

Individual - Solid Waste Class 1, 3 and 4 Landfill Permit Application Or Modification

version 1.33

(Submission #: HQF-66KS-1ETNH, version 1)

Details

Originally Started By	Jonathan King
Submitted	8/29/2025 (10 days ago) by Brad Denton Harville
AFIN	15-00001
Reference #	0284-S3N
Submission ID	HQF-66KS-1ETNH
Submission Reason	Modification
Submission Assigned Staff	Richard Bennett
Status	Action Required

Fees

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Payments/Adjustments	\$0.00
Balance Due	\$2,000.00 (Due)

Form Input

Facility Identification

Facility Type	Class 3N
Type of Application	Modification
Fee Amount	\$2000
Facility Name	Green Bay Packaging Inc - Arkansas Kraft Division Class 3N Landfill
Permit Number	0284-S3N
Arkansas DEQ Facility Identification Number (AFIN)	15-00001

Facility Contact Information and Physical Address

Phone Type **Number** **Extension**

Business 5013549518

Email

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Physical Address

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MORRILTON, AR 72110

Conway

Used for Route Map

Bennett

Applicant Identification

Applicant Name

Green Bay Packaging Inc - Arkansas Kraft Division

Applicant Contact Person and Address

Applicant Contact

First Name **Last Name**

Jacob Wessen

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[NO COUNTRY SPECIFIED]

Secretary of State Filing Information

Arkansas Secretary of State Registered Entity Name

Green Bay Packaging Inc.

Arkansas Secretary of State Filing Number

100061110

Filing Type (Confirm Correct Filing Type)

Domestic

Documentation of Good Standing from Foreign State

[WI Letter of Good Standing.pdf - 08/28/2025 08:28 AM](#)

Comment

NONE PROVIDED

Filing Status with Arkansas Secretary of State

Good Standing

Permit History

Permit History

Type	Permit Number	Date Issued
Initial	0176-SR-1	03/27/1981

Type	Permit Number	Date Issued
Modification	0176-SR-2	07/01/1992
Modification	0284-S3N	11/08/1996

Modification Changes

Select the Modifications

Change in Operating Procedures

Change in Operating Procedures

Provide a Brief Description of Each Proposed Modification to the Operating Procedures

Created a site-specific Construction Quality Assurance (CQA) Plan.

Reason for Modification

Select the Reason for Modification

Improve Site Operations

Drawing Revisions

Are There Any Drawing Revisions Associated with This Modification?

No

Operating Narrative Revisions

Are There Any Operating Narrative Revisions Associated with This Modification?

No

Supplemental Data

Is There Any Supplemental Data Associated with This Modification?

Yes

Identify Below Any Report, Study, Data, Information, Etc. That Was Not Part of Previous Permit Documents

Document Title	Document Description
Construction Quality Assurance and Quality Control Plan	Attached a site-specific plan that outlines the construction quality assurance and quality control procedures of bottom liner and final cover construction.

Supplemental Data Documents

[GBP_CQA-Plan_2025.pdf - 08/28/2025 09:11 AM](#)

[Minor Modification Application Fee.pdf - 08/28/2025 12:46 PM](#)

Comment

NONE PROVIDED

Signatories

Applicant or Authorized Person as Defined in Rule 22.301(h)

First Name	Last Name	
Brad	Harville	
Title		
Vice President & General Manager		
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Business	5013544521	

Engineer or Consultant in Accordance with Rule 22.301(i)

First Name	Last Name	
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Title		
Principal Engineer		
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Mobile	5015544547	

Attachments

Date	Attachment Name	Context	User
8/28/2025 12:46 PM	Minor Modification Application Fee.pdf	Attachment	Jonathan King
8/28/2025 9:11 AM	GBP_CQA-Plan_2025.pdf	Attachment	Jonathan King
8/28/2025 8:28 AM	WI_Letter of Good Standing.pdf	Attachment	Jonathan King

Status History

	User	Processing Status
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8/28/2025 12:47:20 PM	Jonathan King	Signing
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9/4/2025 11:49:43 AM	Richard Bennett	Action Required

Audit

Event	Event Description	Event By	Event Date
Submission Locked	Submission Locked	Richard Bennett	9/4/2025 9:37 AM

Agreements and Signature(s)

SUBMISSION AGREEMENTS

- ☒ I am the owner of the account used to perform the electronic submission and signature.
- ☒ I have the authority to submit the data on behalf of the facility I am representing.
- ☒ I agree that providing the account credentials to sign the submission document constitutes an electronic signature equivalent to my written signature.
- ☒ I have reviewed the electronic form being submitted in its entirety, and agree to the validity and accuracy of the information contained within it to the best of my knowledge.

Applicant or Authorized Person as Defined in Rule 22.301(h)

To the best of my knowledge and belief, I certify the information provided in this application is true and accurate.

Signed
By Brad Denton Harville on 08/29/2025 at 2:51 PM

Engineer or Consultant Who is Retained by the Applicant in Accordance with Rule 22.301(i)

To the best of my knowledge and belief, I certify the information provided in this application is true and accurate.

Signed
By BRAD FUREIGH on 08/28/2025 at 1:31 PM

United States of America

State of Wisconsin

DEPARTMENT OF FINANCIAL INSTITUTIONS

Division of Corporate & Consumer Services



To All to Whom These Presents Shall Come, Greeting:

I, Kristie Pulvermacher, Administrator of the Division of Corporate and Consumer Services, Department of Financial Institutions, do hereby certify that

GREEN BAY PACKAGING INC.

is a domestic corporation or a domestic limited liability company organized under the laws of this state and that its date of incorporation or organization is April 03, 1948.

I further certify that said corporation or limited liability company has, within its most recently completed report year, filed an annual report required under ss. 180.1622, 180.1921, 181.0214 or 183.0212 Wis. Stats., but that it has not filed a statement or articles of dissolution.



IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the Department on August 28, 2025.

A handwritten signature in black ink that reads "Kristie Pulvermacher".

KRISTIE PULVERMACHER, Administrator
Division of Corporate and Consumer Services
Department of Financial Institutions

DFI/Corp/33

To validate the authenticity of this certificate

Visit this web address: <https://apps.dfi.wi.gov/apps/ccs/verify/>

Enter this code: XXXXXXXXXX

CONSTRUCTION QUALITY ASSURANCE AND QUALITY CONTROL PLAN

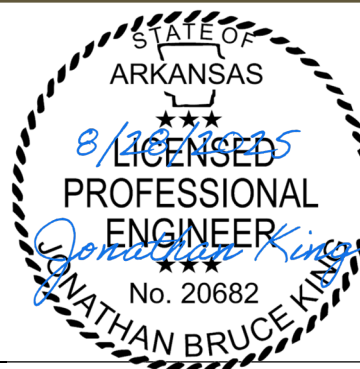
Green Bay Packaging Class 3N Landfill Morriton, Arkansas

Permit No. 0284-S3N
AFIN: 15-00001

August 2025
Promus Project No. 250192

Prepared for:
Green Bay Packaging, Inc. – Arkansas Kraft Division
338 Highway 113 South
Morriton, Arkansas 72110

Prepared by:



Jonathan B. King, PE
Arkansas Professional Engineer License No. 20682

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CONSTRUCTION QUALITY ASSURANCE PLAN

Green Bay Packaging, Inc. – Arkansas Kraft Division
Class 3N Landfill
Morrilton, Arkansas

1.0 INTRODUCTION

The Green Bay Packaging Class 3N Landfill (the “facility”) is owned and operated by Green Bay Packaging, Inc. – Arkansas Kraft Division as a Solid Waste Management Facility under Permit Number 0284-S3N, AFIN: 15-00001 issued by the Arkansas Energy and Environment, Division of Environmental Quality – Office of Land Resources (DEQ). The facility is regulated in accordance with the Arkansas Pollution Control and Ecology Commission Rule No. 22 – Solid Waste Management Rules (the “Rules”), as promulgated by DEQ.

