TECHNICAL SPECIFICATIONS

FARMINGTON BAY - J DIKE RESTORATION

UTAH DEPARTMENT OF NATURAL RESOURCES

PROFESSIONAL ENGINEER
No. 318634
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09/02/2015
STATE OF UTAH

INDEX TO TECHNICAL SPECIFICATIONS

SECTION 2000
DESCRIPTION OF WORK

Part 1 - General

1.01 DESCRIPTION

The work to be completed as required by these contract documents includes all labor, equipment, and materials, unless otherwise specified, for the site preparation, construction of grading and, pipe, compacted fill, construction of earthen swales, channel shaping, filling of ditches or waterways, installation of riprap, removal of debris or non-native items from the project site or any other item as called for or identified on the associated improvement plans. As such, the Contractor will be required to clear vegetation and top soil from work areas, remove trees, stumps, fencing, dewatering, water flow diversion, erosion control and any other work required to provide a complete and finished project as defined by the contract plans and specifications.

1.02 SUBMITTALS

The Contractor shall be responsible for providing submittal information for approval as required in these specifications to the Engineer before purchasing the material or performing the work. The Engineer will review and approve or reject initial submittals in writing within Seven (7) working days after receipt by Engineer. Where the Engineer requests additional information or rejects an initial submittal, the Engineer shall use such time as is necessary to review the additional materials or new submittals.

1.03 CONSTRUCTION SCHEDULE

Within Five (5) working days after a contract is signed the Contractor shall submit a critical path schedule outlining the major elements of the work, the time to complete each element, and an estimate of start and completion dates for each element of the work. The schedule shall be submitted in a format suitable for reproduction and distribution and updated at a minimum monthly during the course of construction.

1.04 PRIORITY OF WORK

The Contractor shall prioritize and order construction to meet the contract requirements or as directed by the Engineer.

1.05 INSPECTION AND TESTING

Inspection and testing shall be performed as needed and as determined by the Owner, Environmental Consultant or Engineer. Means and Methods shall be observed and if concerns arise as to the quality or workmanship of the work provided in either materials or constructed items the Owner, the Environmental Consultant or Engineer may require testing or certified inspections by a third party qualified and licensed to perform respective services in the State which the project is located. The cost for inspection shall be the responsibility of the project owner if the results of such inspections find that the inspected work or items comply with the plans and/or specifications. The cost for inspections, and any subsequent inspections, shall be the responsibility of the contactor if the results of such inspections find that the inspected work or items do not comply with the plans and/or specifications.

1.06 SURVEY CONTROL

The Engineer shall provide vertical and horizontal control at select location(s) around the project. The Contractor is responsible for and shall perform all other surveys and measurements required to accurately layout and control work as shown on the plans. The Contractor shall be responsible for the preservation of temporary benchmarks, stakes, and identified survey pins, and the cost of replacing them if disturbed.

1.07 CONTRACTOR SUPERINTENDENT

The Prime Contractor shall, at the start of construction, designate a Superintendent or other employee to act as a liaison for all communication on the project. This individual shall be responsible for requesting inspection,

notifying the Engineer when segments of the work are complete, and communication of instructions to all employees and subcontractors on the jobsite. Except in emergency situations all specified notifications, submittals, and communications shall be considered valid only if they are received by the Engineer from the designated superintendent.

1.08 SCOPE OF WORK

The work to be performed under this contract includes furnishing all labor, materials, and equipment, unless specifically stated otherwise in the contract documents, for site preparation, project layout, clearing and grubbing, compacted fill placement, construction of sloped or graded bank areas, water control structures, earthen excavation and fill, altering or filling or plugging of existing water courses or ditches, construction of earthen swales, and removal of debris as described on plans and in the technical specifications, installation of riprap or erosion control measures, de-watering or water diversion and all other miscellaneous items as needed to complete the required work.

1.09 PROJECT LOCATION & ACCESS

The site is located within Unit 1 of Farmington Bay Waterfowl Management Area (FBWMA) that exists on the eastern shore of the Great Salt Lake in Davis County, Utah. Approximate Latitude / Longitude coordinates for station1+00 of the proposed J-Dike Restoration project are 40° 56' 45.24" North X 111° 56' 13.16" West. The site is accessible only by gated and locked access roads that are part of FBWMA. The site is not generally open to the public and access and directions to the work area from FBWMA office/yard will be provided as needed and/or shall be coordinated with the Engineer and Owner as needed.

1.10 COMPLETION OF WORK

It is the intent of these specifications and the contract drawings that the work performed under the contract shall result in a complete operating system in satisfactory working condition with respect to the functional purpose of the installation, and no extra compensation will be allowed for anything omitted but fairly implied. The prices paid for various items in the proposal shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all work necessary to complete the finished product as provided in the plans and specifications.

Where the contract requires that materials or equipment be provided or that construction work be performed, and detailed specifications of such materials, equipment, or construction are not set forth, the Contractor shall perform the work using materials and equipment of a quality comparable to the materials and workmanship specified for other parts of the work and at least equal to the general standard of quality found within existing work, from firms of established good reputations, and shall follow best practices in the performance of construction work. The work performed shall be in conformity with the intent to secure the best standard of construction of work as a whole or in part.

Time shall be of the essence hereof.

