.

Land clearing debris (trees, limbs, and brush) may be mulched onsite using a wood chipper. The location of mulch stockpiles shall be approved by the SWCD. Mulch may be used for erosion control as directed by the SWCD. All unused mulch shall be disposed of off-site by Contractor at the conclusion of the project. Costs for off-site disposal, including all necessary permits and fees, shall be incidental to the item of work. Land clearing debris (trees, snags, logs, brush, shrubs, and stumps) too large to be mulched shall be disposed of off-site in accordance with all state and local regulations and laws. Costs for off-site disposal, including all necessary permits and fees, shall be incidental to the item of work.

All trees, snags, logs, brush, shrubs, stumps, and rubbish that are felled, detached, or otherwise dislocated in or near the lake or stream channels shall be disposed of as specified or removed to higher ground prior to the end of each workday. The Contractor is to take precaution, when temporarily stockpiling cleared and grubbed materials, to guard against such cleared and grubbed materials being floated or transported off the worksite by rainstorm runoff.

The Contractor shall mark areas and trees to be cleared and grubbed and the SWCD shall approve these areas and trees prior to removal. All trees located within the work limits shall be removed regardless of their identification on the Construction Drawings, unless expressly directed otherwise by the SWCD.

Upon completion of the clearing and grubbing operation, all areas which have been cleared shall be dressed to be reasonably smooth by blading, dragging or floating. The entire area shall be reasonably free of abrupt mounds, dips and windrows to provide a clear area for construction staking. Earthfill for repairing grubbed areas shall be incidental to the completion of the work.

All trash (rubbish) and all other such waste and refuse materials shall be removed from the worksite and disposed of in an approved landfill in accordance with all state and local regulations and laws. Costs for off-site disposal, including all necessary permits and fees, shall be incidental to the item of work.

Items of work to be performed in conformance with this specification and the construction details therefore are:

a. <u>BID ITEM 2-001, Clearing and Grubbing</u>

(1) This item shall consist of all clearing and grubbing within the work limits required for construction of the works of improvement as shown on the drawings.

(2) In Section 6, Measurement and Payment, a single, lump sum payment will be made for this Bid Item.

****End of Construction Specification 2****

Construction Specification 3—Structure Removal

1. Scope

The work shall consist of the removal, salvage, and disposal of structures (including fences) from the designated areas.

2. Marking

Method 1 — Each structure or structure part to be removed will be marked with stakes, flags, paint, or other suitable method.

Method 2 — The area boundaries from which structures must be removed will be marked using stakes, flags, paint, or other suitable method. Structures to remain undisturbed or to be salvaged will be designated by special markings.

3. Removal

Method 1 — All structures designated for removal in the contract shall be removed to the specified extent and depth.

Method 2 — Within the areas so marked, all visible and buried structures identified shall be removed to the specified extent and depth.

4. Salvage

Structures or structure parts that are designated to be salvaged shall be carefully removed and neatly placed in the specified or approved storage location. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly and systematically match marked with paint before disassembly. All connectors and other parts shall be marked to indicate their proper location within the structure and shall be fastened to the appropriate structural member or packed in suitable containers.

Material from fences designated to be salvaged shall be placed outside the work area on the property on which the fence was originally located. Fence wire shall be rolled into uniform rolls of suitable size and neatly piled with other salvaged materials. Posts and rails shall be neatly stacked.

5. Disposal of refuse materials

Refuse materials resulting from structure removal shall be disposed of in a manner and at locations specified in Section 7 of this specification or in an acceptable manner and at locations approved by the contracting officer. Disposal by burning shall be in accordance with local rules and regulations.

6. Measurement and payment

Method 1 — For items of work for which specific unit prices are established by the contract, payment for the removal of each structure unit, except fences, is made at the contract unit price. Fences removed or removed and salvaged are measured to the nearest linear foot. Payment for fence removal or removal and salvage is made at the contract unit prices for each type and size of fence.

Such payment will constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the completion of the work.

Method 2 — For items of work for which specific lump sum prices are established by the contract, payment for structure removal is made at the contract lump sum price.

Such payment will constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the completion of the work.

All Methods — The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed as a contract line item number in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 7 of this specification.

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. BID ITEM 3-001, Structure Removal

(1) This item shall consist of the removal of the existing 30-inch diameter slide gate from the upstream endwall of the principal spillway riser structure.

(2) In Section 2, Marking, Method 1 shall apply.

(3) In Section 3, Removal, Method 1 shall apply.

(4) In Section 5, Disposal of Refuse Materials, burning is not permitted on this project. All concrete materials, masonry materials, pipes, and all other such waste and refuse materials shall be removed from the worksite and disposed of in a landfill in accordance with all state and local regulations and laws. Costs for offsite disposal, including all necessary permits and fees, shall be incidental to the work.

(5) Earthfill used for repairing areas damaged by structure removal shall be placed in accordance with Construction Specification 23 and shall be incidental to the completion of the work.

(6) Blasting is not allowed.

(7) In Section 6, Measurement and Payment, Method 2 shall apply. A single lump sum payment shall be made for this bid item.

****End of Construction Specification 3****

Construction Specification 5—Pollution Control

1. Scope

The work consists of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.

The following BioPreferred® product categories are applicable to this specification:

— mulch and compost materials

— erosion control materials

— fertilizers

— dust suppressants

— agricultural spray adjuvants

2. Material

Silt fence shall conform to the requirement of Materials Specification 592, Geotextile. All other material furnished shall meet the requirements of the material specifications listed in section 8 of this specification.

3. Erosion and sediment control measures and works

The measures and works shall include, but are not limited to, the following:

Staging of earthwork activities—The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

Seeding—Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of that earthwork activity.

Mulching—Mulching to provide temporary protection of the soil surface from erosion.

Diversions—Diversions to divert water from work areas and to collect water from work areas for treatment and safe disposition. They are temporary and shall be removed and the area restored to its near original condition when the diversions are no longer required or when permanent measures are installed.

Stream crossings—Culverts or bridges where equipment must cross streams. They are temporary and shall be removed and the area restored to its near original condition when the crossings are no longer required or when permanent measures are installed.

Sediment basins—Sediment basins collect, settle, and eliminate sediment from eroding areas from impacting properties and streams below the construction site(s). These basins are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Sediment filters—Straw bale filters or geotextile silt fences trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. Silt fences shall be installed and maintained in accordance with ASTM D6462. These filters are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Waterways—Waterways for the safe disposal of runoff from fields, diversions, and other structures or measures. These works are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Other—Additional protection measures as specified in section 8 of this specification or required by Federal, State, or local government.

4. Chemical pollution

The contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to collect and temporarily contain chemical pollutants, such as drained lubricating or transmission fluids, grease, soaps, concrete mixer washwater, or asphalt, produced as a by-product of the construction activities. Pollutants shall be disposed of in accordance with appropriate state and Federal regulations. At the completion of the construction work, tanks, barrels, and sumps shall be removed and the area restored to its original condition as specified in section 8 of this specification. Sump removal shall be conducted without causing pollution.

Sanitary facilities, such as chemical toilets, or septic tanks shall not be located next to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water source. At the completion of construction activities, facilities shall be disposed of without causing pollution as specified in section 8 of this specification.

5. Air pollution

The burning of brush or slash and the disposal of other materials shall adhere to state and local regulations.

Fire prevention measures shall be taken to prevent the start or spreading of wildfires that may result from project activities. Firebreaks or guards shall be constructed and maintained at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall ensure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the engineer 5 working days before the first application.

6. Maintenance, removal, and restoration

All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site restored to near original condition.

7. Measurement and payment

Method 1—For items of work for which specific unit prices are established in the contract, each item is measured to the nearest unit applicable. Payment for each item is made at the contract unit price for that item. For water or chemical suppressant items used for dust control for which items of work are established in section 8 of this specification, measurement for payment will not include water or chemical suppressants that are used inappropriately or excessive to need. Such payment will constitute full compensation for the completion of the work.

Method 2—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds and supported by invoices presented by the contractor that reflect actual costs. If the total of all progress payments is less than the lump sum contract price for this item, the balance remaining for this item will be included in the final contract payment. Payment of the lump sum contract price will constitute full compensation for completion of the work.

Method 3—For items of work for which lump sum prices are established in the contract, payment will be prorated and provided in equal amounts on each monthly progress payment estimate. The number of months used for prorating shall be the number estimated to complete the work as outlined in the contractor's approved construction schedule. The final month's prorate amount will be provided with the final contract payment. Payment as described will constitute full compensation for completion of the

work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items, and the items to which they are made subsidiary, are identified in section 8 of this specification.

8. Items of work and construction details

a. BID ITEM 5-001, Pollution Control

(1) This item shall consist of performing all work and furnishing, placement, maintenance, and removal of the temporary sediment barrier, tree fencing protection, check dams, rock filter dams, rock filter rings, hay bales, temporary dike and ditches, sediment traps, temporary mulch, construction exits, riprap, tire wash stations, concrete waste management stations, and all earthwork, labor, materials and equipment necessary to prevent environmental pollution at the Site.

(2) An erosion, sediment, and pollution control plan will be provided by the SWCD. This is the minimum. The contractor may require additional measures to meet the requirements of this specification.

(3) All discharges leaving the site shall be composed entirely of storm water and natural stream flow, with the exception of discharges from firefighting activities; fire hydrant flushing; potable water sources including water line flushing; irrigation drainage; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials or pollutants. Absolutely no wash water shall be allowed to discharge to the pool or to the outlet channel downstream of the dam.

(4) The discharge of hazardous substances or oil in the storm water discharge from the site shall be prevented. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this Contract, they shall comply with all applicable Federal, State, and local laws, and regulations concerning environmental pollution control and abatement, as well as with other specific requirements stated elsewhere in the Construction Specifications.

(5) Best management practices are required for all construction activities, and must be implemented in accordance with the design specifications contained in the most recent version of the "Virginia Erosion and Sediment Control Handbook" (Referred to as "The Handbook".

(6) No construction activities, beyond those shown on the construction drawings, shall be conducted within a 25-foot buffer along the banks of all State waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action. Construction activities, beyond those shown on the construction drawings, within the 25-foot buffer may require a Stream Buffer Variance.

(7) Land and water resources within the work limits but outside the limits of permanent work shall be preserved in their present condition or shall be restored to a condition that will appear to be natural and not distract from the appearance of the project.

(8) Soil erosion or pollution of streams or other water sources will be prevented by using natural vegetative screens and grading and other measures as necessary.

(9) Prior to draining the lake, the Contractor shall coordinate with the SWCD regarding the preferred handling of fish and other aquatic wildlife in the lake. The Contractor shall not discharge or permit discharge into streams or other water sources fuels, oils, bitumens, garbage, sewage, or materials which may be harmful to fish, wildlife, or vegetation, or that may be detrimental to outdoor recreation. All work shall be performed in such a manner that objectionable conditions will not be created in waters through or adjacent to the project areas.

(10) Sanitary facilities such as chemical toilets, and sumps, tanks, or barrels used to temporarily store chemical pollutants such as drained lubricating oils, shall be disposed of in accordance with regulations of the Virginia Department of Environmental Quality (DEQ).

(11) The location of the Contractor's camps, access and haul roads, storage and other construction buildings, required temporarily in the performance of the work, shall be approved by the engineer.

(12) The preservation of the landscape shall be considered in the selection of all sites and in the construction of buildings.

(13) All access and haul roads used during construction shall have cross drains installed in all drainage ways. Road surfaces shall be free draining. Concentrations of water shall be directed into stabilized water courses or piped to stable outlets. Debris shall be disposed of at an approved landfill.

(14) The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, or stockpiles of excess waste materials.

(15) The contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without special authority. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless authorized by the engineer.

(16) Monuments, markers, works of art, and sites of natural, historical, or archaeological significance shall be protected before beginning operations near them.

(17) Off-site vehicle tracking of dirt, soils, and sediments and the generation of dust shall be minimized or eliminated to the maximum extent practical.

(18) Concrete washdown of tools, concrete mixer chutes, hoppers and the rear of vehicles shall be performed at the concrete waste management location identified in the construction drawings. Washout of the concrete mixer drum at the construction site is prohibited.

(19) Inspections:

a. Each day when any type of construction activity has taken place at the site, certified personnel provided by the Contractor shall inspect:
   i. all areas at the site where petroleum products are stored, used, or handled for spills and leaks from vehicles and equipment;
   ii. all locations at the site where vehicles enter or exit the site for evidence of off-site sediment tracking; and
   iii. measure rainfall once each 24-hour period at the site.

   These inspections must be conducted until a Notice of Termination (NOT) is submitted.

b. Certified personnel (provided by the Contractor) shall inspect the following at least once every seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches rainfall or greater (unless such storm ends after 5:00 PM on any Friday or on any non-working Saturday, non-working Sunday or any non-working Federal holiday in which case the inspection shall be completed by the end of the next business day and/or working day, whichever occurs first):
   i. disturbed areas of the construction site that have not undergone final stabilization;
   ii. areas used by the contractor for storage of materials that are exposed to precipitation that have not undergone final stabilization; and
   iii. structural control measures.

c. Erosion and sediment control measures identified in the Plan applicable to the site shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to the receiving water(s). These inspections must be conducted until a NOT is submitted.
d. Certified personnel (provided by the Contractor) shall inspect at least once per month during the term of this project (i.e., until a NOT is received by DEQ) the areas of the site that have undergone final stabilization. These areas shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and the receiving water(s). Erosion and sediment control measures identified in the Plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s).
e. Based on the results of each inspection, the site description and the pollution prevention and control measures identified in the Erosion, Sedimentation and Pollution Control Plan, the Plan shall be revised as appropriate not later than seven (7) calendar days following each inspection. Implementation of such changes shall be made as soon as practical but in no case later than seven (7) calendar days following each inspection.
f. A report of each inspection that includes the name(s) of personnel making each inspection, the date(s) of each inspection, major observations relating to the implementation of the Erosion, Sedimentation and Pollution Control Plan, and actions taken shall be made and retained at the site or be readily available at a designated alternate location until the entire site or that portion of a construction project that has been phased has undergone final stabilization and a NOT is submitted to DEQ. Such reports shall identify any incidents of non-compliance. Where the report does not identify any incidents of non-compliance, the report shall contain a certification that the construction site is in compliance with the Erosion, Sedimentation and Pollution Control Plan.

(20) Maintenance - The Contractor shall maintain BMPs installed at the site as required by the Handbook throughout construction until a NOT is received by DEQ.

(21) Records Retention - The Contractor shall retain the following records at the construction site or the records shall be readily available at a designated alternate location from commencement of construction until such time as a NOT is submitted:
   (a) A copy of the Notice of Intent submitted to DEQ;
   (b) A copy of the Erosion, Sedimentation and Pollution Control Plan;
   (c) The design professional's report of the results of the 7-day inspection conducted;
   (d) A copy of all monitoring information, results, and reports;
   (e) A copy of all inspection reports;
   (f) A copy of all violation summaries and violation summary reports; and
   (g) Daily rainfall information

(22) In Section 7, Measurement and Payment, a single, lump sum payment will be made for this Bid Item.

