

CONSTRUCTION SPECIFICATIONS

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PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included

Work under this SECTION covers requirements for materials, tools, equipment, and services necessary to complete the site preparation and site cleanup work for this project. The work shall include, but is not necessarily limited to, completion of the following work:

1. Mobilization
2. Establishment of offices and project trailer
3. Installation of project sign
4. Establishment of sanitary facilities
5. Removal and salvage of existing fencing
6. Installation and removal of temporary fencing
7. Protection of existing utilities, vegetation, and facilities to remain undisturbed
8. Site clearing and grubbing
9. Debris removal and disposal
10. Demobilization

1.2 QUALITY ASSURANCE

- A. Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this SECTION.
- B. In addition to complying with requirements of governmental agencies having jurisdiction, Contractor shall comply with the directives of Engineer and Division.
- C. Applicable Standard: Iowa State University (ISU) Extension Service Publication PM-909, "Preventing Construction Damage to Trees".
- D. Contractor shall comply with most guidelines to protect the Indiana Bat as provided by the Division or in the Appendix.

1.3 JOB CONDITIONS

- A. The Plans do not purport to show all objects existing on the site.
- B. The locations of utility mains, structures, and service connections shown on the plans are approximate only and were obtained from records made available to Engineer and Division. There may be other existing utilities not known to Engineer and Division and not shown on the Plans. The verification of existence and the exact location determination of utility mains, structures, and service connections shall be the responsibility of Contractor.
- C. Contractor shall not perform any work on or cause any damage to existing CRP land, wetlands, or any other jurisdictional lands that are indicated on the Plans as not to be disturbed. Division has no permit to disturb these areas. These areas are under the jurisdiction of other authorities and there could be fines levied against Contractor for disturbance in these areas. If damage does occur to these areas, Contractor shall restore them to an acceptable condition at no cost to Division.
- D. Contractor shall not perform work under the drip line of trees that are to remain. Contractor may request that certain trees within the Project Limits shown on the Plans remain in place. If permission is granted, Contractor shall protect these tree(s) from damage.

- E. Materials to be handled under this Contract include spoil, gob and coal refuse which may be toxic and/or acidic in nature.
- F. Contractor shall not use explosives without written approval of Engineer.
- G. Unless indicated otherwise in the Contract Documents, removed, salvaged or demolished materials shall be considered to be the property of Contractor. Contractor-salvaged materials and demolished materials shall be completely removed from the job site or buried on site as approved by Engineer. Any items indicated in the Contract Documents to be salvaged to the landowner, such as existing fencing, shall be stored on site at a location approved by Engineer.
- H. Contractor shall conduct all work in a manner which shall minimize, to the greatest practical extent, inconvenience to the public, and which shall result in a final product which leaves the site in an equal or better condition than prior to construction.
- I. No trees shall be cleared between the dates of April 15 to September 15 to comply with the requirements of the Indiana bat habitat without the express permission of the Division.

1.4 SUBMITTALS

- A. Contractor shall provide to Engineer a description and the location of any alternative off-site disposal area to be used other than a licensed landfill.
- B. Contractor shall submit a Construction Progress Schedule as specified in SECTION 3-24 CONSTRUCTION SCHEDULE of the General Conditions (*Document N*).
- C. Contractor shall submit weight tickets or billings for all off-site waste disposal, including trash, metal, appliances, tires, hazardous chemicals, etc. to Engineer.
- D. Contractor shall provide Engineer with record survey notes of all existing fence locations within the projects limits and any adjacent fencing to be temporarily removed prior to removing any existing fence.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials, not specifically described but required for proper completion of the work of this SECTION, as selected by Contractor subject to the approval of Engineer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. In company with Engineer, visit the site and verify the extent and location of clearing and site preparation required. Completely remove items scheduled to be removed, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere.
- B. All trees outside the Project Limits shown on the Plans shall remain undisturbed. All trees within the Project Limits, except as noted hereafter, shall be removed. In areas of the site where minimal grading is required, the grading plan should be adjusted slightly in favor of saving well established trees. Cooperate with Engineer to achieve this intent.

3.2 PROTECTION

- A. Contractor shall be responsible for locating and protecting all utilities prior to initiating work. If damage does occur to any existing utilities, Contractor shall restore them in a manner acceptable to the utility provider and Engineer at no cost to the Division.
- B. Contractor shall protect existing vegetation as discussed below.
 - 1. Protect tops, trunks, and roots of existing trees and/or shrubs, indicated or implied to remain, from damage during all operations. Box, fence around, or otherwise protect trees before adjacent work is started. Do not permit heavy equipment or stockpiles within branch spread. Trim or prune to obtain working space in lieu of complete removal whenever possible. Conform with good horticultural practices. Preserve natural shape and character. Refer to ISU Publication PM-909, "Preventing Construction Damage to Trees".
 - 2. Damaged trees shall be repaired or replaced to the satisfaction of Engineer. Repair may include, but not be limited to, trimming, pruning, and application of pruning paint. Repair shall be completed within seventy two (72) hours of occurrence of damage. Remove existing vegetation when damage occurs and survival is doubtful.
 - 3. Adjacent areas to the site with established vegetation shall be protected. If access through established vegetation is required, Contractor shall coordinate his access with Engineer and restore the damaged areas as directed by Engineer.
- C. Contractor shall provide protection for persons and property as discussed below.
 - 1. Barricade open depressions and holes occurring as part of this work.
 - 2. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, burning of landscape waste, equipment vibration, and other hazards created by operations under this SECTION.
- D. Contractor shall use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Contractor shall maintain access to the site at all times.
- F. When requested by Division or Engineer, Contractor shall provide access through the site on an as needed basis to the landowner when access to adjacent lands is restricted.

3.3 OFFICE AND LAY-DOWN AREA

- A. Contractor shall establish, provide, and initiate use of temporary facilities described herein within thirty (30) days of the initiation of construction activities and prior to the first Progress and Pay Request Meeting. The offices and lay-down area can be located anywhere within the Project Limits. The offices and/or lay-down area may be located outside the Project Limits, but only if the location is approved in writing by the landowner on whose property these facilities are located. In addition the location of Contractor supplied Engineer's Field Office must be approved by Engineer.
- B. Engineer's Field Office
 - 1. Provide one hundred (100) square feet office (locked, heated, air conditioned, lighted and wired with electrical power) for Engineer's Representative.
 - 2. Engineer's office can be separate compartment in Contractor's Field Office.

- C. Contractor's Field Office
 - 1. Provide adequate space for field office personnel, suitably furnished, lighted, heated and air conditioned.
- D. Unless specifically indicated elsewhere in the Contract Documents, Contractor shall provide all electric, heat, power, water, telephone, sanitary, and any other utilities or facilities required to perform the work.
- E. Contractor shall terminate use and remove facilities at earliest reasonable time when they are no longer needed. Removal of all temporary facilities is required for final acceptance of the completed project.

3.4 EXISTING FENCES

- A. Any existing fences within the project limits that are indicated to remain shall be protected. If these fences are damaged, the Contractor shall repair them at no cost to Division. Fences outside of the Project Limits which interfere with construction operations shall not be relocated or dismantled until approval is obtained from Engineer. In areas where existing fences outside of the Project Limits cannot be maintained due to construction operations, Contractor will be required to provide temporary fences or other means to prevent unauthorized vehicular, pedestrian or livestock access, as applicable. After work is completed in this area, a replacement fence of the same material type or better shall be replaced at the same location at no cost to Division.
- B. Existing fences within the project limits shall be removed. If the plans indicate the fence is to be salvaged to landowner(s), fencing material shall be rolled in neat bundles and secured with salvaged posts stacked neatly and stored at a location on site to be approved by Engineer. If the landowner(s) do not want the fence salvaged to them, the fencing material becomes the property of Contractor and shall be disposed of as discussed in 3.6 below.
- C. Where existing fences are removed and subsequently replaced as a part of the work, field establish such reference points and ties as are necessary to ensure replacement fencing will follow the same alignment as the existing fencing.

3.5 CLEARING AND GRUBBING

- A. Contractor shall perform clearing and grubbing only to the extent necessary to perform excavation, grading, and other required work.
- B. Clearing includes felling and disposal of trees, brush, and other vegetation. In cutting of timber growth, cuts shall be made such that all trees are felled into the area to be cleared. Exercise care when clearing near the Project Limits so as not to damage existing trees or vegetation to remain.
- C. Clearing also includes removal of all existing fencing materials as discussed in 3.4 above.
- D. Grubbing includes removal and disposal of tree stumps and roots larger than three (3) inches in diameter. Stumps and roots within three (3) feet of final (proposed) grades shall be grubbed. Backfill all excavated depressions with nearby soil or spoil material, compact to approximate density of adjacent undisturbed areas, and grade entire area to drain.
- E. In areas where the fill depth is greater than three (3) feet, undisturbed stumps and roots extending not more than six (6) inches above the ground line and surface vegetation do not need not be removed unless they are located within the vicinity of a dam, terrace, or other structural element.

3.6 DEBRIS REMOVAL AND DISPOSAL

- A. Contractor shall remove and dispose of debris, rubbish, landscape waste and all other materials resulting from the site clearing and preparation operations by either recycling, burning, burying, off-site disposal, chipping, creating brush piles, or a combination thereof. Specific requirements for various disposal techniques are discussed below.
- B. Burning of Landscape Waste
 - 1. State law requires that burning of landscape waste be limited to areas located at least one-quarter (1/4) mile from any inhabited building, unless a variance is obtained from the Iowa Department of Natural Resources, or permission is obtained from all impacted residences located within one-quarter (1/4) mile of the proposed burn area.
 - 2. Contractor shall obtain all necessary permits and comply with all regulatory agencies, including the local Fire Department, governing this work. The local Fire Department must be notified prior to any on site burning.
 - 3. Only vegetative matter may be burned on site. Oil base materials are not allowed to be burned on site. Rubber tires cannot be used to start or maintain burning of brush.
 - 4. No burning will be allowed on any area of the site containing coal refuse.
 - 5. Large trees and stumps may require two (2) or more burning sequences. Tree trunks and limbs greater than three (3) inches in diameter may be sawn or cut in lengths not greater than forty-eight (48) inches and buried in lieu of burning.
 - 6. Protection of property, trees and vegetation that are to remain, both inside and outside the Project Limits, shall be maintained at all times.
- C. Burying
 - 1. Trees, stumps, brush, and the ashes from the burning of landscape waste may be buried within the project limits provided the requirements below are followed.
 - a. No burying of debris shall be completed within areas of the site that contains dams, terraces, any other structures, or where future settlement would be detrimental to the successful reclamation of the site.
 - b. Uncut trees may be placed in dewatered ponds containing muck to provide support. The trees shall be placed uniformly over the muck and shall not exceed a total thickness of five (5) feet.
 - c. All products to be buried not providing support over muck shall be broken or cut to a maximum dimension of forty-eight (48) inches and shall be spaced so normal fill material can be properly placed and compacted thereon. Mass dumping, without spreading and spacing of debris, will not be allowed. Buried debris shall not be allowed to accumulate greater than five (5) feet in depth and shall be covered with a minimum of five (5) feet of cover per foot of debris. The top of the uppermost buried debris shall be at least five (5) feet below final grade. Burial operations shall be permitted only in the presence of Engineer.
 - 2. Farm buildings may be buried provided they are emptied of any contents not authorized for burial and laid flat. Burial operations shall be permitted only in the presence of Engineer.

- D. Habitat Brush Piles
 - 1. Brush piles for habitat may be used in some areas if permission is received from the landowner.
 - 2. The location and number of brush piles shall be approved by Engineer.
 - 3. Brush piles shall not exceed fifty (50) feet in diameter and ten (10) feet in height.
- E. Off-site Waste Disposal:
 - 1. Any household trash, tires, hazardous materials, etc. present at the site, whether shown on the plans or encountered during construction, shall be removed off-site to a licensed landfill or other location approved by Engineer. Weight tickets or billings are required for payment purposes.
 - 2. Small debris and trash shall be removed and sorted by hand. Additional sorting may be requested by Engineer or Division prior to weighing if it is determined that excessive amounts of soil are included with the trash.
 - 3. Metal objects present at the site shall be salvaged where possible or taken to a licensed landfill or other approved location.