1.1. Purpose

In accordance with Rule 22.428, the facility must develop a Construction Quality Assurance/Quality Control Plan (CQA Plan) that specifies the following:

“Quality Assurance Plans – Bottom, sidewall liners and final covers (both synthetic and clay components) shall be constructed in accordance with written quality assurance plans. The plan(s) shall be made a part of the operating narrative and detail quality assurance methods for all aspects of the completed construction. Site specific plans shall be developed based on the provisions of the Generic Construction Quality Assurance Plan for the Lining and Cover Systems Guidance Document dated September 1992. Copies of the generic plan may be received from the Solid Waste Management Division. Facilities may, at their option, adopt the generic plan, develop a site-specific plan that incorporates the generic plan provisions, or adopt the generic plan with certain express site specific modifications. At a minimum, quality assurance plans shall incorporate the specifications described herein.”

This CQA Plan is intended to satisfy Rule 22.428 by developing a site-specific plan that incorporates the generic plan provisions.

Following the construction of each area or cell of the landfill and following closure construction of landfill areas, a Construction Quality Assurance Documentation Report (CQA Report) will be submitted to DEQ. This report shall contain a statement by a Professional Engineer licensed by the State of Arkansas, indicating that construction of the landfill facility was performed in accordance with permit drawings and narrative and this CQA Plan.

1.2. Scope

This CQA Plan addresses the responsibility and authority of various entities involved in the construction of the landfill, quality objectives, construction testing, and documentation during construction at the facility. The plan as developed in this document addresses the following components of construction:

- ▶ Excavation;
- ▶ Structural Fill;
- ▶ Compacted Soil Liner/Final Cover;
- ▶ Geotextiles;
- ▶ Leachate Collection System Components; and
- ▶ Protective Soil Cover.



The CQA Plan presented in the following paragraphs contains the programs for both CQC testing and observations and CQA analyses for the construction. This CQA Plan has been developed to work in conjunction with permitted plans and specifications for the facility. For each construction project, a set of construction drawings and specifications may be developed. In the case of conflict between this CQA Plan and construction plans and specifications, the CQA Plan shall take precedence over both construction specifications and the construction drawings. Construction specifications should be no less stringent than this document.

2.0 RESPONSIBILITY AND AUTHORITY

The responsibility and authority of the individuals and organizations involved in the design, permitting, construction and inspection of a landfill are discussed below. These responsibilities and authorities are in accordance with the EPA Technical Guidance Document *Quality Assurance and Quality Control for Waste Containment Facilities*. The individuals, their affiliation, responsibilities and authorities are described as follows:

- ▶ **Permitting Agency.** The Arkansas Department of Energy and Environment, Division of Environmental Quality – Office of Land Resources (DEQ) is the agency responsible for permitting the landfill. DEQ maintains the responsibility to review the construction specifications and the CQA Plan for compliance with the agency's regulations. DEQ also has the responsibility to review all CQA/CQC documentation during or after construction of a facility, possibly including visits to the construction site to observe the CQC and CQA practices, to confirm that the approved CQA Plan was followed, and that the facility was constructed as specified in the design.
- ▶ **Owner/Operator.** Green Bay Packaging, Inc. – Arkansas Kraft Division (Green Bay Packaging) is the owner/operator. Green Bay Packaging is responsible for the design, construction, and operation of the facility. This responsibility includes complying with the requirements of the DEQ, the submission of CQA/CQC documentation, and assuring the DEQ that the facility was constructed as specified in the construction plans and specifications and as approved by the permitting agency. Green Bay Packaging has the authority to select and dismiss organizations charged with design, construction, and CQA/CQC.
- ▶ **Owner's Representative.** The Owner/Operator will designate an official representative who is responsible for coordinating schedules, meetings, and field activities. This responsibility includes communications to other members in the owner/operator's organization, owner's representative, permitting agency, material suppliers, general contractor, specialty subcontractors or installers, and CQA engineer.
- ▶ **Design Engineer.** The Design Engineer is a professionally licensed firm or person, retained by the Owner/Operator to prepare permit and/or construction documents for acceptance by the Permitting Agency and necessary to construct the facility. The permit documents include forms, narratives, the CQA Plan, and the design of the landfill. The permit documents establish the limits, type, and details for liner systems, leachate management systems and other components for the waste containment facility. The permit documents provide minimum specifications for construction and are the governing document when a specification contradiction is discovered.



The Design Engineer may also develop construction documents (plans and specifications) that further define the nature of the construction effort for bidding and construction purposes. During construction, the Design Engineer may be called upon to provide additional information or resolve discrepancies in the construction documents or CQA Plan, as necessary.

- ▶ **CQA Consultant.** The CQA Consultant shall be selected by, and represent the Owner or Operator. The CQA Consultant shall be responsible for documenting the construction as being in conformance with the CQA Plan. The CQA Plan outlines the minimum inspection requirements to be used by the CQA Consultant to ensure that the requirements of the site permit are satisfied.

In general, the responsibilities and authorities of the CQA Consultant include:

- A working understanding of the project documents;
- Scheduling, coordinating, and performing CQA activities, as appropriate;
- Performing independent on-site observation of the work in progress to assess compliance with the CQA Plan;
- Verifying that the CQC test equipment meets testing and calibration requirements, and that tests are conducted according to standardized procedures defined in the CQA Plan;
- Recording and maintaining test data;
- Identifying CQC-tested work that should be accepted, rejected, or further evaluated;
- Providing recommendations for corrective measures, when needed, and verifying that corrective measures are implemented, as necessary;
- Reviewing and approving quality control documentation and activities;
- Collecting data needed for record documentation;
- Maintaining open lines of communications with other parties involved in the construction; and
- Documenting that major project elements are constructed in accordance with the project documents.

CQA Consultant shall designate a CQA Field Representative (or representatives, as necessary) to perform on-site observation of construction, verify or perform CQC field sampling and testing, develop and maintain daily logs, and report to the CQA Project Manager or CQA Engineer. CQA Field Representatives shall be specifically experienced and trained as field quality control and quality assurance personnel in the area of construction being inspected. The CQA Field Representatives' duties shall include the following:

- Performing independent on-site observation of the work in progress to assess compliance with the project requirements;
- Preparation of a Daily Field Report (DFR) for each day the representative is on site;
- Performing field and laboratory tests on samples retrieved in the field to determine that the materials placed meet the requirements of this CQA Plan;
- Verify that soils testing meets the requirements and that the tests are conducted according to this CQA Plan;



- Reporting to project management the results of the observation activities and field tests, including work that is not of acceptable quality or that fails to meet the specific design;
- Verifying that failed areas of work are reworked or replaced and completed in compliance with the CQA Plan.

