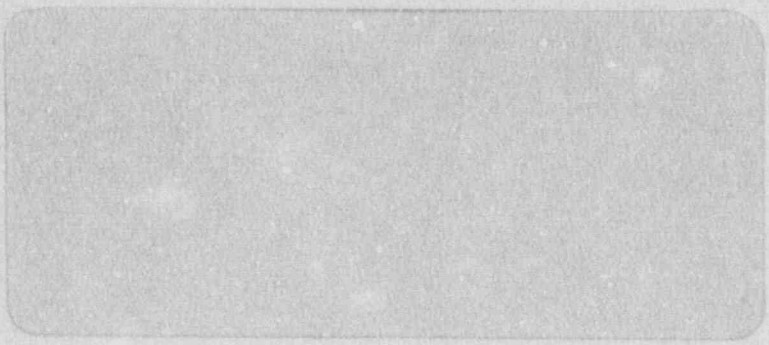

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UMTRA PROJECT

GREEN RIVER, UTAH

REMEDIAL ACTION INSPECTION PLAN

REVIEW COPY

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Document Number: MK-F-UMTRA-30

Revision Number: D

GREEN RIVER
INDEX

STATEMENT OF POLICY

This Remedial Action Inspection Plan identifies the means by which the remedial action activities at Green River, Utah are controlled, verified, and documented. This plan is developed within the scope of the MK-Ferguson Quality Assurance Program Plan and it complies with the applicable parts of ANSI/ASME NQA-1-1979 with the 1981 Addendum and 10CFR50 Appendix B.

The procedures defining Organization, Qualification and Certification of Inspection and Test Personnel, Quality Assurance Records Control, Control of Measuring and Test Equipment, and Nonconformance and Corrective Action shall be in accordance with the applicable sections of the Quality Assurance Program Plan as follows: Organization - QAPP-1, Qualification and Certification of Inspection and Test Personnel, Lead Auditors, and Auditors - QAPP-4, Control of Measuring and Test Equipment - QAPP-5, Quality Assurance Records Control - QAPP-6, and Nonconformance and Corrective Action - QAPP-8.

This Remedial Action Inspection Plan and the Quality Assurance Program Plan describe the means by which the MK-Ferguson Company will assure that the Environmental Protection Agency's requirements, and the Nuclear Regulatory Commission's guidelines for Testing and Inspection Plans During Construction of DOE's Remedial Action at Inactive Uranium Mill Tailings Sites are satisfied.

It is the intent that this plan be applied to all permanent installations and work. Temporary facilities, installations, or work is to be tested and inspected as required by the Design Specifications. Where testing and inspection is not specified in the Design Specifications for temporary work, the work is to be tested and inspected to the degree necessary to ensure it's integrity for the anticipated period of usage, i.e. access roads, temporary ditches, etc.

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

REMEDIAL ACTION INSPECTION PLAN
UMTRA PROJECT
Prime Contract No. DE-AC04-83AL18796

RAIP NO. 1	REV NO.
SITE: GRN	D
DATE: January 22, 1990	
DESIGNATED CONTACT: PHIL D. CATE	

PROCEDURE TITLE: TESTING AND INSPECTION

1.0 PURPOSE

1.1 To describe the methods by which the construction activities will be tested and inspected to verify compliance with the specification requirements.

2.0 SCOPE

2.1 This procedure defines the testing and inspection of remedial action construction activities at Green River, Utah. Types of tests, test frequencies and acceptability, and documentation and reporting requirements are contained in this procedure. Procedures for performing the individual tests shall be in accordance with the applicable ASTM Standards, the referenced methods, and the Design Specifications.