3.7 PROJECT SIGN

- A. Contractor shall provide project identification sign to be detailed as shown on the Plans. Location of the project sign shall be approved by Engineer.
- B. Upon completion of all the work and final acceptance by Division, Contractor shall be responsible to remove the "Hard Hat Area" portion of the sign.

3.8 CLEAN-UP AND REPAIRS

- A. Contractor shall remove equipment, project materials, and wastes such as oil drippings, stones, gravel, packaging containers, etc., from the site and dispose of wastes at an approved off-site location.
- B. Contractor shall repair all areas of rill erosion with a depth greater than three (3) inches and width greater than four (4) inches, or as directed by Engineer.
- C. All disturbed areas outside the Project Limits, such as entrance and haul roads and lay down areas, shall be returned to their original condition by Contractor and as approved by the Engineer.
- D. The materials, equipment, and labor for clean up and repairs are at no cost to Division.

3.9 MEASUREMENT AND PAYMENT

The construction cost of all work included in this SECTION of the Construction Specifications shall be included in Contractor's unit prices set forth in the Proposal and Schedule of Prices (*Document C*) for the work items described below. The unit price for each of these items shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the unit prices so set forth by the amount of the work actually constructed, measured as described herein, shall constitute full payment to Contractor for performance of the work included in this SECTION.

Measurement and payment for each work item in this SECTION shall be in accordance with the following:

- A. *Mobilization*: Payment for the cost of mobilization and demobilization and other work incidental thereto shall be included in the lump sum price set forth for "Mobilization." The lump sum price set forth in Contractor's Proposal and Schedule of Prices (*Document C*) shall include full compensation for mobilization; for preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to and through the site; for establishment of offices, trailers, and other facilities necessary for work on the project; for installing the project sign and removing a portion thereof; for demobilization, and cleanup and repairs; for all other work or operations which must be performed or costs incurred when beginning or performing work on the project including bonding, insurance, obtaining permits, filing affidavits, paying fees, etc. See General Conditions (*Document N*) Item 6-01 and any permits included in an appendix to the specifications.

The amount which Contractor will receive payment for, in accordance with the following schedule, will be limited to five percent (5%) of the total Contract bid. Should the Contractor's bid for this item exceed five percent (5%), the amount over five percent (5%) will not be paid until the Contract is finalized.

Basis of Payment: Partial payment of the lump sum amount bid for Mobilization, not exceeding five percent (5%), will be made in accordance with the following schedule:

1. Upon Contract execution, ten percent (10%) of the pay item will be paid.
2. When five percent (5%) or more of the original Contract amount is earned, an additional twenty percent (20%) of the pay item will be paid.
3. When ten percent (10%) or more of the original Contract amount is earned, an additional twenty percent (20%) of the pay item will be paid.
4. When fifty percent (50%) or more of the original Contract amount is earned, the remaining balance of the pay item will be paid up to a maximum of five percent (5%) of the total bid.

Nothing herein shall be construed to limit or preclude partial payments for other items as provided for by the Contract.

- B. *Clearing & Site Preparation*: The unit price for this work item, as shown in Contractor's Proposal, shall include full payment to Contractor for all clearing, site preparation, debris removal and disposal, fence removal, and other work incidental thereto as required to complete the Project in accordance with requirements of the Contract Documents. This work shall be completed within all areas disturbed by construction operations and limited to the total area enclosed by the "Project Limit" lines shown on the Plans. Partial payments will be made based upon the estimated number of acres cleared or the percentage of clearing that is completed at the time of the pay request.
- C. *Off-site Waste Disposal*: The unit price for this work item as shown in Contractor's Proposal, shall include full payment to Contractor for all work necessary to collect, load, transport, landfill fees

and other work incidental thereto as required to complete the project in accordance with the requirements of the Contract Documents. The waste materials will be measured on the loaded ton as determined from weight tickets. The total estimated quantity for this work item includes only the household trash from the locations noted. Handling and disposal of special items such as tires, batteries, or hazardous waste, will be paid for separately. All other trash and debris will be disposed of in accordance with these specifications.

D. *Summary:* Proposal Bid Items applicable to work covered by this SECTION are as follows:

<u>Description</u>	<u>Unit</u>
Mobilization	Lump Sum
Clearing and Site Preparation	Acre
Off-site Waste Disposal	Ton
Special Waste Disposal	Per Ticket

END OF SECTION 02100

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SECTION 02220 - EARTHWORK, DAMS

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PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

Work under this SECTION covers requirements for materials, tools, equipment and services necessary to complete the Earth Dams for this project. The work shall include, but is not necessarily limited to, completion of the following work:

1. Field engineering.
2. Excavation.
3. Dewatering of excavations prior to filling as may be required.
4. Conveyance, placement, and compaction of excavated materials.
5. Chemical/mechanical soil stabilization as may be required.
6. Implementation of Storm Water Pollution Prevention Plan (SWPPP).

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this SECTION.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directives of Engineer and Division.
- D. References
 1. ASTM D1556: Density of Soil-in-Place by Sand-Cone Method or other equivalent method with Engineers approval.
 2. ASTM D698: Moisture-Density Relations of Soils and Soil-Aggregate Mixtures – Standard Proctor Test.
 3. ASTM D2922: Density of Soil and Soil Aggregate In-Place by Nuclear Methods.
 4. ASTM D3017: Standard Test Method for Water Content of Soil and Rock In-place by Nuclear Methods.
 5. ASTM D2487: Unified Soil Classification System (USCS).
 6. ASTM D4253: Maximum Index and Unit Weight of Soils Using a Vibratory Table.
 7. ASTM D4254: Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 8. ASTM D558: Moisture-Density Relations of Soil-Cement Mixtures.
 9. ASTM D422: Particle-Size Analysis of Soils.
 10. ASTM D4318: Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 11. Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction (IDOT).

- E. The Division/Engineer will retain the services of a Geotechnical Engineer to provide inspection of the core trench, material evaluation and approval, and compaction testing of fill where required. Contractor shall be responsible coordinating and providing advance notice of any operations involving these components to allow adequate time for scheduling and testing.

1.3 JOB CONDITIONS

- A. Nature of Work Site
 - 1. Materials to be handled under this Contract include quantities of spoil, gob, and coal refuse which may be toxic and/or acidic in nature.
 - 2. The Project site is situated in an area where underground coal mining could have been conducted. There is a possibility that mine drifts or shaft openings are present on site. Contractor shall exercise reasonable caution in recognition of this potential hazard, and shall notify Engineer immediately upon discovery of any openings. Sealing of openings will be incorporated into this Contract through issuance of change orders, as required.
 - 3. During excavation in existing spoil piles, Contractor shall recognize possible existence of cavities or smoldering fires and, if encountered, shall notify Engineer promptly. Contractor shall exercise caution and be prepared to take appropriate actions since accelerated combustion may occur. Burning materials shall be extinguished before being covered or incorporated as fill.
 - 4. Spoil material used to construct fills is subject to significant increase in pore water pressure, particularly during rapid construction, with corresponding decrease in shear strength, and thus slope stability. Contractor shall exercise caution and notify Engineer promptly should signs of slope instability appear.

1.4 PERMITS AND FEES

- A. Division has obtained any required permits from the Iowa Department of Natural Resources (IDNR) as required for construction of the dam(s) on this Project. All requirements of the permit(s) have been incorporated into the Construction Specifications and Plans.

1.5 SUBMITTALS

- A. Contractor shall submit or assist with obtaining samples of all on-site or off-site materials intended to be used to complete the work included in this SECTION. The samples shall be obtained by or submitted to the designated Geotechnical Engineer at least ten (10) working days in advance of its intended use. All samples shall be marked with its source and intended use.
- B. The Geotechnical Engineer shall make appropriate examinations, classifications, and perform necessary tests to determine the suitability of the material for its intended use. Engineer will notify Contractor of the suitability of the submitted samples. Any submitted samples deemed unsuitable shall not be used as intended and new samples must be submitted to or obtained by the Geotechnical Engineer.
- C. Contractor shall schedule and coordinate all construction activities requiring observation and testing with Engineer and the designated Geotechnical Engineer.
- D. Copies of all laboratory and field tests will be provided to Contractor, Engineer and Division.

PART 2 - PRODUCTS

2.1 FILL MATERIAL

- A. Impervious Fill Material: Material used as impervious fill in areas designated on the Plans shall be obtained from the area(s) indicated on the Plans as Impervious Fill Material, or in areas as approved by Engineer and Division. Impervious Fill Material shall consist of clay or weathered shale materials that do not have less than sixty percent (60%) by dry weight passing a Standard No. 200 U.S. Sieve. Impervious fill shall be sorted to remove all material having any dimension greater than four (4) inches. All impervious fill shall be classified as CL, CH, or CL-CH in accordance with Unified Soil Classification System (USCS). All impervious fill shall be free from debris, roots, organic matter, frozen material, and coal refuse. Any layers or pockets of granular materials encountered within impervious fill borrow shall not be incorporated as impervious fill.
- B. General Fill Material: General fill materials consist of spoil piles, coal refuse materials, gob and all other soil material from required cut operations. All boulders, large rocks, organic matter, frozen material, and miscellaneous debris shall be sorted out and not used within the footprint of the dam.

2.2 FILTER SAND

- A. Material used to construct the filter blanket and for toe drain backfill shall conform to IDOT SECTION 4112, Fine Aggregate for Mortar, Gradation No. 2. Fine aggregate shall not be of calcareous (limestone) nature. Submit material certifications to Engineer.

2.3 DAM OUTLET STRUCTURES

- A. Refer to SECTION 02310 - DRAINAGE STRUCTURES, DAMS

2.4 SELECT BORROW

- A. Refer to SECTION 02250 - EARTHWORK, SELECT BORROW

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this SECTION will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 ELEVATIONS AND LINES

- A. Contractor shall stake the alignment and grades of earth dams in the field as shown on the Plans.
- B. Rough grading shall be to within three-tenths (0.3) feet of lines and grades as shown on the Plans.
- C. The crest of the dam at its midpoint shall be overbuilt as indicated on the Plans to accommodate anticipated future settlement. The overbuilt crest of the dam shall taper from its mid-point to zero (0) inches at both abutments.

3.3 MAINTENANCE

- A. Protection of newly graded areas.
 - 1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.

2. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Contractor shall scarify the surface, reshape, and compact (if necessary) any areas where grading is completed that becomes disturbed by subsequent construction operations or adverse weather, prior to further construction.
- C. Contractor shall maintain new and existing drainage ways free from detrimental quantities of sediment, leaves, sticks, trash and other debris during execution of the work.
- D. Contractor shall maintain access to adjacent areas at all times.
- E. Contractor shall implement the approved SWPPP for this Project and conduct all excavation and select borrow placement activities to minimize losses due to erosion and sedimentation of adjacent areas.

3.4 WATER CONTROL

- A. Contractor shall furnish, install, operate, and maintain all necessary and sufficient equipment and methods for controlling surface water and groundwater during construction of the earthen dam.
- B. Cofferdams may be used to divert water or collect water for pumping to protect the earth dam during construction. Cofferdams should be located beyond the limits of the proposed earth dam. The cofferdam(s) shall be removed after completion of the dam unless other arrangements are made with Engineer and Division.
- C. All excavations required for construction of the earth dam and drainage structures shall be dewatered as necessary to prevent excessive disturbance of exposed subgrade and allow for fill placement and compaction. Dewatering should be accomplished using pumps, drains, or other suitable methods.

3.5 SUBGRADE PREPARATION

- A. Contractor shall remove all vegetation, topsoil, soft, or otherwise unsuitable material from the footprint of the dam as shown on the plans. Excavate further as needed to the subgrade elevation lines shown on the plans.
- B. The exposed subgrade shall be proofrolled with heavy equipment such as a loaded scaper or tandem-axle dump truck in the presence of the Geotechnical Engineer, and Engineer or Division. Soft or disturbed areas shall be improved by disking, drying, and compacting with a sheep's foot roller or by overexcavating and replacing with suitable, properly compacted, impervious fill. The area and depth of the overexcavation as approved by Division and Engineer shall be jointly measured by Engineer and Contractor for payment quantities prior to backfilling.

3.6 CORE TRENCH

- A. The core trench shall be excavated in the location shown on the plans after the dam footprint has been stripped, proofrolled, and corrected as needed. The core trench shall extend to the minimum width and depth as shown on the plans, unless bedrock is encountered or conditions warrant additional excavation as determined by the Geotechnical Engineer.
- B. The Geotechnical Engineer and Engineer shall observe the core trench prior to backfilling. If additional excavation is required due to the site conditions, the Division shall be informed immediately and this additional excavation shall be measured for payment. If additional excavation is required due to inadequate water control measures or construction techniques used

by Contractor, this additional excavation and backfilling shall be completed at no additional cost to Division.

