ATTACHMENT B

CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PLAN

FOR RECLAMATION OF WHITE MESA MILL FACILITY

BLANDING, UTAH

TABLE OF CONTENTS

1 INTRODUCTION

This Construction Quality Assurance/Quality Control Plan (CQA/QC Plan) has been prepared for construction activities related to the reclamation of the Energy Fuels Resources (USA) Inc. (”EFRI”) White Mesa Mill Facility located in Blanding, Utah and is submitted as an attachment to the Reclamation Plan.

1.1 Purpose and Scope

The purpose of this CQA/QC Plan is to address the Construction Quality Assurance (CQA) and Construction Quality Control (CQC) procedures and requirements to be used during reclamation activities at the site to assure that the project is constructed in conformance with the Technical Specifications, Drawings, and applicable regulatory requirements and permit conditions. The CQA/QC Plan is intended to: 1) define individuals and organizations who will be involved in reclamation activities and their respective responsibilities and qualifications; 2) establish guidelines for the flow of information and project communication; 3) establish protocols for project documentation; and 4) establish specific CQA/CQC procedures for the major components of the project.

This CQA/QC Plan addresses reclamation of the following facilities:

- Cell 1 (evaporation)
- Cells 2, 3, and 4A (tailings)
- Cell 4B (This cell is currently used for evaporation of process solutions. The CQA/QC Plan was written assuming this cell will be used for tailings storage in the future.)
- Mill buildings and equipment
- On-site contaminated areas
- Off-site contaminated areas (i.e., potential areas affected by windblown tailings)

The CQA/QC Plan has been written assuming tailings management Cells 2, 3, 4A, and 4B will receive tailings to the maximum permitted tailings elevations. Cell 2 is full and partially reclaimed. Cell 3 was used for tailings storage, but is currently only receiving mill waste. Cell 3 is partially full and partially reclaimed. Cell 4A is the only cell currently receiving tailings and is

partially full. Cell 4B is used for evaporation of process solutions and has not yet been used for storage of tailings.

Reclamation of the above facilities will include the following:

- Placement of contaminated soils, crystals, and synthetic liner material and any contaminated underlying soils from Cell 1 into the last active tailings cell
- Placement of a compacted clay liner on a portion of the Cell 1 impoundment areas to be used for disposal of contaminated materials and debris from the Mill site
- Decommissioning the Cell 1 (evaporation) area
- Reclamation of the Mill and ancillary areas
- Placement of materials and debris from Mill decommissioning into the Cell 1 Disposal Area or the last active tailings cell
- Placement of an Evapotranspiration (ET) cover over the entire area of Cells 2, 3, 4A, 4B and the Cell 1 Disposal Area
- Construction of runoff control and diversion channels as necessary
- Reclamation of borrow sources

1.2 Definition of Terms

In the context of this CQA/QC Plan, the following definitions apply:

Construction Quality Assurance (CQA) – A planned and systematic pattern of means and actions designed to assure adequate confidence that the materials or services meet contractual and regulatory requirements and will perform satisfactorily in service. CQA refers to means and actions employed by the involved parties to assure conformity of the project work with this CQA/QC Plan, the Drawings, and the Technical Specifications.

Construction Quality Control (CQC) – Actions that provide a means to measure and regulate the characteristics of an item or service in relation to contractual and regulatory requirements. CQC refers to those actions taken by the Contractor, technicians, or other involved parties to verify that the materials and the workmanship meet the requirements of this CQA/QC Plan, the Drawings, and the Technical Specifications.

Technical Specifications – The document that prescribes requirements and standards for specific elements of the reclamation. This document is included as Attachment A to the Reclamation Plan. Technical Specifications will be prepared in final form prior to commencement of reclamation activities.

Drawings – Detailed project drawings to be used in conjunction with the Technical Specifications. These drawings will be prepared in final form as construction drawings prior to reclamation.

Construction Project – The total authorized/approved reclamation project that requires several construction segments to complete.

Construction Segment – A portion of the total construction project involving a specific area or type of work. Several construction segments will likely take place simultaneously during reclamation.

Construction Task – A basic construction feature of a construction segment involving a specific construction activity.

ASTM Standards – The latest versions of the American Society for Testing and Materials specifications, procedures and methods.

2 INVOLVED PARTIES AND PERSONNEL

Each construction task within each segment of the overall project will consist of both a QC and QA component. Compliance reporting will be completed for each segment. Upon completion of all project segments, a final construction report will be prepared for the project. Following is a listing of the parties (organizations and individuals) that will be involved in the implementation of the CQA/QC Plan during the reclamation at the site, including a discussion of each party's responsibility, authority and qualifications.

2.1 Owner

The Owner of this project is EFRI.

2.2 Construction Manager

Responsibility & Authority: The on-site Construction Manager is responsible for the conduct, direction and supervision of all reclamation activities as detailed in the Drawings and Technical Specifications. The Construction Manager will be selected/appointed by the Owner. The Construction Manager is responsible for maintaining a detailed schedule for the various Construction Segments so that each is performed according to the schedule for the overall Reclamation Project. The Construction Manager will interact as required with all other parties involved in implementing the reclamation including the Contractor, the CQA/QC personnel, and the DWMRC Project Manager. In the temporary absence of the Construction Manager, a designated representative will assume the duties of the Construction Manager. The Owner may appoint separate Construction Managers to oversee the various Construction Segments within the overall Reclamation Project. The Construction Manager(s) will report directly to the Owner.

Qualifications: The Construction Manager(s) shall have the mine and mill reclamation and construction experience necessary to manage a large-scale reclamation project.

2.3 Design Engineer

Responsibility & Authority: The Design Engineer is responsible for the design of the various elements of the reclamation project and for preparing the Drawings and Technical Specifications. Throughout the project, the Design Engineer will interact as necessary with the Owner,

Construction Manager, CQA/QC staff, and the DWMRC Project Manager. The Design Engineer will approve all design changes that arise during the course of the Reclamation Project.

Qualifications: The Design Engineer shall be a qualified Professional Engineer registered in the State of Utah. The Design Engineer shall have expertise which demonstrates significant familiarity with the design and construction of the various elements of mine and Mill site reclamation including earthwork, cover design, mill demolition and disposal.

2.4 Contractor

Responsibility & Authority: The Contractor refers to an independent party or parties, contracted by the Owner, performing the work in accordance with this CQA/QC Plan, the Drawings, and the Technical Specifications. It is anticipated that various Contractors will be employed to perform the various Construction Segments within the overall Reclamation Project. The Contractor will work under the direction of and report directly to the Construction Manager.

Qualifications: Qualifications of the Contractor are specific to the construction contract and the specific Construction Segment. The Contractor shall have a demonstrated history of successful construction experience as appropriate for the Construction Segment. The Contractor shall maintain current state and federal licenses as appropriate.

2.5 Surveyor

Responsibility & Authority: The Surveyor is a party, independent from the Owner or Contractor, who is responsible for surveying, documenting, and verifying the location of all significant components of the work. The Surveyor is responsible for issuing Record Drawings of the completed elements of the Construction Project. The Surveyor's work is coordinated with the Contractor and CQA Consultant. The Surveyor will report directly to the Construction Manager.

Qualifications: The Surveyor will be a well-established surveying company with at least 3 years of surveying experience in the State of Utah. All survey activities shall be performed under the direction of a Professional Land Surveyor, licensed as required by State of Utah regulations. The Surveyor shall be fully equipped and experienced in the use of total stations and AutoCAD.

2.6 CQA/QC Consultant

Responsibility & Authority: The CQA/QC Consultant is a party, independent from the Owner or Contractor, who is responsible for observing, testing, and documenting the various activities comprising the Reclamation Project in accordance with this CQA/QC Plan, the Technical Specifications and the Drawings. The CQA/QC Consultant will be responsible for issuing a CQA report at the completion of the Reclamation Project which will document construction and associated CQA/QC activities. The CQA/QC Consultant will work in coordination with the Contractor, Surveyor and other parties and will report directly to the Construction Manager.