(23) Temporary Mulching
   (a) Mulch shall be applied to all exposed areas within 14 days of disturbance
   (b) Select one of the following materials and apply at the depth indicated:

      i. Dry straw or hay shall be applied at a depth of 2 to 4 inches providing complete soil coverage.

      ii. Wood waste (chips, sawdust, or bark) shall be applied at a depth of 2 to 3 inches. Organic material from clearing activities may be chipped and applied as mulch.

iii. Polyethylene film shall be secured over banks or stockpiled soil material for temporary protection

(c) When mulch is used without seeding, mulch shall be applied to provide full coverage of the exposed area.

i. Dry straw or hay mulch and wood chips shall be applied uniformly by hand or by mechanical equipment.

ii. If the area will eventually be covered with perennial vegetation, 20 to 30 pounds of nitrogen per acre in addition to the normal amount shall be applied to offset the uptake of nitrogen caused by the decomposition of the organic mulches.

iii. Apply polyethylene film on exposed areas.

(d) Anchoring mulch

i. Straw or hay mulch can be pressed into the soil with a disk harrow with the disk set straight or with a special "packer disk." Disks may be smooth or serrated and should be 20 inches or more in diameter and 8 to 12 inches apart. The edges of the disk should be dull enough not to cut the mulch but to press it into the soil leaving much of it in an erect position. Straw or hay mulch shall be anchored immediately after application. Straw or hay mulch spread with special blower-type equipment may be anchored. Tackifiers, binders, and hydraulic mulch with tackifier specifically designed for tacking straw can be substituted for emulsified asphalt (refer to the latest edition of the Handbook for emulsified asphalt specifications). Plastic mesh or netting with mesh no larger than one inch by one inch shall be installed according to manufacturer's specifications.

ii. Netting of the appropriate size shall be used to anchor wood waste. Openings of the netting shall not be larger than the average size of the wood waste chips.

iii. Polyethylene film shall be anchor trenched at the top as well as incrementally as necessary.

****End of Construction Specification 5****

Construction Specification 6—Seeding, Sprigging, and Mulching

1. Scope

The work consists of preparing the area for treatment; furnishing and placing seed, sprigs, mulch, fertilizer, inoculant, lime, and other soil amendments; and anchoring mulch in designated areas as specified.

The following BioPreferred® product categories are applicable to this specification:

— Mulch and compost materials

— Erosion control materials

— Fertilizers

— Agricultural spray adjuvants

2. Material

Seed—All seed must conform to the current rules and regulations of the State where it is being used and must be from the latest crop available. It must meet or exceed the standard for purity and germination listed in section 7.

Seed must be labeled in accordance with State laws and U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures are evidence of purity and germination. No seed may be accepted with a test date of more than 9 months before the date of delivery to the site.

Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious weed seed allowable must be as defined in the current State laws relating to agricultural seeds. Each type of seed must be delivered in separate sealed containers and fully tagged unless an exception is granted in writing by the contracting officer.

Fertilizer—Unless otherwise specified, the fertilizer must be a commercial-grade fertilizer. It must meet the standard for grade and quality specified by State law. Where fertilizer is furnished from bulk storage, the contractor must furnish a supplier's certification of analysis and weight. When required by the contract, a representative sample of the fertilizer must be furnished to the contracting officer for chemical analysis.

Inoculants—The inoculant for treating legume seeds must be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and must not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, must be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer must be used, except that four times the amount must be used when seed is applied using a hydraulic seeder. Seed must be sown within 24 hours of treatment and must not remain in the hydraulic seeder longer than 4 hours.

Lime and other soil amendments—Lime must consist of standard ground agriculture limestone, or approved equivalent. Standard ground agriculture limestone is defined as ground limestone meeting current requirements of the State department of agriculture. Other soil amendments must meet quality criteria and application requirements specified in section 7.

Mulch tackifiers—Asphalt emulsion tackifiers must conform to the requirements of ASTM D977, Specification for Emulsified Asphalt. The emulsified asphalt may be rapid setting, medium setting, or slow setting. Nonasphaltic tackifiers required because of environmental considerations must be as specified in section 7.

Straw mulch material—Straw mulch must consist of wheat, barley, oat or rye straw, hay, grass cut from native grasses, or other plants as specified in section 7. The mulch material must be air-dry, reasonably light in color, and must not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds is not permitted. The contractor must provide a method satisfactory to the contracting officer for determining weight of mulch furnished.

Other mulch materials—Mulching materials, such as wood cellulose fiber mulch, mulch tackifiers, synthetic fiber mulch, netting, and mesh may be required for specialized locations and conditions. These materials, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

3. Seeding mixtures, sod, sprigs, and dates of planting

The application rate per acre for seed mixtures, sprigs, or sod and date of seeding or planting must be as shown on the plans or as specified in section 7.

4. Seedbed preparation and treatment

Areas to be treated must be dressed to a smooth, firm surface. On sites where equipment can operate on slopes safely, the seedbed must be adequately loosened (4 to 6 inches deep) and smoothed. Depending on soil and moisture conditions, disking or cultipacking, or both, may be necessary to properly prepare a seedbed. Where equipment cannot operate safely, the seedbed must be prepared by hand methods by scarifying to provide a roughened soil surface so that broadcast seed will remain in place.

If seeding is to be accomplished immediately following construction operations, seedbed preparation may not be required except on a compacted, polished, or freshly cut soil surface.

Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance operations must be removed or disposed of as specified in section 7.

Seedbed preparation must be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the responsible engineer.

5. Seeding, sprigging, fertilizing, mulching, and stabilizing

All seeding or sprigging operations must be performed in such a manner that the seed or sprigs are applied in the specified quantities uniformly in the designated areas. The method and rate of seed application must be as specified in section 7. Unless otherwise specified, seeding or sprigging must be accomplished within 2 days after final grading is completed and approved.

Fertilizer, lime, and other soil amendments must be applied as specified in section 7. When specified, the fertilizer and soil amendments must be thoroughly incorporated into the soil immediately following surface application.

The rate, amount, and kind of mulching or mesh must be as specified in section 7. Mulches must be applied uniformly to the designated areas. They must be applied to areas seeded not later than 2 working days after seeding has been performed. Straw mulch material must be stabilized within 24 hours of application using a mulch crimper or equivalent anchoring tool or by a suitable tackifier. When the mulch crimper or equivalent anchoring tool is used, it must have straight blades and be the type manufactured expressly for and capable of firmly punching the mulch into the soil. Where the equipment can be safely operated, it must be operated on the contour. Hand methods must be used where equipment cannot safely operate to perform the work required.

The tackifier must be applied uniformly over the mulch material at the specified rate, or it must be injected into the mulch material as it is being applied. Mesh or netting stabilizing materials must be applied smoothly but loosely on the designated areas. The edges of these materials must be buried or securely anchored using spikes or staples as specified in section 7.

The contractor must maintain the mesh or netting areas until all work under the contract has been completed and accepted. Maintenance must consist of the repair of areas damaged by water erosion, wind, fire, or other causes. Such areas must be repaired to reestablish the intended condition and to the design lines and grades required by the contract. The areas must be refertilized, reseeded, and remulched before the new application of the mesh or netting.

6. Measurement and payment

Method 1—For items of work for which specific unit prices are established in the contract, each area treated is measured as specified in section 7 and the area is calculated to the nearest 0.1 acre. Payment for treatment is made at the contract unit price for the designated treatment, which will constitute full compensation for completion of the work.

When specified as an item of work, mesh or netting is measured to the nearest square yard of surface area covered and accepted. Payment is made at the contract unit price and will constitute full compensation for completion of the work.

Method 2—For items of work for which specific lump-sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for this item is made at the contract lump-sum price for the item and constitutes full compensation for the completion of the work.

Method 3—For items of work for which lump-sum prices are established in the contract, payment is made as the work proceeds. Progress payments are determined as specified in section 7. Payment of the lump sum contract price constitutes full compensation for completion of the work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 7.

7. Items of work and construction details

a. BID ITEM 6-001, Permanent Vegetative Cover

(1) This item shall consist of applying permanent protective vegetative cover to all disturbed areas within the work limits.

(2) Within sixty (60) days after notice to proceed, the contractor shall submit the name, qualifications, and experience of the company to be assigned to apply the permanent vegetative cover.

(3) Upon notification by the SWCD, the contractor shall apply protective vegetative cover within five working days.

(4) Before seeding commences, topsoil shall be spread over the entire area, working the better topsoil into the more rocky areas. The entire area shall be smoothed with a drag and all clods broken up. All deleterious material, large stones, roots, limbs, and other debris shall be removed to leave a smooth area that would be suitable for mowing. In Section 4, Seedbed Preparation and Treatment, rocks larger than 2 inches in diameter shall be removed.

(5) Details regarding soil fertility analysis to establish application rates of nutrients prior to the beginning of permanent grassing installation are included in the Erosion and Sediment Control Plans within the Construction Drawings.

(6) Purity and germination of seed shall conform to the requirements shown on the Construction Drawings (Erosion, Sedimentation, and Pollution Control Plan). Seed tickets showing State or Federal inspection will be required to verify purity and germination.

(7) Seed mixtures appropriate to the season shall conform to the requirements shown on the Construction Drawings (Erosion, Sedimentation, and Pollution Control Plan).

(8) No lime, fertilizer, or seed shall be mixed, blended, and/or applied except in the presence of the SWCD and/or the Engineer's Representative. The contractor shall give 48 hours notice to the SWCD and/or the Engineer's Representative each time he or she intends to do one of the above operations. Seeding equipment should be cleaned before arrival to the site. Equipment will be inspected upon arrival, prior to mixing, to ensure no seed or foreign matter contaminates the mixture.

Quantities of lime, fertilizer, and seed shall be supported by appropriate weight or volume tickets. Weights of small-grain straw or hay mulch, wood cellulose and cane fiber shall be for air-dry material.

(9) Mulching requirements shall be as indicated on the Construction Drawings.

(10) Maintenance: The Contractor shall be required to do all maintenance necessary to keep seeded areas in a satisfactory condition until final acceptance of the work. This includes repairing washes, installing additional seed, lime, fertilizer and mulch applied to areas where a satisfactory stand of grass has not been achieved. Any erosion occurring in grassed areas shall be immediately repaired.

(11) Watering Schedule: The Contractor shall water newly installed permanent vegetative cover in accordance with the following watering schedule. No additional watering is required if rainfall supplies the amount of water shown below. Water shall be applied at a rate that will prevent erosion and loss of the seed.

- One-half (1/2) inch of water immediately after installation.
- One-fourth (1/4) inch of water every weekday for the next 2 weeks.
- One-fourth (1/4) inch of water three times a week for the next 2 weeks.
- One-half (1/2) inch of water two times a week for the next 2 weeks.

(12) In Section 6, Measurement and Payment, a single, lump sum payment will be made for this Bid Item. Such payment will constitute full compensation for related Subsidiary Item, Water for Construction.

b. BID ITEM 6-002, Temporary Vegetative Cover

(1) This item consists of applying a temporary vegetative cover on unfinished disturbed surfaces.

(2) Temporary vegetative cover shall be applied to earth surfaces disturbed by construction operations on which the SWCD judges that work will be suspended for a period of 14 days or longer. Upon notification by the SWCD, the contractor shall commence applying temporary vegetative cover.

(3) Areas to be seeded shall be dressed to a reasonably smooth surface graded to prevent ponding of water.

(4) Seed type and rate shall be as indicated on the Construction Drawings (Erosion, Sedimentation, and Pollution Control Plan).

(5) Fertilizer type and rate shall be as indicated on the Construction Drawings (Erosion, Sedimentation, and Pollution Control Plan).

(6) Watering Schedule: The Contractor shall water newly installed grass seed used for temporary vegetative cover in accordance with the following watering schedule. No additional watering is required if rainfall supplies the amount of water shown below. Water shall be applied at a rate that will prevent erosion.

- One-half (1/2) inch of water immediately after installation.
- One-fourth (1/4) inch of water three times a week for the next 2 weeks.

(7) Temporary vegetative cover shall not be removed until construction on the treated area requires it. Temporary vegetative cover shall then be removed and disposed of by spreading it in a waste area approved by the SWCD.

(8) In Section 6, Measurement and Payment, a single, lump sum payment will be made for this Bid Item.

c. BID ITEM 6-003, Erosion Control Matting

1) Erosion control blanket shall be used on all cut or fill slopes steeper than or equal to 3H:1V, in the locations shown on the Construction Drawings, or as directed by the SWCD and/or the Engineer's Representative.

(2) Erosion Control Matting Materials: Matting shall consist of North American Green SC-150 Extended Term degradable erosion control blanket, or approved equivalent. Matting shall be constructed with a 70% agricultural straw and 30% coconut fiber matrix and have a functional longevity of up to 24 months.

(3) Site Preparation: Before placing erosion control blanket, the subgrade shall be inspected by Contractor to ensure that it has been properly compacted; has been graded smooth; has no depressed, void, soft, or uncompacted areas; is free from obstructions such as tree roots, projecting stones, or other foreign matter; and has been seeded. Contractor shall not proceed until all unsatisfactory conditions have been remedied. By beginning construction, Contractor signifies his/her approval of preceding work.

(4) Protection of Seeded Area: The erosion control blanket shall be placed over the area to be protected immediately after seeding operations have been completed.

(5) Preparation of Area: All stones, roots, and other objects that may tend to prevent the erosion control blanket from making close contact with the seedbed, shall be removed before the matting is placed.

(6) Erosion control matting shall be installed as directed by the Engineer in accordance with manufacturer's instructions. The extent of erosion control blankets shall be as shown on the Construction Drawings (Erosion, Sedimentation, and Pollution Control Plan).

(7) Straw Mulch: Straw mulch will not be required over the areas protected by the erosion control matting.

(8) Rolling of Planted Area: Immediately after the erosion control matting has been placed and stapled over each area, the entire area covered shall be rolled with a light roller of sufficient weight to press the matting into the surface of the soil. The roller shall not be of such weight as to cause over-compaction of the seed bed. The seed bed shall be sufficiently dry when rolled so as to avoid consolidation of the soil.

(9) Quality Control: Erosion control matting shall not be defective or damaged. Any such problems shall be corrected by Contractor at no cost to Owner and to the satisfaction of Engineer.

(10) In Section 6, Measurement and Payment, a single, lump sum payment will be made for this Bid Item . No additional payments will be made for overlaps or wastage and will cover all labor, equipment, tools, and other items necessary and incidental to placement of an erosion control matting as indicated on the drawings.

d. SUBSIDIARY ITEM, Temporary Mulching

(1) This item shall consist of applying temporary mulch to cover unfinished disturbed areas.

