G

APPENDIX G
HAZARD INPUT DOCUMENT

G.1 Overview

This appendix provides instructions on how to implement and apply the Updated EPRI (2004, 2006) Ground Motion Model (GMM) developed in this project. The material in the sections that follow (together with the computer files referenced therein) defines the model in sufficient detail that it can be coded by a knowledgable practitioner, even one with no direct involvement with this project. Section G.3 provides guidance for the hazard analysts who may use the GMM.

By design, the HID contains all the information required for a future user to implement and exercise the model within a PSHA, but it does not include the technical basis or justification for the elements of the model. Therefore, this appendix contains no arguments or data in support of the model, and no cross-references to portions of the report where these arguments and data are provided. The purpose of the HID is to ensure that the expert assessments made by the TI Team are captured fully and accurately and delivered for use by the hazard analyst for a PSHA at a specific site. This HID was used by this project's hazard analysts to carry out hazard calculations at seven demonstration sites, as summarized in Chapter 8.

G.2 Hazard Input Document

G.2.1 Cluster and Curve Weights

The cluster weights are given in Table G.2.1-1 for both repeated large-magnitude earthquake (RLME) sources and distributed seismicity (general area) sources. More details regarding RLME and distributed seismicity sources are provided in Section G.3.3 below. As in EPRI (2004), there are three alternative branches for each cluster (denoted low, median, and high), with weights of 0.185, 0.63, and 0.185, respectively.

G.2.2 Definition of Midcontinent and Gulf Coast Regions

The map on Figure G.2.2-1 shows the revised definition of the Gulf Coast crustal region. The coordinates of the Gulf Coast region polygon are provided as file *CEUS_gulfsourceregion.dat*. More details regarding the choice between the Midcontinent and Gulf Coast GMPEs are provided in Section G.3.2 below.

G.2.3 Functional Form of GMPEs (Midcontinent and Gulf Coast)

Clusters 1 and 3 use one functional form (with 15 coefficients), Cluster 2 uses a second functional form (with 14 coefficients), and Cluster 4 uses a third functional form (the same functional form used in EPRI, 2004 for Cluster 4).[1] The functional forms for Clusters 1 through 3 are coded in file *EPRI_medians.f*, and key portions are listed below. Unless indicated otherwise, all magnitudes are moment magnitudes[2] and all distances are Joyner-Boore distances (R_{JB}).

Equations for Clusters 1 and 3 (see also Equation 7.6.2-1):

```
dpth = exp(C(12)+C(13)*amag)
rr = sqrt(Rjb**2 + dpth**2)

gamma = C(10)+C(11)*amag

R1 = min(rr,C(14))
R2 = max( min( rr/C(14),C(15)/C(14) ), 1.)
R3 = max( rr/C(15) ,1. )
R1 = LOG(R1)
R2 = LOG(R2)
R3 = LOG(R3)

term = C(1)+C(2)*amag+C(3)*amag**2
geom = (C(4)+C(5)*amag)*R1 +
. (C(6)+C(7)*amag)*R2 +
. (C(8)+C(9)*amag)*R3

EPRI_2012_median_C1C3 = term + geom + gamma*rr
```

Equations for Cluster 2 (see Equation 7.6.2-2):

```
CC = exp(c(11) + c(12)*min(amag,c(14)) + c(13)*max(0.,amag-c(14)))
rr = rjb + CC

gamma = c(8) + c(9)*min(amag,c(14)) + c(10)*max(0.,amag-c(14))

term = c(1)+c(2)*amag+c(3)*amag**2 + c(4)*amag**3

slope = c(5)+c(6)*min(amag,c(14)) + c(7)*max(0.,amag-c(14))
geom = slope*log(rr)

EPRI_2012_median_C2 = term + geom + gamma*rr
```

The coefficients for the Midcontinent (for Clusters 1 through 4, all branches, and all frequencies) are given in Tables G.2.3-1 through G.2.3-5 and in computer files *Cluster_March_Branch.csv*,

[1] See equation identified as F4 on page F-3 of EPRI (2004).

[2] Magnitudes are denoted by M or **M**, or by `amag` in the source-code segments.

where Cluster is either C1, C2, or C3, CR4, and C4NR; and Branch is 05, 50, or 95 denoting low, median, and high, respectively. The coefficients for the Gulf Coast region are given in Tables G.2.3-6 through G.2.3-10 and in computer files *ClusterG_March_Branch.csv*, where the letter G after the cluster name differentiates the Gulf Coast coefficients from the Midcontinent coefficients. Files with a .csv extension may be opened and manipulated in Excel or as ASCII files. It may be convenient to combine them into one large file and perhaps reorganize them by frequency.

