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MEMORANDUM

MFG PROJECT: 180734

TO: Dr. A. K. Ibrahim, U.S. Nuclear Regulatory Commission

FROM: Roslyn Stern, Clint Strachan

DATE: September 7, 2004

SUBJECT: **Sequoyah Fuels Corporation Site, Seismicity Issues**

COPY: Craig Harlin, Sequoyah Fuels Corporation

This memorandum has been prepared to address the seismicity issues discussed in our conference call on July 20, 2004. In this conference call, five technical issues were identified for additional clarification, as a follow-up to the June 22, 2004 response to the NRC Request for Additional Information (RAI) (SFC, 2004). These technical issues are outlined below.

1. Lawson, 1985 Paper

As requested, a copy of the 1985 paper by J. E. Lawson is attached with this memorandum, entitled "Expected Earthquake Ground-Motion Parameters at the Arcadia, Oklahoma Dam Site, SP 85-1."

2. Site Acceleration Values from Random Earthquake Analyses

As requested, we verified the values in the table entitled Site Accelerations from Random Earthquakes Within the Ozark Uplift, using Atkinson and Boore (1995) Attenuation Relationships from Enclosure 3 of June 22, 2004 RAI response. In particular, the 0.27 g value for 10,000-year recurrence interval earthquake occurring 3.5 miles (5.7 km) from site was verified.

As shown in Table 1 below, an earthquake magnitude of 4.4 corresponds to a 10,000-year event occurring within a 5-mile radius of the site. As discussed below (in comment 5), a circle with a 5-mile radius has a mean radius of 3.5 miles. Attenuation relationships have been developed to predict the ground motion at a site as a function of peak ground motion and distance. One such relationship, developed by Campbell (1981), is shown in Table 2. This relationship was developed using worldwide earthquakes. Atkinson and Boore (1995) proposed a relationship based on data from southeastern Canada and northeastern United States. They provide two methods for predicting attenuation relations: 1) a "simplified" quadratic equation, and 2) a list of tabulated values. The table is considered more accurate, but a less functional form that requires interpolating between tabulated values. Using the quadratic equation approximation presented in Atkinson and Boore, the resulting peak ground acceleration is 0.27 g as shown in Table 3. In

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addition, Campbell (2003) developed a new relationship to predict ground motion in the eastern United States by using an empirical method based on western North America that has been adjusted using stochastic and theoretical methods to model ground motions in eastern North America. These values are shown in Table 4. Values from the Atkinson and Boore (1995) quadratic equation, as given in the June 22, 2004 RAI response, are considered most applicable because the range of input parameters for the equation best fits the range of input parameters of the random earthquake study.

Table 1. Probabilistic Assessment of Random Earthquakes Within the Ozark Uplift*

	Circle Radius From Site / Mean Circle Radius (miles)			
Recurrence Interval (years)	**200 / 141**	**50 / 36**	**10 / 7**	**5 / 3.5**
1,000	6.7	5.5	4.0	3.4
2,000	>6.7	5.8	4.3	3.7
10,000	>6.7	6.5	5.0	4.4

*From Table 4.7 of MFG (2003a); values in fraction of gravitational acceleration (g).

Table 2. Site Accelerations from Random Earthquakes Within the Ozark Uplift, using Campbell (1981) Attenuation Relationships*

	Circle Radius From Site / Mean Circle Radius (miles)			
Recurrence Interval (years)	**200 / 141**	**50 / 36**	**10 / 7**	**5 / 3.5**
1,000	0.01	0.02	0.03	0.04
2,000	---	0.03	0.04	0.05
10,000	---	0.05	0.08	0.09

*From Table 4.7 of MFG (2003a); values in fraction of gravitational acceleration (g).
Grayed values indicate values calculated using input parameters outside the intended range of input values.

Table 3. Site Accelerations from Random Earthquakes Within the Ozark Uplift, using Atkinson and Boore (1995) Attenuation Relationships (Quadratic Equation)*

	Circle Radius From Site / Mean Circle Radius (miles)			
Recurrence Interval (years)	**200 / 141**	**50 / 36**	**10 / 7**	**5 / 3.5**
1,000	0.02	0.06	0.08	0.08
2,000	---	0.08	0.12	0.12
10,000	---	0.13	0.25	0.27

*Modified from Table 4.7 of MFG (2003a); values in fraction of gravitational acceleration (g).
Grayed values indicate values calculated using input parameters outside the intended range of input values.