Qualifications: The CQA Consultant shall be a well-established firm specializing in geotechnical and reclamation engineering that possesses the equipment, personnel, and licenses necessary to conduct the observation and testing required. The CQA/QC Consultant will be experienced with earthwork, mill decommissioning, and other reclamation activities. The CQA/QC Consultant will be experienced in preparation of CQA documentation including field documentation, field testing procedures, laboratory testing procedures, and CQA reports.

The CQA Consultant will provide qualified staff for the project which will include the following individuals.

1) CQA Officer
2) CQA Site Manager
3) QC Technicians

2.7 CQA Officer

Responsibility & Authority: The CQA Officer will be responsible for overall implementation and management of the CQA/QC Plan for the reclamation project. The CQA Officer works from the office of the CQA Consultant and conducts periodic visits to the site as required. The CQA Officer will supervise the CQA Site Manager and all QC Technicians and will coordinate with the Surveyor, the Contractor and other staff. The CQA Officer will report directly to the Construction Manager.

The CQA Officer will be expected to maintain a thorough understanding of the existing White Mesa facilities and the reclamation project design documents including the Drawings, Technical

Specifications, and this CQA/QC Plan. He/she will have the authority to reject work or material, to require removal or placement, to specify and require appropriate corrective actions if it is determined that the Quality Control/Quality Assurance, personnel, instructions, controls, tests, or records are not conforming to the CQA/QC Plan, the Construction Plans, or the Technical Specifications. The approval of the CQA Officer is required on all Compliance Reports required in this CQA/QC Plan. Specific responsibilities of the CQA Officer will include the following:

1. Administer the CQA program (i.e., provide supervision of and manage all CQA personnel and activities)
2. Provide and document all necessary training and certifications for CQA personnel
3. Review and approve the Contractor's QC Plan(s), if applicable
4. Attend Project Kickoff and Pre-Construction Meetings, and make site visits as needed
5. Perform ongoing, timely review of all CQA documentation and provide signature on all CQA documentation

Qualifications: The CQA Officer will be a Professional Engineer registered in the State of Utah and will be experienced in providing CQA oversight for large construction projects.

2.8 CQA Site Manager

Responsibility & Authority: The CQA Site Manager will be appointed by the CQA Consultant to provide day-to-day, on-site oversight of the CQA/CQC activities. The CQA Site Manager will report directly to the CQA Officer and will interact with the Construction Manager, Contractor and others on a daily basis, as project activities take place. The CQA Site Manager will maintain a thorough understanding of the Drawings, Technical Specifications, and this CQA/QC Plan. Specific responsibilities of the CQA Site Manager will include the following:

1. Attend all CQA-related meetings including Project Kickoff and Pre-Construction Meetings
2. Provide direct oversight of QC Technicians
3. Assign locations for testing and sampling
4. Oversee the collection and shipping of laboratory test samples

5. Review results of field and laboratory testing and any test results provided by the Contractor and make appropriate recommendations
6. Review the calibration and condition of onsite testing equipment, and maintain necessary equipment documentation
7. Report any deviations from the CQA/QC Plan, Drawings, or Technical Specifications to the Construction Manager and CQA Officer and arrange consultation with other parties as necessary to find solutions to unsolved problems
8. Prepare a daily field report for submittal to the CQA Officer and Construction Manager

Qualifications: The CQA Site Manager will be an engineer experienced in providing field CQA/CQC oversight for construction projects.

2.9 QC Technicians

Responsibility & Authority: The CQA Consultant will utilize various QC Technicians to assist the on-site CQA Site Manager to perform specific tasks through the project to verify the adequacy of construction materials and procedures. The QC Technicians will work under the direct supervision of the CQA Site Manger and will work in close coordination with the Contractor. The number of technicians will depend on the project needs as the work progresses.

Qualifications: The CQA Consultant will identify areas of competency and select technicians as necessary. The QC Technicians will receive on-the-job training or off-site training as required under the direction of the CQA Consultant. The CQA Officer will determine the areas of expertise of the respective technician and maintain a file on each technician's training and certifications.

2.10 Document Control Officer

Responsibility & Authority: The Document Control Officer will be appointed by the Construction Manager to assist with managing the various documents that will be produced throughout the project. The Document Control Officer will maintain permanent files for the Construction Project. All tests, surveys, monitoring and report originals will be maintained in the project files. The Document Control Officer will oversee document reproduction and

distribution. A distribution list will be prepared in coordination with the Owner, Construction Manager, and CQA Officer.

Qualifications: The Document Control Officer will have the organizational and computer skills necessary to manage and distribute the various project documents.

2.11 CQA Laboratory

Responsibility & Authority: The CQA Laboratory is a party, independent from the Owner and Contractor, responsible for conducting tests of soils and other project materials in accordance with ASTM and other applicable standards in either an on-site or off-site laboratory. It is likely that more than one CQA Laboratory will be used to perform testing during reclamation activities, depending upon the material being tested. The CQA Laboratory will work in coordination with other personnel and will report directly to the CQA Consultant.

Qualifications: The CQA Laboratory will be an AASHTO AMRL accredited laboratory in testing soils using the ASTM standards outlined in the Technical Specifications. The CQA Laboratory will be capable of providing test results within a maximum of seven days of receipt of samples and will maintain that capability throughout the duration of the project.

2.12 DWMRC Project Manager

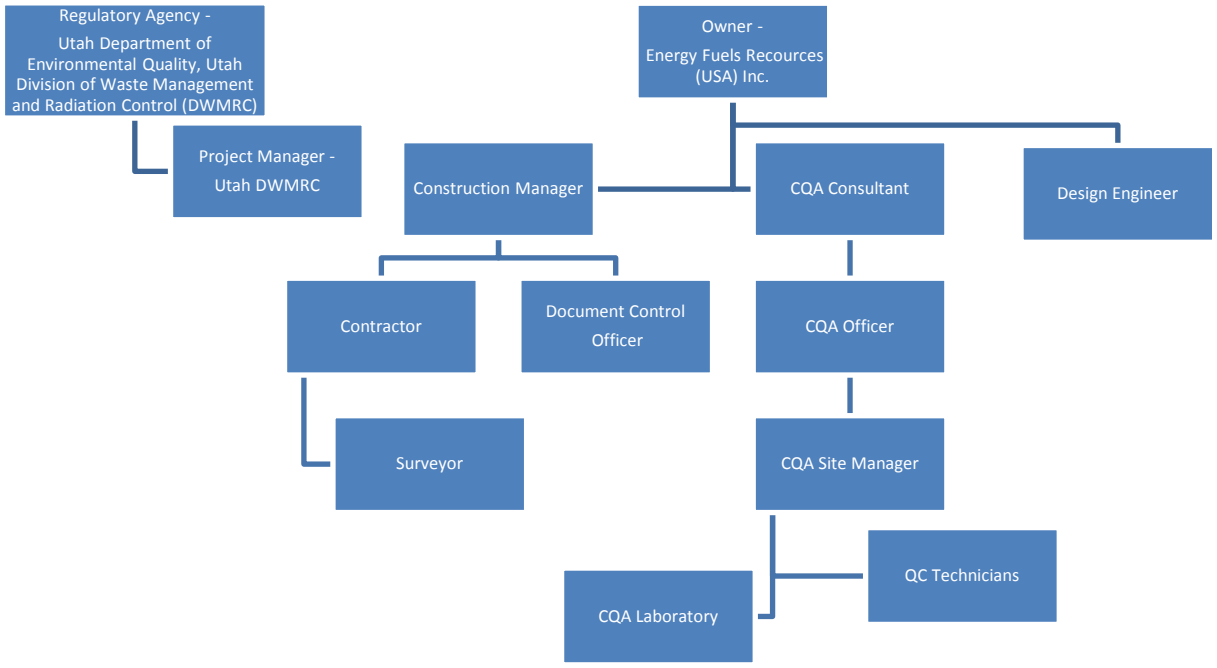
The DWMRC Project Manager will represent the DWMRC's interests in the Reclamation Project. The DWMRC Project Manager may choose to review selected procedures, personnel qualifications, equipment, calculations, and documentation. DWMRC personnel will be granted full access to the project files upon request.