Before the contract is signed the Owner and/or Engineer will consult with the contractor and determine a suitable schedule that will be agreeable to the contractor and the Engineer. Ample time will be allocated to complete the construction as outlined in these technical specifications and as indicated on the plans. If there is a discrepancy between the contract schedule and the issuance of a notice to proceed date, the contract time shall be measured forward in calendar days equal to the amount of calendar days as agreed upon in the contract. Additional time will be allowed only if the contractor can substantiate that delays are attributable to circumstances beyond the contractors' control.

Weather delays will only be allowed for event(s) that are "out of the ordinary" for the construction time frame as defined by specific beginning and ending dates in the contract. Additionally, weather delays must also directly impact the construction schedule or remaining work to be completed to be valid for consideration. Any delay after the end of contract date (as adjusted for any approved delays) shall not be considered for a time extension and regardless of circumstances and liquidated damages may apply until such time that the project is deemed

completed. **In the event that the contractor does not complete the required work within the allowed time, liquidated damages in the amount to $500.00 per day may be assessed.**

1.11 OWNER SUPPLIED MATERIALS

The owner will supply the following:

1. Prefabricated water control structures.
2. HDPE pipe. (The owner will not provide any appurtenances, couplers, lube, gaskets or any items needed to correctly install the pipe). If these items are needed the contractor shall provide them as part of the installation and they shall be considered incidental to this work item.

The owner will provide the above listed materials at the Managers office/yard location and the Contractor shall be responsible to load, transport, unload and install as per the project plans and specifications. The Owner will not supply or provide transports for moving or loading/unloading equipment. Any damage to the owner supplied materials after the Contractor moves them from their storage location will be the responsibility of the Contractor to repair or replace at his/her own expense.

1.12 SUBSTITUTIONS

The statement "or equal" in these specifications shall mean that the contractor may substitute another manufacturer's product as a substitute for that specified. The contractor will thereby warrant that the product will perform as good as or better than that replaced. The statement "or approved equal" in these specifications shall mean that the contractor must submit information and obtain prior approval from the Engineer before making a substitution. Acceptance as equal by the Engineer does not relieve the Contractor of responsibility for the performance of the substitute product.

1.13 SITE CONDITIONS

The Contractor shall minimize disturbance outside the construction limits, and not unnecessarily disturb lands on or adjacent to the site. Damage to any existing equipment or structures due to the Contractor's work or activities shall be repaired or replaced at the expense of the Contractor to the Owner's satisfaction. The contractor shall be responsible for identification and protection of all utilities that may be affected by the work. The Contractor shall not be entitled to additional compensation for protection or avoidance of utilities discovered in the course of the work unless the utilities require a substantial redesign of improvements.

A portion or all of the work described within or otherwise associated with this project **may be constructed under saturated conditions**. By submission of a bid the Contractor acknowledges that they are aware of and are prepared to work under these conditions.

1.14 STORAGE OF MATERIALS

The Contractor shall obtain prior approval from the Engineer or Owner for any area of space required for the Contractor's storage of equipment or supplies during construction. Materials or equipment shall not be placed where it may interfere with normal operations of the facility, nor shall it constitute a hazard to persons or property.

1.15 WILDLIFE PROTECTION

The project site is the primary habitat for many different animals and plants. The contractor shall use all necessary precautions to mitigate the disturbance of the habitat of plants and animals. Wildlife habitat disturbance as required to by the contract plans and specifications shall be minimized to prevent excessive loss or disturbance. Wildlife or plant life shall not be intentionally harmed or destroyed. Infractions may be reported and will be punishable to the maximum extent as allowed pursuant with all applicable local, state and or federal laws.

*** END OF SECTION ***

SECTION 2050
MOBILIZATION

Part 1 - General

1.01 DESCRIPTION

The work shall include the supply and transport of all labor, material and equipment to successfully complete that project as shown on the plans or described by the Engineer. Mobilization shall also include securing all permits for moving equipment on public roadways, construction permits, and other applicable permits.

Part 2 - Materials (not used)

Part 3 - Execution

3.01 GENERAL

The Contractor shall conduct all mobilization operations in a timely orderly manner. Unless otherwise approved by the Engineer, mobilization operations shall commence no later than One (1) week after the notice to proceed. De-mobilization shall be finished within Two (2) weeks after substantial project completion and accepted by Engineer.

Designated staging areas will be determined in the field by the owner or the engineer. The Contractor shall park all inactive equipment in only these designated locations. Refueling and servicing of equipment shall only be performed in these areas. All fuel and oil spills shall be cleaned up and disposed at the sole expense of the Contractor.

During all operations, the Contractor is responsible for maintaining public and private property in original condition. Damage to existing roadways and roadway shoulders, asphalt trail, boardwalk or any other existing site improvements or facilities shall be repaired to the satisfaction of the Engineer at the Contractors expense.

*** END OF SECTION ***

SECTION 2100
SITE PREPARATION

Part 1 - General

1.01 DESCRIPTION

This specification shall cover the supply of all labor, materials, and equipment required for demolition, clearing and grubbing the site as well as topsoil excavation, stockpiling and replacement, de-watering and/or water diversion around project work locations.