CQA Consultant shall designate a CQA Engineer who shall be responsible for overall administration of quality assurance procedures and for the control of quality assurance documents. The CQA Engineer shall be responsible for oversight and coordination of quality assurance technicians and testing laboratories and shall document construction to be in substantial conformance with the CQA Plan. The CQA Engineer may be assisted in fulfilling project responsibilities by a CQA Project Manager or other CQA staff. The CQA documentation report shall bear the seal of a Professional Engineer registered in the state of the Permitting Agency.

- ▶ **CQC Personnel.** Construction Quality Control Personnel are individuals who work for the General Contractor, Subcontractor, or CQA Engineer and whose job it is to collect the data necessary to document that construction is in accordance with the plans and specifications.
- ▶ **CQC Manager.** The Construction Quality Control Manager should be an individual who is experienced in those aspects of landfill construction including clay liner construction and leachate collection system installation. The CQC Manager should maintain overall responsibility for the collection and assimilation of CQC data, and the transfer of these data to the CQA Engineer. Prior to commencement of the project, the CQC Manager shall obtain from the Design Engineer a full set of the plans and specifications for the project. He will check the plans and specifications, including revisions, against the CQA Plan and specifications. Any discrepancies will be brought to the attention of the CQA Engineer for resolution. The CQC Manager will ensure that an up-to-date set of the plans and specifications is maintained at the site or otherwise available (such as using digital media).
- ▶ **CQA Engineer.** The CQA Engineer is responsible for confirming that the facility was constructed in accordance with the plans and specifications as developed by the Design Engineer and approved by DEQ. The CQA Engineer has overall responsibility for manufacturing quality assurance, construction quality control and construction quality assurance. The Owner/Operator will select a CQA Engineer for various phases of construction, typically for each individual landfill cell or closure construction. The CQA Engineer should be a registered professional engineer in the State of Arkansas. He/she should possess individual experience in those aspects of landfill construction including clay liner construction and leachate system installation. The CQA Engineer is responsible for reviewing the CQA Plan as well as general plans and specifications for the project so that the CQA Plan can be implemented with minimal contradictions or unresolved discrepancies. Other responsibilities of the CQA Engineer may include: education of CQC personnel on CQA/CQC requirements, scheduling and coordinating of CQA/CQC inspection activities, ensuring that the procedures established by this CQA Plan are followed, ensuring that test data are maintained for later reporting, and preparation of periodic reports. In the event of nonconformance with the project specifications or CQA Plan, the CQA Engineer should notify the Owner/Operator as to the details and, if appropriate, recommend work stoppage and possible remedial actions. The CQA Engineer is usually required to be at the construction site, or have a representative on-



site, during all major construction operations to oversee construction and CQA/CQC personnel.

- ▶ **General Contractor.** The General Contractor may have overall responsibility for construction of the waste containment facility, or portions thereof. The Owner or Operator may select a General Contractor for various phases of construction, typically, for each individual landfill cell or closure project construction. The General Contractor, as required in the Contract, is responsible for purchase of materials that are not Owner-supplied and that meet specifications, contracts with subcontractors for specialized needs, and has overall control and responsibility for the construction operations, including scheduling. The General Contractor has the primary responsibility for ensuring that the facility is constructed in accordance with the plans and specifications that have been developed by the Design Engineer. The General Contractor is also responsible for informing The Owner/Operator, CQC personnel, CQA Engineer and other installers or contractors of the scheduling and occurrence of construction activities. The Owner/Operator may serve in the capacity of General Contractor and arrange for all, or a portion, of the necessary material, fabrication, and installation contracts. In such cases, the Owner's Representative will serve the same function as the General Contractor.
- ▶ **Subcontractor.** Specialized portions of the construction may be performed by a Subcontractor to the General Contractor, or by a specialty contractor hired directly by the manufacturer, or fabricator or by the Owner/Operator directly. The duties of the Subcontractor will be established by the General Contractor or the Owner/Operator. The Subcontractor is responsible for informing the General Contractor, Owner/Operator, and the CQA Engineer of the scheduling and occurrence of all construction activities to be performed by them.
- ▶ **Testing Laboratory.** Many CQA/CQC tests are performed by commercial laboratories. The Testing Laboratory should have its own internal QC plan to ensure the laboratory procedures conform to the appropriate and current American Society for Testing and Materials (ASTM) standards or other applicable testing standards. The Testing Laboratory is responsible for ensuring that tests are performed in accordance with applicable methods and standards, for following internal QC procedures, for maintaining sample chain-of-custody records, and for reporting data. The Testing Laboratory must be willing to allow the Owner/Operator, Permitting Agency, Design Engineer, Installer, or CQA Engineer to observe the sample preparation and testing procedures, or record-keeping procedures, if they so desire.
- ▶ **Soils Laboratory.** CQA/CQC testing of soils and aggregate may be performed by one or more commercial geotechnical laboratories. The Soils Laboratory is responsible for performing the laboratory testing on earthen materials required by the CQA Plan to determine the specific characteristics of the soils and aggregates. The Soils Laboratory shall also be responsible for providing adequate documentation of analytical results, the test methods followed, and testing equipment used. Work of the Soils Laboratory shall be reported to, and evaluated by, the CQA Consultant.



3.0 PROJECT COORDINATION

In order to achieve an effective quality program during construction and achieve the project requirements by the completion of the project, active and deliberate communication between project parties is essential. Clear and open channels of communication are essential for quality construction and timely project completion.

3.1. Pre-Construction Meeting

A pre-construction meeting may be held prior to commencement of construction at the project site. Additional construction meetings may be held prior to commencement of a new phase of work, such as geosynthetics installation, as necessary. Essential project personnel shall attend the construction meeting(s), as appropriate. Pre-construction meetings may include a discussion of the construction management organization, respective duties during the construction, and periodic reporting requirements for test results and construction activities. A discussion of the schedule for coordinating activities may also be included.

3.2. Progress Meeting

Routine progress meetings may be held from time to time, depending on the ongoing and anticipated construction activities, to discuss project progress. These meetings may include the Owner or Operator's Construction Manager, the CQA Consultant, the General Contractor and Subcontractors, as appropriate. These meetings may be held daily, weekly, monthly or on a periodic basis.

3.3. Issue or Work Deficiency Meetings

A special meeting may be held when a problem or deficiency is identified or anticipated. At a minimum, the meeting should be attended by the General Contractor, and involved Subcontractors, the Owner or Operator's Construction Manager, and the CQA Consultant. If the problem may require a design modification, the Design Engineer should also be present. The purpose of the meeting is to define the problem or work deficiency, review alternative solutions, and most importantly, implement an action plan to resolve the issue.