3.0 DEFINITIONS

None

4.0 ATTACHMENTS

None

5.0 REFERENCES

5.1 10CFR50 APP. B, Criteria 5, 10, 11, 14

5.2 ANSI/ASME NQA-1 1979 with the 1981 Addendum

5.3 Contract DE-AC04-83AL18796

5.4 ASTM

5.5 AASHTO

5.6 H.S. & E. Procedures/Plans

5.7 DOE 5700.6B

5.8 DOE AL5700.6B

5.9 UMTRA Quality Assurance Plan

5.10 MK-Ferguson Quality Assurance Program Plan

5.11 Green River Design Specifications

5.12 American Petroleum Institute

5.13 International Society For Rock Mechanics

5.14 MK-F QA/QC Work Procedures

6.0 PROCEDURES

6.1 Field Density Control

6.1.1 Soil density and moisture testing shall be in accordance with ASTM D-698, ASTM D-1556, ASTM D-2167, ASTM D-2216, ASTM D-2922, ASTM D-3017, or ASTM D-4643, as applicable.

6.1.2 When the microwave oven or nuclear density gauge is used in the determination of the moisture content, a correlation sample will be oven dried a minimum of once every tenth moisture test performed. Moisture correlation test results shall be within plus or minus one percent. If the difference in results is greater than plus or minus one percent, all test results obtained since the previous correlation test shall be re-evaluated. In any event, any test results which would be outside of the Design Specification tolerances shall be retested, where possible. Oven dry moisture content test results will be used as the record test results where moisture correlation test results are greater than plus or minus one percent.

6.1.2.1 When determining the moisture content of soil by the microwave oven method, an initial control on the microwave oven method shall be performed and evaluated, as prescribed below, prior to recording microwave oven test results as record test results.

a. A minimum of ten consecutive moisture correlation tests between the conventional oven dry and microwave oven dry methods shall be performed for each type of soil (i.e. common/general fill, tailings, type A, or radon barrier materials).

b. A minimum of ten consecutive moisture correlation results shall each be within plus or minus one percent for each test, for each soil type.

c. Once the ten consecutive moisture co-relation results are evaluated and found to be within plus or minus one percent, moisture correlations shall be performed in accordance with Section 6.1.2 above.

d. When two consecutive moisture correlation test results performed in accordance with Section 6.1.2 above exceed plus or minus one percent for a specific soil type, the procedure prescribed in Section 6.1.2.1 shall again be performed.

6.1.3 When the nuclear density gauge is used for in-place density determinations, a correlation sand-cone density test shall be performed a minimum of once for each ten nuclear density tests performed. Nuclear gauge and sand-cone density test correlation results shall be within plus or minus two percent. If there is a difference in correlation results greater than plus or minus two percent, the sand-cone test results will be used as the record test results. All test results recorded from the nuclear density gauge results since the last acceptable correlation results shall be re-evaluated. Test results which may be indicated as failures as a result of a re-evaluation, shall be retested in the area represented by the indicated failing test result, where possible.

The nuclear density gauge shall be used in materials with a nominal maximum particle size of 3/4-inches or less. The nuclear density gauge shall not be used in radioactively contaminated materials, or in areas where the gauge may be affected by background radiation or the chemical composition of the soil (i.e. the first lift of radon barrier material).

6.1.4 In-place field density and moisture tests for compacted materials, where density requirements are specified by the Design Specifications, shall be tested at the following minimum frequency:

a. One test per 1,000 cubic yards of select fill materials.

b. One test per 500 cubic yards of radon barrier materials.

c. One test per 3,000 cubic yards of common fill materials, except the retention basin dike which will be one test per 1,000 cubic yards.

d. At least two tests for each day of material placement in excess of 150 cubic yards for each material.

e. There shall be a minimum of one test for each full shift of compaction operations.

6.1.4.1 There shall be a minimum of one in-place moisture content test for each 2,000 cubic yards of contaminated material placed. Moisture content tests shall be performed at the time of material placement.

6.1.4.2 A test may be performed at any time the inspector or Site Manager determines the need to verify moisture or the compaction effort. To the extent possible, as allowed by placement methods and operations, there shall be a minimum of one test each lift. The test location and elevation shall be documented for each test.

6.1.5 Each layer of embankment and backfill shall be compacted to the minimum percentage of maximum dry density as determined by ASTM D-698, in accordance with the percentages prescribed by the Design Specifications.

6.1.5.1 During compaction, the moisture content of fill material shall be maintained to achieve the minimum specified density, and moisture shall be uniformly distributed throughout each lift.

6.1.5.2 All contaminated materials shall be placed at a moisture content less than 3 percent below the optimum moisture content.

6.1.5.3 During compaction of radon barrier materials, the moisture content shall be maintained within optimum to plus three percent of the optimum moisture content. Radon Barrier materials shall be moisture conditioned a minimum of two hours prior to compaction. Moisture shall be added as necessary to maintain a moisture content for two hours prior to compaction equal to or greater than optimum moisture content. Moisture shall not be mixed or otherwise worked into radon barrier materials after placement of materials over the contaminated materials.

6.1.5.4 Select fill type A materials shall be compacted at a moisture content from optimum to 4 percent below optimum moisture content.

6.1.5.5 Optimum moisture content shall be determined in accordance with ASTM D-698.

6.1.6 Maximum density determinations shall be performed prior to the start of embankment or backfill placement when possible. The inspector or technician shall be alert for changes in material such as, color, size distribution, etc. When different material types are encountered a complete maximum density determination test shall be performed.

For material which is a random type, having no specified gradation requirements, there shall be a minimum average of one maximum density test for each 10,000 cubic yards of material placed. For material which has a specified gradation requirement, the frequency may be decreased to a minimum average of one maximum density test for each 15,000 cubic yards of material placed. Maximum density determinations will be accomplished in accordance with ASTM D-698.

6.1.7 In order to assure that the correct maximum dry density is being used to determine the relative compaction, a one point proctor test shall be performed. The material shall be as close to optimum moisture as possible and shall be compacted in accordance with the requirements of ASTM D-698. There shall be a minimum average of one one-point test for each five field density tests performed.

6.1.8 When the level of work activity is such that sand cone density tests are being performed throughout the day, the sand used for determining the volume of the test hole shall be calibrated twice a day and for each new bag of sand.

6.1.9 Density test results shall be recorded and logged on the applicable forms.

6.2 Gradation Testing

6.2.1 Gradation testing of select fill - type A, select bedding, gravel fill, riprap, and radon barrier materials shall be performed in accordance with the applicable ASTMs (D-1140, C-136, D-422) or other referenced testing methods.

6.2.2 Gradation testing of select fill - type A and gravel fill material shall be performed a minimum of once for each 2,000 cubic yards of each material placed. Additionally, material shall be tested for gradation a minimum of once per day during placement in excess of 150 cubic yards.

6.2.3 Gradation testing of radon barrier material shall be performed a minimum of once for each 1,000 cubic yards of material placed. Additionally, one gradation test shall be performed each day during placement. Gradation tests shall be performed before bentonite is mixed with radon barrier materials.

This first lift of radon barrier materials (approximate 9-inch compacted lift) shall have a minimum of 70 percent passing the No. 200 sieve, and all remaining radon barrier materials shall have a minimum of 50 percent passing the No. 200 sieve. Amount of materials passing the No. 200 sieve shall be determined in accordance with ASTM D-1140. All radon barrier materials shall comprise soils with a maximum of 10 percent by weight retained on a No. 4 sieve, determined in accordance with ASTM D-422.

NOTE: Select fill - type B shall be visually inspected to ensure the exclusion of shale bedrock.

6.3 Erosion Protection Materials Testing

6.3.1 Select bedding material and each type of riprap material shall be tested by a commercial testing laboratory during production in accordance with the following:

Riprap Type A and Select Bedding

Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Soundness	ASTM C-88
Abrasion	ASTM C-131

Riprap Type B

Schmidt Rebound Hardness	ISRM Method
Splitting Tensile Strength	ISRM Method
Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Soundness	ASTM C-88
Abrasion	ASTM C-131

Test results shall be submitted to the Design Engineering Firm (M-K Engineers) for analysis and subsequent acceptance or rejection of the material represented by the test results, based on engineering calculations.

6.3.2 Select bedding material and each type of riprap shall be tested for gradation in accordance with the applicable ASTMs (C-117 and C-136), and other referenced testing methods. Test results shall be in accordance with the Design Specification requirements.

6.3.3 Select bedding material and each type of riprap shall be tested, as delineated in sections 6.3.1 and 6.3.2 above, a minimum of four times. The materials shall be tested as prescribed in Section 6.3.1 initially prior to the delivery of any of the materials to the site and as prescribed in Section 6.3.2 upon delivery of any of the material to the site.

Thereafter, the tests shall be performed at a minimum frequency of one test for each 10,000 cubic yards or fraction thereof produced/placed (durability tests for materials produced/gradation tests for materials placed). For materials where the total volume is less than 30,000 cubic yards, the test frequency shall be performed for each type material when approximately one-third and two-thirds of the total volume of material has been produced/placed. A final set of durability tests shall be performed following completion of production for each type material. A final gradation test shall be performed near completion of placement for each type material.

6.3.4 Bedding materials obtained from the Hastings Road Source for use on the tailings embankment shall be tested and inspected in accordance with Sections 6.3.3. and 6.4.7, and other applicable sections of this inspection plan.

Bedding materials shall contain no more than 3 percent of clay lumps and friable particles in aggregates in accordance with ASTM C-142. The test frequency shall comply with the requirements of Section 6.3.3. above.

6.4 Inspections

Daily visual inspections shall be performed to verify that quality related activities are performed in accordance with the requirements of the Design Specifications, Remedial Action Inspection Plan, and the Quality Assurance Program Plan. Daily visual inspections performed by qualified and certified inspection personnel shall be accomplished during execution of the various work activities to assure compliance to the above listed criteria, and as follows:

6.4.1 Excavation

Inspections shall be performed to ensure that the correct line and grades are reached, as required. Where contaminated material is excavated, the inspector shall verify with the H.P. Supervisor that the contaminated material has been removed, as required.

6.4.2 Foundation and Subgrade

Prior to placing the first layer of material on the foundation, a final inspection of the subgrade shall be made to assure that it has no sign of deterioration due to frost action, erosion due to rainwater, rutting, areas of subsidence, or drying out of the surface. The inspection shall verify that the foundation surface has been moistened, but there is no standing water on the surface. In addition, the inspection shall also verify that the foundation surface of cohesive soils has been scarified or penetrated to insure proper bonding of overlying material. Any unacceptable surface material shall be either removed or excavated and recompacted to Design Specification requirements.

The subgrade for the tailings embankment shall not be compacted prior to select fill type A material placement. Loose material shall be removed to the extent possible after excavating into bedrock for the tailings embankment.

The subgrade for the retention basin dike shall be plowed, harrowed, and mixed to a depth of 6 inches. The subgrade shall be compacted to the minimum density as required by the Design Specifications.

6.4.3 Embankment Fill and Backfill

Inspections shall assure that the proper material is placed as designated on the drawings. The loose thickness of the lifts of material shall be verified frequently to ensure compliance to the specification requirements for the particular type of material. The inspections shall assure that the applicable moisture requirements are maintained and that the moisture is uniform throughout each lift.

6.4.3.1 Visual observation shall assure that placement of organics in the encapsulation cell is uniform and evenly distributed, and that the maximum size of the emplaced organic material does not exceed the specified requirements. Inspection shall assure that segregation of tailings slime pockets are avoided during tailings placement.

Contaminated materials shall be placed in approximately 10-inch thick maximum loose lifts prior to compaction. Contaminated materials other than tailings pile and subpile materials shall be compacted by a minimum of four passes of a Caterpillar 825 tamping-foot roller and four passes of a smooth-drum vibratory roller required by the Design Specifications for compaction of contaminated materials. Contaminated materials from the tailings pile and subpile shall be compacted by a minimum of four passes of a smooth-drum vibratory roller required by the Design Specifications for compaction of contaminated materials. Results of visual inspections shall be documented on Daily Inspection Reports.

Sampling and testing for site cell radiological characterization during construction, as delineated in Health Physics Procedure No. RAC-019, shall be routinely monitored to ensure compliance with the prescribed requirements. Monitoring activities performed by quality control shall be documented on CNSI Surveillance Forms and Daily Inspection Report Forms as applicable.

6.4.4 Radon Barrier

The placement of the radon barrier shall receive frequent inspection to verify lift thickness, elevations, moisture content, and as required, the number of roller passes. The moisture content will be determined as frequently as is required to assure the proper moisture content is maintained during the compaction effort.

The moisture content of preceding in-place radon barrier material, with the exception of the top two inches, shall be maintained at not less than minus one percent below optimum moisture. The moisture content shall be maintained as specified until the next lift, including bedding material, is placed and compacted. The specified moisture content shall be verified from samples taken 2 to 4 inches beneath the top surface of the compacted radon barrier lift.

Samples for hydraulic conductivity testing shall be obtained a minimum of once each 2,000 cubic yards, or fraction thereof, of as-compacted radon barrier material. Sample locations shall be evenly distributed, with a minimum of 50 percent of the samples obtained from the disposal cell side slopes. Sampling and testing will be performed to determine as-built hydraulic conductivities by an independent commercial testing laboratory. Test results shall be submitted to the Design Engineers for analysis and acceptance or rejection. Quality control inspection and monitoring verifying compliance to these requirements shall be documented.

6.4.5 Contaminated Materials - Trial Compactions

In-place density and moisture content tests shall be performed within the first 1,000 cubic yards placed (minimum of four lifts), for both windblown-contaminated materials and contaminated materials from the main tailings pile. Lift thickness, compaction equipment, number of roller passes, and moisture content shall comply with Design Specification requirements. Records shall be retained which identify material type, number of roller passes, percent moisture, percent of maximum dry density, elevation and location. After the initial 1,000 cubic yards are tested, in-place moisture and density tests shall be performed once each 6,000 cubic yards of contaminated materials placed. All density test results and records required by this section are considered as information only, and are not subject to acceptance or rejection.

6.4.6 Tailings materials should be placed at an average moisture content of less than 5 percent by volume, and windblown and other vicinity property materials should be placed at an average moisture content of less than 10.6 percent by volume.

Note: Exceptions to these values due to environmental conditions and the construction processes while placing and/or compacting contaminated materials on the tailings embankment should be documented. Contaminated materials moisture content should be as low as reasonably achievable, without causing undue health hazards to workers and the general public, and in ensuring compliance to local, state and federal health and safety standards in affect at the time of construction. Records required by this section are considered as providing information only, and are not subject to acceptance or rejection.

6.4.7 Erosion Protection

The excavation, production, stockpiling, transportation, placement, and compaction of the erosion protection materials shall receive adequate inspection to assure (1) proper techniques are employed to prevent degradation of the material due to improper handling, (2) distribution is uniform, (3) voids are kept as minimal as possible, and (4) proper gradation is maintained. The inspection shall also verify the lift thickness and elevations. Inspection will be provided at the material source as required to assure compliance to the specification requirements.

Riprap material shall be visually inspected to assure the material is sound stone, resistant to abrasion, and free from cracks, seams, weathering rinds, and other defects as shown in the petrographic examination. Material with more than 10 percent sandstone by volume shall be rejected.

6.4.8 Health Physics

The H.P. activities shall be inspected a minimum of once weekly to assure compliance with the applicable H.P. Procedures as specified by the MK-F Quality Assurance Program Plan.

6.4.9 Receiving

6.4.9.1 Instrumentation which is received shall be inspected by the person responsible for using and maintaining the instrument. The instrument shall be inspected for damage, correct operations, and proper calibration records.

The inclusion of the calibration records into the calibration system shall be evidence of satisfactory inspection results.

Equipment which does not meet the applicable requirements shall be returned to the vendor.

6.4.9.2 Materials supplied for permanent installation or which by the specifications require certifications, will be verified by the quality department as having met the specified requirements. The inspector shall sign or initial the transmittal in the appropriate space indicating acceptance or describing the reason(s) for nonacceptance.

6.4.10 Seasonal Shutdowns

During the periods of time when work is interrupted for seasonal shutdowns, the exposed surfaces of the tailings material will be stabilized in a manner to prevent offsite spread of contamination. Prior to the application of protective erosion control measures, exposed surfaces shall be sloped to drain, and compacted with a tracked vehicle up and down the slope to eliminate ruts and ridges. Manufacturers recommendations for the methods of handling, mixing, application, and/or installation of erosion control materials shall be verified.

During this period, surveillances shall be performed and documented routinely to assure that the integrity of the method of stabilization is maintained.

Prior to commencing work following a seasonal shutdown, a radiological survey shall be performed on all areas which may have been subject to contamination as a result of the method of stabilization.

Also prior to commencing work following a seasonal shutdown, the compaction of previously accepted exposed permanent areas will be reverified. Density tests shall be performed in areas that are obviously, or appear to be questionable, (i.e. soft, excessive moisture) in maintaining the minimum specified density. In addition, randomly selected areas, representative of the in-place exposed material, shall be reverified as meeting the specified minimum density requirements. Areas that fail to meet the minimum specified density requirements shall be reworked to meet specified density and moisture requirements or removed and replaced with acceptable fill compacted to meet specified density and moisture requirements.

6.4.11 Bentonite

Bentonite shall be untreated sodium bentonite, and shall meet the requirements of Specification 13A of the American Petroleum Institute.

6.4.11.1 Mixing of bentonite shall not be accomplished in-place. If bentonite is mixed on the ground, loose material to be mixed with bentonite shall be placed on a 1-foot thick layer of specified radon barrier material rolled to a firm condition to avoid contamination by unacceptable materials.

6.4.11.2 Radon barrier materials shall be thoroughly mixed with the specified equipment with a minimum of six percent, by weight, of the specified sodium bentonite. To determine amount of bentonite to be added, multiply by 0.06 the dry weight of radon barrier material. The weight of bentonite to be added to the soils material shall also be calculated in a dry condition.

6.4.11.3 Moisture conditioning of radon barrier material prior to, during, and following mixing with bentonite shall be adequate to achieve a thorough composite mixture, and shall permit uniform and effective addition of any required additional moisture.

6.4.11.4 Mixing of bentonite with radon barrier material shall produce a thoroughly mixed, uniform composite mixture, and adequacy of mixing shall be verified by visual inspection. Weather conditions shall not affect the amount and/or uniformity of bentonite during placing, spreading, or mixing operations.

6.4.12 Equipment

The following functions shall be accomplished by utilizing equipment and methods meeting the specific criteria prescribed by the Design Specifications:

A. Excavation of all materials encountered
B. Compaction of gravel fill materials
C. Mixing and spreading bentonite and radon barrier materials
D. Compaction of contaminated materials
E. Compaction of radon barrier materials
F. Erosion protection during seasonal shutdowns
G. Compaction of bedding material

7.0 RECORDS

7.1 Test and inspection records shall be reported and filed in a timely manner, consistent with the status of work performed. Inspection and test status shall be identified by charts, blueprints, as-builts, or periodic status reports. The inspection and test status shall be available at all times to prevent inadvertent bypassing of an inspection or test.

7.2 Test and inspection records shall contain as a minimum the following:

7.2.1 Items tested or inspected.

7.2.2 Date of test or inspection.

7.2.3 Tester, inspector or data recorder.

7.2.4 Type of test or inspection.

7.2.5 Results and acceptability, including the test or inspection acceptance criteria.

7.2.6 Instrument number used in performing the test or inspection.

7.2.7 Action taken in connection with any deviations noted.

7.2.8 Person evaluating test results, if different than person named in paragraph 7.2.3.

7.3 Daily Inspection Reports shall be generated describing the adequacy, discrepancies, progress, dispositions and details of each days construction activities.

7.4 A Weekly Quality Control Report shall be generated summarizing volume of emplaced materials and number of field and laboratory tests performed for each type material. A copy of the Weekly QC Report shall be transmitted to the MK-F Project Quality Manager.

7.5 Permanent QA/QC records shall be periodically evaluated through internal and external surveillances and audits.

7.6 Test and inspection records shall be filed and maintained in accordance with "QAPP-6, Quality Assurance Records Control".