3 PROJECT COMMUNICATION

3.1 Flow of Information

Effective communication is necessary to ensure a high degree of quality during the Reclamation Project. Specific meetings of key project personnel will take place including a Project Kickoff Meeting, Pre-Construction Meetings, weekly Progress Meetings, and Problem or Work Deficiency Meetings. In addition, informal communication and cooperation will take place between the various parties listed in Section 2 above. The organizational chart showing the proposed lines of communication between the various parties is shown in Figure 1. The planned project meetings are described in the following sections.

Figure 1 – Project Organization



3.2 Project Kickoff Meeting

At the beginning of major reclamation activities, a Project Kickoff Meeting will take place at the site. At a minimum, this meeting will be attended by the Owner, the Construction Manager, the Contractors, the CQA Consultant, the Engineer, and the DWMRC Project Manager. The Construction Manager will conduct a site tour to observe the current site conditions and to identify various areas of the site including equipment storage areas, soil stockpiling areas, and staging areas. The Construction Manager will appoint an individual to record the discussions and decisions of the meeting and distribute meeting minutes to all attendees. Specific items for discussion will include:

1. The Drawings, Technical Specifications, and CQA/QC Plan and any modifications or clarifications to these documents
2. Lines of communication and authority
3. The responsibilities of each party
4. The overall schedule for the Reclamation Project and the anticipated sequencing and schedule of the various Construction Segments
5. Documentation requirements

3.3 Pre-Construction Meetings

The overall Reclamation Project will be comprised of several individual Construction Segments. At the beginning of each Construction Segment, a Pre-Construction meeting will take place at the site and will be attended by the Construction Manager, the Contractor, the CQA Consultant, and the DWMRC Project Manager. The Construction Manager will conduct a tour of the work area to observe the current site conditions and to identify various areas of the site including equipment storage areas, soil stockpiling areas, staging areas, and other details related to the Construction Segment. The Construction Manager will appoint an individual to record the discussions and decisions of the meeting and distribute meeting minutes to all attendees. Specific items for discussion at the Pre-Construction Meetings include the following:

1. The Drawings, Technical Specifications, and CQA/QC Plan and any modifications or clarifications to these documents

2. Safety procedures
3. Lines of communication and authority
4. The responsibilities of each party
5. The overall schedule for the Construction Segment
6. Acceptance and rejection criteria
7. Protocols for handling deficiencies, repairs, and re-testing
8. Documentation requirements

3.4 Progress Meetings

Progress meetings will be held weekly between the CQA Site Manager, the Contractor, the Construction Manager, and other concerned parties participating in the construction of the project. This meeting will include discussions of the progress of the project, planned activities for the next week, and revisions to the work plan or schedule. The Construction Manager will appoint an individual to document the meeting and send meeting minutes to all attendees for review and comment.

3.5 Problem or Work Deficiency Meetings

It is anticipated that most work deficiencies will be minor and can be resolved in the field by the QC Technicians, the CQA Site Manager, and the Contractor. The deficiency and resolution will be recorded in daily field reports and weekly summary reports prepared by the CQA Site Manager.

A special meeting will be held when a problem or deficiency is present, or likely to occur, that cannot be easily resolved in the field. The meeting will be attended by the Contractor, the Construction Manager, the CQA Site Manager, and other parties as appropriate. If the problem requires a design modification, the Engineer should either be present at, consulted prior to, or notified immediately upon conclusion of this meeting. The Construction Manager will appoint an individual to record the meeting and send meeting minutes to all attendees for review and approval. The purpose of the work deficiency meeting is to define and resolve the problem or work deficiency as follows:

1. Define and discuss the problem or deficiency
2. Review alternative solutions
3. Select a suitable solution agreeable to all parties
4. Implement an action plan to resolve the problem or deficiency

4 DOCUMENTATION

4.1 Overview

The CQA Consultant will be responsible to prepare documentation that demonstrates that CQA/CQC requirements have been addressed and satisfied. Documentation will include monitoring logs, testing data sheets, photo logs, equipment calibration forms, daily field reports, weekly summary reports, reports of design or specification changes, and a final CQA Report. Documentation will be maintained in the White Mesa Project files and will be available to the Owner, Engineer, CQA Officer, and the DWMRC Project Manager at all times.

The CQA Officer and Site Manager will be responsible for preparing forms required throughout the Reclamation Project. These forms will be used by QC Technicians and other parties to document QC activities.

4.2 Daily Field Reports

The CQA Site Manager will prepare daily field reports that will document each day's activities. These daily reports will include the following, as applicable:

1. Basic information including date, project name, weather conditions, and the applicable Construction Segment
2. A summary of construction locations, activities, and observations an QC activities performed
3. Equipment and personnel on the project and a summary of meetings and attendees
4. Monitoring logs, testing data sheets, photo logs, and equipment calibration forms
5. A description of materials used and result of testing and documentation
6. Laboratory test reports
7. Reports of construction problems and resolution data sheets
8. Identification of deficient work or materials, and results of re-testing of deficient work
9. The signature of the CQA Site Manager

4.3 Weekly Summary Reports

At the end of each work week, a weekly summary report will be prepared and submitted to the Construction Manager and the CQA Officer. Weekly summary reports will include a brief description of the week's activities and all of the week's daily field reports. The CQA Officer will be responsible to review and sign each weekly summary report.

4.4 Field Change Reports

Changes that do not alter the intent of the Construction Plans or Technical Specifications may be made during construction to fit field conditions. Field changes require the approval of the Construction Manager and the CQA Site Manager. Field changes are to be reported on Form No. F-25 (Included in Section 6.0).

4.5 Construction Problems and Resolution Data Sheets

If significant recurring nonconformance occurs, or if special construction situations arise, the Construction Manager and CQA Officer will be made aware of the situation. The cause of the nonconformance will be determined and appropriate changes in procedures or specifications may be recommended. A Construction Problems and Resolution Data Sheet will be prepared to describe the situation and the resolution. Supporting documentation, such as photos or testing data sheets, will be attached to the data sheet. Data sheets will be included in the daily field reports and weekly summary reports.

4.6 Design or Specification Changes

During construction, design or specification changes may be required. Design changes will require the written approval of the Engineer and will take the form of technical memorandum and/or an addendum to the Drawings or Technical Specifications. Design changes are to be reported on Form No. F-26 (Included in Section 6.0).

4.7 CQA Compliance Reports

At the completion of each Construction Segment, the CQA Consultant will prepare a CQA Compliance Report signed and sealed by a Professional Engineer licensed in the State of Utah. The CQA Report will acknowledge that the work has been performed in conformance with the

Drawings and Technical Specifications. The CQA Report will incorporate supporting documentation including:

1. All daily field reports and weekly summary reports
2. Laboratory test reports
3. Field change reports
4. Construction problems and resolution data sheets
5. Documentation of design or specification changes

Any subsequent Construction Segment that is dependent upon successful completion of a specific Construction Segment cannot be initiated until a Compliance Report is prepared and approved for the previous dependent Construction Segment. Compliance Reports are to be completed on Form No. F-23 (Included in Section 6.0).

