



CONSTRUCTION QUALITY ASSURANCE PLAN

GLENN COUNTY LANDFILL

NEAR ARTOIS, CALIFORNIA

**Revised January 2013
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Prepared for:

**Glenn County
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1 INTRODUCTION

This Construction Quality Assurance (CQA) Plan is for construction work associated with final closure of the Glenn County Phase A Landfill. The work will be performed in strict accordance with requirements of the most recent version of the Final Closure/Postclosure Maintenance Plan (FCPCMP) by Lawrence & Associates. Copies of the FCPCMP will be provided to the CQA Officer and Contractor.

In addition, the work shall be performed in accordance with applicable sections of Title 27 of the California Code of Regulations (CCR), as they pertain to final closures of landfills.

1.1 REVISIONS

Original Version

This CQA was last revised in January 2013 and was incorporated into the FCPCMP that was approved by the Regional Water Quality Control Board (RWQCB).

This Revision

The purpose of this revision is to provide guidance to Glenn County with regard to the portion of the work that the County will be completed with in-house staff. The County will be installing the horizontal gas collectors and part or all of the foundation layer. The County will also be providing CQA Management and Monitoring for the entire project. The County will retain the services of a Soils Testing Company, and where needed, other specialty CQA Monitoring or testing entities.

1.2 GENERAL SCOPE

It is anticipated that Glenn County will construct some or all of the foundation layer during one construction season and a general contractor will be retained to construct the remainder of the foundation layer, geomembrane, and vegetative layer during a second construction season. During review of the FCPCMP, RWQCB staff was concerned that the compacted foundation layer would de-compact during the winter after construction. Therefore, the County will construct an additional 4 inches of foundation layer in which to establish erosion control for one winter. During the following construction season, the closure-cap contractor would strip the upper 4 inches and then proof roll/compact the surface to ensure the regulatory compaction is attained.

In summary, the work consists of the following:

General Information Regarding Foundation Layer:

- Most of the landfill contains more than 1.5 feet of intermediate soil cover and the upper foot will be recompacted to create the bottom foot of the foundation layer and an additional one foot or more of foundation layer soil will be added to provide a full compacted thickness of 24 inches.

- In locations with newer waste it is assumed that a minimum of one foot of intermediate cover will be in place of which the upper 8 inches of the intermediate cover will be recompact to create the lower 8 inches of the foundation layer and an additional 1.33 feet of foundation layer will be added to provide the minimum 24-inch thickness for the foundation layer. The County may elect to install a thicker intermediate cover section and recompact the upper foot of the intermediate cover to create the bottom foot of the foundation layer.

County Work:

- Recover and stockpile rock from graveled roads where applicable.
- Glenn County must ensure that there is no less than 1.5 feet of intermediate cover over the waste to ensure that adequate soil is present to be recompact.
- Clear & grub construction areas and stockpile materials for use in the vegetative layer.
- Recompact the upper one foot of the existing intermediate cover to the standards described herein to create the bottom foot of the foundation layer.
- Install horizontal gas collectors.
- Repair any areas flatter than 3%.
- Survey the surface to provide a basis for measuring the additional thickness.
- Because foundation layer soil constructed by Glenn County will be left for a winter before rest of the closure cap is added, Glenn County will add an additional 4 of foundation layer soil that will be trimmed off by the closure cap Contractor.

Closure Cap Contractor Work:

The Contractor will perform the following steps:

- Recover and stockpile rock from graveled roads where applicable.
- Clear & grub construction areas and stockpile materials for use in the vegetative layer.
- In areas where the County has already installed the foundation layer, after stripping top soil, smooth drum roll the previous county-installed foundation layer.
- Pothole the areas where the foundation layer has not been constructed to verify the thickness of the existing intermediate cover soil.
- In areas where the County has not constructed the foundation layer, recompact the upper 8 inches to one foot of the intermediate cover soil to create the bottom of the foundation layer, and add a minimum of 12-inches to 16 inches of foundation layer to create a minimum constructed thickness of 2 feet.
- Correct any flat spots to ensure a minimum slope of 3% using compacted foundation layer soil. Smooth drum roll the surface,
- Field survey the surface of the foundation layer and obtain approval from the CQA Monitor before installing the geomembrane.
- Excavate anchor trenches (where required).
- Install a 40 mil HDPE or LLDPE textured (both sides) geomembrane on the landfill.
- Install 8-oz. nonwoven geotextile in locations where geocomposite is not used.
- Monitor subliner gas pressure during initial vegetative layer installation to ensure that it does not exceed 14 inches of water column and, if needed, install gas-venting strips as described in the specifications.

- Install a 250-mil geocomposite drainage layer on the side slopes- those steeper than 19% or approximately 5H to 1V.
- Install 18-inch thick vegetative layer.
- Field survey the top of the vegetative layer or otherwise verify thickness to ensure proper thickness is installed.
- Rock graveled benches and roads.
- Apply seeding & mulching and erosion control treatments to cap and above-grade disturbed borrow area.
- Perform an aerial survey of the final closure cap (Owner).
- Prepare & submit a construction certification report (CQA Officer).
- The County may retain the Contractor to maintain erosion control and repair erosion for the first year after construction.

Work by Others:

- Perform an aerial survey of the final closure cap (Owner).
- Prepare & submit a construction certification report (Owner).

This CQA Plan is designed to complement Technical Specifications. This Plan outlines the tasks necessary to ensure that the following items are performed in conformance with the Technical Specifications (Appendix P of the FCPCMP):

- Summary of Work – 01010 Summary of Work
- Survey and Staking – 01050 Field Engineering
- Clearing & Grubbing – 02110 Clearing & Grubbing
- Subgrade and Foundation Layer Preparation – 02210 Site Grading and Foundation Layer
- Vegetative Layer – 02245 Vegetative Layer
- Erosion Control – 02271 Erosion Control
- Rock Channel Protection – 02272 Rock Channel Protection
- Piping Materials for Gas System – 02610 LLDPE Pipe
- 40-mil HDPE or LLDPE Geomembrane – 02750 Geomembrane
- Geocomposite Drainage Layer and Cushion Layer – 02752 Geotextiles

This CQA Plan is also designed to complement the following Drawings. The Drawings follow the text in the FCPCMP.

- Cover Page
- 1.0 Overall Facility Map
- 2.0 Site Map Showing 11-20-2018 Aerial Photography
- 3.0 Final Closure Contours - Keymap
- 4.0 Final Closure Contours – North Half
- 4.1 Final Closure Contours – South Half
- 4.2 Northwest Area
- 4.3 Northeastern Toe Area
- 5.0 Borrow Area Grading Plan
- 6.0 Landfill Cross Section A-A
- 6.1 Southern Road Plan and Profile

- 7.0 Closure Details
- 7.1 Closure Details
- 7.2 Closure Details
- 7.3 Closure Details
- 7.4 Erosion Control Details
- 7.5 Culvert Details
- 7.6 Detention Basin Outlet Details
- 8.0 Erosion Control North Half
- 8.1 Erosion Control South Half
- 8.2 Erosion Control Borrow Area
- 8.3 Erosion Control Details

The Drawings and Specifications are also incorporated within the Contract Documents for the landfill closure. The Drawings and Specifications found within the Contract Documents may be slightly different than the ones in the FCPCMP and shall supersede the ones in the FCPCMP. In case of a discrepancy between this CQA Plan, the Plans and Specifications, and the FCPCMP, the Project Engineer shall be contacted for clarification. It is anticipated that the most stringent requirements shall apply.

