Analytical Services Division

Rocky Flats Environmental Technology Site

STATEMENT OF WORK

for

GEOTECHNICAL MATERIALS AND GEOSYNTHETICS TESTING

GG01-A

April 6, 2001

Approved: _____
Analytical Services

Reviewed For Classification
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INTRODUCTION

This Statement of Work (SOW) provides the technical requirements, quality control procedures, and an analysis structure that is intended to generate data of known and documented quality for geotechnical parameters. The samples to be analyzed may contain potentially hazardous radioactive, inorganic, and/or organic materials. Sample matrices may consist of aggregates, asphalt, concrete, soil, sludge, sediments, geosynthetics, oils, or other materials as appropriate for the methods.

The Laboratory shall employ safe handling procedures, obtain the required licensing for handling any waste generated, utilize generally accepted good laboratory practices in the performance of contract requirements, and shall follow the quality assurance/quality control (QA/QC) program specified herein.

In general, method requirements for geotechnical parameters for the Rocky Flats Environmental Technology Site (Site or RFETS) are consistent with those specified by the American Society for Testing and Materials (ASTM), the American Petroleum Institute (API), the American Association of State Highway and Transportation Officials (AASHTO), and other nationally-accepted analytical methods or protocols. It is the responsibility of the Laboratory to assure that tests are conducted to the latest version of the specified method which has been approved by the issuing agency.

SCOPE

This SOW identifies the technical, data quality, evidentiary and the deliverable requirements for generating geotechnical data for the Rocky Flats Environmental Technology Site. This document addresses all aspects of the data generating process from sample receipt to sample disposal.

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EXHIBIT A:

SUMMARY OF REQUIREMENTS

1. GENERAL REQUIREMENTS

This SOW comprises eight Exhibits for the determination of Geotechnical parameters. Exhibit A provides an overview and general requirements for Geotechnical testing. Exhibit B contains reporting and deliverables requirements. Geotechnical parameters with required standard methods are listed in Exhibit C by Line Item Code which specifies method sources. Exhibit D contains any additional information needed to define the specific application of these procedures. Exhibit E contains general and specific laboratory QA/QC requirements. Exhibit F contains the evidentiary requirements including, chain-of-custody and evidentiary document control requirements that the Laboratory must follow in processing samples under this subcontract, and specifies requirements for written laboratory Standard Operating Procedures (SOPs). To ensure proper understanding of language utilized in this subcontract, Exhibit G contains a glossary of terms. Exhibit H contains references applicable to GG01.

1.1. SOW Compliance

Sample analyses shall meet all the requirements specified in this Statement of Work (SOW). All work performed under this SOW shall be done by the Laboratory under the guidance of the CTR, or if applicable, by designated agents in accordance with contractual agreements.

1.2. Terms and Acronyms

The Laboratory shall use the Exhibit G glossary meaning when a term is used in the text without definition.

1.3. Key Identifiers

The terms *Report Identification Number* (RIN) and *Analytical Batch* are key to this SOW. Exhibit G gives precise definitions of these terms.

1.4. Potential Hazards Advisement

The samples to be analyzed by the Laboratory are from the Rocky Flats Environmental Technology Site and may contain potentially hazardous radioactive, inorganic, biological, and/or organic materials. The Laboratory should be aware of the potential hazards associated with the handling and analysis of these samples.

1.5. Nuclear Regulatory Commission (NRC) License

Laboratories seeking eligibility to receive radioactive or mixed radioactive/hazardous samples shall possess a valid NRC License or a State Radioactive Materials License for radionuclides regulated under the Atomic Energy Act, or must be an exempt facility as designated by a Federal Government Agency. The Laboratory shall provide suitable NRC- or State-licensed facilities to handle analyses of samples that have elevated activity levels. All analyses of radioactive samples, as well as radiochemical analyses, shall be conducted in licensed or exempted facilities. The Laboratory shall notify the CTR of all existing limits on receipt, amounts, and radionuclides that the Laboratory is authorized to handle. Samples without elevated activity levels may be analyzed in non-licensed facilities. Licenses shall be submitted to the CTR, or their designee, prior to the preaward audit, and upon CTR request. Licenses shall be made available for inspection during on-site audits.

1.5.1. Licensed laboratories shall submit all amendments to their NRC (or State) License to the CTR within five days of amendment receipt.

1.5.2. The Laboratory shall have a radioactive materials inventory system in place that allows an inspection of their current nuclear materials inventory (except exempt Federal facilities).

1.5.3. Loss of the NRC license or amendments which restrict the receipt of radioactive or mixed radioactive/hazardous samples may result in a **Subcontract Termination** for these types of samples.

1.6. **Timelines**

Timelines given in terms of days are to be interpreted as calendar days throughout this SOW unless otherwise noted.

1.7. **Sample Size**

The Laboratory shall specify the amount of sample (weight or volume) required to perform analytical determinations. The amount of sample required shall initially be submitted with the Laboratory's bid for services and thereafter in writing to the CTR whenever the Laboratory's analytical needs change.

1.8. **Sample Shipments**

Sample shipments to the Laboratory's facility will be scheduled and coordinated by the CTR. The Laboratory Shipping/Receiving Officer shall communicate with the CTR by telephone or fax using appropriate documentation as necessary throughout the process of sample scheduling, shipment, analysis, and data reporting, to ensure that samples are properly processed.

1.8.1. Samples will routinely be shipped directly to the Laboratory through a delivery service. The Laboratory shall be available to receive sample shipments during regular working hours, and with 24 hours advance notice on weekends and holidays on an as-needed basis. As necessary, the Laboratory shall be responsible for any handling or processing required for the receipt of sample shipments, including pick-up of samples at the nearest servicing airport, bus station, or other carrier service within the Laboratory's geographical area.

1.8.2. If there are problems with samples (e.g., broken or leaking containers) or sample documentation/paperwork (e.g., missing, incomplete, or conflicting COC forms), the Laboratory shall immediately contact the CTR for resolution.

1.9. **Retention of Unused Sample**

The Laboratory shall retain unused samples for 14 days after the CTR receipt of the data. This requires the retention of samples in a secure, stable environment consistent with preservation requirements. After this time period has elapsed, the Laboratory shall contact the CTR in writing to determine the final disposal of the unused samples. Special requests to dispose of samples prior to the 14 days shall be made in writing to the CTR. The Laboratory shall have written approval from the CTR before any samples are disposed or returned.

1.10. **Technical Audits**

The Laboratory shall be subject to routine, on-site technical audits as described in Exhibit E of this SOW.

1.11. **Information Release**

Communication by laboratory staff of analytical results, procedures, data, or similar matters shall be performed in accordance with procedures established in this module. In no case shall reports, results, or raw data be released to a third party without prior written approval of the CTR.

1.12. **Completeness of Deliverables**

Sample data packages and electronic data deliverables (EDDs) that are not complete or that have improperly formatted EDDs are considered noncompliant to subcontract requirements.

1.13. **Response to Site Requests (Resubmission Requests)**

The Laboratory shall provide corrected sample data packages, additional information, or explanations in response to Site inspection of sample data packages. In addition, the laboratory shall provide a copy of previously submitted deliverables at the request of the CTR. The laboratory shall respond to Resubmission Requests in accordance with the deliverable schedule provided in Exhibit B.

2. FACILITY, INSTRUMENTATION AND KEY POSITION REQUIREMENTS

2.1. **Facility**

The Laboratory facility shall meet all requirements of the base analytical methods. The Laboratory shall ensure that the facility condition, construction, and organization are sufficient for safe and effective analytical operations. Adequate bench space, ventilation, lighting, and temperature control shall be demonstrated.

2.2. **Instrumentation**

The Laboratory shall have sufficient testing equipment and capability to meet all terms and conditions of this module, including all equipment requirements specified in base methods used to perform the analyses. At a minimum, the Laboratory shall have all of the following operative equipment and devices at the time of the on-site evaluation and committed for the full duration of the subcontract:

2.2.1. Soil triaxial cells with confining pressures up to 150 psi.

2.2.2. Double, and/or single-plane shear devices for soil.

2.2.3. Geosynthetics shear boxes (minimum 4” x 4”).

2.2.4. Loading frame rated at 1,000 pounds (minimum) for soil testing.

2.2.5. Full set of soil sieves including 3-inch, 2-inch, 1-1/2-inch, 1-inch, 3/4-inch, 3/8-inch, No. 4, No. 8, No. 10, No. 40, No. 50, No. 60, No. 140, and No. 200.

2.2.6. Laboratory Mechanical-Rammer Soil Compactor meeting the specifications in ASTM D 2168.

2.2.7. Vacuum system: a vacuum pump or water aspirator, capable of producing a partial vacuum of 100 mm Hg or less absolute pressure

2.3. Organization and Key Position Requirements

The Laboratory organization shall be clearly structured with well-defined responsibilities for each individual in the management system. This system shall ensure that sufficient resources are maintained to perform the requirements of the SOW. Specifically, all key administrative positions and key technical positions shall be assigned to individuals. The Laboratory shall maintain a chart or diagram illustrating the Laboratory's organizational structure and all key position assignments. The Laboratory shall provide this chart to the CTR twenty-one days prior to the preaward audit and within fourteen days following changes to key positions.

Unless otherwise noted, the following technically relevant experience may be substituted for educational requirements, such that:

- A Master's degree equals a Bachelor's degree and four years of experience
- A Bachelor's degree equals:
  - ◊ An Associate's degree and four years of experience, which equals
  - ◊ A High School diploma and eight years of experience.

The Laboratory shall provide resumes for personnel holding key positions prior to the preaward audit and within fourteen days of assigning personnel to key positions thereafter. Résumés shall include position description, title, education (pertinent to the duties performed for this SOW), number of years of experience (pertinent to the duties performed for this SOW), month and year hired, previous experience, and publications. An updated chart or diagram illustrating the Laboratory's new organizational structure shall accompany résumé submission.

A qualifying individual may fill more than one key position unless stated otherwise. Failure to maintain individuals in each Key Positions may result in a **Subcontract Termination**.

2.3.1. *Key Administrative Positions*

<u>Laboratory Director</u>

Responsibility:	Responsible for all aspects of the inspection and testing laboratory.
Academic Training:	A Bachelor's degree (or equivalent) in a science discipline and shall be a registered engineer or other registered professional.
Experience:	A minimum of 5 years engineering or scientific experience, as appropriate, in the inspection and testing of soil and rock, and at least three years experience in supervising or directing testing or inspection services.