4.8 Final Construction Report

At the conclusion of the Reclamation Project, the Construction Manager or a designated representative will prepare a Final Construction Report. This report will be submitted to the DWMRC for review and approval within 180 calendar days after completion of construction. This report will be prepared under the direct supervision of and stamped by a Professional Engineer registered in the state of Utah. This report will include, at a minimum:

1. All of the individual CQA Compliance Reports which will summarize all CQA/CQC operations, construction equipment and processes, results, and observations of conformance/verification testing
2. A summary of any actions taken to resolve construction problems encountered
3. Field notes and photographs
4. As-built drawings and details

5 CQA/CQC PROCEDURES

This section describes the CQA/CQC monitoring and testing procedures to be used during the Reclamation Project to ensure that construction takes place in accordance with the Drawings and Technical Specifications. Specific requirements for construction procedures and materials are presented in the Drawings and Technical Specifications, along with criteria for site cleanup activities. If there is a conflict between CQA/QC procedures presented herein and those presented in the Technical Specifications, those presented in the Technical Specifications shall take precedence unless otherwise indicated by the Design Engineer.

5.1 Contractor Evaluation

Prior to construction, each Contractor will submit a summary of proposed construction methods, equipment and testing protocols. The Construction Manager, CQA Officer, and Engineer will review the submittal and provide approval, in writing, of the Contractor's plans. The Contractor may be required to modify proposed methods, equipment, or testing protocols prior to approval.

5.2 Testing Methods

Throughout the Reclamation Project, various field and laboratory testing will be conducted to ensure that materials meet the Technical Specifications. Where applicable, testing will be conducted in accordance with the current versions of the corresponding ASTM test procedures. Any revisions to the testing methods will be reviewed and approved by the Engineer and the CQA Officer prior to usage. Testing methods to be used are summarized in Table 1. The required frequency of testing is described in the applicable Sections that follow.

Table 1 - Summary of Testing Methods

TEST METHOD	TEST STANDARD
Particle Size Analysis (Gradation)	ASTM D422
Atterberg Limits	ASTM D4318
Standard Proctor	ASTM D698
Rock Correction of Unit Weight & Water Content	ASTM D4718
Nuclear Moisture/Density Gauge	ASTM D6938

TEST METHOD	TEST STANDARD
Sand-Cone Test	ASTM D1556
Moisture Content	ASTM D2216
LA Abrasion – Coarse	ASTM C535
LA Abrasion – Fine	ASTM C131
Specific Gravity – Aggregate	ASTM C127
Absorption – Aggregate	ASTM C127
Sodium Soundness – Aggregate	ASTM C88

During earthwork operations and fill placement, testing will be conducted to verify that the materials meet the gradation and classification specifications. Testing will include gradation testing (ASTM D422) and Atterberg Limit testing (ASTM D4318).

Moisture-density curves will be developed using the standard Proctor test (ASTM D698). Rock corrections (ASTM D4718) for the Proctor tests may be required depending on the material being tested. Field density testing may be conducted with the sand cone test (ASTM D1556) or a nuclear density gauge (ASTM D6938, or as modified by the QA Manager). Correlation of nuclear density gauge results shall be by comparison with results from sand cone test(s) and laboratory testing for water content(s) using the oven drying method (ASTM D2216) on similar material. A sufficient number of sand cone tests and moisture content tests will be performed to provide a correlation between the sand cone and nuclear density tests.

Rock protection aggregate will be tested using the LA Abrasion test for coarse or fine material (ASTM C535 or C131), the sodium soundness test (ASTM C88), and the specific gravity and absorption test (ASTM C127).

Other field or laboratory testing may be required throughout the Reclamation Project. Any testing shall be performed in accordance with the applicable ASTM or other industry standard.

5.3 Cell 1 Reclamation

Reclamation of Cell 1 will include the removal of contaminated materials including raffinate crystals, PVC liner, and contaminated site soils and the construction of a clay-lined area for permanent disposal of contaminated site materials. This disposal area (the Cell 1 Disposal Area) will be constructed adjacent to and parallel with the existing Cell 1 dike. A sedimentation basin will then be constructed and a drainage channel provided.

5.3.1 Removal of Contaminated Materials

QC staff will monitor of the removal of raffinate crystals, liner, and contaminated soils from Cell 1 and placement in the designated area. QC procedures for the placement of these materials are described in Section 5.4.

5.3.2 Subgrade Preparation

Subgrade for the clay liner may be leveled and filled as needed to provide a stable base for the placement of the clay liner. The QC staff will monitor placement and compaction of any subgrade fill.

5.3.3 Clay-Lined Cell 1 Disposal Area

A clay lined area will be constructed adjacent to and parallel with the existing Cell 1 dike for permanent disposal of contaminated material and debris. Tailings will not be placed in the Cell 1 Disposal Area. The area will be lined with a 12-inch thick clay layer prior to placement of contaminated materials and installation of the final reclamation cap. Placement of clay liner materials will be based on a schedule determined by the availability of contaminated materials removed from the Mill decommissioning area in order to maintain optimum moisture content of the clay liner prior to placing of contaminated materials.

5.3.4 Clay Liner Material Conformance Monitoring and Testing

The CQA Contractor will perform monitoring and frequent verification testing to verify that the clay liner material meets the gradation and classification specifications. The CQA Contractor will monitor earthmoving operations to ensure that fill material is taken from the proper borrow sources.

Clay liner material shall have a D_{100} particle size of less than 1-inch (100 percent passing the 1-inch sieve), and shall be free from roots, branches, rubbish, and process area debris. Liner material shall have a minimum of 40 percent passing the No. 200 sieve and a minimum plasticity index (PI) of 15. Suitable soils will classify as CL, CH, or SC materials under the Unified Soil Classification System.

Gradation and Atterberg limits testing will be performed at a minimum of one test per 2,000 cubic yards of clay liner material placed or when the material shows significant variation. Samples should be randomly selected for testing.

Laboratory test results for the clay liner shall be verified for compliance and approved by the CQA site manager prior to placement of disposed materials in the cell.

5.3.5 Clay Liner and Subgrade Material Placement

QC Technicians will observe the surface condition prior to fill placement. If the compacted surface of any layer of fill is too dry or smooth to bond properly with the layer of material to be placed thereon, it will be moistened and/or reworked with a harrow, scarifier, or other suitable equipment to a sufficient depth to provide relatively uniform moisture content and a satisfactory bonding surface before the next succeeding layer of fill is placed. If the compacted surface of any layer of fill is too wet (due to precipitation) for proper compaction, it will be reworked with harrow, scarifier or other suitable equipment to dry out the layer and reduce the moisture content to within the required limits. It will then be recompacted to the specified requirements.

QC Technicians will monitor the weather and temperature conditions. No material will be placed when fill material or the underlying material is frozen or when ambient temperatures do not permit the placement or compaction of the materials to the specified density without developing frost lenses in the fill.

The QC Technicians will monitor lift thicknesses frequently to verify the Technical Specifications are being met. The required layer and lift thicknesses for the clay liner and subgrade fill are listed in Table 2.

Table 2 - Summary of Liner Component Layers and Lift Thicknesses

Liner Component	Material Type (USCS)	Layer Thickness	Lift Thickness
Subgrade Fill	CL, ML, SC, SP, or SM	Variable	8 in. loose (max.)
Clay Liner	CL, SC, or CH	12 in. (min.)	6 in. loose (max.)

5.3.6 Moisture and Density Control

The QC Technicians will monitor placement, moisture conditioning, and compaction of the fill as it is placed. Prior to the start of field compaction operations, appropriate laboratory compaction curves will be obtained for the range of materials to be placed. Laboratory compaction curves based on complete Proctor tests will be obtained at the frequencies outlined in Table 3, depending on the variability of materials being placed.

Each layer of the fill will be conditioned so that the moisture content is uniform throughout the layer prior to and during compaction. As far as practicable, materials will be brought to the proper moisture content before placement. If necessary, water will be added after lift placement to the material by sprinkling on the layer. Each lift will be compacted by a sufficient number of roller passes or other compaction equipment to achieve the required dry density. Material that is too dry or too wet or does not meet the required dry density will be rejected and reworked until the moisture content and dry density are within the specified limits. Reworking may include removal, re-harrowing, reconditioning, rerolling, or combinations of these procedures.