2 DEFINITIONS

ASTM: American Society for Testing and Materials.

Cal Recycle: State of California, Department of Resources Recycling and Recovery.

Certificate of Completion: Certificate notifying the Contractor that a work item has been completed to the satisfaction of the Owner and the Project Engineer.

Contract Documents: General Provisions, Plans, and Technical Specifications.

CQA: Construction quality assurance.

CQA Firm: Company or individuals, provided by or retained by the Owner to perform monitoring and quality assurance.

CQA Manager or Officer: Civil Engineer or Engineering Geologist registered in the State of California responsible for oversight of CQA activities.

CQA Monitor: Person responsible for performing and documenting the quality-assurance tasks presented in this Plan and working under the direction of the CQA Manager.

Design Report: Plan describing the design assumptions and calculations. In this case, the FCPCMP.

Design Engineer or Project Engineer: Civil engineer or engineering geologist registered in the State of California, retained by the Owner to design the construction items and provide project support as necessary.

HDPE: High Density Polyethylene.

LLDPE: Linear Low Density Polyethylene.

LEA: Local Enforcement Agency: Glenn County Department of Environmental Health.

CVRWQCB: State of California, Central Valley Regional Water Quality Control Board, Redding Office.

Nonconformance: When testing, measurement, or visual observations shows that performance standards for construction are not being met.

Notice of Completion: Notice provided by Owner to Contractor indicating that all of the tasks in the Technical Specifications have been completed to the satisfaction of the Owner. This requires approval from the Glenn County Board of Supervisors.

Owner: The project and property are owned by Glenn County, as administered by the Glenn County Public Works Agency.

Owner's Representative: Dr. Mohammad Qureshi, Director of Public Works, Glenn County Public Works Agency, or designee.

Performance Standard: A minimum limit set on characteristics of materials and construction.

Plans or Drawings: A set of plans describing the construction of the project. Plans or Drawings are considered part of the Contract Documents.

Quality Control: Control of quality provided by the Contractor.

Quality Assurance: Verification of the Contractor's work quality by the CQA Monitor.

Soils Testing Company: Company that provides and independent Soil Technician.

Soils Technician: Employee of a certified soils testing laboratory responsible for performing field tests and collecting samples for laboratory analyses.

Surveyor: Land surveyor, licensed in the State of California, retained by the Contractor to set a grid, set elevation control, and perform tasks described in Section 01050 Field Engineering.

Technical Specifications: That portion of the Contract Documents which present the construction specifications, materials, and performance standards for completing the project.

Testing Laboratory: A certified soils or materials testing laboratory with experience in the work required for this project.

3 REFERENCE DOCUMENTS AND BACKGROUND

- *Lawrence & Associates, January 2013, Glenn County Landfill, Final Closure Postclosure Maintenance Plan, Revised May, 2018.*

The CQA Monitor and CQA Manager must review these documents prior to commencing work.

4 CSI FORMAT

The Technical Specifications will be listed in the Construction Specification Institute (CSI) format and will be divided into sections for each type of construction. Each Section will include roughly the following parts:

- Part 1 - General
 - 1.01 Section includes
 - 1.02 Related sections
 - 1.03 Submittals
- Part 2 - Products
 - 2.01 Materials
- Part 3 – Execution
- Part 4 – Measurement and Payment

It will be the CQA Monitor's or Project Engineer's responsibility, as part of CQA, to verify and/or observe each Section and assure the following:

- Part 1 All submittals have been provided by the Contractor within the time allotted and have been reviewed by the Project Engineer and Owner when appropriate.
- Part 2 The products supplied meet the prescriptive or performance standards described in the Technical Specifications and Drawings.
- Part 3 The work is executed in conformance with the tolerances and methods required and, where not specified, are performed in conformance with applicable codes and industry standards.
- Part 4 Track Contractor progress, and ensure that the billing submitted by the Contractor, or change orders, are in conformance with the specified measurement and payment conditions.

5 PERFORMANCE STANDARDS

The performance standards are minimum requirements for compaction, material quality, dimensions, grades, permeability, and other factors. The Contractor will be allowed to use the construction methods he or she chooses as long as the performance standards are met. The purpose of this Quality Assurance Plan, therefore, is to assure quality of construction by insuring that the performance standards are met and that proper records are kept to demonstrate performance.

6 CQA RESPONSIBILITIES FOR CONTRACTOR- VERSUS COUNTY-PROVIDED WORK

6.1 CONSTRUCTION WORK PERFORMED BY COUNTY

Because the foundation layer construction work that will be performed by the County's Solid Waste Department will be performed as time allows, continuous CQA observation is not practical or warranted. For the construction work performed by Solid Waste personnel, oversight will be provided by County's Engineering Department, under the direct supervision of a licensed Civil Engineer. Mr. Cole Grube, license number 81171, will act as the CQA Manager and coordinate the following testing activities:

- The County surveyor will establish staking that will be used to locate density testing locations and to verify thickness. The surveyor will establish a grid system and a map that will be used to track testing and thickness verification activities.
- An independent Testing Company will be retained to perform density testing and provide test data to the County using the coordinates listed on the stakes as basis of locating the tests. Testing will be performed in accordance with this CQA Plan to verify conformance with the Specifications. As required by Title 27 CCR, no less than 4 compaction tests will be performed per 1,000 cubic yards, and one density/moisture curve (ASTM D1557) will be performed for every 5,000 cubic yards of foundation layer, in random locations. County staff will provide 8, shallow test pits in which the upper few inches have been stripped off and an adjacent area excavated to 12 to 16 inches below the surface (or as requested by the Soils Technician). The shallow test pits will facilitate testing the full thickness of the foundation layer.
- After completion of the foundation layer the County surveyor will verify that the required thickness has been met. Thickness verification may be made using either before/after surveys, ledger boards (as long as they are removed prior to geomembrane installation), and/or test pits.
- The County's Engineering Department staff will maintain records of test locations and results, thickness verification data, and prepare weekly work CQA summary containing the following:
 - Numerical sequence (*e.g.*, week 1, week 2, *etc.*).
 - Dates covered.
 - Brief description of work performed.
 - Brief summary of CQA tasks performed.
 - Description of how failed tests were corrected, cause of failure and re-tested.
 - Copy of grid map showing area of work, location of density/moisture tests.

- Copy of test results.
- Picture of the work area.
- The weekly reports will be compiled into a CQA report with a brief cover letter at the end of the construction season.

6.2 CONSTRUCTION WORK PERFORMED BY CONTRACTOR

The County will provide CQA Management and Monitoring and will retain testing and observation where needed for specialized CQA Monitoring or testing.

7 QUALITY-ASSURANCE TASKS

The following plan is divided into general quality-assurance tasks for each type of work as listed below:

- General tasks
- Personnel, responsibilities, and qualifications
- Record keeping
- Preconstruction
- Construction items from the Technical Specifications

Separate types of quality-control measures will be required for each of these work items. At times, some of the work from each category will overlap and more than one of these sections will be in effect at any given time.