- C. The final core trench dimensions shall be measured jointly by Contractor and Engineer prior to backfilling. Only the amount of excavation approved by Engineer and Division shall be computed for payment. Additional excavated areas extending beyond the amount approved shall be properly backfilled at no additional cost to Division. Any survey information obtained by Contractor shall be provided to Engineer.
- D. The core trench shall be backfilled with impervious fill after receiving approval by Engineer. The impervious fill shall be placed and compacted in accordance with the requirements of this Section.
- E. The core trench shall be dewatered during observations by Engineer and during fill placement. Subgrade and fill materials that become disturbed or too wet for proper compaction shall be removed and replaced at no additional cost to Division.

3.7 IMPERVIOUS FILL PLACEMENT

- A. Impervious fill, as approved by the Geotechnical Engineer, shall be placed in the core trench and within the designated areas of the embankment. Impervious fill shall also be placed as the pond liner where indicated on the Plans.
- B. Impervious fill shall be placed in horizontal lifts. Vertical benches shall be cut into adjacent slopes as needed to allow for horizontal placement.
- C. Impervious fill shall be placed and spread in horizontal, loose lifts of no more than nine (9) inches and compacted to at least ninety-five percent (95%) of the material's maximum standard Proctor dry density.
- D. The moisture content of the impervious fill shall be adjusted as needed by disking and drying or wetting fall within the range of minus two percent (-2%) to plus four percent (+4%) of the material's optimum moisture content as determined by the standard Proctor test.
- E. Compaction of impervious fill and general fill within the footprint of the dam and for the pond liner shall be accomplished with a sheep's foot roller meeting IDOT Section 2001.05A, Tamping-type rollers. Manual compaction equipment shall be used as required to prevent damage to structures and shall meet the same compaction requirements. No other types of compaction equipment will be allowed for placement of impervious fill, unless written approval is obtained from Division or Engineer.
- F. The exposed surface shall be properly prepared prior to placement of each subsequent lift. If the exposed surface becomes too smooth to bond to the next layer, the existing layer shall be scarified. If the exposed surface becomes excessively dry or moist, the surface shall be scarified and moisture conditioned as necessary before placing subsequent fill layers.
- G. Impervious fill shall not be placed during periods of freezing weather or over frozen materials. Frozen material shall not be used as impervious fill.

3.8 CONTROLLED GENERAL FILL PLACEMENT

- A. General fill materials shall be placed in the portions of the dam as shown on the plans adjacent to the impervious fill areas to the rough grade shown on the plans. General fill shall be placed concurrently with impervious fill.
- B. General fill placed within the footprint area of the dam shall be placed in horizontal lifts not to exceed twelve (12) inches in loose thickness. Each lift shall be compacted to at least ninety

percent (90%) of the material's maximum standard Proctor dry density. The moisture content of the general fill placed adjacent to the impervious fill within the footprint of the dam shall be adjusted as needed by diskings and drying or wetting to be within minus two percent (-2%) to plus four percent (+4%) of the material's optimum moisture content as determined by the standard Proctor test.

- C. Compaction of general fill within the footprint area of the dam shall be accomplished with a sheep's foot roller meeting IDOT Section 2001.05A, soil compaction rollers. Manual compaction equipment shall be used as required to prevent damage to structures and shall meet the same compaction requirements. No other compaction equipment will be allowed for placement of impervious fill, unless written approval is obtained from Division.
- D. General fill shall not contain frozen materials, be placed over frozen material, or be placed during a period of freezing weather.

3.9 INTERNAL DRAINS

- A. The dam construction may include installation of internal drains such as a downstream drainage blanket, chimney drain, and/or toe drain. Placement of impervious and general fill shall be completed in a manner that insures these drains function properly.
- B. Refer to SECTION 02310 – DRAINAGE STRUCTURES – DAMS and to the Plans for further details.

3.10 OUTLET STRUCTURES

- A. The dam construction may include installation of both primary and emergency spillways. Refer to SECTION 02310 – DRAINAGE STRUCTURES – DAMS and to the Plans for further details.

3.11 SELECT COVER PLACEMENT

- A. When select cover material is required, this material shall be placed after completion of construction of the earthen dam at the locations and with the thickness shown on the Plans. Refer to SECTION 02250 – EARTHWORK, SELECT BORROW.

3.12 TESTING

- A. Division shall pay all field and laboratory soil tests to ensure that proper compaction and moisture control are being achieved. All test data shall be regularly submitted by the selected Geotechnical Engineer to Engineer, Division, and Contractor.
- B. A minimum of one (1) standard Proctor test shall be performed on each cohesive material type used to construct the dam. Additional laboratory tests will be performed as needed to determine the material's suitability for its intended use.
- C. In-place field density tests shall be performed in sufficient number and locations to ensure that the impervious fill is being placed and compacted in accordance with the Construction Specifications. As a minimum, one (1) test shall be performed for every two (2) feet of loose fill thickness placed and at a maximum spacing of one-hundred (100) feet along the length of the dam both within the impervious fill and general fill sections.
- D. All areas with failing tests shall be reworked by Contractor and retested by the Geotechnical Engineer until the required compaction and moisture content is achieved.
- E. Additional or supplemental field or laboratory tests requested by or conducted for the convenience of Contractor shall be completed at no additional cost to Division.

3.13 MEASUREMENT AND PAYMENT

The construction cost of all work included in this SECTION of the Construction Specifications shall be included in Contractor's unit prices set forth in the Proposal and Schedule of Prices (*Document C*) for the work items described below. The unit price for each of these several items shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the unit prices so set forth by the amount of the work actually constructed, measured as described herein, shall constitute full payment to Contractor for performance of the work included in this SECTION.

Measurement and payment for each work item in this SECTION shall be in accordance with the following:

- A. *Undercut Excavation, Earth Dam:* The unit price for this item shall include all equipment, materials, and labor to remove material below the footprint of the dam as discussed in the Subgrade Preparation and Core Trench portions of this SECTION. Said unit price shall constitute full payment for undercut excavation, and all incidental work pertaining thereto. Excavations for dewatering and cofferdams, if needed, are incidental to construction of the embankment and will not be included in the undercut quantity. Excavation for toe drains, filter sand, and outlet works conduit, if needed, will not be measured for payment and this associated cost should be included in the unit prices for each of these items.

Contractor will be paid for the undercut excavation based on conditions encountered during construction. The undercut area will be jointly measured by Contractor and Engineer. The backfill required for any overexcavation will be paid for as impervious fill. Any undercut excavation and associated backfill not approved by Engineer will not be measured for payment.

Contractor shall be paid at the unit price for "Undercut Excavation" for each cubic yard as measured above. The quantity of cubic yards for the undercut excavation included in the bid items have been separated out of the overall excavation required for rough grading.

- B. *Impervious Fill, Earth Dam and Pond Liners:* The unit price for this item shall include all equipment, materials, and labor required to properly place approved material in the core trench, undercut excavation, and within the designated area of the dam and pond liner as shown on the on the plans. Said unit price shall constitute full payment for dewatering, moisture adjustment and compaction, and all incidental work pertaining thereto.

Contractor will be paid for the bid quantity of impervious fill for the earth dam provided in the specifications unless additional undercut excavation was required or other changes were needed based on conditions encountered during construction. If additional undercut excavation was required, the approved quantity will be added to the bid quantity for impervious fill. If other areas of impervious fill were required by Engineer that are not shown on the plans or were not measured as part of the undercut, these areas will be jointly measured by Contractor and Engineer. Any impervious or general fill placed in undercut excavations not approved by Engineer will not be measured for payment.

Contractor shall be paid at the unit price for "Impervious Fill" for each cubic yard compacted in place and as measured above. The quantity of cubic yards for the impervious fill included in the bid items have been separated out of the overall excavation required for rough grading and has been adjusted for the shrinkage rate indicated in the Supplemental Specifications or Plans.

- C. *Controlled General Fill, Earth Dam:* The unit price for this item shall include all equipment, materials, and labor required to properly place approved material within the designated area of the dam as shown on the on the plans. Said unit price shall constitute full payment for dewatering, moisture adjustment and compaction, and all incidental work pertaining thereto.

Contractor will be paid for the bid quantity of controlled general fill for the earth dam as shown on the plans and in any other areas requested by Division and Engineer. Any controlled general fill

placed in areas not approved by Engineer or Division will not be measured for payment. The quantity of cubic yards for the controlled general fill included in the bid items have been separated out of the overall excavation required for rough grading and has been adjusted for the shrinkage rate indicated in the Supplemental Specifications or Plans.

- D. *Summary:* Proposal Bid Items applicable to work covered by this SECTION are as follows:

<u>Description</u>	<u>Unit</u>
Undercut Excavation, Earth Dam	Cu. Yd.
Impervious Fill, Earth Dam and Pond Liner	Cu. Yd.
Controlled General Fill, Earth Dam	Cu. Yd.

END OF SECTION 02220

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PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included

Work under this SECTION covers requirements for materials, tools, equipment and services necessary to complete the drainage systems for this project. The work shall include, but is not necessarily limited to, completion of the following work:

1. Field engineering.
2. Complete installation of all waterways.
3. Terraces construction.
4. Riprap ditches, ditch construction and riprap placement.
5. Pipe outlets.
6. Terrace intakes.
7. Underground outlets.
8. All excavation, backfill, and compaction necessary to complete these drainage systems.

1.2 QUALITY ASSURANCE

- A. Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this SECTION.
- B. Contractor shall use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, Contractor shall comply with the directions of Engineer and Division.

1.3 SUBMITTALS

- A. Submit material certification, including material type and gradation, for all riprap and porous backfill.
- B. Submit manufacturer's certification and material data for all material delivered to the project site for the work of this section.
- C. Submit weight tickets and/or shipping tickets for all materials delivered to the Project site for the work of this SECTION.

PART 2 - PRODUCTS

2.1 SPOIL MATERIALS

- A. Drainage way subgrades and backfill for pipe, tiling and risers shall be constructed of spoil materials from the required excavation. Backfill material shall be sorted as needed to become free of debris and rocks larger than two (2) inches adjacent to the tiling, and four (4) inches thereafter to the surface.

2.2 PIPE

- A. Corrugated Polyethylene
 - 1. Pipe for tiling shall be non-perforated corrugated polyethylene (PE) tubing and fittings, equal to IDOT Section 4143.01-B, with sizes as shown on the Plans. Fittings may be made of polyvinylchloride (PVC), Schedule 40. Pipe for tiling outlet, the last 20 (twenty) feet minimum, shall be solid PVC pipe, Schedule 40, sized to match the incoming PE tubing. The PVC pipe shall be furnished with no more than one joint. Tees required at wetland tiling outlets shall be solid PVC, Schedule 40, with size to match the incoming PVC pipe.
- B. High Density Polyethylene Pipe (HDPE)
 - 1. HDPE pipe shall be high density, high molecular weight, polyethylene pipe meeting the requirements of AASHTO M 294, Type S corrugated exterior and smooth interior. The pipe shall conform to ASTM D3350 with a minimum cell classification value of 345420C and the minimum pipe stiffness at five percent (5%) deflection per ASTM D2412. The fittings supplied shall be made from polyethylene resin which meets this same specification.
- C. Polyvinyl Chloride Pipe (PVC)
 - 1. PVC pipe shall be plastic PVC – ASTM D3034-SDR35 Type 1, Grade 1. Joints shall meet ASTM D3033/D3034 Standards.
- D. Reinforced Concrete Pipe (RCP)
 - 1. All reinforced concrete pipe and risers shown on the Plans shall meet the requirements of IDOT Section 4145. The diameter and length shall match that shown on the Plans. The joints shall be sealed using cold applied bituminous jointing material. All lift holes shall be plugged with grout.

2.3 RISERS

- A. Terrace Outlets
 - 1. Risers shall be as manufactured by Hickenbottom, Inc.; Agri Drain Corporation; or approved equal. Sizes shall be as shown on the Plans. The top three (3) feet shall be perforated with forty (40), one (1)-inch diameter holes and at least thirty (30) open square inches per foot of riser. Below grade, the riser shall be non-perforated; if perforated, openings shall be completely sealed with three (3) wraps of polyethylene tape or other suitable tape. The riser shall connect onto the tiling with a manufactured tee of a size to match the outgoing tile. Tees which constrict flows shall not be allowed.
- B. Dam and/or Wetland Outlets – See SECTION 02310 – Drainage Systems, Dams and Structures.