Check values for all frequencies and curves and for selected magnitudes and frequencies (based on the original implementations in the **R** language) are given in file *GMPE_medians_March.xlsx* for the Midcontinent and in *GMPE_medians_Gulf_March.xlsx* for the Gulf Coast.

G.2.4 Functional Form and Associated Sigma for Conversion from Epicentral Distance to R_{JB}

Use the functional form in Equation 7.8.1-1 reproduced below (also Eq. G-1 of EPRI, 2004) for all clusters.

$$R_{JB} = R_{Epicentral} \times \left[1 - 1/\cosh\{R_{Adj}\}\right]$$

$$R_{Adj} = C_1 + C_2(\mathbf{M} - 6) + C_3 \ln(R')$$

$$R' = \sqrt{R_{Epicentral}^2 + H^2} \qquad \text{(G.2.4-1)}$$

$$H = \exp\{C_4 + C_5(\mathbf{M} - 6)\}$$

The additional standard deviation in ln[ground-motion amplitude] is given by Equation 7.8.2-1 reproduced below (also Eq. G-4 in EPRI, 2004)

$$\sigma_{Additional} = \frac{F_1\left[1 - 1/\cosh\{\min(F_2 + F_3 R_{Epicentral}, 50)\}\right]}{\cosh[\min\{F_4 \ln(R'/F_5), 50\}]}$$

$$R' = \sqrt{R_{Epicentral}^2 + F_5^2}$$

$$F_1 = \exp\{C_1 + C_2(\mathbf{M} - 6) + C_3(\mathbf{M} - 6)^2\}$$

$$F_2 = \exp\{C_4 + C_5(\mathbf{M} - 6)\} \qquad \text{(G.2.4-2)}$$

$$F_3 = \exp\{C_6 + C_7(\mathbf{M} - 6)\}$$

$$F_4 = \exp\{C_8 + C_9(\mathbf{M} - 6)\}$$

$$F_5 = \exp\{C_{10} + C_{11}(\mathbf{M} - 6)\}$$

Tables G.2.4-1 through G.2.4-8 give the coefficients for Equation G.2.4-1 and Tables G.2.4-9 through G.2.4-16 give the coefficients for Equation G.2.4-2. File *Distance_ConversionCoefficients_March.xlsx* contains coefficients for both equations. There are separate sets of coefficients for each cluster, and for both the cases of ruptures centered on the epicenters and randomly located on the epicenters. Note that, for the sake of consistency in the depth distributions used for the other three clusters, the distance adjustments for Cluster 4 should use the coefficients in the above file, rather than the ones in EPRI (2004).

Check values for the distance conversion and for the associated standard deviations are contained in files *Conversion_March.xlsx* and *Additional_Sigma_from_Distance_Conversion_March.xlsx.*

G.2.5 Aleatory Uncertainty

The model for aleatory uncertainty in ln[Amplitude] (sigma) contains two portions (a frequency- and magnitude-dependent portion and a distance-dependent portion), which should be combined with each other and with the aleatory uncertainty due to distance conversion (see above) using the square root of the sum of the squares (SRSS). The distance and frequency-dependent portion of sigma is tabulated for magnitudes 5, 6, and 7 in Table G.2.5-1. It should be interpolated linearly in **M** between 5 and 6 or between 6 and 7, and it should be treated as constant for magnitudes lower than 5 and greater than 7.

Values of the between-event (tau) and event-to-event (phi) components of this sigma have also been computed and are contained in Section 7.10. They are not included here because they are not needed for single-site PSHAs.

Figure G.2.5-1 shows the frequency- and magnitude-dependent sigma and shows the values from EPRI (2006) for comparison.

The distance-dependent portion of sigma (not included on Figure G.2.5-1) contains two branches, as follows:

- No distance-dependent effect (weight 0.6)
- Use Equation G.2.5-1 below (same as Eq. 6-7 of EPRI, 2006, with $a_1 = 0.16$) (weight 0.4)

$$\sigma_{Rjb} = \begin{cases} 0.16 & \text{for } R_{JB} \le 10\text{ km} \\ 0.16\left(1 - \dfrac{\ln(R_{JB}/10)}{\ln(20/10)}\right) & \text{for } 10\text{ km} < R_{JB} < 20\text{ km} \\ 0 & \text{for } R_{JB} \ge 20\text{ km} \end{cases} \qquad \text{(G.2.5-1)}$$

This representation is a two-branch approximation of the three-branch model developed in EPRI (2006).