1.02 SCOPE OF WORK

Removal of unsuitable material or objects. This includes demolition and removal, clearing and grubbing.
Stripping organics and/or unsuitable soil from areas intended for fill, and borrow.
Preparing areas as necessary to facilitate the construction and installation of water control structures, piping, ditches, levees, dikes, embankments, soil lifts, plantings, access roads, de-watering and/or water diversion around project work locations and any other areas that are necessary to complete the required work.
De-Watering as needed to facilitate any and all construction.

1.03 INSPECTION

The Contractor shall call for inspection after completion of any item that would require visual inspection prior to installation such as base course installation, filter fabric placement in preparation to receive rip rap or any other item as required by the plans or specifications. The Contractor shall call for inspection after completion of stripping under each dike or levee location as applicable. Revetment materials shall be inspected on site prior to installation. Final inspection shall be performed as needed as requested by the contractor or within scheduled construction inspection events.

Part 2 - Materials (not used)

Part 3 - Execution

3.01 CLEARING AND GRUBBING

Clearing shall consist of the cutting, removing, and disposal of all native brush, trees, logs, stumps, roots, heavy sod, vegetation, rocks, and stones larger than Four (4) inches in any dimension, and rubbish within designated work areas. Items or material smaller than Four (4) inches in any direction cleared from the site and suitable as fill material shall be first, utilized in any areas as identified as requiring fill. Material suitable for topsoil shall be reserved for placement within, over or on top of the newly constructed levee to promote revegetation. Excess fill material shall be moved and/or transported to a designated location on site. Excess fill material shall be deposited as spread in accordance with section 3.02 Stripping so as to create an environment conducive for plant growth or re-vegetation of disturbed areas. Placement of cleared material shall be as directed by the Engineer or in accordance with the provided details located in the plans.

3.02 STRIPPING

Stripping shall consist of the complete removal of all earth materials contaminated by organics to prevent those organics from being incorporated into compacted fills. The Contractor shall strip all organic materials from any borrow site or excavation regardless of the depth of material encountered to the satisfaction of the Engineer before using that material for compacted fill.

Additionally, stripping shall be done to remove soil unsuitable for levee, dike or embankment construction.
Unsuitable material may consist of flour-like sand or other highly erodible soils. Stripping shall be done below each levee, dike or embankment footprint as necessary, and as required in all borrow areas that will subsequently be

used for material excavation. The intent of stripping is to eliminate organic materials and unsuitable soils from borrow materials for subsequent levee, dike or embankment fill.
All stripped materials suitable as topsoil shall be first stockpiled and reserved for placement over disturbed areas with the intent to promote native plant regeneration from the seed bank. Stripped and stockpiled material shall be re-spread in Four to Six (4-6) inch lifts as directed by the Engineer. Stripping materials from levee, dike or embankment footprints may be stockpiled alongside the levee, dike or embankment provided that sufficient space is available to prevent accidental incorporation of the materials into compacted fill during trim work on the levee, dike or embankment side slopes. Placement of stripped material shall be as directed by the Engineer. The Contractor shall coordinate stockpiles and re-spreading activities on the project site as directed by the Engineer.

Stripping to a depth of Six (6) inches is assumed for estimates and as the pay quantity regardless of the depth of material actually stripped.

3.03 DEMOLITION AND REMOVAL

Demolition consists of removal or non-native materials such as existing culverts and any other structures found on the jobsite as shown on the plans or as directed in the field. Demolition may include the removal of culvert pipe, steel pipe, concrete items, water control gates, old automobiles, discarded appliances, trash or other man made materials found during construction and not necessarily shown on the plans. The Contractor may be eligible for additional compensation for demolition only if the materials discovered are larger than Forty-Eight (48) inches in diameter and/or are larger than Sixty (60) feet in length and cannot be broken into smaller pieces with equipment equivalent to a backhoe. All materials removed shall become the property of the Contractor and be removed from the site unless otherwise specified by the Engineer. Concrete and brick structures may be broken up and used for riprap, upon approval by the Engineer.

Demolition of woody materials including removal of trees and stumps and any woody vegetation associated with clearing the site to receive soil lifts. The trees and woody material shall be mechanically chipped or ground on site and the remains spread evenly over the area. If the work requires seeding, then the chippings shall be spread loosely over the seeded area as mulch to a depth of no more than 1 inch, or spread evenly in open areas to facilitate the retention of carbon in the project site. Trees and woody material that are too large to be chipped by mechanical equipment shall be cut or reduced in size such that they may be chipped on site. Trees and woody material are not be removed from the site unless specifically directed by the Owner, Engineer, or the owners designated representative.

Demolition of trees identified by the Owner, Engineer or the Owners Representative as invasive species, including but not limited to Russian Olive, Siberian Elm may be removed as part of the demolition process. Trees will be completely removed including the stump and the woody material shall be mechanically chipped on site, and the remains spread evenly over the area to receive seeding as mulch to a depth of no more than 1 inch, or spread evenly in open areas to facilitate the retention of carbon in the project site. Invasive trees and woody material that are too large to be chipped by mechanical equipment shall be cut or reduced in size such that they may be chipped on site. Trees and woody material are not be removed from the site unless specifically directed by the Owner, Engineer, or the owners designated representative. The intent of this specification is to allow for organic material to remain on site.

