Appendix G

Uranium Scanning Procedure

Uranium Scanning Procedure for Property MP−00211

1. Select a Ludlum Model 12 ratemeter with a 44-9 pancake Geiger-Mueller beta-gamma detector or equivalent instrument capable of meeting detection limit criteria.

2. Check that the ratemeter and the detector have calibration stickers attached and that both calibration intervals are valid. Record the calibration due dates in the appropriate section of the Operational Check form (Figure G−1).

3. Check and inspect the instrument for any physical damage. Check the face of the detector to confirm the absence of holes and/or contamination.

4. Turn the instrument on by moving the range switch from the OFF position to BAT position. Verify that the ratemeter indicates above the BAT TEST line. Check the BAT OK space on the Operational Check Form (Figure G−1). If the instrument does not have sufficient battery power, replace the batteries and repeat this step.

5. Move the ratemeter range switch to × 1. Move the RESPONSE switch to the S (slow) position. Place the detector face up and cover it with a piece of paper to shield it from alpha radiation. After approximately 30 seconds, note the background count rate. Record the ratemeter reading in the BETA BACKGROUND COUNT space on the Operational Check Form (Figure G−1).

6. Place the detector over the operational check source. Ensure that the source is centered in the middle of the detector and that the source-to-detector distance is less than ¼-inch. Adjust the RANGE switch if necessary. Allow 30 seconds for the ratemeter to stabilize. Record the ratemeter reading in the BETA SOURCE COUNT space on the Operational Check Form (Figure G−1).

7. Subtract the background count from the source count to determine the net counts and record it in the appropriate space on the Operational Check Form (Figure G−1).

8. Compare the net count with the beta operational check range. If the net count is outside the operational check range, the detector may be replaced with another detector that has a valid calibration sticker, or the ratemeter may be replaced with another, as long as the replacement has a valid calibration sticker and is not marked for use with a specific detector only. Once the defective ratemeter/detector has been identified, tag the instrument as defective and return it to Grand Junction for repair.

9. Upon successfully completing the operational check, survey the proposed footprint of the structure and the spoils pile as follows:

    a. Turn the instrument on by moving the RANGE switch from OFF to × 1, move the AUD switch to the ON position, and select the S (slow) position on the RESPONSE switch.

Alpha and Beta-Gamma Operational Check Form

✓ System Configuration
☐ Model 12/44-9 GM Beta-Gamma Probe
☐ Model 12/43-5 Alpha Probe
☐ Electra/DP6A Dual Probe
☐ Model EL-0018 Tri-Scanner
☐ TCM
☐ LRAD
☐ E600
☐ _____
☐ _____

Instrument ID No._____ Alpha Range_____to_____
Probe ID No. _____

Alpha Source ID No. _____
Beta Surce ID No. _____ Beta Range_____to_____

Date	Operator	Cal Due Dates Inst. / Probe	Bat OK ✓	Count Mode Alpha ✓	Count Mode Beta ✓	Background Count[a]	Source Count	Net Count	Comments	Verified By TL / Date
		/								/
		/								/
		/								/
		/								/
		/								/
		/								/
		/								/
		/								/

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NOTES: [a]The alpha background count rate must be less than:
20 cpm for the Model 12 ratemeter and 43-5 probe
5 cpm for the Electra ratemeter and DP6A probe
N/A = Not Applicable

Figure G−1. Alpha and Beta-Gamma Operational Check Form

b. Determine the background count rate of the region to be surveyed by holding the detector out and away from the surface to be scanned. Allow approximately 30 seconds for the ratemeter to stabilize. Note and record the ratemeter reading on the survey data sheet (Figure G−2).

c. Scan the proposed footprint of the structure and spoils pile. Scan measurements are conducted by selecting the F (fast) position on the RESPONSE switch. Pass the detector slowly (approximately one detector width per second) over the surface to be scanned while holding the detector ¼-inch from the surface. Observe the ratemeter needle and listen to the speaker. Adjust the RANGE switch if necessary. If the speaker indicates an increase in the count rate, investigate the surrounding area carefully. If activity is detected above background levels, delineate the area and mark the boundaries with chalk, tape, paint, or other suitable substance. Note and record the range of survey readings (lowest to highest) for the surveyed area on the survey data sheet (Figure G−2).

d. Conduct discrete measurements by selecting the S (slow) position on the RESPONSE switch. Hold the detector ¼-inch from the surface to be surveyed. Allow approximately 30 seconds for the ratemeter to stabilize. Adjust the RANGE switch if necessary. Note and record the meter reading.

e. Use the following equation to convert the survey readings to disintegrations per minute per 100 square centimeters (dpm/100 cm^2):

$$\text{Beta dpm/100 cm}^2 = [(CR - BKG)/A] \times T \times CF \times 100 \times B$$

Where

CR = Survey reading count rate in cpm,
BKG = Background reading in cpm,
A = 15.5 (area of detector in cm^2 for Ludlum Model 44-9 beta-gamma detector),
T = 1 (count time factor for Ludlum Model 12),
CF = Calibration factor (dpm/cpm),
B = Beta backscatter factor determined for specific materials types (default value = 1), and
100 = Conversion from dpm/cm^2 to dpm/100 cm^2.

- If the beta-gamma measurements are less than 30 percent above background, the uranium concentration is less than 230 milligrams per kilogram (mg/kg), and the building permit may be issued.
- If the beta-gamma measurements are greater than or equal to 30 percent above background, inform the City of Monticello that uranium contamination may exist and that the building permit shall not be issued until mitigation steps are taken. The only means of determining the actual uranium concentration is to conduct laboratory analysis on a soil sample.

ALPHA AND BETA-GAMMA SURVEY DATA SHEET

Survey Location: _____ Date: _____ Operator: _____

Instrument Model Number: _____ Probe Model Number: _____ Alpha Cal Factor: _____

Instrument ID Number: _____ Probe ID Number: _____ Beta Cal Factor: _____

Calibration Expires _____ Calibration Expires: _____

Location	Measurement Type[a]	Material Type	Instrument Reading	Background	Units[b]	Count Time	dpm/100 cm^2	Comments

Figure G−2. Alpha and Beta-Gamma Survey Data Sheet

ALPHA AND BETA-GAMMA
SURVEY DATA SHEET (Continued)

Location	Measurement Type[a]	Material Type	Instrument Reading	Background	Units[b]	Count Time	dpm/100 cm^2	Comments

Verified: _____ **Date:** _____

Notes:
a. Measurement Type = Alpha, Beta-Gamma, or Alpha Plus Beta
b. Units = Counts, cps, or cpm

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Figure G−2 (continued). Alpha and Beta-Gamma Survey Data Sheet

After-Calibration Source Response Check Data Sheet

Location _____

Month _____Day _____ Year _____

Survey Instrument Data

Manufacturer _____

Model No. _____

Government Property No. _____

Calibration Due Date_____

Detector/Probe Data *(if applicable)*

Manufacturer _____

Model No. _____

Government Property No. _____

Calibration Due Date _____

Check Source Data

Isotope _____

Source I.D. No. _____

Instrument Scale	Source Detector Distance	Shielding/Geometry	Instrument Response	-20%	+20%	Scale Units

Comments:

_____

_____

_____

_____

_____

_____

_____

_____	_____	_____
Performed by (print)	*Performed by (signature)*	*Date*
_____	_____	_____
Reviewed by (print)	*Reviewed by (signature)*	*Date*

File Index No. _____

Figure G−3. After-Calibration Source Response Check Data Sheet

When beta-gamma measurements exceed 30 percent above background, and the property owner wishes to proceed with building a habitable structure at this location, the mitigation steps are to:

- Continue excavating until beta-gamma measurements are less than 30 percent above background. The Monticello Legacy Management (LM) Representative shall continue conducting beta-gamma scans to determine whether the measurements are less than 30 percent above background; or
- Collect soil samples for total uranium analysis to determine if uranium levels are less than the residential uranium standard of 230 mg/kg (note: ratemeter readings of 5−10 times background may equate to less than 230 mg/kg uranium). Obtain a soil sample from the top 6-inch interval of the area that had the highest beta-gamma measurement. The sample will represent the worst-case scenario with respect to uranium contamination. Collect the sample in a 125-milliliter glass wide-mouth sample bottle. No preservative or cooling is necessary.
- When collecting samples for laboratory analyses the Monticello LM Representative will contact the Site Manager to coordinate sample collection and shipping through the contractors Laboratory Services Coordinator. The Laboratory Services Coordinator will assist in providing the necessary paperwork and contacting the laboratory that will receive the samples.
- Request results on an "as received" basis. Laboratory results are normally returned within thirty days; however, the sample must be analyzed within 6 months of collection to meet the holding time requirement. Collect and submit the sample to the analytical laboratory in accordance with direction and sample collection and shipping forms provided by the Laboratory Services Coordinator.
- If the uranium concentration in the soil within the proposed footprint of the structure is less than 230 mg/kg, notify the City that they may issue the building permit and that construction may resume.
- If the uranium concentration in the soil within the proposed footprint of the structure is greater than or equal to 230 mg/kg, notify the City that soil removal must be completed prior to issuance of a building permit.
- If the uranium concentration in the spoils pile is greater than or equal to 230 mg/kg, direct the City to transport the material to the Temporary Storage Facility.
- Notify the Site Manager of the status of the uranium concentration and whether or not a habitable structure will be constructed.
- Note all observations, notifications, and scan results in the Former Millsite and City-Owned Properties record book in accordance with the record procedures described in Section 4.4 and Appendix B of the *Long-Term Surveillance and Maintenance Plan for the Monticello NPL Sites*.

End of current text