

# Montana Fish, Wildlife & Parks

## SPECIFICATIONS FOR WORK SPECIAL PROVISIONS

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## 1. PROJECT DESCRIPTION

The Project involves construction work associated with:

**Pond Liner Replacement at the Miles City Fish Hatchery  
Fish, Wildlife & Parks (FWP) project # 7213100  
Located in Custer County, MT**

The project generally includes replacement of existing geomembrane pond liner in the Hatchery ponds, including but not limited to: removal of existing liner, grading & shaping as required, furnish and install geomembrane pond liner, and other incidentals as described in the design plans and specifications.

## 2. PROJECT RELATED CONTACTS

Project contacts are designated as follows:

**Owner:**

Montana FWP  
1420 E. Sixth Ave.  
PO Box 200701  
Helena, MT 59620-0701

**FWP Project Representative:**

Phil Jagoda, P.E.  
FWP Project Manager  
1522 9<sup>th</sup> Avenue  
Helena, MT 59620  
406-841-4009 (wk)  
406-431-3755 (cell)  
406-841-4004 (fax)

## 3. SITE INSPECTION

All Bidders should satisfy themselves as to the construction conditions by personal examination of the site described in this document. Bidders are encouraged to make any - investigations necessary to assess the nature of the construction and the difficulties to be encountered, see General Conditions, Article 3.

## 4. SOILS INFORMATION

Limited Geotechnical investigation work has been completed for this Project. It is the responsibility of the Bidders to review and interpret all investigations, findings, and reports made part of this contract prior to bid preparation, see General Conditions, Article 3. Three types of soils will be encountered; a) 6" of road mix with 6" of pit run on roadway sections, b) a silty clay in the general dike area and c) a lean to fat clay liner on the slopes of the ponds. Additionally, there is some cobble armoring that will be relocated.

## 5. PROJECT REPRESENTATIVE, INSPECTIONS, AND TESTING

The Contractor's work will be periodically tested and observed to insure compliance with the Contract Documents. Complete payment will not be made until the Contractor has demonstrated that the work is complete and has been performed as required. If the Project Representative detects a discrepancy between the work and the requirements of the Contract Documents at any time, up to and including final inspection, such work will not be completely paid for until the Contractor has corrected the deficiency, see General Conditions, Article 9.

The Project Representative will periodically monitor the construction of work to determine if the work is being performed in accordance with the contract requirements. The Project Representative does not have the authority or means to control the Contractor's methods of construction. It is, therefore, the Contractor's responsibility to utilize all methods, equipment, personnel, and other means necessary to assure that the work is installed in compliance with the Drawings and Specifications, and laws and regulations applicable to the work. Any discrepancies noted shall be brought to the Contractor's attention, who shall immediately correct the discrepancy. Failure of the Project Representative to detect a discrepancy will not relieve the Contractor of his ultimate responsibility to perform the work as required, see General Conditions, Article 3.

The Contractor shall inspect the work as it is being performed. Any deviation from the Contract requirements shall be immediately corrected. Prior to any scheduled observation by the Project Representative, the Contractor shall again inspect the work and certify to the Project Representative that he has inspected the work and it meets the requirements of the Contract Documents. The Project Representative may require uncovering of work to verify the work was installed according to the contract documents, see General Conditions, Article 12.

The work will be subject to review by the Project Representative. The results of all such observations, and all contract administration, shall be directed to the Contractor only through the Project Representative.

5.1 Services Required by the Contractor. The Contractor shall provide the following services:

- a. Any field surveys to establish locations, elevations, and alignments as stipulated on the Contract Documents. FWP reserves the right to set preliminary construction staking for the project. The Contractor is responsible to notify FWP for any construction staking discrepancies.
- b. Preparation and certification of all required shop drawings and submittals as described in the General Conditions, Article 3.
- c. All testing requiring the services of a laboratory to determine compliance with the Contract Documents shall be performed by an independent commercial testing laboratory acceptable to the Project Representative. The laboratory shall be staffed with experienced technicians properly equipped, and fully qualified to perform the

tests in accordance with the specified standards.

- d. Preparation and submittal of a construction schedule, including submittals, see General Conditions, Article 3. The schedule shall be updated as required, as defined in the Contract Documents.
- e. All Quality Control testing as required by the Contractor's internal policies.
- f. All Quality Assurance testing and/or re-testing as stated in the Contract Documents, see General Conditions, Article 13.

5.2 Services Provided by the Owner. The Owner shall provide the following services at no cost to the Contractor except as required for retests as defined in the Contract Documents.

- a. The Project Representative may check compaction of backfill and surfacing courses using laboratory testing submittal information supplied by the Contractor. These tests are to determine if compaction requirements are being fulfilled in accordance with the Contract Documents. It is ultimately the responsibility of the Contractor to insure that this level of compaction is constant and met in all locations.
- b. Any additional Quality Assurance testing deemed appropriate by the Owner, at the Owner's expense.

## 6. ENGINEERING INTERPRETATIONS

Timely Engineering decisions on construction activities or results have an important bearing on the Contractor's schedule. When engineering interpretation affects a plan design or specifications change, it should be realized that more than 24 hours may be required to gain the necessary Owner participation in the decision process including time for formal work directive or change order preparation as required.

## 7. REJECTED WORK

Any defective work or nonconforming materials or equipment that may be discovered at any time prior to the expiration of the warranty period, shall be removed and replaced with work or materials conforming to the provisions of the Contract Documents, see General Conditions, Article 12. Failure on the part of the Project Representative to condemn or reject bad or inferior work, or to note nonconforming materials or equipment on the Contractor's submittals, shall not be construed to imply acceptance of such work. The Owner shall reserve and retain all its rights and remedies at law against the Contractor and its Surety for correction of any and all latent defects discovered after the guarantee period (MCA 27-2-208).

Only the Project Representative will have the authority to reject work which does not conform to the Contract Documents.

## 8. UTILITIES

The exact locations of existing utilities that may conflict with the work are not precisely known. It shall be the Contractor's responsibility to contact the owners of the respective utilities and arrange for field location services. **One Call Locators, 1-800-424-5555**

The Contract Documents may show utility locations based on limited field observation and information provided to the Project Representative by others. **The Project Representative cannot guarantee their accuracy.** The Contractor shall immediately notify the Project Representative of any discrepancies with utility locations as shown on the Contract Drawings and/or their bury depths that may in any way affect the intent of construction as scoped in these specifications.

There will be no separate payment for exploratory excavation required to locate underground utilities.

8.1 Notification. The Contractor shall contact, in writing, all public and private utility companies that may have utilities encountered during excavation. The notification includes the following information:

- a. The nature of the work that the Contractor will be performing.
- b. The time, date and location that the Contractor will be performing work that may conflict with the utility.
- c. The nature of work that the utility will be required to perform such as moving a power pole, supporting a pole or underground cable, etc.
- d. Requests for field location and identification of utilities.

A copy of the letter of notification shall be provided to the Project Representative. During the course of construction, the Contractor shall keep the utility companies notified of any change in schedule, or nature of work that differs from the original notification.

8.2 Identification. All utilities that may conflict with the work shall be the Contractor's responsibility to locate before any excavation is performed. Field markings provided by the utility companies shall be preserved by the Contractor until actual excavation commences. All utility locations on the Drawings should be considered approximate and should be verified in the field by the Contractor. The Contractor shall also be responsible for locating all utilities that are not located on the Drawings.

Utilities are depicted on the Contract Documents in accordance with their achieved "Quality Levels," as defined in the American Society of Civil Engineer's Document, ASCE 38, "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data." Reliance upon these data for risk management purposes during bidding does not relieve the Contractor, or Utility Owner from following all applicable utility damage prevention statutes,

policies, and/or procedures during construction. It is important that the Contractor investigates and understands the scope of work between the project Owner and Engineer regarding scope of limits of the utility investigations leading to these utility depictions. Definitions of Quality Levels are described as follows:

- a. "QUALITY LEVEL A" – (QLA): LOCATING THROUGH EXCAVATION. QLA data are highly accurate and are obtained by surveying an exposed utility. As such, both horizontal and vertical data are recorded. Survey accuracies are typically set at 15mm (1/2-inch) vertically, and to project survey standards horizontally (typically the same as for topography features), although these survey accuracies and precisions are generally left to the owner to specify in a scope of work. In addition to the applicable standard of care and any other additional standards imposed by commercial indemnity clauses, the accuracy of these location data is also typically guaranteed. Other data typically characterized include material type, surface elevation, utility size/capacity, outside dimensions, and configurations, soil type, and utility condition.
- b. "QUALITY LEVEL B" – (QLB): DESIGNATING. QLB information is obtained through the application of appropriate surface geophysical methods to identify the existence and approximate horizontal location of utilities (a utility's "designation") within the project limits, followed by survey, mapping, and professional review of that designation. Underground utilities are identified by interpretation of received signals generated either actively or passively, and through correlating these received signals with visible objects (QLC) and record data (QLD) to determine function. Designated utilities that can't be identified are labeled as "unknowns." Although approximate has no accuracy associated with it, generally the locations are within inches rather than feet. The more utility congested the area or the deeper the utilities, the less likely it is that the designations will achieve that accuracy. These designations are then surveyed to project accuracies and precisions, typically third-order accuracy similar to other topography features. Note that surveying existing one-call marks does not lead to QLB data, since the genesis of the marks was not under the direct responsible charge of the professional certifying the QLB depictions, and one-call generally does not address unknown utilities, privately owned utilities, utilities without records, abandoned utilities, and so on. Nor does the professional have knowledge of the field technician's qualifications, training, and level of effort.
- c. "QUALITY LEVEL C" – (QLC): SURFACE VISIBLE FEATURE SURVEY. QLC builds upon the QLD information by adding an independent detailed topography site survey for surface-visible appurtenances of subsurface utilities including but not limited to fire

hydrants, valves, risers, and manholes. Professional judgment is used to correlate the QLD data to the surveyed features, thus increasing the reliability of both utility location and existence. It is a function of the professional to determine when records and features do not agree and resolve discrepancies. This may be accomplished by depiction of a utility line at quality level D, effectively bypassing or disregarding (but still depicting) a surveyed structure of unknown origin. Additional resolution may result from consultation with utility owners.

- d. "QUALITY LEVEL D" – (QLD): EXISTING RECORDS RESEARCH. QLD is the most basic level of information. Information is obtained from the review and documentation of existing utility records, verbal accounts, and/or one-call markings (to determine the existence of major active utilities and their approximate locations).

- 8.3 Removal or Relocation of Utilities. All electric power, street lighting, gas, telephone, and television utilities that require relocation will be the responsibility of the utility owner. A request for extending the specified contract time will be considered if utility owners cause delays.
- 8.4 Public Utilities. Water, sewer, storm drainage, and other utilities owned and operated by the public entities shall, unless otherwise specifically requested by the utility owner, be removed, relocated, supported or adjusted as required by the Contractor at the Contractor's expense. All such work shall be in accordance with these Contract Documents, or the Owner's Standard Specifications or written instructions when the work involved is not covered by these Specifications.
- 8.5 Other Utilities. Utilities owned and operated by private individuals, railroads, school districts, associations, or other entities not covered in these Special Provisions shall, unless otherwise specifically requested by the utility owner, be removed, relocated, supported or adjusted as required by the Contractor at the Contractor's expense. All work shall be in accordance with the utility owner's directions, or by methods recognized as being the standard of the industry when directions are not given by the owner of the utility.
- 8.6 Damage to Utilities and Private Property. The Contractor shall protect all utilities and private property and shall be solely responsible for any damage resulting from his construction activities. The Contractor shall hold the Owner and Project Representative harmless from all actions resulting from his failure to properly protect utilities and private property. All damage to utilities shall be repaired at the Contractor's expense to the full satisfaction of the owner of the damaged utility or property. The Contractor shall provide the Owner with a letter from the owner of the damaged utility or property stating that it has been repaired to the utility owner's full satisfaction.

- 8.7 Structures. The Contractor shall exercise every precaution to prevent damage to existing buildings or structures in the vicinity of his work. In the event of such damages, he shall repair them to the satisfaction of the owner of the damaged structure at no cost to the Owner.
- 8.8 Overhead Utilities. The Contractor shall use extreme caution to avoid a conflict, contact, or damage to overhead utilities, such as power lines, streetlights, telephone lines, television lines, poles, or other appurtenances during the course of construction of this project.
- 8.9 Buried Gas Lines. The Contractor shall provide some means of overhead support for buried gas lines exposed during trenching to prevent rupture in case of trench caving.
- 8.10 Pavement Removal. Where trench excavation or structure excavation requires the removal of curb and gutter, concrete sidewalks, or asphalt or concrete pavement, the pavement or concrete shall be cut in a straight line parallel to the edge of the excavation by use of a spade-bitted air hammer, concrete saw, colter wheel, or similar approved equipment to obtain a straight, square clean break. Pavement cuts shall be 2 feet wider than the actual trench opening.
- 8.11 Survey Markers and Monuments. The Contractor shall use every care and precaution to protect and not disturb any survey marker or monuments, such as those that might be located at lot or block corners, property pins, intersection of street monuments or addition line demarcation. Such protection includes markings with flagged high lath and close supervision. No monuments shall be disturbed without prior approval of the Project Representative. Any survey marker or monument disturbed by the Contractor during the construction of the project shall be replaced at no cost to the Owner by a licensed land surveyor.
- 8.12 Temporary Utilities. The Contractor shall provide all temporary electrical, lighting, telephone, heating, cooling, ventilating, water, sanitary, fire protection, and other utilities and services necessary for the performance of the work. All fees, charges, and other costs associated therewith shall be paid for by the Contractor.

## 9. CONSTRUCTION SAFETY

The Contractor shall be solely and completely responsible for conditions of the jobsite,



including safety of all persons (including employees and subcontractors) and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. The Contractor's failure to thoroughly familiarize himself with the aforementioned safety provisions shall not relieve them from compliance with the obligations and penalties set forth therein, see General Conditions, Article 10.

## **10. CONSTRUCTION LIMITS AND AREAS OF DISTURBANCE**

- 10.1 Construction Limits. Where construction easements or property lines, are not specifically called out on the Contract Documents, limit the construction disturbance to ten (10) feet, when measured from the edge of the slope stake grading, or to the adjacent property line, whichever is less. Disturbance and equipment access beyond this limit is not allowed without the written approval of both the Project Representative and the Owner of the affected property. If so approved, disturbance beyond construction limits shall meet all requirements imposed by the landowner; this includes existing roads used and/or improved as well as the construction of new access roads. Special construction, reclamation, or post-construction reclamation or other closure provisions required by the landowner on access roads beyond the construction limits shall be performed by the Contractor at no additional cost to the Owner.
- 10.2 Areas of Disturbances. Approved areas of disturbance are those areas disturbed by construction activities within the construction limits and along designated or approved access routes. Such areas may require reclamation and revegetation operations, including grading to the original contours, top soiling with salvaged or imported topsoil, seeding, fertilizing, and mulching as specified herein. Other areas that are disturbed by the Contractor's activities outside of the limits noted above will be considered as site damage or unapproved areas of disturbance, see General Conditions, Articles 3 and 10. This includes areas selected by the Contractor outside the defined construction limits for mobilization, offices, equipment, or material storage.

## **11. DECONTAMINATE CONSTRUCTION EQUIPMENT**

Power wash all construction equipment entering the project site to prevent the spread of noxious weeds and aquatic invasive species. This applies to all FWP projects, whether or not individual construction permits specifically address cleaning of equipment.

## **12. TREE PROTECTION AND PRESERVATION**

The Contractor and the Owner shall individually inspect all trees within the project construction limits prior to construction. The Owner shall determine which trees are to be removed and which trees are to be preserved. Construction of the grading, utilities and various roadway facilities must not significantly damage the trees root system or

hinder its chances for survival. Reasonable variations from the Contract Documents, as directed by the Project Representative, may be employed to ensure the survival of trees.

### **13. CONSTRUCTION SURVEYS**

The Contractor will be responsible for all layout and construction staking utilizing the Project Representative's existing control and coordinate data for the project. Dimensions and elevations indicated in layout of work shall be verified by the Contractor. Discrepancies between Drawings, Specifications, and existing conditions shall be referred to the Project Representative for adjustment before work is performed. The Project Representative may set location and grade stakes prior to construction; however, it is ultimately the responsibility of the Contractor to check and verify all construction staking for the project.

Existing survey control (horizontal and vertical) has been set for use in the design and ultimately the construction of these improvements. A listing of the coordinates and vertical elevation for each of these control points may be included in the project drawings.

The Contractor will be responsible for preserving and protecting the survey control until proper referencing by the Contractor has been completed. Any survey control obliterated, removed, or otherwise lost during construction will be replaced at the Contractor's expense.

Contractor shall be aware of property pins and survey monuments. Damage to these pins will require replacement of such by a registered land surveyor at no cost to the owner.

The Contractor shall provide construction staking from the Contractor's layouts and the control points. Contractor's construction staking includes at a minimum:

1. Slope stakes located at critical points as determined by the Project Representative.
2. Blue tops every longitudinally and transversely for subgrade and crushed base to verify finish grading of course.
3. Location and grade stakes for drainage features and retaining walls.
4. Location stakes for roadside safety items, permanent and temporary traffic control, and misc. items as determined by the Project Representative.

Original field notes, computations and other records taken by the Contractor for the purpose of quantity and progress surveys shall be furnished promptly to the Project Representative and shall be used to the extent necessary in determining the proper amount of payment due to the Contractor.

### **14. MATERIAL SOURCES AND CONSTRUCTION WATER**

The Contractor shall be responsible for locating all necessary material sources, including aggregates, earthen borrow and water necessary to complete the work. The Contractor shall be responsible for meeting all transportation and environmental regulations as well as paying any royalties. The Contractor shall provide the Project Representative with written approvals of landowners from whom materials are to be obtained, prior to approval.

The Contractor may use materials from any source, providing the materials have been tested through representative samples and will meet the Specifications.

Water for construction needs and compaction efforts shall be supplied by the Contractor. Water source is available from the Hatchery source ponds to the Contractor, after discussion and approval with the Hatchery Manager.

### **15. MATERIALS SALVAGE AND DISPOSAL**

Notify the Owner for any material salvaged from the project site not identified in the Contract Documents. The Owner reserves the right to maintain salvaged material at the project site, compensate the Contractor for relocation of salvaged material, or agreed compensation to Owner for material salvaged by the Contractor.

Haul and waste all waste material to a legal site and obey all state, county, and local disposal restrictions and regulations.

### **16. STORED MATERIALS**

Contractor shall use an approved storage area for materials. Materials and/or equipment purchased by the Contractor may be compensated on a monthly basis. For compensation, provide the Project Representative invoices for said materials, shop drawings and/or submittals for approval, and applicable insurance coverage, see General Conditions, Article 9.

### **17. STAGING AND STOCKPILING AREA**

Contractor shall use staging and stockpiling sites to facilitate the project as approved by the Owner. Contract Documents may show approved staging and stockpiling locations. Notify Owner within 24 hours for approval of staging and stockpiling sites not shown on the Contract Drawings.

### **18. SECURITY**

The Contractor shall provide all security measures necessary to assure the protection of equipment, materials in storage, completed work, and the project in general.

### **19. CLEANUP**

Cleanup for each item of work shall be fully completed and accepted before the item is considered final. If the Contractor fails to perform cleanup within a timely manner the Owner reserves the right to withhold final payment.

## **20. ACCESS DURING CONSTRUCTION**

Provide emergency access at all times within the project throughout the construction period.

## **21. CONSTRUCTION TRAFFIC CONTROL**

The Contractor is responsible for providing safe construction and work zones within the project limits by implementing the rules, regulations, and practices of the Manual on Uniform Traffic Control Devices, current edition.

## **22. SANITARY FACILITIES**

Provide on-site toilet facilities for employees of Contractor and Sub-Contractors and maintain in a sanitary condition.

## **23. CONTRACT CLOSEOUT**

The Contractor's Superintendent shall maintain at the project site, a "Record Set of Drawings" showing field changes, as-built elevations, unusual conditions encountered during construction, and such other data as required to provide the Owner with an accurate "as constructed" set of record drawings. The Contractor shall furnish the "Record Set" to the Project Representative following the Final Inspection of the Project.

The Contractor's final payment will not be processed until the "Record Set" of drawings are received and approved by the Project Representative.

## **24. MEASUREMENT AND PAYMENT**

Review these Contract Documents for additional Measurement and Payment specifications for definitions. Quantities are listed on the Bid Proposal for Payment Items. Additional material quantities, volumes, and measurements may be shown on the Contract Document drawings and/or specifications.

Unit Price quantities and measurements shown on the Bid Proposal are for bidding and contract purpose only. Quantities and measurements supplied, completed for the project, and verified by the Project Representative shall determine payment. Each unit price will be deemed to include an amount considered by the Contractor to be adequate to cover Contractor's overhead and profit for each bid item.

The Owner or Contractor may make a Claim for an adjustment in Contract Unit Price if the quantity of any item of Unit Price Work performed by the Contractor differs

materially and/or significantly (increase or decrease by 50%) from the estimated quantity indicated on the Bid Proposal.

Lump sum bid item quantities will not be measured. Payment for these lump sum bid proposal items will be paid in full amount listed on the Bid Proposal when accepted by the Project Representative, unless specified otherwise.

## **SPECIFICATIONS FOR WORK**

### **TECHNICAL PROVISIONS**

#### **Incorporation of Montana Public Works Technical Specifications.**

The Technical Specifications as found in Montana Public Works Standard Specifications (MPWSS), Seventh Edition, April 2021 Addendum; are hereby incorporated by reference and made a part of this Contract:

#### **Incorporation of Montana Fish, Wildlife & Parks Technical Specifications and Modifications to MPW Technical Specifications.**

In addition to the MPWSS Technical Specifications are the following Montana Fish, Wildlife & Parks Technical Specifications (modifications to MPWSS Technical Specifications).

SECTION 01010-	Summary of Work
SECTION 01050 -	Field Engineering
SECTION 01300 -	Submittals
SECTION 01450 -	Mobilization/Demobilization
SECTION 01750 -	Final Cleanup
SECTION 01800 -	Erosion and Sediment Control
SECTION 02110 -	Geotextiles
SECTION 02230 -	Street Excavation, Backfill, and Compaction
SECTION 02400 -	Geomembrane
SECTION 02425 -	Geogrid
SECTION 02450 -	Geocomposite
SECTION 02475 -	Cellular Soil Confinement System
SECTION 02730 -	Pipe
SECTION 02910 -	Revegetation

## SECTION 01010

### SUMMARY OF WORK

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### PART 1 GENERAL

##### 1.3 WORK SEQUENCE

Add the following:

- A. Project work must be completed by November 30, 2022. Contractor will be required to coordinate work with the Fish Hatchery Manager, as the sequencing of the work will be highly dependent on the fish rearing requirements of the hatchery ponds and draining or filling of specific ponds for fish needs.
- B. Contractor shall give the fish hatchery manager minimum 72 hours notice for any ponds that need to be drained prior to performing work in the ponds or grading of the base soils or removal of accumulated sediments. Contractor shall be aware that the ponds will require time to drain water and residual water may be present in ponds after draining which could require day(s) to drain of residual water. Appropriate dewatering methods may be necessary by the contractor, which may include pumping, piping, etc. The Contractor will be responsible for all materials, equipment & labor necessary to properly dewater the ponds for proposed work, and maintain dewatering throughout the project, which shall be considered incidental to the project.
- C. Contractor will be required to coordinate pond liner work with any other contractors present at the site conducting construction on other hatchery pond work in the vicinity. Ongoing construction will be occurring at the same time as liner construction, therefore all Contractors will be required to coordinate all work and site presence to eliminate interruptions. Owner will not be responsible for project scheduling delays or down-time charges that are a result of Contractors not coordinating work together, regardless if resultant Contractors are under same contract or sub-contract.
- D. Additionally, all Contractors working at the hatchery property will need to coordinate work with Hatchery Manager, as the property is an active fish hatchery with multiple employees that will actively be using the site, draining and filling hatchery ponds, operating site mechanical controls, and other operations that may occur in the vicinity of construction. Coordination with all involved parties will be required.

##### 1.4 CONTRACTOR USE OF PREMISES

Add the following:

- E. No sanitary or potable water services are available at the site. Contractor shall provide port-a-jons for employees use during the duration of the project.

**END OF SECTION 01010**



## SECTION 01050

### FIELD ENGINEERING

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### PART 3 EXECUTION

##### 1.1 CONSTRUCTION SURVEY

- A. Engineer will provide survey control (northing/easting) and benchmarks (local datum) for all designed alignments and profiles, as shown on the project drawings.
- B. Contractor will be responsible for setting slope stakes and grade stakes at 50' intervals on tangent sections and at 25' on horizontal curves, based on Owner provided control and alignment staking. The contractor will be responsible to provide own blue top staking prior to paving or re-installation of road gravel materials. Limit grade stake tolerances to +/-0.04'.

#### PART 4 MEASUREMENT AND PAYMENT

Add the following:

- A. Contractor construction surveying will not be measured for payment, and is considered incidental to other bid items in this contract.

**END OF SECTION 01050**

## **SECTION 01300**

### **SUBMITTALS**

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### **PART 2 PRODUCTS**

##### **2.1 REQUIRED PRODUCT SUBMITTALS**

- A. Contractor shall provide submittals to the Engineer for review for the following products to be used in the project:
  - a. Construction schedules as indicated in Section 01300 of the MPWSS
  - b. Proposed dewatering plan for base grading and liner installation
  - c. All geomembrane product submittals as indicated in the technical specifications.
  - d. All other construction materials necessary for pond liner construction not specifically mentioned in this section, at the request of the Engineer.

**END OF SECTION 01300**

## SECTION 01450

### MOBILIZATION/DEMobilIZATION

Added Section.

#### **PART 1                    GENERAL**

##### 1.1    DESCRIPTION

- A. This item shall consist of the preparatory work and operations necessary performed by the Contractor for the movement of personnel, equipment, supplies, and incidentals to and from the work site. The work includes those actions necessary for obtaining necessary permits required for mobilization; for the establishment of all offices and facilities necessary to work on the project; for premiums on contract bonds; for insurance for the contract; and for other work on the various items on the project site. Mobilization costs for subcontracted work shall be considered to be included.
- B. Contractor's cost for administration, bonding, insurance, and site documents shall be included in mobilization and shall not be paid as a separate item.
- C. All equipment moved to the project sites shall be in good mechanical condition and free of fuel, oil, lubrication, or other fuel leaks. The Contractor shall immediately remove any equipment potentially or actually discharging environmentally damaging fluids.
- D. All equipment moved to the project sites shall be thoroughly cleaned before it is brought to the sites to prevent the introduction of weed seeds. Equipment removed from the sites may not be returned to the sites again until it is thoroughly cleaned again.

#### **PART 2                    PRODUCTS – NOT USED**

#### **PART 3                    EXECUTION – NOT USED**

#### **PART 4                    MEASUREMENT AND PAYMENT**

##### 4.1    MEASUREMENT

- A. There will be no direct measurement of this item.

## 4.2 PAYMENT

B. Partial payments for mobilization/demobilization will be made based on the lump sum bid price as follows:

- 25% of the amount bid for mobilization/demobilization when the Contractor has moved on-site and begun construction activities.
- 50% of the amount bid for mobilization/demobilization when 25% of the contract amount (exclusive mobilization/demobilization) has been completed.
- 75% of the amount bid for mobilization/demobilization when 50% of the contract amount (exclusive mobilization/demobilization) has been completed.
- 100% of the amount bid for mobilization/demobilization when 75% of the contract amount (exclusive mobilization/demobilization) has been completed.

**END OF SECTION 01450**

**SECTION 01750**  
**FINAL CLEANUP**

Added Section.

**PART 1                   GENERAL**

1.1   DESCRIPTION

- A.    This work consists of final cleanup of the project site prior to final acceptance.

**PART 2                   PRODUCTS – NOT USED**

**PART 3                   EXECUTION**

3.1   CONTRACTOR RESPONSIBILITIES

The contractor shall be responsible for final clean up at the end of the project to a level satisfactory to the owner. All construction debris, no matter how small, shall be collected and removed from the site. All wheel ruts shall be filled in and be leveled to match the adjacent grade and material. Re-seeding or re-sodding, or other re-surfacing may be necessary to repair any construction related impacts or damage.

All survey markings, stakes, temporary paint marks, flagging and other devices shall be removed regardless of who installed them. All excess pavement, concrete, gravel, soil, or other construction materials not intended for permanent use shall be removed.

All final slopes shall be dressed manually to remove woody debris, accumulated trash and oversized material. Any new slope or topsoil surfaces shall be hand raked to provide a uniform appearance. The contractor shall dress all gravel, pavement and concrete edges to eliminate abrupt edges and provide a smooth transition. All construction related temporary sediment control devices shall be removed as soon as practical.

**PART 4                   MEASUREMENT AND PAYMENT**

4.1   PAYMENT

Unless specifically noted otherwise, all final cleanup work shall be incidental to other work items in the contract and no separate payment shall be made.

**END OF SECTION 01750**

## SECTION 01800

### EROSION AND SEDIMENT CONTROL

#### Added Section.

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

- A. This work consists of furnishing, constructing, and maintaining permanent and temporary erosion control and sediment control measures as shown on the project drawings and/or project related construction permits.
- B. The Contractor is responsible for control of surface water, subsurface water, and drainage during the construction period. All temporary fills, crossings, and culverts necessary to promote drainage during construction will be installed and removed at the Contractor's expense prior to acceptance of the work. Any claims arising from upstream or downstream damages as a result of the construction or failure of these temporary works will be the Contractor's responsibility.
- C. All dewatering areas or temporary soil cofferdams shall use erosion BMPs as necessary to control offsite sediment turbidity or erosion.

#### PART 2 PRODUCTS

##### 2.1 GENERAL

- A. Temporary and erosion control products utilized include but are not limited to backfill material; berms; brush barriers; erosion control blankets, bales, wattles, logs, rolls; erosion control culvert pipe; detention basins; fertilizer; geotextile; mulch; plastic lining; riprap; sandbags; seed; silt fence; and water.
- B. Contractor will be required to dewater ponds after the Owner has drained the ponds of water. Subsurface water will be present, or make take considerable time to completely drain out, therefore the contractor should have necessary equipment and manpower to dewater prior to commencing work in each respective pond. Proper planning prior to construction start will need to be coordinated with the Hatchery Manager.

##### 2.2 EROSION CONTROL WATTLES

- A. Where designated, provide a sediment retention product made from straw and coconut fiber reinforced with a 100% bio-degradable netting. Use wood stakes to secure sediment retention product in place, spacing per the manufacturer's recommendations. An acceptable product is *SediMax-SW*, manufactured by *North American Green*, or approved equal.

## 2.2 EROSION CONTROL BLANKETS

- A. Where designated, provide a sediment retention product made from straw and coconut fiber reinforced with a 100% bio-degradable netting. Use wood stakes to secure sediment retention product in place, spacing per the manufacturer's recommendations. An acceptable product is *BioNet® S150BN™*, manufactured by *North American Green*, or approved equal.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Provide permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction according to the contract erosion control plan, environmental permits, and as directed by the Project Representative. These erosion control measures shall be designed, implemented, and maintained by the Contractor in accordance with Best Management Practices (BMPs) to control erosion and sediment release from the work site.
- B. Install permanent and temporary erosion control measures according to the Storm Water Pollution Prevention Plan (SWPPP), if applicable, approved construction permits, and erosion control drawings.
- C. Dewater ponds as needed to perform construction in each respective pond. Appropriate methods will need to be used during dewatering so excessive silt or sediment is not introduced into the hatchery pond water circulation system. Additionally, dewatering operations cannot cause undue erosion or damage at discharge location.
- D. When erosion control measures are not functioning as intended, immediately take corrective action.

## PART 4 MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT AND PAYMENT

- A. Erosion and sediment control will not be measured for payment, and is considered incidental to other bid items in this contract.

**END OF SECTION 01800**

## SECTION 02110

### GEOTEXTILE

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

Add the following:

This work also includes the installation of high-survivability, non-woven geotextile beneath riprap rock placement or beneath other materials of construction as specified in the project. A minimum 8 oz non-woven geotextile will be required as specified below.

##### 1.2 REFERENCES

C. Delete this section and add the following:

Provide geotextile meeting the strength requirements from Table 1.

**Table 1. High Survivability, Non-Woven Geotextile Requirements**

	TEST METHODS	UNITS	REQUIREMENTS
Weight	ASTM D-3776-85	oz/sy	8.0
Grab Elongation	ASTM D 4632-86 <sup>(1)</sup>	%	>50
Grab Tensile Strength	ASTM D-4632-86 <sup>(1)</sup>	lbs	220
Trapezoid Tear Strength	ASTM D-4533-85	lbs	95
CBR Puncture Strength	ASTM D-6241	lbs	575
Permittivity	ASTM D 4491	Sec <sup>-1</sup>	≥0.02
Apparent Opening Size	ASTM D 4751	Sieve Size (in)	#30 (≤0.024)
Ultraviolet Stability (Retained Strength)	ASTM D 7238	%	≥80 after 500 hours of exposure

<sup>(1)</sup> Constant rate of extension of 12 in/min.

**END OF SECTION 02110**



## SECTION 02230

### STREET EXCAVATION, BACKFILL AND COMPACTION

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### PART 1 GENERAL

##### 1.3 DENSITY CONTROL TESTING

###### C. Material Submittals

1. The Owner will provide gradation & proctor test results to contractor for use to obtain required compaction. Contractor may need to obtain additional proctor tests if soils vary from initial sample and the required density cannot be met due to differing soil conditions. Cost of proctor tests will be covered under the bid line item for soils testing allowance, unless the allowance has been exhausted, then Owner will complete additional proctor tests for Contractor's use.

#### PART 3 EXECUTION

##### 3.1 CLEARING AND GRUBBING

Add the following:

B. Stockpile the respective road mix, clay liner, and general fill material in separate stockpiles for later re use. Avoid mixing the material as little as possible. If contractor contaminates the road mix or clay liner, he will be required to provide replacement material at no additional costs to the owner.

C. River rock to be salvaged and moved from ponds as illustrated in the design drawings shall be placed as required in the details and site drawings.

##### 3.4 EXCAVATION

Add the following:

Sheeting, Shoring, and Bracing: Except where trench banks are cut back on a stable slope, provide and maintain all sheeting, shoring, and bracing necessary to protect workers, and to protect adjoining grades and structures from caving, sliding, erosion or other damage in accordance with Occupational Safety and Health Standards (29 CFR Part 1926 – Construction Standards for Excavations), the Site Specific Health and Safety Plan, and other applicable codes and governing authorities.

**PART 4 MEASUREMENT AND PAYMENT**

**4.1 METHOD OF MEASUREMENT AND PAYMENT**

1. Items will not be measured for payment and are considered incidental to be paid under respective bid line items.

**END OF SECTION 02230**

**SECTION 02400**  
**GEOMEMBRANE LINER**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. The work in this Section includes the furnishing of all materials, tools, supervision, equipment, and labor consisting of but not limited to: transportation, proper storage and handling, geomembrane layout and placement, seaming, patching, seam testing, removal of unsuitable materials, protection of installed materials and all work incidental to the proper installation of the geomembrane liner, as specified herein and as indicated on the Drawings.
- B. Contractor will provide the geomembrane material, including extrudate/welding rod.
- C. Contractor shall be responsible for geomembrane material staging areas, unloading, stockpiling, storage, and protection.

**1.2 MANUFACTURER'S CONFORMANCE TESTING REQUIREMENTS**

- A. The Contractor shall have the manufacturer provide quality control certificates on each roll of geomembrane delivered to the site. The certificates shall be prepared by the geomembrane manufacturer and shall conform to testing frequencies and parameters as indicated in Part 2.1 of this Section. The certificates shall indicate manufacturer's name, type of material, nominal thickness, roll width and length, and date of manufacture.
- B. Extrudate rod shall be manufactured of the same resin type as the geomembrane and shall have the physical properties as indicated in Part 2.1 of this Section.

**1.3 LINE AND GRADE CONTROL**

- A. The Contractor is responsible for line and grade control for all aspects of the work in this Section in accordance with the Drawings and these Specifications.

**1.4 SUBMITTALS**

- A. The manufacturer shall submit quality control certificates on each roll of the geomembrane. Such test results must document compliance with the specifications in Part 2.1 of this Section.
- B. The Contractor shall submit geomembrane panel layout drawings at least 10 days prior to beginning the installation of the geomembrane liner. The panel layout Drawings shall be prepared at scale not less than 1" = 50'. Each drawing shall show the location of geomembrane panels, seam locations, pipe penetrations, and anchor trench.
- C. Contractor shall submit acceptable verification of installer's qualifications and experience.

- D. During installation, the Contractor shall provide the following to the Engineer:
1. Daily construction progress reports clearly showing geomembrane panels placed by date.
  2. Daily weld test records, including welder startup testing.
  3. Daily records of field seam testing, destructive and non-destructive, for the geomembrane.
  4. Laboratory test results on seam testing must be submitted to the Engineer within 72 hours of seaming, or work will not be permitted to continue.

### **1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Handle and store geomembrane rolls and associated materials in such a manner as to ensure a sound, undamaged condition. Procedures shall be in conformance with manufacturer's recommendations.
- B. Rolls will be stored at the job site away from high-traffic areas but sufficiently close to the active work area to minimize handling. The designated storage area should be flat, dry and stable.
- C. Only non-damaged geomembrane shall be included within the Work.
- D. The Contractor shall replace geomembrane material found to be damaged after delivery to the site, or as a result of unloading, storage, or handling by the Contractor, which is unable to meet the specifications of the project, as necessary.

### **1.6 QUALIFICATIONS**

- A. The manufacturer must have at least five years' experience in the manufacture of the specified geomembrane material. In addition, the geomembrane manufacturer shall have produced at least 10 million square feet of similar material.
- B. The installer must have at least three years' experience in the installation of the specified geomembrane material. Also, the installer must have installed at least 10 projects involving a total of 5 million square feet of similar material within the last three years.
- C. The installer's supervisor must be on-site and be in responsible charge for the full duration of the geomembrane installation. The supervisor must have supervised the installation of at least 2.5 million square feet of geomembrane on a minimum of 5 different projects.
- D. The installer must establish a Quality Control (QC) representative who must be responsible in the field for the quality and integrity of the geomembrane installation, including all testing, inspections, documentation and interaction with the Engineer. The QC representative must have performed these duties on at least 2.5 million square feet of geomembrane.
- E. The Contractor is responsible for all means, methods, techniques, sequences and procedures related to the installation of the geomembrane materials.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. Geomembrane materials shall be delivered to the site and shall be Dura-Skrim® N45B as manufactured by Raven Engineered Films, or approved equal.
- B. The geomembrane liner shall be 45-mil smooth scrim reinforced polyethylene (RPE), also known as reinforced linear low density polyethylene (LLDPE-R).

The geomembrane material shall be tested to the frequencies and physical properties as follows:

<b>45 MIL Reinforced LLDPE Geomembrane Testing Frequency and Test Methods<sup>1</sup></b>		
<b>Test</b>	<b>Frequency</b>	<b>Value</b>
Thickness (ASTM D5199)	Each roll	45 mil (nominal) 40 mil (min. ave.)
Weight (ASTM D5261)	Each roll	210 lb./1,000 ft <sup>2</sup> (nominal) 189 lb./1,000 ft <sup>2</sup> (min. ave.)
Grab Tensile (ASTM D7004) each direction	30,000 lbs.	Strength: 250 lb. (min. ave.) Elongation: 22% (min. ave.)
Tongue Tear (ASTM D5884) each direction	30,000 lbs.	55 lbs. (min. ave.)
Index Puncture (ASTM D4833)	30,000 lbs.	85 lbs. (min. ave.)
Ply Adhesion (ASTM D6636) <sup>2</sup>	30,000 lbs.	20 lbs. (min. ave.)
Oxidative Induction Time (OIT) <sup>2</sup> (a) Standard OIT (ASTM D8117) — or — (b) High Pressure OIT (ASTM D5885)	per formulation	100 (min. ave.) 400 (min. ave.)
Oven Aging at 85°C <sup>2</sup> (ASTM D5721) (a) Standard OIT - % ret. after 90 days (ASTM D8117) <sup>2</sup> — or — (b) High Pressure OIT - % ret. after 90 days (ASTM D5885) <sup>2</sup>	per formulation	35% (min. ave.) 60% (min. ave.)
UV Resistance <sup>2</sup> (ASTM D7238) (a) Standard OIT <sup>2</sup> (ASTM D8117) — or — (b) High Pressure OIT -% ret. after 1600 hrs. (ASTM D5885)	per formulation	N.R. <sup>2</sup> 35% (min. ave.)
NOTES: 1. Properties presented in this table are based on GRI GM25, Test Methods, Test Properties and Testing Frequency for Reinforced Linear Low Density Polyethylene (LLDPE-R) Geomembranes, dated 03/18/2021. 2. See reference notes found in Table 1 from GRI GM25.		

- C. Geomembrane and extrudate rod shall be manufactured with the same resin type. Each batch of resin used to produce the geomembrane and extrudate rod shall have the physical properties as follows:

<b>GEOMEMBRANE RESIN PROPERTIES AND QUALITY CONTROL TESTING REQUIREMENTS</b>		
<b>Test</b>	<b>Standard</b>	<b>HDPE Value</b>
Density	ASTM D1505	0.939 g/cc (max.)
Melt Flow Index	ASTM D1238	1.0 g/10 minutes (max.)

## **2.2 ANCHOR TRENCH**

- A. The Contractor shall excavate the anchor trench at locations as shown on the Drawings. All road gravel materials and anchor trench backfill soils shall be segregated for later re-use. The backfill material shall be a clean soil, free of contamination, sharp rocks, debris of any kind, organic matter, vegetation, and other unsuitable materials over 3 inches in diameter.

## **2.3 TEXTURED WALKWAYS**

- A. Each lined pond shall have an access point opposite side of the kettle walkway and also at the shallow end of pond near the inflow pipe for safe staff access. These access points shall consist of textured walkways as detailed in the project design drawings.
- B. Textured walkways shall be linear low density polyethylene (LLDPE) or RPE (LLDPE-R), and have texturing at a min. on the exposed side for walkways to allow FWP staff safe access into the ponds. The texturing shall have a minimum asperity height of 10 mil, and shall be either co-extrusion (blown film) or structured (calendered extrusion) at the manufacturing facility. Walkways shall be extrusion welded around the entire perimeter to the underlying pond liner, or shall be a separate panel welded to the adjacent smooth geomembrane. All seams shall meet required QC testing between the textured and smooth panels if that option is chosen.

## **PART 3 – EXECUTION**

### **3.1 GENERAL**

- A. All work shall be performed in accordance with the Drawings, these Specifications and manufacturer recommendations.

### **3.2 PREPARATION**

- A. The Contractor shall conduct all work necessary to ensure that the surfaces on which the geomembranes are to be placed are free of irregularities, erosion rills, protrusions, loose soil, changes in grade, stones, rocks, sticks, roots, sharp objects, or debris of any kind that may damage the geomembranes. No areas with standing water or that are excessively softened by high water content shall be allowed.

### 3.3 GEOMEMBRANE LINER INSTALLATION

- A. Panel placement should commence at the upgradient limit of work and progress in a downhill fashion. The panels may be placed by manually unrolling the geomembrane into position or by using heavy equipment provided the chosen method does not create ruts or other damage in the underlying materials or damage the geomembrane. Textured geomembrane shall not be dragged or slid directly over underlying geocomposite strips without the use of a rub sheet. Contractor shall confirm the installed geomembrane does not displace previously installed geocomposite gas venting strips.
- B. The geomembrane panels shall be, to the maximum extent possible, oriented parallel to the line of maximum slope, (i.e., oriented up and down, not across, the side slope). No horizontal seams shall be within five feet of the toe of the slope or any anchor trench. No horizontal seams shall be allowed on slopes unless otherwise approved by the Engineer. Alternative methods of installing pre-fabricated geomembrane panels at the manufacturer and delivering to site in one-piece or sections to be field welded will be considered. Contractor will be required to submit alternative fabrication/installation methods to Engineer for review and approval prior to material manufacture and delivery to site.
- C. After the geomembrane is completely unrolled it must be positioned. If the panel is being installed overlapping a previously placed panel; as recommended by the geomembrane manufacturer, care must be taken to align the sheets for seaming. When positioned, wrinkles shall be worked out of the geomembrane, prior to seaming.
- D. Care must be taken to minimize the extent to which the geomembrane is dragged across underlying soils in order to avoid damage to the surface of the underlying soils. Due to the possible damage that can result from the textured surface of the geomembrane, the geomembrane panels **shall not** be dragged over the surface, except for slight adjustments as may be necessary for obtaining the correct overlap of panels. Rub sheets are **required** if the Contractor chooses to drag the geomembrane over the underlying surface, whether the surface is soil or another geosynthetic material.
- E. All deployed panels must be provided with ballast to geomembrane. At a minimum, sand in burlap bags should be placed every 1 to 2 feet along a seam.

### 3.4 GEOMEMBRANE SEAMING

- A. All geomembrane seam welding shall be by the hot-wedge (fusion) weld method. The welding equipment shall form a double-track fusion weld seam with an air channel in between. Extrusion welding is allowed but shall be limited to detail work and patching, and shall not be used as a general method of seaming unless otherwise approved by the Engineer. The welding process shall be in accordance with the geomembrane manufacturer's recommendations.
- B. Prior to field seaming, the geomembrane surface shall be free of dust, silt and debris. Furthermore, the welding surface must be dry and at the proper temperature as recommended by the geomembrane manufacturer. The installer should be equipped with an ample supply of clean rags to dry and remove dust from the welding surface. A means for preheating the seam prior to welding may be necessary in cold weather.

- C. Seaming shall only be performed under proper weather conditions. The highest and lowest allowable ambient temperatures for welding are based on conditions such as ambient temperature, wind, subgrade conditions, exposure to sunlight, material type, and material thickness. Welding in such temperatures may be performed by increasing or decreasing the welding speeds and/or wedge temperature. Seaming shall not be performed during periods of precipitation. An ambient temperature between 32°F and 90°F as measured six inches above the geomembrane surface is recommended. The Engineer at its discretion may request cessation of seaming due to unacceptable weather conditions or may require an increase in the number of trial welds and/or supplemental destructive seam testing.
- D. All seams shall extend the full length of the panels being joined. When seaming adjacent panels along an anchor trench, the seam shall extend completely through the anchor trench. Plywood or other flat surfaces shall be used to bridge the trench while welding the seam.
- E. All "fish-mouths" and wrinkles on a seam shall be removed by cutting the geomembrane and installing an overlapping patch.
- F. The Contractor shall not conduct any seaming operations without prior notification to the Engineer.

### **3.5 PATCHING**

- A. Once the geomembrane has been deployed, the panels must be examined for flaws, holes, defects and tears. Each location requiring a repair shall be repaired using the following procedures:
  - 1. Patching - A patch shall be used to repair defects in the geomembrane that are 1/8-inch or larger.
  - 2. Abrading and Re-welding - This procedure may be used to repair seam sections that are less than 10 feet in length
  - 3. Spot Welding - Spot welding may be used to repair small tears, pinholes and/or other small defects.
  - 4. Capping – Capping shall be used to repair failed seams that are greater than 10 feet in length.
- B. Patches or caps shall extend at least six inches beyond the edge of the defect. The edges of the patch or cap shall be extrusion welded to the in-place geomembrane after both the liners are abraded to remove the surface sheen of the geomembrane and to provide a surface that is more conducive to accepting the weld. Welding of the repair patch or cap shall be completed by extrusion welding the geomembrane. The repairs shall be non-destructive tested using the vacuum-box method as described in this Section.
- C. The Contractor shall not conduct repairs without prior notification to the Engineer.

### **3.6 GEOMEMBRANE TESTING**

- A. Trial Weld Tests



1. The Contractor shall perform trial welds for each piece of welding equipment to be used as follows: at the beginning of each seaming period, at least once every four (4) hours, when the person running the welding equipment has changed, when the welding equipment has been shut-off or has been unused for a period for one hour or longer, and if there has been a 20°F rise or drop in ambient temperature since the last passing trial weld. The Engineer may require more frequent trial welds when the ambient air temperature is less than 40°F or in the Engineer's observations of seam conditions warrant additional trails welds.
2. Trial welds shall be performed on fragment pieces of geomembrane, varying in length between three-feet (extrusion welds) to ten-feet (double-track welds) long and one (1) foot wide. Once completed, the weld shall be visually inspected for deficiencies before taking a minimum of seven, one-inch wide random specimens from the trial weld. The seven specimens shall be tested by the Contractor for peel and shear strength (five in peel, two in shear) using a field tensiometer with the results being properly recorded by the Contractor and presented to the Engineer daily. When peel testing is performed, both welds of double fusion welds shall be tested to provide an indication of the quality of the weld. All trial weld specimens shall exhibit a film tear bond (FTB) and shall meet or exceed the minimum seam strength requirements. Only those pieces of equipment that provide passing test results shall be used for seaming or repair work
3. Additional trial welds shall be performed for failed samples. This retesting procedure includes adjusting the temperature of the double-track hot-wedge (or extrusion welding gun) and/or the speed at which the double-track hot-wedge weld is performing. Once adjustments have been made, additional trial welds shall be made and tested. If the specimen fails the retest, the seaming apparatus and procedures will not be accepted and shall not be used for seaming until the deficiencies are corrected and a minimum of two consecutive successful trial welds are achieved.

B. Non-Destructive Tests

1. The Contractor shall perform non-destructive tests on all welds during the seaming process to establish seam continuity. All seams constructed in the field shall be subjected to non-destructive testing along their entire lengths (including seams that pass through the anchor trench).
2. The Contractor shall verify the continuity of the entire length of hot wedge welded field seams by performing an air pressure test.
3. The air pressure test shall be performed on all double-track hot-wedge welds. This test method involves the application of air pressure from 27 to 30 psi to the channel between the parallel welds and observing the stability of the pressure for the duration of the test. After a two-minute (minimum) relaxation period to stabilize the air pressure in the channel, the pressure shall be at least 27 psi before beginning the test. The test shall be at least 5 minutes in length. If a pressure loss exceeding 3 psi is observed, the seam shall be considered discontinuous (unacceptable) and repairs shall be made.

4. At the conclusion of a passing seam channel test, the end of the seam channel opposite the pressure test gauge must be cut to relieve the pressure. If the pressure gauge does not detect a drop in pressure it must be assumed that the seam channel is blocked. In this case, the location of the blockage must be identified and the seam retested in segments for continuity.
5. The Contractor shall verify all field seams constructed by the extrusion welding method by performing the vacuum box test.
6. The vacuum box test shall be used on seams that cannot be tested by air pressurization. After a generous amount of soapy solution has been applied to the seam length to be tested, the vacuum box test apparatus shall be placed over the seam and a vacuum of at least 2 psi shall be applied to the seam or until the tested area has risen off the ground due to the applied vacuum. The test apparatus shall stand at the applied vacuum for a period not less than 15 seconds. During the test, the response of the soapy solution shall be observed and noted. Bubbling of the solution indicates the presence of a hole or discontinuity. The location of holes and discontinuities shall be marked and repaired.
7. The Contractor shall not conduct any non-destructive seam tests without prior notification to the Engineer.

C. Destructive Tests

1. The Contractor shall verify that all seam welds are fully integrated with each other and evaluate seam strength by collecting seam samples for destructive testing. At a minimum, one seam sample shall be taken, at random, every 500 feet of seam length. The locations of seam samples shall be determined by the Engineer. If field conditions warrant, or Engineer suspects a seam may not have been constructed properly, samples may be collected at a greater frequency.
2. ***Since the pond liner integrity is foremost importance in the function of the hatchery pond liners, alternative methods to destructive sampling in the pond footprint may be considered by the Engineer, if prior submittal has been reviewed by the Engineer before project initiation. Examples of other methods may include samples on top the slope or near the anchor trench, or other tests which can confirm full compliance of seam integrity while minimizing destructive methods within the pond footprints.***
3. Each destructive sample, measuring twelve (12) inches wide and fifty (50) inches long, shall be cut from the seam by the Contractor. Seven 1-inch wide by 12-inch long specimens shall be cut from each sample by the Contractor. Each specimen shall be tested in the field by the Contractor for peel and shear strength (five in peel, two in shear) using a field tensiometer with the results being properly recorded by the Contractor. Results shall be provided to the Engineer on a daily basis when samples are taken. When peel testing is performed, both welds of double fusion welds shall be tested to provide an indication of the quality of the weld. All specimens shall exhibit a film tear bond (FTB). The peel strength of four out of five specimens in peel shall meet

or exceed the minimum seam strength requirements. The fifth specimen must meet or exceed 80% of the minimum seam strength requirements. If the sample passes the field peel and shear tests, the remaining sections shall be cut and distributed as follows:

- a) one 12 inch by 12 inch section for the Owner,
  - b) one 12 inch by 12 inch section for the Contractor.
4. The Owner, at their discretion and cost, may send seam samples to a laboratory for testing. The test requirements for the independent laboratory testing will be as described below.
  5. Each of the 12-inch by 18-inch samples for laboratory testing shall provide 10 specimens: five for shear and five for peel. When peel testing is performed, both welds of double fusion welds shall be tested to provide an indication of the quality of the weld. All specimens shall exhibit a film tear bond (FTB). The peel (shear) strength of four out of five specimens in peel (shear) shall meet or exceed the minimum seam strength requirements. The fifth specimen must meet or exceed 80% of the minimum seam strength requirements.
  6. If the sample fails the peel and shear tests in the laboratory, then the Contractor has the following options to reconstruct the seam between the failed location and any passed test section, which include:
    - a) cap stripping of the seam, or
    - b) replacing the failed seam with a new two foot wide panel that is double-track welded to the adjacent panels, or
    - c) retrace the failed seam in both directions, by taking additional samples for destructive testing and conducting field peel and shear tests, until the length of the poor quality seam is established. Additional destructive samples shall be collected at minimum intervals of ten (10) feet from the location of the failed sample. Upon attaining passing results from the destructive samples, the seam shall be reconstructed between the passing location and the original failed location.
  7. All passing seams shall be bounded by two locations from which passing laboratory destructive tests have been taken. Reconstructed seams of over 50 feet or more in length must have a sample taken from the reconstructed seam in order to pass the destructive testing.
  8. Testing of the geomembrane seams shall be performed in accordance with ASTM D-7747, in conjunction with GRI-GM19b. All seams shall meet the requirements in the following table:

45 mil Smooth LLDPE-R		
Property	Shear strength	Peel Strength
Hot Wedge/Air Seams <sup>1</sup>	90 lb.	30 lb.
Other Seam Types	100 lb.	30 lb.

Notes: 1) also for other possible seaming methods, e.g. ultrasonic

2) Values are based on 1.0 in. wide strip tensile strength per D7747 for laboratory testing specimens.

#### D. PIPE PENETRATIONS

1. The Contractor shall furnish all liner penetration boots and other appropriate material required to complete the installation of the geomembrane. All geomembrane boots shall be of the same sheet density and at least as thick as the liner being welded to.
2. In attaching the geomembrane liner penetration boot in the field, no field seams or welds will be allowed in locations or configurations that do not allow for quality control testing. Visual observation is not considered a sole acceptable method for in-field quality control.
3. Where clamps, fasteners, gaskets, seals or sealants are used, the Contractor shall use only materials that are compatible with the geomembrane material and the proposed material to be contained.
4. The Contractor shall provide suitable documentation to indicate that the clamps or fasteners will maintain their seal through adverse temperature cycles.

#### 3.7 PROTECTION OF INSTALLED MATERIALS

- A. The Contractor shall be responsible for maintaining installed materials and preventing their damage.
- B. The geomembrane shall be properly secured and/or ballasted so as to prevent uplift by wind or accumulated gases. Any geomembrane that is damaged as a result of the Contractor's negligence to secure the deployed geomembrane properly, shall be the responsibility of the Contractor to replace accordingly. Additional time for completion of the project will not be allowed when materials must be replaced as a result of the Contractor's inability to properly secure the geomembrane.
- C. Vehicular movement over the geomembrane shall not be permitted.
- D. Damaged geomembrane and scrap material are the property of the Contractor and shall be removed from the site and disposed of at a licensed disposal facility. The Contractor shall retain all ownership and responsibility for the geomembrane until final acceptance of the entire project by Owner.

### **3.8 RECORD DRAWINGS**

- A. The Contractor shall submit “as-built” Record Drawings of the geomembrane liner to the Owner within 10 business days after the completion of the project. The drawings shall show geomembrane panel locations panel numbers, repairs, seams, and destructive sample locations and be at a scale not smaller than 1 inch = 50 feet. Three paper copies and one digital copy (AutoCAD 2018 or later) shall be provided.
- B. The Contractor shall provide all QC documentation to the Engineer and Owner at the end of the project prior to project close-out. QC documentation shall include all field installation testing and QC processes.

### **3.9 WARRANTY**

- A. The manufacturer shall warrant that the geomembrane liner is free from manufacturing defects and that the geomembrane, when properly installed and maintained, shall not suffer significant deterioration due to normal weather aging. The material shall be warranted for 20 years minimum.
- B. The Contractor shall guarantee the geomembrane installation against defects in the installation and workmanship for one (1) year commencing with the date of final acceptance.

### **4.0 MEASUREMENT AND PAYMENT**

#### **4.1 GENERAL**

- A. Geomembrane will be measured and paid by the square foot (SQFT) including all labor, equipment, materials and incidentals required for the completion of the work. Waste and overlap has not been factored into the quantities, is considered incidental to the project, and will not be paid as extra.

**END OF SECTION**

## SECTION 02425

### GEOGRID

#### Added Section

#### **PART 1 GENERAL**

##### 1.1 DESCRIPTION

- A. This work includes the installation of triaxial geogrid for use as reinforcement in the gravel access ramps into the slope-lined ponds, as specified in the project drawings.

##### 1.2 REFERENCES

- A. ASTM Standards:

D123 Terminology Relating to Textiles

D1388 Test Methods for Stiffness of Fabrics

D4354 Practice for Sampling Geotextiles

D4439 Terminology for Geotextiles

D4595 Tensile Properties of Geotextiles by the Wide Width Strip Method

D5262 Tension Creep Testing of Geosynthetics

D5322 Practice for Laboratory Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids

D5818 Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics

D6213 Practice for Tests to Evaluate the Chemical Resistance of Geogrids to Liquids

D6637 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi Rib Tensile Method

D6992 Test Method for Accelerated Tensile Creep and Creep Rupture of

Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method

D7737 Test Method for Individual Geogrid Junction Strength

##### 1.3 SUBMITTALS

- A. Submit the following:

1. Certification: The contractor shall provide to the Engineer a certificate stating the name of the manufacturer, product name, style number, and chemical composition and other pertinent information to fully describe the geogrid. The Certification shall state that the furnished geogrid meets MARV requirements of the specification as evaluated under the

Manufacturer's quality control program. The Certification shall be attested to by a person having legal authority to bind the Manufacturer.

2. Quality Standards: The contractor shall provide to the Engineer the Manufacturer's Quality Control Plan.

#### 1.4 QUALITY ASSURANCE

##### 1. Manufacturer Qualifications:

1. The Manufacturer shall have the following credentials:
  - a) Geosynthetic Accreditation Institute (GAI) – Laboratory Accreditation Program (LAP)

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Geogrid labeling, shipment, and storage shall follow ASTM D4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

B. During storage, geogrid rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geogrid.

## **PART 2 PRODUCTS**

### 2.1 MANUFACTURERS

- A. Product shall be Tensar TriAx<sup>®</sup> TX7 triaxial geogrid, or an equivalent which meets the below stated specification requirements and which has been approved by the Engineer.
- B. The geogrid shall be manufactured from a punched polypropylene sheet, which is then oriented in three substantially equilateral directions so that the resulting ribs shall have a high degree of molecular orientation, which continues at least in part through the mass of the integral node.
- C. The index properties contributing to the performance of a mechanically stabilized layer include the following:

**Table 1. Geogrid Index Properties<sup>1</sup>**

	<b>TEST METHODS</b>	<b>UNITS</b>	<b>Longitudinal /Transverse</b>	<b>Diagonal</b>	<b>General</b>
Rib Pitch <sup>2</sup>		mm(in)	40 (1.60)	40 (1.60)	
Mid-rib depth <sup>2</sup>		mm(in)	1.6 (0.06)	2.0 (0.08)	
Mid-rib width <sup>2</sup>		mm (in)	1.3 (0.05)	1.0 (0.04)	
Rib shape					Rectangular
Aperture shape					Triangular

Notes: 1. Unless indicate otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02.

2. Nominal dimensions.

<b>GEOGRID MANUFACTURER’S QUALITY CONTROL TESTS</b>		
<b>Properties</b>	<b>Standard</b>	<b>Value</b>
Tensile Strength (at ultimate)	ASTM D6637	---
Density	ASTM D1505	0.940 g/cc (min.)
Carbon Black Content	ASTM 1603	2%-3%

## **2.2 QUALITY CONTROL**

- A. Manufacturing Quality Control: Testing shall be performed at an on-site laboratory accredited by GAI-LAP for tests required for the geogrid, at frequency meeting or exceeding ASTM D4354.
- B. Ultraviolet Stability shall be verified by an independent laboratory on the geogrid or a geogrid of similar construction.

## **3.0 EXECUTION**

**3.1** Manufacturer’s Installation guidelines shall be followed, unless as otherwise required by the Engineer.

**END OF SECTION 02425**



**SECTION 02450**  
**GEOCOMPOSITE**

Added Section

**PART 1 GENERAL**

1.1 DESCRIPTION

- A. This work includes the installation of bi-planar geocomposite for use as gas venting strips in the fully lined ponds, as specified in the project drawings.
- B. Coordinate the geocomposite installation with the installation of the geomembrane pond liner and subgrade preparation.

1.2 SUBMITTALS

- A. The Contractor shall submit to the Engineer either product cut sheets or samples of the Geocomposite which will be used for the project.
- B. The Contractor shall submit quality control certificates provided by the Manufacturer on each roll of Geocomposite to the Engineer. The certificates shall be prepared by the geocomposite Manufacturer and provide testing frequencies and test results as indicated in Part 2.1 of this Section.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store geocomposite rolls and associated materials in such a manner as to ensure a sound, undamaged condition. Procedures shall be in conformance with Manufacturer's recommendations.
- B. Rolls will be stored at the job site away from high-traffic areas but sufficiently close to the active work area to minimize handling. The designated storage area should be flat, dry and stable. Moisture protection of geocomposite rolls should be provided by its packaging; however, an additional tarpaulin or plastic sheet is recommended to provide extra protection.

1.4 QUALIFICATIONS

- A. The geocomposite manufacturer must have at least five years experience in the manufacture of such geocomposite. In addition, the geocomposite manufacturer shall have produced at least 10 million square feet of similar material.
- B. The geocomposite installer must have at least three years experience in the installation of such geocomposite. Also, the geocomposite installer must have installed at least 10 projects involving a total of 5 million square feet of similar material within the last three years.

- C. The geocomposite installer’s supervisor must be on-site and be in responsible charge throughout the geocomposite installation. The supervisor must have supervised the installation of at least 2.5 million square feet of geocomposite.
- D. The geocomposite installer must establish a Quality Control (QC) representative who must be responsible in the field for the quality and integrity of the geocomposite installation, including all testing, inspections and documentation. The QC representative must have performed these duties on at least 2.5 million square feet of geocomposite.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. The Geocomposite shall be comprised of a needle-punched, non-woven, continuous filament polypropylene geotextile fabric of at least 8 ounce which is factory heat-bonded to both sides to a high-density polyethylene (HDPE) geonet.
- B. The heat bonding technique between the geotextile and the geonet should be that of hot air to prevent flattening of the geotextile surface.
- C. The geocomposite material delivered to the site shall be manufactured by Solmax, Agru-America, GSE Lining Technology, Inc., Tenax Corporation, or approved equal and shall be tested for the frequencies and physical properties as follows:

<b>GECOMPOSITE MANUFACTURER’S QUALITY CONTROL TESTS</b>			
<b>Material</b>	<b>Properties</b>	<b>Standard</b>	<b>Value</b>
Geonet	Thickness	ASTM D5199	250 mil (min.)
	Density	ASTM D1505	0.940 g/cc (min.)
	Carbon Black Content	ASTM 1603	2%-3%
Geocomposite	Ply Adhesion	ASTM D7005	1.0 lbs/in (avg.) 0.5 lbs./in. (min.)
	Transmissivity (ultimate)	GRI GC8	2.50 x 10 <sup>-4</sup> m <sup>2</sup> /s (min.)
Note: Transmissivity shall be measured in a 12” by 12” box using the same boundary conditions, load, duration and gradient as those used by the manufacture to establish the minimum average for the required test value.			

**3.0 EXECUTION**

**3.1 GENERAL**

- A. All work shall be performed in accordance with the Construction Drawings, these Specifications and any pertaining Manufacturer requirements.

**3.2 PREPARATION**

- A. The Contractor shall conduct all work necessary to ensure that the surface on which the geocomposite is to be placed is free of irregularities, protrusions, loose

soil, changes in grade, stones, rocks, sticks, roots, sharp objects, or debris of any kind which may damage the geocomposite or the overlying geomembrane.

### **3.3 GEOCOMPOSITE INSTALLATION**

- A. Contractor shall not drag the geomembrane over the underlying geocomposite, and cause damage to the geotextile portion of the geocomposite or displace the geocomposite strips from the intended location. Contractor will be required to use a rub sheet if they propose to drag the geomembrane.
- B. The geocomposite installer will inspect all deployed panels of geocomposite for proper adhesion of the geotextile to the geonet. If any areas of delamination are identified, they will be marked and replaced by the geocomposite installer at no cost to the Owner.
- C. All deployed panels must be provided with ballast to prevent their movement. The Contractor shall provide ballast, as needed, to prevent the movement of deployed geocomposite. At a minimum, sand in burlap bags should be placed every 1 to 2 feet along a seam. Sand bags shall be removed when placing or prior to installing the geomembrane.

### **3.4 PROTECTION OF INSTALLED MATERIALS**

- A. The Contractor shall be responsible for maintaining installed materials and preventing their damage.
- B. Vehicular movement over the geocomposite strips shall not be permitted. No equipment shall be operated directly on the geocomposite or other geosynthetic surface.
- C. Damaged geocomposite and scrap material are the property of the Contractor and shall be removed from the site at the Contractor's expense.
- D. In the event of damage to prior work or work completed as specified in this Section, the Contractor shall immediately make all repairs and replacements necessary.

### **3.5 WARRANTY**

- A. The geocomposite manufacturer shall warrant that the geocomposite be free from manufacturing defects and that the geocomposite, when properly installed and maintained, shall not suffer significant deterioration due to normal weather aging.
- B. The geocomposite installer shall guarantee the geocomposite installation against defects in the installation and workmanship for one (1) year commencing with the date of final acceptance.

**END OF SECTION 02450**

## SECTION 02475

### CELLULAR SOIL CONFINEMENT SYSTEM

#### Added Section

#### **PART 1 GENERAL**

##### 1.1 DESCRIPTION

- A. This section includes providing all material, labor, tools and equipment for installation of the Cellular Soil Confinement System (geocells) as shown in the Contract Documents and as specified in this section.
- B. The Cellular Soil Confinement System shall be used for slope protection where indicated on the contract drawings for beneath the pond liner.
- C. Coordinate the installation with the geomembrane pond liner and subgrade preparation.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. AASHTO M 218 - Steel Sheet, Zinc-Coated (Galvanized) for Corrugated Steel Pipe.
  - 2. AASHTO M 288 - Geotextile Specification for Highway Applications
- B. American Society of Testing and Materials (ASTM)
  - 1. ASTM D 1505 - Density of Plastics by the Density-Gradient Technique.
  - 2. ASTM D 1603 – Standard Test for Carbon Black in Olefin Plastics
  - 3. ASTM D 1693 – Environmental Stress-Cracking of Ethylene Plastics.
  - 4. ASTM D 5199 – Measuring Nominal Thickness of Geotextiles and Geomembranes.
  - 5. ASTM E 41 – Terminology Relating to Conditioning.

##### 1.3 SUBMITTALS

- A. Submit manufacturer's shop drawings, including Manufacturer's product data, samples and section layout.
- B. Design Calculations and Drawings. Provide a complete set of design calculations including a description of the static analysis performed to determine the slope and crest anchorage requirements.
  - 1. At a minimum; include design conditions, slope stability calculations, calculated factors of safety and friction angles Provide the number of stakes, stake length, attachment device and spacing.
  - 2. Submit cross section and plan view drawings.

- C. Manufacturer's Certificate of Analysis: Manufacturer shall supply certificate of analysis containing the following test results for the cellular confinement material used for project: Base Resin Lot Number(s), Resin Density per ASTM-1505, Production Lot Number(s), Material Thickness, Short Term Seam Peel Strength, and percentage of Carbon Black. Submit qualifications certifying the installer is experienced in the installation of the specified products.
- D. Submit qualifications of Manufacturer's field representative certifying the field representative is experienced in the installation of the specified products.
- E. Equivalent material submittals from other manufacturers must submit records, data, independent test results, samples, certifications, and documentation deemed necessary by the Engineer to prove equivalency. The Engineer shall approve or disapprove other Manufacturers' materials after all information is submitted and reviewed.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in Manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and Manufacturer.
- B. The materials shall be stored in accordance with Manufacturer's instructions. The materials shall be protected from damage and away from direct sunlight.
- C. The materials shall be delivered, unloaded and installed in a manner to prevent and minimize damage.

#### 1.5 QUALITY ASSURANCE AND CONTROL

- A. The cellular confinement system material shall be provided from a single Manufacturer for the entire project.
- B. Any substitute materials submitted shall provide a certification that their cellular confinement manufacturing process is part of an ISO program and a certification will be required specifically stating that their testing facility is certified and in accordance with ISO. An ISO certification for the substitute material will not be acceptable unless it is proven it pertains specifically to the geocell manufacturing operations.
- C. The Manufacturer shall provide certification of compliance to all applicable testing procedures and related specifications upon the customer's written request. Request for certification shall be submitted no later than the date of order placement.
- D. Pre-Installation Meeting: Prior to installation of any materials, conduct a pre-installation meeting to discuss the scope of work and review installation requirements. The pre-installation meeting shall be attended by all parties involved in the installation of the cellular confinement system.
- E. Manufacturer's Field Representative Qualifications:
  - 1. Manufacturer shall provide a qualified field representative on site at the start of construction to ensure the system is installed in accordance with the Contract

Documents.

2. Manufacturer's field representative shall have a minimum 5 years installation experience with the specified products in the specified application.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

Presto Geosystems, PO Box 2399, Appleton, Wisconsin 54912-2399  
Toll Free: (800) 548-3424. Phone: (920) 738-1328. Fax: (920) 738-1222  
E-Mail: [info@prestogeo.com](mailto:info@prestogeo.com). Website: [www.prestogeo.com](http://www.prestogeo.com)  
(or approved equal)

### **2.2 GEOWEB CELLULAR CONFINEMENT SYSTEM**

#### **A. Manufacturing Certification**

1. The Manufacturer shall have earned a certificate of registration, which demonstrates that its quality-management system for its Geoweb cellular confinement system is currently registered to the ISO 9001:2008 and CE quality standards.

#### **B. Base Materials**

1. Polyethylene Stabilized with Carbon Black
  - a. Density shall be 58.4 to 60.2 pound/ft<sup>3</sup> (0.935 to 0.965 g/cm<sup>3</sup>) in accordance with ASTM D 1505.
  - b. Environmental Stress Crack Resistance (ESCR) shall be 5000 hours in accordance with ASTM D 1693.
  - c. Ultra-Violet light stabilization with carbon black.
  - d. Carbon Black content shall be 1.5 to 2 percent by weight, through addition of a carrier with certified carbon black content.
  - e. Carbon black shall be homogeneously distributed throughout material.
  - f. The manufacturer must have an in-place quality control to prevent irregularities in strip material.

#### **C. Cell Properties**

1. Individual cells shall be uniform in shape and size when expanded.
2. Individual cell dimensions (nominal) shall be dimensions  $\pm 10\%$ .
3. GW30V-Cell
  - a. Length shall be 11.3 inches (287 mm).
  - b. Width shall be 12.6 inches (320 mm).
  - c. Nominal area shall be 71.3 in<sup>2</sup> (460 cm<sup>2</sup>) plus or minus 1%.
  - d. Nominal depth shall be 4 inches (100 mm).

#### **D. Strip Properties and Assembly**

1. Perforated Textured Strip/Cell

- a. Strip sheet thickness shall be 50 mil (1.27 mm), minus 5 percent, plus 10 percent in accordance with ASTM D 5199. Determine thickness flat, before surface disruption.
  - b. Polyethylene strips shall be textured surface with a multitude of rhomboidal (diamond shape) indentations.
  - c. Textured sheet thickness shall be 60 mil plus or minus 6 mil (1.52 mm plus or minus 0.15 mm).
  - d. Indentation surface density shall be 140 to 200 per in<sup>2</sup> (22 to 31 per cm<sup>2</sup>).
  - e. Perforated with horizontal rows of 0.4 inch (10 mm) diameter holes.
  - f. Perforations within each row shall be 0.75 inches (19 mm) on-center.
  - g. Horizontal rows shall be staggered and separated 0.50 inches (12 mm) relative to hole centers.
  - h. Edge of strip to nearest edge of perforation shall be a minimum of 0.3 inches (8 mm).
  - i. Centerline of spot weld to nearest edge of perforation shall be a minimum of 0.7 inches (18 mm).
  - j. A slot with a dimension of 3/8 inch x 1-3/8 inch (10 mm x 35 mm) is standard in the center of the non-perforated areas and at the center of each weld.
2. Assembly of Cell Sections
- a. Fabricate using strips of sheet polyethylene each with a length of 142 inches (3.61 m) and a width equal to cell depth.
  - b. Connect strips using full depth ultrasonic spot-welds aligned perpendicular to the longitudinal axis of strip.
  - c. Ultrasonic weld melt-pool width shall be 1.0 inch (25 mm) maximum.
  - d. Weld spacing for GW30V-cell sections shall be 17.5 inches plus or minus 0.10 inch (445 mm plus or minus 2.5 mm).

#### E. Cell Seam Strength Tests

- 1. Minimum seam strengths are required by design and shall be reported in test results. Materials submitted with average or typical values will not be accepted. Written certification of minimum strengths must be supplied to the engineer at the time of submittals.
- 2. Short-Term Seam Peel-Strength Test
  - a. Cell seam strength shall be uniform over full depth of cell.
  - b. Minimum seam peel strength shall be 320 lbf (1,420 N) for 4 inch (100 mm) depth.
- 3. Long-Term Seam Peel-Strength Test
  - a. Conditions: Minimum of 7 days in a temperature-controlled environment that undergoes change on a 1-hour cycle from room temperature to 130 °F (54 °C).
  - b. Room temperature shall be in accordance with ASTM E41.
  - c. Test samples shall consist of two, four-inch (100 mm) wide strips welded together.

- d. Test sample consisting of two carbon black stabilized strips shall support a 160 pound (72.5 kg) load for test period.
4. 10,000-hour Seam Peel Strength Certification

Presto Geosystems shall provide data showing that the high-density polyethylene resin used to produce the Geoweb sections has been tested using an appropriate number of seam samples and varying loads to generate data indicating that the seam peel strength shall survive a loading of at least 209 lbf (95 kg) for a minimum of 10,000 hours.

## **2.3 INTEGRAL COMPONENTS**

### **A. ATRA® Stake Clip**

1. The ATRA Stake Clip is a molded, high-strength polyethylene device available in standard (0.5 inch) and metric (10–12 mm) versions.
2. ATRA Stake Clips can be installed as an end cap on standard (0.5 inch) and metric (10–12 mm) steel reinforcing rods to form ATRA Anchors.

### **B. ATRA® Key**

1. ATRA keys shall be constructed of polyethylene and provide a high strength connection with minimum pull-through of 275 lbs (125 kg).
2. ATRA keys shall be used to connect sections together at each interleaf and end to end connection.
3. Metal staples or zip ties are not allowed.

## **2.4 STAKE ANCHORAGE**

### **A. ATRA® Anchors**

1. ATRA Anchors shall consist of standard (0.5 inch) or metric (10–12 mm) steel reinforcing rod with an ATRA® Stake Clip attached as an end cap.
2. ATRA anchors shall be assembled by inserting the ATRA Stake Clip onto the reinforcing rod so that the end is flush with the top of the ATRA Stake Clip. Prior to attaching the ATRA Stake Clip, the reinforcing rod shall be beveled and free from all burrs.
3. The anchor length and placement shall be as shown in the Contract Documents.

## **2.5 CELL INFILL MATERIALS**

- A. Cell infill material shall be onsite granular fill consisting of USCS classification of lean clay (CL) to fat clay (CH) with sands.
- B. Infill material shall be free of any foreign material.
- C. Infill material shall be free-flowing and not frozen when placed in the Geoweb panels.



### **3.0 EXECUTION**

#### **3.1 GENERAL**

- A. All work shall be performed in accordance with the Construction Drawings, these Specifications and any pertaining Manufacturer requirements.

#### **3.2 EXAMINATION**

- A. Verify site conditions & layout of structures are as indicated on the drawings. Notify the Engineer if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.

#### **3.3 INSTALLATION OF THE CELLULAR SOIL CONFINEMENT SYSTEM**

- A. Prepare subgrade and install cellular soil confinement system in accordance with Manufacturer's recommendations.
- B. Sub Grade Preparation:
  - 1. Excavate or fill foundation soils so top of installed section is flush with or slightly lower than adjacent terrain or final grade as indicated on the drawings or as directed by the Engineer.
  - 2. All subgrade soils beneath the cellular confinement system that must be regraded shall be placed and compacted in lifts not to exceed 12-inches. Compacted soils must meet or exceed 95% of the Standard Proctor.
  - 3. Install geotextile separation layer (if required) on prepared surfaces ensuring required overlaps are maintained and outer edges of geotextile are buried in accordance with the Manufacturer's recommendations.
- C. Section Anchorage
  - 1. Anchorage requirements for the sections shall be as shown on the Contract Documents and as directed by the Engineer.
  - 2. Anchorage with ATRA Anchors
    - a. Position collapsed sections at the crest of the slope.
    - b. If required, excavate the anchor trench at the top of the slope to the depth as shown on the Contract Documents.
    - c. Drive ATRA anchors at the crest of the slope to secure the sections in place and allow expansion of the sections into position.
    - d. After the sections are expanded as desired, drive ATRA Anchors so the arm of the ATRA Stake Clip engages with the top of the cell wall.
    - e. Anchorage pattern and stake length shall be as indicated on the Contract Documents.
    - f. Fill the anchorage trench with the specified material and compact as required.
- D. Section Placement and Connection

1. Verify all sections are expanded uniformly to required dimensions and that outer cells of each section are correctly aligned. Interleaf or overlap edges of adjacent sections. Ensure upper surfaces of adjoining sections are flush at joint and adjoining cells are fully aligned at the cell wall slot.
  2. Connect the sections with ATRA keys at each interleaf and end to end connection. Insert the ATRA key through the cell wall I-slot before inserting through the adjacent cell. Turn the ATRA key 90 degrees to lock the sections together.
- E. Infill Soil Placement
1. Place specified infill in expanded cells with suitable material handling equipment, such as a backhoe, front-end loader, conveyor, or crane-mounted skip.
  2. Limit drop height to a maximum of 3 feet (1 m) to prevent panel distortion.
  3. Fill sections from the crest of the slope to toe or in accordance with Engineer's direction.
  4. Infill material shall be free-flowing and not frozen when placed into the sections.
  5. Evenly spread infill and tamp into place. Overfill the geocell confinement system by a minimum of 2-inches to allow for settlement and protection of the overlying pond liner.
  6. Install pond liner over the completed geocells as required, assuring no damage occurs to both the geocells and the overlying pond liner.

### **3.4 WARRANTY**

- A. The Manufacturer shall warrant each section that it ships to be free from defects in materials and workmanship at the time of manufacture. The Manufacturer's exclusive liability under this warranty or otherwise will be to furnish without charge to the original f.o.b. point a replacement for any section which proves to be defective under normal use and service during the 10-year period which begins on the date of shipment. The Manufacturer reserves the right to inspect any allegedly defective section in order to verify the defect and ascertain its cause.
- B. This warranty shall not cover defects attributable to causes or occurrences beyond the Manufacturer's control and unrelated to the manufacturing process, including, but not limited to, abuse, misuse, mishandling, neglect, improper storage, improper installation, improper alteration or improper application.
- C. The installer shall guarantee the geocell installation against defects in the installation and workmanship for one (1) year commencing with the date of final acceptance.

**END OF SECTION 02475**

## SECTION 02730

### PIPE

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### PART 2 PRODUCTS

##### 2.2 PIPE MATERIALS

###### A. Polyvinyl Chloride Pipe (PVC)

Add the following Section with:

1(b). Pipe for the underdrain collection system shall be Schedule 40 PVC. Perforated sections shall have a perforation schedule of ½-inch dia. perforations at 45-degrees, spaced at 4-inches staggered. Perforations shall be around entire perimeter of pipe.

###### C. High Density Polyethylene Pipe (HDPE)

Remove & replace the following Section with:

1(a). Pipe for the underdrain collection system shall be SDR21 HDPE pipe. Perforated sections shall have a perforation schedule of ½-inch dia. perforations at 45-degrees, spaced at 4-inches staggered. Perforations shall be around entire perimeter of pipe.

**END OF SECTION 02730**

## SECTION 02910

### REVEGETATION

All applicable portions of this specification section in the MPWSS shall apply with the following additions, deletions and/or modifications.

#### PART 1 GENERAL

##### 1.1 DESCRIPTION

Add following:

This work also includes conserving, placing, and finishing topsoil placement at designated areas on the project drawings or as directed by the Engineer.

#### PART 2 PRODUCTS

##### 2.1 SEED

Add the following:

Utilize the following seed mix for all areas to be seeded.

Seed Name	% Pure Live Seed	Lbs. Per Acre
Western Wheatgrass	30	*
Bluebunch Wheatgrass	20	*
Hard Fescue	20	*
Slender Wheatgrass	15	*
Smooth Bromegrass	15	*

\* Drilled Rate = 8 lbs/acre, Broadcast and Hydroseed Rate = 16 lbs/acre

##### 2.2 TOPSOIL

Add the following:

Utilize all salvaged topsoil conserved from clearing and grubbing operations to cover excavation and embankment slopes prior to fertilizing, seeding, or mulching.

##### 2.4 FERTILIZER

Add the following:

When broadcast seeding, apply the fertilizer separately. When drill seeding, do not apply seed and fertilizer in a single mixture. The fertilizer must be applied separately, either broadcast before seed application, or surface banded during seeding.

#### **PART 4 MEASUREMENT AND PAYMENT**

##### **4.1 GENERAL**

Delete this section and add the following:

- A. Revegetation will be measured and paid by the lump sum (LPSM) including all labor, equipment, materials and incidentals required for the completion of the work.
- B. Placing conserved topsoil will not be measured for payment and is considered incidental to other work items in this Contract.

**END OF SECTION 02910**

October 15, 2021

Phillip Jagoda, P.E.  
Montana Fish Wildlife and Parks, Design and Construction  
PO Box 200701  
Helena, MT 59620

**RE: Miles City Fish Hatchery  
Pioneer Technical Services, Inc. Project No. 2101077**

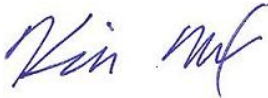
Dear Mr. Jagoda,

On October 7, a sample was delivered to our AASHTO/ASTM accredited materials testing laboratory. The sample was referenced as “Pond #21” and given Lab No. 25692. The testing was performed in general accordance with the following Standards:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C136, C117);
- Standard Proctor Moisture/Density Relationships (ASTM D698 Method A); and
- Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318).

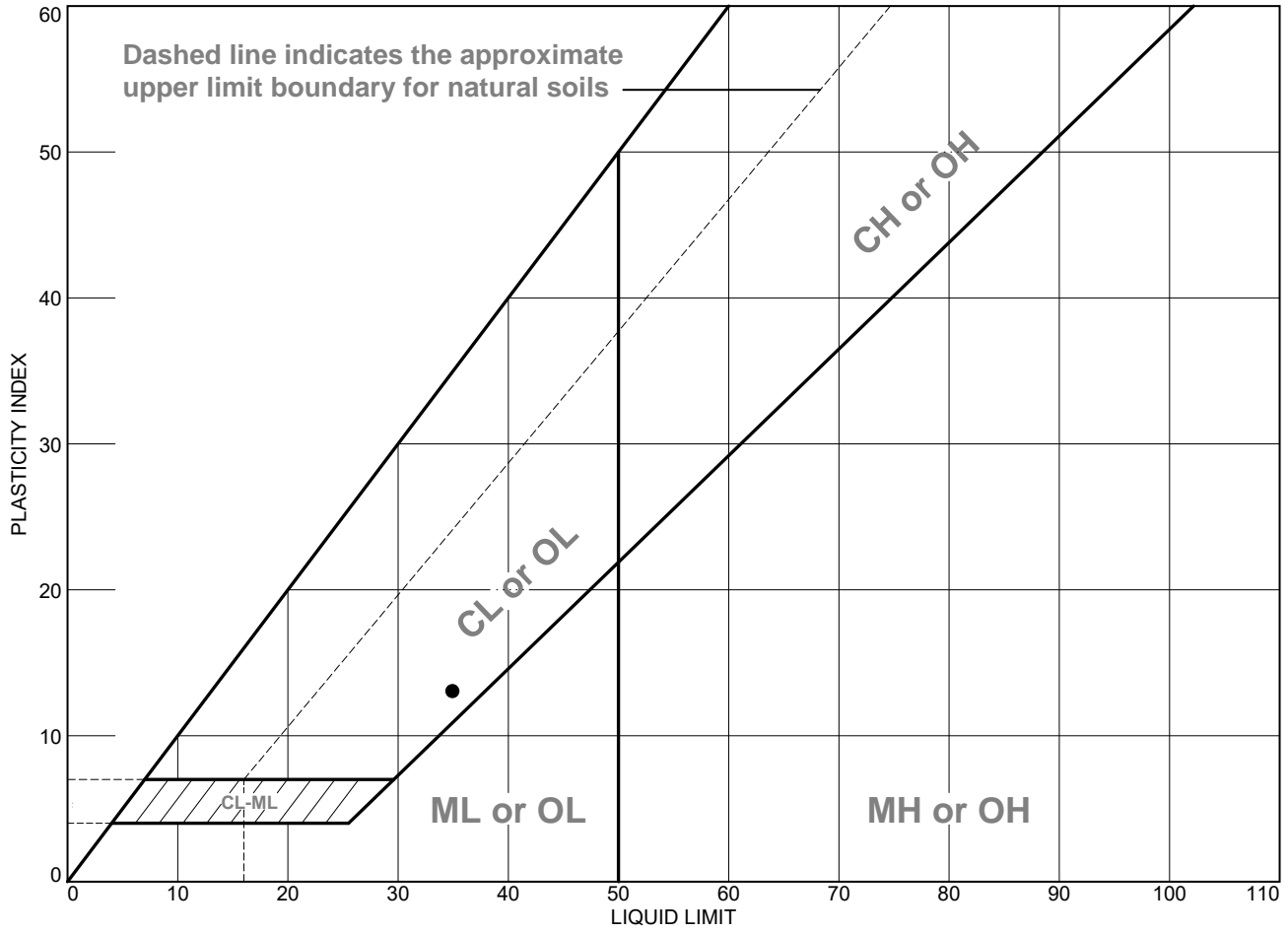
The grain-size distribution, proctor curve, and Atterberg Limits chart are included with this report. We thank you for using Pioneer Technical Services, Inc. for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Kevin Mock at (406) 443-6053.

Sincerely,  
PIONEER TECHNICAL SERVICES, INC.



Kevin Mock  
Materials Testing Supervisor

# LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
● lean clay	35	22	13	97	87	CL

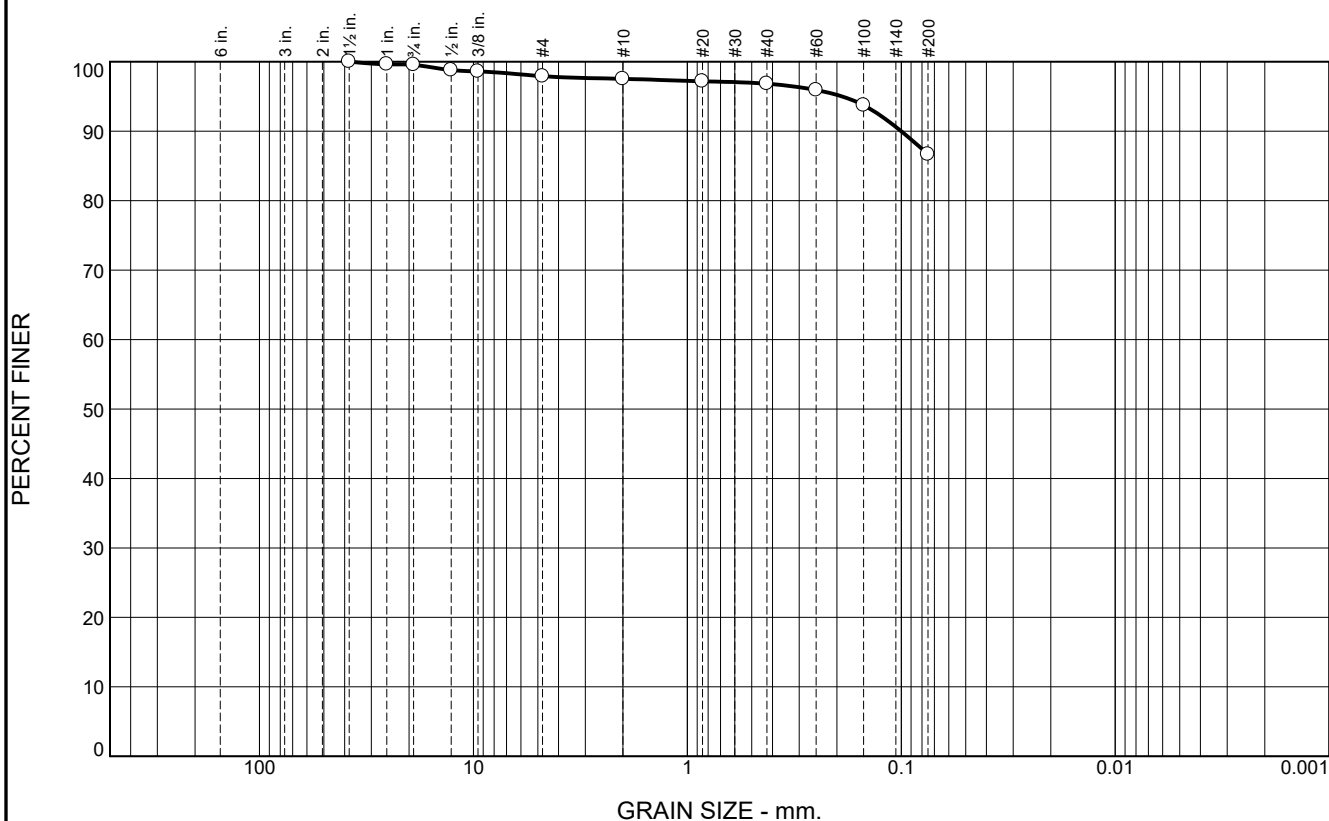
**Project No.** 2101077      **Client:** Montana Fish Wildlife and Parks  
**Project:** Miles City Fish Hatchery  
**● Location:** Pond #21      **Sample Number:** 25692

**Remarks:**



**Figure**

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	0	1	10	87	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100		
1"	100		
3/4"	100		
1/2"	99		
3/8"	99		
#4	98		
#10	98		
#20	97		
#40	97		
#60	96		
#100	94		
#200	87		

**Soil Description**  
lean clay

**Atterberg Limits**  
PL= 22      LL= 35      PI= 13

**Coefficients**  
D<sub>90</sub>= 0.1002      D<sub>85</sub>=      D<sub>60</sub>=  
D<sub>50</sub>=      D<sub>30</sub>=      D<sub>15</sub>=  
D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=

**Classification**  
USCS= CL      AASHTO= A-6(11)

**Remarks**  
F.M.=0.22

\* (no specification provided)

**Location:** Pond #21  
**Sample Number:** 25692

**Date:** 10-13-21

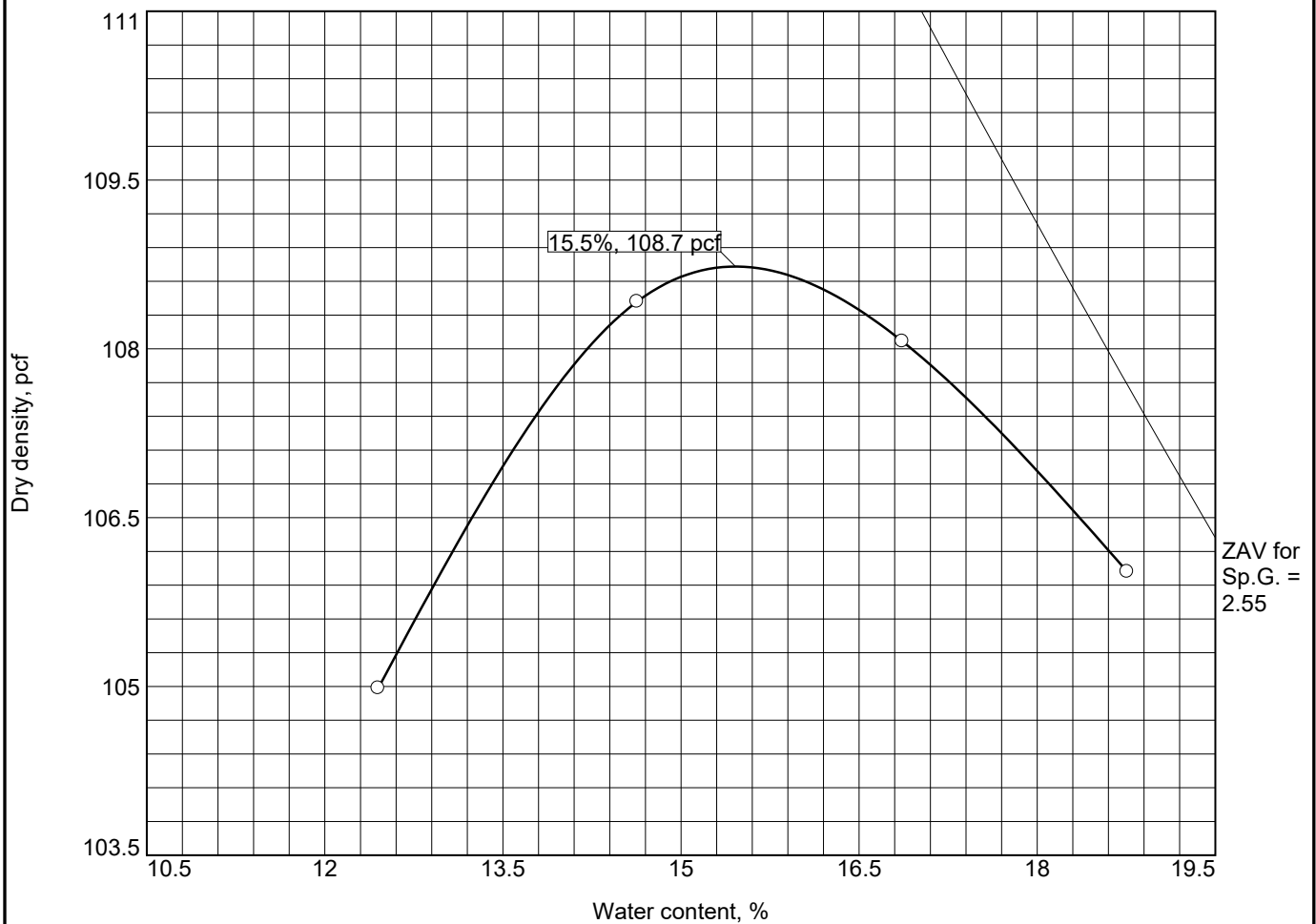


**Client:** Montana Fish Wildlife and Parks  
**Project:** Miles City Fish Hatchery

**Project No:** 2101077


**Figure**





Test specification: ASTM D 698-12 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CL	A-6(11)		2.65	35	13		87

TEST RESULTS		MATERIAL DESCRIPTION
Maximum dry density = 108.7 pcf Optimum moisture = 15.5 %		lean clay
<b>Project No.</b> 2101077 <b>Client:</b> Montana Fish Wildlife and Parks <b>Project:</b> Miles City Fish Hatchery  <b>Date:</b>		<b>Remarks:</b>
<b>Location:</b> Pond #21 <b>Sample Number:</b> 25692		
		<b>Figure</b>



May 17, 2012

Mr. Kenneth Phillips, P.E.  
MT FWP Design & Construction  
PO Box 200701  
Helena, MT 59620

**RE: Miles City Hatchery  
Pioneer Technical Services Project No. 16636**

Dear Mr. Phillips,

On May 10<sup>th</sup>, a sample from the Miles City Hatchery Project was delivered to our ASTM/AASHTO accredited materials testing laboratory. The sample was referenced as 'Miles City Liner' and given Lab No. 12616. The testing request was:

- Standard Test Method for Particle-Size Analysis of Soils (ASTM D422);
- Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318);
- Proctor Moisture/Density Relationships (ASTM D698 Method A);
- Standard Test Method for pH of Soils (MT 232); and,
- Standard Test Method for Water-Soluble Sulfate in Soil (MT 232).