<u>Project Manager</u>

Responsibility:	Responsible for overall aspects of this SOW (from sample receipt through data delivery), and serves as the primary contact for the CTR.
Academic Training:	A bachelor's degree (or equivalent) in a science discipline.
Experience:	A minimum of three years of experience in testing or inspection services.

<u>Quality Assurance Officer</u>

Responsibility:	Responsible for assuring the Laboratory's QA Program meets all requirements of this SOW. Reports directly to upper management.
Academic Training:	A bachelor's degree (or equivalent) in a science discipline.

Experience:	A minimum of four years of experience in testing or inspection services, including at least two years of applied experience with QA principles and practices in testing or inspection services.
Health and Safety Officer	***(Subcontracted personnel may be used for this position)***
Responsibility:	Responsible for overseeing the Health and Safety Program including personnel monitoring activities for hazardous, chemical, and radiological (if applicable) contaminates.
Academic Training:	A bachelor's degree (or equivalent) in a science discipline and certification in industrial hygiene. For laboratories analyzing radioactive samples, the academic training shall also include course work in radiation health and safety.
Experience:	A minimum of four years of experience in chemical safety, including at least two years of applied experience with laboratory health and safety practices. For laboratories analyzing radioactive samples, experience shall include 2 years of applied radiological health and safety practices.
Shipping/Receiving Officer	
Responsibility:	Responsible for all shipments to and from the laboratory facility.
Academic Training:	Certification as a "Hazmat" Employee in accordance with 49 CFR 172.
Experience:	A minimum of one year of experience in the transportation of hazardous/ or radioactive materials.

2.3.2. ***Key Technical Positions***

Geotechnical Testing Lead/Supervisor

Responsibility:	Responsible for the review of geotechnical data and preparation of reports. Must be able to stamp geotechnical data reports if required.
Academic Training:	A minimum of a bachelor's degree (or equivalent) in Civil Engineering, Geological Engineering, Geoenvironmental Engineering, Geology, or Construction Engineering and Management.
Experience:	A minimum of five years of engineering or scientific experience in the inspection and testing of soil, rock, and geosynthetics.

2.3.3. ***Technical Lead/Supervisor***

Responsibility:	Responsible for the preparation and testing of samples. Shall be capable of evaluating the test results in terms of specification compliance.
Academic Training:	A minimum of a high school diploma and a college-level course in general chemistry, geology, or earth science.
Experience:	A minimum of three years of experience in geotechnical parameter testing.

3. LABORATORY HEALTH AND SAFETY PROGRAM

3.1. Health and Safety Program Areas

At a minimum, the Laboratory shall develop and maintain effective programs in all of the following health and safety areas:

- respiratory protection
- occupational injury and illness reporting meeting the requirements of 29 CFR 1904
- chemical hygiene and hazard communication
- waste management
- safety training

3.1.1. The Laboratory shall provide and document safety training for all personnel.

3.1.2. The Health and Safety Officer shall have the responsibility and authority to stop unsafe work that may jeopardize the health of the laboratory staff and/or the environment.

3.2. **Hazardous or Radioactive Constituents**

Sample preparation for all tests involving actual or possible hazardous or radioactive constituents shall be performed in an environment that follows ALARA concepts and principles and meets applicable regulatory requirements .

3.3. **Chemical Hygiene/Hazard Communication Program**

3.3.1. The Laboratory shall have a documented Chemical Hygiene/Hazard Communication Program reflecting actual process operations.

3.3.2. The Laboratory shall ensure that protective apparel and safety equipment are available and compatible with the degree of protection required for the substances handled. Signs and labels clearly identifying emergency information and equipment shall be prominently posted.

3.3.3. The Laboratory shall routinely perform and document safety inspections for housekeeping, safety showers, eyewash stations, fire extinguisher, emergency lighting, and any other areas of concern.

3.3.4. The Laboratory shall maintain and document fume hood operation in compliance with ANSI/AIHA Z9.5-1992 (Laboratory Fume Hood Section) and ANSI/ASHRAE 110-1195 procedures.

3.3.5. The Laboratory shall meet applicable Federal and State regulations, including radioactive material license requirements, for performing and documenting environmental monitoring of airborne concentrations and laboratory surface contamination for radioactive and highly toxic chemicals. The means for meeting these requirements shall be documented by the Laboratory.

3.3.6. The Laboratory shall develop and implement a spill control policy. This policy shall address spill containment, cleanup, reporting, and emergency procedures.

3.3.7. The Laboratory shall clearly mark or label all chemicals not in their original container.

3.3.8. The Laboratory shall have Material Safety Data Sheets (MSDSs) for all laboratory chemicals. MSDSs shall be readily accessible to employees.

4. WASTE MANAGEMENT

4.1. Waste Management Program

The Laboratory shall develop, and implement, and maintain a Waste Management Program documenting procedures and operating conditions for the handling, storage, shipment, and disposal of hazardous and/or radioactive waste in accordance with Federal, State, and local laws and regulations.

4.2. Effluent Monitoring Program

The Laboratory shall establish and document, per applicable federal, state and local regulations, an Effluent Monitoring Program to ensure discharges to sanitary sewers meet regulatory limits.

4.3. Waste Disposal

Unless directed otherwise by the CTR, the Laboratory shall be responsible for the proper disposal of all waste generated during the analysis of Site samples. This includes waste categorized as hazardous waste, medical waste, low-level (radioactive) waste, and mixed waste (radioactive and hazardous). Waste forms include, but are not limited to, the following:

- The original sample (if not authorized for returned to the Site by the CTR)
- Sample analysis residue
- Excess chemicals
- Laboratory materials contaminated by the sample (e.g., lab coats, glassware, pipette tips, planchets, and sample containers)

Evidence of improper waste disposition or documentation may result in a **Subcontract Termination**.

4.4. Waste Disposal Documentation

The Laboratory shall certify the disposition and disposal location of waste generated from the analysis of Site samples and shall maintain the records as required by any applicable federal, state, and/or local laws. These records shall be available for inspection during on-site audits and upon request.

4.5. Return of Unused Samples

The Site will only accept the return of unused samples, partially used samples, or laboratory derived waste when authorized in writing by the CTR at the time sample confirmation.

At the time of analysis request, the CTR will identify, in writing whether unused sample(s) are to be returned to the Site for disposal or the responsibility for disposal belongs to the Laboratory.

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EXHIBIT B:

REPORTING AND DELIVERABLES REQUIREMENTS

1. INTRODUCTION

GG01 Exhibit B contains reporting and deliverables requirements applicable to all Geotechnical line item codes defined in GG01 Exhibit C. Requirements for Sample Data Packages, Supporting Documentation Packages (Support Package), and other deliverables specific to this Geotechnical SOW are detailed. The following tables identify the deliverable requirements for GG01:

Table B-1: Turnaround Time/Package (TATPKG) Codes
Table B-2: Standard Deliverable Sample Data Package
Table B-3: Standard Deliverable Plus Raw Data Sample Data Package
Table B-4: Other Deliverables
Table B-5: Supporting Documentation

These tables define major deliverable components as *Deliverable Sections* which are each assigned titles. Text accompanying the tables provides structural and content requirements. Tables and text also provide reference lists for geotechnical deliverable requirements found in this module.

2. TURNAROUND TIME (TAT) AND DATA PACKAGE CATEGORY

RFETS will use a Turnaround Time/Package (TATPKG) Code on the Chain of Custody (COC) form to request TAT and the Sample Data Package Category. This information will be provided under the "Sample Analysis" column of the COC. The following table identifies the TATPKG Codes and their associated TAT and Data Package Category:

Table B-1: TATPKG Codes

Delivery Type	TATPKG Code	TAT/Data Package Category
Standard Delivery	**28dS**	28 Day/Standard Deliverable
	28dF	28 Day/Standard Plus Raw Data Deliverable
Expedited Delivery	**14dS**	14 Day/Standard Deliverable
	14dF	14 Day/Standard Plus Raw Data Deliverable
	7dS	7 Day/Standard Deliverable
	7dF	7 Day/Standard Plus Raw Data Deliverable

Note: All days are listed as calendar days from the Validated Time of Sample Receipt (VTSR) to the date the item is received by the CTR

2.1. Standard Delivery

The CTR will contact the Laboratory with their intent to submit samples both verbally and in writing using a Laboratory Confirmation Form. The Laboratory shall notify the CTR within 24 hours of receiving the confirmation form of their ability to perform the requested test(s) or of any technical problems associated with meeting a 28 day delivery time. IF technical problems exist, an appropriate time for delivery shall be established between the CTR and the Laboratory at the time of notification. Data packages received after 28 days from the VTSR without this prior notification shall be considered late.

2.2. Expedited Analyses

The laboratory shall have the ability to handle expedited analyses (rush service). Only those samples specifically marked on the COC with an expedited TATPKG Code shall be treated as expedited samples

2.2.1. ***Right to Refuse Expedited Samples:*** The Contractor will request verbally and in writing, using the Laboratory Confirmation Form, all expedited analysis requests prior to sample shipment. The laboratory may, at their discretion, refuse to accept an expedited request. This refusal may be verbal, but must be documented in writing. This refusal must be performed in a timely manner; within 24 hours of the request.

2.2.2. ***Premium Pay for Expedited Analyses:*** Premium pay for expedited analyses will be according to the Expedited Analysis Pricing Table included in the Schedule B1. Expedited pricing shall be provided as a percentage of the 28 day standard delivery prices.

3. SAMPLE DATA PACKAGE REQUIREMENTS

3.1. Sample Data Package General Requirements

3.1.1. ***Difficult Matrix***: If deliverable requirements and schedules specified in this SOW cannot be met due to a difficult matrix, the Laboratory shall forward written notification to the CTR describing the problems encountered (e.g., due to very low permeability or low test gradients specified).

3.1.2. ***Original Documents***: All components of sample data package deliverables shall contain original documents where possible. Photocopies of original documents shall be included in the sample data package when the original is bound in a logbook maintained by the Laboratory. Photocopies of original documents may also be submitted if the original data were previously submitted under another RIN.

3.1.3. ***Pagination***: The complete sample data package shall be single sided and consecutively paginated. If original data included in the sample data package are two-sided, the original sheets shall be included immediately followed by a photocopy of the second side of the original.

3.1.4. ***Colored Paper***: Under no circumstances shall colored paper be used in a sample data package.

3.2. Sample Data Package Standard Deliverable Components

Table B-2 lists the required sample data package components for a Geotechnical Standard Deliverable Sample Data Package. Details of each component follow the tables as indicated.