The required density testing frequencies are included in Table 3. For all materials, a minimum of two tests will be taken for each day that more than 150 cubic yards of material is placed. A minimum of one test per lift and at least one test for every full shift of compaction operations will be taken.

Field density testing may be conducted with the sand cone test (ASTM D1556) or a nuclear density gauge (ASTM D6938, or as modified by the QA Manager). Correlation of nuclear density gauge results shall be by comparison with results from sand cone test(s) and laboratory testing for water content(s) using the oven drying method (ASTM D2216) on similar material. A sufficient number of sand cone tests and moisture content tests will be performed to provide a

correlation between the sand cone and nuclear density tests. Field density tests shall be compared with standard Proctor tests (ASTM D698 Method A or C) on the same material.

Testing frequency may be increased by the CQA Site Manager if variability of materials is noted at the site, during adverse conditions, or to isolate failing areas of the construction.

Field density testing should not jeopardize the integrity of the clay liner. Holes in the clay material resulting from testing should be repaired by hand by filling with clay fill, or by filling with bentonite powder which is hydrated to fully seal the hole.

Table 3 - Summary of Liner Component Moisture-Density Testing Frequencies and Requirements

Liner Component	Test Frequency	Density Requirement*	Moisture Requirement*	Proctor Frequency
Subgrade Fill	1/1,000 cubic yards placed	90% (min.)	+/- 3%	1/10,000cubic yards placed
Clay Liner	1/500 cubic yards placed	95% (min.)	+/- 2%	1/5,000 cubic yards placed

* Based on maximum dry density and optimum water contents as determined by standard Proctor tests (ASTM D698 Method A or C) on the same material.

5.3.7 Sedimentation Basin and Discharge Channel

After contaminated material is removed from Cell 1 and the Cell 1 Disposal Area clay liner has been constructed, Cell 1 will be breached and constructed as a sedimentation basin. A discharge channel out of the sedimentation basin will be constructed. Details of these features are provided in the Drawings and Technical Specifications. The QC staff will monitor the excavation and construction of these features to ensure conformance with the Technical Specifications.

The channel excavation will be located within competent bedrock. The CQA team must document and verify the competency of the sedimentary bedrock along the channel for the Engineer and the Owner's approval.

5.3.8 Riprap Conformance Monitoring and Testing

A rock apron will be constructed at the transition from soil to bedrock within the sedimentation basin. Rock apron riprap material of the specified size shall have a minimum rock quality

designation or durability score of 70 or higher. If actual rock quality designation is between 65 and 69, oversizing will be required. Rock quality designations below 65 will not be acceptable.

The rock size specifications for the riprap shall be confirmed by particle-size distribution testing prior to placement, using ASTM D422, ASTM D5519, or an approved equivalent method for large-sized material. Testing shall be at a frequency of at least one test per 10,000 cubic yards of riprap placed, per select size, or when riprap characteristics show significant variation.

Test series for rock durability will include specific gravity, absorption, sodium soundness and LA abrasion. During construction additional test series and gradations will be performed for each type of riprap when approximately one-third (1/3) and two-thirds (2/3) of the total volume of each type have been produced or delivered. For any type of rock where the volume is greater than 30,000 cubic yards, a test series and gradations will be performed for each additional 10,000 cubic yards of rock produced or delivered.

5.3.9 Riprap and Filter Material Placement

In subgrade areas requiring fill placement to achieve final grades, after liner removal, the upper 12 inches shall be scarified, moisture conditioned and compacted prior to fill placement.

Filter material and riprap shall be placed in one or more lifts to form a continuous, uniform layer on top with a minimum thickness as identified in the Drawings. The top surface of the riprap shall be track-rolled or tamped with the bucket of a track-hoe to provide a uniform riprap surface and minimize void spaces within the riprap.

5.3.10 Tolerances

Completed grading for the sedimentation basin, in soil, shall be within 1.0 foot (horizontally) of the lines as designed, and within 0.1 foot (vertically) of the elevations as designed. Final surfaces shall be smoothed to avoid abrupt changes in surface grade or areas of runoff concentration.

The completed grading for the discharge channel (and portions of the sedimentation basin) in rock shall be within 2.0 foot (horizontally) of the lines as designed, and within 0.5 foot (vertically) of the elevations as designed. The final rock surfaces will be rough and shall not be

filled to make grade. The bedrock channel shall be constructed at or below the design grades in order to meet the intent of the design.

5.3.11 Nonconformance, Corrective Action and Stop Work

The CQA staff, including the CQA Site Manager and QC Technicians, will have the authority to reject material brought to the site or material that has been placed. For a failed field moisture/density test, the QC Technician will determine the extent and depth of the affected area and require the Contractor to re-work the material as described above. If persistent failed tests occur (indicating inadequate compaction methods), the CQA Site Manager will have the authority to stop the work until the underlying cause is determined and the Contractor can demonstrate that moisture/density specifications can be met.

Laboratory test results for the clay liner shall be verified for compliance and approved by the CQA site manager prior to placement of disposed materials in the cell.

5.3.12 Documentation

Field and laboratory test results, observations of fill placement, and field compaction test results will be recorded using the appropriate field forms and reports, as described in Section 4. Table 4 includes a summary of the required materials testing and frequencies.

Table 4 - Summary of Testing Frequency and Criteria for Clay Liner and Sedimentation Basin Riprap

Component	Test	ASTM Standard	Frequency	Criteria
Clay Liner	Gradation (200 Wash)	D422	1/2,000cubic yards	40% min. passing the 200 sieve
	Atterberg Limits	D4318	1/2,000 cubic yards	Min. PI = 15
Riprap*	Gradation with 200 Wash	D422	1/10,000 cubic yards	D_{50}, Durability

*Rock durability testing per section 5.3.8

5.4 Mill Decommissioning

Decommissioning of the Mill will include:

- Disposal of the Mill processing equipment and structures and contaminated soils in the Mill area
- Cleanup of contaminated areas of the Mill Site including ore storage area and roadways
- Cleanup of windblown contamination

These areas are shown on the Drawings. The Technical Specifications describe methods and cleanup criteria, including radiological equipment that will be used and the development of cleanup criteria. Contaminated materials will be disposed of in the designated areas of the tailings impoundment.

The CQA Contractor will provide specialized QC Technicians qualified to monitor the dismantling of the Mill equipment and structures and the cleanup of contaminated soils. These Technicians will be trained in the proper use and calibration of radiological monitoring equipment and will monitor the work to ensure the cleanup criteria are met.

5.4.1 Characterization Surveys

Following scanning, classification and cleanup (as required), the areas will be scanned again to verify compliance with activity criteria. QC Technicians will use calibrated beta/gamma instruments capable of detecting activity levels of less than or equal to 25 percent of the guideline values.

After removal of contamination, the technicians will make final surveys over the remediated areas. The QC Technicians will document within the specific ten meter by ten meter grids, the sample point locations, as detailed in the Technical Specifications. Soil samples from 10 percent of the surveyed grids will be chemically analyzed to confirm the initial correlation factors utilized and confirm the success of cleanup effort for radium, thorium and uranium. Ten percent of the samples chemically analyzed will be split and duplicates will be sent to an off-site

laboratory. Spikes and blanks, equal to 10 percent of the samples that are chemically analyzed, will be processed with the samples.

5.4.2 Contaminated Material Disposal

Contaminated materials including mill debris, site soils, liner material, and raffinate crystals will be disposed of in the designated portion of the Cell 1 Disposal Area. Material specifications and placement methods are described in the Construction Plans and Technical Specifications. The CQA Contractor will provide monitoring and testing during material placement.

5.4.3 Material Conformance Monitoring

For scrap and debris, the QC Technicians will monitor the volume and size of the material to ensure compliance with the maximum dimensions provided in the Technical Specifications (a maximum dimension of 20 feet and a maximum volume of 30 cubic ft) and to ensure that containers are properly pierced. If the size limits are exceeded, the QC staff will require the Contractor cut the material down to size.