8 GENERAL TASKS

8.1 SCHEDULE OF WORK

Within the number of days specified in the Contract Documents after award of the Contract, the Contractor shall provide a schedule of work to the CQA Monitor. The schedule of work shall list the anticipated dates in which each Bid Item in the Technical Specifications will be completed. An updated schedule shall be provided within one week of request by the CQA Monitor.

8.2 PRECONSTRUCTION MEETING (CLOSURE PERFORMED BY CONTRACTOR)

The preconstruction meeting will be held prior to or during mobilization of the Contractor onto the site. The meeting will be scheduled at a time mutually acceptable to the Design Engineer, Owner, CQA Firm, and the Contractor. The meeting will be documented by the CQA Monitor. The LEA, CalRecycle, and CVRWQCB representatives should be invited, although their participation is not mandatory. The purpose of the preconstruction meeting will be to:

- Answer any questions regarding interpretation of the Technical Specifications.
- Notify the Contractor of any special conditions related to the use permits for the site.
- Define lines of communication and authority.

- Review testing procedures.
- Determine Contractor's source of construction water and power.
- Establish procedure for notifying Contractor of deficiencies, non-conformances, and correction of non-conformances.
- Monitor site and establish locations for field offices, limits of work, storage locations, and mobilization locations.
- Address any particular concerns of the state and local agencies.

8.3 DAILY MEETINGS (CLOSURE PERFORMED BY CONTRACTOR)

The CQA Monitor may meet with the Contractor daily during periods of complicated work to evaluate the progress of work. Continuous monitoring will be required for this project. Where appropriate, the following will be discussed:

- If the project schedule is being met.
- Amount of material placed the previous day and anticipated amount to be placed during current day.
- Amount of HDPE or LLDPE geomembrane placed the previous day and anticipated amount to be placed during the current day.
- Determine work items included in the day's activities.
- Discuss Contractor's personnel and equipment assignments.
- Discuss any non-conformances and correction procedures.
- Present the Contractor with copies of test data received the previous day.

The CQA Monitor will record the items discussed in a daily report. These meetings will be informal unless a special meeting is called for an important purpose. If a special meeting is called, the minutes of the meeting will be completed by the CQA Monitor and attached to the daily log.

Daily logs for the week should be submitted to the CQA Manager by the following Monday.

8.4 WEEKLY OR BI-WEEKLY MEETINGS (CLOSURE PERFORMED BY CONTRACTOR)

Meetings will be held, at minimum, either weekly or bi-weekly, depending on the pace of the work. The CQA Monitor, CQA Manager (if needed), Design Engineer (if needed), and Owner's representative will attend. These meetings may be held by conference call when a site visit is not necessary.

Prior to the weekly meeting, it is recommended that the CQA Monitor compile all of the daily logs, notices of nonconformance, corrections of nonconformance, testing results, submittals, requests for change orders, and grade-monitoring logs for the CQA Manager to review. The CQA Manager will review the materials for conformance with the requirements of the Technical Specifications. The CQA Monitor will compile and collate the records for observations and summarize his or her comments for the weekly meeting. It is recommended that the CQA Monitor, Project Engineer, Owner's Representative, Contractor, and subcontractors be present.

During the weekly meeting, the Contractor will submit a revised construction schedule and records of weekly safety meetings to the CQA Monitor.

8.5 PERSONNEL QUALIFICATIONS

8.5.1 Contractor

The Contractor will be selected in a competitive-bid process. The Contractor will be required to have a current Class A contractor's license in the State of California with experience in landfill construction. The Technical Specifications provide specific experience requirements for the liner installer that must be met.

8.5.2 Design Engineer

The Design Engineer will be a civil engineer or engineering geologist, licensed in the State of California, with experience in design of landfills. The Engineer will be responsible for the following:

- Project design.
- Review and respond to submittals that require input from the Design Engineer.
- Review and respond to requests for information.
- Review monthly billing requests that have been pre-reviewed by the CQA Monitor, if requested by the County.
- Answer questions from the CQA Monitor or CQA Manager regarding the intent of the project or potential changes.
- Provide design changes.
- Review the CQA data prior to approval of the foundation layer, liner, and final sign-off (e.g. performance audits), if requested by the County.

8.5.3 CQA Manager

The CQA Manager for contractor-constructed work will be a civil engineer or engineering geologist licensed in the State of California with no less than three years' experience in construction monitoring. The CQA Manager will be responsible for:

- Peer review of Drawings and Specifications.
- Review of submittals and, if needed, forwarding submittals to Project Engineer.
- Coordinating preconstruction meeting.
- Review of daily logs, schedules and meeting minutes.
- Submitting daily or weekly logs to the RWQCB.
- CQA oversight.
- Preparing CQA report.

8.5.4 CQA Monitor

The CQA Monitor will be, at minimum, a geologist, engineer-in-training, or trained construction monitor with at least three years of experience in civil construction monitoring.

The responsibilities of the CQA Monitor will include:

- Performing or overseeing soils testing by the testing laboratory and logging the locations of each test.
- Coordinating sampling and testing of factory-supplied sheet goods.
- Witnessing installations.
- Performing preliminary assessment of data to assess whether performance standards are being met and submitting pass/fail data sheets to the CQA Manager for review.
- Writing nonconformance notices (for approval by the CQA Manager) and verifying that the Contractor has taken appropriate corrective action.
- Complete daily logs and minutes of weekly meetings, assessing compliance with the progress schedule, and filing and organizing observation records.
- Ensuring that the Contractor maintains a visitor's log.

8.5.5 Testing Laboratory and/or Soils Technician

The responsibility of the testing laboratory will be to perform specific tests at the request of the CQA Monitor or CQA Manager, at the locations indicated by the CQA Monitor, and then report the findings to the CQA Monitor or Manager. Testing laboratories may include geosynthetics or soils testing facilities. The Design Engineer may request the testing laboratory to perform additional tests, as needed. For County construction work, the County will retain a testing company to perform field density/moisture tests, collect samples and perform density moisture curves.

8.5.6 Owner Provided Surveyor

The Owner will provide a surveyor, licensed in the state of California, provide basic control staking. For Contractor-provided work, the Owner will provide the control coordinates and elevations to the Contractor. For County construction, the County Surveyor or their designated representative will perform surveys and or document test pits to verify adequate foundation layer thickness.

9 LINES OF COMMUNICATION AND AUTHORITY

The CQA Monitor will be the Owner's onsite representative and will be responsible for communication between the Contractor and the CQA Manager. The CQA Manager will be the liaison between the Owner, Project Engineer, and CQA Monitor.

10 RECORD KEEPING

10.1 FORMS

The following forms are attached in **Appendix A**. The selected CQA firm or County may use their preferred forms or other means of correspondence to meet the same intent.

10.1.1 Daily Log

The daily log will be used to summarize the work performed by the Contractor during that day. Information logged will include an estimate of temperature, weather conditions, and rainfall within the last 24 hours. Temperature, rainfall, and wind must be estimated in appropriate units (i.e., inches, degrees, and mph). The log must also contain, at minimum, the following information as applicable to the work being performed:

- Visitors.
- Subcontractors present.
- Equipment and personnel working.
- Testing performed that day.
- Summary of work performed that day.
- Documentation of verbal communication with Contractor such as deficiencies noted or corrected, clarification provided, questions asked by the Contractor, etc.
- Attach quality-assurance forms, sample-collection/field-test logs, nonconformance notices.
- All references to earthwork must be keyed to survey or staking coordinates.