(2) Temporary mulch shall be applied to earth surfaces disturbed by construction operations on which the engineer judges that work will be suspended for a period of 14 days or longer and it is determined mulch can be used in lieu of temporary vegetation. Upon notification by the engineer, the contractor shall commence applying temporary mulch.

(3) Requirements for temporary mulch shall be as indicated in Construction Specification 5.

(4) Separate payment will not be made for this item of work. Compensation for temporary mulching shall be included in BID ITEM 5-001, Pollution Control.

****End of Construction Specification 6****

Construction Specification 7—Construction Surveys

1. Scope

The work consists of performing all surveys, measurements, and computations required by this specification.

2. Equipment and material

Equipment for construction surveys shall be of a quality and condition to provide the required accuracy. The equipment shall be maintained in good working order and in proper adjustment at all times. Records of repairs, calibration tests, accuracy checks, and adjustments shall be maintained and be available for inspection by the engineer. Equipment shall be checked, tested, and adjusted as necessary in conformance with manufacturer's recommendations.

Material is field notebooks, stakes, templates, platforms, equipment, spikes, steel pins, tools, and all other items necessary to perform the work specified.

3. Quality of work

All work shall follow recognized professional practice and the standards of the industry unless otherwise specified in section 9 of this specification. The work shall be performed to the accuracy and detail appropriate for the type of job. Notes, sketches, and other data shall be complete, recorded neatly, legible, reproducible and organized to facilitate ease in review and allow reproduction of copies for job documentation. Survey equipment that requires little or no manual recording of field data shall have survey information documented as outlined in section 9 of this specification.

All computations shall be mathematically correct and shall include information to identify the bid item, date, and who performed, checked, and approved the computations. Computations shall be legible, complete, and clearly document the source of all information used including assumptions and measurements collected.

If a computer program is used to perform the computations, the contractor shall provide the engineer with the software identification, vendor's name, version number, and other pertinent data before beginning survey activities. Computer generated computations shall show all input data including values assigned and assumptions made.

The elevations of permanent and temporary bench marks shall be determined and recorded to the nearest 0.01 foot. Differential leveling and transit traverses shall be of such precision that the error of vertical closure in feet shall not exceed plus or minus 0.1 times the square root of the traverse distance in miles. Linear measurements shall be accurate to within 1 foot in 5,000 feet, unless otherwise specified in section 9 of this specification. The angular error of closure for transit traverses shall not exceed 1 minute times the square root of the number of angles turned.

The minimum requirements for placing slope stakes shall be at 100-foot stations for tangents, as little as 25 feet for sharp curves, breaks in the original ground surface and at any other intermediate stations necessary to ensure accurate location for construction layout and measurement. Slope stakes and cross sections shall be perpendicular to the centerline. Significant breaks in grade shall be determined for cross sections. Distances shall be measured horizontally and recorded to the nearest 0.1 foot. Side shots for interim construction stakes may be taken with a hand level.

Unless otherwise specified in section 9 of this specification, measurements for stationing and establishing the location of structures shall be made to the nearest 0.1 foot.

Elevations for concrete work, pipes, and mechanical equipment shall be determined and recorded to the nearest 0.01 foot. Elevations for earth work shall be determined and recorded to the nearest 0.1 foot.

4. Primary control

The baselines and bench marks for primary control, necessary to establish lines and grades needed for construction, are shown on the drawings and have been located on the job site.

These baselines and bench marks shall be used as the origin of all surveys, layouts, and measurements to establish construction lines and grades. The contractor shall take all necessary precautions to prevent the loss or damage of primary control points. Any stakes or control points lost or damaged by construction activity will be reestablished by the contractor or at contractor expense.

5. Construction surveys

Before work starts that requires contractor performed surveys, the contractor shall submit in writing for the engineer's review: the name, qualifications, and experience of the individuals to be assigned to the survey tasks.

Method 1—Contractor performed surveys shall include:

- checking and any supplemental or interim staking
- performing quantity surveys, measurements, and computations for progress payment
- other surveys as described in section 9 of this specification

Method 2—Contractor performed surveys shall consist of all work necessary for:

- establishing line and grade for all work
- setting slope stakes for all work
- checking and any supplemental or interim staking
- establishing final grade stakes
- performing quantity surveys, measurements, and computations for progress payment
- other surveys as described in section 9 of this specification

Method 3—Contractor performed surveys shall consist of all work necessary for:

- establishing line and grade for all work
- setting slope stakes for all work
- checking and any supplemental or interim staking
- establishing final grade stakes
- performing quantity surveys, measurements, and computations for progress payments
- performing original (initial) and final surveys for determinations of final quantities
- other surveys as described in section 9 of this specification.

6. Staking

The construction staking required for the item shall be completed before work on any item starts. Construction staking shall be completed as follows or as otherwise specified in section 9 of this specification:

Clearing and grubbing—The boundary of the area(s) to be cleared and grubbed shall be staked or flagged at a maximum interval of 200 feet, closer if needed, to clearly mark the limits of work. When contractor staking is the basis for determining the area for final payment, all boundary stakes will be reviewed by the engineer before start of this work item.

Excavation and fill—Slope stakes shall be placed at the intersection of the specified slopes and ground line. Slope stakes and the reference stakes for slopes shall be marked with the stationing, required cut or fill, slope ratio, and horizontal distance from the centerline or other control line. The minimum requirements for placing slope stakes is outlined in section 3, Quality of work.

Structures—Centerline and offset reference line stakes for location, alignment, and elevation shall be placed for all structures.

7. Records

All survey data shall be recorded in fully identified standard hard-bound engineering survey field notebooks with consecutively numbered pages. All field notes and printed data shall include the purpose or description of the work, the date the work was performed, weather data, sketches, and the personnel who performed and checked the work. Electronically generated survey data and computations shall be bound, page numbered, and cross referenced in a bound field notebook containing the index for all survey activities. All work shall follow recognized professional practice.

The construction survey records shall be available at all times during the progress of the work for examination and use by the engineer and when requested, copies shall be made available. The original field notebooks and other records shall be provided to and become the property of the owner before final payment and acceptance of all work.

Complete documentation of computations and supporting data for progress payments shall be submitted to the engineer with each invoice for payment as specified in section 9 of the specification. When the contractor is required to conduct initial and final surveys as outlined in section 5, Construction Surveys, notes shall be provided as soon as possible after completion to the engineer for the purpose of determining final payment quantities.

8. Payment

Method 1—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds, after presentation of correct and accurate invoices by the contractor showing related costs and evidence of the charges of suppliers, subcontractors, and others for supplies furnished and work performed. Invoices for the total amount of the contract price will not be accepted until all surveys are complete and required documentation has been determined complete. If the total of such payments is less than the lump sum contract price for this item, the unpaid balance will be included in the final contract payment. Payment of the lump sum contract price will constitute full compensation for completion of all work under the bid item.

Method 2—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds with progress payment amounts determined as a percentage of the total work planned as projected from the contractor's approved construction schedule. Payment of the lump sum contract price will constitute full compensation for completion of all work under this bid item.

All Methods—Payment will not be provided under this item for the purchase price of materials or equipment having a residual value.

Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the item to which they are made subsidiary are identified in section 9 of this specification.

9. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. BID ITEM, Construction Surveys

(1) This item shall consist of furnishing all equipment and materials and performing all construction survey layout and progress payment quantities as required by this specification.

(2) In Section 5, Construction Surveys, Method 3 shall apply.

(3) In Section 8, Payment, a single, lump sum payment will be made for this Bid Item.

(4) Construction surveys shall be performed by a professional surveyor with demonstrable experience. At least 14 calendar days prior to the start of construction operations the Contractor shall furnish in writing to the SWCD and the Engineer, for approval, the names and qualifications of the persons proposed to perform the construction layout surveys.

(5) A person knowledgeable in the means and methods of surveying and layouts shall be on site at all times with the appropriate equipment.

(6) Survey points for vertical and horizontal control were set by the SWCD and shall be located or reestablished by the Contractor and used for control. If the survey points are within the work area, the Contractor shall relocate the points to an area outside of, but convenient to the work area.

(7) The following survey items, if applicable, shall be provided:

(a) As-built Drawing showing the location of all pertinent structures associated with the items of work.

1. Permanent and temporary site benchmarks and/or control points
2. Principal spillway riser footing structure corners and gate (with horizontal and vertical dimensions and invert).
3. Ground shots at 25 foot intervals along the dam baseline for the following:
    a. Upstream toe of earthen wave berm
    b. Upstream edge of crest of earthen wave berm
    c. Downstream edge of crest of earthen wave berm
    d. Upstream edge of dam crest
    e. Downstream edge of dam crest
4. Ground shots to suitably identify the extents and resulting grades of the borrow area after all excavation from and stabilization of the borrow area is complete.

(8) Survey submittals shall include a plan view with points identified and electronic delivery of point data. Survey information shall have sufficient point data to generate contours and terrain models realistic of the Site conditions. Break-lines and other Site constraints needed for the generation of realistic terrain models shall be included with the submittal.

****End of Construction Specification 7****

Construction Specification 8—Mobilization and Demobilization

1. Scope

The work consists of the mobilization and demobilization of the contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

2. Equipment and material

Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in Section 4 of this specification.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

3. Payment

Payment will be made as the work proceeds, after presentation of paid invoices or documentation of direct costs by the contractor showing specific mobilization and demobilization costs and supporting evidence of the charges of suppliers, subcontractors, and others. When the total of such payments is less than the lump sum contract price, the balance remaining will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for completion of the work.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

4. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. BID ITEM, Mobilization and Demobilization

(1) This item shall consist of the mobilization and demobilization of the contractor's people and equipment necessary for performing the work and for any bond or alternative payment protection and insurance required under this contract. This item shall also include improvement of the access road to the Site to the SWCD's satisfaction, and to facilitate mobilization of equipment and materials to the Site. The Contractor shall maintain the access road in a smooth rut-free condition at all times throughout the contract period. When road conditions are deemed unacceptable by the SWCD and the Engineer, the contractor shall service the road at no additional cost. Road servicing shall include re-grading and placement of additional aggregate or other measures required to keep the access road in a safe and trafficable condition.

(2) Contractor shall notify utility companies at least 30 days prior to any work within the utility right-of-way.

(3) Contractor shall contact the Virginia Utility Protection Service prior to commencing work at the site to locate the underground water lines, sewer lines, power lines, and communication lines located at the site.

(4) The mobilization operation shall include the items enumerated in Section 2, Equipment and Material of this specification.

(5) Demobilization shall include the items of work enumerated in Section 2, Equipment and material of this specification. Demobilization shall also include restoration of the project area and the removal of all debris, trash, tires, equipment, equipment parts, chains, cables, and other such items resulting from the construction operation. This material shall be removed from the worksite and disposed of in an approved sanitary land fill of the Contractor's own choosing.

(6) Demobilization shall also include the repair of any damage to paved areas that the contractor has utilized for work areas. Damaged areas shall be repaired to pre-work condition or better as determined by the SWCD.

(7) In Section 3, Payment, a single, lump sum payment will be made for this Bid Item.

****End of Construction Specification 8****

Construction Specification 10—Water for Construction

1. Scope

The Work consists of furnishing, transporting, measuring, and applying water as specified.

2. Facilities and equipment

The Contractor shall install and maintain access and haul roads and furnish, operate, and maintain all pumps, meters, piping, tanks, storage, and other facilities required to load, transport, store, distribute, and use construction water as specified.

These facilities shall be equipped with accurate, Work-dedicated meters; tanks of known volume; or other devices that provide a correct measurement of water supplied. Meters shall be installed at the point of delivery into water hauling equipment or application system, such as sprinkler systems or flooding systems, as specified.

3. Dust abatement and haul road maintenance

Water for dust abatement and haul road maintenance shall be applied to haul roads and other dust producing areas as needed to prevent air pollution or excessive dust (which causes impaired vision on trafficked roads and in Work areas) and to maintain the roads in good condition for safe and efficient operation during periods of use. Roads that may be jointly used with the public and by the Contractor's equipment shall have dust abatement provisions acceptable to the public entity that has road maintenance responsibility. Compensation for water used for dust abatement and haul road maintenance shall be as specified in section 8 of this Specification.

4. Earthfill, drainfill, and rockfill

Water required for proper installation of earthfill, drainfill, and/or rockfill shall be used in the fill materials as specified in the applicable construction Specification(s). Compensation for construction water used for earthfill, drainfill, and/or rockfill shall be as specified in section 8 of this Specification.

5. Concrete, mortar, and grout

Water required in the mixing or curing of concrete, shotcrete, roller compacted concrete, or other portland cement mortar or grout shall meet the requirements of the applicable construction Specifications and shall be used in conformance with those Specifications. Payment for construction water used in these items is covered by the applicable concrete, mortar, or grout Specification, or a combination of these.

6. Other construction requiring water

Water required and used for other construction activities under this Contract, but not specifically covered by this Specification shall be considered subsidiary to the item(s) of Work that requires its use.

7. Measurement and payment

Method 1—For water items for which specific Unit Prices are established in the Contract, the volume of water furnished and used in accordance with the Specifications will be measured to the nearest 1,000 gallons.

Payment for water is made at the Contract Unit Price. Such payment will constitute full compensation for the direct costs of water. All other costs necessary for transportation, distribution, and application are subsidiary to the items of Work with which they are associated.

Method 2—For water items for which specific Unit Prices are established in the Contract, the volume of water furnished and used in accordance with the Specifications will be measured to the nearest 1,000 gallons.

Payment for water and the cost associated with transportation, distribution, and application is made at the Contract Unit Price. Such payment will constitute full compensation for completion of the Work.

Method 3—For water items for which specific Unit Prices are established in the Contract, the volume of water used in accordance with the Specifications will be measured to the nearest 1,000 gallons.

Payment for water is made at the Contract Unit Price. Such payment, excluding water cost, will constitute full compensation for completion of the Work.

All methods—The following provisions apply to all methods of measurement and payment:

- The measurement for payment will include all water used except as noted in sections 5, 6, and 8 of this Specification. Measurement for payment will not include water that is used inappropriately or in excess of that needed to accomplish the specified task.
- Compensation for any item of Work described in the Contract, but not listed in the Bid Schedule is included in the payment for the item of Work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 8 of this Specification.

8. Items of Work and construction details

This construction site is subject to the surface water permitting requirements of the Commonwealth of Virginia. The Contractor will be responsible for obtaining any required water withdrawal or use permits, including the payment of any fees associated with the permit.

Items of Work to be performed in conformance with this Specification and the construction details are:

a. Subsidiary Item, Water for Construction

(1) This item shall consist of conveying, spreading, and sprinkling of water as applicable for dust abatement, earthfill, drainfill, topsoil, irrigation of seeded areas, and any other construction activity. Use of water for these activities shall be considered subsidiary to those items.

(2) Water shall be obtained from the on-site stream/lake or an off-site source. Water pumped from the on-site stream/lake shall not be applied to drainfill. If the on-site stream/lake cannot be utilized to provide sufficient water for construction, the Contractor shall obtain water offsite.