Table 4. Site Accelerations from Random Earthquakes Within the Ozark Uplift, using Campbell (2003) Attenuation Relationships*

	Circle Radius From Site / Mean Circle Radius (miles)			
Recurrence Interval (years)	**200 / 141**	**50 / 36**	**10 / 7**	**5 / 3.5**
1,000	0.02	0.03	0.10	0.15
2,000	---	0.04	0.14	0.20
10,000	---	0.08	0.26	0.36

*Modified from Table 4.7 of MFG (2003a); values in fraction of gravitational acceleration (g).
Grayed values indicate values calculated using input parameters outside the intended range of input values.

3. Peak Acceleration Summary Table

The table entitled Peak Accelerations Associated with Seismic Events in the June 22 2004 RAI response show peak accelerations associated with all known faults considered as active faults using the updated attenuation equation. As included in Table 5, the peak accelerations calculated from the MCE associated with all known faults considered as active faults increased by up to a factor of three when the Campbell (2003) and Atkinson and Boore (1995) attenuation relations are used.

Table 5. Peak Accelerations Associated With Seismic Events*

Seismic Event	Campbell (1981)	Campbell (2003)	Atkinson and Boore (1995)
MCE associated with known active fault (Meers)	0.015	0.019	0.015
MCE associated with known active fault (Humboldt fault zone)	0.012	0.017	0.019
MCE associated with all known faults considered as active faults	0.150	0.492	0.464
Random earthquake within five-mile radius of site (10,000 year recurrence interval)	0.09	Not applicable	0.27
June 20, 1926 Sequoyah County earthquake	0.023	Not applicable	0.061

*Modified from Table 5.1 of MFG (2003a) and Table in June 22, 2004 RAI; values in fraction of gravitational acceleration (g).

A comparison of the peak accelerations using different attenuation relationships is shown in attached Table A.1.

In the Facility Seismicity Evaluation report (MFG, 2003), all known faults in the site area were conservatively considered as active faults to eliminate questions about whether or not a particular fault was potentially active (capable). When the Atkinson and Boore (1995) and Campbell (2003) relationships were used, this conservative approach results in relatively high peak accelerations at the site. These peak accelerations are not consistent with the measured seismic activity in this relatively inactive area of Oklahoma.

A more detailed literature review of potentially active (capable) faults in the area was conducted to assess the potential impact on peak site acceleration. Since it has previously been shown that the disposal cell can withstand an acceleration of 0.27 g (June 22, 2004 RAI response, from random earthquake analysis), only faults that could produce accelerations greater than 0.27 g, if active, are considered further. The Campbell (2003) relation is used because it is the latest relationship found in the literature for eastern United States and has input parameters (magnitude and distance) that are similar to those in Table A.1. The considered faults are presented in Table 6.

In the 1970's, the Black Fox Nuclear Power Plants Units 1 and 2 were approved for construction, with the projects canceled in 1982 during construction permit review. However, extensive geology and seismic evaluations had been conducted and the Safety Evaluation Report had been submitted. The Black Fox proposed site was near Inola, Oklahoma, approximately 60 miles north of the SFC site, on the western flank of the Ozark Uplift. Therefore, there is considerable overlap in the study regions of the two sites. The majority of the faults listed in Table 6 fall within the 50-mile radius study area of the Black Fox site, and all are within the 200-mile radius study area. In fact, all of the original faults listed in Table A.1 are located within the 200-mile radius study area of the Black Fox report.

Table 6 Maximum Credible Earthquake and Site Ground Vibratory Motion for Critical Faults with Potential Horizontal Accelerations Greater than 0.27 g.