Because of the slow pace of work, weekly logs will be provided for County construction. If the pace of construction warrants, more frequent logs will be prepared.

10.1.2 Weekly or Bi-Weekly Meeting Minutes Log

The CQA Monitor or CQA Manager will take minutes during the weekly meetings. Copies will be made and circulated to the Project Engineer, Owner, and Contractor. The revised construction schedule will be attached to each log.

10.1.3 Nonconformance/Inadequacy Notice

The Nonconformance Notice will be used by the CQA Monitor to notify the Contractor in writing that the performance standards set forth in the Technical Specifications have not been met. Correction of the inadequacy will also be noted on the same form. The location of the inadequacy must be defined by grid coordinates or other repeatable measurements. Field testing sheets and laboratory reports must be attached or verbal results cited.

10.1.4 Certificate of Completion Form

The Certificate of Completion form will be used by the CQA Monitor to notify the Contractor they have completed a Bid Item or a portion of a Bid Item. The purpose of the Certificate of Completion will be to notify the Contractor that a scope of work is finished so that the Contractor can proceed with subsequent work and receive payment by the Owner.

10.1.5 Submittal Form

The CQA Monitor will provide a submittal form in their own format.

10.2 FILING

Five three-ring binders (or the equivalent electronic file) will be kept by the CQA Monitor or CQA Manager for future submittal to the CQA Firm, Owner, Local Enforcement Agency, Project Engineer, and RWQCB. The binders will include:

- Bid Summary.
- Addenda.
- Notice to Proceed.
- Requests for payment.
- Written correspondence (including printouts of emails).
- Conversation logs other than those on the daily logs.
- Daily Logs and Weekly Meeting Minutes.
- Survey data.
- Soil test results.
- HDPE or LLDPE test results.
- Submittals.
- Other pertinent data.

The CQA Manager may rearrange the above information in an order or combination that best suits his or her record keeping procedures.

11 NONCONFORMANCE

Where testing indicates that the performance standards are not met, the CQA Monitor may, at his or her discretion, order additional testing from the Testing Laboratory to further define the lateral and vertical extent of the nonconformance. The CQA Monitor may recommend ways for the Contractor to improve methods to better meet the performance standards, although it is the Contractor's responsibility to meet the standards of the Technical Specifications regardless of the CQA Monitor's comments. After the area has been repaired, the CQA Monitor will order retests to document conformance with the performance standard. After testing indicates passing results, the CQA Monitor will complete the Nonconformance-Inadequacy Form citing the method of correction and retest numbers. The Contractor is responsible for the cost of retests for failed original tests.

12 SPECIFIC CQA TASKS

12.1 GENERAL SITE PREPARATION

The CQA Monitor will verify that the requirements of the Technical Specifications for mobilization and that the agreements made during the preconstruction meeting are satisfied. The CQA Monitor will report any changes from the tasks discussed with the Project Engineer during the preconstruction meeting. The CQA Monitor will review the following sections for this work:

01010 – Summary of Work

The following administrative sections will be included in final construction documents, but are not in the FCPCMP; the CQA Monitor must also be familiar with these documents:

Notice to Bidders
Bid Schedule
Construction Contract
General Provisions
Special Provisions
Addenda
01020 - Site Safety
01039 - Coordination and Meetings
01300 - Submittals
01700 - Closeout
01900 - Mobilization

Both the Contractor and third party CQA firms shall provide their own site safety plan and have those plans on site. It will be the responsibility of the CQA Monitor to verify that the Contractor submits a copy of their safety plan prior to performing work and maintains one on site at all times work is being performed by the Contractor or his or her subcontractors.

12.2 SURVEYING AND STAKING

12.2.1 General

The CQA Monitor will review the following sections for this work:

01010 – Summary of Work
01050 – Field Engineering
02210 – Site Grading

Surveying and field engineering are described in Section 01050 – Field Engineering of the Technical Specifications. The Owner will provide a list of control points to the CQA Monitor to be forwarded to the Contractor's Surveyor. The Contractor is required to retain the services of a licensed surveyor to perform the following tasks:

- After grubbing, survey the closure surface.
- Stake the ends and hinge points of horizontal gas collectors.
- Survey the surface after installation of the foundation layer (in the same spots).
- Visually monitor for spots that will not drain properly and spot check them (may be performed by grade setter).
- Stake the anchor trenches (may be performed by qualified grade setter).
- Survey the edge of the liner.
- Survey the top of the vegetative layer on the same grid, plus locate the ends limits of gravel areas, culverts, and any other items that require measurement for payment.

The Surveyor will be required to stake control on a 100-foot grid and survey points on a 50-foot grid, at grade breaks, and other break lines. The tolerances are described in the specification. After each survey, the Surveyor shall provide an ASCII file with the data in northing and easting and an elevation for the surface of the subgrade, foundation layer, and vegetative layer. Additionally, the Contractor's Surveyor shall provide a contour map in AutoCAD showing 2-foot contours, the edge of the liner, geocomposite layers, and other as-built site features. The Surveyor may propose a similar staking scheme that addresses the intent described above. However, topographic contour mapping shall not be used to measure thickness of the foundation and vegetative layers.

It will be the responsibility of the CQA Monitor to coordinate with the Project Engineer to provide AutoCAD drawings to the Surveyor. The CQA Monitor or CQA Manager will review and distribute the maps to the Contractor, Owner, and Project Engineer. The CQA Manager will provide the cut and fill quantities to the Contractor and supporting data for his or her review and use for his or her pay request. The CQA Monitor or CQA Manager will compare the grid elevations to ensure that the grading, culvert, and stream bed slopes have been completed correctly. The Contractor is responsible for the cost of replacing damaged survey control.

12.2.2 Performance Standards

The Contractor's Surveyor shall meet the minimum accuracy requirements listed in the Technical Specifications. The Contractor shall provide construction staking, grade setting, and survey of the settlement monuments. Locations of the settlement monuments are shown on **Drawing C1.0** of the **FCPMP**.

12.2.3 Field Observation

1. Ensure that the Contractor has replaced any lost or damaged control stakes provided by the Owner's Surveyor.
2. Confirm that the Contractor places the settlement monuments in accordance with the Technical Specifications and at the locations shown on the Drawings.

12.2.4 Review Contractor Submittals

The Contractor is required to submit a survey of the surface of the finished foundation layer demonstrating that the foundation layer is a minimum of 24-inch thick and test data that demonstrate that the material meets the Specification. The CQA Monitor will review the submittals and compare the submitted data against the Technical Specifications. If the Contractor requests the use of an alternate borrow source, a gradation, permeability, and sample of the material must be submitted to the Design Engineer for approval.