As an alternative to chipping and only as directed by the Owner, the Engineer or the Owners representative, woody material may also be placed into small piles not to exceed 15 feet in diameter at the base and 6 feet in height to serve as habitat structures at select locations to be determined on site as appropriate.

Excavations caused by removal of existing material shall be backfilled in accordance with Section 2200, Earthwork.

3.04 PROTECTION

The work location is located on public property. It is not anticipated that the general public will be present at any time during the construction activities, however the Contractor shall provide protection devices (as appropriate)

including barricades, fencing, warning signs, lights, and other devices necessary to ensure security and safety within the project site during all aspects of the work.

3.05 TEMPORARY ROADS

It is not anticipated that temporary roads will be necessary. Construction of any temporary road shall be with the Engineer's prior approval only.

Any temporary roads constructed for the use of the contractor shall be removed and left in a condition satisfactory to the Engineer upon completion of the project. Where excess compaction has occurred the Engineer may require ripping or discing of temporary roads.

3.06 CONTROL OF SURFACE/SUBSURFACE WATER

The Contractor is responsible for control of surface water, subsurface water and drainage during the construction period. All temporary equipment, fills, crossings, or culverts necessary to promote drainage, de-watering or water diversion will be installed and removed at the Contractor's expense prior to acceptance of the work. Any claims arising from upstream or downstream damages as a result of the construction or failure of these temporary works will be the Contractors' responsibility. No additional payment will be made to the Contractor for any work to be done as a result of adverse weather conditions or changing site conditions during the construction period. The work done on this premises may contain ground water at or near the surface. The contractor shall be responsible for any and all de-watering activities associated with construction. This project is intended to restore and/or create wetlands or riparian corridor habitat and by virtue of the nature of this project it is fairly implied and explicitly indicated that a portion or all of the work described within or otherwise associated with this project **may be constructed under saturated conditions**. By submission of a bid the Contractor acknowledges that they are aware of and are prepared to work under these conditions.

3.07 DUST CONTROL

The Contractor shall comply with all regulatory requirements for dust control on the project site.

3.08 REMOVAL OF DAMAGED ITEMS

All materials removed and deemed unusable by the Engineer shall become the property of the Contractor and be removed from the site.

*** END OF SECTION ***

SECTION 2200
EARTHWORK

Part 1 - General

1.01 DESCRIPTION
The work shall include the supply of all labor, material and equipment required to complete the construction or rehabilitation of levees, dikes, compacted fill placement, grading, trench excavation and backfill, ditches, swales, roadways, channel grading or re-contouring, piping, excavation and backfill around pipe and/or water control structures.

1.02 SCOPE OF WORK (as needed or indicated by plan set or documents)
a. Compacted Fill
b. Construction of ditches, levees and swales
c. Cleaning or re-shaping ditches
d. Filling or plugging of existing ditches or swales
e. Channel Bank Grading
f. Swales or drainage channels to meet the intent of the plans and/or specifications
g. Trenching
h. Compaction testing and certification
i. Channel shaping or re-contouring

1.03 INSPECTION
The Contractor shall stop work and call for inspection at the following points of construction:

Upon discovery of major changes in soil composition during borrow and excavation operations
After reaching final grade on all excavation locations including but not limited to soil lifts, dikes, levees and embankment grading.
Before fill is placed over newly installed pipe or anti-seepage collars.
As needed to provide documentation for compaction.

Part 2 – Materials

2.01 SELECT FILL OR AGGREGRATE BASE IMPORT MATERIALS

The following select import materials are required where shown on the plans or specified.

¾" aggregate base – gravel surfacing and select fill
The aggregate base shall be ¾" maximum size and meet the gradation as follows:

Sieve Sizes	% passing
1"	100
¾"	87-100
No. 4	30-65
No. 30	5-35
No. 200	0-12

¾ inch aggregate base material shall be used for select fill material under structures where specified, around pipes where specified and on all roadways requiring gravel surfacing.

Part 3 – Execution

3.01 BORROW AREA EXCAVATION

Borrow areas shall be maintained during construction in a graded condition such that drainage is assured and that operations can resume quickly after precipitation periods. Following completion of the work, borrow areas are to be left in a graded condition acceptable to the Engineer and all haul roads, access roads, and temporary crossings are to be removed. Material may differ from location to location with respect to suitability of use. The contractor should be ready to borrow and transport material from any location within the project site that will be used as a borrow area.

Unless approved by the engineer, borrow of levee, dike or berm material must be more than Fifty (50) linear feet from the fill location in any direction. The intent of this direction is to alleviate the "moat" configuration next to a levee, dike or berm.

Unless specifically designated on the plans or approved by the engineer, no borrow material may be taken from any area that will be higher in elevation than One (1) foot below that of the top of the levee, dike or berm or soil lift. The intent of this direction is to alleviate any disturbed or scared areas that are above the full pool flood elevation.

