SEQUOYAH FUELS
A GENERAL ATOMICS COMPANY

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RE: 9746-N

July 22, 1997

Certified Mail
Return Receipt Requested

Mr. John W. N. Hickey, Chief
Low-Level Waste and Decommissioning
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: License SUB-1010; Docket No. 40-8027
Response to NRC Questions Related to Seismic Conditions Near The Sequoyah Facility

Dear Mr. Hickey:

Your letter dated April 23, 1997 transmitted NRC Staff questions concerning seismic conditions surrounding the Sequoyah Fuels Corporation (SFC) Facility located near Gore, Oklahoma. You requested that SFC respond to these questions within 90 days. I have enclosed SFC's response to the Staff's questions with this letter.

SFC has submitted information about the structural geology and seismic conditions at its facility on previous occasions as a result of applications for license renewal, a license amendment request, and site characterization for decommissioning. The NRC has access to this information on SFC's docket. Since reference have been made in the enclosed response to additional materials that may not be readily accessible to your staff, I have enclosed those materials as attachments to the response.

NMSS

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HIGHWAY 10 & I-40 PO BOX 610, GORE, OKLAHOMA 74435 (918) 489-5511 FAX (918) 489-2291

Should you or your staff have questions with regard to the enclosed response during the course of your review, please contact Kenny Schlag at (918) 489-3307 or Craig Harlin at (918) 489-3386.

Sincerely,

John H. Ellis
President, SFC

XC: James C. Shepherd, NRC NMSS/LLDR (without attachments)
Alvin Gutterman, Morgan, Lewis & Bockius (without attachments)

Response to NRC Questions Related to Seismic Conditions Near the Sequoyah Facility

Geologic Stability Issue - Capable Fault

Question 1

Are any of the faults mapped at or near the site capable faults (e.g. Carlisle, Marble City, South Fault of Warner Uplift, unnamed faults, or their splays or parents')? Explain.

Response

None of the faults mapped at or near the Facility are believed to be capable faults as described in 10 CFR Part 100, Appendix A.

The Facility geology is discussed in detail in the Draft Site Characterization Report[1]. In summary, the Facility is located on the southwest flank of a large tectonic feature known as the Ozark Uplift[2]. Bedrock formations present in the region consist of Pennsylvanian, Mississippian, Devonian, Silurian and Ordovician-aged shale, limestone, siltstone and sandstone formations (>300 million years old). The geological formations regionally dip to the southwest at one to four degrees toward another tectonic feature known as the Arkoma Basin. The horst and graben type faulting found in the area are normal faults which suggest that tensional forces have been responsible for their formation[3].

The planes of the various faults are not exposed at the surface, however, some are visible in highway cuts and others are revealed by low hummocky parallel ridges which stretch across pasture lands. Quaternary-aged terrace deposits and alluvial material cover most all of the Atoka Bedrock in the area except where streams and manmade activity has exposed portions of bedrock. There is no direct evidence that any of the faults mapped near the Facility extend from the bedrock into these Quaternary-aged terrace deposits which suggests any fault movement was prior to the deposition of these terrace deposits (>1 million years).

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[1]Sequoyah Fuels Corporation, Draft Site Characterization Report, February 2, 1996, Docket 40-8027.

[2]J. K. Arbenz, Tectonic Map of Oklahoma Showing Surface Structural Features, 1956. (Attachment 1)

[3]J. G. Blythe, Atoka Formation On The North Side Of The McAlester Basin, pp 36-37, Oklahoma Geological Survey, Circular 47, 1959. (Attachment 2)

Question 2

Are any of the basement (blind) faults at or near the site capable faults? Explain.

Response

None of the basement faults mapped at or near the Facility are believed to be capable faults as described in 10 CFR Part 100, Appendix A.

The known basement faults mapped below the Atoka Formation are in the Arbuckle Formation. Some of these faults were discussed as possible hydrologic barriers in the Class I Injection Well Data Evaluation Report[4]. In fact, some faults mapped in the Arkoma Basin to the south of the Facility which transect Mississippian and older units apparently do not cut Atoka strata. These basement faults therefore, are a result of movements which occurred in Mississippian and in early Desmoinesian time (>320 million years)[5]. For most recorded seismic activity in the state, the focal depth is unknown. All available evidence indicates that no Oklahoma hypocenters have occurred deeper than 15-20 km[6].

Question 3

a) Is there any seismic activity associated with these faults? Explain.
b) What is the seismic history of the area within 100 km of the site? Explain.

Response

a) There is no evidence of seismic activity associated with any faults in the Ozark Uplift in Eastern Oklahoma.

The Oklahoma Geological Survey Observatory (OGS) in Leonard, Oklahoma, routinely tracks eleven seismic stations across the state. This data, managed by the Observatory in Leonard, shows no evidence that the observed earthquake hypocenters are in any way connected to the tensional faults mapped in the area. The OGS has concluded in a publication entitled the Oklahoma

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[4]Roberts/Schornick and Associates, Final Class I Injection Well Data Evaluation Report, Sequoyah Fuels Corporation, April 4, 1995, Docket 40-8027.