2.4 FILTER FABRIC

- A. Filter fabric shall meet the requirements of IDOT Section 4196.01-C, Engineering Fabric - Embankment Erosion Control.

2.5 EROSION CONTROL MAT

- A. Erosion control mat for slopes shall be made of interlocking coconut or wood fibers with plastic netting applied to both sides for holding the fibers in place. The product should be rated to perform on slopes of up to two horizontal to one vertical (2H:1V) with a longevity of more than twelve (12) months and up to two (2) years.
- B. Erosion control mat for channels and spillways shall be made of interlocking coconut or wood fibers with plastic netting applied to both sides for holding the fibers in place. The product should be rated to perform on slopes of up to two horizontal to one vertical (2H:1V) with a longevity of more than two (2) years and up to three (3) years, and must be capable of withstanding the flows as determined by Engineer.
- C. Wire staples will not be allowed on the project. All “stapling” of the mat must be done using twelve (12) inch long, tapered hardwood stakes. The staking pattern shall match the manufacturer’s recommended stapling pattern for the project’s soil and discharge conditions and, where more stringent, the pattern shown on the Plans.

2.6 RIPRAP

- A. Riprap shall be quarried limestone, sound, durable, and angular or blocky in shape. No more than ten percent (10%) of the stone shall have an elongation greater than 3:1. No stone shall have an elongation greater than 4:1. Riprap shall be well-graded material meeting the specifications of IDOT Sections 4130.01 and 4130.02, Class E Revetment for Non-primary projects.
- B. The stone shall be free from cracks, seams, or other defects that would tend to increase its deterioration from natural causes. The material shall contain a combined total of not more than five (5) percent by weight of earth, sand, shale, and non-durable rock.
- C. Engineer shall inspect the riprap at the quarry prior to initial loading, and may do so periodically throughout material delivery. After visual inspection, Engineer may designate material as too fine or too coarse and may require material to be loaded from another area. If material changes occur as the material is delivered to the project site, Engineer has the authority to require removal of the objectionable material and replacement with suitable riprap at no cost to Division.

2.7 EROSION STONE

- A. Erosion stone for the tiling outlets shall be quarried limestone and shall consist of a nominal six (6) inch mixture, by visual examination. Stone shall meet the specifications of IDOT Sections 4130.03, 4130.04 and 4130.05 Erosion Stone gradation.

2.8 CONCRETE

- A. All connections in piping where a change in pipe size or type occurs, and every joint where there is a sudden change in pipe direction, shall be sealed and/or buttressed with concrete. Concrete can be ready-mix, hand-mixed, or packaged gravel-mix concrete. Areas where concrete is known to be needed include:
 - 1. PE tubing to PVC outlets, all sizes.
 - 2. Riser connections, all sizes.
 - 3. Tiling to main line tiling at wye or tee, all sizes
 - 4. Any other locations shown on plans.

2.9 GROUT

- A. Grout for riprap ditch lining shall be composed of ten (10) sacks or nine-hundred and forty (940) pounds of Type I or II Portland cement to around two-thousand two-hundred (2200) pounds of fine aggregate material conforming to IDOT 4110.01, Gradation No. 2 for each cubic yard. Potable water shall be added to provide a thick creamy consistency and should not exceed forty-seven (47) gallons per cubic yard. Air entraining admixtures conforming to ASTM C 260 shall be added to provide an air content of between six (6) to ten (10) percent.
- B. Flyash can also be substituted for Portland cement in the grout mixture provided the flyash used meets the requirements of IDOT Section 4108 and does not exceed twenty (20) percent of the Portland cement.

2.10 RODENT GUARDS

- A. Electroplated zinc-coated rodent guards for the appropriate size of piping shall be as distributed by Agri Drain Corp. or approved equal. Rodent guards shall be hinged to allow debris to exit the piping when flows are present.

2.11 TRASH RACKS/BAR GUARDS

- A. Bar Guard Intakes

Trash racks shall be Bar Guard Intakes as distributed by Agri Drain Corp., or approved equal. Sizes shall be as shown on the Plans.
- B. Other Trash Racks or Guards shall be as specified on the Plans or the Engineering Special Conditions.

2.12 POROUS BACKFILL

- A. Porous Backfill for subdrain shall be non-calcareous material meeting IDOT Item 4131, Gradation No. 29. Limestone porous backfill will not be allowed.

2.13 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by Contractor, subject to the approval of Engineer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Contractor shall examine the areas and conditions under which work of this SECTION will be performed and shall correct conditions detrimental to timely and proper completion of the work. Contractor shall not proceed until unsatisfactory conditions are corrected.

3.2 PROTECTION

- A. Contractor shall use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- B. Contractor shall maintain access to adjacent areas at all times.

- C. Contractor shall protect previous construction from damage while constructing drainage systems.
- D. Contractor shall protect drainage systems from damage during subsequent construction in the areas.
- E. Contractor shall follow all guidelines for trench safety provided by OSHA.

3.3 CARE OF WATER

- A. Contractor shall furnish and operate sufficient pumps and/or provide other means including materials, labor, and equipment to prevent interference to any work by water, ice or snow. No structure or pipe shall be laid in water, and no water shall be allowed to run into or over any work or pipe until installation is capable of accepting water without damage or deterioration. Damage of any kind resulting from insufficient pumping facilities or similar lack of proper conduct of the work shall be corrected by Contractor at no cost to Division.

3.4 FLOW LINES AND GRADES

- A. Construct drainage systems precisely to lines and grades as shown on the Plans or as required for proper functioning.
- B. Pipe runs shall be installed straight with a uniform slope to meet entrance and exit conditions at both ends of the pipe run. Slopes shall be uniform in so far as practical. Piping shall be installed with a minimum of two percent (2%) slopes unless conditions indicate flatter slopes are required.
- C. Match flow lines and provide smooth transitions between intersecting riprap ditches, between terrace tile outlets and riprap ditches, between subdrain outlet and grassed swale, and between terrace tile outlets and grassed swales.

3.5 TILING & RISERS

- A. Tiling
 - 1. Install tiling in strict accordance with these Specifications, manufacturer's recommendations, and the Plans. In case of discrepancy, the most stringent requirements shall apply. Install tiling after completion of rough grading in affected areas.
 - 2. Excavate trenches to a minimum depth of three and one-half (3.5) feet below finish grades where grades permit, and to a width no wider than eighteen (18) inches for six (6) inch tiling. In lieu of using a backhoe for installation, tiling may be installed with a tiling machine provided the machine is equipped with a cutting edge which creates either a ninety (90) degree V-groove, or a semi-circular trough of a size which shall accept the tiling without excess movement.
 - 3. After excavation, lay tiling in bottom of trench. Sort out any unsuitable material, such as larger rocks or sticks, from excavated material to be used as backfill. If excavated material is unsuitable, then provide an alternate source of suitable backfill. Carefully place and compact backfill within the area around and to within one-half (0.5 feet) above the tile to ensure that backfill is placed under the pipe haunches and that the tiling is properly and fully supported. Care shall be taken to not collapse or displace the tile during backfilling procedures. Backfill placed within the remainder of trench shall be placed in lifts of no more than one (1) foot in structural areas and no more than (two (2) feet in non-structural areas. Each lift shall be compacted with either the bucket of a hoe or the wheel of construction equipment. Reshape and/or compact adjacent ground surface as required.

4. Except at top riser of each run of tiling, connect subsequent riser tubing to main tiling run with a wye or tee. Place concrete collar around joint.
5. Seal all below grade joints in tiling with three (3) wraps of polyethylene tape or other suitable tape. This applies to all tees, wyes, elbows, couplings, joints, etc. that also have a concrete collar.
6. The last twenty (20) feet, minimum, or terrace tiling which daylightes shall be rigid PVC piping. Seal the transition joint between PE tubing and PVC pipe as per A.4 above and place a concrete collar around the joint. Install a rodent guard within six (6) inches of the outlet end of all PVC piping. Where tiling outlets into a wetland, install the rodent guard in the pipe ahead of the outlet tee. Fasten outlet tee to pipe using aluminum sheet metal screws.
7. If any tiling collapses due to improper installation or from routing of construction equipment over the trench, or it becomes clogged for whatever reason, correct the malfunction at no cost to Division. Correction of any malfunction shall also be required during the one (1) year guarantee period and shall be repaired at no cost to Division.

B. Riser

1. Install terrace risers in strict accordance with these Specifications, manufacturer's recommendation, and the Plans. In case of discrepancy, the most stringent requirements shall apply. Provide tees for every riser. Depending on location, use either an in-line tee or a blind tee with cap, as recommended by manufacturer. Fasten riser sections using aluminum sheet metal screws. Seal below-grade riser joints with three (3) wraps of polyethylene tape or other suitable tape and then cover joints with concrete as shown on the Plans.
2. Contractor shall install two (2) steel fence posts on opposite sides of each riser and bind them together with No. 9 wire.
3. Backfill excavation with compacted lifts using excavated material unless this material is unsuitable. Provide suitable backfill material if necessary. Reshape and/or compact adjacent ground surface as required.

3.6 PIPES

- A. Pipes shall be installed in strict accordance with these Specifications, manufacturer's recommendations, and the Plans. In case of discrepancy, the most stringent requirements shall apply. Install tiling after completion of rough grading in affected areas.
- B. Excavate trenches to the minimum depth as shown on the Plans and to widths to allow for twelve (12) inches of clearance on each side of the pipe. The trench shall have vertical side walls to the crown of the pipe with the remainder of the excavations sloped as needed for stability and to satisfy OSHA requirements.
- C. Lay the pipe in the center of the trench with female joints facing upstream. Place joint sealant as required as each piece is placed. All gaskets shall be protected during installation.
- D. Backfill with suitable material in lifts not exceeding eight (8) inches and compacted by hand operated mechanical tampers to a height at least twelve (12) inches above the pipe. Exercise care not to cause the pipe to shift and/or to uplift while placing and compacting material up to the top of

the pipe. Continue backfilling with compacted lifts to the surface. Mass dumping of the backfill will not be allowed. Settled areas shall be corrected by Contractor at no cost to Division.

3.7 FILTER FABRIC

- A. Filter fabric shall be delivered to the job site in such a manner as to facilitate handling and incorporation into the work without damage. Material shall be stored in such a manner as to prevent exposure to direct sunlight and damage by other construction activities.
- B. Prior to the installation of the fabric, the application surface shall be cleared of debris, sharp objects and trees. Tree stumps shall be removed to a depth of at least two (2) feet below the ground surface. In the case of subgrades, all wheel tracks or ruts in excess of three (3) inches in depth shall be graded smooth or otherwise filled with soil to provide a reasonably smooth surface.
- C. Fabric may be installed on the application surface either by hand or mechanical methods, provided that the fabric is not torn or the surface rutted. Fabric of insufficient width or length to fully cover the specified area shall be lapped a minimum of twenty-four (24) inches, or sewn. If sewn, the minimum lap shall be four (4) inches and the seam strength shall be equal to or more than the minimum grab tensile strength of the fabric when wet tested.
- D. Placement of material on the fabric shall be accomplished by spreading dumped material off of previously placed material with a bulldozer blade or end-loader, in such a manner as to prevent tearing or shoving of the cloth. Dumping of material directly on the fabric will only be permitted to establish an initial working platform. No vehicles or construction equipment shall be allowed on the fabric prior to placement of the granular blanket.
- E. Fabric which is damaged during installation or subsequent placement of riprap, due to failure of Contractor to comply with these provisions, shall be repaired or replaced at his expense, including costs of removal and replacement of the riprap. Torn fabric may be patched in-place by cutting and placing a piece of the same fabric over the tear. The dimensions of the patch shall provide for at least two (2) feet of overlap in every direction, and it shall be weighted or otherwise secured to prevent the granular material from causing lap separation.

