

RAI 12.F:

Description of Deficiency: The information provided in TR Section 2.6 does not meet the applicable requirements of 10 CFR Part 40, using the review procedures in Section 2.6.2 and using acceptance criteria in Section 2.6.3 of NUREG-1569.

Request for Additional Information: Please address the following issues regarding the proposed preoperational environmental monitoring program for the MEA:

F. In TR Section 2.9.6, the applicant stated that transects will be made across the MEA to collect surface and subsurface soil samples in areas of the proposed well field. While general guidance in RG 4.10 was followed in preparing the proposed baseline soil sampling program, staff cannot determine that the full extent of operations within the proposed MEA will have the necessary baseline soil sampling performed to meet 10 CFR Part 40, Appendix A, Criterion 7, requirements. Please provide a more detailed description of where surface and subsurface oil sampling will be performed.

RAI 12.F Response (05/21/15):

Section 2.9.6 has been revised and the sampling results are presented in their entirety in Appendix BB, Tetra Tech (2015) Report; Section 2.1.



May 25, 2014 and September 26, 2014. The samples were analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210 (Table 2.9-37).

Collection of fish tissue at N-1 and N-2 (Figure 2.7-4) was not feasible due to the small fish population with insufficient fish biomass. Attempting to collect the required amount of fish tissue needed for the analytical laboratory to obtain the required LLD would decimate the limited fish population.

The analytical data sheets and the QA/QC summary reports for the fish tissue samples are shown in Appendix X.

As of May 2010, the Nebraska Department of Human and Health Services (NDHHS) with the NDEQ, the NGPC and the Nebraska Department of Agriculture (NDA), have issued fish consumption advisories for warning to limit the consumption of northern pike in Box Butte Reservoir due to elevated mercury concentrations (NDEQ 2011a).

Due to the lack of background data from the study area with which to compare the current findings, radionuclide data interpretation is impracticable at this time, other than that the concentrations are considered low. The radiological results will serve as background information for future sampling events and the development of long-term trends.

2.9.6 Baseline Soil Monitoring

RG 4.14 recommends soil samples be collected as follows:

- Up to 40 surface soil samples ~~would be~~ collected at 300-meter intervals to a distance of 1,500 meters in each of eight directions from the center of the milling area. Surface soil samples ~~would be~~ collected to a depth of 5 cm using consistent sampling methods. Sampling ~~would be~~ conducted once prior to construction and repeated for locations disturbed by excavation, leveling, or contouring. All samples ~~would be~~ analyzed for radium-226, and 10 percent of the samples analyzed for natural uranium, thorium-230, and lead-210.
- Five or more surface soil samples (to a depth of 5 cm) ~~would be~~ collected at the same locations used for air particulate samples. Samples ~~would be~~ collected once prior to construction. Samples ~~would be~~ analyzed for natural uranium, radium-226, thorium-230, and lead-210.
- Five subsurface samples ~~would be~~ collected at the center point location and distances of 750 meters in each of four directions. Subsurface soil samples ~~would be~~ collected to a depth of 1 meter and divided into three equal sections for analysis. Samples ~~would be~~ collected once prior to construction and repeated for locations disturbed by construction. All samples ~~would be~~ analyzed for radium-226, and one set of the samples ~~would be~~ analyzed for natural uranium, thorium-230, and lead-210.

All baseline soil samples were collected as described in RG 4.14. The baseline soil monitoring results are included in the Marsland Expansion Area Baseline Radiological Investigation Report (Tetra Tech 2015) and are presented in Appendix BB.



~~8/29/2014D.~~

~~Soil samples will be collected at 300-meter intervals to a distance of 1,500 meters in each of eight directions from the centerpoint of the satellite facility. In addition, transects will be made through the center areas of each proposed mine unit to collect samples at 300-meter intervals. Sampling distances for some sampling points on transects from centerpoint of satellite facility and through the mine units may be modified to obtain a more representative sampling of the project area (e.g., proposed wellfield layouts).~~

~~Surface soil samples to a depth of 5 cm will be collected at 300-meter intervals to a distance of 1,500 meters (where feasible) along established transects. Any areas disturbed by excavation, leveling, or contouring would be resampled. All surface samples (5 cm) will be analyzed for radium-226, and 10 percent of the samples for natural uranium, thorium-230, and lead-210. Surface soils samples at each air monitoring station will be analyzed for natural uranium, radium-226, thorium-230, and lead-210. All surface soil sampling will occur once prior to construction and repeated for any locations disturbed by excavation, leveling, or contouring. Subsurface samples will be analyzed once prior to construction and repeated for any locations disturbed by construction.~~

~~In this application, Cameco requests a soil sampling program different from that specified in NUREG-1569, Standard Review Plan for In Situ Leach Uranium Extraction License Applications. Specifically, Cameco proposes taking soil samples at both 5 cm and 15 cm depths as recommended by NUREG-1569, Acceptance Criteria 2.9.3 (2) for background decommissioning, with the exception of samples taken at the air monitoring stations. In a public meeting (ML 12255A258), NRC stated that in light of the EPA's technical basis for its radium-226 soil cleanup standard (refer to EPA 520/4-82-013-2, Final Environmental Impact Statement for remedial Action Standards for Inactive Uranium Processing Sites [40 CFR 192], Volume II, October 1982, pages D-51, 52), where EPA found no difference in health protection between averaging contamination throughout the top 5 cm of soil versus the top 15 cm of soil, it is not necessary to sample to 15 cm at the air monitoring stations. That rationale is applicable here.~~

~~For background samples (excluding the air monitoring stations), subsurface samples will be collected at the satellite facility center reference location and at a distance of 750 meters (alternate distances in some cases as explained above) in each of four directions. Additional subsurface samples will be collected along the additional transects discussed above. Any areas disturbed by construction will be resampled. Subsurface soil profile samples would be collected to a depth of 1 meter. Samples would be divided into three equal sections for analysis. All subsurface samples would be analyzed for radium-226, and one set of samples for natural uranium, thorium-230, and lead-210.~~

~~Soil samples were will be collected in accordance with the SHEQMS Volume VI Environmental Manual (CBR 2010).~~

Quality of Soil Measurements

The accuracy of monitoring data is critical to ensure that the soil monitoring program precisely reflects radionuclide concentrations. RG 4.14 specifies the following LLDs:

Radionuclide	Recommended LLD	LLD
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	$\mu\text{Ci/g (dry)}$	pCi/g (dry)
Natural Uranium	2×10^{-7}	.2 pCi/g
Radium-226	2×10^{-7}	.2 pCi/g
Thorium-230	2×10^{-7}	.2 pCi/g
Lead-210 (dry)	2×10^{-7}	.2 pCi/g

~~Soil samples collected by CBR will adhere to the requirements of RG 4.14.~~

2.9.7 Baseline Sediment Sampling

Sediments of lakes, reservoirs, and flowing bodies of surface water may become contaminated as a result of direct liquid discharges, wet surface deposition, or from runoffs associated with contaminated soils. Because of various chemically and physically binding interactions with radionuclides, sediments serve as integrating media that are important to environmental monitoring.

RG 4.14 recommends that sediment samples be collected from sediments of surface water passing through the project site or offsite surface waters that may be subject to drainage from potentially contaminated areas. The PPMP and operational monitoring plan will be designed to meet the criteria outlined in RG 4.14 (NRC 1980). Samples are to be collected once following spring runoff and in late summer following a period of extended low flow.

2.9.7.1 Niobrara River Sediments

Sediment sampling in RG 4.14 requires samples from each large onsite body of water or offsite surface waters that may be subject to direct surface drainage from potentially contaminated areas that could be affected by a tailings impoundment failure. There are no onsite surface impoundments, so such sampling is not required. Sediment samples will be collected from the Niobrara River, which could receive surface water runoff by means of ephemeral drainages located on the MEA project site (**Figure 2.7-4**). Sediments of the Niobrara River were sampled at designated upstream and downstream sampling locations (sample points N-1 and N-2) (**Figure 2.7-4**). Water samples are also collected at these sampling points. The downstream sampling point is located to assess potential impacts from either of the two ephemeral drainages that drain the MEA.

Sediment samples at N-1 and N-2 sampling points were collected on March 20, 2013. The radiological sample analytical results for lead-210, radium-226, thorium-230, and natural uranium are shown in **Table 2.9-38**. The analytical results for lead-210, radium-226, thorium-230 and uranium were the same for each parameter for both sampling sites, with all but radium-226, being at or near the reporting limits. (i.e., lead-210 at 0.3 pCi/g – dry weight [RL 0.2 pCi/g – dry wt], radium-226 at 0.4 pCi/g – dry weight [RL 0.04 mg/kg – dry weight], thorium-230 at 0.2 pCi/g – dry weight [RL 0.2 pCi/g – dry weight], and uranium at 0.4 mg/kg – dry weight [RL 0.3 mg/kg – dry weight] and 0.3 pCi/g – dry weight [RL 0.2 pCi/g – dry weight]).