(3) Separate payment will not be made for this item of Work. Compensation for conveying, spreading, sprinkling and any other use of water shall be included in the applicable Bid Item for which it is used including, but not limited to the following Bid Items:

Bid Item 5-001, Pollution Control
Bid Item 6-001, Permanent Vegetative Cover
Bid Item 8-001, Mobilization & Demobilization
Bid Item 23-001, Earthfill
Bid Item 26-001, Topsoil

****End of Construction Specification 10****

Construction Specification 11—Removal of Water

1. Scope

The work consists of the removal of surface water and ground water as necessary to perform the construction required by the contract in accordance with the specifications. It shall include: (1) constructing, installing, building, and maintaining all necessary temporary water containment facilities, channels, and diversions; (2) furnishing, installing, and operating all necessary pumps, piping, and other facilities and equipment; and (3) removing all such temporary works and equipment after their intended function is no longer required.

2. Diverting surface water

The contractor shall install, maintain, and operate all cofferdams, channels, flumes, sumps, and all other temporary diversion and protective works needed to divert streamflow and other surface water through or around the construction site. Control of surface water shall be continuous during the period that damage to construction work could occur. Unless otherwise specified and/or approved, the diversion outlet shall be into the same drainageway that the water would have reached before being diverted.

The contractor shall furnish the contracting officer, in writing, a proposed plan for diverting surface water before beginning any construction activities for which a diversion is required, unless waived in Section 8 of this specification. Acceptance of this plan or the waiving of the plan requirement will not relieve the contractor of the responsibilities related to this activity during the process of completing the work as specified.

3. Dewatering the construction site

Foundations, cutoff trenches, and all other parts of the construction site shall be dewatered and kept free of standing water and muddy conditions as necessary for the proper execution of the work. The contractor shall furnish, install, operate, and maintain all drains, sumps, pumps, casings, well points, and all other equipment required to properly dewater the site as specified. Dewatering systems that cause a loss of soil fines from the foundation areas will not be permitted.

The contractor shall furnish the contracting officer, in writing, a proposed plan for dewatering before commencing with any construction activity for which dewatering may be required, unless waived in Section 8 of this specification. Acceptance of this plan or the waiving of the plan requirement will not relieve the contractor of the responsibilities for completing the specified work.

4. Dewatering borrow areas

The contractor shall maintain all borrow areas free of surface water or otherwise provide for timely and effective removal of surface and subsurface water that accumulates within the borrow area, unless waived in Section 8 of this specification. Borrow material shall be processed as necessary to achieve proper and uniform moisture content at the time of placement.

If pumping to dewater borrow areas is included as a bid item of work in the bid schedule, each pump discharge pipe shall be equipped with a water meter. The meter shall be such that the measured quantity of water is accurate within 3 percent of the true quantity. The contractor shall provide necessary support to perform accuracy tests of the water meter when requested by the contracting officer.

5. Erosion and pollution control

Removal of water from the construction site, including the borrow areas, shall be accomplished so that erosion and the transporting of sediment and other pollutants are minimized. Dewatering activities shall be accomplished in a manner that the water table water quality is not altered. Pollution control activities shall not conflict with the requirements of Construction Specification 5, Pollution Control, if it is a part of this contract.

6. Removal of temporary works

When temporary works are no longer needed, the contractor shall remove and return the area to a condition similar to that which existed before construction. Areas where temporary works were located shall be graded for sightly appearance with no obstruction to natural surface waterflows or the proper functioning and access to the works of improvement installed. The contractor shall exercise extreme care during the removal stages to minimize the loss of soil sediment and debris that was trapped during construction.

Pipes, casings, and any other material used to dewater the site shall be removed from temporary wells. The wells shall be filled to ground level with clean gravel or other suitable material approved by the contracting officer. The contractor shall exercise extreme care to prevent pollution of the ground water by these actions.

7. Measurement and payment

Method 1 — Items of work listed in the bid schedule for removal of water, diverting surface water, and dewatering construction sites and borrow areas are paid for at the contract lump sum prices. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2 — Items of work listed in the bid schedule for removal of water, diverting surface water, dewatering construction sites, and dewatering borrow areas are paid for at the contract lump sum prices. Such payment will constitute full compensation for furnishing, installing, operating, and maintaining the necessary trenches, drains, sumps, pumps, and piping and for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work. The exception is that additional payment for pumping to dewater borrow areas and the removal of water will be made as described in the following paragraph.

If pumping to dewater borrow areas is a contract bid item, payment is made at the contract unit price, which shall be the price per 1,000 gallons shown in the bid schedule. Such payment will constitute full compensation for pumping only. Compensation for equipment and preparation and for other costs associated with pumping is included in the lump sum payment for removal of water or the lump sum payment for dewatering the borrow areas. Payment is made only for pumping that is necessary to dewater borrow areas that cannot be effectively drained by gravity or that must have the water table lowered to be usable as a suitable borrow source. Pumping for other purposes will not be included for payment under this item.

All Methods — The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the contract line item to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

8. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. BID ITEM 11-001, Removal of Water

(1) This item shall consist of all operations necessary for removal of the surface and subsurface water from all work areas, in order to construct the work to the lines and grades shown on the drawings. The cost of sumps, pumps, dewatering well points, dewatering wells, interception trenches, and sedimentation ponds shall be incidental to the work of Removal of Water.

(2) In Section 7, Measurement and Payment, a single, lump sum payment will be made for this Bid Item.

(3) Plans for diverting surface waters and dewatering the site shall be submitted to the SWCD and the Engineer 21 days prior to the start of any operation requiring diverting surface water or dewatering the site. Draining of the lake shall not commence until the plan has been approved by the SWCD. No excavation will begin on the existing dam until the plan has been approved by the Contracting Officer's Representative. The plan shall include the use of dewatering wells or well points as a method to dewater the site. Contractor shall utilize test pits, piezometers, and sumps to determine the location of the phreatic surface.

(4) Twenty-one (21) days prior to modifying the normal pool elevation of the lake, the Contractor shall notify the SWCD and the Engineer in writing so that adjacent property owners and other interested parties may be notified of this activity.

(5) Prior to draining the lake, the Contractor shall coordinate with the SWCD regarding the preferred handling of fish and other aquatic wildlife in the lake.

(6) Prior to the start of excavation, the Contractor shall remove sediment from the vicinity of the low-level gate so that the footing of the riser is clear of sediment. The Contractor is to use caution when removing sediment so as to not damage the riser structure. After removing the upstream sediment, the Contractor may utilize the existing low-level gate to lower or maintain the water surface elevation of the lake prior to or during construction. The lake shall be maintained at or below the prescribed construction phase water surface elevation until the Contractor is given written approval from the SWCD that the pool can be raised.

(7) Contractor shall be permitted to cease or reduce subsurface dewatering activities once the portions of the structure that required subsurface dewatering are completed and backfilled. Approval to cease or reduce subsurface dewatering shall be approved by the SWCD and the Engineer.

****End of Construction Specification 11****

Construction Specification 21—Excavation

1. Scope

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

2. Classification

Excavation is classified as common excavation, rock excavation, or unclassified excavation in accordance with the following definitions.

Common excavation is defined as the excavation of all materials that can be excavated, transported, and unloaded using heavy ripping equipment and wheel tractor-scrapers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by excavators having a rated capacity of one cubic yard or larger and equipped with attachments (shovel, bucket, backhoe, dragline, or clam shell) appropriate to the material type, character, and nature of the materials.

Rock excavation is defined as the excavation of all hard, compacted, or cemented materials that require blasting or the use of ripping and excavating equipment larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than 1 cubic yard encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material.

For the purpose of these classifications, the following definitions shall apply:

Heavy ripping equipment is a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a track type tractor having a power rating of at least 250 flywheel horsepower unless otherwise specified in Section 10.

Wheel tractor-scraper is a self-loading (not elevating) and unloading scraper having a struck bowl capacity of at least 12 cubic yards.

Pusher tractor is a track type tractor having a power rating of at least 250 flywheel horsepower equipped with appropriate attachments.

Unclassified excavation is defined as the excavation of all materials encountered, including rock materials, regardless of their nature or the manner in which they are removed.

3. Blasting

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by a person(s) of proven experience and ability who is authorized and qualified to conduct blasting operations.

Blasting shall be done in a manner as to prevent damage to the work or unnecessary fracturing of the underlying rock materials and shall conform to any special requirements in Section 10 of this specification. When specified in Section 10, the contractor shall furnish the engineer, in writing, a blasting plan before blasting operations begin.

4. Use of excavated material

Method 1 — To the extent they are needed, all suitable material from the specified excavations shall be used in the construction of required permanent earthfill or rockfill. The suitability of material for specific purposes is determined by the engineer. The contractor shall not waste or otherwise dispose of suitable excavated material.

Method 2 — Suitable material from the specified excavations may be used in the construction of required earthfill or rockfill. The suitability of material for specific purposes is determined by the engineer.

5. Disposal of waste materials

Method 1 — All surplus or unsuitable excavated materials are designated as waste and shall be disposed of at the locations shown on the drawings.

Method 2 — All surplus or unsuitable excavated materials are designated as waste and shall be disposed of by the contractor at sites of his own choosing away from the site of the work. The disposal shall be in an environmentally acceptable manner that does not violate local rules and regulations.

6. Excavation limits

Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase. Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work. Excavations outside the lines and limits shown on the drawings or specified herein required to meet safety requirements shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation.

7. Borrow excavation

When the quantities of suitable material obtained from specified excavations are insufficient to construct the specified earthfills and earth backfills, additional material shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as specified in Section 10 or as approved by the engineer.

Borrow pits shall be excavated and finally dressed to blend with the existing topography and sloped to prevent ponding and to provide drainage.

8. Overexcavation

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the engineer. Concrete that will be exposed to the atmosphere when construction is completed shall meet the requirements of concrete selected for use under Construction Specification 31, Concrete for Major Structures, or 32, Structure Concrete, as appropriate.

Concrete that will be permanently covered shall contain not less than five bags of cement per cubic yard. The concrete shall be placed and cured as specified by the engineer.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved, compacted earthfill. The exception to this is that if the earth is to become the subgrade for riprap, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the

specifications for the riprap, rockfill, bedding, or drainfill. Before correcting an overexcavation condition, the contractor shall review the planned corrective action with the engineer and obtain approval of the corrective measures.

9. Measurement and payment

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits is measured and computed to the nearest cubic yard by the method of average cross-sectional end areas or by methods outlined in Section 10 of this specification. Regardless of quantities excavated, the measurement for payment is made to the specified pay limits except that excavation outside the specified lines and grades directed by the engineer to remove unsuitable material is included. Excavation required because unsuitable conditions result from the contractor's improper construction operations, as determined by the engineer, is not included for measurement and payment.

Method 1 — The pay limits shall be as designated on the drawings.

Method 2 — The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed before the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill, the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

Method 3 — The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed before the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill, the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
b. The lower and lateral limits shall be the true surface of the completed excavation as directed by the engineer.

Method 4 — The pay limits shall be defined as follows:

a. The upper limit shall be the original ground surface as it existed before the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill, the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
b. The lower limit shall be at the bottom surface of the proposed structure.
c. The lateral limits shall be 18 inches outside of the outside surface of the proposed structure or shall be vertical planes 18 inches outside of and parallel to the footings, whichever gives the larger pay quantity, except as provided in d below.
d. For trapezoidal channel linings or similar structures that are to be supported upon the sides of the excavation without intervening forms, the lateral limits shall be at the underside of the proposed lining or structure.
e. For the purposes of the definitions in b, c, and d, above, any specified bedding or drainfill directly beneath or beside the structure will be considered to be a part of the structure.

All methods — The following provisions apply to all methods of measurement and payment.

Payment for each type and class of excavation is made at the contract unit price for that type and class of excavation. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work except that extra payment for backfilling overexcavation will be made in accordance with the following provisions.

Payment for backfilling overexcavation, as specified in Section 8 of this specification, is made only if the excavation outside specified lines and grades is directed by the engineer to remove unsuitable material and if the unsuitable condition is not a result of the contractor's improper construction operations as determined by the engineer.

Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

10. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. BID ITEM 21-001, Excavation, Common

(1) This item shall consist of all necessary excavation required to remove the existing riser structure gate, regrade the embankment dam to the lines and grades indicated on the Construction Drawings, and construct the wave berm to the lines and grades shown on the drawings. All excavation shall be performed in a manner that will not result in unnecessary sediment pollution. All excavation shall be performed in a safe manner that complies with OSHA regulations for Trenching and Shoring and Confined Spaces. Contractor shall furnish and place all sheeting, shoring, bracing, and supports incidental to excavation.

(2) Section 4, Use of Excavated Materials, Method 1 shall apply. Suitable materials resulting from these excavations shall be used as onsite earthfill or topsoil. Excavated materials shall be placed, spread, and compacted in its final location as soon as possible following excavation, unless stockpiling is approved by the SWCD. The contractor will be permitted to stockpile excavated materials in a temporary stockpile area as shown in the Construction Drawings. The excavated material shall be protected for re-use in a manner that will minimize contamination and moisture absorption, as approved by the engineer. Stockpiled excavated materials shall meet the soil erosion and sediment control requirements in Construction Specification 5, Pollution Control. At the end of the Contract, any excess material in the temporary stockpile area shall be disposed of in accordance with Section 5, Disposal of Waste Materials, Method 2.

(3) In Section 5, Disposal of Waste Materials, Method 1 shall apply and work shall be conducted in accordance with Bid Item No. 23-002. Payment shall be made under the unit prices established in Bid Item No. 23-002.

(4) Plan of Operations: Not less than 21 calendar days before beginning any excavation work, the contractor shall submit to the SWCD for review and approval a detailed plan of the proposed excavation operations. The plan shall include, but not be limited to, a list of equipment, order and sequence of work, proposed locations of stockpiles and location and proposed construction of haul roads, including widths and post-construction obliteration and restoration, and proposed erosion and sediment control measures. The submittal shall address in detail and specify the erosion and sediment control measures as required by Construction Specification 5, Pollution Control. The submittal shall address in detail and specify the dewatering measures as required by Construction Specification 11, Removal of Water.

(5) If during excavation, groundwater is encountered, excavation operations shall cease, the excavation shall be stabilized, and excavation shall not continue until the area is dewatered to the required depth, as specified in Construction Specification 11.

(6) All logs, stumps, roots, and debris removed during the excavation operations shall be disposed off-site as specified in Construction Specification 2, Section 7, Paragraph a.(5) and (6) of this set of specifications.

(7) Sheeting and Bracing: Furnish, put in place and maintain sheeting and bracing required to support the sides of the excavation and prevent loss of ground that could damage or delay the work or endanger adjacent structures.

(8) The estimated depth and extent of excavation is shown on the drawings. During the progress of the work, the slopes, grades or dimensions of the excavations may require adjustment from those shown on the plans or specified herein based on conditions encountered in the field. Any such over excavation must be at the direction of, or

approved by, the Contracting Officer's Representative and will be paid for at the contract unit price for common excavation.