3.8 RIPRAP DITCHES & OTHER RIPRAP WORK

- A. When rough grades have been achieved, excavate the area to receive riprap or erosion stone to permit placement of riprap or stone the full depth as shown on the Plans. Dispose of excavated material by incorporating it into general grading of the site.
- B. Riprap or erosion stone shall be placed over filter fabric in areas shown on the Plans and in a manner which shall produce a reasonably well-graded mass of stone with the minimum practical percentage of voids. All material shall be placed and distributed such that there shall be no objectionable accumulations of either the larger or smaller sizes of stone, and such that the entire mass of stone shall be in accordance with the lines, grades and thickness as shown on the Plans.
- C. Contractor shall place the riprap or erosion stone so as to not tear, puncture, or shift the filter fabric. Riprap or stone shall not be dropped more than two (2) feet when being placed on filter fabric. Tears or rips in the fabric shall be repaired in accordance with manufacturer's recommendations.
- D. It is the intent of this Specification to produce a fairly compact riprap or stone protection in which all sized of material are placed in their proper proportions. Placing or rearranging of individual stones by hand or mechanical equipment should be anticipated and may be required to the extent necessary to secure the specified results.

- E. Contractor shall complete the following in riprap ditches requiring grout:
 - 1. Larger spaces between stones shall be filled with smaller pieces of riprap. The stones shall be compacted to give them firm bearing and stability.
 - 2. After stone surface has been inspected and approved, the spaces between the stones shall be completely filled with grout. The grout shall be brushed or broomed into the spaces to ensure proper filling.
 - 3. Grout placement and curing shall meet the requirements of IDOT Section 2507.03 G, Grouting.

3.9 EROSION CONTROL MAT

- A. Careful installation of erosion control mat is critical for its immediate and long term performance. Contractor shall install per details shown on the Plans and in strict accordance with manufacturer's recommendations. Where details on the Plans show more stringent requirements, drawing details shall apply. Staking patterns shall be based on the design discharge rates as determined by the Engineer.
- B. Contractor shall fine grade the surface as uniformly as possible and remove any rocks, roots and other deleterious substances. The success of the mat relies heavily on its placement such that it is uniformly in contact with the ground. Proceed with seeding operations in Section 02700 – SEEDING or Section 02710 – INTERIM SEEDING, including soil testing, seedbed preparation, liming, fertilizing, seeding and mulching.
- C. After seeding and mulching has been performed in accordance with Section 02700, Contractor shall install erosion control mat as and where shown on the Plans.
- D. Contractor shall reseed all disturbed areas by hand. A light overseeding by hand of the overall mat area may be beneficial but is not mandatory.

3.10 TERRACES

- A. Terraces shall be installed after rough grading is completed.
- B. Terraces shall be constructed in conformance with details and dimensions shown on the Plans. Fill placement and compaction shall be as specified in Section 02200 EARTHWORK - ROUGH GRADING, Item 3.9 *Fill Placement and Compaction*.

3.11 MEASUREMENT AND PAYMENT

The construction cost of all work included in this Section of the Construction Specifications shall be included in Contractor's unit prices set forth in the Proposal and Schedule of Prices (*Document C*) for the work items described below. The unit price for each of these items shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the unit prices so set forth by the amount of the work actually constructed, measured as described herein, shall constitute full payment to Contractor for performance of the work included in this SECTION.

Measurement and payment for each work item in this SECTION shall be in accordance with the following:

- A. *Riprap and Erosion Stone*: The unit prices shall include all materials and work required for installation of the riprap or erosion stone in conformance with these Construction Specifications and the Plans, including excavation, removal and disposal of excavated material, and furnishing and placing the stone. Measurement for payment shall be based on the tonnage of riprap or

erosion stone actually installed as determined from weight tickets, rounded to the nearest one-tenth (0.1) ton. Only material placed in accordance with the Plans and these Specifications shall be measured and paid.

- B. *Filter Fabric:* Filter fabric used on the project, in accordance with the Plans and/or approved by Engineer, shall be measured and paid in this Item. The quantity of in-place fabric shall be measured to the nearest square yard jointly by Contractor and Engineer. Laps and waste shall not be measured. Only material placed in accordance with the Plans and these Construction Specifications shall be measured and paid.
- C. *Erosion Control Mat:* The unit price for erosion control mat shall represent full payment for furnishing, delivery and installation in strict accordance with these Construction Specifications and the Plans.

Said unit price shall include furnishing and installing the erosion control mat with wooden stakes, including equipment and labor required and reseeding of disturbed areas. Measurement for payment purposes shall be the area installed in square yards, exposed at the surface. No measurement or payment shall be allowed for waste, laps or buried ends or edges.

- D. *Riser - Terraces:* Unit prices shall include all materials and work required for installation of risers in conformance with details and dimensions shown on the Plans, these Construction Specifications, and as may be required by the manufacturer. Unit prices shall include furnishing and installing risers, fittings, tape, concrete, excavation, backfill, metal stakes, and all other incidental construction including furnishing and installing silt fencing around the riser, cleaning of sediment, maintenance and repairs. Measurement for payment of risers shall be based on the number of said risers, properly installed and maintained.
- E. *Riser - Other:* Unit price shall include all materials and work required for installation of risers in conformance with details and dimensions shown on the Plans and these Specifications. Unit prices shall include furnishing and installing the riser and trash rack or bar guard, connecting the pipe, concrete, excavation, backfill, and all other incidental construction including cleaning of sediment, maintenance and repairs. Measurement and payment of riser shall be based on the number of each riser properly installed and maintained.
- F. *Tiling:* The unit prices shall include all materials and work required for installation of the tile and fittings (PE and PVC as applicable) in conformance with details and dimensions shown on the Plans. The unit prices shall include furnishing and installing the pipe, fittings, trenching, removal and disposal of excess trench material, dewatering, backfill, compaction, and all other work items incidental thereto, including rodent guards and tape and concrete for sealing below-grade connections. Tees required on the ends of tiling shall also be incidental to this work item. Measurement for payment shall be based on the length of tiling for a specified diameter actually installed as determined from field measurements and rounded to the nearest foot.
- G. *Pipes:* The unit prices shall include all materials and work required for installation of the various pipes and fittings in conformance with details and dimensions shown on the Plans. The unit prices shall include furnishing and installing the pipe, fittings, excavating, removal and disposal of excess trench material, dewatering, backfill, compaction, and all other work items incidental thereto, including sealing of below-grade connections. Measurement for payment shall be based on the length of various pipes for each specified diameter actually installed as determined from field measurements and rounded to the nearest foot.
- H. *Grout:* This unit price shall include all materials and work required for installation of grout (riprap channels, stilling basins, etc.) in conformance with these Construction Specifications and the Plans. Measurement for payment shall be based on cubic yards of grout actually installed as determined

from delivery tickets, rounded to the nearest cubic yard. Only material placed in accordance with the Plans and these Construction Specifications shall be measured and paid.

- I. *Terrace*: The unit price for terraces in this SECTION shall include materials, equipment, and work required to construct (grade) the terraces in conformance with details and dimensions shown on the Plans. The length of installed terraces shall be measured to the nearest foot jointly by Contractor and Engineer.
- J. *Summary*: Proposal Bid Items applicable to work covered by this SECTION are as follows:

<u>Description</u>	<u>Unit</u>
Riprap	Ton
Erosion Stone	Ton
Filter Fabric	Square Yard
Erosion Control Mat	Square Yard
Riser - Terrace	Each
Riser - Other	Each
Tiling - (size)	Lineal Foot
Pipe - (size)	Lineal Foot
Grout	Cubic Yard
Terraces	Lineal Foot

END OF SECTION 02300

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work under this SECTION covers requirements for materials, tools, equipment and services necessary to complete the herbaceous seeding of all areas disturbed during construction of this project. The work shall include, but is not necessarily limited to, completion of the following work:
 - 1. Preparation of seedbed.
 - 2. Testing surface materials for lime and fertilizer application rates.
 - 3. Applying lime, fertilizer, and seed.
 - 4. Applying mulch.
 - 5. Applying erosion control mat if specified.
 - 6. Temporary fencing if required.
 - 7. Field engineering.

1.2 QUALITY ASSURANCE

- A. Qualifications of Workers: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this SECTION.
- B. All seed shall meet or exceed requirements contained in specifications of this SECTION and Federal, State and County laws requiring inspection for plant disease and insect control and shall be labeled and certified in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and Iowa State laws. All seed must be dated for test and be from the last season prior to date of delivery.
- C. Lime Materials shall be a Standard Ground Agricultural Limestone which meets current requirements of the Iowa Department of Agriculture and Land Stewardship as prescribed under the Iowa Agricultural Limestone Act.
- D. Fertilizer shall be a commercial grade fertilizer and shall meet standards for grade and quality as per the requirements of the Iowa Department of Agriculture and Land Stewardship.
- E. Mulch shall meet the requirements of PART 2 PRODUCTS of this SECTION. Contractor shall identify to Engineer the locations from which the straw mulch was obtained and prove weight.
- F. Inoculants used for treating legume seed shall be pure culture of nitrogen-fixing bacteria prepared specifically for the legumes specified in PART 2 PRODUCTS of this SECTION. Inoculant containers must be clearly marked by the manufacturer for each specified species and have an expiration date.
- G. Engineer reserves the right, at any time, to sample all materials for testing to determine compliance with the requirements of this SECTION.

1.3 JOB CONDITIONS

- A. Areas to be seeded include all project areas disturbed by excavation, grading and other construction procedures required for the completion of this contract.
- B. Seeding shall be performed only during the seasons specified. The planting operation shall not be performed during times of drought, excessive moisture, or other unfavorable climatic conditions.

- C. Prior to the work of this SECTION, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- D. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- E. Prior to permanent seeding, the waiting period as determined by Division will be required after the lime and mulch has been applied to sites where no cover material is available. This waiting period is necessary to allow the lime-spoil reaction to occur, providing a suitable environment for vegetation. The waiting period has traditionally been ninety (90) days.

1.4 SUBMITTALS

- A. Certificates and Receipts
 - 1. Certification shall be submitted to Engineer that all seed to be used is in compliance with the following:
 - a. The Federal Seed Act.
 - b. Iowa Department of Agriculture & Land Stewardship regulations.
 - c. Species type and pounds of pure live seed (PLS) certification.
 - d. Date and results at germination and purity tests.
 - e. Test date to determine the percentages of germination and purity have been completed within a nine (9) month period, exclusive of the calendar month in which the test was completed.
 - f. The seed analysis on the label shall be mechanically printed.
 - 2. Suppliers certification of Effective Calcium Carbonate Equivalent (ECCE) content per ton of material must be submitted to and approved by Engineer prior to initial applications and subsequently as requested by Engineer. Necessary information shall include:
 - a. Name and location of supplier.
 - b. Name and address of agency and/or laboratory making ECCE determination.
 - c. Clear identification of stockpile from which limestone is obtained.
 - d. Date of last ECCE test and those for the previous four (4) tests on which ECCE is based.
 - e. Receipts stating weight of material on each truck which arrives on site.
 - 3. Fertilizer delivered in bulk shall be accompanied by the suppliers' certification of analysis and weight for each shipment made to the job site. Fertilizer delivered in individual containers shall be sealed and clearly marked for analysis and weight.
 - 4. Contractor shall supply verification of the weight of mulch delivered to the job site in a method satisfactory to Engineer.
 - 5. Inoculants delivered to the job site must be clearly identified and marked with expiration dates.
- B. Testing
 - 1. Contractor shall select a soil testing laboratory for use on the seeding work and submit the name, address and telephone number for approval by Engineer at least thirty (30) calendar days prior to sampling time.

2. Contractor shall submit to Engineer and Division the results of all tests for specified lime and fertilizer recommendations prior to application as specified in Item 3.2 in this SECTION. Payment for these tests will be made by Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle materials in accordance with the General Conditions and the Special Conditions.
- B. Storage of all materials on the job site must be approved in writing in advance by Engineer.
- C. Any materials approved for storage on site which, in the opinion of Engineer or Division, are being degraded due to storage must be removed and replaced at no additional cost to Division.
- D. Use all means necessary to protect materials from the elements during delivery, handling and storage.
- E. Deliver packaged materials (seed, etc.) to site in supplier's original unopened containers; each container to bear certification as specified. Pure live seed (PLS) certification shall be attached to all seed containers and shall not be removed except by Engineer.
- F. At no time shall seed materials or inoculants be stored outside of the specified planting periods. Inoculants shall be stored in a cool place, away from heat. Partially used packages of inoculants shall be tightly resealed.
- G. Store packaged materials off ground and protect from moisture. Moisture damaged materials are unacceptable. Wet, moldy or otherwise damaged seed is unacceptable.