5.4.4 Material Placement

QC Technicians will monitor material placement to verify the debris is spread out and placed according to the Technical Specifications and that voids are filled with stockpiled soils, contaminated soils, tailings and/or other approved materials. The approval of the Construction Manager and CQA Officer will be required for the use of other materials to fill voids.

A minimum of one foot of compacted soil will be required above the clay liner prior to placing any scrap or debris.

When liner or other lightweight material is placed, the QC staff will ensure that at least one foot of soil, crystals or other materials is placed above for protection against wind.

To the extent practicable, the various materials will not be concentrated in thick deposits on top of the tailings, but will be spread over the working surface as much as possible to provide relatively uniform settlement and consolidation characteristics of the cleanup materials.

It is anticipated that raffinate crystals will have a consistency similar to a granular material when brought to the cells, with large crystal masses being broken down for transport. Placement of the crystals will be performed as a granular fill, with care being taken to avoid nesting of large sized material. Actual placement procedures will be evaluated by the QC staff during construction as crystal materials are brought and placed in the cells.

Soil or soil-like material shall be placed and compacted over each lift of debris or other materials in lifts not to exceed two feet in loose thickness and compacted prior to placement of additional lifts.

5.4.5 Material Compaction

CQA staff will monitor material compaction to verify compliance with the Technical Specifications. The first lift (bridging lift) will be compacted by the tracking of heavy equipment, such as a Caterpillar D6 Dozer (or equivalent), using at least 4 passes, prior to the placement of a subsequent lift. Contaminated soils and other cleanup materials after the bridging lift will be compacted to the density requirement provided in the Technical Specifications. During construction, compaction requirements for the raffinate crystals will be re-evaluated based on field conditions and modified by the Construction Manager and CQA Officer, with the agreement of the DWMRC personnel.

Soil or similar material shall be compacted with a minimum of six passes with self-propelled, towed, or hand-held vibratory compaction equipment. The number of passes shall be confirmed with actual compaction equipment on site with a field test section of soil to establish a correlation between the field compaction method and 80 percent of maximum dry density for the soil, as determined by the standard Proctor test (ASTM D698).

The upper 12 inches of the final disposed material surface shall be compacted to 90 percent of the maximum dry density for the material, as determined by the standard Proctor test.

Field density tests shall be compared with standard Proctor tests (ASTM D698 Method A or C) on the same material. Standard Proctor tests shall be conducted at a frequency of at least one test

per 5,000 cubic yards of material compacted, or when material characteristics show significant variation.

Field density testing may be conducted with the sand cone test (ASTM D1556) or a nuclear density gauge (ASTM D6938, or as modified by the QA Manager). Correlation of nuclear density gauge results shall be by comparison with results from sand cone test(s) and laboratory testing for water content(s) using the oven drying method (ASTM D2216) on similar material. A sufficient number of sand cone tests and moisture content tests will be performed to provide a correlation between the sand cone and nuclear density tests.

The frequency of the field density and moisture tests will be not less than one test per 1,000 cubic yards of compacted fill. A minimum of two tests will be taken for each day that more than 150 cubic yards of material is placed. A minimum of one test per lift and at least one test for every full shift of compaction operations will be taken. Tables 5 and 6 summarize the placement and testing criteria for the disposed materials.

Table 5 - Summary of Disposed Materials and Lift Thicknesses

Disposed Materials	Material Type (USCS)	Layer Thickness	Lift Thickness
Debris Lift	Variable	48 in. (max.)	As needed to fill voids
Fill Above Debris Lift	Variable	36 in. (min.)	12 in. compacted (max.)

Table 6 - Summary of Disposed Materials Moisture-Density Testing Frequencies and Requirements

Disposed Materials	Test Frequency	Density Requirement *	Proctor Frequency
Fill around debris	1/1,000 cubic yards placed	80% (min.)	1/5,000 cubic yards placed
Upper Debris Fill	1/1,000 cubic yards placed	90% (min.)	1/5,000 cubic yards placed

* Based on maximum dry density and optimum water contents as determined by standard Proctor tests (ASTM D698 Method A or C) on the same material.

5.4.6 Final Slope and Grades

The final disposed material surface shall have maximum side slopes of 5:1 and a top surface sloping in the directions and grades shown on the Drawings. The side slopes and top surface shall be free from abrupt changes in grade or areas of runoff concentration. The final disposed

material surface shall be compacted with approved construction equipment to form a smooth surface with uniform density for subsequent cover placement.

5.4.7 Tolerances

The final surface of the disposed material shall be smoothed to avoid abrupt changes in surface grade. The layer thicknesses shall meet the required minimum thicknesses.

5.4.8 Nonconformance, Corrective Action and Stop Work

The CQA Site Manager and QC Technicians will have the authority to reject scrap and debris that is not properly prepared for placement. The Contractor may be required to reduce the size of large pieces of material or pierce drums or other containers. CQ staff may also require site soils to be re-worked if a failed test indicates the compaction requirements were not met. If persistent inadequacies occur during the placement of contaminated materials, the CQA Site Manager will have the authority to stop the work until the underlying cause is determined and the Contractor can demonstrate that the Technical Specifications can be met.

5.4.9 Documentation

All observations and monitoring of contaminated material placement and all field compaction test results will be recorded using the appropriate field forms and reports, as described in Section 4.

5.5 Settlement Plates

The CQA team will need to verify proper construction and placement of the settlement points. The Surveyor will conduct the settlement plate measurements based on the DWMRC approved monitoring plan.

5.6 Cover System

A multi-layered earthen cover will be placed over tailings Cells 2, 3, 4A, and 4B and the portion of Cell 1 used for disposal of contaminated materials (the Cell 1 Disposal Area). The cover layers, from bottom to top, will include: 1) interim fill layer, 2) compacted cover layer 3) growth medium layer, and 4) erosion protection layer. Layers 1 through 3 will consist of “random fill.”

The material specifications, layer configurations, layer thicknesses, borrow sources, placement methods, and compaction requirements are described in the Technical Specifications. The CQA Contractor will provide monitoring and testing during material placement.

5.6.1 Material Conformance Monitoring and Testing

The CQA Contractor will perform monitoring and frequent verification testing to ensure that the fill materials meet the gradation and classifications specifications. The CQA Consultant will monitor earthmoving operations to ensure that the fill material is taken from the proper borrow sources.

Prior to the placement of the next layer of the cover, the CQA Site Manager or the QC Technicians under the supervision of the CQA Site Manager shall inspect the completed layer and document any of the following:

- Erosion of the layer surface
- Cracking or desiccation of the surface
- Fill areas that may contain excessive organics or other debris
- Depressions, or settlement of the layer
- Irregularities in the layer surface (e.g. grading errors)

Any documented items that constitute non-conformance with the Drawings and Technical Specifications should be corrected prior to placement of the subsequent layer of the cover.

5.6.1.1 Random Fill

Random fill will be used for each of the lower three layers of the cover system. The fill will consist of mixtures of sands and silts with varying amounts of clay and random amounts of gravel and rock-size material. Random fill, except for the interim fill layer, shall have a maximum particle size of 6 inches, and at least 10 percent of the material shall be finer than the No. 200 sieve. Oversized material will be controlled through selective excavation at the stockpiles and through the utilization of a grader, bulldozer or backhoe to cull oversize materials from the fill. The source of these materials will be site stockpiles from previous cell construction activities.

Testing for all layers except the interim fill shall consist of No. 200 sieve wash and particle-size distribution testing (ASTM D422) at a frequency of at least one test per 2,000 cubic yards of fill placed, or when material characteristics show a significant variation.

5.6.1.2 Topsoil-Gravel Admixture

Topsoil-gravel admixture material shall be free from roots, branches, rubbish, and debris. The gravel portion of the topsoil-gravel admixture material will consist of granular materials from approved off-site sources.