Fault ID	Fault Length (km)	Dist. from Site (km)	MCE (Slemmons 1982)	Hor. Accel. at Site Campbell 2003 (g)	Black Fox (BF) Fault ID	BF Fault Name	Tectonic Province (1)	Comments
103	42.1	1	7.0	1.403	91	Lyons	OU	BF fault 91 extends farther north than fault 103 of this report. Marble City fault, not capable per NRC Dec. 3, 1998 letter to James Shepherd (SFC). Lyons fault not capable per BF report.
99	4.4	8	5.7	0.472	78	Webbers Cove	AB	South Fault of Warner Uplift. Segments 35, 101, 12, 99, and 33 in this report considered collectively as Webbers Cove Fault in BF report. Fault not capable per BF report and NRC Dec. 3, 1998 letter to James Shepherd (SFC).
95	15.7	16	6.4	0.464	77	Greenleaf Lake	OU	Northern part forms horst with southern part of South Qualls fault (83 of BF report). Fault not capable per BF report.
83	9.0	14	6.1	0.450	85		AB	Segments 70 and 83 of this report considered collectively as fault 85 in BF report. Fault not capable per BF report.
50	21.1	19	6.6	0.416	50		AB	Fault not capable per BF report.
33	3.1	9	5.5	0.355	78	Webbers Cove	AB	Segments 35, 101, 12, 99, and 33 in this report considered collectively as Webbers Cove Fault in BF report. Fault not capable per BF report.
81	14.4	20	6.4	0.346			AB	Fault no addressed specifically in BF report, but covered generally with Arkoma Basin faults.
49	11.0	19	6.2	0.338	88	Black Gum	OU	Fault not capable per BF report.
22	18.6	23	6.5	0.323	82	Qualls-Welling	OU	Segments 22 and 119 in this report considered collectively as fault 82 in BF report. Fault not capable per BF report.
85	9.7	19	6.2	0.321	83	South Qualls	OU	Fault not capable per BF report.
79	29.5	27	6.8	0.300	93	Greasy Creek	OU	Intersects the north end of the Atkins fault (94 of BF report). Fault not capable per BF report.
57	9.5	20	6.1	0.296	90		OU	Segments 20, 57, and 80 considered collectively as fault 90 in BF report. Fault not capable per BF report.
78	8.5	20	6.1	0.278	27	Keefeton	CP	Segments 31 and 78 considered collectively as fault 27 in BF report. Fault not capable per BF report.
70	7.2	14	6.0	0.277	85			Segments 70 and 83 of this report considered collectively as fault 85 in BF report
37	15.2	25	6.4	0.254	95		OU	Fault 95 in BF report shown extending north to Akins fault. Fault not capable per BF report.
102	32.9	32	6.9	0.250	12		CP	Fault not capable per BF report.
53	28.3	31	6.8	0.246	78A	S. Muskogee	OU	Segments 18, 66, 54, 56, and 65 considered collectively as fault 94 in BF report. Fault not capable per BF report.
39	5.3	14	5.8	0.241	79		CP	Fault not capable per BF report.
18	4.6	14	5.7	0.239	94	Akins	OU	Fault not capable per BF report.
20	5.7	15	5.8	0.228	90		OU	Segments 20, 57, and 80 considered collectively as fault 90 in BF report. Fault not capable per BF report.
35	3.4	13	5.5	0.217	78	Webbers Cove	AB	Segments 35, 101, 12, 99, and 33 in this report considered collectively as Webbers Cove Fault in BF report. Fault not capable per BF report.

(1) OU = Ozark Uplift; AB = Arkoma Basin; CP = Cherokee Platform

As shown in Table 6, the faults of interest fall within one of three tectonic provinces: Ozark Uplift, Cherokee Platform, or Arkoma Basin. In the Black Fox report, ages of faults were estimated using surface geological studies, reconnaissance photogeologic evaluations, published subsurface data, analyses of limited amounts of oil and gas well drilling data, and field review of selected structures. As discussed in the Black Fox Geotechnical Investigations, and paraphrased below, no faults within the study area of these provinces are considered capable. Selected sections of the Black Fox Geotechnical Investigation are included as an attachment to this memo.