1.6 SITE DISTURBANCES

- A. Take precautions to insure that equipment and vehicles do not unnecessarily disturb or damage existing grading, other site improvements, or adjacent areas to the work.
- B. Repair any damage and return site and adjacent areas disturbed by Contractor's operations to original condition at no cost to Division.

PART 2 - PRODUCTS

2.1 AGRICULTURAL LIME

- A. Agricultural lime shall be ground calcitic limestone conforming to the current requirements of the Iowa Department of Agriculture and Land Stewardship. The lime shall have a minimum fineness of fifty five percent (55%) and shall contain not less than 1000 pounds ECCE per ton of lime to be applied.
- B. If lime containing not less than 1000 pounds ECCE per ton is not locally available, Contractor may submit a proposal for use of equivalent material based upon the minimum pounds required of ECCE per acre.
- C. Lime sludge salvaged from water treatment plants or other industrial operations shall not be approved as a substitute for agricultural lime.

2.2 FERTILIZER

- A. Inorganic fertilizer shall be a standard commercial product which, when applied at the proper rate, shall supply the quantity of total nitrogen (N), available phosphoric acid (P), and soluble potassium (K) as specified herein.
- B. Inorganic fertilizer shall be a commercial balanced fertilizer, uniform in composition, liquid or dry and free flowing. Fertilizer may be delivered bulk from the supplier or in its original unopened containers. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

2.3 MULCH

- A. Mulch materials shall consist of wheat, oats, rye, hay, grass cut from native grasses or other plants approved in writing by Division.
- B. Mulch shall be of air dry straw that has been properly cured and harvested. Mulch harvested after a killing frost or during dormant periods will not be acceptable. Mulch shall not be rotted, brittle, moldy, caked or otherwise degraded.
- C. Mulch shall be free of noxious weeds as published by the local County Weed Commissioner and other weeds deemed undesirable by Engineer, such as foxtail, etc.
- D. Each load of mulch shall be subject to inspection and acceptance by Engineer prior to unloading.
- E. At least fifty percent (50%) of the salvage weight of each mulch bale shall contain mulch with a length of ten (10) inches or greater. This requirement shall apply to all mulch intended for crimping into the sown seedbed.

2.4 SEED

- A. Seed delivered to the job site shall be labeled according to the U.S. Department of Agriculture Federal Seed Act and shall be furnished in containers with tags showing seed mixture, purity, germination, weed content, name of seller, and date on which seed was tested.
- B. Moldy seed or seed that has been damaged in storage shall not be used. Seed that is more than one growing in ages shall not be used.
- C. Seed Mixture: Seed mixtures shall consist of the varieties, mixtures and application rates by pound pure live seed (PLS) per acre as stated in the Supplemental Specifications and as determined below:

$$\text{Pure Live Seed per pound (PLS/lb)} = \frac{(\% \text{ purity}) \times (\% \text{ germination})}{100 \quad 100}$$

$$\text{Actual pounds of seed per acre} = \frac{\text{lbs PLS per acre}}{(\text{PLS})/\text{lb.}}$$

2.5 LEGUME SEED INOCULANT

- A. Inoculant for treating leguminous seed shall be a pure culture of nitrogen-fixing bacteria, specific for the seed species to be inoculated. Containers shall be plainly marked with the expiration date for use and manufacturer's directions for inoculating seed.
- B. Methods of inoculation shall conform to manufacturer's recommendations for the particular species of legume.

- C. Inoculants shall be applied at double the manufacturer's recommendation.
- D. Use sufficient inoculants to cover all leguminous seed before mixing with other seeds. Seed shall be slightly moistened or a sticker shall be used to ensure the inoculants adheres to the seed. The time lapse for sowing seed following inoculation shall not exceed 24 hours.

PART 3 - EXECUTION

3.1 INITIAL PREPARATION

- A. Except in the case of temporary seeding, the required lime/mulch treatment specified in Section 02400 - SUBGRADE PREPARATION, WITHOUT COVER MATERIAL or 2410 – SUBGRADE PREPARATION, WITH COVER MATIERAL shall have been performed and completed prior to initiating work of this Section in any area.
- B. Areas of the site that do not have cover material shall also have had the waiting period completed as determined by Division.
- C. Any wetland or pond areas with pooled water levels above the specified seeding elevations for wetland seeding shall be lowered as needed at no additional cost to Division.

3.2 TESTING – FERTILITY

- A. Contractor shall collect samples of finish grades as specified below for testing provided all of the initial preparations are completed. Engineer **must** be present when samples are collected to prepare a sampling location plan. The samples shall be submitted to laboratory to determine lime and fertilizer recommendations. Payment for these soil tests will be the responsibility of Contractor.
 - 1. Engineer and Contractor shall collect composite samples of not less than ten (10) well-distributed individual soil cores from any contiguous area of ten (10) acres or less. Cores shall be three-quarter (3/4) inch to one (1) inch diameter to a depth of about twelve (12) inches. Areas having observable differences in material types or surface conditions (soil types) shall be handled as different composite samples, even if less than (10) ten acres.
 - 2. Contractor shall combine soil cores to form composite samples for each (10) ten acres of contiguous area and/or observable different soil types by mixing well and placing in sample bag(s) to be sent to laboratory. (e.g. If total area is 30 acres and has two distinctly different soil types of 15 acres each, then there should be four (4) composite samples containing ten (10) soil cores each – two (2) composite samples from each soil type.)
- B. Deliver each composite soil sample to the approved soil testing laboratory. Deliver samples for testing six (6) to eight (8) weeks prior to the beginning of the specified planting period. A shorter lead time may be possible depending on the laboratory. Test each composite sample for:
 - 1. pH
 - 2. Buffer pH (Buffer Index)
 - 3. CEC (Cation Exchange Capacity)
 - 4. Phosphorus - Bray I (P₁ weak Bray) with recommendations
 - 5. Exchangeable Potassium with recommendations
 - 6. Nitrate Nitrogen with recommendations
- C. Recommendations from the lab shall include rates for applying lime, nitrogen, phosphorus, and potassium for the appropriate grass mix (pasture land) for each area.
- D. Submit test results and laboratory recommendation to Engineer and Division for review at least one (1) week prior to scheduled date for application of lime and/or fertilizer.

- E. Soil test results and laboratory recommendations shall be used by Engineer and Division in determining the amounts of lime and fertilizer to be applied. Engineer's and Division's final rates shall govern and these rates may be more or less than those recommended by the laboratory.
- F. Cost of all services required from the testing laboratory for fertility shall be the responsibility of Contractor.

3.3 SEEDBED PREPARATION

- A. Dispose of any growth, rocks, or other obstructions which might interfere with tilling, seeding, or later maintenance operations. Dispose of clods, rocks and other objects which are six (6) inches or greater in diameter.
- B. Till all areas to be seeded by disking or other approved method; thoroughly loosen and pulverize the soil to a depth of six (6) inches. This may require multiple passes of the disk or other approved equipment. This entire operation shall be considered the **first disking**. Lime and fertilizer shall not be incorporated during the first disking operation.
- C. After application of lime and fertilizer (see Item 3.4 *Liming and Fertilizing* below), redisk the site as described above. Multiple passes may be required. This entire operation shall be considered the **second disking** operation.
- D. Harrow the site until the condition of the seedbed is suitable for seeding. The harrow shall be set to achieve the desired result. This may require manually resetting the teeth to a greater depth, weighting the harrow, removing extension arms on either side of the main frame, a combination of the above, or other modifications. In lieu of harrowing, or if the harrow is not producing the desired result, redisk the area until the condition of the seedbed is suitable for seeding. This entire operation shall be considered the **third disking** operation.
- E. After the third disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment. Cultipacking shall continue until such time as a finely pulverized and firmly compacted seedbed is obtained and accepted by Engineer. The seedbed shall be cultipacked again following completion of seeding to ensure adequate seed-soil contact.
- F. Maintain the seedbed until seeded and mulched to provide a smooth area with no rills or eroded areas. Repair and restore prepared seedbed if eroded or otherwise disturbed.
- G. Throughout seedbed preparation activities, disking, harrowing and other operations may expose rocks, boulders, rubbish, debris, etc. During and/or upon completion of each disking and harrowing operation, and prior to continuing with the next operation, pick up all debris, rubbish, etc., remove or bury all boulders, and pick up all rocks that hinder seedbed preparation or will impede seeding the site or mechanical mowing of the reclaimed site. Dispose of rocks and boulders in locations as approved by Engineer. Dispose of debris, rubbish, etc. by burying on site or hauling to an approved landfill.
- H. Contractor shall not perform seedbed preparation when ground conditions are unsuitable due to excessive moisture, snow, frost, or frozen ground, as determined by Engineer or Division.

3.4 LIMING AND FERTILIZING

- A. Agricultural lime, nitrogen (N), phosphorus (P), and potassium (K) shall be applied to all areas to be permanently seeded, and shall be incorporated by disking into the top six (6) inches of the prepared seedbed. Areas to be temporarily seeded shall only be required to have nitrogen incorporated.
- B. Lime and fertilizer shall be incorporated separately or simultaneously, depending upon the timing of product delivery and application.

1. **Lime:** The lime shall be applied and incorporated no less than one (1) week prior to seeding. Once applied, it shall be incorporated within a period of time which will avoid losses due to wind or rain.
 2. **Fertilizer:** The fertilizer must be applied and incorporated no more than one (1) week prior to seeding. Once applied, it too shall be incorporated within a period of time which will avoid losses due to wind or rain.
 3. If lime and/or fertilizer is applied but not yet incorporated, and Engineer or Division believes significant loss of lime and/or fertilizer has occurred due to bad weather, Engineer or Division may then require Contractor to reapply lime, fertilizer, or both, as applicable, at the rates and in the areas of the site so directed by Engineer and Division, at no additional cost to Division.
 4. Incorporation of lime and fertilizer, whether done separately or simultaneously, shall be considered the second disking operation (see Item 3.3 SEEDBED PREPARATION, D above). Once the lime and fertilizer have both been applied and incorporated, continue seedbed preparation as described in 3.3 SEEDBED PREPARATION.
- C. The application rate of agricultural limestone shall be based upon results of soil test conducted in Item 3.2 TESTING - FERTILITLY in this SECTION. For bidding purposes, it is estimated that the rate provided on the plans or in the Supplemental Specification shall be applied.
- D. Nitrogen (N), Phosphorus (P) and Potassium (K) fertilizer shall be applied to permanent cover seeding at a rate determined by the results of the soil testing in Item 3.2 TESTING - FERTILITY, in this SECTION. For bidding purposes, the rates provided on the plans or in the Supplemental Specification shall be applied.

3.5 SEEDING

- A. All permanent seeding shall be completed within the seeding season dates shown below. Temporary seeding shall be completed at any time where weather will promote vegetation growth.
- | | |
|---------|--------------------------|
| Spring | April 1 - May 30 |
| Fall | August 15 - September 15 |
| Dormant | November 15 to Freeze Up |
- B. If contractor foresees that seeding cannot be completed within the specified seeding seasons, he shall submit a written request for a seeding date extension to Division. All seeding completed outside of approved seeding dates is at Contractor's risk. Any repairs and reseeded that becomes necessary as a result of work completed outside the approved dates shall be completed by contractor at no cost to Division.
- C. General Requirements:
1. As weather and site conditions permit, within the specified seeding season, seed site areas as shown on the Plans and all other disturbed areas.
 2. When conditions are such that less than satisfactory results are likely to be obtained by reason of drought, excessive moisture, snow, or frozen soil, seeding work shall be halted and resumed only when conditions are favorable or when approved alternative or corrective measures and procedures have been affected.
 3. Proceed with seeding work as rapidly as portions of the site become available within seasonal limitations. In any event, seeding shall be accomplished before the prepared seedbed becomes eroded, crusted over, or dried out and shall not be conducted when the

ground is frozen or snow covered. Should seeding not be accomplished prior to the prepared seedbed becoming eroded, crusted over, or dried out, or the ground becomes snow covered or frozen, Engineer or Division shall require Contractor to rework the seedbed as necessary prior to seeding at no cost to Division.