(9) All necessary precautions shall be taken to preserve the material below and beyond the indicated or specified lines of all excavations in the best possible condition. Any and all excess excavation for the convenience of the contractor or over excavation performed by the contractor for any purpose or reason except as may be ordered in writing by the Contracting Officer's Representative shall be at the expense of the contractor. Where required to complete the work, all such excess excavation and over excavation shall be refilled at the expense of and by the contractor. Over excavation shall be backfilled to the moisture and density specified for earthfill in Construction Specification 23, Earthfill.

(10) In Section 9, Measurement and Payment, a single, lump sum payment will be made for this Bid Item.

****End of Construction Specification 21****

Construction Specification 23—Earthfill

1. Scope

The work consists of the construction of earth embankments, other earthfills, and earth backfills required by the drawings and specifications.

Earthfill is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner.

Earth backfill is composed of natural earth material placed and compacted in confined spaces or adjacent to structures (including pipes) by hand tamping, manually directed power tampers or vibrating plates, or their equivalent.

2. Material

All fill material shall be obtained from required excavations and designated borrow areas. The selection, blending, routing, and disposition of material in the various fills shall be subject to approval by the engineer.

Fill materials shall contain no frozen soil, sod, brush, roots, or other perishable material. Rock particles larger than the maximum size specified for each type of fill shall be removed prior to compaction of the fill.

The types of material used in the various fills shall be as listed and described in the specifications and drawings.

3. Foundation preparation

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable material or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface material of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of 2 inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose material by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be no steeper than one horizontal to one vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

4. Placement

Earthfill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the engineer. Earthfill shall not be placed upon a frozen surface nor shall snow, ice, or frozen material be incorporated in the earthfill matrix.

Earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified in section 10 or shown on the drawings. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted.

Hand compacted earth backfill shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of earth backfill compacted by manually directed power tampers.

Earth backfill shall be placed in a manner that prevents damage to the structures and allows the structures to assume the loads from the earth backfill gradually and uniformly. The height of the earth backfill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earthfill and earth backfill in dams, levees, and other structures designed to restrain the movement of water shall be placed to meet the following additional requirements:

(a) The distribution of materials throughout each zone shall be essentially uniform, and the earthfill shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material. Zone earthfills shall be constructed concurrently unless otherwise specified.

(b) The surface of each layer shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

(c) The top surface of embankments shall be maintained approximately level during construction with two exceptions: A crown or cross-slope of about 2 percent shall be maintained to ensure effective drainage, or as otherwise specified for drainfill or sectional zones.

(d) Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of streamflow during construction are specifically authorized in the contract.

(e) Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all material not meeting the requirements of this specification and shall be scarified, moistened, and recompacted when the new earthfill is placed against it. This ensures a good bond with the new earthfill and obtains the specified moisture content and density at the contact of the inplace and new earthfills.

5. Control of moisture content

During placement and compaction of earthfill and earth backfill, the moisture content of the material being placed shall be maintained within the specified range.

The application of water to the earthfill material shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the material after placement on the earthfill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet when deposited on the earthfill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted earthfill or a foundation or abutment surface in the zone of contact with the earthfill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content before placement of the next layer of earthfill.

6. Compaction

Earthfill—Earthfill shall be compacted according to the following requirements for the class of compaction specified:

Class A compaction—Each layer of earthfill shall be compacted as necessary to provide the density of the earthfill matrix not less than the minimum density specified in Section 10 or identified on the drawings. The earthfill matrix is defined as the portion of the earthfill material finer than the maximum particle size allowed in the reference compaction test method specified (ASTM D698 or ASTM D1557).

Class B compaction—Each layer of earthfill shall be compacted to a mass density not less than the minimum density specified.

Class C compaction—Each layer of earthfill shall be compacted by the specified number of passes of the type and weight of roller or other equipment specified or by an approved equivalent method. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

Earth backfill—Earth backfill adjacent to structures shall be compacted to a density equivalent to that of the surrounding inplace earth material or adjacent required earthfill or earth backfill. Compaction shall be accomplished by hand tamping or manually directed power tampers, plate vibrators, walk-behind, miniature, or self-propelled rollers. Unless otherwise specified heavy equipment including backhoe mounted power tampers or vibrating compactors and manually directed vibrating rollers shall not be operated within 3 feet of any structure. Towed or self-propelled vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from a crane or hoist is not permitted.

The passage of heavy equipment will not be allowed:

- Over cast-in-place conduits within 14-days after placement of the concrete
- Over cradled or bedded precast conduits within 7 days after placement of the concrete cradle or bedding
- Over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or 3 feet, whichever is greater, except as may be specified in section 10.

Compacting of earth backfill adjacent to structures shall not be started until the concrete has attained the strength specified in section 10 for this purpose. The strength is determined by compression testing of test cylinders cast by the contractor's quality control personnel for this purpose and cured at the work site in the manner specified in ASTM C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of earth backfill adjacent to structures shall not be started until the following time intervals have elapsed after placement of the concrete.

Structure	Time interval (days)
Vertical or near-vertical walls with earth loading on one side only	14
Walls backfilled on both sides simultaneously	7
Conduits and spillway risers, cast-in-place (with inside forms in place)	7
Conduits and spillway risers, cast-in-place (inside forms removed)	14
Conduits, pre-cast, cradled	2
Conduits, pre-cast, bedded	1
Cantilever outlet bents (backfilled both sides simultaneously)	3

7. Reworking or removal and replacement of defective earthfill

Earthfill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable earthfill. The replacement earthfill and the foundation, abutment, and earthfill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

8. Testing

During the course of the work, the contractor shall perform quality control tests, as applicable, to identify earthfill and earth backfill materials; determine the reference maximum density and optimum moisture content; and document that the moisture content of material at the time of compaction and the density of earthfill and earth backfill in place conform to the requirements of this specification.

Determining Reference Maximum Density and Optimum Moisture Content—For Class A compaction, the reference maximum density and optimum moisture content shall be determined in accordance with the compaction test and method specified on the drawings or in section 10.

Documenting Specification Conformance—In-place densities of earthfill and earth backfill requiring Class A compaction shall be measured in accordance with ASTM D1556, D2167, D2937, D6938 or D8167. Moisture contents of earthfill and earth backfill at the time of compaction shall be measured in accordance with ASTM D2216, D4643, or D6938. Values of moisture content determined by ASTM D2216 are considered the true value of the soil moisture. Values of moisture content determined by ASTM D4643 or D6938 shall be verified by comparison to values obtained by ASTM D2216. Values of in-place density and moisture content determined by these tests shall be compared to the minimum density and moisture content range specified on the drawings or in section 10.

Correction for Oversize Particles—If the materials to be used for earthfill or earth backfill contain more than 5 percent by dry weight of oversize rock particles (particles larger than those allowed in the specified compaction test and method), corrections for oversize particles shall be made using the appropriate procedures explained in ASTM D4718.

9. Measurement and payment

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earthfill and earth backfill within the specified zone boundaries and pay limits is measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Unless otherwise specified in section 10, no deduction in volume is made for embedded items, such as, but not limited to, conduits, inlet structures, outlet structures, embankment drains, sand diaphragm and outlet, and their appurtenances.

The pay limits shall be as defined below, with the further provision that earthfill required to fill voids resulting from overexcavation of the foundation, outside the specified lines and grades, will be included in the measurement for payment only under the following conditions:

- Where such overexcavation is directed by the engineer to remove unsuitable material, and
- Where the unsuitable condition is not a result of the contractor's improper construction operations as determined by the engineer.

Earthfill beyond the specified lines and grades to backfill excavation required for compliance with OSHA requirements will be considered subsidiary to the earthfill bid item(s).

Method 1—The pay limits shall be as designated on the drawings.

Method 2—The pay limits shall be the measured surface of the foundation when approved for placement of the earthfill and the specified neat lines of the earthfill surface.

Method 3—The pay limits shall be the measured surface of the foundation when approved for placement of the earthfill and the measured surface of the completed earthfill.

Method 4—The pay limits shall be the specified pay limits for excavation and the specified neat lines of the earthfill surface.

Method 5—The pay limits shall be the specified pay limits for excavation and the measured surface of the completed earthfill.

Method 6—Payment for each type and compaction class of earthfill and earth backfill is made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work.

Method 7—Payment for each type and compaction class of earthfill and earth backfill is made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work except furnishing, transporting, and applying water to the foundation and earthfill material. Water applied to the foundation and earthfill material is measured and payment made as specified in Construction Specification 10.

All methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10 of this specification.

10. Items of work and construction details

BID ITEM 23-001, Earthfill, On-site Use

(1) This bid item shall consist of all earthfill and backfill obtained from on-site sources as required to construct the proposed wave berm, to regrade the embankment, and all other work shown on the Construction Drawings. The upper 12 inches of surface material necessary to achieve final grades as indicated on the Construction Drawings shall be paid under Bid Item 26-001, Topsoiling.

(2) In Section 9, Measurement and Payment, a single, lump sum payment will be made for this Bid Item . Such payment will constitute full compensation for related Subsidiary Items, Water for Construction. Earthfill materials obtained from the borrow area indicated on the Construction Drawings shall be paid under Bid Item 23-001, Earthfill, On-site Use, and no payment for excavation of these materials shall be made.

(3) Material shall consist of silts (ML, MH), silty sands (SM), clayey sands (SC), or clays (CL, CH) according to the Unified Soil Classification System.

(4) In Section 6, Compaction, compaction shall be Class A. Unless otherwise specified, the in-place density shall be 95% of the Standard Density or greater as defined in ASTM D698, Method A.

(5) The moisture content of the fill matrix at the time of compaction shall be 0% to 4% above the optimum moisture content as determined by ASTM D698.

(6) The maximum layer thickness before compaction shall be 9 inches, or 4 inches where hand operated compaction equipment is used.

(7) The maximum particle size shall not exceed two-thirds of the lift thickness and shall contain less than one percent by weight of organics.

(8) Prior to placement of the initial fill layer on earthen foundations, the foundation shall be loosened to a depth of approximately 3 inches and, after any necessary moisture adjustments, shall be compacted with a minimum of six complete passes of the compaction equipment.

(9) After being deposited on the fill, each lift of fill material shall be spread, bladed and smoothed to the extent necessary to insure that the surface is free of abrupt mounds, depressions or windrows to provide a smooth uniform surface for operation of plowing and compaction equipment. Each lift of fill material shall then be disked, or plowed to an acceptable degree and depth so as to thoroughly loosen and blend the material with the preceding lift before compaction is started.

The maximum disk blade size shall be 36" in diameter; and minimum disk size shall be 34" in diameter. An increase in the weight of the plow; an increase in disc size; a decrease in thickness of lifts being placed, or any combination of these may be required to accomplish the blending and bonding herein specified.

(10) All foundation and embankment surfaces shall be closely examined immediately prior to the placement of all earthfills and backfills. All materials that exhibit drying cracks, slaking, or other evidences of being unstable or unsuitable, shall be removed or reworked by scarification, wetting, and compaction to the affected depths prior to the placement of fill. Additional compensation will not be made for removing or reworking the foundation or fill materials to meet the requirements herein specified.

b. BID ITEM 23-002, Earthfill, Off-site Disposal

(1) This item shall consist of the activities associated with hauling and disposal of unsuitable or excess excavated soil and rock materials that are not to be used as part of construction of the earth portion of the on-site permanent work.

(2) Unsuitable/Excess Excavated Soil Materials: The Contractor shall stockpile all earthfill and topsoil material, as specified in Construction Specification 21. At the completion of earthfill and topsoiling activities, excess soils or soils deemed unsuitable by the SWCD shall be removed from the site in as specified in Construction Specification 21.

(3) Measurement for Earthfill, Off-site Disposal, shall be calculated as the amount of excavated materials as determined by Bid Item 21-001, Excavation, minus the volume of on-site earthfill as determined by Bid Item 23-001, Earthfill, On-Site Use.

Earthfill, Off-site Disposal = Excavation, Common **minus** Earthfill, On-site Use

(4) Payment shall be made at a single, lump sum payment for this Bid Item.

End of Construction Specification 23

Construction Specification 26—Topsoiling

1. Scope

The work consists of furnishing and spreading topsoil to specified depths at locations shown on the drawings.

2. Quality of topsoil

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, rocks, or other unsuitable material. Additional quality requirements, if any, are in Section 7 of this specification.

3. Furnishing

Method 1 — Topsoil shall be salvaged from designated earth surfaces that will be disturbed by construction activities. After designated sites have been cleared and grubbed, the topsoil shall be removed from the designated areas and stockpiled at locations shown on the drawings or acceptable to the engineer. Unsuitable material encountered during removal of topsoil shall be disposed of at locations shown on the drawings or approved by the engineer, or it will be otherwise hauled and disposed of at locations removed from the construction site. The contractor is responsible for complying with all local rules and regulations and the payment of any and all fees that may result from the disposal at locations outside the construction work limits.

Method 2 — Topsoil shall be furnished from an offsite source designated by the contractor. The engineer shall be granted access to the source for inspection and acceptance before delivery to the site. Test results and samples shall be provided when specified in Section 7 of this specification.

4. Stockpiling

Stockpiles of topsoil shall not conflict with the requirements of Construction Specification 5, Pollution Control, when made a part of this contract.

5. Spreading

Method 1 — Spreading shall not be conducted when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to uniform spreading operations. Surfaces designated to receive a topsoil application shall be lightly scarified just before the spreading operation.

Following the spreading operation, the topsoil surface shall be left reasonably smooth and without ruts or surface irregularities that could contribute to concentrated waterflow downslope.

Method 2 — Spreading shall not be performed when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to uniform spreading operations. Surfaces designated to receive a topsoil application shall be lightly scarified just before the spreading operation. Where compacted earthfills are designated to be topsoiled, the topsoil shall be placed concurrently with the earthfill and shall be bonded to the compacted fill with the compacting equipment.

Following the spreading operation, the topsoil surface shall be left reasonably smooth and without ruts or surface irregularities that could contribute to concentrated waterflow downslope.

6. Measurement and payment

Method 1 — The total surface covered by topsoil is measured and the area(s) computed to the nearest square yard. Payment for furnishing and placing topsoil is made at the contract unit price.

Method 2 — The total surface covered by topsoil, except the surface area of embankments, levees, dikes, and other earthfills not included for payment, is measured and the area(s) computed to the nearest square yard.

Payment for topsoil spread on the surface of embankments, levees, dikes, and other earthfills is included in the measurement and payment for that item of earthfill where topsoil application occurred.

Method 3 — For items of work for which specific unit prices are established in the contract, the volume of topsoil furnished and spread is computed to the nearest cubic yard by the method of average cross-sectional end areas from surveys of the excavated topsoil stockpile or, if not stockpiled, cross-sectional surveys of the borrow area(s). Payment for furnishing and spreading topsoil is made at the contract unit price.