4.0 PROJECT CONTROL VISITS

4.1. Periodic Visits

Periodically, the CQA Manager and the Certifying Engineer(s) shall visit the construction site. This visit should be coordinated with a similar visit by the Design Engineer when appropriate. In accordance with Arkansas Rule 22.428(h), the professional certifying the construction shall at minimum visit the site at least once prior to construction, once during construction and once after construction is substantially completed, unless such visits are not practical.

5.0 CONSTRUCTION QUALITY CONTROL

Construction Quality Control (CQC) is the act of performing and documenting visual inspections, and field and laboratory testing of the construction materials and methods used and sampling of the components of construction. CQC technicians are responsible for performing the tests required and



collecting the necessary samples to document that the materials and construction practices used are in accordance with the project designs.

The Daily Field Report (DFR) is the primary communication tool for the CQC technicians. The CQC Technician and/or CQC Manager should prepare, or have prepared, a DFR for each day the technician is on site. At a minimum, the DFR will document the following:

- Contractors and subcontractors working on-site;
- Equipment available and operating on-site;
- Weather conditions;
- Time CQC personnel were on-site;
- Summary of the contractor's activities throughout the day;
- Types of testing performed, location of the tests, and test results;
- Types of samples obtained, location of the sample points and plans for sample testing;
- Summaries of any meetings held on-site that were attended by CQC personnel; and,
- Notation of on-site visitors that are significant to the construction (Design or CQA Engineer, regulatory representatives, etc.)

DFRs should be submitted to the CQA Engineer, the Owner's Representative, and the Design Engineer, as requested. Additionally, the CQC Manager should maintain a copy of each DFR at the site throughout the duration of the project.

The CQC process will result in the collection of extensive data and samples of completed work products. The location of pertinent tests or sampling points shall be documented in a manner suitable to allow re-establishment of the sample location. Date and time of the action shall be included. Horizontal location shall be specified by the method in use for this work at the facility (e.g., grid coordinates, station and offset, etc.). Where elevation is also important (e.g., lift number), it shall be included. Each test or sample shall be assigned a unique identification.

Samples to be sent off-site shall be under chain-of-custody control. The control sheet shall include the unique sample identification, the sample destination, and the required testing.

The CQC process will oversee the major work elements of excavation, subgrade verification, compacted soil liner construction, clay cap construction, and leachate collection system installation. The CQC aspects of each of these work elements are addressed individually in subsequent sections of this plan.

6.0 CONSTRUCTION QUALITY ASSURANCE

The purpose of construction quality assurance (CQA) is to ensure the facility is constructed in accordance with the project plans and that the CQA Plan is followed. Additionally, it is the responsibility of the CQA Engineer to review CQC actions, perform analytical and statistical analyses of the data collected, and to prepare the Construction Documentation Report.

The CQA Engineer will maintain copies of DFRs, field and laboratory test reports, project-related memoranda, design change information, etc. The CQA Engineer will also review all such information and document its compliance with this CQA Plan.



Upon completion of a cell, phase of a cell, portion of the cap or other milestone occasion as directed by the owner, the CQA Engineer shall prepare a final Construction Documentation Report on the work accomplished. This report shall be signed and sealed by the CQA Engineer. The report shall include the following:

- Results and locations of testing;
- Daily Field Reports;
- Demonstration that the construction specifications were met;
- Demonstration that the testing frequencies of the CQA Plan were met;
- Demonstration that the acceptance criteria of the CQA Plan were met; and
- Statement by the CQA Engineer that the components inspected met the requirements addressed by the CQA/CQC Plan.

7.0 SURVEYING

Surveying of lines and reference elevations is conducted on an ongoing basis during the construction of the compacted soil liner, leachate collection system components, and soil cover. Accurate surveying is essential to ensure that the liner/cover and hydraulic transport systems function as designed. The Contractor will be responsible for establishing grade control and the preparation of accurate record drawings (as-builts). The CQA Consultant will be responsible for reviewing all surveying activity performed by the Contractor to ensure that construction adheres to the Project Plans and Specifications.

7.1. Survey Control

At least one permanent benchmark will be established for the project in a location convenient for reference during construction. The reference datum will be consistent with State Plane Coordinates and/or the established facility grid/survey coordinate system. The vertical and horizontal control for the benchmarks shall be established within normal land surveying standards. All initial survey controls are either in place as of the date of this writing, or will be established by the Design Engineer prior to execution of the Project.

7.2. Precision and Accuracy

A wide variety of survey equipment is available for use in projects of this type. The survey instruments used for this work should be sufficiently precise and accurate to meet the needs of the project. All survey instruments should be capable of reading to a precision of 0.1 feet and with a setting accuracy of ± 0.8 sec. (2.2×10^{-3} degrees).

7.3. Lines and Grades

The following surfaces shall be surveyed by the Contractor and verified by the CQA Consultant to document the lines and grades achieved during placement and compaction.

1. For the berms and other earthworks:
 - original grade surface;
 - compacted surface of cut slopes; and
 - finished grade surface.



2. For the compacted soil liners:
 - original contours;
 - prepared subgrade surface; and
 - finished compacted soil liner surface.
3. For the soil cover materials:
 - prepared surface; and
 - finished soil cover surface.

In addition, the lateral and vertical extent critical leachate collection system components shall be provided on the record drawings for future reference (if necessary).

7.4. Frequency and Spacing

All surveying should be carried out immediately upon completion of a given installation to facilitate progress and avoid delaying commencement of the next installation. Any surveying conducted by the CQA team, is to be conducted as a check on the Contractor, but is not intended to alleviate the Contractor from his/her responsibilities for insuring that all construction is within the required grades and lines shown in the project plans and specifications.

The following minimum spacings and locations should be provided for survey points:

- All "flat" surfaces, such as the base of the landfill, with gradients less than 10 percent, should be surveyed on a square grid not wider spaced than 50 feet;
- On all slopes greater than 10 percent, a square grid not wider than 50 feet should be used, but in any case, a line at the crest, midpoint, and toe of the slope should be taken;
- A line of survey points no further than 50 feet apart must be taken along any slope break (this will include the inside edge and outside edge of any bench on a slope);
- A line of survey points no further than 50 feet apart must be taken at the invert of any pipes or other appurtenances to the liner;
- At the corners and midpoints of the top and bottom of all sumps; and
- At the midpoint of the crest of the outside berms.

7.5. Documentation

Copies of all field survey notes should be retained by the Surveying CQA Managing Engineer. The findings from the field surveys should be documented on a set of Survey Record (As-Built) Drawing(s). As-built drawing(s) and as-built data shall be provided to the CQA Engineer, as requested, to facilitate determination of compliance with specification requirements. Survey data shall be illustrated in a topographic format and table form demonstrating calculated component thicknesses at each point. The as-built survey information, certified by the surveyor, will be submitted in the CQA Report.