12.2.5 Field Observation

1. Ensure that the subgrade has been prepared as described in Part 11.3.1 (Prepared Subgrade) of this CQA Plan.

12.3 CLEARING & GRUBBING

Section 02110 of the Technical Specifications describes clearing & grubbing. Before clearing & grubbing, the Contractor will remove and stockpile gravel road surfaces. The Contractor will strip the grass and upper 3 inches of soil off of the top of the foundation layer and stockpile it in the locations approved by the Owner. The CQA Monitor shall confirm that the grass and topsoil have been stripped before regrading the foundation layer.

12.4 HORIZONTAL GAS COLLECTORS

The CQA Monitor (or for the County, the CQA Manager's designated representative) shall review the submittal of the HDPE Pipe and Leach Rock as described in Section 02610 - HDPE Pipe and the geotextile as described in Section 02752 - Geotextiles. The CQA Monitor shall also verify that the staked locations of the horizontal collectors match the locations shown on the Drawings. During excavation, the CQA Monitor shall verify that the trenches are the approximate depth and are constructed as shown on the Drawings. The CQA Monitor shall also verify that extracted waste is placed in the designated area and covered daily with soil or tarps. The designated location of waste placement will be determined prior to preparation of the final contract documents.

Prior to installation of the horizontal gas collectors in the vicinity of the recently placed waste, the CQA Monitor shall contact the CQA Manager or Design Engineer to evaluate the need for more closely spaced trenches in that area.

12.5 FOUNDATION LAYER AND OTHER SITE GRADING

Contractor responsibilities and performance standards are described in the Sections 02210 - Site Grading and Foundation Layer, 02272 – Rock-Lined Channel Protection and Rip Rap in the Technical Specifications.

To construct the foundation layer:

- (1) Approximately 3 inches of soil containing roots and grass will be stripped off of the surface and stockpiled as described by the Owner during a weekly meeting. The stockpile will be used later for top dressing on the vegetative layer.
- (2) Test pits have shown that the top deck has at least 18 inches of existing intermediate cover. The upper 12 inches (left after clearing & grubbing) of this cover will be ripped and recompacted to create the bottom 12 inches of the foundation layer.
- (3) Soil from the borrow area will then be used to create the upper 12 inches of the foundation layer.

Although the existing soil may meet the minimum compaction requirements, the RWQCB has determined that the full thickness of the foundation layer must be recompacted to meet the letter of Title 27. Therefore, requests by the Contractor to leave in-place soil undisturbed with testing will not be allowed.

12.5.1 Inert Tire Area

The 30-foot wide area in which tire bales called the inert cell, have been placed will be constructed in a similar manner to the foundation layer. The inert cell will be covered with the same capping method as the other areas of the landfill as described in Section 4.7 of the Final Closure & Postclosure Maintenance Plan (FCPMP). The edges shall be tapered to match the top of the vegetative layer. The Contractor must be careful not to rip into the tires as the bales will expand when opened.

12.5.2 Staking Requirements

The specification for Field Engineering requires construction staking after the topsoil is stripped off. The stakes will be used to control the work and locate tests; the related survey data will be used to provide a basis of volume calculation for pay quantities. The Contractor's Surveyor is required to set and survey a grid and then survey the grid a second time after completion of the foundation layer. The difference between the two surfaces times the area will be used to calculate the pay volume. The pay volume will be limited to a thickness of 2 feet unless the CQA Monitor requests that an area that will not drain properly must receive additional foundation layer material. The CQA Monitor shall note on a drawing which areas have been approved for additional fill.

12.5.3 Performance Requirements

According to Title 27, Section 21090 (a)(1), "the foundation layer shall be compacted to the maximum density obtainable at optimum moisture content using methods that are in accordance with accepted civil engineering practice." Compaction to 90% of maximum dry density per ASTM D1557 at a specified range of moisture contents is generally considered "accepted engineering practice" for foundation layers in landfill closure caps. Using the moisture density relationship for the sandy soil found at the Landfill, the appropriate moisture content for the silty soil at the subject site is plus or minus 3% of optimum. Compaction to 90% of maximum dry density should be readily achievable within this moisture range. This combination of dry density and moisture requirement also applies to other embankments constructed of soil within the scope of work (with the exception of the vegetative layer described later in this plan).

The foundation layer may be thicker than 24 inches, but shall be no thinner than 24 inches. Some flexibility on the slope of the closure cap is allowed but under no circumstances shall the slopes be flatter than 3% nor steeper than 3 to 1 (horizontal dimension to vertical dimension).

12.5.4 Monitoring and Testing Requirements

Observation Methods

- Review grades to ensure side slopes are not too steep, nor too flat.
- Perform visual evaluation of soils for consistency and sample for additional proctor curves, as needed.

Test Methods

Use the following test methods and frequencies shown on **Table 1**. Test pits shall be backfilled with compacted soil.

Table 1
Test Frequencies for Foundation Layer

Property	Test Method	Frequency
USCS Soil Classification Visual Manual Method	ASTM D2487	1/5,000 CY, or 1 per week ¹
Proctor Curve	ASTM 1557	1/5,000 CY, or 1 per week ¹
Nuclear Density/Moisture	ASTM D6938	4/1,000 CY or four per day ¹

Notes: 1. Whichever is less.
CY: cubic yards

12.5.4.1 In Case of Failed Density Test

In the case of a single failed density test in a given location, the CQA Monitor shall require two additional tests within 5 feet of the of the original test. If the additional tests pass, the failing test shall be considered an outlier and the compaction accepted as-is. In the event one or more of the retests fail, the Contractor shall excavate the location in the presence of the CQA Monitor and identify the cause of the failed tests (e.g. zone of poor moisture control). The Contractor shall then pothole to identify the extent of the low density soil, re-moisture condition the soil, and then recompact it. The CQA Monitor shall test around the edges of the recompacted area and within the recompacted area to ensure that the edges of the affected area have been reached and that the recompacted soil meets the required dry density and moisture content. If the foundation layer soil is significantly different than that described in the FCPCMP, the CQA Monitor shall collect soil samples for Proctor Curve analysis (ASTM D1557) and then reevaluate the nuclear density readings.

The CQA Monitor shall track his or her time spent doing retests as the cost for the time will be subtracted from the Contractor's payment. Retests resulting from a change in soil type will not be deducted from the Contractor's payment.

12.5.5 In Case Unexpected Waste is Encountered

It is possible that waste is will be encountered when creating the drainages swales or recompacting the existing intermediate cover of closure cap. A bid item has been included for this possibility. If waste is encountered, it shall be excavated to no less than 6 inches below the bottom of the foundation layer (2.5 feet below the top of the foundation layer) and replaced with compacted foundation layer soil. The Contractor shall relocate the excavated waste to an approved area on the landfill for burial or to the transfer station for disposal as directed by the Owner. The CQA Monitor shall calculate the volume excavated for payment. During the weekly meetings when foundation layer work is being performed, the CQA Monitor should remind the contractor that if trash is encountered and must be removed, the Contractor shall

coordinate with the CQA Monitor so that the CQA Monitor is present during trash removal to calculate the volume excavated.

12.6 HDPE OR LLDPE (TEXTURED) GEOMEMBRANE

The work to be performed for installation of the 40-mil HDPE or LLDPE (textured) geomembrane is described in Section 02750 – Geomembrane of the Technical Specifications. The geomembrane shall be 40-mil double sided textured.