Table B-2: Standard Deliverable Sample Data Package

Component Name	Description
Cover Page	The cover page shall contain a list of all samples analyzed within a Report Identification Number (RIN) and provide certain analytical information and general comments applicable to the RIN as a whole. At a minimum this is to include: • Laboratory Name & Address • Subcontract Number, Name & Address of Client • Statement of Work Identifier • Method Name or Description • Contractor RIN • Laboratory Report Identification & Date Issued • Line Item Code(s) associated with the RIN • Contractor Sample Numbers cross-referenced to laboratory ID numbers • Matrix • Date sample(s) received at laboratory • Date sample(s) prepared • Date sample(s) analyzed • Comments:
Chain of Custody	Original COC (Photo copy if original submitted under another RIN)
Laboratory Case Narrative	The laboratory case narrative is a document written by the laboratory for each sample data set, which includes, at a minimum, the following: • A short description of the samples upon receipt at the laboratory, which may include date of receipt, condition of sample containers, temperature, and pH (litmus test is appropriate), and presence of the chain of custody; • The method used for the analysis including the method version identifier, and a notation of deviations from the standard. Where a method includes a decision tree(s) leading to different test methods, the narrative must contain a sequential description of these decision points and results; • For any specified method that permits the use of alternate procedures (for example, ASTM D 698 when run according to Line Item Code GG01*021 includes procedures *A*, *B*, and *C*), report the procedure used and the rationale for selecting that specific procedure; • Any significant technical difficulties encountered in preparing and analyzing the samples, which may directly affect the quality of the results; • Any matrix anomalies that affect, or may affect, the applicability of the method; • Any instances of repreparation and/or reanalysis of samples due to nonconformances with requirements; • A listing of deviations from regulatory-driven method requirements and accompanying regulatory agency-approved variance(s); • An explanation of laboratory data qualifiers used with the reported data; Signature(s) of laboratory designee(s) for ensuring data quality and data package content.
Sample and QC Results Summary	See Detail

3.2.1. ***Sample and QC Results Summary***

3.2.1.1. **Divider Sheet**: The *Sample And QC Results Summary* shall be preceded by a divider sheet which is titled "Sample and QC Results Summary." The divider sheet shall be paginated along with the rest of the Sample Data Package. The *Sample and QC Results Summary* shall comply with the following structural requirements:

3.2.1.2. **Reporting Forms**

- All report pages must include the RIN.
- When the specified method allows choice of test conditions, those conditions shall be summarized in tables on the reporting forms.
- For those analyses performed according to ASTM methods, all items listed in the *Report* section of the required ASTM method shall be included in the Sample and QC Results Summary. Each item in the *Report* section must be addressed in the reporting forms including those items specified to be reported only under certain conditions.
- Required graphs, figures, and plots must be clearly labeled. Labels must include the sample identity and accurately reflect the information in the raw data sheets.
- Where required by referenced standards or methods provide qualified interpretations (by an area specialist) of raw data, graphs, results, etc. with suitable documentation to support interpretation.
- Submit QC results as required in the Required Method or if specifically required by the requesting authority.

3.3. **Sample Data Package Standard Plus Raw Data Deliverable Components**

Table B-3 lists the required sample data package components for a Geotechnical Standard Plus Raw Data Deliverable Sample Data Package. Details of each component follow the tables as indicated.

Table B-3: Standard Plus Raw Data Deliverable Sample Data Package

Component Name	Description
Standard Deliverable	All components contained in the Standard Deliverable data package.
Preparation and Analysis Raw Data	The *Preparation and Analysis Raw Data Section* shall contain all instrument print outs, bench sheets, calibration data, and other raw data generated to obtain the information specified in the *Sample And QC Results Summary* specified in the preceding section of GG01 Exhibit B. Sample preparation raw data shall be documented in the form of preparation bench sheets and/or preparation logs. These preparation logs must include the following: • Analytical Batch identifier (see the definition of Analytical Batch in Exhibit G) • Date of preparation • Identifier for the laboratory SOP for the preparation performed • Identifiers for all samples prepared • Initial and final weights and volumes for all samples including gross weights and tare weights where applicable • Comments describing any significant sample changes or reactions which occur during preparation • Indication of percent moisture as applicable • Signatures and dates of all analysts and reviewers

4. REQUIREMENTS FOR OTHER DELIVERABLES

The following table defines other required deliverables in addition to the Sample Data Package deliverables for Geotechnical.

TABLE B-4 OTHER DELIVERABLES

Deliverable Title	Schedule	Recipient	Reference (Exhibit/Section)
Copies of radioactive license	• Prior to preaward audit, • available during audits and upon request	CTR	Exhibit A/Section 1
Amendments to radioactive license	5 days after receipt	CTR	Exhibit A/Section 1
Resubmission requests	• 7 days from request for a Standard Deliverable • 1 business day from request for a Expedited Deliverable	CTR	Exhibit A/Section 1
Résumé of individuals holding key positions	• Prior to preaward audit • 14 days of assigning new personnel to key positions	CTR	Exhibit A/Section 2
List of Active SOPs	• At time of subcontract award • 14 days of new or amended SOPs	CTR	Exhibit B/Section 5
Intralaboratory certification documentation by analyst	Available during audits and upon request	Maintained at Laboratory	Exhibit E/Section 2
Internal Quality System Review Reports	Available during audits and upon request	Maintained at Laboratory	Exhibit E/Section 2
Response to Non-Compliance Notification (NCN)	As specified in the NCN	CTR	Exhibit E/Section 3
Audit corrective action response	As determined during audit debriefing	Lead Auditor	Exhibit E/Section 10
Root cause and corrective action reports for failed PE samples	21 days from receipt of results	CTR	Exhibit E/Section 5
Calibration and Standardization Documentation	Available during audits and upon request	Maintained at Laboratory	Exhibit E/Section 8
Instrument maintenance/repair documentation	Available during audits and upon request	Maintained at Laboratory	Exhibit E/Section 8
Signed copy of COCs and discrepancy reports	Relayed by fax within 24 hours of sample receipt	CTR	Exhibit F/Section 2
Return of sample shipping Containers	Within 2 weeks of sample receipt	Sender	Exhibit F/Section 3

5. SUPPORTING DOCUMENTATION

The laboratory shall maintain supporting documentation relevant to analyses performed on Site samples. This documentation shall be maintained per the Document Retention requirements identified in Exhibit F and shall be available during audits or upon request.

5.1. Minimum Documentation Requirements

Table B-5 lists the minimum required documentation that shall be maintained by the laboratory.

TABLE B-5 SUPPORTING DOCUMENTATION

Deliverable Section Title	Reference (Exhibit/Section Number)
Quality Records	Exhibit F/Section 4
Copy of Sample Data Package	Exhibit B/Section 5
Original logs logbooks, and other Quality Records	Exhibit B/Section 5 Exhibit F/Section 4
Standard Operating Procedures	Exhibit B/Section 5 Exhibit F/Section 5
Software Quality Assurance	Exhibit B/Section 5 Exhibit F/Section 6

5.2. Internal COC Requirements

The Support Package shall include sample receipt, storage, tracking, and internal COC records as required in Exhibit F.

5.3. Copy of the Sample Data Package

The Support Package shall include a photocopy of the Sample Data Package.

5.4. Original Logs Sheets and /or Logbooks

Logs and/or logbooks including, but not limited to, preparation logs, instrument run logs, balance calibration logs, and instrument maintenance logs.

5.5. Standard Operating Procedures

The laboratory shall maintain current and superceded copies of SOPs used in the generation of Site data. SOPs shall be available during audits. Uncontrolled copies of SOPs shall be provided to the CTR within 3 days of request. Specific SOP requirements are identified in Exhibit F.

5.5.1. ***List of Active SOPs***: The laboratory shall provide the CTR a complete list of all active SOPs relevant to this SOW at the time of subcontract award. The list shall include procedure identifier, title, and effective date. During the term of performance of the subcontract, the Laboratory shall provide the CTR with an updated SOP list within 14 days of the effective date of new or amended SOPs.

5.6. Software Quality Assurance

The laboratory shall maintain a historical file of software revisions and associated validation documentation as described in Exhibit F.

EXHIBIT C:

GEOTECHNICAL PARAMETERS LIST WITH REQUIRED METHOD REFERENCES

1. INTRODUCTION

Test descriptions along with their required method and specific instructions have each been associated with two Line Item Codes (LIC) in the tables that follow. These codes along with a test description will be identified on the COC under the "Sample Analysis" Column. The laboratory shall immediately contact the CTR if, in their profession judgement, an inappropriate LIC was requested. All Line Item Code discrepancies shall be resolved with the CTR before any work begins.

1.1. LICs with a prefix of "GG01"

A LIC with a prefix of "GG01" identifies a test where there are no associated costs for sample disposal incorporated into the cost to perform the test.

Tests that have no associated cost for sample disposal may occur in one of two ways:

1.1.1. ***Return of Unused Sample***: A sample associated with test(s) identified with a "GG01" prefix will be returned to the Site for disposal if written authorization was obtained from the CTR at the time of sample confirmation. If an authorization for return was obtained and, at the time of sample receipt, the prefix for the LIC on the COC is not "GG01" the CTR shall be immediately notified for resolution.

1.1.2. ***Multiple Tests Requested On Same Sample***: A sample associated with multiple tests (LICs) where disposal costs are covered under one or more LICs, the remaining tests for that sample will be requested under LICs with a prefix of "GG01".

1.2. LICs with a prefix of "GG02"

A LIC with a prefix of "GG02" identifies a test where the cost to dispose any remaining sample upon the completion of the determination is incorporated into the cost of the test. The use of "GG02" assumes the laboratory recommended quantity of sample was provided to perform the requested test.

When more than one test is performed on the same sample the following applies:

1.2.1. ***A Laboratory Recommended Sample Size was Provided***: When the sample size provided equals the laboratory recommended sample size for one of multiple tests requested, the LIC prefix "GG02" will be used for the one test, and all other tests will be requested using the "GG01" prefix.

1.2.2. ***More Than the Laboratory Recommended Sample Size was Provided***: When the sample size provided exceeds the laboratory recommended sample size for any of the requested tests, the LIC prefix "GG02" may be applied to multiple tests to cover the cost of sample disposal. All other tests shall be requested using the "GG01" prefix.

At the time of sample confirmation, the CTR and the Laboratory shall agree on the tests assigned the "GG02" prefix.