Ozark Uplift. There are only a few cases in the western Ozark Uplift where there is field evidence that can closely date the fault movement. In these cases, the latest fault movements are dated as post-Mississippian and pre-middle Pennsylvanian in age. Faults in the southwestern part of the Ozark uplift that are overlain by undisturbed Quaternary terrace deposits along the Verdigris and Arkansas Rivers are estimated as older than 0.6 million years. Indirect evidence of age of the Ozark Uplift faults is seen in the relationship of topography to faulting. "While some of the faults have a strong effect on the general alignment of stream valleys, topographic offset equivalent to the stratigraphic displacement is lacking. In fact, post-faulting erosion has, in some places, produced topographic ridges on the downthrown side of faults where the downdropped rocks are more resistant to erosion than those in the adjacent upthrown block. This type of evidence indicates that a considerable lapse of time has occurred in these locations since the latest movements on the faults." As stated in the Black Fox report, faulting within the Ozark Uplift is interpreted to have ceased by the end of Permian time (225 million years before present).

Cherokee Basin-Central Oklahoma Platform Province. Published subsurface studies of the province within Oklahoma indicate that structural relief is much greater in pre-Middle Pennsylvanian rock than it is at the surface in rocks of that age. This decrease in fold amplitude indicates that the most important period of folding and faulting may have occurred prior to late Middle Pennsylvanian time. Photogeologic reconnaissance of a part of this province adjacent to the Black Fox site indicates that no deformation of Quaternary beds overlying Pennsylvanian rocks (along the Arkansas River) has taken place. None of the surface faults in this province are believed to be capable faults.

Arkoma Basin Province. As stated in the Black Fox report, faulting and folding in the Arkoma Basin began during deposition of Atokan and early Desmoinesian strata, as indicated by numerous unconformities and conglomerates in this section and by the thinning of strata over growing folds. The youngest rocks within the basin, of middle Desmoinesian strata, are folded and faulted. In a general sense, the latest age of movement on faults in this province is established by the unconformable overlap of the entire province by Mesozoic and Cenozoic strata of the Mississippi Embayment in eastern Arkansas. In addition, the close relationship between the structures of the Ouachita Mountains Uplift and those of the Arkoma Basin indicates a broad similarity in age of the structures in these provinces. The deposition of Cretaceous strata over a profound erosional unconformity along the south flanks of the Ouachita Mountains Uplift places an upper limit on the major period of deformation in southern Oklahoma. The only evident post-Cretaceous structural activity appears to have been mild uplift of the region. Within this framework of regional structural history, there is no evidence that any of the surface faults in this province have been active since before Cretaceous time (135 million years before present).

Because none of the faults listed in Table 6 are considered active, the upper limit of the peak horizontal acceleration considering all other known faults to be active can be estimated to be 0.27 g or less (equal to or less than the peak horizontal acceleration based on the random earthquake analysis). There are no known faults that meet the ~~minimum length~~ requirements (set by 10 CFR 100 Appendix A III) that are not covered by the 200-mile radius study area of the Black Fox report. The Black Fox report found no evidence of any active faults. Crone and Wheeler (2000) indicate the only active faults in the study area are the Meers fault and the Humboldt fault zone. As shown in Table 5, the peak horizontal acceleration due to these faults is 0.019 g.

Based on random earthquake analyses, existing faults, and recorded seismic events, the design peak horizontal acceleration is 0.27 g. This compares to a design Safe Shutdown Earthquake (SSE) of 0.12 g acceleration for the Black Fox site (Shannon and Wilson, 1975). Likewise, the random earthquake analysis for the Arcadia Dam site (located approximately 130 miles west of SFC site) determined a peak ground acceleration of 0.12 g based on a 2000-year recurrence interval and a 95 % non-exceedance probability.

4. Potential For Ground-Motion Amplification

In order to confirm that amplification of ground motion is not anticipated as seismic waves are propagated upward through the sedimentary rocks underlying the disposal cell site, more information regarding the soil profile is provided. The disposal cell will be constructed on sandstone and siltstone units of the Pennsylvanian Atoka Formation. Geologic cross sections of the site area with these units and their geologic descriptions are provided in MFG (2002). The SFC site is located at the top of the drainage in the area, so that unconsolidated soil-like materials on top of the Atoka Formation rocks are of limited thickness. Terrace deposits and highly weathered portions of the Atoka Formation in the site area are on the order of ten to twenty feet thick. In addition, most of these surficial soils in the disposal cell area will be excavated during subsoil cleanup operations and placed and compacted in the disposal cell during site reclamation.