4. Schedule permanent seeding such that mulching of seeded areas takes place no later than forty-eight (48) hours after seeding partial areas. The time period between seeding and mulching shall be shortened if it appears adverse weather conditions could either cause damage to the seeded area or delay the timely application of mulch. If, prior to mulching, the seeded area is damaged by adverse weather, or success of the seeding is in doubt due to Contractor's failure to apply mulch in a timely manner, the seedbed or the area so affected shall be reprepared and the area reseeded, all at no additional compensation. Reapplication of lime, fertilizer, or both may also be required depending on Engineer's or Division's opinion of the severity of damage due to weather or, in the case of fertilizer, on the time lapse between initial fertilizer application and reseeded. Reapplication of lime and/or fertilizer, if required by Engineer or Division, shall also be done at no cost to Division.

D. Permanent Seeding:

1. Seed all areas to be seeded with the appropriate seed mix as shown on the Plans. Seed shall be applied at the rates previously described in this Section. Sow seed with the contour using a grassland or rangeland drill set for the specified seeding rates. The drill shall be equipped with double coulter furrow openers. The drill shall be subject to acceptance by Engineer. Drill seeding shall be accomplished with drills set at no more than six (6) inches apart. Overlap each successive seeding pass to ensure complete coverage. Upon a show of green, bare areas will be reseeded at no additional cost to Division.
2. Embed the seed at a depth recommended for the species.
3. Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas not accessible to drills or other equipment, and may be allowed for correction or bare spots. Once broadcast, the seed must be covered with soil to a depth recommended for the species.
4. Upon completions of the seeding operation, cultipack the seedbed to provide a positive seed-soil contact. If the drill seeder is equipped with an approved cultipacker or press wheels, separate operations shall not be necessary. The type of cultipacker/seeder to be used shall be subject to acceptance by Engineer.

3.6 MULCHING

- A. Mulch shall be applied immediately to all areas sown to permanent or temporary seed, except areas receiving erosion control mat.
 1. Mulch shall be uniformly applied at the rate of three (3) tons per acre. The mulch may be spread either by hand or by mechanical spreader. When spread by hand, it shall be torn from the bale, "fluffed up" and spread uniformly over the area. When spread by mechanical spreader, the machine shall be adjusted to prevent cutting the mulch into pieces shorter than six (6) inches and to provide uniform distribution of the mulch over the area. The mulch, when applied, shall provide a uniform cover.
 2. After application, the mulch shall be anchored into the soil by crimping into the soil with a mulch tiller to a minimum depth of two (2) inches. Anchoring shall be accomplished by using a mulch tiller with rolling coulter type disk which shall be sufficiently dull on the cutting edge to prevent cutting the mulch. The disk must be of sufficient diameter to

prevent the frame of the mulch tiller from dragging the mulch. The number of passes over the mulch shall not exceed two (2).

3. The mulch shall not be covered with excessive amounts of soil. The rows or furrows made by the straw mulch crimping equipment (mulch tiller) shall be spaced not more than nine (9) inches apart.
4. All straw mulching operations shall be done on the contour. The spreading and anchoring will be so scheduled and performed progressively so that wind damage will be held to a minimum as approved by Engineer.

3.7 MAINTENANCE

A. Protection of Seeding:

1. Vehicular traffic on areas seeded with temporary or permanent seeding, shall be restricted to travel necessary to establish seeding and other travel approved by Engineer.
2. Protect seeded areas from damage due to operations of other contractors and trades, and trespassers. Maintenance shall commence immediately following seeding operations and shall continue until Division has issued final acceptance of the project. Repair or replace damaged areas.

B. Reconditioning Existing Areas:

1. Contractors equipment, project materials, and wastes such as oil drippings, stones, gravel, packaging containers, etc., shall be removed from the site or disposed of in a manner approved by Engineer and Division.
2. All disturbed areas including areas outside grading limits, such as entrance and haul roads, shall be reconditioned and planted according to this specification.

C. Repairs:

1. Repair all areas of rill erosion with a depth of greater than three (3) inches and width greater than four (4) inches.
2. Repair defects in vegetation having individual bare areas greater than one (1) square foot or total bare areas exceeding two percent (2%) of the entire vegetated area.
3. The costs of materials and labor for repairs are at no additional cost to Division.

3.8 MINIMUM REQUIREMENTS FOR ACCEPTANCE

- A. Ninety (90) days following evidence of plant growth or green-up, Division, Engineer, and Contractor shall inspect and evaluate the seeded areas for acceptance based on the criteria listed below.
- B. The plant growth shall provide a minimum of seventy-five (75%) cover over the seeded area. Areas failing to meet this cover density shall be interseeded or reseeded and mulched as required by Engineer and Division, at no cost to Division.
- C. All plants included in the seed mixture must be present in the vegetation stand growing on site. If a species is nearly or totally absent from the vegetation stand, Engineer and Division will require Contractor to interseed the missing species at no cost to Division.

- D. Areas of suspected hot spots shall be soil tested by Engineer or Division to determine if the failure of the seeding to meet acceptance criteria is due to low pH conditions. Engineer and Division may require Contractor to lime, fertilize, seed, and mulch these areas. Any additional work required in confirmed hot spot areas shall be paid for by Division at the appropriate bid item cost for each work item.
- E. Following repair of defects, unaccepted areas, and reseeding of hot spot areas, the repaired areas will again be inspected ninety (90) days after evidence of plant growth or greenup. These areas shall be evaluated using the criteria listed in this Section.
- F. In the event that in either the original seeding, repair seeding, or reseeding of hot spots it is found that the work, materials, or seedbed preparation failed to meet the quality or application rates specified, additional work shall be required at no cost to Division.

3.9 MEASUREMENT AND PAYMENT

The construction cost of all work included in this SECTION of the Construction Specifications shall be included in Contractor's unit prices set forth in the Proposal and Schedule of Prices (*Document C*) for the work items described below. The unit price for each of these several items shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the unit prices so set forth by the amount of the work actually constructed, measured as described herein, shall constitute full payment to Contractor for performance of the work included in this SECTION.

Measurement and payment for each work item in this SECTION shall be in accordance with the following:

- A. *Agricultural Limestone, Seeding:* Contractor's unit price for limestone used in permanent seeding work shall represent full payment for the furnishing, delivery, application and incorporation as per these specifications. The actual application rate will vary pending the recommendation of soil tests conducted in Item 3.1 TESTING -FERTILITY in this SECTION.

Measurement for payment purposes shall be the actual number of tons of effective calcium carbonate equivalence (ECCE) applied by Contractor in complying with requirements of this SECTION. Weight tickets must accompany each shipment of agricultural lime and shall form the basis for measurement and payment.

- B. *Nitrogen (N), Phosphorous (P), and Potassium (K):* Payment for all fertilizer furnished, delivered, applied and incorporated into seedbeds, per requirements of this SECTION, shall be made in accordance with Contractor's unit prices for Nitrogen, Phosphorous and Potassium. The actual application rates for Phosphorous (P) and Potassium (K) will vary pending results of soil tests conducted in Item 3.2 TESTING - FERTILITY in this SECTION. The cost of soil testing for Phosphorous and Potassium application rates shall be included in Contractor's unit prices. The cost of nitrogen for temporary seeding shall be measured and paid for as part of the cost of implementing the Storm Water Pollution Prevention Plan in SECTION 02120. The cost of nitrogen for wetland fertilizer shall be measured and paid for in either in SECTION 02400 or SECTION 02410.

Measurement for payment purposes shall be the actual weight to the nearest pound of each of the fertilizer components described.

- C. *Seeding:* Contractor's unit prices for Permanent and Above Waterline Seeding shall represent full payment for the planting of all permanent seeded areas in accordance with requirements of this SECTION. Said unit price shall include the furnishing of all seed materials, soil testing, seedbed preparation, inoculants, planting of seeds, and mulching, including all required equipment labor and any required reseeding to complete all permanent seeding as specified herein.

Measurement for payment purposes shall be the area seeded in acres, rounded to the nearest one-tenth (1/10) acre. Contractor shall provide field measurements as required to show the limits of

the seeding. Engineer will determine in acres, to the nearest one-tenth (1/10) acre, the actual area that seeding has been performed, based on Contractor's field measurements. In lieu of field measurements, Contractor may request acceptance of plan (bid) quantity in accordance with 7-01 MEASUREMENT (Document N). Payment for seeding shall be made only after all submittals have been approved as required under this SECTION. Seeded areas outside the Project Limits will not be measured for payment. No separate measurement and payment apply to overseeding; the cost of over-seeding shall be subsidiary to seeding.

- D. *Mulch, Seeding:* Contractor's unit price for mulch shall represent full payment for mulching in accordance with requirements of this SECTION 02700 – SEEDING. Said unit price shall include the furnishing and application of all straw mulch, including all required equipment and labor to complete the work as specified herein. Payment for mulch shall be made only after all submittals have been approved as required under this SECTION 02700 - SEEDING. Payment will not be made on total site acreage if not substantiated by adequate weigh tickets.

Measurement for payment purposes shall be by the acre which shall be identical to the area as measured and approved for permanent seeding and above waterline seed..

- E. *Summary:* Proposal Bid Items applicable to work covered by this SECTION are as follows:

<u>Description</u>	<u>Unit</u>
Agricultural Lime, Seeding	Ton (ECCE)
Nitrogen (N)	Pound
Phosphorus (P)	Pound
Potassium (K)	Pound
Permanent Seeding	Acre
Mulch, Seeding	Acre
Wetland Seeding – Above Water Line	Acre

END OF SECTION 02700

SUPPLEMENTAL CONSTRUCTION SPECIFICATIONS

SUPERIOR #1 ENHANCEMENT PROJECT

Statement of Work
Superior #1 Enhancement Project
Sections 14, 22, 23 and 24, Township 73 North, Range 19 West
Cedar Township, Whippoorwill Branch Watershed
Monroe County, Iowa

I. General Provisions

A. Contract Information

1. The contract will be between the successful bidder and the Division of Soil Conservation (DSC). The contact person Judith Krebsbach can be reached at Judith.krebsbach@iowaagriculture.gov or 515-281-5347, fax number is 515-281-6170. Contact Dharmvir (DV) Bhatnagar for technical questions at Dharmvir.bhatnagar@iowaagriculture.gov or 515-281-7678.
2. A pre-bid conference is scheduled on Wednesday, February 20, 2013, 10:00 a.m., Community Center, 608 West 17th Street, Lovilia, Iowa. Attendance at the pre-bid conference by prospective bidders is mandatory.
3. Bids must be received by 3:00 p.m. on Tuesday, March 5, 2013. Sealed Bids can be submitted by mail or in person. The project shall be completed by May 31, 2013.

B. Location and Description of Problem

1. The site is divided in north and south by the county road H-20. Two landowners, Hollinrake and Kurimski, share the problem areas in north side. Problem areas in south of H-20 lie on adjoining landowners Hollinrake and Garrett. Watershed for the project is Whippoorwill Branch, a tributary of Cedar Creek.
2. The permitted site had been reclaimed in 2007 with the bond forfeiture money. The 2008 and 2010 heavy rains caused some erosion problems. Follow-up minor repair tasks will be pursued in this project.
3. The problems that need attention are gully or channel erosion, terrace sloughing, terrace breaches, erosion on the back slope of an embankment and plugged/broken tile lines.

C. Scope of Work

1. The purpose of this contract is to mitigate the gully erosion, replacement of plugged or broken tile lines and correcting the erosion problems at affected embankment and terraces as indicated on the map sheets and explained under "II. Execution of Work" in this document.
2. The contractor shall furnish all labor, materials, and equipment and shall perform all operations necessary for the enhancement activities. This includes seeding the disturbed areas and clean-up and restoration of the site following completion of the work.
3. Any/all damages caused by the contractor's operation shall be corrected at his expense.
4. Garrett area is divided into six pastures by electric fences. The contractor should contact the landowner who will move cattle away from the area where contractor will be working.
5. Landowner will fence out the cattle in the repaired areas until the revegetation is established.

D. Extent of Work

The contractor shall perform enhancement work at the prices for the items as bid. No additional compensation will be paid above the unit prices stated in the contractor's proposal because of differences between proposed and actual prices. The contractor shall only be paid for the work completed. Estimated quantities are only for the purposes of comparing bid submittals. The contractor will be paid for the actual quantities and is not bound to the estimated quantity. If other items are needed that are outside of the unit prices provided, a change order will be developed based upon mutual agreement between the Contractor and Division.