Material removed during clearing and grubbing operations shall be considered unsuitable for compacted fill and will be first, stockpiled and reserved for placement over compacted fill and any disturbed areas with the intent to promote native plant regeneration from the seed bank. This organic grubbed material shall be stockpiled on the inside or waterside of any levee, dike or berm. If excess organic material remains after placement over the compacted fill levee, dike or berm and any disturbed areas it may be placed, at the engineers direction and approval, within the confines of the impounded water to create islands and or shallow areas. Islands shall be un-compacted and may be shaped at the contractors discretion providing that they are not higher than 36" in elevation above the top of respective levee, dike or berm and the top width is not more than 5 times of the largest dimension in any direction and all side slopes are no steeper than 5:1. All islands or shallow areas shall not exceed 30% of the total open water (3 foot or deeper) at full pool elevation. Should additional organic material be available after topping the compacted fill and creation of islands or shallow areas the remaining material shall be spread loosely on adjacent land to conform more or less with the existing topography. Deposited material shall be as directed by the engineer or authorized representative.

3.02 PIPE INLET/ OUTLET, DITCH, SWALE, CHANNEL SHAPING OR BENCH CONSTRUCTION

The Contractor shall enlarge/construct the pipe inlet/outlet, ditches, swales or benches to the dimensions shown on the drawings. They shall be constructed to provide uniform bottom slopes without any high spots or sharp drop-offs. Spoil may be used as fill for other areas of the project or shall be evenly spread on the adjacent ground not closer than Five (5) feet to the shoulder of the ditch or swale. Spoil shall blend with the natural landscape. Where field conditions require, all pipe inlets/outlets, ditches, swales or benches shall be constructed to a length and location as necessary to achieve positive drainage to comply with the intent of the design.

All suitable material removed as part of the construction of pipe inlet/outlet, swales, ditches or benches shall, depending on field conditions, be utilized in the construction of the dikes or levees before any material is removed from the designated borrow areas. The engineer shall make the usage determinations as necessary and as dictated by existing field conditions.

3.03 LEVEE, DIKE AND EMBANKMENT FILLS

All levee, dike and embankment fills shall be free of organic material and large rocks over Four (4) inch in diameter and shall consist of native soils. Unless otherwise specified, all material shall be placed in loose lifts not to exceed Eight (8) inches in thickness and shall be compacted by suitable compaction equipment to comply with the specified compaction requirements as outlined for the respective areas or location of fill. Maximum density shall be as determined by the Standard Proctor method ASTM D698. The Contractor shall provide labor and equipment to ensure that soil moisture is within Two (2) percent optimum moisture.

Shaping of the levee, dike or embankment shall break up lumps and clods and yield a smooth surface and obtain a finish to the lines and grades shown on the drawing. Levee tops shall be drivable by maintenance vehicles.

Levee, dike, berm or embankment material excavated from ditches/borrows with tractor-scraper units shall be placed in successive layers across the entire width of the levee, dike or embankment. Each layer must be spread as deposited longitudinally along the levee, dike or embankment with each layer not exceeding Eight (8) inches in thickness. The initial lift shall be placed on undisturbed soil after stripping is completed. With the Engineer's approval the initial layer may be increased in thickness in wet areas to provide a working pad capable of supporting the hauling equipment. The levee, dike or embankment at all times must be maintained in a reasonable level condition and hauling equipment shall be directed over the full width of each layer to facilitate uniform compaction.

Where levee, dike or embankment material is excavated with bucket equipment, it shall be deposited into the levee, dike or embankment within reach of the equipment or hauled directly to the levee, dike or embankment site. To prevent levee, dike or embankment failure, stock piling on levees, dikes, embankment or berms will not be permitted. Materials shall be placed and spread in layers with each layer after spreading not to exceed Eight (8) inches in thickness.
All levee, dike or embankment construction must be as continuous as possible and the fill maintained such that drainage is assured at all times.

Hand compactors shall be used when compacting any fill material within Two (2) feet of any water control structure.

3.04 TRIMMING

The crest, side slopes, and berms of fills and excavations shall be trimmed to conform to the lines and grades shown on the drawings. Crest elevations above specified are acceptable, with the exception of spillways, as noted below. Placement of stockpiled topsoil, erosion protection devices, etc. shall be interpreted to occur above the neat line dimensions on the plans unless otherwise indicated. Finished levees and roadways shall be crowned to a minimum of Two (2) percent.

All spillway crests shall be constructed to the specified elevation and no topsoil or other materials shall be added to the spillway, which will cause the spillway elevation to deviate from the design elevation.

3.05 MINIMUM RADII

Whether shown on the plan sheet or not, the intersection between embankments shall be constructed with a minimum radius of Sixteen (16) feet no matter what the angle of intersection.

3.06 TRENCHING

The Contractor will be required to excavate to the lines and grades shown on the plans. All pipe shall be installed with a minimum cover as shown on the plans. The length of trench excavation in advance of the pipe laying shall be kept to a minimum and shall not exceed One-Hundred Fifty (150) feet, unless authorized by the engineer.
Trenches shall be of sufficient width in the pipe zone to permit the proper installation and bedding, and to provide proper compaction of backfill of materials. The Contractor shall not over excavate by digging below specified lines and grades. If, in the opinion of the Engineer, the Contractor over excavates material in an area, he shall replace at his expense the over excavated material with suitable site material and compact that material to a density equal to the surrounding in-situ material.

Placement of bedding shall precede the installation of pipe. Bedding shall provide uniform support along the entire length of the pipe barrel, without load concentration at joints, fittings, etc. All adjustments to the line and grade shall be made by scraping or filling with bedding material under the pipe, and not by blocking or wedging.