All methods — The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

All payment methods — Payment will constitute full compensation for all labor, equipment, material, and all other items necessary and incidental to the completion of the work. This includes excavating, stockpiling, hauling, spreading, and the wasting of unsuitable excavated material.

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. BID ITEM NO. 26-001, Topsoiling

(1) This item shall consist of salvaging, stockpiling, hauling, and spreading topsoil. Topsoil stripping shall be paid for under Bid Item 21-001, Excavation. Topsoil shall be spread a minimum of 12 (4) inches deep, normal to the slope, unless shown otherwise on the Construction Drawings.

(2) In Section 2, Quality of Topsoil, any rocks, clods, or other particles greater than 2 inches in diameter shall be removed or pulverized prior to application of permanent vegetative cover.

(3) In Section 3, Furnishing, Method 1 shall apply.

(4) In Section 5, Spreading, Method 2 shall apply. Topsoil shall be compacted to the extent that the pressure required to advance a gauged, handheld soil penetrometer through the topsoil layer does not exceed 300 psi.

The topsoil shall be spread uniformly to the specified thickness. Finished grades shall be maintained at that specified, and the final surfaces of topsoiled areas shall be dressed by blading, dragging, or floating operations.

(5) Topsoil shall be salvaged from the existing embankment area and other areas within the work limits. If additional topsoil is needed, it shall be obtained off-site at the contractor's responsibility and shall be approved by the SWCD and the Engineer.

(6) Following clearing and grubbing operations, the contractor shall strip all areas of the permanent construction to depths indicated on the Construction Drawings to remove all unsuitable material and topsoil. The unsuitable materials to be removed by stripping shall include all vegetation, sod including roots and fibrous organic material, topsoil, and all other organic and objectionable materials that are unsuitable for use in the permanent construction required under these specifications or that might interfere with the proper bonding of the embankment with the foundation, or the proper compaction of the materials in the embankment, or that might be otherwise objectionable as determined by the SWCD and the Engineer.

(7) The contractor shall segregate and stockpile stripped materials that meet the definition of topsoil as defined herein. Stripped materials that do not meet the definition of topsoil shall be disposed off-site as specified in Construction Specification 2, Section 7, Paragraph a.(5) and (6) of this set of specifications.

(8) The contractor will be permitted to stockpile topsoil materials in a temporary stockpile area as indicated on the Construction Drawings. The excavated topsoil material shall be protected for re-use in a manner that will minimize contamination and moisture absorption, as approved by the Engineer. Stockpiled excavated topsoil materials shall meet the soil erosion and sediment control requirements in Construction Specification 5, Pollution Control.

(9) Details regarding soil fertility analysis to establish application rates of nutrients prior to the beginning of permanent grassing installation are included in the Erosion and Sediment Control Plans provided by the SWCD.

(10) Bonding - Use one of the following methods to insure bonding of topsoil and subsoil:

(i) Tilling. After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 3 inches to permit bonding of the topsoil to the subsoil.

(ii) Tracking. Passing a bulldozer over the entire surface area of the slope to leave horizontal depressions.

(11) Applying – Topsoil should be handled only when it is dry enough to work without damaging soil structure.

(12) In Section 6, Measurement and Payment, a single, lump sum payment will be made for this Bid Item.

****End of Construction Specification 26****

Construction Specification 71—Water Control Gates

1. Scope
The work consists of furnishing and installing water control gates including gate stems, hoists, lifts, and other appurtenances.

2. Material
The gates furnished shall conform to the requirements of Material Specifications 571, 572, and 573, as appropriate, and as specified in section 8 of this specification and on the drawings. All gates shall be furnished complete with hoisting equipment and other specified appurtenances.

3. Installing gates
The contractor shall install the gates in a manner that prevents leakage around the seats and binding of the gates during normal operation.

Surfaces of metal against which concrete will be placed shall be free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings.

Anchor bolts, thimbles, and spigot frames shall be secured in true position within the concrete forms and maintained in alignment during concrete placement.

Concrete surfaces against which rubber seals will bear or against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.

When a flat frame is installed against concrete, a layer of concrete mortar shall be placed between the gate frame and the concrete.

When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate frame and the thimble in accordance with the recommendations of the gate manufacturer.

Wall plates, sills, and pin brackets for radial gates shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

4. Installing hoists and lifts
Gate stems, stem guides, and gate lifts shall be carefully aligned so that the stem shall be parallel to the guide bars or angles on the gate frame following installation.

5. Radial gate seals
The rubber seals for radial gates shall be installed so that the seals contact the walls or wall plates throughout the entire gate length when the gate is in the closed position.

6. Operational tests
After the gate(s) and hoist(s) (or lifts) have been installed, they shall be cleaned, lubricated, and otherwise serviced by the contractor in accordance with the manufacturer's instructions. The contractor shall test the gate and hoist by operating the system several times throughout its full range of operation. The contractor shall make any changes or adjustments necessary to ensure satisfactory operation of the complete gate system.

7. Measurement and payment

The number of each type, size, and class of gate is counted. Payment for furnishing and installing each type, size, and class of gate shall be made at the contract unit price for that type, size, and class of gate. Such payment constitutes full compensation for all labor, equipment, material, and all other items necessary and incidental to the completion of the work including furnishing and installing anchor bolts and all specified appurtenances and fittings.

Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in section 8 of this specification.

8. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

b. BID ITEM 71-001, Water Control Gate

(1) This item shall consist of furnishing and installing the 30-inch diameter principal spillway riser structure replacement gate, hoisting assemblies and appurtenances shown on the drawings.

(2) The gate shall be a Whipps, Inc. stainless steel Series 935 slide gate, or approved equal.

(3) The gate shall be manufactured to be compatible for mounting to the existing riser structure end wall. Dimensions between the operating platform and existing gate opening shall be field verified by the contractor prior to ordering gate materials.

(4) The gate stem shall be stainless steel and shall be of sufficient diameter to withstand the thrusts encountered in operation of the specified type and class gate.

(5) All fasteners shall be stainless steel.

(6) Stem guides shall be adequately spaced and of sufficient number to properly support the stem during operation of the gate.

(7) Hoist or lift shall be of similar construction as the existing gate.

(8) All metal items that are not either stainless steel or bronze shall be cleaned and painted in conformance with the gate manufacturer's instructions. After painted surfaces are dry, the machined or bearing surfaces and the holes, both plain and threaded, shall be coated with a protective grease until installation. Painting of gate and appurtenances shall be included in Bid Item 71-001, Water Control Gate.

(9) The item of work subsidiary to this bid item is Structure Removal as specified in Construction Specification 3.

****End of Construction Specification 71****

Construction Specification 81—Metal Fabrication and Installation

1. Scope
The Work consists of furnishing, fabricating, and erecting metalwork, including the metal parts and fasteners of the composite structures.

2. Material
Unless otherwise specified, material shall conform to the requirements of Material Specification 581, Metal. Steel shall be structural quality unless otherwise specified. Castings shall be thoroughly cleaned and subjected to careful inspection before installation. Finished surfaces shall be smooth and true to assure proper fit. Galvanizing shall conform to the requirements of Material Specification 582, Galvanizing.

3. Fabrication
Fabrication of structural steel shall conform to the requirements of Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction), American Institute of Steel Construction.

Fabrication of structural aluminum shall conform to the requirements in the Aluminum Design Manual available from The Aluminum Association.

4. Erection
The frame of metal structures shall be installed true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

As erection progresses the Work shall be securely bolted up, or welded, to resist all dead load, wind, and erection stresses. The Contractor shall furnish such installation assisting bolts, nuts, and washers as may be required.

No riveting or welding shall be performed until the structure is stiffened and properly aligned.

Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

All field welding shall be performed in conformance to the requirements for shop fabrication except those that expressly apply to shop conditions only.

5. Protective coatings
Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.

Items specified to be painted shall be painted in conformance to the requirements of Construction Specification 82 for the specified paint systems.

6. Measurement and payment
***Method 1*—**The Work is not measured. Payment for metal fabrication and installation is made at the Contract lump sum price in the Contract. Such payment constitutes full compensation for all labor,

equipment, material, and all other items necessary and incidental to the completion of the Work including connectors and appurtenances, such as rivets, bolts, nuts, pins, studs, washers, hangers, and weld metal.

***Method 2*—**The weight of metal installed complete in place shall be determined to the nearest pound. Unless otherwise specified, the weight of metal shall be computed by the method specified in section 3 of the Code of Standard Practice for Steel Buildings and Bridges, American Institute of Steel Construction, except that the following unit weights shall also be used, as appropriate, as the basis of computation:

Material	Unit weight (lb/ft^3)
Aluminum alloy	173
Bronze or copper alloy	536
Iron, malleable	470
Iron, wrought	487

Payment for furnishing, fabricating, and installing metalwork is made at the Contract Unit Price for the specified types of labor, material, equipment, and all other items necessary and incidental to the completion of the Work.

***Method 3*—**The Work is not measured. Payment for furnishing, fabricating, and installing each item of metalwork is made at the Contract Price for that item. Such payment constitutes full compensation for all labor, equipment, material, and all other items necessary and incidental to the completion of the Work including connectors and appurtenances, such as rivets, bolts, nuts, pins, studs, washers, hangers, and weld metal.

***All methods*—**The following provisions apply to all methods of measurement and payment. Compensation for any item of Work described in the Contract, but not listed in the Bid Schedule, is included in the payment for the item of Work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 7 of this Specification.

7. Items of Work and construction details

Items of Work to be performed in conformance with this Specification and the construction details are:

(a) Bid Item 81-001, Metalwork

(1) This Bid Item shall consist of furnishing all materials and labor to install the metalwork as shown on the Construction Drawings.

(2) Metalwork includes the following items:

- DIP Conduit Riser Structure Attachment

(3) Metalwork (other than cleanout covers), and all associated hardware, shall be fabricated from stainless steel conforming to ASTM A240, Type 304 or 316, unless otherwise indicated on the Construction Drawings.

(4) Submit Shop Drawings of all fabricated steel and miscellaneous metalwork items for review and approval by the Engineer, including all dimensions, sizes, finishes, fasteners, welds, and the relationship of Work to the adjoining construction. Riveted connections will not be permitted. Shop Drawings must be approved by the Engineer prior to ordering the required materials.

(5) For standard manufactured items, submit catalog worksheets showing illustrated cuts of the items to be furnished, including scale details, dimensions, and materials of construction for review and approval by the Engineer.

(6) Like items of equipment provided hereunder, although for different services, shall be the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

(7) Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

(8) Welder certificates signed by Contractor certifying that welders comply with requirements specified below:

a. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code – Steel", D1.3 "Structural Welding Code – Sheet Steel", and D1-2 "Structural Welding Code – Aluminum".

b. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

(9) In Section 6, Measurement and Payment, Method 1 shall apply.

****End of Construction Specification 81****

Construction Specification 94—Contractor Quality Control

1. Scope

The work consists of developing, implementing, and maintaining a quality control system to ensure that the specified quality is achieved for all materials and work performed.

2. Equipment and materials

Equipment and material used for quality control shall be of the quality and condition required to meet the test specifications cited in the contract. Testing equipment shall be properly adjusted and calibrated at the start of operations and the calibration maintained at the frequency specified. Records of equipment calibration tests shall be available to the engineer at all times. Equipment shall be operated and maintained by qualified operators as prescribed in the manufacturer's operating instructions, the references specified, and as specified in section 10 of this specification. All equipment and materials used in performing quality control testing shall be as prescribed by the test standards referenced in the contract or in section 10.

All equipment and materials shall be handled and operated in a safe and proper manner and shall comply with all applicable regulations pertaining to their use, operation, handling, storage, and transportation.

3. Quality control system

Method 1—The contractor shall develop, implement, and maintain a system of quality control to provide the specified material testing and verification of material quality before use. The system activities shall include procedures to verify adequacy of completed work, initiate corrective action to be taken, and document the final results. The identification of the quality control personnel and their duties and authorities shall be submitted to the contracting officer in writing within 15 calendar days after notice of award.

Method 2—The contractor shall develop, implement, and maintain a system adequate to achieve the specified quality of all work performed, material incorporated, and equipment furnished before use. The system established shall be documented in a written plan developed by the contractor and approved by the contracting officer. The system activities shall include the material testing and inspection needed to verify the adequacy of completed work and procedures to be followed when corrective action is required. Daily records to substantiate the conduct of the system shall be maintained by the contractor. The quality control plan shall cover all aspects of quality control and shall address, as a minimum, all specified testing and inspection requirements. The plan provided shall be consistent with the planned performance in the contractor's approved construction schedule. The plan shall identify the contractor's onsite quality control manager and provide an organizational listing of all quality control personnel and their specific duties. The written plan shall be submitted to the contracting officer within 15 calendar days after notice of award. The contractor shall not proceed with any construction activity that requires inspection until the written plan is approved by the contracting officer.

All methods—The quality control system shall include, but not be limited to, a rigorous examination of construction material, processes, and operation, including testing of material and examination of manufacturer's certifications as required, to verify that work meets contract requirements and is performed in a competent manner.

4. Quality control personnel

Method 1—Quality control activities shall be accomplished by competent personnel. A competent person is: One who is experienced and capable of identifying, evaluating, and documenting that materials and processes being used will result in work that complies with the contract; and, who has authority to take prompt action to remove, replace, or correct such work or products not in compliance. Off-site testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, laboratory certification or inspection information. The Contractor shall submit to the Contracting Officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

Method 2—Quality control activities shall be accomplished by competent personnel who are separate and apart from line supervision and who report directly to management. A competent person is one who is experienced and capable of identifying, evaluating, and documenting that material and processes being used will result in work that complies with the contract, and who has authorization to take prompt action to remove, replace, or correct such work or products not in compliance. Offsite testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, laboratory certification or inspection information. The contractor shall submit to the contracting officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

5. Post-award conference

The contractor shall meet with the contracting officer before any work begins and discuss the contractor's quality control system. The contracting officer and the contractor shall develop a mutual understanding regarding the quality control system, including procedures for correcting quality control issues.

6. Records

The contractor's quality control records shall document both acceptable and deficient features of the work and corrective actions taken. All records shall be on forms approved by the contracting officer, be legible, and be dated and signed by the competent person creating the record.

Unless otherwise specified in section 10 of this specification, records shall include:

a. Documentation of shop drawings including date submitted to and date approved by the contracting officer, results of examinations, any need for changes or modifications, manufacturer's recommendations and certifications, if any, and signature of the authorized examiner.

b. Documentation of material delivered including quantity, storage location, and results of quality control examinations and tests.

c. Type, number, date, time, and name of individual performing quality control activities.

d. The material or item inspected and tested, the location and extent of such material or item, and a description of conditions observed and test results obtained during the quality control activity.

e. The determination that the material or item met the contract provisions and documentation that the engineer was notified.

f. For deficient work, the nature of the defects, specifications not met, corrective action taken, and results of quality control activities on the corrected material or item.