2. SOIL AND ROCK TESTING

2.1. Soil Classification Tests

TABLE C-1: SOIL CLASSIFICATION TESTS

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A001	GG02A001	Laboratory Determination of Water (Moisture) Content of Soil and Rock	ASTM D 2216	
GG01A002	GG02A002	Laboratory Determination of Water (Moisture) Content of Soil by the Microwave Oven Method	ASTM D 4643	
GG01A003	GG02A003	*Liquid Limit, Plastic Limit, & Plasticity Index of Soils;* Wet Preparation Procedure Specified.	ASTM D 4318, Method A (Multipoint), Wet Preparation Procedure	
GG01A004	GG02A004	*Liquid Limit, Plastic Limit, & Plasticity Index of Soils*; Dry Preparation Procedure Specified.	ASTM D 4318 Method A, Multipoint, Dry Preparation Procedure.	
GG01A005	GG02A005	*Liquid Limit, Plastic Limit, & Plasticity Index of Soils;* Wet Preparation Procedure Specified.	ASTM D 4318, Method B, One-Point, Wet Preparation Procedure	
GG01A006	GG02A006	*Liquid Limit, Plastic Limit, & Plasticity Index of Soils*; Dry Preparation Procedure Specified.	ASTM D 4318 Method B, One-Point, Dry Preparation Procedure.	
GG01A007	GG02A007	Shrinkage Factors of Soils by the Wax Method	ASTM D 4943	
GG01A008	GG02A008	Particle-Size Analysis of Soils	ASTM D 422, Grain Size Analysis Only (3-inch to No. 200)	Unless Otherwise Requested, Use Following Sieves (3”, 1-1/2”, ¾”, 3/8”, #4, #10, #20, #40, #60, #100, #200)
GG01A009	GG02A009	Particle-Size Analysis of Soils	ASTM D 422, Grain Size Analysis Only (3/4-inch to No. 200)	Unless Otherwise Requested, Use Following Sieves (3/4”, 3/8”, #4, #10, #20, #60, #100, #200)
GG01A010	GG02A010	Particle-Size Analysis of Soils	ASTM D 422, Hydrometer Analysis Only	Air Dispersion Preferred but High Speed Mechanical Stirrer Acceptable

TABLE C-1: SOIL CLASSIFICATION TESTS

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A011	GG02A011	Particle-Size Analysis of Soils	ASTM D 422, Grain Size and Hydrometer Analysis	Unless Otherwise Specified, Use Following Sieves (3”, 1-1/2”, ¾”, 3/8”, #4, #10, #20, #40, #60, #100, #200)
GG01A012	GG02A012	*Amount of Material in Soils Finer Than No. 200 Sieve*; Method A Specified	ASTM D 1140, Method A (Wash through Sieve)	
GG01A013	GG02A013	*Amount of Material in Soils Finer Than No. 200 Sieve*; Method B Specified	ASTM D 1140, Method B (Minimum 2-hr Soak with Deflocculating Agent)	
GG01A014	GG02A014	*Specific Gravity of Soils*; Method A Specified	ASTM D 854, Method A (Oven-dry Specimen)	Boiling not Allowed
GG01A015	GG02A015	*Specific Gravity of Soils*; Method B Specified	ASTM D 854, Method B (Moist Specimen)	Boiling not Allowed
GG01A016	GG02A016	*Specific Gravity of Soils*; Special Requirements	ASTM D 854	RA to Specify Special Treatment of Soils Containing Cementing Agents or Use of Kerosene as Wetting Agent
GG01A017	GG02A017	Classification of Soils for Engineering Purposes (USCS)	ASTM D 2487	Used in Conjunction with ASTM D 4318 and D 422

2.2. Engineering Soil Properties

TABLE C-2: ENGINEERING SOIL PROPERTIES
(Compaction/Density, Consolidation, Permeability, Strength/Bearing)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A018	GG02A018	*Laboratory Compaction Characteristics of Soil using Standard Effort*; Procedure A Specified	ASTM D 698, Procedure A	
GG01A019	GG02A019	*Laboratory Compaction Characteristics of Soil using Standard Effort*; Procedure B Specified	ASTM D 698, Procedure B	
GG01A020	GG02A020	*Laboratory Compaction Characteristics of Soil using Standard Effort*; Procedure C Specified	ASTM D 698 Procedure C	
GG01A021	GG02A021	*Laboratory Compaction Characteristics of Soil using Standard Effort*; Procedure A, B, or C Based on the Material Gradation.	ASTM D 698	Testing Laboratory Must Select Procedure A, B, or C Based on the Material Gradation.
GG01A022	GG02A022	*Laboratory Compaction Characteristics;* Special Requirements	Modified ASTM D 698	Follow ASTM D 698 except RA Specifies No. Drops per Lift
GG01A023	GG02A023	*Laboratory Compaction Characteristics (Modified Effort)*; Procedure A Specified	ASTM D 1557 Procedure A	
GG01A024	GG02A024	*Laboratory Compaction Characteristics (Modified Effort)*; Procedure B Specified	ASTM D 1557 Procedure B	
GG01A025	GG02A025	*Laboratory Compaction Characteristics (Modified Effort)*; Procedure C Specified	ASTM D 1557 Procedure C	
GG01A026	GG02A026	*Laboratory Compaction Characteristics (Modified Effort)*; Procedure A, B, or C Based on the Material Gradation.	ASTM D 1557	Testing Laboratory Must Select Procedure A, B, or C Based on the Material Gradation.

TABLE C-2: ENGINEERING SOIL PROPERTIES
(Compaction/Density, Consolidation, Permeability, Strength/Bearing)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A027	GG02A027	Density and Unit Weight of Soil in Place (Sand-Cone Method)	ASTM D 1556	
GG01A028	GG02A028	Density of Soil in Place by the Drive-Cylinder Method	ASTM D 2937	
GG01A029	GG02A029	*Maximum Index Density & Unit Weight of Soils Using a Vibratory Table*; Oven Dried Soil Specified	ASTM D 4253 Method 1A or 2A (Oven Dried Soil)	Unless Specifically Requested, Use Vibratory Table Based on Availability
GG01A030	GG02A030	*Maximum Index Density & Unit Weight of Soils Using a Vibratory Table*; Wet Soil Specified	ASTM D 4253 Method 1B or 2B (Wet Soil)	Unless Specifically Requested, Use Vibratory Table Based on Availability
GG01A031	GG02A031	*Minimum Index Density & Unit Weight of Soils & Calculation of Relative Density*; Test Method A Specified	ASTM D 4254 Test Method A (Funnel or Hand Scoop)	Preferred Method
GG01A032	GG02A032	*Minimum Index Density & Unit Weight of Soils & Calculation of Relative Density*; Test Method B Specified	ASTM D 4254 Test Method B (Extracted Tube)	
GG01A033	GG02A033	*Minimum Index Density & Unit Weight of Soils & Calculation of Relative Density*; Test Method C Specified	ASTM D 4254 Test Method C (Inverted Graduated Cylinder)	
GG01A034	GG02A034	Density of Soil in Place by the Sleeve Method	ASTM D 4564	
GG01A035	GG02A035	Resistance R-Value and Expansion Pressure of Compacted Soils	ASTM D 2844	
GG01A036	GG02A036	*One-Dimensional Consolidation Properties of Soils*; Method A Specified	ASTM D 2435 Method A (24-hr Loading Increments)	RA to Specify Magnitude and Sequence of each Load Increment including Location of a Rebound Curve, if Directed

TABLE C-2: ENGINEERING SOIL PROPERTIES
(Compaction/Density, Consolidation, Permeability, Strength/Bearing)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A037	GG02A037	*One-Dimensional Consolidation Properties of Soils*; Method B Specified	ASTM D 2435 Method B (End of Primary Consolidation Loading Increments)	RA to Specify Magnitude and Sequence of each Load Increment and Criteria to Determine End of Primary Consolidation
GG01A038	GG02A038	One-Dimensional Consolidation Properties of Soils Using Controlled-Strain Loading	ASTM D 4186	RA to Specify 1) Strain Rate, 2) if and when Secondary Compression to be Evaluated, 3) Strain or Stress Level to Halt Test, and 4) if Rebound is Required
GG01A039	GG02A039	*One-Dimensional Swell or Settlement Potential of Cohesive Soils*; Method A Specified	ASTM D 4546 Method A	Water Type Specified by RA
GG01A040	GG02A040	*One-Dimensional Swell or Settlement Potential of Cohesive Soils*; Method B Specified	ASTM D 4546 Method B	Water Type Specified by RA, Vertical Pressure Specified by RA
GG01A041	GG02A041	*One-Dimensional Swell or Settlement Potential of Cohesive Soils*; Method C Specified	ASTM D 4546 Method C	Water Type Specified by RA, Load Increments for Consolidation Portion Specified by RA
GG01A042	GG02A042	Expansion Index of soils	ASTM D 4829	
GG01A043	GG02A043	Capillary-Moisture Relationships for Coarse- and Medium-Textured Soils by Porous-Plate Apparatus	ASTM D 2325	
GG01A044	GG02A044	Capillary-Moisture Relationships for Fine-Textured Soils by Pressure-Membrane Apparatus	ASTM D 3152	RA to Specify Testing Pressure Increments (Min. 3, Max. 5 Testing Points)
GG01A045	GG02A045	Permeability of Granular Soils (Constant Head)	ASTM D 2434	
GG01A046	GG02A046	Relative Hydraulic Conductivity for Water and Air in Unsaturated Soils	van Genuchten Approach EPA/600/2-91/065 RETC Code (modified)	

TABLE C-2: ENGINEERING SOIL PROPERTIES
(Compaction/Density, Consolidation, Permeability, Strength/Bearing)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A047	GG02A047	Measure of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Slurry Comparability	API Recommended Practice 13B	
GG01A048	GG02A048	*Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter*; Method A Specified	ASTM D 5084 Method A (Constant Head)	RA to Specify 1) Type of Permeant, 2) Specimen Preparation (e.g., Undisturbed Sample from Shelby Tube, Laboratory Compacted Specimen using Standard Proctor and Optimum Water Content), 3) Effective Stress of Consolidation, and 4) Testing Gradient
GG01A049	GG02A049	*Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter*; Falling Head Method Specified	ASTM D 5084 Method B or C (Falling Head with Constant or Rising Tailwater)	RA to Specify 1) Type of Permeant, 2) Specimen Preparation (e.g., Undisturbed Sample from Shelby Tube, Laboratory Compacted Specimen using Standard Proctor and Optimum Water Content), 3) Effective Stress of Consolidation, and 4) Initial Head
GG01A050	GG02A050	*Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter*; Method D Specified	ASTM D 5084 Method D (Constant Rate of Flow)	RA to Specify 1) Type of Permeant, 2) Specimen Preparation (e.g., Undisturbed Sample from Shelby Tube, Laboratory Compacted Specimen using Standard Proctor and Optimum Water Content), 3) Effective Stress of Consolidation, and 4) Testing Gradient
GG01A051	GG02A051	Falling Head Permeability	COE Method in EM 1110-2-1906	Specify Void Ratio for which Hydraulic Conductivity is Required
GG01A052	GG02A052	*California Bearing Ratio of Laboratory-Compacted Soils*; One Water Content Specified	ASTM D 1883	Minimum Dry Unit Weight Specified by RA, Properly Cure Self-Cementing Materials as Directed