The underlying Atoka Formation units are of the same geologic age and the same geophysical province as the Pennsylvanian units evaluated in the Black Fox Geotechnical Investigation. Measured shear wave velocities at Black Fox were greater than 2,000 feet per second in the upper weathered zone (20 to 30 feet thick), and were greater than 4,000 feet per second below the weathered zone.

The National Earthquake Hazard Reduction Program (FEMA, 1995) and the International Building Code (IBCO, 2000) site class definitions for these materials are site class B in the upper 20 to 30 feet, and site class A below this depth. The corresponding ground-motion amplification through these materials is expected to be negligible.

5. Mean Circle Radius

The mean circle radius used in evaluating the random earthquake event roughly followed the procedure described in the Lawson (1985) paper that is included as an attachment to this memo.

As described in the Facility Seismicity Evaluation (MFG, 2003), historical earthquake events were ranked according to magnitude for each tectonic province. The spatial distribution of the earthquakes is uniform across the province. From this data, a magnitude versus frequency relationship is developed. However, because of the characteristics of a uniform distribution, a larger province area will have more data, and therefore, a larger projected magnitude for a given recurrence interval. For a uniform distribution, if the area in question were cut in half, the historical occurrence of earthquakes would also be cut in half. Also with a uniform distribution, the magnitude versus frequency relationship becomes zero at a point. For example, the probability of having a 5.0 magnitude earthquake at a finite point at the site is infinitesimally small. However, the probability of having this same earthquake within 20 miles of the site is quantifiable, and the probability of having that earthquake within 200 miles of the site is greater than the probability of the event occurring within 20 miles of the site.

In order to correct for the bias to province area, the magnitude versus frequency relationship must be corrected for area. In the Lawson (1985) paper, frequency relationships were divided by 1,000 km^2 in order to normalize the data of larger provinces. Rather than normalize the data to 1,000 km^2, frequency relationships were normalized to 1 km^2 for this study. However, to use the attenuation relationships developed by Campbell (2003), Atkinson and Boore (1995), and others, a definable distance between the site and the epicenter of a seismic event is required. The magnitude associated with a certain recurrence interval applies to an area, not a point. Assuming the site itself is at the center of the area in question, the radius r_0 is the radius of a circle within which an earthquake of magnitude M will have a certain probability of occurring. To apply the event at the site would provide unrealistically high accelerations, while to apply it at the outer limits of the area (i.e. at r_0) would be unconservative. Therefore, the event was applied at the mean radius of the circle ($\sqrt{2}\ r_0$). This mean radius represents the radius at which half the area within the circle is located closer to the site, and half the area within the circle is located farther from the site.

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Attachment 2

Table A.1 Maximum Credible Earthquake and Site Ground Vibratory Motion for Critical Faults

Table A.1. Maximum Credible Earthquake and Site Ground Vibratory Motion for Critical Faults