The mixture will be 25 percent gravel by weight. The gravel will be purchased from nearby commercial sources of alluvial gravel and cobbles. The gravel portion of the topsoil-gravel admixture material shall be a screened product and have a maximum particle size of less than 1-inch. The topsoil portion of the topsoil-gravel admixture material will consist of select material from the on-site topsoil borrow area.

Gradation specifications for the gravel used for topsoil-gravel admixture material shall be confirmed by gradation testing prior to mixing with the topsoil, to determine the maximum particle size. Testing shall consist of particle-size distribution testing (ASTM D422) at a frequency of at least one test per 2,000 cubic yards of rock delivered to the site, or when rock characteristics show a significant variation.

Gradation specifications for topsoil-gravel admixture material shall be confirmed by gradation testing, on samples collected from the point of placement (on the topdeck). Testing shall consist of particle-size distribution testing (ASTM D422) at a frequency of at least one test per 2,000 cubic yards of mixture placed, or when the characteristics of the mixture show a significant variation.

Layer thickness of the topsoil-gravel admixture will be controlled through establishment of grade stakes placed on a 200 x 200 foot grid on the top of the cells and by a 100 x 100 foot grid on the cell slopes. Physical checks of topsoil-gravel admixture depth will be accomplished through the

use of hand dug test pits at the center of each grid in addition to monitoring the depth indicated on the grade stakes.

5.6.2 Material Placement

QC Technicians will observe the surface condition prior to fill placement. If the compacted surface of any layer of fill is too dry or smooth to bond properly with the layer of material to be placed thereon, it will be moistened and/or reworked with a harrow, scarifier, or other suitable equipment to a sufficient depth to provide relatively uniform moisture content and a satisfactory bonding surface before the next successive layer of fill is placed. If the compacted surface of any layer of fill is too wet (due to precipitation) for proper compaction of the fill material to be placed thereon, it will be reworked with harrow, scarifier or other suitable equipment to reduce the moisture content to the required level. It will then be recompacted to the specified requirements.

Nesting of oversized material will be controlled through selective excavation of stockpiled material, observation of placement by QC Technicians with authority to stop work and reject material being placed and by culling oversized material from the fill utilizing a grader. Successive loads of material will be placed on the fill so as to produce the best practical distribution of material.

QC Technicians will monitor the weather and temperature conditions. No material will be placed when the fill material or the underlying material is frozen or when ambient temperatures do not permit the placement or compaction of the materials to the specified density without developing frost lenses in the fill.

QC Technicians will monitor and document lift thicknesses frequently to ensure the Technical Specifications are being met. The required layer and lift thicknesses are listed in Table 7.

Table 7 - Summary of Cover Component Layer and Lift Thicknesses

Cover Component	Layer Thickness	Lift Thickness
Interim Fill	30 in. (min.)	12 in. loose (max.)
Compacted Cover Layer	36 to 48 in. (min.)	12 in. loose (max.)
Growth Medium Layer	42 in. (min.)	18 in. loose (max.)
Erosion Protection Layer	6 in. (min.)	6 in. (max.)

5.6.3 Density Control

The QC Technicians will monitor placement, moisture conditioning, and compaction of the fill as it is placed. Prior to the start of field compaction operations, appropriate laboratory compaction curves will be obtained for the range of materials to be placed. Laboratory compaction curves based on complete Proctor tests will be conducted at the frequencies outlined in Table 8, depending on the variability of materials being placed.

Each layer of the fill will be conditioned so that the moisture content is uniform throughout the layer prior to and during compaction. Each lift will be compacted by a sufficient number of roller passes or other compaction equipment to achieve the required dry density. Material that does not meet the required dry density will be rejected and will be reworked until the dry density is within the specified limits. Reworking may include removal, re-harrowing, reconditioning, re-rolling, or combinations of these procedures.

The required testing frequencies are included in Table 8. For all layers requiring compaction testing, a minimum of two tests will be taken for each day that an applicable amount of fill is placed in excess of 150 cubic yards. A minimum of one test per lift and at least one test for every full shift of compaction operations will be taken.

Table 8 - Summary of Cover Component Density Testing Frequencies and Requirements

Cover Component	Compaction Test Frequency	Relative Compaction Requirement*	Proctor Frequency
Compacted Cover Layer	1/500 cubic yards placed	95% (min.)	1/5,000 cubic yards placed
Growth Medium Layer	1/2,000 cubic yards placed	85% (min.)	1/10,000 cubic yards placed

* Based on maximum dry density and optimum water contents as determined by standard Proctor tests (ASTM D698 Method A or C) on the same material.

Field density testing may be conducted with the sand cone test (ASTM D1556) or a nuclear density gauge (ASTM D6938, or as modified by the QA Manager). Correlation of nuclear density gauge results shall be by comparison with results from sand cone test(s) and laboratory testing for water content(s) using the oven drying method (ASTM D2216) on similar material. A sufficient number of sand cone tests and moisture content tests will be performed to provide a correlation between the sand cone and nuclear density tests. Field density tests shall be compared with standard Proctor tests (ASTM D698 Method A or C) on the same material. Rock corrections (ASTM D4718) for oversize particles may be required for the topsoil-gravel admixture material (or other materials) depending on the gradation of the gravel material selected.

The actual frequency of testing may be increased by the CQA Site Manager if variability of materials is noted at the site, during adverse conditions, or to isolate failing areas of the construction.

5.6.4 Surface Slopes and Grades

The final cover surface shall have maximum side slopes of 5:1 and a top surface sloping in the direction and grade shown on the Drawings. The side slopes and top surface shall be free from abrupt changes in grade or areas of runoff concentration. The perimeter apron at the toe of the side slopes shall have a minimum width of 20 feet from the toe of the side slopes and slope away from the toe of the side slopes (as shown on the Drawings).

5.6.5 Tolerances

The completed cover surface shall be constructed to within 1.0 foot (horizontally) of the lines as designed, and within 0.1 foot (vertically) of the elevations as designed. The final surface of the cover shall be smoothed to avoid abrupt changes in surface grade. The layer thicknesses shall meet the required minimum thicknesses identified in the Technical Specifications and Drawings.

5.6.6 Nonconformance, Corrective Action and Stop Work

The CQA Site Manager and QC Technicians will have the authority to reject material that is brought to the site or material that has been placed. For a failed field density test, the QC Technician will determine the extent and depth of the affected area and require the Contractor to re-work the material as described above. If persistent failed tests occur (indicating inadequate compaction methods), the CQA Site Manager will have the authority to stop the work until the underlying cause is determined and the Contractor can demonstrate that the moisture/density specifications can be met.

5.6.7 Documentation

All field and laboratory test results, observations of fill placement, and field compaction test results will be recorded using the appropriate field forms and reports, as described in Section 4. Table 9 includes a summary of the required materials testing and frequencies for the cover components.

Table 9 - Summary of Testing Frequency and Criteria for Cover Components

Component	Test	ASTM Standard	Frequency	Criteria
Random Fill (compacted cover & growth medium layers)	Gradation with 200 Wash	D422	1/2,000 cubic yards	Max. Particle = 6 inches, Min. 10% passing the No. 200 sieve
Rock Mulch	Gradation	D422	1/2,000 cubic yards	$D_{100} \leq 1$ inch

5.7 Riprap and Filter Material

The side slopes of the reclaimed cover will be protected by riprap surfacing. The size, thickness and gradation requirements for the riprap are provided in the Drawings and Technical Specifications.

5.7.1 Material Conformance Monitoring and Testing

Riprap will be a screened product transported from aggregate sources north of the project site. The CQA Contractor will perform monitoring and frequent verification testing to confirm that the riprap meets the gradation and durability specifications.

During active riprap placement, each load of material will be visually checked against standard piles for gradation prior to transport to the tailings cells.