The Record Drawing(s) should include the following information when applicable:

- ▶ Layout of Prepared Area in Relation to Permitted Boundaries;
- ▶ Property boundaries and/or corners;
- ▶ Monitoring wells and piezometers (if scale permits);



- ▶ Leachate risers, manholes and collection piping related to the specific cell and/or construction;
- ▶ Limits of existing/future refuse disposal areas;
- ▶ Any gas monitoring facilities or wells in the area;
- ▶ Labeling and Miscellaneous Information;
 - Descriptions of what each line style represents
 - Drawing scale
 - Legend
 - North Arrow
- ▶ Existing Contours (prior to construction activity corresponding to this project);
- ▶ A key map showing the location of the construction related to the permitted design, along with an identification of areas previously constructed and areas yet to be constructed; and
- ▶ The top elevations of each pertinent surface to a construction event, e.g., compacted soil liner, protective cover, soil cover layer, etc. referenced to the site grid coordinate system;
- ▶ The location of slope breaks, leachate sump and trenches, berms; and
- ▶ The limits of the extent of the intermediate cover including all slopes;
- ▶ Any other features deemed significant.

8.0 QA/QC FOR ELEMENTS OF CONSTRUCTION

The quality control, quality assurance and surveying requirements provided above will apply to the various elements of construction that are required for the landfill. Because of the unique construction aspects of each element, each is addressed separately in the following sections. Tables 1, 2, and 3 provided within this plan present testing methods, frequencies, and requirements for each of the construction elements. The following sections detail these testing requirements.

8.1. Excavation

Materials from on-site excavations that meet material acceptance criteria may be utilized for various purposes such as structural fill, compacted soil liner, bottom liner protective soil cover, vegetative soil cover, and other civil improvements. Additionally, the soil derived from excavations may be used as daily cover for landfill operations.

There are no testing or sampling requirements associated with quality control of excavations (other than surveying) because materials acceptance will be confirmed during liner/cap construction. However, the contractor should visually note material transitions and segregate stockpiles accordingly.

8.1.1. Subgrade Verification

The subgrade is defined as the soils which form the floor and side slopes of the cell after all soils have been excavated but prior to placement of compacted clay liner. In excavated or cut areas, the cell floor bearing surface for the soil liner shall be proof-rolled with a fully loaded, rubber-tired vehicle of sufficient weight to reveal areas requiring stabilization. Areas that exhibit instability, as determined by the CQA Engineer or Design Engineer, shall be stabilized. The stabilization may involve undercut and backfill or other procedures, typical for stabilization of subgrades in structural fill areas. In sloped



areas where proof-rolling is not practical, the subgrade shall be visually evaluated for stability or evaluated by other means acceptable to the Design Engineer or CQA Engineer.

8.2. Structural Fill

The CQA Engineer shall verify that the structural fill soils used for achieving design subgrade elevations are sampled and tested according to the ASTM methods and frequencies in Table 1. When fill is necessary to achieve the soil liner subgrade, the final surface in fill areas shall also be tested for density and moisture content at the minimum frequency specified for structural fill in Table 1.

8.2.1. Materials Verification

Fill materials shall conform to the requirements of this CQA Plan and be approved by the CQA Engineer prior to placement. The materials should be free of large roots, construction debris, organic matter, or any other type of deleterious matter.

The CQA Engineer may adjust the test requirements and frequencies provided in Table 1 as necessary to achieve the performance requirements. If materials are found to be highly consistent, then the testing requirements of Table 1 may also be relaxed appropriately.

8.2.2. Fill Placement / Compaction

The fill materials should be placed in loose lifts, graded to provide a uniform thickness not exceeding nine inches. The surface of each preceding, compacted lift should be lightly scarified to ensure adequate bonding between lifts.

The lift should be compacted to a dry density equal to at least that noted on Table 1. In addition to this density requirement, the compacted lift should be visually stable under the weight of the compactor without pumping or other excessive deflection.

8.2.3. Field Moisture / Density Testing

Subsequent to placement and compaction of each lift, the CQC Technician should determine the in-place density and moisture content. Table 1 provides the methods and minimum frequency of testing for structural fill. Each test must be specifically determined to "Pass" or "Fail". Failing tests should be specifically tracked until the failed area is reworked and re-tested satisfactorily.

Separate samples should be collected for moisture content analysis to verify the nuclear testing method. The number of separate samples should be sufficient to determine the need for moisture correction, as specified by the CQA Engineer. Appropriate moisture corrections should be applied to the nuclear testing methods if the moisture content analyses indicate the need.

8.3. Compacted Soil Liner or Final Cover

The compacted soil liner or final cover will be constructed using soils obtained from on-site and/or off-site sources. The following paragraphs outline quality control parameters for the compacted soil liner or final cover material acceptance and verification.

8.3.1. Material Acceptance

The selection of the proper soil types and verification of material consistency is a requirement for a low permeability soil liner or final cover. Therefore, material acceptance includes a pre-construction laboratory material evaluation program, demonstration of compliance through construction of a test pad, if required, and a continued material verification during construction.



8.3.1.1. Material Evaluation

Each soil type proposed for use in the soil liner or final cover construction shall be evaluated. Pre-construction laboratory qualification testing for soil liner or final cover materials shall be accomplished through source testing of the proposed soils in accordance with the frequencies specified in Table 1 or Table 2. Based on the results of the testing, the CQA Consultant shall determine if the material is acceptable and identify the preliminary placement acceptance criteria (moisture content and percent compaction) required to provide reasonable assurance that the permeability requirement will be achieved. The CQA Consultant should take into consideration the minimum requirements outlined in Table 1 or Table 2 when establishing placement criteria. This testing shall be performed on new soil types and new borrow areas prior to acceptance for construction as the compacted soil liner or final cover.

8.3.1.2. Test Pad

The Earthwork Contractor may be required to prepare a soil liner or final cover test pad for determining the necessary compactive effort and procedures necessary for achieving the desired consistency associated with the compacted soil liner or final cover. The Earthwork Contractor must prepare a test pad in accordance with this section unless it can be demonstrated that the Earthwork Contractor successfully constructed a minimum of 500,000 square feet of compacted soil liner or final cover consistent with the requirements of this CQA Plan during the past three (3) years. Demonstrations of Earthwork Qualification shall be submitted to the Project Manager and/or CQA Engineer prior to mobilization. If this requirement is met, the Owner and/or CQA Engineer can submit a written request to DEQ to waive the test pad requirement. Regardless of Earthwork Contractor's experience, the Owner, CQA Engineer, or other Regulatory Official may request that the compacted soil liner or final cover test pad be constructed to provide on-site verification of the moisture, density, and permeability relationships for the soil liner or final cover materials.

The purpose of the soil liner or final cover test pad is to establish the methods and materials that will be required to construct a compacted soil liner or final cover that will meet the required permeability. The test pad may be utilized to evaluate compacted soil liner or final cover performance and to confirm or modify the range of dry densities and moisture contents at which the proposed liner soils will exhibit the required permeability. After a soil material has been tested, approved for use, and the preliminary placement criteria are established, the contractor's equipment and construction methods shall be evaluated to determine if they are suitable to achieve the required compaction and permeability. The test pad shall be constructed using the same equipment and methods proposed for the construction of the compacted soil liner or final cover. The test pad dimensions shall be a minimum of 50 feet wide by 50 feet long and be 2 feet thick. The test pad shall be constructed in 6-inch thick compacted lifts. The proposed soil shall be placed at the specified moisture and percent compaction established from the pre-construction testing program. The test pad construction shall be monitored by the CQA Consultant and shall be constructed in accordance with the full requirements of the compacted soil liner or final cover. The CQC Field Representative shall perform a minimum eight (8) moisture and density compaction tests per lift to ensure the placement criteria are achieved. During the test pad construction, a minimum of six (6) undisturbed samples should be collected in the near vicinity of a moisture and density compaction test. Samples should be tested in accordance with Table 1 or Table 2 requirements. The results of the samples collected from the test pad shall be used by the CQA Consultant to confirm or modify the preliminary placement criteria, as necessary, to establish the material placement acceptance criteria to be used in construction of the



soil layer. If the test pad is constructed as part of the compacted soil liner or final cover in the cell and all other requirements are verified, the testing performed on the test section may also be used to fulfill the construction testing requirements for the compacted soil liner or final cover.