12.6.1 Performance Standards

40-mil HDPE or LLDPE textured geomembrane for the drainage layer shall meet the minimum standards shown on **Table 2** and also shown in specification 02750. The resin used to manufacture the HDPE or LLDPE geomembrane shall meet the minimum standards shown on **Table 3**.

**Table 2
HDPE or LLDPE Geomembrane (Textured) Requirements**

Property	Test Method	Units	HDPE	LLDPE
Thickness (nominal)	ASTM D 5994	mil	40	40
Thickness (minimum)	ASTM D 5994	mil	36	36
Density	ASTM D 1505	g/cm ³	0.94	0.939
Carbon Black Content	ASTM D 1603/4218	%	2-3	2-3
Carbon Black Dispersion (min.)	ASTM D 5596	rating	1 or 2 ¹	1 or 2 ¹
Asperity Height (min)	ASTM D 7466	mil	18	18
Tensile Properties:	ASTM D 6693:			
Tensile Strength at Break (min.)		psi	60	60
Elongation at Break (min.)		%	100	250
Tear Resistance (min.)	ASTM D 1004	lbs	28	28

Notes: 1: Applies to bear Spherical agglomerates: 9 of 10 views shall be Category 1 or 2, No more than 1 view from Category 3.

The slope stability analyses for the closure cap were performed using direct shear data based on a GSE Ultra Flex LLDPE geomembrane with an asperity height of 18 mil, covered by an 8-oz woven geotextile for the top deck and covered by geocomposite drainage layer for the sideslope. If the Contractor elects to propose a different geomembrane, the Contractor shall provide direct shear testing to demonstrate that the proposed geomembrane meets the strength parameters described in Specification Section 02750 – Geomembrane. The CQA Monitor or Manager should remind the Contractor to provide the test data as early in the project as possible. If it is ambiguous as to whether the strength parameters meet the required strength parameters, provide the test results to the Design Engineer for review.

**Table 3
Resin Requirements**

Property	Test Method	Units	HDPE Value	LLDPE Value
Density	ASTM D 1505 or D792, Method B	g/cc	0.932 Minimum 0.945 Maximum	>0.915
Melt Flow Index (max.)	ASTM D 1238 (190/2.16)	g/10 min	< 1.0	< 1.0
Oxidative Induction Time	ASTM D 3895 (1-atm/200°C)	min	>100	>100

12.6.2 Check Submitted Manufacturer’s Data and Direct Shear Results Against Requirements

Check the following information:

1. Published product properties against **Tables 2 & 3**.
2. Verify that a GSE UltraFlex LLDPE is being submitted or if a substitute is being proposed by the Contractor, the required direct shear test are provided.
3. Technical Specifications and seaming techniques.
4. The manufacturer’s certification stating that the material proposed is similar to and of the same formulation as that for which test results are submitted, and by which actual usage has been demonstrated to be satisfactory for the intended application.

12.6.3 Obtain Samples for Confirmation Analysis

The CQA Monitor or testing laboratory will obtain one sample per every 100,000 square feet of material to be used on the site or every lot, whichever is greater, and submit the samples to a geosynthetics laboratory for conformance testing. The samples shall be tested for the analyses listed on **Tables 2 & 3**. The CQA Monitor will compare the test results to the requirements on **Tables 2 & 3**.

12.6.4 Monitor Installation

The monitoring duties to be performed are described in Section 02750 – Geomembrane, of the Technical Specifications.

12.6.5 Approval

Once the textured HDPE or LLDPE geomembrane is installed, and all of the test data and monitoring records have been reviewed by the CQA Manager, the CQA Monitor will notify the Contractor in writing that the HDPE or LLDPE geomembrane is complete in conformance with the Technical Specifications and that placement of the geotextile may proceed. If partial

approval is requested by the Contractor, the CQA Monitor may define an area that has been completed by dimensions from the anchor trenches or by coordinates.

12.7 GEOCOMPOSITE

The work to be performed for installation of the Geocomposite (**Drawings C4.0 and 4.1**) will be described in Section 02740 of the Technical Specifications.

12.7.1 Performance Standards

Geocomposite for the embankment shall meet the minimum standards shown on **Table 4** on the following page.

Table 4
Geocomposite with 8-oz. Geotextile - Properties

Property	Test Method	Units	Min Value	Qualifier
Geonet				
Thickness	ASTM D 5199	mil	270±15 ³	Range
Carbon Black	ASTM D 4218	%	2 to 3	Range
Tensile Strength	ASTM D 5035	lb/in	50	Minimum
Melt Flow	ASTM D 12383	g/10 min	1	Maximum
Density	ASTM D 1505	g/cm ³	0.94	Minimum
Transmissivity ¹	ASTM D 4716	m ² /sec	2.5x10 ⁻³	MARV ²
Geocomposite				
Ply Adhesion (min)	ASTM D 7005	lb/in	1	MARV
Transmissivity ¹	ASTM D 4716	m²/sec	=>5 x10⁻⁴	MARV
Geotextile				
Weight	ASTM D 3776	oz/yd ²	8	MARV
Thickness (min.) ³	ASTM D 1777	mils	90	MARV
Grab Tensile (min.)	ASTM D 4632	lbs.	200	MARV
Grab Elongation (min.)	ASTM D 4632	%	50	MARV
Puncture Resistance (min.)	ASTM D 4833	lbs.	130	MARV
Burst Strength (min.)	ASTM D 3786	psi	450	MARV
Trapezoidal Tear (min.)	ASTM D 4533	lbs.	80	MARV
Permittivity (min.)	ASTM D 4491	sec ⁻¹	1.5	MARV
AOS	ASTM D 4751	US Sieve	80	MARV

1. Transmissivity measured using water at 21 ± 2°C (70 ± 4°F) with a gradient of 0.1 and a confining pressure of no less than 500 psf between steel plates after 15 minutes. Values may vary between individual labs. Geonet transmissivity may vary significantly as long as the geocomposite transmissivity is met.
2. MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.
3. Thickness may vary significantly as long as the geocomposite transmissivity

12.7.2 Obtain Samples for Confirmation Analysis

The CQA Monitor or testing laboratory will obtain one sample per every 100,000 square feet of material to be used on the site or every lot, whichever is greater, and submit the samples to a geosynthetics laboratory for conformance testing. The samples shall be tested for the analyses listed on **Table 5**. The CQA Monitor will compare the test results to the requirements on **Table 5**.

If the test fails or has a significantly different combination of phi and cohesion (shear), contact the Design Engineer with the results. The Design Engineer may decide to retest or reanalyze the slope stability analysis. If the transmissivity is less than that described in **Table 5**, the geocomposite shall be rejected and a geocomposite with a thicker geogrid and/or from another manufacturer shall be provided and tested for conformance. It is recommended that the transmissivity and ply adhesion tests be performed and evaluated first before performing the direct shear, although concurrent testing may be required for the Contractor to meet his or her schedule.