E. Certifications:

1. The contractor shall present proof of adequate liability insurance (minimum \$100,000 per person, \$500,000 per occurrence, \$100,000 property damage) and worker's compensation prior to award of contract.
2. The successful bidder must be eligible to receive a permit to conduct surface coal mining operations; eligibility is to be confirmed by OSM's Applicant Violator System (AVS) prior to contract award. These forms will be included with the contract to be signed and returned. The

SUPERIOR #1 ENHANCEMENT PROJECT

successful bidder will also be required to sign a certification of lower tier debarment and suspension.

3. The contractor is to notify DSC at least 48 hours prior to initiation of project work so that arrangement for an on-site project inspector can be made.
4. If the successful bidder's bid is in excess of \$10,000, he must agree to and sign a Nondiscrimination Clause, Certificate of Nonsegregated Facilities form and Equal Employment Opportunity form prior to the contract being awarded.
5. The Contractor will comply with the normal General Conditions associated with the Iowa construction contracts.

F. **Permits and Observance of Laws:**

The contractor shall obtain all necessary permits and licenses which are needed to carry out work on the site. Further, the contractor is responsible for complying with all local, State, and Federal regulations. DSC will not be liable for any citation received by the contractor as a result of failure to comply with applicable regulations.

G. **Bond:**

The successful bidder will be required to provide a performance bond equal to the amount of the contract. The performance bond shall remain in effect until one year after completion of the project.

II. Execution of Work

A. Site Access

1. The access to the three non-contiguous problem areas will be as follows:
 - a. West of the project area from a county gravel road for Garrett area
 - b. North of H-20 from Hollinrake field for problems in north, and
 - c. East of the project area from a county road for Hollinrake area in south
 - d. For terrace breach west of the creek in Hollinrake area in south, a detour may be needed for a dysfunctional culvert over the creek from pond P7.

B. Mobilization (bid item #1):

1. Refer Standard Specifications 02100 Mobilization, Site Clearing and Preparation.
2. The cost for mobilization shall include all costs for bonds and insurance as well as moving necessary equipment and personnel onto and off the site.
3. All exposed soil areas resulting from the necessary repairs under this contract will be seeded and measured to be paid for as part of the seeding costs. Excessive disturbance or disturbance of areas deemed unnecessary by the Division will be corrected at the contractor's own expense.

C. Off-site Waste Disposal (bid item #2):

1. Refer Standard Specifications 02100 Mobilization, Site Clearing and Preparation at 3.6 E for generic details and at 3.9 C for payment.
2. The expected items for offsite waste disposal are plugged and broken tiles removed for discard or reuse (refer sheets 3 and 4).
3. The extraction of the tiles will be incidental to other associated bid items.

D. Remove Tiling North of H-20 (bid item #3):

1. One tile with 10-inch riser crosses the fence from Kurimski area to Hollinrake area, refer sheet 5. The tile will be removed for off-site waste disposal. The riser will be saved for installation to a new location few feet North of the present location, where the broken tile will be replaced with a new 10-inch tile and where the riser is missing.
2. The item will be paid per lineal feet of the tile removed.
3. Backfilling of the area where from the tile is removed, machine compacting and grading will be incidental to the unit price.

E. Repair Terrace Breaches (bid item #4):

1. Refer Standard Specifications 02300 Drainage Systems, General at 3.10 which refers to 02200 Earthwork – Rough Grading at 3.9 E, F and G.
2. Terraces have breached at two locations: Hollinrake area (sheet 4) and Kurimski area (sheet 5).
3. The breached portions will be repaired to the same cross-section as the existing sections on either side of the breaches.

SUPERIOR #1 ENHANCEMENT PROJECT

4. The soil for the fill will come from Lowering the emergency spillway (sheet 5) and from adjacent areas (sheet 4).
 5. The item will be paid per lineal feet of the breaches; it will be measured jointly by the contractor and the Division.
 6. Terrace flow line will be graded to flow to the nearest tile intake riser, the cost will be incidental to this bid item.
- F. Repair Eroded Channels (bid item #5):
1. Eroded channels in Garrett area (sheet 3), north and south of the creek, will be repaired.
 2. The repair will involve backfilling the eroded portions, machine compacting and grading.
 3. The soil will come from the digging of Below-Grade Check-Dams and/or from adjacent areas.
 4. The finish cross-section will conform to Section A-A, sheet 6.
 5. The elevation at the ends of the channels will stay the same as was before the erosion; it will negotiate with the undisturbed adjacent ground.
 6. North channel will have about 5% grade and south channel about 10%.
 7. The payment for the item will be made per lineal feet; it will be measured jointly by the contractor and the Division.
 8. Installation of Below-Grade Check-Dams (BGCD) with erosion stone over filter fabric and Above-Grade Check-Dams (AGCD) with riprap above BGCD in the eroded channels will be paid for the cost of materials exclusive of this bid item.
- G. Backfill Eroded Gullies (bid item #6):
1. The gully erosion, caused by terrace breaches (sheets 4 and 5) or tile failures (sheets 3 and 5), will be repaired by backfilling, machine compacting and grading.
 2. The soil for backfilling will come from lowering emergency spillway (sheet 4) and/or from adjacent areas (sheets 3 and 5).
 3. The item will be paid per lineal feet of the gullies backfilled, it will be measured jointly by the contractor and the Division.
- H. Tiling (bid items #7 and #8):
1. Refer Standard Specifications Section 02300 at 2.2 B and C and 3.5 A.
 2. Plugged or broken tiles at Ponds P3 and P4 (sheet 3) will be removed and replaced with the 12" tiles. One new 12" tile will replace the existing tile at P1 (sheet 5). An additional 12" tile will be installed by the side of the replaced tile at P1 (sheet 5).
 3. One tile blow-out by a terrace north of P4 (sheet 3) may need replacement of the broken portion.
 4. All tiling will be dual wall, smooth interior except where only the broken portion is replaced.
 5. Backfilling, machine compacting and grading the trench after tiling tasks are incidental to the bid item. Soil will be taken from digging the trench for tiling or from adjacent areas.
 6. Removal of broken or plugged tiles will be incidental to the bid item.
 7. Payment for tile replacement/installation will be per lineal feet; it will be measured jointly by the contractor and the Division.
 8. All new or replaced tiling will have a tile riser at the intake, paid as a separate bid item.
 9. Riprap over filter fabric placed as energy dissipater at all tile outlets will be paid by ticket (riprap) and measurement (filter fabric).
- I. Tile Riser 10-inch New (bid item #9):
1. Refer Standard Specifications Section 02300 at 3.5 B.
 2. New tile riser will be installed with the new tiling (sheet 5) per Standard Specifications.
- J. Tile Riser 10-inch Old (bid item #10):
1. Refer Standard Specifications Section 02300 at 3.5 B.
 2. Existing tile risers will be saved and installed with the tile to be replaced (sheets 3 and 5) per Standard Specifications.
- K. Erosion Stone (bid item #11):
1. Refer Standard Specifications Section 02300 at 2.7.
 2. Erosion Stone will be installed per Section B-B, refer Sheet 6 in eroded channels (sheet 3).
 3. The item will be paid per weight tickets rounded to one-tenth of a ton.

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- L. Riprap Grade E (bid item #12):
1. Refer Standard Specifications Section 02300 at 2.6 and 3.8.
 2. Riprap will be installed in eroded channels (sheet 3) as shown in Sections C-C and D-D, refer Sheet 6 and in Apron at tile outlets as shown in sheet 7.
 3. The item will be paid per weight tickets rounded to one-tenth of a ton.
- M. Filter Fabric (bid item #13):
1. Refer Standard Specifications Section 02300 at 2.4 and 3.7.
 2. Filter Fabric will be used underneath erosion stone and riprap, refer sheets 6 and 7.
 3. The item will be paid by joint measurement by contractor and Division rounded to the nearest square yard. Overlap will not be measured for payment.
- N. Erosion Control Blanket (bid item #14):
1. Refer Standard Specifications Section 02300 at 2.5 and 3.9.
 2. Erosion Control Blanket will be used at finish level in eroded channels, refer sheet 6.
 3. The item will be paid by joint measurement by contractor and Division rounded to the nearest square yard. Overlap will not be measured for payment.
- O. Correcting back slope of the embankment at P7 (bid item #15, sheet 4):
1. The eroded portions of the back slope of the embankment of pond P7 shall be backfilled and sufficiently compacted to withstand erosion.
 2. The backfill material will come from lowering of the emergency spillway.
 3. The backfilled material in the eroded portions will be adequately blended with adjacent areas.
 4. About 30 cubic yards of cut is estimated for filling the eroded areas on the back slope of the dam.
 5. The cubic yards are mentioned for evaluating the extent of excavation. Additional cubic yards, if any, will not be considered for additional payment.
 6. Emergency spillway will be graded and blended with adjacent areas after back slope repairs.
 7. Payment for this item shall be made as a lump sum.
 8. Excavation is incidental to the lump sum payment for the item.
- P. Terrace Sloughing (bid item #16, sheet 4):
1. Restore the terrace by pushing the soil from toe end.
 2. Restoration includes shaping and adequately compacting the terrace after toe-pushing.
 3. About 250' length of the terrace will require raising the ridge about 2' in height.
 4. Terrace flow-line will be graded to flow toward the tile inlet, incidental to the item.
 5. Payment for this item shall be made as a lump sum.
- Q. Lowering Emergency Spillway (bid item #17, sheet 5):
1. The emergency spillway about 20' in length will be lowered by two (2) feet.
 2. Additional two (2) feet will be dug in the central 20' to contain riprap over filter fabric.
 3. The grading of the embankment shall be maintained for smooth vehicular traffic.
 4. Hauling of the dug-out soil to backfill the gullies and terrace breach in the pond basin will be incidental to this bid item.
 5. Payment for this item shall be made as a lump sum.
- R. Seeding (bid items #18 through 23):
1. All exposed soil areas resulting from the necessary repairs under this contract shall be seeded with the seed mix provided below.
 2. Seed bed preparation shall include applying agricultural lime (ECCE) and Nitrogen, Phosphorus and Potassium per soil test result to exposed soil areas and disking them into upper 6 inches. Soil samples will be taken and paid by the contractor and shall be tested by a certified laboratory.
 3. After seeding is complete, the area shall be mulched with 2 tons per acre of straw mulch crimped into the surface.
 4. Agriculture Lime will be paid per weight tickets for ECCE for actual number of tons.
 5. Fertilizer N, P, K will be paid per weight ticket rounded to nearest pound.
 6. Seeding and mulch will be paid for the acres measured jointly by Contractor and Division and rounded to the nearest one tenth of an acre.

Permanent Seeding Areas:

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GARRETT PROPERTY (1 acre), SHEET #3

Seed provided by landowner

ALL OTHER AREAS (1 acre), SHEETS #4 and #5

Oats	30 lbs PLS/acre
Alfalfa	6 lbs. PLS/acre
Red Clover	4 lbs. PLS/acre
Perennial Ryegrass	8 lbs. PLS/acre
Smooth Brome	6 lbs. PLS/acre
Timothy	2lbs. PLS/acre
Orchard Grass	6 lbs. PLS/acre

$$\text{Pure Live Seed per pound (PLS/lb)} = \frac{(\% \text{ purity}) \times (\% \text{ germination})}{100 \quad 100}$$

$$\text{Actual pounds of seed per acre} = \frac{\text{lbs PLS per acre}}{(\text{PLS})/\text{lb.}}$$

All seeding rates are specified as pounds of pure live seed per acre (lbs. PLS/A).

Seed delivered to the job site shall be labeled according to the U.S. Department of Agriculture Federal Seed Act and shall be furnished in containers with tags showing seed mixture, purity, germination, weed content, name of seller, and date on which seed was tested. Moldy seed or seed that has been damaged in storage shall not be used. Use previous season seed crop only.

Legume Seed Inoculant

Inoculant for treating leguminous seed shall be a pure culture of nitrogen-fixing bacteria, specific for the seed species to be inoculated. Containers shall be plainly marked with the expiration date for use and manufacturer's directions for inoculating seed.

Methods of inoculation shall conform to manufacturer's recommendations for the particular species of legume.

Use sufficient inoculant to cover all leguminous seed before mixing with other seeds. Seed shall be slightly moistened or a sticker shall be used to ensure the inoculant adheres to the seed. The time lapse for sowing seed following inoculation shall not exceed twenty-four (24) hours.

END OF STATEMENT OF WORK