[5]J. G. Blythe, Atoka Formation On The North Side Of The McAlester Basin, p. 36, Oklahoma Geological Survey, Circular 47, 1959.

[6]J. E. Lawson, Jr. and K. V. Luza, Oklahoma Earthquake Catalog, pp. 17, 18, Oklahoma Geological Survey, 1995. (Attachment 3)

Earthquake Catalog[7] that there has been little tectonic activity in this area since late Pennsylvanian time. The Earthquake Map of Oklahoma[8] shows the majority of seismic activity in Oklahoma occurring in the central portion of the state.

b) The seismic history of the area has been documented by the OGS in the Oklahoma Earthquake Catalog which presents the earthquakes that have been felt in Oklahoma from 1882 to 1994. A portion of this historical earthquake data was submitted in response to a similar information request by the NRC in 1983[9]. The NRC reviewed this data and published their conclusions in NUREG 1157[10]. A probabilistic acceleration map and seismic risk map are also included in NUREG 1157. Additional information on earthquakes in Oklahoma can be found on the internet (see Internet Sites in the References).

Geomorphic Stability Issue - Mass Movement

Question

What is the potential for mass movement, such as landslide, earthflow, slumping and the like, to significantly affect erosion - or radon protection barriers over the next 1000 years? Explain.

Response

There is very little potential for mass movement of earthen material at the Facility over the next 1000 years.

The Facility is situated on relatively flat lying bedrock. The topographic relief relative to the proposed disposal cell is depicted on Figure 1[11] which is attached. The regional

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[7]J. E. Lawson, Jr. and K. V. Luza, Oklahoma Earthquake Catalog, p. 4, Oklahoma Geological Survey, 1995.

[8]J. E. Lawson, Jr. and K. V. Luza, Earthquake Map of Oklahoma (Map GM-35), Oklahoma Geological Survey, 1995. (Attachment 4)

[9]Kerr McGee Nuclear Corporation, Responses to U.S. Nuclear Regulatory Commission Site Visit Information Requests, Questions 38, August 19, 1983, Docket 40-8027.

[10]U. S. Nuclear Regulatory Commission, Environmental Assessment for Renewal of Special Nuclear Material License No. SUB-1010, Sequoyah Fuels Corporation, Docket No. 40-8027, NUREG-1157, August 1985.

[11]Sequoyah Fuels Corporation, Draft Decommissioning Alternatives Study Report, Appendix C, December 17, 1996, Docket 40-8027.

dip of the bedrock is to the southwest at one to four degrees[12]. The natural sandstone and shale sequences appear to be very stable when exposed. There is no visible evidence of natural sloughing or major fracturing at or near the Facility which would indicate a potential for mass movement of the physical structures at the site. In particular, the drainage area which makes the closest approach to the proposed disposal cell, designated as Outfall 005, is heavily vegetated along the entire drainage and shows no signs of mass movement even on the most pronounced relief. This is consistent with the rock and soil structure in this region where surficial masses are not prone to such movements.

The engineered controls of the Robert S. Kerr Navigational System (Arkansas River) as well as Lake Tenkiller Dam (Illinois River) reduce the risk from major catastrophic flooding which could alter loose, exposed bedrock along the river systems. However, any slope failure due to flooding would be limited to the immediate area along the river banks.

The disposal cell will be designed to avoid adverse effects on performance due to mass movement such as landslides and earth-type failures of manmade embankments according to published regulatory guidance and industry standards.

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[12]Sequoyah Fuels Corporation, Draft Site Characterization Report, February 2, 1996, Docket 40-8027.

Additional References

J. E. Lawson, Jr. and K. V. Luza, Oklahoma Earthquakes, 1995, Oklahoma Geology Notes, Vol. 56, No. 2, April 1996. (Attachment 5)

J. E. Lawson, Jr., Expected Earthquake Ground-Motion Parameters at the Arcadia, Oklahoma, Dam Site, Special Publication 85-1, 1985. (Attachment 6)

R. L. DuBois, Seismic Risk in Oklahoma, May 5, 1972, Earth Sciences Division, University of Oklahoma, August 19, 1983, Docket 40-8027.

Service Testing Laboratory, Report of Atterberg Limits, Shrinkage Limits, Unconfined Compression, and Compression Tests, August 10, 1983, Docket 40-8027.

US Nuclear Regulatory Commission, Final Environmental Statement related to the Sequoyah Uranium Hexafluoride Plant, NUREG-75/007, February 1975, Docket 40-8027.

D. L. Warner, Environmental Assessment Related to Proposed Deep Well Injection of Liquid Raffinate At The Kerr McGee Sequoyah Facility, Oklahoma, March 1983, Docket 40-8027.

Sequoyah Fuels Corporation, Responses to EPA Comments on the Final Class I Injection Well Report, July 7, 1996, Docket 40-8027.

Internet Sites

gopher://wealaka.okgeosurvey1.gov/, Oklahoma Geological Survey gopher server

www.ou.edu/special/ogs-pttc, Oklahoma Geological Survey web site

http://geology.cr.usgs.gov/, US Geological Survey web site for the central region