**Table 5
 Geocomposite with 8-oz. Geotextile - Testing Requirements**

Property	Test Method	Units	Min Value
Ply Adhesion (min)	ASTM D 7005	lb/in	1
Transmissivity ¹	ASTM D 4716	m ² /sec	=>5 x10 ⁻⁴
Direct Shear ²	ASTM D5321-B	Residual Phi (Deg) / Cohesion (psf)	21/40

1. Transmissivity measured using water at 21 ± 2°C (70 ± 4°F) with a gradient of 0.1 and a confining pressure of no less than 500 psf between steel plates after 15 minutes.
2. Clayey Silt soil remolded to 85% of maximum dry density on top of proposed geocomposite. Perform test flooded, consolidated for 24 hours, and loaded at 100, 200 and 400 psf. Apply displacement at 0.04 inches per minute for no less than 3inches. Use 12" x 12" or larger apparatus.

12.7.3 Check Manufacturer's Data Against Requirements

Check the following information:

1. Published product properties on **Table 4**.
2. Technical Specifications and seaming techniques.
3. The manufacturer's certification stating that the material proposed is similar to and of the same formulation as that for which test results are submitted, and by which actual usage has been demonstrated to be satisfactory for the intended application.

If the published values for the geocomposite proposed by the Contractor do not meet those described in **Table 4**, contact the Design Engineer for review and clarification.

12.7.4 Monitor Installation

The monitoring duties to be performed will be described in Section 02740 of the Technical Specifications.

12.7.5 Monitor Vegetative Layer Placement

The Contractor shall not be allowed to place vegetative layer soil on the geocomposite until the installation in that particular area has been observed and approved by the CQA Monitor, and has been certified by the Contractor, installer, or manufacturer's representative to have been installed in accordance with the Drawings, Technical Specifications, and manufacturer's recommendations.

All geocomposite should be covered within ten (10) days. If the geocomposite will be left exposed for more than ten (10) days, the manufacturer (prior to shipping) shall provide field test data and written recommendations for the maximum time of ultraviolet (UV) exposure. Geocomposite which will be left exposed for more than four (4) weeks shall be routinely sampled every four (4) weeks, and tested for tensile strength. Samples should be taken from the exposed geocomposite, and these areas properly repaired. If, within the time frame of recommended exposure, the tensile strength of the geocomposite falls below 80 percent of the original values, the Contractor shall replace the defective material at no additional cost to the Owner.

The CQA Monitor will visually observe the placement of the embankment fill material to ensure that:

1. Cover material shall be placed on the geocomposite by dumping rather than blading.
2. No wheeled or tracked equipment are operated on the geocomposite without at least 12 inches of cover.
3. Initial cover material is placed from an up-slope position wherever possible.
4. No permanent depth markers are used on the geocomposite.
5. Cover material is placed so as to minimize the formation of wrinkles in the geocomposite.
6. The drainage layer meets the requirement of less than 1/2 inch diameter rock and is free of deleterious substances.
7. All wrinkles over 4 inches tall have been cut out and repaired.

12.7.6 Approval

Once the geocomposite is installed, and all of the test data and monitoring records have been reviewed by the CQA Manager, the CQA Monitor will notify the Contractor in writing that the geocomposite is complete in conformance with the Technical Specifications and that placement of the remaining embankment fill may proceed. If partial approval is requested by the

Contractor, the CQA Monitor may define an area that has been completed by dimensions from the anchor trenches or by coordinates.

12.7.7 In Case of Failure

If the geocomposite is torn during installation, the Contractor shall be required to remove the soil from the geocomposite, cut out the affected area, observe the underlying HDPE or LLDPE for damage, repair the damage (if any) as described in the Technical Specifications, and then install a patch in the affected area. The patch shall be cut and the geogrid trimmed so that the geogrid matches the shape of the geogrid area cut out for the repair and so that the geotextile overlaps the surrounding geotextile by at least 6 inches. The top layer of geotextile shall be heat bonded to the surrounding undamaged geogrid. The Contractor is responsible for all costs associated with the repair/replacement of failed materials.

12.7.8 In Case of Unexpected Gas Pressure

The closure cap is designed with gas-relief trenches spaced for gas generation from old waste with a very high soil content (equating to low gas production). It is possible however that pockets of more active waste could be present and that gas-relief trenches do not provide enough relief. Therefore, during initial geomembrane installation, the liner installer shall install pressure measurement ports beneath the geomembrane that can be monitored after placement of the vegetative layer. If gas pressure exceeds 14 inches of water column beneath the vegetative-layer covered geomembrane after 48 hours, the CQA Monitor shall contact the Design Engineer for guidance. The Design Engineer may recommend that the Owner direct the Contractor to implement the contingency plan for installation of landfill gas vent strips in the top of foundation layer for the remainder or specific portions of the geomembrane as described in the Specifications.

The CQA Monitor will be provided a map showing the location of the most recent waste placement; special attention shall be given to these areas.

12.8 GEOTEXTILES

The work to be performed for installation of geotextile (**Drawings C4.0 and 4.1** and associated details) will be described in Section 02752 of the Technical Specifications.

12.8.1 Performance Standards

Nonwoven geotextiles for the cushion layer shall meet the minimum standards shown on **Table 6** (following page).

Seams for the geotextile shall be sewn or heat lystered so that it provides a continuous filter with no perforations.

Table 6
Non-Woven Geotextile Requirements

Property Geotextile	Test Method	Units	Min. Geotextile Value		
Nominal Weight	ASTM D 3776	oz/yd ²	8	12	16
Thickness (min.)	ASTM D 1777	mil	90	130	145
Grab Tensile (min.)	ASTM D 4632	lbs	200	275	350
Grab Elongation (min.)	ASTM D 4632	%	50	50	50
Puncture Resistance (min.) CBR Puncture Test	ASTM D 6241 4833	lbs	500 130	185	220
Burst Strength (min.)	ASTM D 3786	psi	450	600	700
Trapezoidal Tear (min.)	ASTM D 4533	lbs	80	115	130
Permittivity (min.)	ASTM D 4491	sec ⁻¹	1.15	0.7	0.7

Note: The values in the above table are intended to convey the general quality requirements for the cushion layer. Permittivity is not a minimum value for the cushion layer.

12.8.2 Check Manufacturer's Data Against Requirements

Check the following information:

1. Published product properties.
2. Technical Specifications and seaming techniques.
3. The manufacturer's certification stating that the material proposed is similar to and of the same formulation as that for which test results are submitted, and by which actual usage has been demonstrated to be satisfactory for the intended application.

Obtain samples for confirmation analysis:

1. No tests required.

12.8.3 Monitor Installation

The following monitoring duties will be performed:

1. Confirm overlaps and seams on the sides of the panels are oriented parallel to the line of maximum slope, (i.e., down, not across slope).
2. Confirm that horizontal overlaps or seams at the ends of the rolls (overlaps or seams running perpendicular to the slope) are at least 5 feet away from toe or crest of slope.
3. Confirm that the numbers of overlaps or seams in the corners, odd-shaped geometric and outside corner locations are kept to a minimum.
4. Confirm that overlaps or seams are identified with a numbering / labeling system that is compatible with the panel identification system.
5. Confirm Contractor overlaps geotextile 24 inches when overlaps are used.
6. Make sure Contractor does not overlap the sides of the rolls horizontally on side slopes (i.e., overlap down, not across slopes).