7. Reporting results

The results of contractor quality control inspections and tests shall be communicated to the engineer immediately upon completion of the inspection or test. Unless otherwise specified in section 10, the original plus one copy of all records, inspections, tests performed, and material testing reports shall be submitted to the engineer within one working day of completion. The original plus one copy of documentation of material delivered shall be submitted to the engineer before the material is used.

8. Access

The contracting officer and the engineer shall be given free access to all testing equipment, facilities, sites, and related records for the duration of the contract.

9. Payment

Method 1—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds, after presentation by the contractor of invoices showing related costs and evidence of charges by suppliers, subcontractors, and others for furnishing supplies and work performed. If the total of such payments is less than the lump sum contract price for this item, the remaining balance is included in the final contract payment. Payment of the lump sum contract price constitutes full compensation for completion of the work.

Payment is not made under this item for the purchase cost of material and equipment having a residual value.

Method 2—For items of work for which lump sum prices are established in the contract, payment is prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating shall be the number estimated to complete the work. The final month's prorate amount is made with the final payment. Payment as described above constitutes full compensation for completion of the work.

Payment is not made under this item for the purchase cost of material and equipment having a residual value.

All methods—Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10.

10. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details are:

a. Subsidiary Item, Contractor Quality Control

(1) This item shall consist of developing, implementing, and maintaining a quality control system to ensure that the specific quality is achieved for all materials and work performed.

(2) The burden of proof that work performed meets contract requirements and has been performed in a workmanlike manner is the Contractor's.

(3) Inspection is defined as a rigorous examination of construction materials, processes and operations, including testing of materials and examination of manufacturer's certifications as required, to verify that work meets contract requirements and is performed in a workmanlike manner.

(4) In Section 3, Quality Control System, Method 2 shall apply. However, the Quality Control System shall not include material testing of soil, unless the Contractor elects to provide such testing as part of his Quality Control System.

(5) In Section 4, Quality Control Personnel, Method 2 shall apply. The contractor shall designate in writing the lead quality control person, herein after referred to as the contractor's Quality Control Supervisor.

(6) The contractor's Quality Control Supervisor shall meet and/or possess the following minimum requirements for knowledge, abilities and experience:

(a) Knowledge of construction staking and grade control and have the ability to interpret survey notes and prepare quantity computations.
(b) Documentation of previous job experience will be required.
(c) Knowledge of sampling of soils, and determination of density of in place soils.
(d) Knowledge of soils and earthwork, including foundations and soil classifications.
(e) Ability to maintain adequate files and records of construction inspection
(f) Have a minimum of 5 years of experience related to construction inspection.

(7) All sampling and testing shall be in accordance with the standard methods identified in the Construction Drawings and Specifications.

(8) The Contractor's inspection system shall be approved and operational before commencement of work.

(9) Prior to installation of any material, except earthfill, the contractor's Quality Control Supervisor shall determine that the material meets the requirements of the specifications and furnish a statement to that effect to the Contracting Officer’s Representative. The statement shall include the basis on which the determination was made, together with any supporting data.

(10) The Contractor's quality control system shall include, but is not limited to, the following minimum requirements.

(a) Clearing and Grubbing - Intermittent inspection of removal methods to assure prevention of damage to adjacent property, utilities, trees not marked for removal, and other improvements. Inspection of subgrades to determine that all roots, stumps, and other woody debris have been removed from the foundation area. Inspection of disposal to assure that burning meets specified time and weather conditions and that burial of materials is within authorized areas and meets minimum cover requirements.

(b) Structure Removal - Intermittent inspection to verify that: structures are removed to the specified depth and extent; care is taken in removing materials to be salvaged; salvaged materials are placed as specified; and refuse material is disposed of as specified.

(c) Pollution Control - Intermittent inspection of the installation, operation, and maintenance of all pollution control measures throughout the term of the contract to assure compliance with all specified conditions. Inspection of the condition and need for repairs shall be made after each significant runoff event.

(d) Protective Cover - Inspection prior to application of any materials to verify that: the work is within specified dates; the finish of the work area is suitable for application of protective cover; all seed is of the specified varieties and meets the requirements of state law as to germination, purity, testing dates, and each container is tagged; lime and fertilizer meet the specified requirements and material certifications are on hand; mulch is of the specified type and quality and weight tickets or other means of determining weight of mulch are provided. Continuous inspection shall be provided during application of the work to verify that: the seedbed is prepared as specified; lime, fertilizer, seed and mulch are applied at the specified rates and incorporated as specified. Seed tags, weight tickets, and certifications shall be provided to the Engineer for all materials incorporated in the work.

(e) Construction Surveys - Inspection to verify that: all surveys are performed in a timely manner and to the specified accuracy; records of surveys are maintained in accordance with the specifications; staking and marking of surveys is in accordance with specifications.

(f) Removal Of Water - Intermittent inspection of stream flow, diversions and impoundments, and the dewatering of the foundation areas to verify compliance with specifications and approved dewatering plans and that no adverse effects are occurring.

(g) Excavation - Intermittent inspection to verify that: all excavation is performed as specified and meets the required lines and grades; all materials selected for use in backfill are free of undesirable materials and are placed in designated stockpile areas; stockpile areas are graded and drained.

(h) Earthfill - The following requirements shall apply to all classes of earthfill:

(i) Continuous inspection during placement to verify that: foundation or subgrade areas are in the specified condition for placement of earthfill; earthfill materials are free of undesirable materials, are of the classification specified, and obtained from the specified borrow areas or stockpiles; placement, compaction, and moisture requirements are being met as specified; and mechanical and hand directed compaction is being accomplished as specified. Minimum Compaction and Moisture Test requirements are the following:

- One test per 100 cubic yards placed or one per lift whichever is greater.
- Earthfill in trenches or next to structures – one test per 100 cubic yards placed.

(ii) The contractor will not be required to develop compaction curves and test in-place moisture-density of the Class A earthfill. Testing for quality assurance on Class A earthfill will be provided by the Design Professional.

(i) Salvaging and Spreading Topsoil - Intermittent inspection to verify that the topsoil is obtained from the specified source, is placed to the specified thickness, and is compacted as specified.

(11) In Section 9, Payment, no payment will be made for this Item. Payment for this item shall be subsidiary to Items of Work associated with this item.

****End of Construction Specification 94****

Construction Specification 447—Wave Berm Construction

1. Scope

The work consists of constructing a wave berm. The work also includes mobilizing and demobilizing appropriate equipment, site preparation, excavation, earthfill, rock placement and site restoration.

2. Mobilization and Demobilization

Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment and operating supplies to the site and premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site. The demobilization shall include but not be limited to, removal and disposal of all trash, debris, equipment, parts, supplies and all other such items.

3. Pollution Control

Pollution control shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.

The contractor shall be responsible for obtaining all required permits and developing all required plans necessary to comply with local, state, and federal regulations regarding erosion and sediment control, stormwater management, and water quality.

All erosion and sediment control measures are to be placed prior to, or as the first step in clearing, grading, or other land-disturbing activities. If pollution control measures are damaged by a run-off producing event, necessary repairs shall be made immediately. The measure and works shall include, but are not limited to the following:

Staging of earthwork activities **–** The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

Seeding **–** Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of the earthwork activity.

Mulching **–** Mulching to provide temporary protection of the soil surface from erosion.

Diversion **–** Diversions to direct water from work areas and to collect water from work areas should be constructed concurrent with excavation activities. These are temporary measures and shall be removed and the area restored to near original condition.

Sediment filters **–** Straw bale filters or geotextile sediment fences shall be installed to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These filters are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures

are installed.

Temporary soil stockpiles – Temporary soil stockpiles shall be stabilized with temporary mulching or protected with sediment trapping measures.

Dust abatement – Dust created by project activities shall be minimized by proper ground cover or application of water to dirt surfaces, if necessary.

Chemical pollution – The contractor shall take all necessary precautions to minimize the potential for chemical pollution of the site and existing streams. All equipment lubricating materials, hydraulic fluids, and transmission fluids drained from any equipment shall be captured in acceptable containers and shall be disposed of off-site in an approved location in accordance with local laws and regulations.

4. Clearing and Grubbing

Clearing and grubbing shall consist of the removal and disposal of trees, snags, logs, brush, stumps, shrubs and rubbish from the designated areas. The limits of the area(s) to be cleared and grubbed will be marked with stakes, flags, or other suitable methods by the contractor and approved by the owner. Trees to be left standing and uninjured will be designated by special markings placed on the trunk about 6 feet above ground surface. Any damages resulting from the contractor's operations or neglect shall be repaired by the contractor.

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs, rubbish, and similar materials shall be cleared from within the limits of the designated areas. Unless otherwise specified, all stumps, roots, and root clusters that have a diameter of 1 inch or larger shall be grubbed out to a depth of at least 1 foot below the ground surface, unless otherwise specified.

All materials cleared and grubbed from the designated areas shall become property of the contractor and shall be removed from the site and disposed of in accordance with all applicable federal, state and local regulations. Burning shall be allowed as defined in Section 14. If burning is permitted, any portions of the material not completely combusted, including all ashes, shall be removed from the site and disposed of in accordance with all applicable federal, state, and local regulations.

5. Survey

The contractor is responsible for assuring that wave berm construction is completed according to line and grade shown on drawings.

6. Excavation

Excavation shall consist of all excavation activities required for placement of the filter drain materials, pipes and appurtenances as required by the drawings and specifications.

Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase. Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work. Excavations outside the lines and limits shown on the drawings or

specified herein required to meet safety requirements shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation.

Unless otherwise specified, excavation for and subsequent installation of each drain line shall begin at the outlet end and progress upstream.

The contractor shall utilize the necessary equipment to ensure the proper installation and excavation of the filter drain and appurtenances.

Excavation beyond the specified lines and grades shall be corrected by filling the resulting voids with approved, compacted earthfill. The exception to this is that if the earth is to become the subgrade for riprap, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding, or drainfill. Before correcting an overexcavation condition, the contractor shall review the planned corrective action with the owner and obtain approval of the corrective measures.

All surplus or unsuitable excavated materials are designated as waste and shall be spread evenly over the excavation footprint.

7. Earthfill

Earthfill is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner and shall consist of all earthfill activities required for the wave berm construction.

Material- All fill material shall be obtained from required excavations and designated borrow areas. Fill material shall contain no frozen soil, sod, brush, roots, or other perishable material. Rock particles larger than 6 inches shall be removed prior to compaction of the backfill. The type of material used in the various fills shall be Class A.

Foundation Preparation- Foundations for earthfill shall be stripped to remove vegetation and other unsuitable material or shall be excavated as specified.
Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface material of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of 2 inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose material by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be no steeper than one horizontal to one vertical unless

otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

Placement- Earthfill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the engineer. Earthfill shall not be placed upon a frozen surface nor shall snow, ice, or frozen material be incorporated in the earthfill matrix.
Earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed nine inches. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than nine inches before being compacted.

Earthfill and earth backfill in dams, levees, and other structures designed to restrain the movement of water shall be placed to meet the following additional requirements:

(a) The distribution of materials throughout each zone shall be essentially uniform, and the earthfill shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material. Zone earthfills shall be constructed concurrently unless otherwise specified.

(b) The surface of each layer shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

(c) The top surface of embankments shall be maintained approximately level during construction with two exceptions: A crown or cross-slope of about 2 percent shall be maintained to ensure effective drainage, or as otherwise specified for drainfill or sectional zones.

(d) Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of streamflow during construction are specifically authorized in the contract.

(e) Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than 3 feet horizontal to 1 foot vertical. The bonding surface of the embankment in place shall be stripped of all material not meeting the requirements of this specification and shall be scarified, moistened, and recompacted when the new earthfill is placed against it. This ensures a good bond with the new earthfill and obtains the specified moisture content and density at the contact of the inplace and new earthfills.

Control of Moisture Content- During placement and compaction of earthfill and earth backfill, the moisture content of the material being placed shall be maintained within the specified range. The application of water to the earthfill material shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the material after placement on the earthfill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet when deposited on the earthfill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted earthfill or a foundation or abutment surface in the zone of contact with the earthfill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content

before placement of the next layer of earthfill.

Compaction- Earthfill—Earthfill shall be compacted according to the following requirements for the class of compaction specified:
Class A compaction—Each layer of earthfill shall be compacted as necessary to provide the density of the earthfill matrix not less than the minimum density specified in Section 10 or identified on the drawings. The earthfill matrix is defined as the portion of the earthfill material finer than the maximum particle size allowed in the reference compaction test method specified (ASTM D698 or ASTM D1557).

Reworking or removal and replacement of defective earthfill- Earthfill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable earthfill. The replacement earthfill and the foundation, abutment, and earthfill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

8. Removal of Water

Dewatering work consists of the removal of surface water and ground water as necessary to construct the wave berm. It shall include: (1) constructing, installing, building, and maintaining all necessary temporary water containment facilities, channels and diversions; (2) furnishing, installing, and operating all necessary pumps, piping, and other facilities and equipment; and (3) removing all such temporary works and equipment after their intended function is no longer required.

The contractor shall install, maintain, and operate all channels, sumps, and all other temporary diversion and protective works needed to divert water from the filter drain bed. Unless otherwise specified and/or approved, the diversion outlet shall be into the same drainageway that the water would have reached before being diverted.

Removal of water from the construction site shall be accomplished so that erosion and the transporting of sediment and other pollutants are minimized. Dewatering activities shall be accomplished in a manner that the water table water quality is not altered. Dewatering activities shall not conflict with the requirements of Section 3, Pollution Control.

When temporary works are no longer needed, the contractor shall remove and return the area to a condition similar to that which existed before construction.

9. Topsoiling

Topsoil shall be salvaged from designated earth surfaces that will be disturbed by construction activities. After designated sites have been cleared and grubbed, the topsoil shall be removed from the areas and stockpiled at locations acceptable to the owner.

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, rocks, or other unsuitable material.

Spreading shall not be conducted when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to uniform spreading operations. Surfaces designated to

receive a topsoil application shall be lightly scarified just before the spreading operation.

Stripping topsoil will consist of removing a minimum of 9 inches from areas to be disturbed within the work limits. All stripped topsoil that is not directly placed on disturbed areas shall be temporarily stockpiled within the work limits of the project. The stockpile area shall be protected from erosion in accordance with the Pollution Control Section.

All removed topsoil shall be spread on disturbed areas to a relatively uniform thickness. A minimum of 6 inches of topsoil shall be spread on the earthen surfaces of the finished wave berm and cut area of the auxiliary spillway.

10. Seeding and Mulching

Liming, fertilizing, seeding, and mulching shall be performed within 5 days from disturbance unless the seedbed cannot be properly prepared due to wetness, snow, or frozen soil or as otherwise directed by the owner.

Lime shall be standard agricultural ground limestone. Fertilizer shall meet the requirements of the applicable Virginia state laws, and shall be in such physical condition to ensure uniform application over the area to be fertilized. Rates of application shall be as specified in Section 14 of this specification.