8.3.1.3. Material Verification

Material verification testing shall be performed during construction to verify that the materials being utilized match the properties of soils approved by pre-construction evaluation testing. Materials verification testing should be performed in accordance with Table 1 or Table 2.

8.3.2. Construction Control

During construction of the compacted soil liner or final cover, visual control must be exercised to observe material consistency and appropriate construction methods. The following paragraphs outline the requirements for visual control of construction quality of the soil liner or final cover systems.

8.3.2.1. Roots / Clods

The CQC Technician shall maintain continuous visual inspection of all soil liner or final cover placement, processing, and compaction. He/she shall specifically observe the materials to determine no substantial change in materials from the accepted materials. In addition, the CQC Technician should watch for the presence of roots, sticks, stones, or other deleterious matter, and for clod size.

No roots or sticks with a diameter in excess of ½ inch or length in excess of 6 inches should be allowed to remain in the loose lifts. Clods should be processed by disking or other means to render clod sizes of less than 4 inches prior to compaction. In addition, the materials should be essentially free of any other foreign materials.

The CQC Technician shall notify the earthwork contractor of non-conformities. In the event such non-conformities are not resolved, the compaction effort should be suspended, and the CQA Engineer should be notified. Any such notification requirements should be recorded in the DFR.

8.3.2.2. Lift Thickness

The compacted lift thickness of the soil liner or final cover shall not exceed eight inches. The CQC Technician shall visually verify the compacted lift thickness continuously during construction. Notations regarding lift thickness should be made in the DFR and in the photographic record to document the QC effort.

8.3.2.3. Compaction Techniques

The compactive effort should be accomplished by using a compactor with the ability to penetrate the lift thickness at least 4 inches with “teeth” or “pads” on the compacting device. The CQA Engineer will determine the adequacy of compaction equipment. The number of passes over the loose lift should be adequate to achieve the required moisture density requirements. The QC technician should maintain continuous visual observations of the compaction effort and document the compaction techniques in the DFR and in the photographic record.

8.3.2.4. Lift Bonding

After each lift is placed and compacted, and prior to placement of a subsequent lift, the surface of the existing lift should be sufficiently moistened and roughened to allow bonding of the two lifts. This



should be accomplished by watering or scarifying the existing lift to form a one to two-inch thick roughened surface. Scarification can be accomplished with a disc, compactor, or similar equipment to achieve the required result.

The construction quality control should include visual documentation of the continuous scarification process. This effort should be documented in the DFR's and in the photographic record.

8.3.3. Field Moisture / Density Testing

Subsequent to placement and compaction of each lift, the QC Technician should determine the in-place density and moisture content for comparison to the predetermined requirements as established in Section 8.3.1 and during the pre-construction laboratory material evaluation program. In place testing should be performed by the methods and frequencies established in Table 1 or Table 2. Testing holes or penetrations made in the soil liner or final cover shall be backfilled with soil material used in construction, bentonite, or soil/bentonite mix and tamped. Areas where failing tests are recorded shall be reworked and retested until satisfactory results are obtained. The boundaries of the area to be reworked will be determined by the CQA Consultant. The non-conforming area shall be scarified, recompacted, reworked, and dried or moisture conditioned as required to achieve satisfactory test results as determined by the project requirements. Alternatively, the material may be removed and replaced by acceptable soil liner or final cover material.

If the portable nuclear density gauge testing (ASTM D6938) is used as the primary means for evaluating compaction (in situ density and moisture), the device shall be calibrated properly and the equipment manufacturer's recommendations for evaluating device standard counts shall be followed. Nuclear density gauge test results shall be verified using alternate test methods such as the drive cylinder method (ASTM D2937) and oven moisture content (ASTM D2216) or other approved methods. The CQA Engineer shall direct the correlation testing, evaluate the results and determine the need to apply or adjust correction offsets, as appropriate.

8.3.4. Permeability Testing

Thin-walled tube samples of each lift of soil liner or final cover shall be obtained and tested at the frequency indicated in Table 1 or Table 2. The sampling locations will be determined by the CQC Technician and distributed across the construction area. Test locations should be selected in the immediate vicinity of a field moisture content/density test location and these associations documented.

Loose surface material may need to be removed prior to sampling. The undisturbed samples shall be taken by carefully advancing a sampler tube into the compacted lift being evaluated. The permeability sampler tube shall be advanced perpendicular to the face of the compacted soil layer for parallel lift construction. The resulting hole(s) in the soil liner or final cover shall be backfilled with soil material used in construction, bentonite, or soil/bentonite mix and tamped or other manner as approved by the CQA Engineer. The sample shall be trimmed, as necessary, so that no material protrudes from the sample cylinder. It shall then be capped or sealed to prevent loss of moisture. The sample shall be marked with the sample identification and sent to the soil laboratory for testing, as specified.

Samples shall be tested according to Table 1 or Table 2 utilizing the latest ASTM testing methods. The CQA Engineer or Design Engineer will specify the effective confining stress to be used during testing. The Soils Laboratory shall keep the CQC Manager informed of the status of all permeability testing. If a sample fails to achieve the project requirements, the Laboratory Manager shall



immediately inform the CQA Engineer to evaluate the results. The area to be reworked shall be determined by the CQA Engineer. Reworked areas shall be retested for moisture and density in accordance with previous sections prior to resampling and retesting.

8.3.5. Subgrade Acceptance

Upon satisfactory completion of the compacted soil liner or final cover, the surface of the liner must be prepared for deployment of the geomembrane liner or other geosynthetic material, where applicable. This process must be observed by the CQC Technician and documented by a Subgrade Acceptance Form. This form must be signed and dated by the General Contractor and Geosynthetic Installer and must specify the area that is being accepted. This acceptance by the Geosynthetic Installer documents the suitability of the subgrade for geomembrane deployment and seaming.

8.4. Geotextiles

Geotextile(s) may be included in the design to be directly over other materials for protection or as a filter over or around a drainage material. This section addresses the CQA requirements related to the manufacture and installation of the geotextiles.

8.4.1. Material Acceptance

The geotextile supplier shall provide the CQA Engineer with manufacturer quality control (MQC) information and warranty data for the materials to be delivered on site at least one week prior to delivery. The MQC data will be evaluated against the geotextile specifications outlined in Table 3. Based upon the information provided, the CQA Engineer may accept the materials for shipment if the requirements of Table 3 are met. In some instances, the CQA Engineer may delay material approval for shipment until satisfactory conformance results are obtained from the geosynthetics testing laboratory.