7. Observe sewn seams for gaps or unraveling thread.

12.8.4 Monitor Cover Material Placement

The Contractor shall not be allowed to place drainage-layer material on the geotextile until the installation in that particular area has been tested, and approved by the CQA Monitor, and has been certified by the Contractor, installer, or manufacturer's representative to have been installed in accordance with the Drawings, Technical Specifications, and manufacturer's recommendations.

All geotextiles should be covered within ten (10) days. If the geotextile will be left exposed for more than ten (10) days, the manufacturer (prior to shipping) shall provide field test data and written recommendations for the maximum time of UV exposure. Geotextiles which will be left exposed for more than four (4) weeks shall be routinely sampled every four (4) weeks, and tested for tensile strength. Samples should be taken from the exposed geotextile, and these areas properly repaired. If, within the time frame of recommended exposure, the tensile strength of the geotextile falls below 80 percent of the original values, the manufacturer shall replace the defective material assuming all cost for removal of the defective material and installation of the replacement material.

The CQA Monitor will visually observe the placement of the drainage-layer material to ensure that:

1. Cover material shall be placed on the geotextile by dumping rather than blading.
2. No low-ground pressure wheeled or tracked equipment are operated on the geocomposite without at least 12 inches of cover.
3. No Soil hauling trucks or graders shall operate on areas with less than two feet of soil cover.
4. Initial cover material is placed from an up-slope position wherever possible.
5. No probes for checking the depth of cover over the geotextile are used.
6. No permanent depth markers are used on the geotextile.
7. Cover material is placed so as to minimize the formation of wrinkles in the geotextile.
8. The drainage layer meets the requirement of less than 1/2 inch diameter rock and is free of deleterious substances.
9. All wrinkles over 4 inches tall have been cut out and repaired.

12.8.5 Approval

Once the geotextile is installed, and all of the test data and monitoring records have been reviewed by the CQA Manager, the CQA Monitor will notify the Contractor in writing that the geotextile is complete in conformance with the Technical Specifications and that placement of the protective layer may proceed. If partial approval is requested by the Contractor, the CQA Monitor may define an area that has been completed by dimensions from the anchor trenches or by coordinates.

12.9 VEGETATIVE LAYER

The vegetative layer is described in Section 02245 –Vegetative Layer of the Technical Specifications. The vegetative layer consists of native soil obtained from excavation of the borrow area shown on **Drawing C5.0** of the FCPMP.

12.9.1 Performance Standards

The vegetative layer material must be placed to the specified thickness (18 inches) so that it does not damage the geomembrane or geocomposite. Deleterious materials, including caliche nodules over 6 inches in diameter, sticks, and roots must be picked from the material. The soil shall be compacted to no less than 85% of maximum dry density per ASTM D1557 at plus or minus 3% of optimum moisture content. Prior to application of erosion control, track walk up and down the slope.

12.9.2 Field Observation

Observe the placement of the material over the geotextile as described in Part 12.8.4 (Geotextiles, Cover Installation) of this CQA Plan.

The Contractor may install more than the required thickness at his own cost. Once the installation of the protective layer is complete and observed, the CQA Monitor will provide written notice that the Contractor may proceed with erosion control.

12.9.3 Testing

CCR Title 27 does not require density testing of the vegetative layer. The pay quantity, however, is based on a minimum of 85% of maximum dry density or greater, and infrequent nuclear density gage testing of the vegetative layer will be performed to confirm that the minimum density is being achieved. A minimum of one moisture/density test per ASTM D6938 is recommended per every acre to verify conformance with the specifications this specifications. The test should be performed after clearing three inches of loose soil off the top of the vegetative layer. If failing density tests are encountered, perform the re-test procedure as described in Section 02210 - Site Grading and Foundation Layer. If needed, increase the frequency, as needed to document Contractor conformance.

12.9.4 In Case of Failed test or Damaged Liner

In case of a failed density test, perform the retest procedure described in Section 12.5.4.1 above. In case of damage to the geocomposite or geomembrane, the Contractor shall be required to expose the damaged area and repair the damage as described in the pertinent sections of this CQA Plan at his or her own cost. The Owner is not responsible for the cost of repairing/replacing failed materials.

12.10 DRAINAGE AND EROSION CONTROL

From a CQA standpoint, erosion control includes installation of rock lining in channels, and culverts to route storm water beneath roads, and installation of seeding and mulching on the

finished vegetative layer. The soil at this site is somewhat erosive, and the erosion control must be completed no later than October 1 of the construction season. If the Contractor falls behind schedule, completing erosion control on the toe and side slopes takes first priority.

Prior to construction the Contractor will be required to submit a construction Stormwater Pollution Prevention Plan (SWPPP) to the Owner for review. Construction activities will fall into the following categories in roughly chronological order:

1. Drainage swales are created during the construction of the foundation layer.
2. On the toe of the landfill, the geocomposite drainage layer will serve as the cushion layer for rock and rip-rap placement in ditches and energy dissipators. Elsewhere, 8-ounce nonwoven geotextile will be used as a cushion layer between rock and the geomembrane or rock and vegetative-layer soil beneath drainage ditches.
3. The geocomposite termination will be covered by a rock apron. Observe the depth and width of installation.
4. Portions of the perimeter road will covered by woven geotextile and angular rock. Confirm that the fabric is installed and proper rock thickness placed. No submittal or testing will be required for the woven geotextile.
5. All disturbed areas, both in the borrow areas and closure cap (excluding rock lined swales and graveled roads) will be seeded, fertilized, and mulched as described in the Technical Specifications.
6. Ensure that straw wattles are placed on the contour using a level, properly contoured, staked, and located in a shallow swale for good bonding with the soil.
7. Monitor erosion control for thorough placement.

A primary goal of the CQA Monitor will be to confirm that the geomembrane is not punctured during placement of erosion and sediment control features. If a puncture occurs, the CQA Monitor shall confirm that the Contractor repairs the puncture in accordance with the Technical Specifications. Another goal is to confirm that the proper materials are used for construction of the culverts and lined drainage swales.

12.11 FINAL CLEANUP

The CQA Monitor will make a visual observation of the site to verify the following:

- All equipment, vehicles, and field offices have been removed.
- All trash has been removed.
- No oil, hydraulic fluid, fuel, or other deleterious substances have been left onsite in containers or in the soil.
- All remaining spoil piles have been graded in accordance with the Plans and Technical Specifications.

- All contract items have been completed.
- All of the monitoring facilities are undamaged.
- All gates and fences are undamaged or have been repaired.
- The site and surrounding area has been left in a neat and orderly manner.
- Observation of these items will be reported on a daily report log.

13 NOTICE OF FINAL COMPLETION AND CQA REPORT

After the CQA Monitor finds all items completed, he or she will recommend the Owner to file the Notice of Completion. The CQA Monitor and CQA Manager will then compile the project documents, as described above, into a CQA report. The CQA Manager will prepare a cover letter stating that after reviewing the monitoring documents, to the best of his or her knowledge, the final closure features have been installed in accordance with the Drawings and Technical Specifications. The copy of the letter sent to the Owner and will have an original wet stamp of the CQA Manager.

Title 27 CCR requires that the Final CQA report shall be submitted to the Regional Water Quality Control Board within 60 days of the completion of construction to conform to Waste Discharge Requirements for construction reports.

APPENDIX A
Forms