TABLE C-2: ENGINEERING SOIL PROPERTIES
(Compaction/Density, Consolidation, Permeability, Strength/Bearing)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A053	GG02A053	*California Bearing Ratio of Laboratory-Compacted Soils*; Water Content Range Specified	ASTM D 1883	Minimum Dry Unit Weight Specified by RA, Properly Cure Self-Cementing Materials as Directed
GG01A054	GG02A054	Moisture Content Penetration Resistance Relationships of Fine-Grained Soils.	ASTM D 1558	
GG01A055	GG02A055	Unconsolidated, Undrained, Compressive Strength of Cohesive Soil in Triaxial Compression	ASTM D 2850	
GG01A056	GG02A056	*Direct Shear Tests of Soils Under Consolidated Drained Conditions*; Coarse Grained Soils (Test Duration Less than One-Hour)	ASTM D 3080	RA to Specify Normal Stress and Rate of Shear, Conduct Test Until 20% Lateral Displacement Achieved
GG01A057	GG02A057	*Direct Shear Tests of Soils Under Consolidated Drained Conditions*; Fine Grained Soils (Test Duration Greater than One-Hour)	ASTM D 3080	RA to Specify Normal Stress and Rate of Shear, Conduct Test Until 20% Lateral Displacement Achieved
GG01A058	GG02A058	Unconfined Compressive Strength Index of Chemical-Grouted Soils	ASTM D 4219	RA to Specify Specimen Fabrication and Curing Conditions
GG01A059	GG02A059	Consolidated-Undrained Triaxial Compression Test of Cohesive Soils	ASTM D 4767 Wet Mounting Procedure	RA to Specify Failure Criteria
GG01A060	GG02A060	*Unconfined Compressive Strength of Cohesive Soils*; Undisturbed Sample	ASTM D 2166	
GG01A061	GG02A061	*Unconfined Compressive Strength of Cohesive Soils*; Remolded Sample	ASTM D 2166	
GG01A062	GG02A062	*Unconfined Compressive Strength of Cohesive Soils*; Laboratory Compacted Sample	ASTM D 2166	Specify Water Content and Compaction Density or Effort

2.3. Other Soil Tests

TABLE C-3: OTHER SOIL TESTS
(Dispersion, Chemical/Corrosion, Bentonite, Phase Relationships)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A063	GG02A063	*Identification and Classification of Dispersive Clay Soils by the Pinhole Test*; Method A Specified	ASTM D 4647 Method A (Disturbed Soil at Natural Water Content)	RA to Specify Water Type
GG01A064	GG02A064	*Identification and Classification of Dispersive Clay Soils by the Pinhole Test*; Method B Specified	ASTM D 4647 Method B (Disturbed Soil, Air-Dried)	Specify Water Content for Testing
GG01A065	GG02A065	*Identification and Classification of Dispersive Clay Soils by the Pinhole Test*; Method C Specified	ASTM D 4647 Method C (Undisturbed Sample)	
GG01A066	GG02A066	Dispersive Characteristics of Clay Soil by Double Hydrometer	ASTM D 4221	
GG01A067	GG02A067	*pH of Soils*; Method A and Water Solution Specified	ASTM D 4972 Method A (pH Sensitive Electrode System)	
GG01A068	GG02A068	*pH of Soils*; Method A and Calcium Chloride Solution Specified	ASTM D 4972 Method A (pH Sensitive Electrode System)	
GG01A069	GG02A069	Soil pH	EPA SW-846 9045A	
GG01A070	GG02A070	Sulfates	HACH Method	Use 1:1 Ratio of Soil to Deionized Water after Soil has been Air-dried and Sieved through No. 10
GG01A071	GG02A071	Chlorides	HACH Method	Use 1:1 Ratio of Soil to Deionized Water after Soil has been Air-dried and Sieved through No. 10
GG01A072	GG02A072	Resistivity	HACH Method	
GG01A073	GG02A073	Total Organic Carbon (TOC)	EPA SW-846 9060	
GG01A074	GG02A074	Density of Bentonitic Slurries	ASTM D 4380	

TABLE C-3: OTHER SOIL TESTS
(Dispersion, Chemical/Corrosion, Bentonite, Phase Relationships)

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A075	GG02A075	Sand Content by Volume of Bentonitic Slurries	ASTM D 4381	
GG01A076	GG02A076	Marsh Funnel Viscosity	API RP 13B	
GG01A077	GG02A077	Gel Strength	API RP 13B	
GG01A078	GG02A078	Mud Weight (Density)	API RP 13B	
GG01A079	GG02A079	Filtrate Loss	API RP 13B	Conduct Test under Low-Pressure/Low Temperature Conditions Only
GG01A080	GG02A080	Flocculation Observation	API RP 13B	
GG01A081	GG02A081	*Porosity*; Volumetric Method Specified	COE Volumetric Method in EM 1110-2-1906	
GG01A082	GG02A082	*Porosity*; Displacement Method Specified	COE Displacement Method in EM 1110-2-1906	

2.4. Rock Tests

TABLE C-4: ROCK TESTS

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A083	GG02A083	Triaxial Compressive Strength of Undrained Rock Core Specimens Without Pore Pressure Measures	ASTM D 2664	
GG01A084	GG02A084	Direct Tensile Strength of Intact Rock Core Specimens	ASTM D 2936	
GG01A085	GG02A085	Unconfined Compressive Strength of Intact rock Core Specimens	ASTM D 2938	

3. CONCRETE AND AGGREGATE TESTING

TABLE C-5: CONCRETE AND AGGREGATE TESTING

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A100	GG02A100	*Unit Weight and Voids in Aggregate*; Rodding Procedure	ASTM C 29 Rodding Procedure	
GG01A101	GG02A101	*Unit Weight and Voids in Aggregate*; Jiggling Procedure	ASTM C 29 Jiggling Procedure	
GG01A102	GG02A102	*Unit Weight and Voids in Aggregate*; Shoveling Procedure	ASTM C 29 Shoveling Procedure	
GG01A103	GG02A103	Sieve Analysis	ASTM C 136	RA to Specify Sieve Sizes as Required in Specifications
GG01A104	GG02A104	Specific Gravity and Absorption of Coarse Aggregate	ASTM C 127	
GG01A105	GG02A105	Specific Gravity and Absorption of Fine Aggregate	ASTM C 128	24-hr Soaking Required unless Specifically Stated Otherwise

TABLE C-5: CONCRETE AND AGGREGATE TESTING

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A106	GG02A106	*Soundness of Aggregates by Freezing and Thawing*; Procedure A (Total Immersion)	AASHTO T103 Procedure A	RA to Specify Number of Cycles (Typically 5)
GG01A107	GG02A107	*Soundness of Aggregates by Freezing and Thawing*; Procedure B (Partial Immersion, Ethyl Alcohol Solution))	AASHTO T103 Procedure B	RA to Specify Number of Cycles (Typically 5)
GG01A108	GG02A108	*Soundness of Aggregates by Freezing and Thawing*; Procedure C (Partial Immersion, Water)	AASHTO T103 Procedure C	RA to Specify Number of Cycles (Typically 5)
GG01A109	GG02A109	Soundness of Aggregates by Use of Magnesium Sulfate	ASTM C 88	RA to Specify Number of Cycles (Typically 5)
GG01A110	GG02A110	Soundness of Aggregates by Use of Sodium Sulfate	ASTM C 88	RA to Specify Number of Cycles (Typically 5)

4. GEOSYNTHETICS TESTING

TABLE C-6: GEOSYNTHETICS TESTING

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A200	GG02A200	Determining Apparent Opening Size of a Geotextile	ASTM 4751	Report AOS in millimeters
GG01A201	GG02A201	Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head	ASTM D 4716	RA to Specify 1) Substrate and Superstrate, 2) Three Test Gradients, 3) Applied Normal Compressive Stress, and 4) Seating Time
GG01A202	GG02A202	Determining the Coefficient of Geosynthetic and Geosynthetic Friction by the Direct Shear Method	ASTM D 5321 Procedure A	RA to Specify Three Test Normal Stresses

TABLE C-6: GEOSYNTHETICS TESTING

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A203	GG02A203	Determining the Coefficient of Soil and Geosynthetic Friction by the Direct Shear Method	ASTM D 5321 Procedure B	RA to Specify and/or Provide the Soil, Conditioning of the Soil, Test Normal Stresses, and Selection of Deformation Rate
GG01A204	GG02A204	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products	ASTM D 4833	
GG01A205	GG02A205	*Permittivity of Geotextiles Under Load*; Recommended Normal Stresses Stated in Standard	ASTM D 5493	Use Recommended Normal Stresses as Stated in Standard
GG01A206	GG02A206	*Permittivity of Geotextiles Under Load*; User Specified Normal Stresses	ASTM D 5493	RA to Specify Normal Stresses
GG01A207	GG02A207	Measuring Mass Per Unit Area of Geotextiles	ASTM D 5261	
GG01A208	GG02A208	*Multi-Axial Tension Test for Geosynthetics*; Centerpoint Deflection Method	ASTM D 5617 Test Method A	
GG01A209	GG02A209	*Multi-Axial Tension Test for Geosynthetics*; Volume Displacement Method	ASTM D 5617 Test Method B	
GG01A210	GG02A210	*Hydraulic Conductivity Ratio (HCR) Testing of Soil/Geotextile Systems*; Undisturbed Sample	ASTM D 5567	RA to Specify 1) Termination Criteria, 2) Hydraulic Gradient, and 3) Effective Stress
GG01A211	GG02A211	*Hydraulic Conductivity Ratio (HCR) Testing of Soil/Geotextile Systems*; Laboratory Compacted Sample	ASTM D 5567	RA to Specify 1) Water Content and Compaction Density or Method of Sample, 2) Termination Criteria, 3) Hydraulic Gradient, and 4) Effective Stress
GG01A212	GG02A212	*Trapezoid Tearing Strength of Geotextiles*; Dry Specimen	ASTM D 4533	
GG01A213	GG02A213	*Trapezoid Tearing Strength of Geotextiles*; Wet Specimen	ASTM D 4533	

TABLE C-6: GEOSYNTHETICS TESTING

LIC **Excludes** Sample Disposal	**LIC** **Includes** Sample Disposal	**Test Description**	**Required Method**	**Specific Instructions**
GG01A214	GG02A214	*Tensile Properties of Geotextiles by the Wide Width Strip Method*; Conditioned (Dry) Specimen	ASTM D 4595	
GG01A215	GG02A215	*Tensile Properties of Geotextiles by the Wide Width Strip Method*; Wet Specimen	ASTM D 4595	
GG01A216	GG02A216	*Strength of Sewn or Thermally Bonded Seams of Geotextiles*; Dry Specimen	ASTM D 4884	
GG01A217	GG02A217	*Strength of Sewn or Thermally Bonded Seams of Geotextiles*; Wet Specimen	ASTM D 4884	
GG01A218	GG02A218	Performance Strength of Geomembranes by the Wide Strip Tensile Method	ASTM D 4885	Crosshead speed shall be 1 mm/min unless Specified Otherwise by RA

EXHIBIT D:

ANALYTICAL METHODS

1. INTRODUCTION

This Exhibit contains the analytical methods requirements for Geotechnical analysis.

2. METHOD SELECTION AND APPLICATION

2.1. Required Methods

Methods used for analysis must meet all the following requirements:

2.1.1. Analyses performed must be in strict conformance to the Required Methods specified in GG01 Exhibit C. Deviations from Required Methods must be detailed in Section 7 of the Sample Data Package Deliverable as specified in GG01 Exhibit B Section 2. It is the responsibility of the Laboratory to assure that tests are conducted according to the latest version of the specified method which has been approved by the issuing agency (e.g., ASTM, API, AASHTO, EPA).

2.1.2. It is the responsibility of the Laboratory to assure that the method is appropriate to the sample matrix. If the Laboratory determines that an improper procedure or method has been specified (e.g., it is not appropriate to run an unconfined compressive strength test on samples containing significant portions of sand or which are not saturated), the CTR shall be notified immediately. Sample pretreatment and analysis procedures must be appropriate to the sample matrix and method requirements.

2.2. Interpretation of Base Method Requirements

Analyses performed must meet requirements of the Required Methods.

2.2.1. The Laboratory shall be in strict compliance with all requirements in these methods which are stated as 'must' or 'shall.'

2.2.2. Additional method requirements and quality assurance measures are listed in GG01 Exhibit E. In the event method requirements and quality assurance measures in approved methods sources appear to be less stringent than those specified in Module GG01, the requirements of Module GG01 shall prevail.

2.3. Required Method Modifications

Required methods may be modified or alternative methods substituted only with the written consent of the CTR.

3. SAMPLE HOLDING TIMES AND PRESERVATION REQUIREMENTS

Requirements for sample holding times and handling of samples for geotechnical parameters are specified in the Required Methods. Many samples for geotechnical materials testing do not have specified holding times. The Laboratory must meet the turnaround time for package delivery.

4. ADDITIONAL REQUIREMENTS FOR ALL METHODS

The purpose of this section is to provide specific guidance for analyses specified in GG01 Exhibit C. This section is <u>not</u> intended to be a comprehensive requirements document, rather it

is intended to clarify and supplement requirements found in the Required Methods. The objective is to increase uniformity between Laboratories, where possible, while still meeting or exceeding minimum method requirements.:

4.1. **Replicate Sample Analysis**

Most geotechnical tests do not require replicate analyses. When replicates are specified in Required Methods (e.g., measuring mass per unit area of geotextiles), calculate the average and standard deviation of the results for the test specimens per the Required Method being followed.

4.2. **Requirements for Sample Dilutions**

For geotechnical test specimens requiring dilutions with water or other liquids, follow the Required Method or equipment manufacturer's recommended ratio (e.g., HACH methods require a 1:1 ratio of soil to water for measurement of sulfates and chlorides).

4.3. **Sample Failure**

Sample failure occurs from time to time due to the incompatibility of the test to the material (e.g., sandy sample undergoing an unconfined compression test). Should failure occur, the CTR shall be notified immediately of the failure. All raw data gathered including test conditions etc. shall be included in the deliverables described in Exhibit B, and the information for the failed sample must be documented in the case narrative.

4.4. **Type of Water used in Testing**

4.4.1. ***Tap Water***: Unless otherwise specified by the Requesting Authority in the Required Method, use tap water from the laboratory for all water requirements necessary to run the geotechnical tests.

4.4.2. ***Deionized Water***: When a method calls for the use of Deionized (DI) water, at a minimum, the requirements for ASTM D 1193-99 water shall be met.

4.4.3. ***Specified Permeant***: In some cases, the CTR may specify and/or supply the permeant to be used in certain geotechnical tests (e.g., landfill leachate for permeability testing, site-specific water for dispersion or swell testing). In these cases, the Laboratory shall use due care in handling the permeant, dispose of the permeant per COC requirements, or in a logical manner, and shall report all such use in the Sample Data Package Deliverable as specified in GG01 Exhibit B Section 3.

EXHIBIT E:

QUALITY ASSURANCE/QUALITY CONTROL

REQUIREMENTS

1. INTRODUCTION

The purpose of this Exhibit is to describe the minimum QA/QC operations necessary to satisfy the analytical requirements associated with the determination of the target Geotechnical analysis. These operations are designed to ensure the generation of comparable data from all laboratories. These requirements do not release the Laboratory from maintaining its own QC checks on method and instrument performance.

2. QUALITY ASSURANCE PLANS AND PROGRAMS

The laboratory must meet all requirements detailed in American Society of Testing and Materials (ASTM) Practice D 3740, "Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction." The Laboratory Quality Assurance Program must describe the Laboratory program for compliance with this standard.

2.1. QA Plan Review

The Laboratory's management shall regularly review the status and adequacy of the QA Plan and develop and maintain a system to promote continuous quality improvement, including a system to monitor laboratory performance.

2.2. QA Training

The laboratory staff shall receive QA training appropriate to their participation. Training shall be performed as necessary to assure that each staff member understands the QA and technical requirements applicable to their work. Documentation of training, whether specific or general, shall be maintained by the Laboratory and be available during on-site inspections and upon CTR request.

2.3. QA Personnel

QA personnel shall operate independently from cost and schedule considerations and shall have the responsibility and authority to stop unsatisfactory work.

2.4. Analyst Certification (Intralaboratory Certification)

2.4.1. Procedures shall be in place for the establishment and implementation of an intralaboratory certification program for the indoctrination and training of personnel performing activities under this SOW (analysts). This program must define how sufficient analyst proficiency is defined, achieved, maintained, and documented.

2.4.2. Analysts that have not passed intralaboratory certification for a method shall not conduct analyses under this SOW. The certification documentation shall be maintained by the laboratory and be available during on-site inspections and upon CTR request.

2.4.3. Analysts shall be recertified at least every two years.

2.5. **Internal Quality System Review**

The laboratory shall meet the requirements for an Internal Quality System Review as described in ASTM Practice D 3740. Internal Quality System Review reports shall be maintained by the laboratory and made available during audits or upon CTR request.

3. NONCONFORMANCES

3.1. **Self Identified Nonconformance**

Nonconformances must be identified, documented, evaluated, and resolved. Conditions adverse to quality shall be promptly identified and corrected.

3.1.1. Nonconforming items shall be identified and/or segregated until disposition.

3.1.2. The identification of adverse conditions and corrective actions shall be documented and reported to laboratory management.

3.2. **Contractor Identified Nonconformance**

A Non-Compliance Notification (NCN) will be issued to the laboratory for SOW noncompliance issues identified by the Contractor. The NCN will state the non-compliance, identify the source requirement(s), and request a required action. The laboratory shall complete all requested actions by the date identified on the NCN

3.3. **Corrective Action Tracking System**

The Laboratory shall implement a corrective action tracking system to ensure follow-up actions are taken to confirm and document corrective action implementation.

4. ON-SITE LABORATORY EVALUATIONS

The Laboratory may be subject to three types of audits: pre-award, routine, and follow-up as described below:

4.1. **Pre-award**

A pre-award audit is a comprehensive audit performed prior to subcontract award.

4.2. **Routine**

A routine audit is a comprehensive audit performed to verify adherence to and effectiveness of QA/QC requirements. The Laboratory shall be subject to routine, on-site audits not more than two times per calendar year during performance of this SOW. The preliminary pre-award audit performed prior to subcontract award does not count as one of these routine audits.

4.3. **Follow-up**

A follow-up audit verifies that adequate corrective action has been implemented by the Laboratory in response to a previous audit.

4.4. **Schedules and Notifications**

On-site inspections, surveillance, or audits for the purpose of identifying and resolving deficiencies or verifying corrective actions may be performed at any time during performance of the subcontract. Unannounced and announced inspections may be performed at any time during the subcontract period; written notification shall be provided to the Laboratory for announced inspections. Laboratories shall make all requested data and documentation related to this SOW available during audits.

4.5. **Corrective Action Reports in Response to Audit Reports**

Following an on-site evaluation, the auditors will conduct an audit closing conference with laboratory staff to discuss identified deficiencies and establish a schedule for corrective action. The Laboratory shall address corrective actions taken to resolve the deficiencies identified during the on-site visit according to the schedule set during the audit closing conference. Failure to meet the established timeline for responding to the identified deficiencies and/or failure to meet the established corrective action schedule may result in a **Subcontract Termination**.

5. LABORATORY EVALUATION SAMPLES

The laboratory shall participate in a formal proficiency sample program(s) as described in ASTM Guide E 1301. An in-house program or a program operated by an independent third party is acceptable. The scope of participation shall be sufficient to validate quality system operation.

5.1. **Unacceptable Performance**

Production of a value falling outside the warning limits, as calculated by the program, will result in a probationary period until the next reporting period for the failed test. If the Laboratory fails a second evaluation, the Laboratory will not receive samples for that test method until an acceptable PE score has been achieved. Root cause and corrective action reports for proficiency samples outside of acceptable limits are to be submitted to the CTR within 21 days from receipt of the scores.

6. ANALYTICAL STANDARDS AND REAGENTS REQUIREMENTS

This Section contains requirements for acquisition, maintenance, and documentation of standards and reagents. It is the responsibility of the Laboratory to obtain those analytical reference standards required for direct analytical measurements and for the purpose of traceability.

6.1. **Purchase of Analytical Reagents and Standards**

6.1.1. The Laboratory shall have a documented program for controlling the quality of purchased reagents and standards.

6.1.2. The Laboratory shall have an established system for approving vendors to procure supplies and services. All analytical reagents shall be obtained from these approved vendors.

6.1.3. Material Safety Data Sheets (MSDSs) received from reagent suppliers shall be maintained by the Laboratory and submitted upon CTR request.

6.2. **Purchase of Standards**

Whenever possible, the Laboratory shall purchase NIST Standard Reference Materials (SRMs), NIST-traceable SRMs, or NIST-approved certified reference materials. If appropriate NIST reference materials are unavailable, the Laboratory can purchase standards necessary to perform the analyses required in this SOW from other approved suppliers. Analytical reference standards purchased from these other suppliers must meet the following criteria:

6.2.1. The supplier must provide standard values with error estimates and a description of the statistical method for obtaining these estimates.

6.2.2. The Laboratory shall perform an independent verification of the supplier-determined standard value. This verification shall be performed by absolute or comparison methods; however, if a comparison method is used, the comparison shall be to two standard sources independent of the supplier. Laboratory and supplier standard values shall be identical at the 5% significance level.

6.3. Standard Certificates

Standard certificates shall be kept on file in the Laboratory and available to laboratory personnel. Copies of the standard certificates shall be made available during on-site inspections or within 7 calendar days of request. Standard certificates shall include, at a minimum, all of the following items:

- An identifier for the standard unique to the actual material (or lot) certified
- Identification of the certifying entity
- Signature of a representative of the certifying entity, a certificate printed on official letterhead, or a certificate affixed with certification seals
- A description of the material certified [including matrix and values for parameter(s) certified]
- Error estimates for certified parameter values
- Definition of a finite certification period
- Certificates for NIST-traceable standards must contain SRM identifiers of all NIST materials used for traceability and a description of the process used for relating parameter values to NIST values shall be included.

7. METHOD SPECIFIC QC REQUIREMENTS

7.1.1. **Default Protocols:** Where Required Methods do not require specific QC protocols, laboratory SOPs shall specify requirements which meet or exceed requirements of the laboratory's QAP.

7.1.2. **General Requirements**: Other method specific QC requirements have been included in GG01 Exhibit D.

8. MEASURING AND TESTING EQUIPMENT REQUIREMENTS

8.1. Requirements

The Laboratory shall establish and document calibration methods and intervals for M&TE. M&TE shall include all instrumentation and used to generate analytical results and to demonstrate compliance to procedural requirements.

8.2. Documentation

The following must be recorded on preprinted forms or bound notebooks for all instrumentation and equipment used:

- The Manufacturer and model identifications
- Instrument/equipment configurations. Configuration descriptions shall include the nomenclature utilized by the required procedure in the configuration description (e.g. *Hand operated*, *Motor driven*).
- Instrument/equipment settings.

8.3. Instrument Configuration

The laboratory shall configure instrumentation/equipment according to method specifications.

8.4. Calibration and Standardization

The following identifies the minimum Required Documentation for calibration and standardization:

- All raw data including instrument readings and/or strip-charts
- Raw data to verify the initial conditions of the instrument and graphical interpretations

The laboratory shall calibrate instruments and equipment according to the standard or method and instrument manufacturer. A record shall be maintained at the laboratory supporting instrument calibration and shall be available for on-site audits.

8.5. **Instrument Maintenance, Repair, Configuration**

8.5.1. The Laboratory shall document all maintenance and repairs on laboratory instrumentation, including date of maintenance/repair and personnel performing the task.

8.5.2. The Laboratory shall develop preventive maintenance schedules in accordance with instrument manufacturer recommendations.

8.5.3. Any repair, reconfiguration, or replacement of an instrument component shall be followed by verification of the calibration of the system. If the calibration verification parameters are not met, an appropriate calibration shall be performed.

8.5.4. Instrument maintenance/repair documentation shall be maintained by the Laboratory and be available upon request and during on-site audits.

9. DATA MANAGEMENT

Data management activities include specifying the acquisition, entry, update, correction, deletion, storage, and security of computer readable data and files. Exhibit F contains procedural requirements for data management and software QA.

10. CERTIFICATIONS AND APPROVALS

Laboratories are encouraged to provide proof of certifications or approvals for any programs in which the Laboratory is participating. Proof of Laboratory certifications (or approvals) delivered to the CTR may increase the potential sample load for Laboratories providing this proof.

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EXHIBIT F:

EVIDENTIARY REQUIREMENTS

1. INTRODUCTION

The purpose of this Exhibit is to describe the evidentiary requirements that must be followed for the preparation and analysis of Site samples for geotechnical parameters under this subcontract.

2. SAMPLE CHAIN-OF-CUSTODY

Each labeled sample will have a chain-of-custody (COC) record generated by the Contractor and will include evidence of continuous custody of samples inclusive of sample shipment (if applicable), sample receipt, sample preparation, and sample analysis. However, this requirement is satisfied by the laboratory designee(s) signing the receipt form (or COC) upon sample receipt for shipment (if applicable) or at the laboratory. At a minimum, each COC record will list the sample identification, sample date, list of sample containers, tests to be performed on the contents of each container per procedure, and a TATPKG Code. Once the appropriate COC or receipt form is signed, the laboratory assumes full responsibility for the samples regardless of position in the analytical process.

2.1. Sample Custody Receipt

The laboratory shall maintain appropriate chain-of-custody records for all samples. At a minimum the laboratory shall perform the following:

1. Sign and date/time the field or Contractor COC records indicating sample receipt.
2. Assign a unique laboratory identification or tracking number to the sample.
3. Write the laboratory identification number on the COC record or sample receiving report.
4. Fax or email a signed copy of the COC to the CTR within 24 hours of sample receipt. This transmittal shall include, if applicable, documentation regarding any discrepancies encountered between samples received and COC records, discovery of lost, damaged, or destroyed samples, and any internal laboratory “discrepancy reports” and their resolutions.

2.2. Definition of Sample Custody

The laboratory shall have procedures ensuring that sample custody is maintained and documented. A sample is in the laboratory's custody if:

- The sample is in the laboratory's or the laboratory's authorized agent's possession, or
- The sample is in the laboratory's view after being in possession, or
- The sample is in the laboratory's possession and is locked up, or
- The sample is placed in a designated secure area, accessible only to the laboratory or the laboratory's authorized agents (if applicable).

2.3. Sample Integrity

The laboratory shall assure the integrity and security of all samples. The laboratory shall maintain internal COC records or other written/electronic records documenting all phases of sample handling from receipt through disposal.

3. SAMPLE RECEIVING REQUIREMENTS

3.1. Radiological Screening

The Laboratory shall establish, implement, and document procedures to ensure that the sample's radioactivity levels are consistent with the accompanying documentation and that Laboratory regulatory levels are not exceeded.

3.2. Sample Custodian

The Laboratory shall designate a sample custodian responsible for receiving all samples and an alternate custodian to receive samples in the event that the sample custodian is not available.

3.3. Shipping Container Inspection

The condition of shipping containers, sample containers, and custody seals (intact or not intact) shall be inspected upon receipt by the sample custodian or alternate.

3.4. Opening Containers

3.5. To minimize personnel exposure to possible radiological or hazardous materials, Shipping containers shall be opened in a contamination-free area that follows ALARA concepts and principles and meets applicable regulatory requirements.Return of Shipping Containers

The Laboratory shall return shipping containers to the sender within 2 weeks of sample receipt.

4. DOCUMENTS AND RECORDS

Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings that include quantitative or qualitative acceptance criteria that can be used to determine whether activities are satisfactorily accomplished. Revisions to instructions, procedures, and drawings that affect the process or are technical in nature shall receive the same level of review and approval by the affected parties as the original document. Editorial changes may be made to instructions, procedures, and drawings without review and approval. Document control shall include measures by which documentation can be controlled, tracked, and updated in a timely manner to ensure that applicability and correctness are established. Control measures shall be used to ensure that documents are reviewed for adequacy, approved for release by authorized personnel, and distributed to and used at the location of the prescribed activity.

4.1. Quality Records

Quality records shall include but not limited to, documents such as operating logs, results of reviews, inspections, tests, assessments, monitoring of work performance, material/sample analyses, calibration records and sub-contractor evaluations/results. Records shall also include closely related data such as qualifications of personnel, procedures, and equipment. Inspection and test records shall include, as a minimum, the identification of the inspector or data recorder, the type of observation, the results, the acceptability, and the action taken to correct any deficiencies noted.

4.2. General Requirements

4.2.1. Documents designated to become quality records shall be legible, accurate, complete, and appropriate to the work accomplished.

4.2.2. Corrections to documents that will become quality records shall be made by drawing one line through the error, initialing and dating the error, and justifying the correction (if not self-explanatory).

4.2.3. Changes to computerized data records shall be identified such that original and corrected entries are retrievable and the individual initiating the changes can be identified.

4.3. **Document Control Requirements**

Document control shall include measures by which documentation can be controlled, tracked, and updated in a timely manner to ensure that applicability and correctness are established. Control measures shall be used to ensure that documents are reviewed for adequacy, approved for release by authorized personnel, and distributed to and used at the location of the prescribed activity.

4.3.1. The laboratory policy and its implementation shall ensure that controlled copies of analytical procedures and that Standard Operating Procedures (SOPs) are available to the analyst.

4.3.2. Obsolete or superseded documents shall be identified, and measures shall be taken to prevent their use, including removal from the work place.

4.3.3. A procedure delineating the records control system shall be established. This procedure shall include the following:

- Specifications of items, data, and processes of which records are to be controlled
- Requirements for the preparation, review, approval, and maintenance of records to accurately reflect completed work and to fulfill statutory requirements
- Requirements and responsibilities for record transmittal, distribution, change, retention, protection preservation, traceability, archival, retrieval, and disposal
- Verification that records received are legible and are in agreement with the transmittal document
- Requirements for access to and control of the files
- Procedures for the control, and client confidentiality accountability of records removed from the storage location
- Procedures for filing of supplemental information and disposing of superseded records
- Storage of records in a manner approved by the organizations responsible for the records
- Replacement, restoration, or substitution of lost or damaged records
- Procedures for data correction, which include how corrections are to be made and establish who is authorized to change or correct data.