Selected rolls of geotextile material will be sampled at the manufacturer and/or onsite, and conformance tests performed on the sample by a GAI certified geosynthetics laboratory, as required by Table 3. The CQA conformance testing shall be reviewed and approved by the CQA Engineer prior to proceeding with field installation.

8.4.2. Shipping and Storage

During shipment and storage, the geotextile shall be protected from ultraviolet light exposure, moisture, dirt, dust, puncture or other damaging conditions. The General Contractor shall be responsible for storage and protection of the geotextile rolls. The CQA Technician shall observe material handling and storage. Handling of the geotextile should be with devices that are not capable of cutting, puncturing or otherwise abrading the materials. Any noticeable defects of the delivered material will be documented on the material inventory sheets, and the damaged rolls shall be segregated. Care shall be taken to prevent entrapment of excessive dust or dirt during installation. If the geotextile is not free of soil and debris before installation, it shall be cleaned by the General Contractor just prior to installation.

8.4.3. Installation

The geotextile shall be placed with the long dimension of the rolls running vertical with the slope, rather than across (horizontal to) the slope. The geotextile shall be rolled down the slope in a manner that continually keeps the material in tension. If necessary, the geotextile shall be straightened by



hand after being unrolled to minimize wrinkles. Adjacent rolls shall be overlapped in accordance with the manufacturer's recommendations. The geotextiles will then be overlapped and sewn or heat tacked per the manufacturer's recommendation. All soil materials located on top of the geotextile shall be deployed in such a manner as to ensure that the geotextile and underlying materials are not damaged, that minimal slippage of the geotextile on underlying layers occurs, and that no excess tensile stresses occur in the geotextile.

8.5. Leachate Collection System / Protective Cover

The material for leachate collection system/protective cover includes leachate pipe, protective cover soil and gravel. The following paragraphs detail CQA requirements related to the construction of the leachate collection system (LCS). This section addresses material acceptance and installation procedures.

8.5.1. Material Acceptance

The CQA Consultant shall review the manufacturers' submittals for leachate collection pipe and geotextile, as applicable, to confirm that these materials meet the project requirements. The leachate collection pipe will be inventoried by the CQA Technician as it arrives on-site. The protective cover soil and gravel components of the LCS will be sampled and tested according to Table 1, as part of the pre-construction laboratory material evaluation program.

8.5.2. Material Verification

The leachate collection pipe will be inventoried by the CQA Technician at the site. The manufacturer's verification data sheet will be reviewed upon delivery and compared to the project requirements.

The protective cover soil and leachate gravel will be sampled and tested to document compliance with the material requirements. Construction testing will be as indicated in Table 1.

8.5.3. Visual Inspection

The CQA Field Representative shall maintain continuous visual inspection during all phases of the leachate system construction. All construction will be performed in accordance with the specifications and construction drawings. Daily documentation will be recorded on the daily field reports. Visual inspection will include at a minimum:

- Leachate pipe installation will be observed to determine type, location, elevations and orientation of the perforations.
- The gravel pack placement around the leachate pipe will be inspected for deleterious materials, proper pipe alignment and overlap or seaming in conformance with the project drawings. The gravel pack shall be constructed in such a manner that the finished item is firm and compact, and neither damages nor shifts the pipe.
- The protective cover soil will be observed to note any visual indications of material change. There are no specific dry density or moisture content requirements for the placement. The protective cover soil shall be constructed in such a manner that the finished component is properly placed, based upon visual observations.
- The installation of the geotextile will be in accordance with the Construction Drawings. For the gravel pack, the material will be placed so the wrap overlap is at least 36 inches. The wrap overlaps will be observed and reported on the daily field report form.



8.6. Protective Soil Cover (Final Cover)

The protective soil cover (also includes vegetative topsoil /erosion layer) is the material used to construct the protective soil cover layer and the final cover diversion berms. The protective soil cover may be constructed from the soils that have been stockpiled from excavations, from onsite sources, or from offsite sources. The following paragraphs detail CQA requirements related to the construction of protective cover.

8.6.1. Material Acceptance

The selection of the proper soil types and documentation of material consistency is a requirement for the protective soil cover. Therefore, material acceptance includes a pre-construction laboratory material evaluation program and continued material verification testing during construction. Material evaluation shall be performed for each soil type to be used as a protective soil cover. Pre-construction laboratory qualification testing the protective cover materials should be accomplished through source testing of the proposed soils in accordance with the frequencies specified in Table 1. The material shall be substantially free of organics, over-size rocks, frozen material, foreign objects, or other deleterious materials. In final cover applications the top six inches of protective cover/vegetative top soil shall be suitable for sustaining vegetative growth and appropriate erosion resistance.

8.6.2. Construction Control

During construction of the protective soil cover layer, visual control must be exercised to observe material consistency and appropriate construction methods. The CQC Technician should perform continuous visual observation of the materials being placed as the protective soil cover. If significant variation in materials is apparent, in the opinion of the CQC Technician, the CQA Engineer should be notified of the variation. The CQA Engineer should recommend procedures to further evaluate the variation or to stop placement until the source characteristics are determined in accordance with Table 1. The CQC Technician should visually observe the construction process, and this effort should be documented in the DFRs and in the Photographic Record. The following paragraphs outline the requirements for visual control of construction quality of the soil liner/cover system.

8.6.2.1. Maximum Particle Size and Foreign Materials

The CQC Technician shall maintain visual inspection of the protective soil cover material placement. The technician shall specifically observe the materials to determine no substantial change in materials has occurred. In addition, the technician should visually inspect the soil for deleterious matter.

Soils to be used for the construction of the protective soil cover shall be reasonably free of roots, sticks, or any other foreign materials to the extent practical. The maximum allowable particle size for the soil layers is indicated in Table 1.

The CQC Technician shall notify the Earthwork Contractor of observed non-conformities. In the event such non-conformities are not resolved, the compaction effort should be suspended, and the CQA Engineer should be notified.