Bedding shall be placed in uniform loose layers of not more than Eight (8) inches in depth, and compacted to Ninety (90) percent maximum density as determined by the Standard Proctor method ASTM D698. Material shall be compacted along the sides of pipe to the depth shown on the plan, and worked carefully under the pipe haunches.
The Contractor shall furnish, install and operate all necessary equipment to keep the excavations above the foundation (sub grade) level free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or nuisance to public. Dewatering equipment shall be in good working condition and shall be available throughout the construction. The contractor shall also provide competent workers for the operation and maintenance of the pumping equipment.

If in the opinion of the Engineer or Contractor the site-excavated material is unsuitable for backfill, the Contractor shall supply, from an assigned borrow area, suitable impervious backfill material.

3.07 SOIL COMPACTION (as needed)

Visual inspection and testing will be performed by the Engineer or an authorized representative, on the work at the Engineer's discretion. Soil and fill compaction testing will be conducted in accordance with ASTM D2922/D3017 and Maximum density will be determined by the Standard Proctor Method ASTM D698, for all compacted fill material in any non-linear volumetric placement, dikes or levees, select fill material under any structure, select fill material bedding for any pipe or any other area requiring compaction.

Compaction testing shall be ascertained and certified, unless specifically noted as different on respective detail, to a minimum level of Ninety (90) percent maximum density as determined by the Standard Proctor method ASTM D698.

The contractor shall demonstrate to the Engineer's satisfaction that the compaction density has been achieved. If the compaction is not achieved or the contractor cannot demonstrate that the means and methods being utilized are sufficient to meet the specification then the Engineer may require additional testing at an interval to be determined as site conditions warrant or as required by the engineer, at the contractors' expense.

The Engineer may employ or require the contractor to utilize the services of an independent third party firm or individual to provide certified verification of soil compaction. The individual or firm shall be licensed and appropriately registered with the state in which the project is located.

When the Contractor has reached a point in construction where inspection is required to proceed (based on these specifications or verbal instructions from the Engineer), Contractor shall provide a minimum of forty-eight (48) hours notice to the Engineer before demobilizing equipment that may be necessary to adjust or modify the work in question. The Engineer will make every effort to provide inspection on shorter notices.

No Compaction testing shall take place without approval or the presence of the engineer or his representative. The engineer or his representative reserves the right to choose the locations or site of individual tests.

*** END OF SECTION ***

SECTION 2210
EROSION CONTROL

Part 1 – General

1.01 DESCRIPTION
This work shall consist of supply and placement of filter fabric or bedding materials and rock riprap as protective covering on or at the bases of channels and slopes, around culvert inlets and outlets and on embankments or such other places as may be indicated on the plans, as specified herein, or as directed by the Engineer.

Part 2 - Materials

2.01 FILTER FABRIC
The filter fabric shall be a non-woven polyester or polypropylene geotextile. This geotextile shall have a minimum grab tensile strength of One Hundred Fifty (150) pounds as determined by ASTM D-1682. The geotextile shall have a maximum equivalent opening size (E.O.S.) of a number Seventy (70) U.S. standard sieve. Filter fabric shall be Tencate Mirafi N-Series 160N or approved equal.
Tencate Mirafi – 365 South Holland Drive – Pendergrass, Georgia 30567 – (706) 693-2226

The contractor shall supply filter fabric, all pins and other items necessary to fasten the filter fabric to the ground so it will not slide or form gaps when placing rock riprap.
All materials shall be handled and stored in a careful and workmanlike manner to the satisfaction of the Engineer.

2.02 RIPRAP
The Contractor shall supply rock, which will consist of cobble, crushed rock. Unless otherwise specified, the stone shall be well graded and range in size from Three (3) inch to Twelve (12) inch in diameter with not more than Fifteen (15) percent greater than Nine (9) inches diameter and not less than Fifteen (15) percent smaller than Four (4) inches diameter. All riprap shall be composed of hard, durable, sound pieces having a specific gravity of not less than Two and one half (2.5). Any material containing asphalt will not be allowed. Rock shall be approved by the Engineer prior to installation.

Part 3 – Execution

3.01 SUBGRADE PREPARATION
The areas on which the bedding material or fabric is to be placed shall be graded to the lines shown on the plans. The soil surface shall be smooth and free from any obstructions to provide adequate contact area between the soil and the bedding material or filter fabric.

3.02 FILTER FABRIC
The filter fabric shall be placed in such a way that there is adequate contact area between the soil and the fabric. Installation shall start on the downstream end of the slope. Pins shall be installed to prevent the filter fabric from sliding for forming gaps during installation of the filter material and placing of the rock riprap.
When filter fabric is required on a slope, an anchor trench shall be constructed on the upstream end of the filter fabric and a toe trench shall be constructed on the downstream end of the installation. The trenches shall be perpendicular to the slope and must be at least Two (2) foot wide and Two (2) foot deep. The filter fabric shall be placed in the anchor trench and the toe trench. The trenches shall be backfilled and compacted to adequately anchor the filter fabric.

Where a seam is needed to provide a continuous coverage of the filter fabric, the two pieces of filter material shall be overlapped a minimum of Two (2) feet. Pins shall be placed in the overlap area to prevent slipping during

placement of the filter material and rock riprap. Great care shall be taken to protect the filter fabric from damage either from wheels or tracks or any sliding that may be caused by the equipment.