4.4. **Document Retention**

Documentation and records generated by the Laboratory shall be retained at the laboratory facility for a period of five calendar years. After this period, records may be disposed of with the following provisions:

4.4.1. Six months prior to the date the Laboratory intends to dispose of documentation and records related to Site sample analyses, the Laboratory shall notify the CTR or designated representative in writing. Documentation and records shall not be disposed without written approval from the CTR.

4.4.2. The Site retains the right to request physical reproduction of the documentation and records by the Laboratory at any time during the retention period.

5. STANDARD OPERATING PROCEDURES

A standard Operating Procedure (SOP) is defined as a written narrative description of facility procedures including examples of laboratory documents. The laboratory shall have written SOPs which cover, at a minimum, the following areas:

- Sample tracking and COC (from receipt to disposition)

- Sample preparation (including subsampling) and testing
- Instrument Calibration
- Calibration Verifications
- Sample storage and security
- Proper sample disposition
- Facility security
- Data reduction, verification, and reporting
- Acceptance criteria (e.g., QC limits, calibrations, etc.)
- Document control
- Data packages review prior to submittal
- Shipment of deliverables
- Records disposition
- Preparation and traceability of standards
- Equipment maintenance
- Qualification of personnel and training
- Software Control

6. SOFTWARE CONTROL

6.1. Software Documentation

Systems design interface and Software Development Life Cycle (SDLC) documentation shall be required for each computer program that (1) is capable of being tested and evaluated independently and (2) is a part of a software system affecting the quality of analytical tests. Software design shall (1) depict top-down structured development with major modules satisfying an identifiable contract requirement and (2) be approved by management and quality assurance personnel prior to use. Program development will depict a top-down structured format with data flow and program control being identifiable and traceable. Program modules will be traceable to the applicable software design requirement. Original Equipment Manufacturer (OEM) provided software which are not modified are exempt from the requirements of this paragraph.

6.2. Software Testing

Verification of computer programs affecting the quality of analytical tests shall be performed and documented. Test requirements and acceptance criteria shall be estimated prior to testing. Software verification testing shall be performed by qualified individuals that are not part of the development effort or who report to the Contractor's Manager responsible for software development. Models, methods, assumptions, and the computer environment which are used in the test shall be identified and documented. OEM provided software packages which are not modified shall be verified by using data for which the correct results are known.

6.3. Software Control

Configuration Management methods shall be established to ensure that changes to computer software which affect the quality of analytical tests are properly controlled and approved. Analytical test results shall be traceable to the version(s) of software used in the analysis, data collection, evaluation and/or reporting of test results.

6.4. Security of Software

Policy and procedures shall be established which will ensure the security of the software affecting the quality of analytical test results. This includes the loss and the unauthorized use of the computer software. Both software and electronic data shall be backed up at a documented

frequency. The frequency of backup shall be based on the amount of data and the impact of the loss of data or software on the organization.

6.5. Error Control

Policy and procedures shall be established to evaluate, control, and correct data entry errors or program problems which affect the quality of analytical test results. Software errors found during use shall be reported to the appropriate level of management. In the case of field/laboratory-developed software, personnel shall be assigned to verify all errors and document the error notification and all corrective actions. Error handling shall include all users so that previously reported data may be evaluated and corrective actions may be tracked.

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EXHIBIT G:

GLOSSARY OF TERMS AND ACRONYMS

1. GLOSSARY OF TERMS

ANALYTICAL BATCH: A set of samples analyzed together as a unit for the purpose of method QA/QC. An analytical batch may contain several RINs. It is also possible that several analytical batches could comprise a single RIN. Each analytical batch shall have a unique identifier that associates client and QC samples within the batch.

BOTTLE IDENTIFICATION NUMBER: A unique identifying number assigned to each sample container associated within a RIN and Sample Event. This number begins at '001' and increases sequentially until the event changes.

CALIBRATION: The establishment of an analytical curve relating the response of an instrument to a quantifiable characteristic of the analyte in known standards.

CONTRACTOR TECHNICAL REPRESENTATIVE (CTR): Person responsible for providing technical oversight of the subcontract.

CUSTODY SEAL: Adhesive seal applied to sample bottles to maintain Chain of Custody until sample is delivered to the laboratory.

DAY: Unless otherwise specified, day shall mean calendar day. There are 365.25 days per year.

ERROR: An estimation of the analytical measurement uncertainty, expressed as an error term with a specific analytical result, or as a typical value for a specific analytical technique.

IN-HOUSE: At the laboratory facility which is identified in the subcontract.

LABORATORY: Synonymous with subcontractor as used herein.

LABORATORY REPORT IDENTIFICATION: The laboratory's identification for samples contained in a RIN for geotechnical testing.

LINE ITEM CODE: This code, included on the COC or other documentation received with samples, designates the test prescription.

MATRIX: The predominant material of which the sample to be analyzed is composed.

MIXED WASTE: Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation Recovery Act respectively.

NIST-TRACEABLE STANDARD: A Standard Reference Material (SRM) purchased either directly from the National Institute of Standards and Technology (NIST) or the other approved vendors who provide the traceability certificate to the NIST.

PROTOCOL: A compilation of the procedure to be followed with respect to sample receipt and handling, test methods, data reporting and deliverables, and document control.

REPORT IDENTIFICATION NUMBER (RIN): A grouping of samples identified by the CTR to be included in a single sample data package. An RIN may be comprised of more than one analytical batch, in which case, each analytical batch shall have a unique identifier that associates client and QC samples within

the batch. Conversely, if two or more RINs are combined into one analytical batch, each RIN data package must contain all required QC results. RINs are formatted as YY*NNNN, where YY is the 2-digit designator for the Federal fiscal year in which the sample was assigned, * is the letter P, J, or L, and NNNN designates a four-digit number.

SAMPLE: A substance or sample submitted from an outside entity to the laboratory for testing.

SAMPLE DATA PACKAGE: A deliverable that includes data from analysis of all samples in one RIN for geotechnical testing.

LABORATORY: Testing and Inspection Services Laboratory.

LABORATORY CASE NARRATIVE: The section of the data package describing all problems or unusual circumstances encountered during sample testing. The narrative should include descriptions of matrix interferences, dilutions required, explanations of any Quality Control deficiencies, method modifications and all other information that might affect the validation of the data. Also referred to as Case Narrative and Narrative.

SAMPLE EVENT NUMBER: A unique identifier number beginning at '001 that identifies a sampling event(s) within an individual RIN. This identifier increases sequentially until the RIN changes.

SAMPLE NUMBER (SITE SAMPLE NUMBER): A unique identification number generated by concatenation of the Report Identification Number, Sample Event Number, and the Bottle Identification Number. The format for the site sample number is YY*NNNN-EEE.BBB, where YY*NNNN' is the RIN (* may be any character), 'EEE' is the sample event number that starts at '001' and increases sequentially until the RIN changes and resets the sample event number back to '001', 'BBB' is the Bottle Identification Number that starts at '001' and increases sequentially for all sample bottles taken within an event. The following is an example of a site sample number: 01J1234-001.001. All components of the sample number may be found on the COC.

SAMPLE RECEIPT: Refers to the date on which a sample is received at the laboratory facility, as recorded on the shipper's delivery receipt. Also referred to as VTSR (validated time of sample receipt), Laboratory Receipt Date, and Receipt Date.

SECONDARY STANDARD: A standard solution prepared at a medium concentration by dilution of the stock standard. Secondary standards also may be purchased from a chemical supply house.

SITE: The Rocky Flats Environmental Technology Site.

SITE SAMPLE IDENTIFIER: See SAMPLE NUMBER.

SOIL: Synonymous with soil/sediment or sediment as used herein.

STATEMENT OF WORK (SOW): As used herein, the Geotechnical Materials and Geosynthetics Testing Statement of Work identified as GG01.

TURN AROUND TIME: The elapsed time from the date a laboratory receives a sample(s) to the date the Site receives the complete sample data package.

VALIDATED TIME OF SAMPLE RECEIPT (VTSR): Synonymous with Sample Receipt date as used herein.

WORKING STANDARD: A daily calibration standard solution prepared by diluting the secondary standard. Working standards are prepared at multiple concentrations from the same secondary standards.

2. ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CDPHE	Colorado Department of Public Health and Environment (formerly CDH, Colorado Department of Health)
CFR	Code of Federal Regulations
COC	Chain-of-Custody
CTR	Contractor Technical Representative
DI	Deionized (water)
DOE	Department of Energy
DOT	U. S. Department of Transportation
EPA	U. S. Environmental Protection Agency
M&TE	Measuring and Testing Equipment
MSDS	Material Safety Data Sheet
N/A	Not Applicable
NICET	National Institute for Certification in Engineering Technologies
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
PE	Performance Evaluation
QA	Quality Assurance
QC	Quality Control
RFETS	Rocky Flats Environmental Technology Site
RIN	Report Identification Number
RA	Requesting Authority
RM	Required Method
SOP	Standard Operating Procedure
SOW	Statement of Work
SRM	Standard Reference Material
SW-846	U. S. EPA-OSWER Document Test Methods for Evaluating Solid Waste
TAT	Turn Around Time
TATPKG	Turnaround Time/Package Code, used on the COC to identify turnaround requirements and Data Package type/category.
TOC	Total Organic Carbon
USEPA	United States Environmental Protection Agency
VTSR	Validated Time of Sample Receipt

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EXHIBIT H:

REFERENCES

1. REFERENCES

This list is provided for reference only. Some publications may have been updated or superceded.

1.1. American Association of State Highway and Transportation Officials (AASHTO), Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part II Methods of Sampling and Testing, 13th ed., July 1982.

1.2. American Society of Testing and Materials (ASTM), Annual Book of ASTM Standards, Volume 4.02 - Concrete and Aggregates, 2000.

1.3. American Society of Testing and Materials (ASTM), Annual Book of ASTM Standards, Volume 4.08 - Soil and Rock (I): D 420 - D 4914, 2000.

1.4. American Society of Testing and Materials (ASTM), Annual Book of ASTM Standards, Volume 4.09 - Soil and Rock (II): D 4943 - latest; Geosynthetics, 2000.

1.5. American Petroleum Institute (API), Standard Procedure for Laboratory Testing Drilling Fluids, 6th ed., May 2000.

1.6. United States Army Corp of Engineers (COE), Engineering and Design - Laboratory Soils Testing, EM 1110-2-1906, August 1986.