5.7.1.1 Riprap

Material for the perimeter aprons and side slopes will consist of granular materials from approved off-site areas. Riprap shall meet NRC long-term durability requirements (rock quality designation of 65 or more; Johnson, 2002).

Riprap shall be a screened product, free from roots, branches, rubbish, and debris. The specifications as given below are for rock quality designations of 70 or higher. If actual rock quality designation is between 65 and 69, additional oversizing will be required. Rock quality designations below 65 will not be acceptable.

Designated gradations for the riprap will be specified on the final drawings for construction. Riprap will be imported from off-site.

- Side slope riprap shall have a minimum D_{50} as listed below and a minimum layer thickness of 1.5 times the D_{50} or the D_{100} of the riprap, whichever is greater:
    - 1.7 in. for non-accumulating flow side slopes
    - 5.3 in. for Cell 4A and Cell 4B southern side slopes
    - 4.5 in. for Cell 1 Disposal Area side slope

- Riprap used in the rock aprons shall have a minimum D_{50} as listed below and a minimum layer thickness of 1.5 times the D_{50} or the D_{100} of the riprap, whichever is greater:
    - 3.4 in. for Rock Apron A
    - 10.5 in. for Rock Apron B
    - 9.0 in. for Rock Apron C

Material specifications for the riprap shall be confirmed by gradation testing conducted by the CQA Laboratory. Testing shall consist of particle-size distribution testing (ASTM D422) at a frequency of at least one test per 10,000 cubic yards of rock delivered to the site, or when rock characteristics show a significant variation.

Riprap layer thickness will be controlled through establishment of grade stakes placed on a 200 x 200 foot grid on the top of the cells and by a 100 x 100 foot grid on the cell slopes. Physical checks of riprap depth will be accomplished through the use of hand dug test pits at the center of each grid in addition to monitoring the depth indicated on the grade stakes.

Test series for rock durability will include specific gravity, absorption, sodium soundness and LA abrasion. During construction additional test series and gradations will be performed for each type of riprap when approximately one-third (1/3) and two-thirds (2/3) of the total volume of each type have been produced or delivered. For any type of rock where the volume is greater than 30,000 cubic yards, a test series and gradations will be performed for each additional 10,000 cubic yards of rock produced or delivered. Gradation tests will also be performed at the direction of the QC Technician for any locations considered inadequate based on visual inspection by the QC Technician, or if difficulties are experienced by the Contractor during rock placement.

5.7.1.2 Filter Material

Filter material shall be free from roots, branches, rubbish, and debris. Filter material will generally be classified as sand containing gravel and fines and shall meet the following gradation specifications.

Table 10 – Filter Material Gradation

Sieve Size	Percent Passing, by Weight
3-inch	100
No. 4	70-100
No. 20	40-60
No. 200	0-5

Material specifications for the filter material shall be confirmed by gradation testing conducted by the CQA Laboratory. Testing shall consist of particle-size distribution testing (ASTM D422) at a frequency of at least one test per 10,000 cubic yards of filter material delivered to the site, or when material characteristics show a significant variation.

Filter layer thickness will be established during construction with grade stakes placed on a grid or centerline and offset pattern and layer thickness marks on each grade stake. The minimum thickness of the layer will be verified by spot checking of layer thickness by hand excavation in selected locations.

5.7.2 Material Placement

QC Technicians will monitor riprap placement. An initial section of each type of riprap constructed shall be visually examined and used to evaluate future placement. The initial section will be constructed with material meeting gradation and riprap thickness requirements. Initial testing should be conducted to determine the gradation and the rock weight/unit volume that will be achieved in future rock placement activities. Riprap material will be hauled to the reclaimed surfaces and placed on the surfaces using belly dump highway trucks and road graders. Riprap will be dumped in windrows and the grader will spread the riprap in a manner to minimize segregation of the material. Depth of placement will be controlled through the establishment of grade stakes. Minimum required thicknesses for riprap and filter material layers are provided in

the Technical Specifications and Drawings. Physical checks of riprap depth will be accomplished through the use of hand dug test pits at the center of each grid in addition to monitoring the depth indicated on the grade stakes. The Contractor will excavate the test pits, and QC Technicians will observe and document the excavation. Placement of riprap will avoid accumulation of riprap sizes less than the minimum D_{50} size and nesting of the larger sized rock. Additional riprap placement requirements include:

- Individual stones shall not be greater than 90 percent of the riprap layer thickness.
- Dumped riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing bedding material.
- Hand placement or rearrangement of individual stones will be required only to the extent necessary to secure the results specified above. Larger stones may require individual placement by equipment.
- Any stones that are not firmly wedged shall be adjusted and additional selected stones inserted or existing stones replaced, so as to achieve a solid interlock.

5.7.3 Compaction

QC staff will monitor riprap placement. The riprap layer will be compacted by at least two passes by a D7 Dozer, tamping with the bucket of a trackhoe, or equivalent methods in order to key the rock for stability.

5.7.4 Tolerances

The completed riprap shall be placed to within 5.0 foot (horizontally) of the layout as designed, and within 0.5 foot (vertically) of the elevations as designed. The rock layer thicknesses shall meet the minimum requirements. Minimum required thicknesses for riprap and filter material layers are provided in the Technical Specifications and Drawings. Riprap layer thickness will be directly measured as outlined in Section 5.7.2. A measurement device (i.e. tape measure) may be used to determine the distance from the top of the bedding or filter layer to the top of the riprap layer.

5.7.5 Nonconformance, Corrective Action and Stop Work

The CQA Site Manager and QC Technicians will have the authority to reject riprap that is brought to the site or riprap that has been placed. For rejected riprap, QC Technicians will identify the extent of inadequate riprap and will require the Contractor to excavate the material and place additional riprap. If persistent failed tests occur (indicating inadequate placement methods), the CQA Site Manager will have the authority to stop the work until the underlying cause is determined and the Contractor can demonstrate that the riprap can be placed according to the Technical Specifications.

5.7.6 Documentation

All field and laboratory test results, observations of riprap placement, and field compaction test results will be recorded using the appropriate field forms and reports, as described in Section 4. Table 11 includes a summary of the required materials testing and frequencies for the erosion protection materials.

Table 11 - Summary of Testing Frequency and Criteria for Riprap and Filter Material

Component	Test	ASTM Standard	Frequency	Criteria
Riprap*	Gradation with 200 Wash	D422	1/10,000 cubic yards	D_{50} and Durability*
Filter Material	Gradation with 200 Wash	D422	1/10,000 cubic yards	See Table 10

*Rock durability testing per section 5.7.1.1

5.8 Protection of Soil Stockpiles

The Contractor shall maintain proper erosion control measures for stockpiles and may be required to cover piles in situations where precipitation is anticipated. The CQA Site Manager should document improper stockpile management in situations where the integrity of the material is affected. The Construction Manager and/or the CQA Officer should determine corrective measures.

6 FIELD REPORT FORMS

Form No. F-23

COMPLIANCE REPORT

Project No._____ Date:_____

Construction Segment:_____

_____

Drawing No.:_____

Specification No.:_____

Description of Completed Construction Segment:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

By: CQA Officer _____

Approvals:

CQA Site Manager _____

DWMRC Project Manager _____

Form No. F-25

FIELD CHANGE ORDER

Project No._____ Date:_____

Drawing No.:_____

Specification No.:_____

Design Feature:

_____

_____

_____

_____

Modifications:

_____

_____

_____

_____

Reason:

_____

_____

_____

_____

Initiated by:_____

Approved by:_____
CQA Site Manager

Form No. F-26

DESIGN CHANGE ORDER

Project No._____ Date:_____

Drawing No.:_____

Specification No.:_____

Design Feature:

_____

_____

_____

Change in Design:

_____

_____

_____

Reason:

_____

_____

_____

Initiated by:_____

Approvals:

CQA Site Manager:_____

DWMRC Project Manager:_____

Design Engineer:_____