Fault ID [1]	Fault Length (km)	Distance from Site (km)	MCE (Slemmons, 1982, normal faults)	MCE (Slemmons, 1982, reverse faults)	Horizontal Acceleration at Site (Campbell, 1981) (g)	Horizontal Acceleration at Site (Atkinson and Boore, 1995) (g)	Horizontal Acceleration at Site (Campbell, 2003) (g)	Comments
Faults Located Within 20 miles of Site								
103	42.1	1	7.0		0.661	22.127	1.403	Marble City fault, not capable
79	29.5	27	6.8		0.124	0.340	0.300	Not capable, per BF report
53	28.3	31	6.8		0.108	0.292	0.246	Not capable, per BF report
50	21.1	19	6.6		0.145	0.446	0.416	Not capable, per BF report
22	18.6	23	6.5		0.120	0.363	0.323	Not capable, per BF report
95	15.7	16	6.4		0.150	0.492	0.464	Not capable, per BF report
37	15.2	25	6.4		0.100	0.300	0.254	Not capable, per BF report
82	15.2	28	6.4		0.092	0.273	0.224	Not capable, per BF report
81	14.4	20	6.4		0.121	0.383	0.346	Not capable, per BF report
65	11.9	30	6.3		0.076	0.226	0.175	Not capable, per BF report
49	11.0	19	6.2		0.115	0.373	0.338	Not capable, per BF report
93	10.0	25	6.2		0.086	0.267	0.221	Not capable, per BF report
85	9.7	19	6.2		0.109	0.356	0.321	Not capable, per BF report
57	9.5	20	6.1		0.103	0.333	0.296	Not capable, per BF report
52	9.3	31	6.1		0.068	0.205	0.154	Not capable, per BF report
83	9.0	14	6.1		0.136	0.473	0.450	Not capable, per BF report
58	8.8	23	6.1		0.085	0.269	0.225	Not capable, per BF report
77	8.5	26	6.1		0.076	0.238	0.191	Not capable, per BF report
78	8.5	20	6.1		0.097	0.316	0.278	Not capable, per BF report
56	8.2	22	6.1		0.087	0.277	0.235	Not capable, per BF report
31	7.9	29	6.0		0.066	0.203	0.154	Not capable, per BF report
43	7.6	21	6.0		0.088	0.283	0.243	Not capable, per BF report
76	7.5	30	6.0		0.063	0.193	0.145	Not capable, per BF report
70	7.2	14	6.0		0.122	0.423	0.277	Not capable, per BF report
74	6.6	32	5.9		0.056	0.172	0.081	Not capable, per BF report
6	6.2	29	5.9		0.059	0.182	0.088	Not capable, per BF report
24	6.2	25	5.9		0.069	0.218	0.114	Not capable, per BF report
45	6.0	27	5.9		0.064	0.200	0.101	Not capable, per BF report
72	5.8	23	5.9		0.071	0.227	0.121	Not capable, per BF report
20	5.7	15	5.8		0.105	0.358	0.228	Not capable, per BF report
80	5.5	29	5.8		0.056	0.176	0.085	Not capable, per BF report
75	5.4	30	5.8		0.054	0.168	0.079	Not capable, per BF report
39	5.3	14	5.8		0.108	0.372	0.241	Not capable, per BF report
63	5.2	26	5.8		0.060	0.190	0.095	Not capable, per BF report
48	5.1	28	5.8		0.056	0.175	0.084	Not capable, per BF report
97	4.9	27	5.8		0.058	0.184	0.091	Not capable, per BF report
62	4.8	28	5.7		0.055	0.172	0.083	Not capable, per BF report
23	4.6	29	5.7		0.052	0.164	0.078	Not capable, per BF report

Table A.1. Maximum Credible Earthquake and Site Ground Vibratory Motion for Critical Faults (cont)

Fault ID	Fault Length (km)	Distance from Site (km)	MCE (Slemmons, 1982, normal faults)	MCE (Slemmons, 1982, reverse faults)	Horizontal Acceleration at Site (Campbell, 1981) (g)	Horizontal Acceleration at Site (Atkinson and Boore, 1995) (g)	Horizontal Acceleration at Site (Campbell, 2003) (g)	Comments
Faults Located Within 20 miles of Site								
18	4.6	14	5.7		0.105	0.366	0.239	Not capable, per BF report
59	4.6	29	5.7		0.052	0.163	0.077	Not capable, per BF report
99	4.4	8	5.7		0.168	0.659	0.472	South Fault of Warner Uplift, not capable
41	4.2	29	5.7		0.050	0.159	0.075	Not capable, per BF report
27	4.0	20	5.6		0.070	0.229	0.129	Not capable, per BF report
46	4.0	31	5.6		0.045	0.140	0.063	Not capable, per BF report
73	3.9	30	5.6		0.047	0.147	0.068	Not capable, per BF report
47	3.8	32	5.6		0.043	0.134	0.060	Not capable, per BF report
66	3.7	18	5.6		0.075	0.249	0.146	Not capable, per BF report
71	3.5	24	5.6		0.056	0.179	0.092	Not capable, per BF report
35	3.4	13	5.5		0.095	0.330	0.217	Not capable, per BF report
44	3.4	22	5.5		0.058	0.187	0.099	Not capable, per BF report
42	3.2	20	5.5		0.062	0.203	0.112	Not capable, per BF report
51	3.2	27	5.5		0.048	0.152	0.073	Not capable, per BF report
69	3.2	14	5.5		0.087	0.298	0.191	Not capable, per BF report
38	3.1	26	5.5		0.049	0.157	0.077	Not capable, per BF report
26	3.1	23	5.5		0.054	0.175	0.090	Not capable, per BF report
33	3.1	9	5.5		0.132	0.490	0.355	Not capable, per BF report
29	3.1	26	5.5		0.048	0.153	0.075	Not capable, per BF report
68	3.0	12	5.5		0.100	0.348	0.236	Not capable, per BF report
Hypothetical	3.0	8	5.5		0.137	0.514	0.375	
Faults Located Within 50 Miles of Site								
102	32.9	32	6.9		0.112	0.294	0.250	Not capable, per BF report
105	25.9	39	6.7		0.085	0.220	0.169	Not capable, per BF report
104	22.7	47	6.7		0.068	0.174	0.122	Not capable, per BF report
110	18.9	79		6.9	0.049	0.104	0.073	Not capable, per BF report
111	18.1	73		6.9	0.052	0.114	0.074	Not capable, per BF report
Hypothetical	18.1	32		6.9	0.112	0.293	0.250	
200	50.0	61	7.1		0.074	0.157	0.113	Not capable, per BF report
201	29.4	61	6.8		0.059	0.136	0.089	Not capable, per BF report
203	14.1	74	6.4		0.034	0.086	0.049	Not capable, per BF report
204	12.4	76	6.3		0.031	0.079	0.045	Not capable, per BF report
205	10.6	75	6.2		0.029	0.076	0.042	Not capable, per BF report
202	10.5	63	6.2		0.035	0.095	0.053	Not capable, per BF report
209	10.1	58	6.2		0.038	0.103	0.059	Not capable, per BF report
207	8.5	76	6.1		0.026	0.069	0.038	Not capable, per BF report
208	6.7	79	5.9		0.022	0.060	0.021	Not capable, per BF report
206	4.1	69	5.7		0.020	0.057	0.017	Not capable, per BF report