The seed shall conform to the latest seed laws of the United States and of Virginia. Species, the source of production if native grasses are used, and rate of seeding shall be as specified in Section 14 of this specification.

The entire area to be seeded shall be reasonably smooth and all washes and gullies shall be filled to conform to the desired cross-section before actual seedbed preparation is begun. Scarify subsoil areas perpendicular to water flow before they are filled. After final grading, the required fertilizer (except that applied by hydraulic seeding) and/or lime shall be applied uniformly and incorporated into the top 3 inches of the soil. The seedbed preparation operation shall be suspended when the soil is too wet or too dry.

Seed immediately after preparation of the seedbed. Uniform seed distribution shall be accomplished by drilling, broadcasting or hydraulically seeding. If a hydraulic seeder is used, the seed, fertilizer and mulch may be applied together with water.
The required mulching shall be performed with hydraulic seeding or immediately after seeding. The mulch shall be applied uniformly over the area. The type and rate shall be as specified on the drawings or as shown in Section 14.

The mulch, except for hydraulically placed mulch, shall be anchored. Anchoring of the mulch shall be performed by application of a commercially available tackifier at the rate recommended by the manufacture, a mulch anchoring tool, tandem disk weighted and set nearly straight, track type tractor, or by installation of mulch netting. Mechanical anchoring shall be performed in a manner that creates ridges perpendicular to the flow of water.

11. Payment

Payment shall be made by one lump sum payment at the time of project completion and upon acceptance by the owner.

12. Items of work and construction details

Items of work to be performed in conformance with this specification and construction details are:

A. Subsidiary Item, Wave Berm Construction

1) This item shall consist of all necessary work to construct the wave berm as shown on the drawings.

2) Burning shall not be allowed on this project unless approved by the owner.

3) The Contractor is responsible for the dewatering of the lake to levels required for construction prior to beginning construction. The level of water in the lake cannot be lowered at a rate greater than 6 inches per day. Dewatering may being at any time after the award of the contract with the approval of the Contracting Officer. The dewatering system shall remain in place for the duration of construction and must be capable of managing all flow into excavations and work areas to allow for removal of sediment and construction of wave berm to be done in dry conditions. Excavation required for construction shall be kept free of water during the installation of the wave berm. The water table shall be maintained a minimum of 2 feet below the subgrade during the installation.

4) Seeding mix, fertilizer, lime, and mulch, application rate and planting times shall be in accordance with the erosion, sedimentation, and pollution control plan provided by the SWCD.

5) In Section 11, Payment, a separate payment shall not be made for this Subsidiary Item. Payment of this item shall be subsidiary to Bid Item 23-001, Earthfill, On-site Use

Material Specification 571—Slide Gates

1. Scope

This specification covers the quality of metal slide gates for water control.

2. Class and type of gate

The class of gate is expressed as a numerical symbol composed of the seating head and unseating head. The two numbers are separated by a hyphen with the seating head listed first. For this purpose, the heads must be expressed in terms of feet of water. Gates must be of the specified types as defined below:

Light duty

Type MLS-1 Cast iron with cast iron seat facings
Type MLS-2 Fabricated metal

Moderate duty

Type MMS-1 Cast iron with bronze seat facings, cast iron or galvanized structural steel guides, and galvanized steel, bronze, or stainless steel fasteners.

Type MMS-2 Cast iron with bronze seat facings, cast iron or stainless steel guides, and bronze or stainless steel fasteners. Guides and fasteners are stainless steel, when specified.

Heavy-duty

Type MHS-1 Gray cast iron slides, frames, guides, and yokes, fitted with bronze seat facings, bronze wedges and wedge blocks or wedge seat facings, and bronze stem blocks or thrust nuts, bronze or stainless steel fasteners, and cold-rolled steel stems except where stainless steel stems are specified.

Type MHS-2 Gray cast iron slides, frame, guides, and yokes, fitted with stainless steel seat facings, wedges, wedge seat facings, stems and fasteners and austenitic cast iron stem blocks or thrust nuts.

Type MHS-3 Austenitic gray cast iron slides, frames, guides, and yokes, fitted with nickel-copper alloy seat facings, wedges, wedge seat facings, stems and fasteners and austenitic cast iron stem blocks or thrust nuts.

3. Quality of material

Material for slide gates and appurtenances must conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements.

Material	ASTM specification
Cast iron and gray cast iron	A48, Class 30 A126, Class B
Austenitic cast iron	A436
Structural steel shapes, plates	A36 and bars
Cold rolled steel	A108
Carbon steel bars	A108 or A575
Stainless steel	A167, A276, A582; Type 302, 303, 304, or 304L
Castings, nickel and nickel alloy	A494
Carbon steel sheets and strips	A1011
Zinc-coated carbon steel sheets	A653 or A924
Bronze bar, rods, shapes	B21 or B98
Naval bronze	B21
Phosphor bronze	B103 or B139
Manganese bronze	B138 or B584
Silicon bronze	B98 or B584
Cast bronze	B584
Nickel-copper alloy plate, sheet	B127 strip
Nickel-copper alloy rod or bar	B164
Rubber for gaskets and seals	D395, D412, D471, D572, or D2240

Galvanizing (zinc coating) must conform to the requirements of Material Specification 582.

4. Fabricated metal gates (light-duty gates)

Fabricated metal gates must be built to withstand the seating head expressed by the gate class designation. Unless otherwise specified, the gates must be galvanized steel with flat-back frames.

5. Cast iron gates (light-duty gates)

The frame must be cast iron of the specified type. The front face must be machined to receive the gate guides.

The gate slide must be cast iron and be fabricated to withstand the seating and unseating heads expressed by the gate class designation as defined in section 2 of this specification.

Grooves must be cast on the vertical sides of the slide to match the guide angles.

The gate guides must be galvanized structural steel and be fabricated to withstand the total thrust of the gate slide from water pressure and wedge action under maximum operating conditions.

Wedges and wedge seats must have smooth bearing surfaces. Wedges may be cast as integral parts of the slide. Removable wedges and wedge seats must be fastened to the slide, frame, or guides by

means of suitable studs, screws, or bolts and be firmly locked in place after final adjustment. Each interacting set of wedge and wedge seat must be adjustable as needed to ensure accurate and effective contact. Adjusting bolts or screws must be bronze or galvanized steel.

Seat facings must be machined to a smooth finish to ensure proper watertight contact.

6. Frame or seat (moderate- and heavy-duty gates)

The frame must be cast iron and of the specified type. The front face must be machined to receive the gates guides, and the rear face must be machined as required to match the specified attaching means. For heavy-duty gates, a dovetailed groove must be machined on the perimeter of the front face to receive the seat facing.

7. Gate slide (moderate- and heavy-duty gates)

The gate slide must be cast iron, rectangular in shape, and have horizontal and vertical stiffening ribs of sufficient section to withstand the seating and unseating heads expressed by the gate class designation as defined in section 2 of this specification. For heavy-duty gates, a dovetailed groove must be machined on the perimeter of the slide face to receive the seat facing.

Tongues must be machined on the vertical sides of the slide along its entire height to match the guide grooves and angles with a maximum clearance of 1/16 inch for gates smaller than 54 inches by 54 inches, and 1/8 inch for larger gates.

A nut pocket with reinforcing ribs must be integrally cast on the vertical centerline and above the horizontal centerline of the slide. The pocket must be of a shape adequate to receive a flat-backed thrust nut or stem block and be built to withstand the opening and closing thrust of the stem.

8. Gate guides (moderate- and heavy-duty gates)

The gate guides must be built to withstand the total thrust of the gate slide from water pressure and wedge action. The gate guides must be cast iron for heavy-duty gates.

Grooves must be machined-in cast iron guides to receive the tongue on the gate slide throughout the entire length of the guide.

The guides must be of adequate length to retain a minimum of one-half the height of the gate slide when the gate is fully opened.

9. Wedges and wedge seats (moderate- and heavy-duty gates)

Pads for supporting wedges, wedge seats (or blocks), and wedge loops (or stirrups) must be cast as integral parts of the gate frame, slide, or guides and be accurately machined to receive those parts. Wedges and wedge seats must have smooth bearing surfaces for moderate-duty gates and have machine finish bearing surfaces for heavy-duty gates. Removable wedges may be cast as integral parts of the slide for moderate-duty gates. Wedges must be fastened to the gate slide, frame, or guides with suitable studs, screws, or bolts and be firmly locked in place after final adjustment. Each interacting set of wedge and wedge seat must be adjustable as needed to ensure accurate and effective contact.

10. Seat facing

Moderate-duty gates—Seat facings must be machined to a smooth finish to ensure proper watertight contact. Bronze facings must be securely attached by welding or other approved methods.

Heavy-duty gates—Seat facings must be pressed or impacted into the machined dovetailed grooves on the gate slide and frame and machined to a smooth finish to ensure proper watertight contact.

11. Yoke

When a self-contained gate is specified, the yoke must be of such design as to withstand the loads resulting from normal operation of the gate. For moderate- and heavy-duty gates, cast iron yokes must be provided with machined pads for connecting to the ends of gate guides and to receive the stem thrust cap or hand-wheel lift.

12. Flush bottom seal (heavy-duty gate)

When a flush bottom sealing gate is specified, a solid, square-corner type rubber seal must be provided at the bottom of the gate opening. It must be securely attached either to the bottom of the slide or to the frame. Metal surfaces bearing on the rubber seal must be smooth and rounded as necessary to prevent damage to the seal during gate operation.

13. Gate stem and lift (or hoist)

The gate stem and lift or hoist must be of the specified type, size, and capacity. If hand operated, it must be capable of moving the gate slide under normal conditions with the specified seating and/or unseating head of water against the gate, following unseating from the wedging device, with a pull on the hand-wheel or crank of not more than 25 pounds.

Unless otherwise specified, the stem must be carbon steel and be furnished in sections as necessary to permit reasonable ease of installation. Couplings must be bolted, pinned, or keyed to the stem. The stem must be furnished with rolled or machine-cut 29-degree Acme threads of sufficient length to completely open the gate. The threads must be smooth and of uniform lead and cross-section, such that the nut can travel the full length without binding or excessive friction. For moderate- and heavy-duty gates, the stem must be threaded for connection to the stem block or thrust nut on the gate slide.

The lift must be compatible with the type of stem furnished. Unless otherwise specified, the lift nut must be cast bronze for light- and moderate-duty gates and cast manganese bronze for heavy-duty gates and be fitted with ball or roller thrust bearings designed to withstand the normal thrust developed during opening and closing of the gate at the maximum operating heads. All gears, sprockets, and pinions must be machine-cut, with ratios and strength adequate to withstand expected operating loads. Sufficient grease fittings must be provided to allow lubrication of all moving parts. An arrow and the word "open" must be cast on the rim of the hand-wheel or on the lift housing to indicate the direction of gate opening. Unless otherwise specified, the lift for the nonrising-stem gate must be provided with an indicator capable of showing both when the gate is fully open and when it is fully closed for the moderate- and heavy-duty gates.

Provisions must be made to prevent stem rotation within the stem block or thrust nut or at the connection of the gate slide.

Stop collars must be provided to prevent over-travel in opening and closing the gate.

14. Stem guides

Unless otherwise specified, stem guides must be cast iron for light-duty gates and cast iron with bronze bushed collars for moderate- and heavy-duty gates. They must be fully adjustable in two directions.

15. Wall thimble (moderate- and heavy-duty gates)

When a wall thimble is specified, it must be of the same cast iron used in the gate frame and of the section, type, and depth specified. The front flange must be machined to match the gate frame and drilled and tapped to accurately receive the gate attachment studs.

Gaskets or mastic to be installed between the thimble and the gate frame must conform to the recommendations of the gate manufacturer and be furnished with the thimble.

16. Fasteners

Unless otherwise specified, all anchor bolts and other fasteners must be galvanized steel or bronze for light-duty gates, galvanized steel or stainless steel or bronze for moderate-duty gates, and of the quality and size recommended by the gate manufacturer for heavy-duty gates. All anchor bolts, assembly bolts, screws, nuts, and other fasteners must be of ample section to withstand the forces created by operation of the gate while subjected to the specified seating and unseating heads. Anchor bolts must be furnished with two nuts to facilitate installation.

17. Installation instructions

Before installation, provide the engineer with the manufacturer's complete installation data, instructions for adjustments, and drawings or templates showing the location of all anchor bolts for each gate.

18. Painting

When specified, gates and accessories must be painted by the designated paint system.

19. Certification

The supporting data submitted to the engineer must include the name of the manufacturer, the manufacturer's model number (for standard catalogue items), or the seating and unseating heads for which the gate is designed. Include any drawings and specifications necessary to show that the gate conforms to the requirements of this specification.

Material Specification 581—Metal

1. Scope
This specification covers the quality of steel and aluminum alloys.

2. Structural steel
- Structural steel shall conform to the requirements of ASTM A 36.
- High-strength low-alloy structural steel shall conform to ASTM A 242 or A 588.
- Carbon steel plates of structural quality to be bent, formed, or shaped cold shall conform the ASTM A 283, Grade C.
- Carbon steel sheets of structural quality shall conform to ASTM Standard A 1011, Grade 40, or A 1008, Grade 40.
- Carbon steel strip of structural quality shall conform to ASTM Standard A 1011, Grade 36.

3. Commercial or merchant quality steel
Commercial or merchant quality steel shall conform to the requirements of the applicable ASTM listed below:

Product	ASTM standards
Carbon steel bars	A 575, Grade M 1015 to Grade M 1031
Carbon steel sheets	A 1011
Carbon steel strips	A 1011
Zinc-coated carbon steel sheets	A 653 or A 924

4. Aluminum alloy
Aluminum alloy products shall conform to the requirements of the applicable ASTM standard listed below. Unless otherwise specified, alloy 6061-T6 shall be used.

Product	ASTM standard
Standard structural shape	B 308
Extruded structural pipe and tube	B 429
Extruded bars, rods, shapes, and tubes	B 221
Drawn seamless tubes	B 210
Rolled or cold-finished bars, rods, and wire	B 211
Sheet and plate	B 209

5. Bolts
Steel bolts shall conform to the requirements of ASTM Standard A 307. If high-strength bolts are specified, they shall conform to the requirements of ASTM A 325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of ASTM Standard A 153 except that bolts 0.5 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM Standard B 633, Service Condition SC 3, or ASTM B 766, unless otherwise specified.

6. Rivets
Unless otherwise specified, steel rivets shall conform to the requirements of ASTM Specification A 31, Grade B. Unless otherwise specified, aluminum alloy rivets shall be Alloy 6061 conforming to the requirements of ASTM Standard B 316.

7. Welding electrodes
Steel welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.1, "Specification for Mild Steel Covered Arc-Welding Electrodes," except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating does not chip or peel while being used with the maximum amperage specified by the manufacturer.

Aluminum welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.10, "Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes."