

**TECHNICAL SPECIFICATIONS**

**FOR**

**UNIT 1 FINAL COVER MAINTENANCE**

McCourtney Road Landfill  
Nevada County, California

February 2017

Prepared for:

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## TABLE OF CONTENTS

DIVISION 1 – GENERAL REQUIREMENTS .....	1
SECTION 01010 – SUMMARY OF WORK.....	1
SECTION 01020 – SITE SAFETY .....	4
SECTION 01039 - COORDINATION AND MEETINGS .....	6
SECTION 01050 – FIELD ENGINEERING .....	8
SECTION 01300 – SUBMITTALS.....	11
SECTION 01400 – QUALITY CONTROL .....	12
SECTION 01600 – MATERIAL AND EQUIPMENT .....	14
SECTION 01700 – CONTRACT CLOSEOUT.....	15
DIVISION 2 – SITE WORK.....	16
SECTION 02010 – MOBILIZATION.....	16
SECTION 02220 – EXCAVATION AND GRADING .....	17
SECTION 02243 – GEOSYNTHETIC CLAY LINER .....	23
SECTION 02270 – EROSION CONTROL.....	31

## ATTACHMENTS

PROJECT PLANS

CQA PLAN

## **DIVISION 1 – GENERAL REQUIREMENTS**

### **SECTION 01010 – SUMMARY OF WORK**

#### **PART 1 - GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Summary of work
- B. Contractor use of site and premises
- C. Work sequence
- D. Owner occupancy

##### **1.02 RELATED SECTIONS**

- A. General Conditions
- B. Special Conditions

##### **1.03 SUMMARY OF WORK**

- A. Existing site conditions: The Contractor shall make a thorough examination of the site to determine all existing conditions affecting the work.
- B. The work to be performed by the Contractor shall conform to the requirements of the General Conditions, these specifications, project plans, CQA Plan and other related documents, and shall include the furnishing of all labor, materials, tools, equipment and services necessary therefore incidental to complete the project. The work shall consist of, but not be limited to, the following:
  - C. Repair Areas 1 and 2
    - 1. Remove topsoil layer and vegetative layer to new GCL (geosynthetic clay liner, see Sheet 2) subgrade. Stockpile topsoil (upper six inches) and vegetative soil separately for reuse.
    - 2. Grade, prepare and compact the subgrade surface with a smooth drum roller to support the new GCL.
    - 3. On the perimeter of the repair area, remove soil from existing GCL surface for overlap. Preserve the existing GCL and do not allow equipment traffic directly on GCL.

4. Preserve landfill gas wellheads. One 4-inch PVC well casing is located within each repair area. Owner will remove and replace wellhead and lateral gas piping.
5. Subcontract with qualified Geosynthetic Installer for installation of new GCL over the prepared soil surface and installation of new well boots.
6. Replace the vegetative layer using select imported soil and onsite soil. No angular materials or rocks greater than 1 inch in any dimension may be placed within 6 inches of the GCL.
7. Replace topsoil layer.
8. Fertilize and seed.
9. Install erosion controls.

D. Minor Repair Areas 3 through 10

1. Place and compact additional topsoil layer (typically 6 to 12 inches) to repair surface and promote drainage using select imported soil.
2. Fertilize and seed.
3. Install erosion controls.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Access to site is by the main facility entrance on Wolf Mountain Road. Contractor shall check in at the site office and shall make prior arrangements for site access during non-business hours, if necessary.
- B. Temporary power, if needed, is the responsibility of the Contractor.
- C. Water for dust control and earthwork will be available at the facility.
- D. Borrow soil is stockpiled near the repair areas for Contractor's use. An estimated 220 cubic yards (as measured in place) of select soil will need to be imported in addition to using approximately 50 cubic yards of onsite borrow soil located on the landfill deck.
- E. Construction operations are limited to the immediate vicinity of the repair areas and the existing access roads.
- F. Contractor is responsible for securing the work site so that it does not present a safety hazard.

## 1.05 WORK SEQUENCE

- A. Contractor shall submit a work schedule indicating sequence and dates for various phases of construction.
- B. Contractor shall subcontract with qualified Geosynthetic Installer for installation of GCL.
- C. Contractor shall notify CQA Monitor of any changes in schedule as soon as changes are anticipated.

**END OF SECTION**

## **SECTION 01020 – SITE SAFETY**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Requirements for site safety plan
- B. Information regarding potential contaminants

#### **1.02 RELATED SECTIONS**

- A. Section 02220 Excavation and Grading

#### **1.03 REFERENCES**

- A. Occupational Safety and Health (OSHA) Standards

#### **1.04 SITE SAFETY PLAN**

- A. Contractor shall prepare a site-specific safety plan describing the methods Contractor will implement to insure the safety of Contractor employees. Safety topics include but are not limited to:
  - 1. Protection from health risks associated with municipal refuse.
  - 2. Protection from health risks and other risks associated with landfill gas.
  - 3. Protection from accident and injury related to equipment operations, heat stress, earthwork and other work related to construction activities.
- B. The site safety plan shall include emergency response plans for fire and injury, including emergency telephone numbers and a map and directions to the nearest hospital.

#### **1.05 PRESCRIPTIVE STANDARDS**

- A. No smoking shall be allowed within 100 feet of the landfill unit.
- B. No open flame, sparks, welding or other source of combustion shall be allowed within 100 feet of the landfill unit.
- C. Preserve and protect the existing landfill components, including landfill liner components, gas wells, existing GCL and new GCL.
- D. Conduct a safety orientation prior to beginning work, and for all new employees, and conduct daily tailgate safety meetings.

- E. Maintain a copy of the site safety plan and material safety data sheets for chemicals, fuels or lubricants used at the site, in an unlocked location available to all employees, visitors, Owner, CQA Monitor and Engineer.
- F. Conform to all applicable OSHA standards.
- G. These prescriptive standards are intended as minimum requirements, and do not relieve Contractor of responsibility to assure safety of Contractor employees and site visitors.

#### 1.06 SUBMITTALS

- A. Keep a copy of the safety plan on site at all times during the work, and submit a copy of the site safety plan to the Local Enforcement Agency (LEA; Nevada County Department of Environmental Health) upon request.

#### 1.07 MEASUREMENT AND PAYMENT

- A. Work under this section shall be considered incidental, and no separate payment shall be made.

**END OF SECTION**

## **SECTION 01039 - COORDINATION AND MEETINGS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Coordination
- B. Field Engineering
- C. Preconstruction meeting
- D. Geosynthetics pre-installation meeting
- E. Progress meetings

#### **1.02 RELATED SECTIONS**

- A. Section 01700 - Contract Closeout

#### **1.03 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

#### **1.04 FIELD ENGINEERING**

- A. Set and verify finish subgrade for soil surface receiving new GCL and finish grade of topsoil surface.

#### **1.05 PRECONSTRUCTION MEETING**

- A. After notice of award, Owner will schedule a meeting at the site prior to or during mobilization.
- B. Attendance required: Contractor, Owner, Engineer, CQA Manager
- C. Agenda
  1. Designation of personnel representing the parties in contract, responsibilities, authority and lines of communication
  2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, requests for information and contract closeout procedures
  3. Schedule
  4. Owner's requirements



5. Construction facilities provided by Owner, construction water source
6. Security and housekeeping procedures
7. Testing and recordkeeping procedures, correcting and documenting construction deficiencies
8. Work area security and safety
9. Definition of storage areas, work areas, stockpile areas, laydown areas, access roads, haul roads, and related items.

#### 1.06 GEOSYNTHETICS PRE-INSTALLATION MEETING

- A. Contractor will schedule a meeting at the site prior to or during mobilization for GCL installation.
- B. Attendance required: Contractor, Geosynthetic Installer, Owner, Engineer, CQA Manager
- C. Agenda
  1. Submittals and review
  2. Subgrade acceptance
  3. Schedule
  4. Responsibilities, authority and lines of communication
  5. Work area security and safety
  6. Procedures for correcting and documenting construction deficiencies
  7. Definition of storage areas, work areas, stockpile areas, laydown areas, access roads, haul roads, and related items

**END OF SECTION**

## **SECTION 01050 – FIELD ENGINEERING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Survey and field engineering, and layout of all work.
- B. Establishing and maintaining all lines and grades.
- C. Project record documents.

#### **1.02 RELATED SECTIONS**

- A. Proposed finish grade contours are shown on the project plans for Repair Areas 1 and 2. Survey is required for Repair Areas 1 and 2.
- B. Proposed finish grade contours for minor Repair Areas 3 through 5 and 7 through 10 shall match surrounding contours and maintain a minimum slope of 2% to drain.
- C. Proposed finish grade contours for minor Repair Area 6 shall match surrounding contours and maintain uniform slope.
- D. Information regarding survey monumentation is available to bidders.
- E. Basic site engineering requirements may also be described in other sections of these specifications.

#### **1.03 QUALITY ASSURANCE**

- A. Employ a Land Surveyor or Engineer registered in the State of California and acceptable to the Engineer, to perform survey work of this section.

#### **1.04 SUBMITTALS FOR REVIEW**

- A. Data demonstrating qualifications of persons proposed to be engaged for field engineering services. On request, submit documentation verifying accuracy of survey and field engineering work.
- B. Submit a certificate signed by a registered professional that the elevations and locations of the work in Repair Areas 1 and 2 are in conformance with contract documents.

#### **1.05 PROJECT RECORD DOCUMENTS**

- A. Maintain a complete and accurate log of control and survey work.

#### **1.06 EXAMINATION**

- A. Verify locations of survey control points prior to starting work.

- B. Promptly notify the Engineer of any discrepancies discovered.

#### 1.07 SURVEY REFERENCE POINTS

- A. Contractor to locate and protect survey control and reference points.
- B. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- C. Promptly report to the Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- D. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to and approval from the Engineer.

#### 1.08 SURVEY REQUIREMENTS

- A. Provide field engineering services.
- B. Utilize recognized engineering survey practices.

#### 1.09 MEASUREMENT AND PAYMENT

- A. Payment for field engineering is lump sum, and includes all work associated with surveying, project layout and construction control.

### **PART 2 - PRODUCTS**

#### 2.01 GRADE SHEETS

- A. Provide copies of grade sheets to Engineer.

#### 2.02 TOLERANCES

- A. Subgrade for new GCL:
  1. Finish subgrade shall be constructed to within plus 0.0 foot or minus 0.1 foot for grades and +/- 1 foot for lines.
  2. Finish subgrade surface shall not vary by more than 0.10 foot from a uniform plane when measured with a 10-foot straight edge.
  3. A minimum slope of 2 percent shall be maintained in at least one direction from any given point.
- B. Finish grade for topsoil layer:
  1. Finish topsoil layer for Repair Areas 1 and 2 shall be constructed to within +/- 0.1 foot for grades and +/- 1 foot for lines.

2. A minimum slope of 2 percent shall be maintained in at least one direction from any given point for finish topsoil layer at Repair Areas 1 through 5 and 7 through 10 on the landfill deck.
3. Finish topsoil layer for Repair Area 6 shall confirm with the surrounding landfill slope.
4. Finish grade shall slope away from nearby landfill gas wells at a minimum slope of 10 percent for a distance of 5 feet.

**END OF SECTION**

## **SECTION 01300 – SUBMITTALS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Submittal procedures
- B. Construction progress schedules
- C. Manufacturer's certificates

#### **1.02 RELATED SECTIONS**

- A. Section 01400 Quality Control

#### **1.03 SUBMITTAL PROCEDURES**

- A. Transmit each submittal with a transmittal form approved by Nevada County Department of Public Works
- B. Sequentially number the transmittal forms
- C. For revisions and resubmittals, identify all changes made since previous submission

#### **1.04 CONSTRUCTION PROGRESS SCHEDULES**

- A. Submit initial schedule within 10 days after notice to proceed, and prior to start of work.
- B. Revise and resubmit as required.
- C. Notify CQA Monitor as soon as schedule changes are anticipated.

**END OF SECTION**

## **SECTION 01400 – QUALITY CONTROL**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Quality control
- B. Quality assurance

#### **1.02 RELATED SECTIONS**

- A. Section 01300 Submittals

#### **1.03 REFERENCES**

- A. Conform to referenced standards by date of issue current upon date of contract.
- B. Should specified reference standards conflict with contract documents, request clarification from the Engineer before proceeding.
- C. Contractual relationships of the parties to the contract shall not be altered from those set forth in the contract documents by mention or inference otherwise in any reference document.

#### **1.04 QUALITY CONTROL**

- A. Contractor shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply fully with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with contract documents, request clarification from the Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.

#### **1.05 QUALITY ASSURANCE**

- A. Owner is to retain QA Manager and QA Monitor pursuant to the Construction Quality Assurance (CQA) Plan (Holdrege & Kull, February 2017).
- B. The Contractor shall cooperate with the CQA Monitor, prepare earthwork testing areas using earthwork equipment, furnish samples of material.

- C. Notify CQA Monitor promptly when changes in schedule are anticipated, and no less than 24 hours prior to expected time for operations requiring services.
- D. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for excessive retesting will be charged to the Contractor by deducting inspection or testing charges from the contract price.

#### 1.06 MANUFACTURER CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer to the Engineer.
- B. Indicate whether material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but must be acceptable to the Engineer.

**END OF SECTION**

## **SECTION 01600 – MATERIAL AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Products
- B. Transportation and handling
- C. Storage and protection

#### **1.02 RELATED SECTIONS**

- A. Section 01300 Submittals
- B. Section 01400 Quality Control

#### **1.03 TRANSPORTATION AND HANDLING**

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.

#### **1.04 STORAGE AND PROTECTION**

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store sensitive products in weather-tight, climate-controlled enclosures.
- C. For exterior storage of fabricated products, place on sloped supports, above ground.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of product.
- E. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.

**END OF SECTION**



## **SECTION 01700 – CONTRACT CLOSEOUT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Closeout procedures
- B. Project record documents

#### **1.02 CLOSEOUT PROCEDURES**

- A. Clean work site, remove waste and surplus materials.
- B. Submit written certification that contract documents have been reviewed, work has been inspected and work is complete in accordance with contract documents and ready for the Engineer's review.
- C. Provide submittals to the Engineer that are required by governing or other authorities.
- D. Submit final application for payment identifying total adjusted contract sum, previous payments, and sum remaining due.

#### **1.03 PROJECT RECORD DOCUMENTS**

- A. Submit grade sheets, geosynthetics product data sheets, manufacturer's certifications and installation layout sheets.

**END OF SECTION**

## **DIVISION 2 – SITE WORK**

### **SECTION 02010 – MOBILIZATION**

#### **PART 1 - GENERAL**

##### **1.04 SECTION INCLUDES**

- A. Mobilization procedures

##### **1.05 MOBILIZATION PROCEDURES**

- A. This work shall consist of preparatory work and operations necessary for the movement of personnel, equipment, materials, supplies, and incidentals to the site, and all other work and operations that must be performed or that cause costs to be incurred prior to beginning work on the various items under this contract (Bonds, initial schedules, etc.).

##### **1.06 MEASUREMENT AND PAYMENT**

- A. Payment for mobilization is lump sum including all incidentals.

**END OF SECTION**

## **SECTION 02220 – EXCAVATION AND GRADING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

##### **A. Repair Areas 1 and 2**

1. Remove topsoil layer and vegetative layer to new GCL subgrade (see Sheet 2). Stockpile topsoil (upper six inches) and vegetative soil separately for reuse.
2. Grade, prepare and compact the surface with a smooth drum roller to support the new GCL.
3. On the perimeter of the repair area, remove soil from existing GCL surface for overlap. Preserve the existing GCL and do not allow equipment traffic directly on GCL.
4. Preserve landfill gas wellheads. One 4-inch PVC well casing is located within each repair area. Owner will remove and replace wellhead and lateral gas piping.
5. Subcontract with qualified Geosynthetic Installer for installation of new GCL over the prepared soil surface and installation of new well boots.
6. Replace the vegetative layer using select imported soil and onsite soil. No angular materials or rocks greater than 1 inch in any dimension may be placed within 6 inches of the GCL.
7. Replace topsoil layer.

##### **B. Minor Repair Areas 3 through 10**

1. Place and compact additional topsoil layer (typically 6 to 12 inches) to repair surface and promote drainage using select imported soil.

#### **1.02 RELATED SECTIONS**

- A. Section 01050 Field Engineering
- B. Section 01400 Quality Control
- C. Section 02270 Erosion Control

#### **1.03 MEASUREMENT AND PAYMENT**

- A. Payment for site grading is lump sum including all incidentals. Payment for import of select soil is per cubic yard as measured in place.

#### 1.04 REFERENCES

- A. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils
- B. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- C. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- D. ASTM D2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

#### 1.05 QUALITY CONTROL

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. See Section 01050 Field Engineering for tolerances for line and grade.
- C. A qualified testing laboratory will be retained by the Owner to perform QA tests for soil compaction and for observation of the earthwork. Owner's QA testing does not relieve Contractor from QC responsibilities and contract responsibilities.
- D. Samples of all imported fill material shall be delivered to Engineer at least five (5) days prior to import of soil. Written approval of material must be obtained prior to import.

#### 1.06 PRESERVE LANDFILL GAS WELLHEADS DURING EARTHWORK

- A. Preserve landfill gas wellheads and laterals. Well casings are located within Repair areas 1, 2, 4, 8, and 9.

#### 1.07 SUBCONTRACT QUALIFIED GEOSYNTHETIC INSTALLER

- A. Subcontract qualified Geosynthetic Installer for installation of new GCL over the prepared subgrade.

#### 1.08 SUBMITTALS

- A. Submit representative soil samples to Engineer at least five days prior to import of soil material. Obtain written approval of material prior to import. Comply with General Conditions and pertinent provisions of Section 01300.

## 1.09 PRODUCT HANDLING

- A. Comply with provisions of Section 01600. Protect soil and soil stockpiles from erosion by wind or rain.

## PART 2 - PRODUCTS

### 2.01 SELECT IMPORT

- A. Representative sample of proposed select import soil shall be submitted for review by Engineer prior to import.
- B. Select import shall be uncontaminated, clean and free of debris and organic matter, and shall contain no rocks greater than 1 inch in any dimension and no sharp, angular material.

### 2.02 VEGETATIVE LAYER

- A. Vegetative layer soil is to be removed, stockpiled and replaced.
- B. Onsite borrow used to supplement the vegetative layer shall be uncontaminated, clean and free of debris and organic matter, and shall contain no rocks greater than 3 inches in any dimension. Rocks or rock fragments greater than 1 inch must be screened or otherwise removed from the fill. No rocks greater than 1 inch in any dimension shall be placed within 3 inches of any GCL.

### 2.03 TOPSOIL LAYER

- A. Topsoil (upper six inches of existing soil) is to be removed, stockpiled separately and replaced.
- B. No additional topsoil is necessary if the existing topsoil is preserved and stockpiled separately. If additional topsoil is required because it was not adequately preserved, Contractor shall provide it at Contractor's cost, meeting the following requirements:
  - 1. Gradation Limits: Sand, 50 to 80 percent; clay 20 percent maximum; silt 30 percent maximum. Gradation limits shall be as defined in ASTM D422.
  - 2. Permeability Rate: Not less than 0.5 inch per hour nor more than 2 inches per hour when tested in accordance with ASTM D2434, California Test 220, or other approved method.
  - 3. Agricultural Suitability: The topsoil shall allow proper seed germination and be suitable to sustain the growth of the plants specified over a minimum of ten seasons, as determined by an approved local soil and plant testing laboratory.

Required amendments shall be recommended by the testing laboratory if the soil is not deemed suitable for the plants specified herein.

### **PART 3 - EXECUTION**

#### **3.01 DUST CONTROL**

- A. Apply water to work area and haul routes as necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.
- B. Control dust emissions in accordance with Northern Sierra Air Quality Management District (NSAQMD) Rule 226.

#### **3.02 PROTECTION OF GCL AT REPAIR AREAS 1 AND 2**

- A. Soil shall be placed with low ground pressure equipment. A minimum thickness of 12 inches of cover shall be kept between heavy equipment and GCL.
- B. No vehicles shall be driven directly over the GCL until the proper thickness of cover has been placed. Care should be taken to avoid damaging the GCL by making sharp turns or pivots with equipment.
- C. To prevent damage to the GCL, the initial lift of soil cover shall not be compacted in excess of 90 percent of the maximum dry density as determined by ASTM D1557.
- D. Soil cover placement and equipment movement shall be along the GCL roll direction (parallel to the seams), and not perpendicular to the roll direction.
- E. If GCL is damaged during fill placement, it must be repaired pursuant to these specifications. The minimum patch size is 2 feet by 2 feet.
- F. Survey grade stakes shall not penetrate the existing or new GCL layer.

#### **3.03 PROTECTION OF LANDFILL GAS WELL CASING**

- A. Preserve landfill gas wellheads and laterals. Well casings are located within Repair Areas 1, 2, 4, 8, and 9. Coordinate with owner to remove and replace wellhead and lateral gas piping.

#### **3.04 SUBGRADE**

- A. Cut subgrade to line and grade shown on plans
  - 1. Finish subgrade shall be constructed to within plus 0.0 foot or minus 0.1 foot for grades and +/- 1 foot for lines.

2. The finish subgrade surface shall not vary by more than 0.10 foot from a uniform plane when measured with a 10-foot straight edge.
  3. A minimum slope of 2% shall be maintained in at least one direction from any given point.
- B. Prepare subgrade surface for installation of new GCL.
1. Remove rocks greater than 1 inch exposed at subgrade surface. The finish subgrade surface shall be free of all rocks, sharp stones, or debris of any kind that may damage the GCL.
  2. Moisture condition and compact with smooth drum roller to 90% of ASTM D1557 maximum dry density.
  3. Proof rolling shall be observed by the CQA Monitor to verify that the surface is firm and non-yielding. Loose or soft materials should be removed and replaced with compacted fill.
- C. Prepare GCL overlap zone
1. All soil shall be removed from the existing GCL for a minimum distance of one foot, as measured radially, at the overlap zone on the perimeter of the repair area to allow for GCL-to-GCL contact. Hand tools shall be used for final cleaning and sweeping to avoid damage to the existing GCL.
- D. Secure approval of Engineer in writing for subgrade prior to placing GCL.
- ### 3.05 VEGETATIVE LAYER
- A. Secure approval of Engineer in writing for GCL prior to placing vegetative layer.
- B. Preserve GCL during fill placement and compaction as described above in this section.
1. If GCL is damaged during fill placement, it must be repaired pursuant to these specifications. The minimum patch size is 2 feet by 2 feet. Survey grade stakes shall not penetrate the existing or new GCL layer.
- C. Fill shall be placed in lifts (layers) not exceeding 8 inches compacted thickness.
- D. Fill shall be processed and uniformly moisture conditioned within two percentage points of ASTM D1557 optimum moisture content prior to placement.
- E. Fill shall be compacted to a minimum of 90% of the ASTM D1557 maximum dry density.

- F. The completed vegetative layer shall have a thickness of 12 inches above the completed GCL layer.

### 3.06 TOPSOIL LAYER

- A. Upon acceptance of vegetative layer by Engineer, place and compact topsoil layer to 85 percent relative compaction as determined by ASTM D1557.
- B. The completed topsoil layer shall be a minimum thickness of 6 inches above the completed vegetative layer.
- C. Construct to line and grade shown on plans
  - 1. The finish topsoil layer shall be constructed to within +/- 0.1 foot for grades and +/- 1 foot for lines.
  - 2. A minimum slope of 2% shall be maintained in at least one direction from any given point for Repair Areas 1 through 5 and 7 through 10 on the landfill deck.
  - 3. Finish topsoil layer at Repair Area 6 shall conform to the surrounding landfill slope.

### 3.07 QUALITY CONTROL / QUALITY ASSURANCE

- A. Field testing will be provided by the Engineer or independent laboratory.
- B. Secure Engineer's approval of finish subgrade surface prior to GCL placement.
- C. Secure Engineer's approval GCL layer prior to vegetative layer placement.
- D. Secure Engineer's approval of finish vegetative layer surface prior to topsoil placement.
- E. Failed tests shall result in removal, re-processing and recompaction of materials. Retesting shall be at the discretion of the Engineer, and shall be at the Contractor's expense.

**END OF SECTION**



## **SECTION 02243 – GEOSYNTHETIC CLAY LINER**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. This section describes the general requirements for the manufacture, supply, installation, and quality control (QC) of geosynthetic clay liner (GCL) for final cover repair at Repair Areas 1 and 2. Contractor shall subcontract with a qualified Geosynthetic Installer for GCL supply and installation, as set forth in this section.

#### **1.02 RELATED SECTIONS**

- A. Section 01400 – Quality Control
- B. Section 01600 – Material and Equipment
- C. Section 02220 – Excavation and Grading

#### **1.03 REFERENCES**

- A. ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- B. ASTM D3776 – Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
- C. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles
- D. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- E. ASTM D5261 – Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- F. ASTM D5321 – Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear
- G. ASTM D4643 – Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
- H. ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
- I. ASTM D5890 – Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners

J. ASTM D5891 – Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners

K. ASTM D5887 – Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter

#### 1.04 SUBMITTALS

A. Product Data: Include installation, handling, storage, and repair instructions. Submit 5 days prior to shipment to the site.

B. Certificates: Certifying that geotextile meets or exceeds material specifications. Submit 5 days prior to shipment to the site.

C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's Representative's name and registered with manufacturer. Submit 5 days prior to installation.

D. Manufacturer's QC certificates, including roll numbers and identification, sampling procedures, and results of quality control tests verifying that material properties are achieved.

E. GCL installation plan, including:

1. Drawings showing field panel layout with the proposed placement sequencing, schedule, and panel identification of the GCL sections.

2. Typical seam section and any 3 and 4 way seam intersections.

3. Each panel shall be marked with an identification code (numeric or alphanumeric) consistent with the layout plan.

#### 1.05 QUALITY ASSURANCE

A. Perform work in accordance with the CQA Plan.

#### 1.06 QUALIFICATIONS

A. Geotextile Manufacturer shall be a well-established firm with more than two years experience in the manufacture of geotextiles.

B. Submit certified minimum average roll property values and the test methods used to determine those properties.

C. Geosynthetic Installer shall meet the requirements of the CQA Plan.

D. Geosynthetic Installer shall submit a complete description of their QC program, as applicable, for handling, installing, testing, repairing and providing a completed lining in accordance with the requirements of these specifications. Installer shall

have QC experience on 500,000 square feet of GCL. Resume shall be submitted with the QC program.

#### 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Install geotextile in dry conditions and in accordance with manufacturer's instructions.
- B. Suspend installation operations whenever climatic conditions, as determined by Owner's Representative, are unsatisfactory for placing geotextile to the requirements of this specification.

#### 1.08 MEASUREMENT AND PAYMENT

- A. GCL supply and installation, as set forth in this section, will be performed on a lump sum basis.

### PART 2 - PRODUCTS

#### 2.01 BENTONITE

- A. Bentonite shall meet or exceed the following properties (BAS and GLA, 1996):

Property	Test Method	Unit	Value
Sodium Montmorillonite Content	X-ray diffraction	%	≥90
Free Swell (2 grams)	ASTM D5890	ml	≥24
Fluid Loss	ASTM D5891	ml	≤16
Moisture Content	ASTM D4643/D2216	%	≤10

- B. Bentonite shall be virgin first quality product mined and processed specifically for the purpose of manufacturing GCL.

#### 2.02 CARRIER GEOTEXTILE

- A. Carrier geosynthetics shall be minimum 6-oz\sy, nonwoven, needlepunched polyester or polypropylene geotextile. The bentonite shall be attached to the carrier geosynthetics in a manner which prevents separation during transport, handling and installation and which is not detrimental to the other components of the composite liner system. The bentonite clay layer shall be incorporated between the two layers of carrier geotextiles and interlocked by needlepunching or stitching. Edge seams shall be sewn or stitched during manufacture.

- B. Carrier geotextiles shall be sampled and tested by the manufacturer during production to ensure product quality. The GCL Manufacturer shall sample and test geotextile(s) for quality control purposes. Quality control certificates from the Geotextile Manufacturer and GCL Manufacturer shall be submitted to and approved by the Engineer prior to shipment of the GCL to the site.
- C. Carrier geotextiles shall meet or exceed the minimum average roll values for the following physical properties (BAS and GLA, 1996):

Property	Test Method	Unit	Value
Mass per Unit Area	ASTM D3776	oz/sy	5.5
Grab Strength <sup>1</sup>	ASTM D4632	lbs	160
Grab Elongation <sup>1</sup>	ASTM D4632	%	50
Trapezoidal Tear Strength <sup>1</sup>	ASTM D4533	lbs	60

Note: 1 = Machine direction

### 2.03 GEOSYNTHETIC CLAY LINER

- A. GCL shall meet or exceed the minimum average roll values for the following physical and hydraulic properties (BAS and GLA, 1996):

Property	Test Method	Unit	Value
Mass per Unit Area, 20% moisture	ASTM D3776/D5261	oz/ft <sup>2</sup>	16
Grab Strength	ASTM D4632	lbs	88
Internal Shear Strength	ASTM D5321	deg;psf	5; 400
Puncture Resistance	ASTM D4833	lbs	102
Grab Elongation	ASTM D4632	%	20
Hydraulic Conductivity <sup>1</sup>	ASTM D5887	cm/s	<5x10 <sup>-9</sup>

Note: 1 = At 10 psi effective confinement stress

- B. GCL shall have no holes, pinholes, bubbles, blisters, gels, nicks, tears, cuts on edges, or contamination by foreign matter. GCL shall be needle-free. GCL shall be supplied in rolls and folding shall not be permitted.
- C. Each roll shall be labeled or tagged with roll identification number, name of manufacturer, date of production, product type and grade, lot number, physical

dimension, and roll weight. The label or tag information shall be affixed or attached to the roll at all times during deployment of the roll. The product identification number, manufacturer name and lot number shall also be stenciled onto the start of each roll so that a positive verification can be made with label or tag information.

- D. GCL shall be monitored throughout the manufacturing process for product integrity and consistency. Manufacturer shall sample rolls for the following physical properties and at the following minimum frequency or per lot whichever results in the greatest number of tests:

<b>Property</b>	<b>Test Method</b>	<b>Minimum Frequency</b>
Mass per Unit Area	ASTM D3776	every 20,000 ft <sup>2</sup>
Moisture Content <sup>1</sup>	ASTM D4643	every 20,000 ft <sup>2</sup>
Hydraulic Conductivity	ASTM D5887	every 50,000 ft <sup>2</sup>

Note: 1 = Raw bentonite

#### 2.04 DELIVERY, STORAGE, AND HANDLING

- A. Handling, storage, and care of GCL shall be the responsibility of the Contractor. The Contractor shall be liable for all damage to the materials incurred prior to final acceptance by the Engineer.
- B. The Contractor shall be responsible for storage of the GCL at the site after the material is delivered. The geotextile shall be stored off the ground and out of direct sunlight, and shall be protected from mud, dirt, and dust, and any additional storage procedures required by the Geotextile Manufacturer.
- C. All rolls shall be identified at the factory with the following:
1. Manufacturer's name
  2. Product identification
  3. Lot Number
  4. Roll number
  5. Roll dimensions
- D. GCL shall be handled in such a manner as to ensure they are not damaged in any way.

- E. Precautions shall be taken to prevent damage to underlying materials during placement of the GCL.
- F. After unwrapping the geotextile from its cover, the geotextile shall not be left exposed for a period in excess of 30 days.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Ensure that subgrade soil has met all required compaction and preparation criteria and has been approved in writing by Engineer.
- B. Examine materials for defects including rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or handling.
- C. Remove defective or damaged materials.

### **3.02 INSTALLATION**

- A. Notify CQA Manager at least 24 hours in advance of intention to commence placement of GCL.
- B. Installation shall be performed in accordance with manufacturer's instructions and the following general guidelines.
  - 1. Use equipment which does not damage GCL, supporting subgrade surface or existing underlying GCL.
  - 2. All personnel working on GCL shall wear shoes that do not damage the GCL. No personnel shall be allowed to engage in activities that could damage the GCL.
  - 3. Clamps and other metal tools used in the work area shall have rounded edges (no sharp) corners. Clamps and other metal tools shall not be tossed or thrown.
  - 4. Panels shall be unrolled with a method that protects the GCL from scratches and crimps and protects the soil subgrade and underlying materials from damage.
  - 5. Place adequate temporary hold-downs to prevent uplift by wind.
  - 6. Protect GCL in heavy foot traffic areas by geotextile, extra GCL or other suitable materials. Materials used for protection shall be temporary and shall not be used as any part of the permanent installation. Do not allow vehicle traffic on GCL surface.

7. The number of panels deployed in one day shall be limited to the number of panels which can be installed, anchored, covered and sealed with vegetative cover material, and protected from moisture on the same day. In no case shall the GCL be exposed to the elements at the end of the day.

#### C. Weather Conditions

1. GCL shall not be deployed during precipitation, in the presence of excessive moisture, in areas of ponded water, or in the presence of excessive winds. All deployed GCL material shall be covered as soon as possible with a vegetative cover material and before the end of each working day.

#### D. Wind Protection

1. Protect GCL against adverse effects of high wind such as uplift. Sand bags may be used for this purpose.
2. Sand bags shall be sufficiently close-knit to preclude fines from working through the bottom, sides, or seams. Paper bags, whether or not lined with plastic, shall not be permitted.
3. Burlap bags, if used, shall be lined with plastic.
4. Sand bags shall contain not less than 40, nor more than 60 pounds of sand having 100 percent passing a number 8 screen, and shall be tied closed after filling, using only plastic ties. Metal or wire ties shall not be allowed.
5. Sand bags that are split, torn or otherwise losing their contents shall be immediately removed from the work area and any spills immediately cleaned up.

#### E. Seams shall be detailed to have the same minimum hydraulic conductivity as required through the body of the GCL.

1. Overlay all seams by a minimum of 6 inches.
2. Mark rolls with a continuous line along the edge of the roll at a distance of 6 inches for the purpose of verifying the minimum overlap.
3. Apply powdered bentonite (of the same quality used in the manufacturer of the GCL) between seams at the rate of 1/4 pound per linear foot of seam. Nails and staples will not be allowed.
4. Follow additional manufacturer recommendations regarding overlap and seaming.

5. For final seaming inspection, seams and the surface of the GCL shall be checked for defects, holes, blisters, undispersed raw materials, or signs of contamination by foreign matter. Installer shall distinctively mark (preferably with paint) repair areas and indicate required type of repair.

F. Repairs

1. Repair damaged GCL with patches of the same product. Patches shall overlap the edge of a hole or tear a minimum of 12 inches in all directions. Nails and staples will not be allowed.

G. Placement of Overlying Materials

1. Soil cover shall be placed with low ground pressure equipment. A minimum thickness of 12 inches of cover shall be kept between heavy equipment and the GCL at all times. No vehicles shall be driven directly over the GCL until the proper thickness of cover has been placed. Care should be taken to avoid damaging the GCL by making sharp turns or pivots with equipment.
2. To prevent damage to the GCL, the initial lift of soil cover shall not be compacted in excess of 90 percent of the maximum dry density as determined by ASTM D1557.
3. Soil cover placement and equipment movement shall be along the GCL roll direction, and not transverse to the roll direction.

- H. Any leading edge of panels left uncovered shall be protected at the end of the working day with a waterproof sheet which is adequately secured with sand bags or other ballast.

3.03 FIELD QUALITY CONTROL

1. The Contractor shall accept and retain full responsibility for all materials and installation and shall be held responsible for any defects in the completed system.

**END OF SECTION**



## SECTION 02270 – EROSION CONTROL

### PART 1 - GENERAL

#### 1.09 SECTION INCLUDES

- A. Erosion control shall conform to these technical specifications and Section 20 of the Caltrans Standard Specifications except as modified herein.

#### 1.010 MEASUREMENT AND PAYMENT

- A. Payment for erosion control is lump sum including all incidentals.

### PART 2 - PRODUCTS

#### 2.05 SEED

- A. The amount and type of seed shall be as follows (BAS and GLA, 1996) and shall comply with Caltrans Section 20, 20-2.10:

<b>Seed</b>	<b>Rate</b> (pounds per acre)
Vulpia myuros (Zorro fescue)	5
Festuca ovina (Covar fescue)	20
Hykon rose clover, inoculated	10
Lupinus bicolor (bicolor lupine)	2
Eschscholzia californica (California poppy)	2
Trifolium incarnatum (crimson clover)	2

#### 2.06 FIBER

- A. Comply with Caltrans Section 20, 20-2.07

#### 2.07 STRAW

- A. Comply with Caltrans Section 20, 20-2.06

#### 2.08 STABILIZING EMULSION

- A. Comply with Caltrans Section 20, 20-2.11

## 2.09 FERTILIZER

- A. Fertilizer shall be applied at the rates listed below (BAS and GLA, 1996) and shall comply with Caltrans Section 20, 20-2.02

<b>Fertilizer</b>	<b>Rate</b> (pounds per acre)
Ammonium phosphate	200
Soil sulfur	1,000
Agricultural gypsum	2,000

## 2.010 FIBER ROLLS

- A. Prefabricated fiber rolls (wattles) shall conform to Caltrans Best Management Practice (BMP) SE-5.

## PART 3 - EXECUTION

### 3.04 PREPARATION

- A. All areas designated to receive seed are to be pre-dampened to a 2-inch depth. Do not seed in hot, dry conditions.

### 3.05 TIMING

- A. Apply seed between the dates of October 1 and November 15.

### 3.06 APPLICATION

- A. Seed, fertilizer, fiber and stabilizer shall be uniformly spread over all areas disturbed by the work. Seed shall either be applied mechanically in a dry condition or with hydroseeding equipment, at the Contractor's option. If the Contractor elects to hydroseed, a minimum of 1,200 kg of fiber per acre shall be mixed and applied with the seed, and fertilizer may be mixed with the seed and fiber and applied in the hydroseeding operation. The fiber shall be furnished at the Contractor's expense and shall be in addition to incorporating straw.

### 3.07 FIBER ROLLS

- A. Installation of fiber rolls (wattles) shall conform to Caltrans Best Management Practice (BMP) SE-5.
- B. Fiber rolls shall be installed on contour at the downslope edge of each repair area and within each the repair area at a maximum spacing of 30 feet.

1. Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
2. Stake fiber rolls into a 2-inch to 4-inch deep trench. Trench width shall be equal to the width of the roll.
3. Drive wood stakes at the end of each fiber roll and every four feet along the roll. Stakes shall be nominal  $\frac{3}{4}$  in x  $\frac{3}{4}$  in with a minimum length of 24 inches.
4. If more than one fiber roll is placed in a row, rolls shall be overlapped, not abutted.

**END OF SECTION**