Table A.1. Maximum Credible Earthquake and Site Ground Vibratory Motion for Critical Faults (cont)

Fault ID	Fault Length (km)	Distance from Site (km)	MCE (Slemmons, 1982, normal faults)	MCE (Slemmons, 1982, reverse faults)	Horizontal Acceleration at Site (Campbell, 1981) (g)	Horizontal Acceleration at Site (Atkinson and Boore, 1995) (g)	Horizontal Acceleration at Site (Campbell, 2003) (g)	Comments
Faults Located Within 100 Miles of Site								
106	36.7	100		7.2	0.050	0.089	0.084	Not capable, per BF report
108	36.2	135	6.9		0.029	0.052	0.054	Not capable, per BF report
107	34.9	123	6.9		0.032	0.059	0.058	Not capable, per BF report
113	26.8	94		7.1	0.048	0.091	0.077	Not capable, per BF report
Hypothetical	26.8	80		7.1	0.055	0.110	0.083	
211	10.2	158		6.6	0.019	0.035	0.033	Not capable, per BF report
216	109.7	145		7.8	0.054	0.063	0.096	Not capable, per BF report
212	76.2	118		7.6	0.057	0.081	0.102	Not capable, per BF report
210	88.7	102	7.4		0.059	0.094	0.098	Not capable, per BF report
217	85.1	147		7.6	0.048	0.060	0.085	Not capable, per BF report
215	61.6	119		7.5	0.052	0.077	0.094	Not capable, per BF report
213	51.5	151		7.4	0.038	0.054	0.068	Not capable, per BF report
214	23.3	105		7.0	0.040	0.076	0.068	Not capable, per BF report
Faults Located Within 150 Miles of Site								
109	118.0	202	7.6		0.034	0.037	0.053	Not capable, per BF report
114	35.6	173	6.9		0.022	0.036	0.037	Not capable, per BF report
219	80.5	162		7.6	0.042	0.051	0.073	Not capable, per BF report
221	72.2	232	7.3		0.023	0.026	0.034	Not capable, per BF report
220	39.3	190	7.0		0.021	0.032	0.034	Not capable, per BF report
Humboldt	---	225.26	6.5		0.012	0.019	0.017	Humboldt
Faults Located Within 200 Miles of Site								
Meers Fault	54.0	306	7.2		0.015	0.015	0.019	Meers Fault

(1) Fault ID corresponds to numbers shown on Figures 3.3 through 3.7 of the MFG (2003) Facility Seismicity Evaluation.