3.03 RIPRAP

Riprap shall be dumped, rolled or placed in such a manner that the smaller stones will be uniformly distributed throughout the mass. Sufficient handwork shall be done to provide a neat and uniform surface, with the depth being specified herein and as shown on the plans.

The surface may not vary from the theoretical surface by more than 2" at any point, unless otherwise specified. Areas to receive Riprap shall be excavated so that the top of the Riprap layer is consistent with the flow line, top of existing ground surface or as needed to achieve the required depth as specified.

END OF SECTION

SECTION 2600
WATER CONTROL STRUCTURES AND PIPE

Part 1 - General

1.01 DESCRIPTION
The work of this section shall include the supply of all labor, and equipment required to complete the installation of any pipe, cast in place or pre-cast water control structures, as called for on the drawings and/or specified herein.

1.02 SCOPE OF WORK (as needed or indicated by plan set or documents)
a. Excavation of compacted embankment and/or native material for pipe
b. Preparation and compaction of sub-grade
c. Bedding of pipe and water control structures
d. Backfill of excavated area with compacted backfill
e. Installation of Pre-cast concrete structures
f. Installation of pipe
g. Anti-flotation devices (if needed)
h. Safety grating
i. Water control gates and appurtenances

1.03 INSPECTION
The contractor shall request inspection prior to placement of prefabricated risers or pipe to allow inspection of the excavation and initial backfill.

Part 2 - Materials

2.01 APPURTENANCES
The Contractor shall supply all couplers, nuts, bolts, stoplogs, stoplog channels, sealants, and all accessories recommended by the material manufacturer or necessary for a complete installation. All pipe, gates and materials shall be new (not used) except where salvaged materials are specified on the plans. Materials supplied may be subject to inspection and tests by the Engineer or his representative.

2.02 HDPE PIPE
HDPE PIPE SHALL BE PROVIDED BY THE OWNER

Polyethylene drainpipe shall be of the nominal size shown on the plans. The pipe shall be profile wall (corrugated) with a smooth interior and meet the requirements of either AASHTO M252 Type S, AASHTO M294 Type D or S, AASHTO MP7 depending on the pipe diameter. Pipe and fittings shall conform to ASTM D3350 and ASTM F477. Pipe joints shall be beveled or mitered, silt tight and non-rated watertight. Pipe shall be manufactured by ADS, Hancor or approved equal.

2.03 PRE-CAST CONCRETE RISERS
PRE -CAST CONCRETE RISERS SHALL BE PROVIDED BY THE OWNER

Pre-cast structures shall conform to dimensions as noted on plans and shall be manufactured to meet ACI 318 requirements and shall adhere to specifications in section 3100 Pre-Fabricated concrete.

Pre-Cast Concrete Risers shall be Manufactured Horizon West Environmental or approved equal.
Horizon West – 146 Sunny Glen Circle– Kaysville, Utah 84037 – (801) 647-5700

2.04 WOOD STOPLOGS

WOOD STOPLOGS WILL BE PROVIDED BY THE OWNER

Wooden stoplogs shall be kiln-dried redwood or Douglas Fir without knots or knotholes. Each board will be cut to fit individual structures allowing a Three-Eighths 3/8-inch clearance on each end for swelling when wet. An even number of each size comprising of a mixture of 4x4, 4x6 and 4x8 boards shall be supplied for each structure. Stop logs shall be manufactured to the configurations and dimensions shown on the plans.

2.05 STOPLOG LIFTING HOOK

STOPLOG LIFTING HOOKS SHALL BE PROVIDED BY THE OWNER

Stoplog lifting hooks shall be manufactured to the dimensions shown on the plans. One hook shall be supplied for each structure.

2.06 BAND AND GASKET (if needed)

Bands may be either of the following:

Bands shall be Twenty-Four (24) inches wide and of the same material as the pipe and shall be installed using a band type gasket of expanded rubber of at least Twelve (12) inches in width, meeting requirements of ASTM D1056 for the "RE" closed cell grades.

"Hugger" type bands shall be a minimum of Thirteen (13) inches wide and of the same material as the pipe and shall be installed using o-ring gaskets meeting the requirements of ASTM C361 and ASTM C443.

All connections shall be watertight.

2.07 ANTI FLOTATION DEVICES (if needed)

Anti flotation devices shall be manufactured to the dimensions shown on the plans. Steel reinforcement shall not be required on concrete weights. Concrete shall conform to Section 3100 Pre fabricated concrete. Anchor Chains shall be Stainless Steel and sized to support One thousand Five Hundred (1,500) pounds minimum.