TABLES

TABLE 1
TESTING REQUIREMENTS – BOTTOM LINER & LEACHATE COLLECTION SYSTEM COMPONENTS

Item	Test Method	Minimum Frequency	Minimum Criteria
Structural Fill	Moisture-Density (ASTM D-698)	1 test/10,000 CY and changes in material	N/A
	Compaction – Nuclear (ASTM D-6938)	1 test/10,000 SF/lift or 1 test/200 LF of trench	Dry Density $\geq$ 95% MDD
Compacted Soil Liner (Pre-Construction)	Soil Classification (ASTM D-2487)	1 test/20,000 CY and changes in material	CL, CH or SC
	Moisture-Density (ASTM D-698)	1 test/20,000 CY and changes in material	N/A
	Atterberg Limits (ASTM D-4318)	1 test/20,000 CY and changes in material	PI $\geq$ 10
	Grain Size – wash 200 (ASTM D-6913, D-1140)	1 test/20,000 CY and changes in material	100% passing 1-inch Sieve $\geq$ 80% passing No. 4 Sieve $\geq$ 30% passing No. 200 Sieve
	Moisture Content (ASTM D-2216)	1 test/20,000 CY and changes in material	N/A
	Permeability (Remolded) (ASTM D-5084)	1 test/20,000 CY and changes in material	$\leq 1 \times 10^{-7}$ cm/sec
Compacted Soil Liner (During Construction)	Compaction – Nuclear (ASTM D-6938)	1 test/10,000 SF/lift	Dry density $\geq$ 90% MDD Moisture $\geq$ OMC ⁽¹⁾
	Soil Classification (ASTM D-2487)	1 test/5,000 CY and changes in material	CL, CH or SC
	Moisture-Density (ASTM D-698)	1 test/5,000 CY and changes in material	N/A
	Atterberg Limits (ASTM D-4318)	1 test/5,000 CY and changes in material	PI $\geq$ 10
	Grain Size – wash 200 (ASTM D-6913, D-1140)	1 test/5,000 CY and changes in material	100% passing 1-inch Sieve $\geq$ 80% passing No. 4 Sieve $\geq$ 30% passing No. 200 Sieve
	Moisture Content (ASTM D-2216)	1 test/5,000 CY and changes in material	N/A
	Undisturbed (UD) Permeability (ASTM D-5084)	1 test/ 5,000 CY and 1 in-place test/40,000 SF/lift	$\leq 1 \times 10^{-7}$ cm/sec
	Survey	50-foot grid and 50-ft spacing along grade breaks	$\geq$ 24-inch thickness
Protective Cover (Pre-Construction)	Grain Size (ASTM D-6913, D-1140)	1 test/source	100% passing 1-inch Sieve
	Constant Head Permeability (ASTM D-2434)	1 test/source	$\geq 1 \times 10^{-3}$ cm/sec
Protective Cover (During Construction)	Grain Size (ASTM D-6913, D-1140)	1 test/5,000 CY or changes in material	100% passing 1-inch Sieve
	Constant Head Permeability (ASTM D-2434)	1 test/5,000 CY or changes in material	$\geq 1 \times 10^{-3}$ cm/sec
	Survey	50-foot grid and 50-ft spacing along grade breaks	$\geq$ 6-inch thickness
Leachate Gravel (Pre-Construction)	Grain Size (ASTM D-6913, D-1140)	1 test/source	100% passing 2-inch Sieve $\leq$ 5% passing 3/8-inch Sieve
	Constant Head Permeability (ASTM D-2434)	1 test/source	$\geq 1 \times 10^0$ cm/sec
	Carbonate Content (ASTM D-4373)	1 test/source	< 10% by weight
Leachate Gravel (During Construction)	Grain Size (ASTM D-6913, D-1140)	1 test/5,000 CY or changes in material	100% passing 2-inch Sieve $\leq$ 5% passing 3/8-inch Sieve
	Constant Head Permeability (ASTM D-2434)	1 test/5,000 CY or changes in material	$\geq 1 \times 10^0$ cm/sec

Table 1 Notes: Slight modifications to the minimum criteria are acceptable if the permeability criterion is met.

TABLE 2
TESTING REQUIREMENTS – FINAL COVER SYSTEM COMPONENTS

Item	Test Method	Minimum Frequency	Minimum Criteria
Compacted Clay Cap (Pre-Construction)	Soil Classification (ASTM D-2487)	1 test/20,000 CY and changes in material	CL, CH or SC
	Moisture-Density (ASTM D-698)	1 test/20,000 CY and changes in material	N/A
	Atterberg Limits (ASTM D-4318)	1 test/20,000 CY and changes in material	PI ≥ 10
	Grain Size (ASTM D-6913, D-1140)	1 test/20,000 CY and changes in material	100% passing 1-inch Sieve ≥ 80% passing No. 4 Sieve ≥ 30% passing No. 200 Sieve
	Moisture Content (ASTM D-2216)	1 test/20,000 CY and changes in material	N/A
	Permeability (Remolded) (ASTM D-5084)	1 test/20,000 CY and changes in material	≤ 1x10 ⁻⁷ cm/sec
Compacted Clay Cap (During Construction)	Compaction – Nuclear (ASTM D-6938)	1 test/10,000 SF/lift	Dry density ≥ 90% MDD Moisture ≥ OMC ⁽¹⁾
	Soil Classification (ASTM D-2487)	1 test/5,000 CY and changes in material	CL, CH or SC
	Moisture-Density (ASTM D-698)	1 test/5,000 CY and changes in material	N/A
	Atterberg Limits (ASTM D-4318)	1 test/5,000 CY and changes in material	PI ≥ 10
	Grain Size (ASTM D-6913, D-1140)	1 test/5,000 CY and changes in material	100% passing 1-inch Sieve ≥ 80% passing No. 4 Sieve ≥ 30% passing No. 200 Sieve
	Moisture Content (ASTM D-2216)	1 test/5,000 CY and changes in material	N/A
	Hydraulic Conductivity (ASTM D-5084)	1 test/ 5,000 CY and 1 undisturbed test/40,000 SF/lift	≤ 1x10 ⁻⁷ cm/sec
	Survey	50-foot grid and 50-ft spacing along grade breaks	≥ 18-inch thickness
Topsoil/Vegetation Layer	Upper Lift	N/A	Must support vegetation
	Survey	50-foot grid and 50-ft spacing along grade breaks	≥ 6-inch thickness

Table 2 Notes: Slight modifications to the minimum criteria are acceptable if the permeability criterion is met.

TABLE 3
TESTING REQUIREMENTS – NONWOVEN GEOTEXTILE

Properties	Test Method	Minimum MQC Test Frequency	Minimum CQA Test Frequency	Test Values			
				(6 oz/sy)	(8 oz/sy)	(10 oz/sy)	(12 oz/sy)
Mass/Unit Area (min.)	ASTM D-5261	1 per 100,000 SF	1 per 250,000 SF	6 oz/yd ²	8 oz/yd ²	10 oz/yd ²	12 oz/yd ²
Grab Tensile Strength (min.)	ASTM D-4632	1 per 100,000 SF	1 per 250,000 SF	150 lb	190 lb	230 lb	300 lb
Grab Tensile Elongation (min.)	ASTM D-4632	1 per 100,000 SF	1 per 250,000 SF	50 %	50 %	50 %	50 %
Trapezoidal Tear Strength (min.)	ASTM D-4533	1 per 100,000 SF	1 per 250,000 SF	95 lb	95 lb	95 lb	115 lb
Puncture (CBR) Strength (min.)	ASTM D-6241	1 per 100,000 SF	1 per 250,000 SF	410 lb	535 lb	700 lb	850 lb
UV Resistance (min.)	ASTM D-7238	N/A	N/A	70 %	70 %	70 %	70 %
Apparent Opening Size (max.)	ASTM D-4751	1 per project	1 per project	50 Sieve	60 Sieve	60 Sieve	70 Sieve
Permittivity (min.)	ASTM D-4491	1 per project	1 per project	1.1 sec ⁻¹	1.0 sec ⁻¹	0.9 sec ⁻¹	0.7 sec ⁻¹

Table 3 Notes: UV Resistance evaluation to be on 2.0 inch strip tensile specimens per ASTM D 5035 after 500 lt. hrs. exposure.