**Table 1 – Corrosivity Testing Results**

Lab No.	pH (s. u.)	Soluble Sulfate (%)
12616	8.4	0.1679

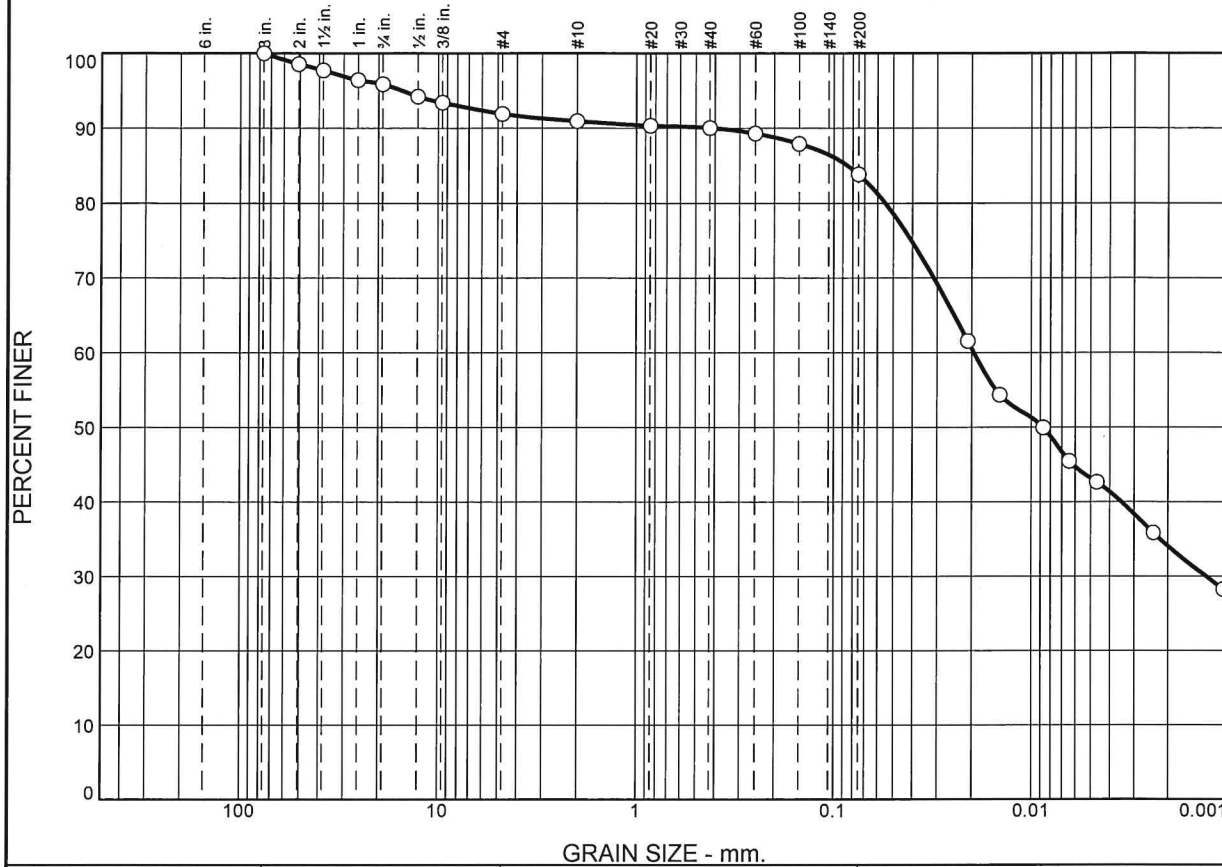
The grain size distribution chart, Atterberg limits chart, USDA textural classification chart and the Proctor curve are included with this report. We thank you for using Pioneer Technical Services for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Todd Lorenzen or Paul Bushnell at (406) 443-6053.

Sincerely,  
PIONEER TECHNICAL SERVICES, INC.

Todd Lorenzen, P.E.  
Senior Geotechnical Engineer

Paul Bushnell  
Materials Testing Supervisor

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	4	4	1	1	6	41	43

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	99		
1.5	98		
1	96		
.75	96		
.5	94		
.375	93		
#4	92		
#10	91		
#20	90		
#40	90		
#60	89		
#100	88		
#200	84		

**Material Description**

fat clay with sand

**Atterberg Limits**  
 PL= 16      LL= 58      PI= 42

**Coefficients**  
 D<sub>90</sub>= 0.4005      D<sub>85</sub>= 0.0851      D<sub>60</sub>= 0.0195  
 D<sub>50</sub>= 0.0087      D<sub>30</sub>= 0.0013      D<sub>15</sub>=  
 D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= CH                      AASHTO= A-7-6(36)

**Remarks**

\* (no specification provided)

**Source of Sample:** Miles City Liner  
**Sample Number:** 12616

**Date:**

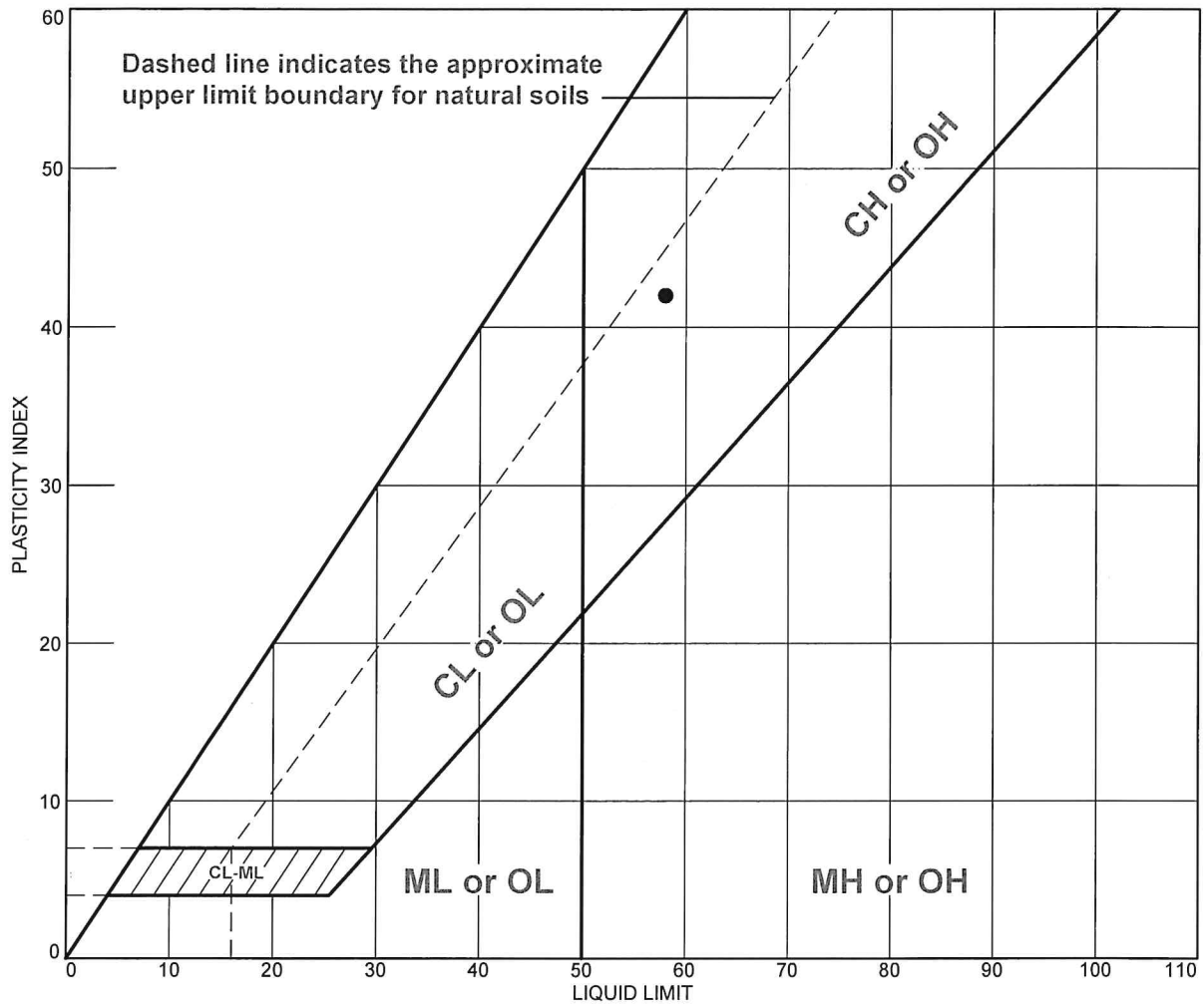


**Client:** MT FWP Design & Construction  
**Project:** Miles City Hatchery

**Project No:** 16636

**Figure**

# LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• fat clay with sand	58	16	42	90	84	CH

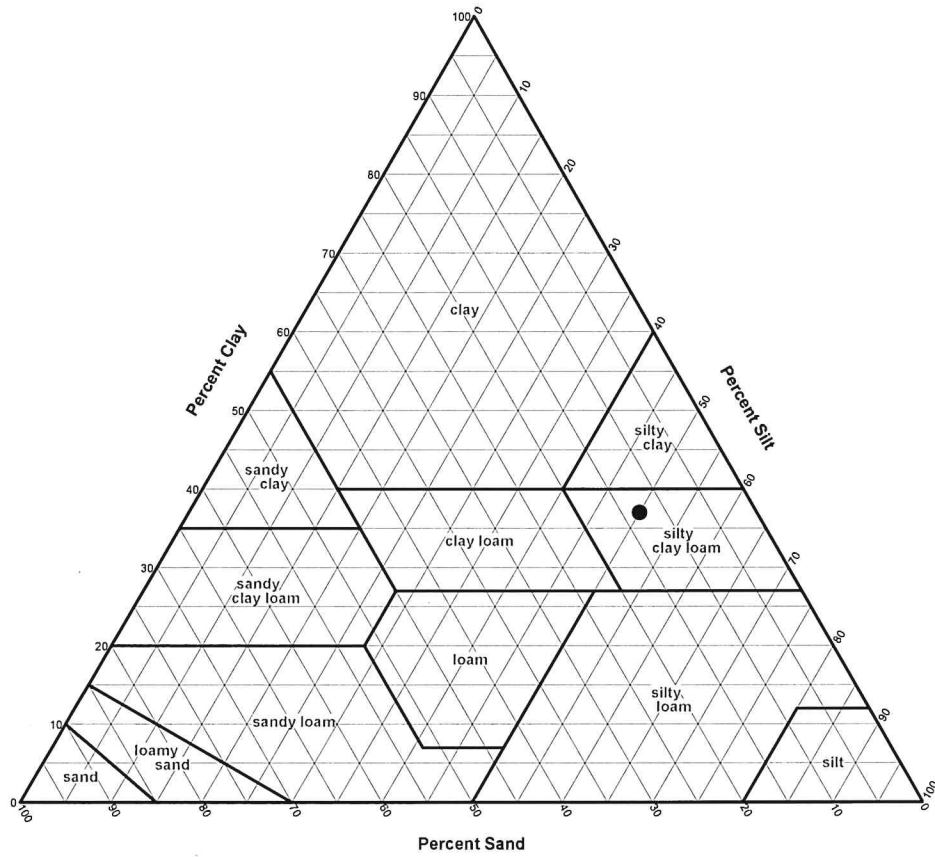
**Project No.** 16636      **Client:** MT FWP Design & Construction  
**Project:** Miles City Hatchery  
**• Source of Sample:** Miles City Liner      **Sample Number:** 12616

**Remarks:**



Figure

# USDA Soil Classification



SOIL DATA						
Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
			Sand	Silt	Clay	
● Miles City Liner	12616		13	49	37	Silty clay loam



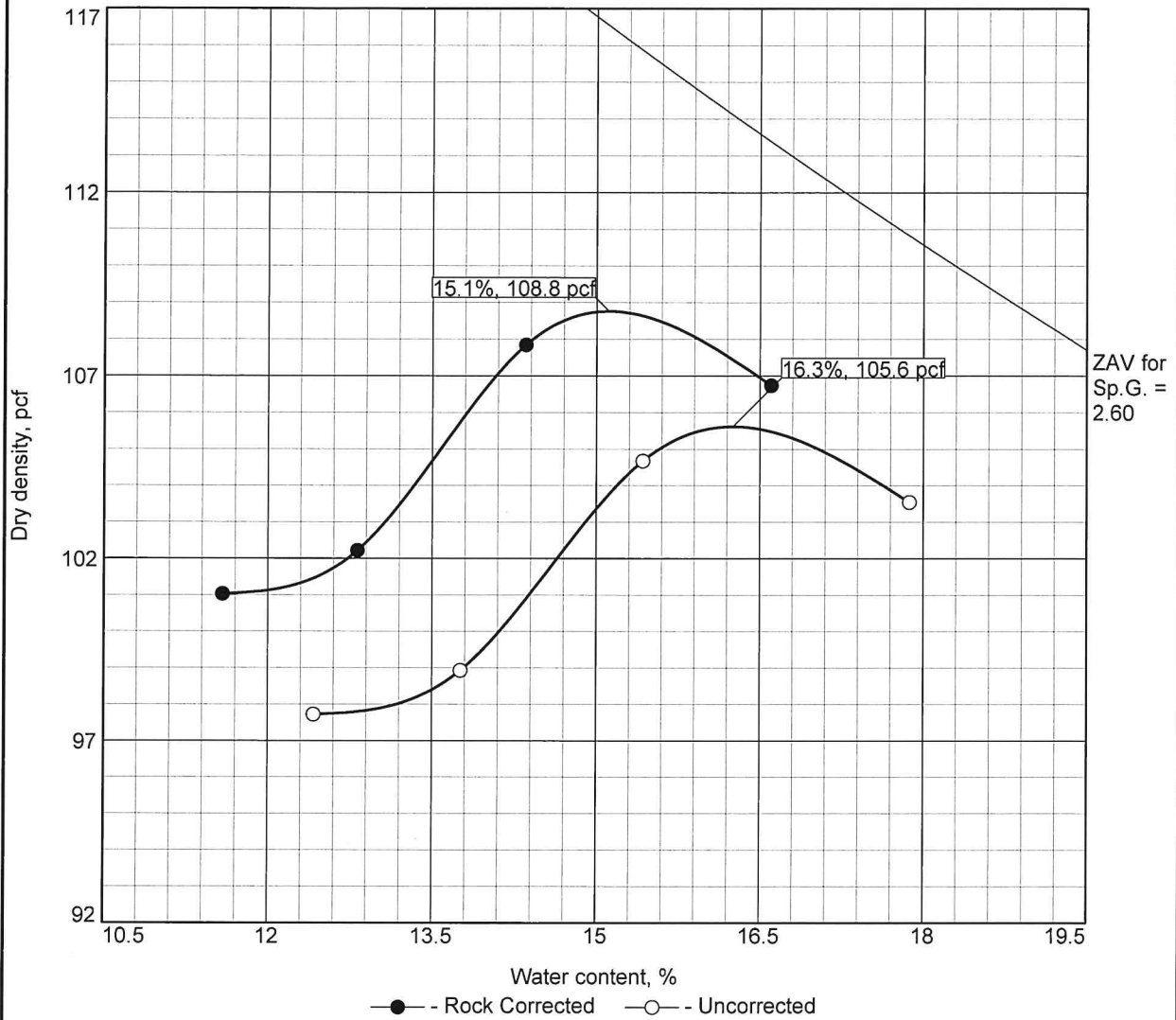
**Client:** MT FWP Design & Construction

**Project:** Miles City Hatchery

**Project No.:** 16636

**Figure**

# COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method A Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CH	A-7-6(36)			58	42	8	84

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 108.8 pcf	105.6 pcf	fat clay with sand
Optimum moisture = 15.1 %	16.3 %	

**Project No.** 16636      **Client:** MT FWP Design & Construction  
**Project:** Miles City Hatchery

○ **Source of Sample:** Miles City Liner      **Sample Number:** 12616

**Remarks:**



**Figure**