2.08 SAFETY GRATING

SAFETY GRATING SHALL BE PROVIDED BY THE OWNER

All safety grating shall be constructed to fit the location to receive the grating with minimum clearance as outlined below. All seating shall be fabricated to allow for adequate clearance for placement and thermal expansion. Adequate clearance shall be defined as One Half Inch (1/2") on each end. Grating shall be cut so that grating pattern matches adjacent sections where applicable. All grating shall be banded as applicable. Factory galvanized finish is specified otherwise post construction hot dip galvanized treatment is required. Safety grating shall be capable of supporting a minimum of Three hundred (300) pounds over a Six (6) foot span with no more than a ¼" deflection. All appurtenances shall be stainless steel or as provided by the manufacturer.
Safety grating shall be Amico 38-4-64, One and One Half Inch by One Quarter Inch (1 1/2" x ¼") heavy duty welded steel grating or approved equal
Aimco – 212 North 1330 West – Orem, Utah – (801) 225-9350

2.09 CONCRETE ADHESIVE (if needed)

Concrete/grout adhesive for bonding cold concrete joints shall be high modulus, high strength epoxy bonding adhesive. Adhesive shall be Sikadur 32, Hi-Mod or approved equal.
Sika Corporation – 201 Polito Avenue – Lyndhurst, New Jersey 07071 – (800) 933-7452

2.10 REPAIR GROUT

Grout for repair of surface defects, severe defects and cracks shall be a crystalline fast setting, non-shrink, high bond strength hydraulic cement compound. Grout shall be Xypex patch and plug or approved equal.
Xypex Chemical Corporation – 13731 Mayfield Place – Richmond, B.C. Canada V6V 2G9 – (800) 961-4477

Part 3 – Execution

3.01 HANDLING AND STORAGE OF MATERIALS

All materials shall be handled and stored in careful and workmanlike manner to the satisfaction of the Engineer. Any dents or depressions put in the riser from storage or handling during transportation or installation shall not be allowed. The Contractor shall be responsible for replacement and reinstallation of the damaged riser at his/her own expense. Prior to installation of the control structure, any protective coating which has been removed from the structure exposing the pipe shall be recoated. Welding, drilling, bolting or otherwise attaching devices (temporary or permanent) to the structure to assist in structure installation is prohibited.

Reasonable care shall be used in the removal and installation of salvaged structures. Damage to salvaged structures when reasonable care is used shall not be the responsibility of the contractor.

3.02 UNSUITABLE MATERIAL

If in the opinion of the Engineer or Contractor the site-excavated material is unsuitable for backfill, the Contractor shall supply, from an assigned borrow area, suitable impervious backfill material.

3.03 ASSEMBLY OF PIPE

The Contractor, after preparation of the bed, shall assemble the pipe in strict accordance with the manufacturer's instructions. All pipe supplied to site shall be inspected prior to assembly for chipping or damage in handling and shall be repaired as directed by the Engineer. Joints of pre-cast structures will be sealed in a suitable way so that leakage is prevented.

3.04 INITIAL BACKFILL

Initial backfill shall be deposited in horizontal, uniform layers not exceeding Six (6) inches in thickness before compaction, and each layer shall be thoroughly compacted throughout to ensure thorough tamping of backfill under the haunches and around the pipe. Compaction is to be achieved by hand and/or mechanical compaction. Compacted initial backfill shall extend to a minimum depth of Six (6) inches above the top of the pipe for the entire width of the trench. Vehicles shall not be permitted to cross the pipe until initial backfill is completed. Extreme care shall be exercised until the final grade and compacted cover has been reached or the aggregate road base is in place. No boulders, non-specified rock, organic material, or debris shall be permitted in the trench. This material will be classified as unsuitable material and treated as such. Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacements or which may damage the installation shall not be used.

3.05 FINAL BACKFILL

After initial backfilling has been completed, the remaining backfill, consisting of suitable site material, shall be placed in layers not exceeding Eight (8) inch before compaction. Each layer shall be compacted by mechanical means to a density equivalent to that of the surrounding unexcavated material.

No boulders, non-specified rock, organic material, or debris shall be permitted in the trench. This material will be classified as unsuitable material and treated as such. Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacements or which may damage the installation shall not be used.

Backfill shall be executed to the lines and grades shown on the plans and as specified herein. A minimum cover of Twelve (12) inches shall apply to all installed culvert pipe. Where necessary the Contractor may mound compacted soils to achieve the minimum cover. These mounds shall be constructed with side slopes at Ten Horizontal to One Vertical (10:1) or flatter and compacted to the specification of the adjacent levee or in situ material as applicable.

3.06 AGGREGATE BASE OR SELECT FILL PLACEMENT

The areas located under concrete structures shall be properly prepared to ensure minimal settlement. The Contractor shall prepare said base areas by stripping all unsuitable material from beneath proposed structures, extending Two (2) feet horizontal per foot of excavated depth past the structure. If excavation exceeds Two (2) foot in depth, the Engineer may require installation of a geotextile fabric to provide adequate support for construction.

In-situ soil below the foundation shall be compacted to a minimum of Ninety (90) percent relative density as determined by the Standard Proctor method ASTM D698. Select fill material shall be placed in Six (6) inch lifts and compacted to Ninety (90) percent relative compaction as determined by the Standard Proctor method ASTM D698. A minimum of Eighteen (18) inches of compacted select fill shall be provided under concrete structures.

The areas located under around and on top of pipes shall be properly prepared to ensure minimal soil particle transport. The Contractor shall prepare said areas by installing select fill in accordance with details and specifications. The select fill shall be compacted to a minimum of Ninety (90) percent maximum density as determined by the Standard Proctor method ASTM D698. The Contractor shall provide labor and equipment to ensure that moisture is within Two (2) percent optimum.

*** END OF SECTION ***