May 21, 2004

Mr. John H. Ellis
President
Sequoyah Fuels Corporation
P.O. Box 610
Gore, OK 74435

SUBJECT: SEQUOYAH FUELS CORPORATION - MATERIALS LICENSE NO. SUB-1010 - REQUEST FOR ADDITIONAL INFORMATION - RECLAMATION PLAN - GEOTECHNICAL STABILITY (TAC L52511)

Dear Mr. Ellis:

The U.S. Nuclear Regulatory Commission (NRC) has completed a detailed technical review of the geotechnical stability aspects of Sequoyah Fuels Corporation's (SFC's) proposed Reclamation Plan for the SFC facility in Gore, Oklahoma. We have reviewed the original submittal of January 28, 2003, and supplements submitted by letters dated August 8, 2003, August 29, 2003, and February 17, 2004. Our review has identified deficiencies in the material provided; we will need the additional information identified in the enclosure in order for us to complete our geotechnical stability review. Note that the enclosed request for additional information (RAI) includes RAIs in seismology and surface water hydrology which directly relate to geotechnical stability. However, as we have not completed our review in those and other technical areas of the reclamation plan, we may have additional RAIs in the future. Note also, that the numbering scheme identifies the area of review (e.g., GT for geotechnical stability) and continues the RAI numbering from our March 23, 2003, letter. Within 30 days of the date of this letter please either provide the requested information or a schedule to provide the information.

If you have any questions concerning this letter, please contact me at (301) 415-6629 or by e-mail at mhf1@nrc.gov.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Myron H. Fliegel, Project Manager
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No. 40-8027
License No. SUB-1010

Enclosure: Request for Additional Information

cc: William Andrews, USGS
Patricia Ballard, NRMNC
Michael Broderick, OK DEQ
Will Focht, OSU
Alvin Gutterman, Esq., Morgan Lewis & Bockius
Pat Gwin, Cherokee Nation
Jeannine Hale, Esq., Cherokee Nation
Craig Harlin, SFC
Jim Harris, USACE
Sarah Penn, Esq., OK AG
Kathy Peter, USGS
Troy Poteete, Cherokee Nation
Charles Scott, USFWS
David Smit, OK DEQ
Merritt Youngdeer, BIA
Rita Ware, EPA

May 21, 2004

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Myron H. Fliegel, Project Manager
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No. 40-8027
License No. SUB-1010

Enclosure: Request for Additional Information

cc: William Andrews, USGS
Patricia Ballard, NRMNC
Michael Broderick, OK DEQ
Will Focht, OSU
Alvin Gutterman, Esq., Morgan Lewis & Bockius
Pat Gwin, Cherokee Nation
Jeannine Hale, Esq., Cherokee Nation
Craig Harlin, SFC
Jim Harris, USACE
Sarah Penn, Esq., OK AG
Kathy Peter, USGS
Troy Poteete, Cherokee Nation
Charles Scott, USFWS
David Smit, OK DEQ
Merritt Youngdeer, BIA
Rita Ware, EPA

DISTRIBUTION :

FCLB r/f	CNWRA	J.Whitten/RIV	C.Schulte
B.Ibramim	J.Caverly	A.Coggins	ACNW

C:\ORPCheckout\FileNET\ML041480552.wpd

ML041480552

OFC	FCFB		FCFB		FCFB	
NAME	M. Fliegel		B. Garrett		R. Nelson	
DATE	5/18/04		5/19/04		5/21/04	

OFFICIAL RECORD COPY

Sequoyah Fuels Corporation
Reclamation Plan Geotechnical Stability Review
Request for Additional Information

Geotechnical (GT) Stability

GT2 *Requirement to demonstrate factors of safety assuring long-term stability of the disposal-cell embankment [Criterion 4(c) of 10 CFR Part 40, Appendix A]*. Provide the basis for the friction angle of 20° assigned to the interface between the cover soil and synthetic liner in the slope stability analysis in Appendix C, Seismic and Static Stability, page C-4 of the Reclamation Plan (RP). The interface is expected to be wet considering the normal function of the synthetic liner is to intercept moisture infiltration. Lubrication of the interface may occur when wet because of the overlying clayey soil. Therefore, the justification should consider the effects of the interface being wet or it should show that it will not be wet.

GT3 *Requirement to provide a cover design reasonably assuring the control of radiological hazards for at least 200 years [Criterion 6(1)(i) of 10 CFR Part 40, Appendix A]*. Provide an assessment of potential settlement of the cover system, considering the properties and thicknesses of the disposal-cell materials, and an analysis to demonstrate that such settlement would not cause cracking and deterioration of the cover. The analysis should consider whether soil overlying Layer C (Section 3.4 of the RP) may flow into void spaces between fragments of structural materials (e.g., concrete and asphalt) in Layer C. Provide particle-size and placement-control specifications for the structural fragments, and show that such specifications will be sufficient to avoid large void spaces in Layer C. Variations in subgrade compressibility (e.g., because parts of the disposal cell will overlie a concrete subgrade) should also be considered.

GT4 *Requirement to demonstrate factors of safety assuring long-term stability of the disposal-cell embankment [Criterion 4(c) of 10 CFR Part 40, Appendix A]*. Provide justification for considering a seismic coefficient of 0.05 (Appendix C, Seismic and Static Stability, p. C–4) in slope stability analysis that is smaller than the minimum seismic coefficient of 0.1 recommended in section 2.2.3 of the Standard Review Plan (SRP, NUREG–1620).

GT5 *Requirement for stability of liners [Criterion 5A(2)(a) of 10 CFR Part 40, Appendix A]*. Provide information to demonstrate whether the soil from the identified borrow pits can meet the specifications for the clay liner. Provide a mineralogical description of the soil to be used in the construction of the clay liner. The description should include any heterogeneity in the borrow pit materials that may affect material characteristics during construction. If the material is heterogeneous, it may be appropriate to propose a periodic testing after construction begins. Sections 2.6.2 and 4.2.2 of the technical

specifications in Attachment A to the RP indicate that clay for the compacted clay liner will come from the borrow area at the south end of the facility. Sections 4.2.2 and 4.3.4 of the technical specifications for the disposal cell call for a 2-ft-thick compacted clay liner. The liner is to be installed using 6-in lifts, with 50 percent of the material passing a No. 200 sieve and with a minimum plasticity index of 10. These specifications meet the design criteria in existing U.S. Environmental Protection Agency guidance for solid waste disposal facilities, but it is not clear whether the clay content and clay type of the locally derived soils in the borrow pit will meet this requirement or whether the soil will need to be amended. There are some descriptions provided in borehole logs for the fertilizer pond berms and subsoils just north of the borrow pit (Appendix C, Attachment A.2), but these descriptions are general in nature and do not include the level of detail necessary to evaluate the geotechnical properties. In addition, there is a brief summary description of site characteristics of Unit 54 that includes the borrow pit (Appendix C, Attachment A.1), but the summary is focused on soil analysis for radionuclides. Provide field and laboratory tests characterizing the borrow areas to satisfy SRP sections 2.1 and 2.6 acceptance criteria.

GT6 *Requirement for testing to demonstrate that the performance properties of the clay materials used in the clay liner will not deteriorate with respect to permeability or stability [Criterion 5E(1) of 10 CFR Part 40, Appendix A]*. Provide a technical basis to demonstrate sufficient long-term stability of the clay liner materials with anticipated leachates. For example, the clay structure (and therefore permeability) may depend on the presence of cations such as sodium, potassium, or calcium. Although there is no current tailings solution with which to conduct testing, there are some estimates of likely leachate compositions. For example, in Section 3.0 of the Hydrogeological and Geochemical Site Characterization Report (Appendix B of the RP), there is reference to a treatability study that evaluated the leaching characteristics of disposal materials using a modified version of the American National Standard (ANS) for the Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short Term Procedure (ANSI/ANS–16.1). The report refers to the high pH buffering capacity and the high cation exchange capacity of the fly ash and cement matrix associated with disposal materials.

GT7 *Requirement for stability of liners [Criterion 5A(1) of 10 CFR Part 40, Appendix A]*. Provide a description of how the clay liner and the cover-system soil will be protected to maintain the target moisture content and hydraulic conductivity considering the potential occurrence of adverse weather conditions if the construction extends through several seasons, and provide a description of measures to minimize cracking. Weather and temperature conditions, such as freeze/thaw, rain, or extended dry periods, may lead to dessication, cracking, or other types of deterioration of these soil layers during construction. SRP section 2.6 calls for compaction specifications to include restrictions on work in adverse weather conditions such as freezing conditions and rain. Sections 4.3.4 and 4.4.2 of the technical specifications for the disposal cell (Attachment A of the RP) provide information about the placement of the clay liner material and the in-place testing to ensure meeting hydraulic conductivity requirements. The RP only provides a general schedule for constructing the cell base and dike, but this construction extends through a period of 2 years. No information is provided in the technical specifications for procedures, such as rolling or covering, that may be used to protect the clay liner.

GT8 Provide a description of the cleanup level used to determine the volume of contaminated soil to be disposed of in Layer D of the disposal cell. Several cleanup levels are reported for determining which contaminated soils will be placed in disposal Layer D. For example, in several places, a cleanup level of 27 pCi/g is reported (section 3.4.1 of the RP and section 2.4 of Appendix C), while 100 pCi/g is referenced in other areas (RP Table 3-1, and Attachment F, section 6.2.4). Estimates of the volume of material for disposal as Layer D will depend on the cleanup level, with lower levels resulting in a greater volume of material. Section 2.6 of the SRP calls for the demonstration that all contaminated materials at the site can be placed within the planned configuration of the stabilized pile. Current estimates of the volume of material for disposal using the 27 pCi/g cleanup level are approximately 8.3 million ft^3 (RP, Section 1.3.2). This volume is well below the potential maximum capacity of the facility (12 million ft^3), but the estimated volumes should be based on a consistently applied cleanup level.

Seismology (S)

S7 *Requirement to demonstrate factors of safety assuring long-term stability of the disposal-cell embankment [Criterion 4(c) of 10 CFR Part 40, Appendix A]*. Provide justification for using the Campbell (Bulletin of the Seismological Society of America, 1981) attenuation equation to calculate peak ground acceleration considering that the equation is restricted to the near-source region (~50 km) of earthquakes of magnitude 5.0 or greater. This attenuation equation is also based on empirical data from earthquakes recorded in the western United States and other regions of the world. There are attenuation models applicable to the central and eastern United States [e.g., Campbell (Bulletin of the Seismological Society of America, 2003), and Atkinson and Boore (Bulletin of the Seismological Society of America, 1995)] that encompass the magnitudes and distances listed in Tables 4.1, 4.2, 4.5, 4.7, and 5.1 of the RP.

S8 *Requirement to demonstrate factors of safety assuring long-term stability of the disposal-cell embankment [Criterion 4(c) of 10 CFR Part 40, Appendix A]*. Provide a justification for not accounting for local soil amplification at the disposal site when calculating the design seismic ground motion.

Surface Water (SW) Hydrology and Erosion Protection

SW6 Provide an assessment of potential infiltration caused by preferential flow pathways that could develop over time from many factors such as cover cracking, root penetration, and heterogeneity of cover materials. The infiltration models in Appendix C do not include such information. The implications of the various assumptions associated with the HELP and TerraSim models of the expected infiltration values also need to be evaluated. This information is essential for a review of the disposal cell design (SRP, section 2.5.2). The assessment requested is important because the proposed design relies on evapotranspiration, and the low permeability and high drainage characteristics of the engineered cover to reduce infiltration and seepage.