G.3 User Instructions

This section contains guidance regarding the use of the GMPEs described above when performing a PSHA study. The main topics are the choice between the Midcontinent and Gulf

Coast GMPEs for a particular source and whether the Cluster 4 GMPEs should be used. In these and other matters of usage, the guidance provided in EPRI (2004) is generally followed.

G.3.1 Range of Applicability

The GMM presented here is applicable to moment magnitudes (**M**) 5 to 8.5 and distances from 0 to 500 km. Although no data are available for magnitudes in the upper half of this magnitude range, the ensemble of selected models from the literature used inferences from other regions to constrain these estimates and provide a sufficiently wide range of epistemic uncertainty. It is also recognized that most of the hazard at CEUS sites and at frequencies of 5 Hz or greater comes from the lower half of this magnitude range.

Although magnitudes ≥ **M** 5 were emphasized, the GMM presented here may also be used for magnitudes between **M** 4 and **M** 5, if required for hazard studies that use the CAV (cumulative absolute velocity) filter. The GMM is also considered applicable to distances of 500–1,000 km, although the uncertainty is greater at these distances because less effort was spent on this distance range.

The GMM presented should not be used at distances greater than 1,000 km. The behavior of the selected models was not checked in this distance range and no comparisons to data beyond 1,000 km were performed. There are also indications that the data at these distances are affected by selection bias, where only unusually high recordings meet the signal-to-noise criteria and get processed.

G.3.2 Midcontinent vs. Gulf Coast Regions

The geographical boundary between the Midcontinent and Gulf Coast regions was presented on Figure G.2.2-1. In cases where a source is wholy or partially within one region and the site is within another, the selection between the Midcontinent and Gulf Coast model is not straightforward. It is recommended that the hazard analyst select the region that contains the majority of the travel path, which may be defined as the minimum distance from the source to the site.

It is also appropriate to prorate the Midcontinent and Gulf Coast ground-motion amplitudes, taking into account the fraction of the source-site path that is contained within each region. In that case, the ground-motion amplitude should be calculated as the distance-weighted logarithmic average of the ground motions computed for the Midcontinent and Gulf Coast regions.

G.3.3 Use of Cluster 4 GMPEs

Following EPRI (2004), this project recommends that Cluster 4 be used only for sources whose main contribution to hazard comes from magnitudes above 6.0.[3] In the context of the CEUS-SSC study (EPRI/DOE/NRC, 2012), this recommendation may be translated into the recommendation that Cluster 4 be used only for RLME sources. Two variants of the Cluster 4 GMPEs consider

[3] EPRI (2004) refers to these as non-general seismic sources.

whether or not the source is rifted. The choice between these two should be based on knowledge of the tectonics of the RLME under consideration.

For sites affected by both general area (distributed seismicity) and RLME sources, the approach illustrated on Figure G.3.3-1 (modified from Figure 5.4 of EPRI [2004]) should be used for building the proper correlations into the ground-motion logic tree.

G.3.4 Electronic Attachments

All the computer files referenced above are provided as electronic attachments to this Appendix, within a zip file. Table G.3.4-1 lists these files and contains a summary of their contents.

Table G.2.1-1
Cluster Weights

Cluster Number	Weight (RLME sources)	Weight (Distributed seismicity sources)
1	0.15	0.185
2	0.31	0.383
3	0.35	0.432
4	0.19	0.000

Table G.2.3-1
GMPE Coefficients for Cluster 1, Midcontinent Region (Sheet 1 of 2)

High Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	-1.741E+00	9.078E-01	-3.331E-02	-1.995E+00	1.193E-01	-2.112E+00	9.747E-02	-2.468E+00	1.570E-01
25	-2.065E+00	1.094E+00	-3.549E-02	-1.670E+00	7.244E-02	-2.404E+00	1.750E-01	-3.118E+00	2.572E-01
10	-1.502E+00	9.470E-01	-3.383E-02	-1.901E+00	1.158E-01	-1.758E+00	6.194E-02	-3.063E+00	2.703E-01
5	-3.787E+00	1.183E+00	-3.079E-02	-1.343E+00	4.361E-02	-1.148E+00	2.991E-03	-1.912E+00	1.223E-01
2.5	-8.305E+00	2.132E+00	-8.381E-02	-1.005E+00	-3.668E-04	-8.359E-01	-2.110E-02	-1.206E+00	3.171E-02
1	-1.705E+01	4.106E+00	-2.037E-01	-6.753E-01	-3.943E-02	-4.802E-01	-5.237E-02	-8.714E-01	8.667E-03
0.5	-2.298E+01	5.659E+00	-3.150E-01	-1.192E+00	3.643E-02	-1.836E-01	-1.069E-01	-4.637E-01	-4.932E-02
Median Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	-3.319E+00	1.268E+00	-6.382E-02	-1.892E+00	1.107E-01	-2.389E+00	1.557E-01	-2.497E+00	1.647E-01
25	-2.235E+00	1.212E+00	-5.816E-02	-1.880E+00	1.037E-01	-2.384E+00	1.443E-01	-2.642E+00	1.607E-01
10	-3.135E+00	1.306E+00	-6.238E-02	-1.754E+00	9.942E-02	-2.139E+00	1.316E-01	-2.400E+00	1.523E-01
5	-4.677E+00	1.557E+00	-7.678E-02	-1.658E+00	9.415E-02	-1.985E+00	1.268E-01	-2.071E+00	1.347E-01
2.5	-8.615E+00	2.453E+00	-1.346E-01	-1.551E+00	8.433E-02	-1.859E+00	1.176E-01	-1.877E+00	1.184E-01
1	-1.693E+01	4.368E+00	-2.544E-01	-1.378E+00	6.594E-02	-1.620E+00	9.272E-02	-1.642E+00	9.510E-02
0.5	-2.433E+01	6.022E+00	-3.514E-01	-1.258E+00	5.294E-02	-1.385E+00	6.748E-02	-1.433E+00	7.481E-02
Low Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	-4.848E+00	1.621E+00	-9.426E-02	-1.801E+00	1.038E-01	-2.658E+00	2.127E-01	-2.531E+00	1.731E-01
25	-2.088E+00	1.266E+00	-7.828E-02	-2.145E+00	1.427E-01	-2.327E+00	1.083E-01	-2.188E+00	6.719E-02
10	-4.659E+00	1.645E+00	-9.066E-02	-1.635E+00	8.719E-02	-2.496E+00	1.976E-01	-1.750E+00	3.638E-02
5	-6.172E+00	2.026E+00	-1.225E-01	-1.804E+00	1.179E-01	-2.993E+00	2.776E-01	-2.138E+00	1.328E-01
2.5	-9.963E+00	2.924E+00	-1.829E-01	-1.783E+00	1.187E-01	-3.206E+00	3.074E-01	-2.374E+00	1.777E-01
1	-1.778E+01	4.751E+00	-2.995E-01	-1.752E+00	1.182E-01	-3.106E+00	2.928E-01	-2.226E+00	1.522E-01
0.5	-2.586E+01	6.414E+00	-3.878E-01	-1.271E+00	6.127E-02	-2.640E+00	2.503E-01	-2.372E+00	1.943E-01

Table G.2.3-1
GMPE Coefficients for Cluster 1, Midcontinent Region (Sheet 2 of 2)

High Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
100	-7.989E-04	6.614E-05	1.841E+00	3.107E-02	70	130
25	-5.394E-04	-2.835E-05	1.356E+00	1.037E-01	70	130
10	-4.617E-04	-7.789E-05	1.923E+00	1.455E-02	70	130
5	-2.657E-03	2.064E-04	1.333E+00	9.310E-02	70	130
2.5	-2.793E-03	2.469E-04	8.951E-01	1.573E-01	70	130
1	-1.954E-03	1.450E-04	6.201E-01	1.938E-01	70	130
0.5	-2.172E-03	2.316E-04	1.575E+00	5.290E-02	70	130
Median Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
100	-9.028E-04	2.638E-05	1.781E+00	3.712E-02	70	130
25	-8.213E-04	2.740E-05	1.845E+00	3.645E-02	70	130
10	-1.312E-03	2.413E-05	1.783E+00	3.298E-02	70	130
5	-1.459E-03	2.092E-05	1.753E+00	2.906E-02	70	130
2.5	-1.222E-03	1.907E-05	1.749E+00	2.812E-02	70	130
1	-9.006E-04	1.591E-05	1.754E+00	2.622E-02	70	130
0.5	-6.909E-04	1.218E-05	1.714E+00	2.746E-02	70	130
Low Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
100	-9.935E-04	-1.544E-05	1.737E+00	4.032E-02	70	130
25	-1.056E-03	7.620E-05	2.378E+00	-3.753E-02	70	130
10	-2.131E-03	1.211E-04	1.679E+00	4.530E-02	70	130
5	-4.780E-04	-1.307E-04	1.829E+00	1.974E-02	70	130
2.5	-6.192E-05	-1.440E-04	1.904E+00	9.728E-03	70	130
1	-2.885E-04	-4.353E-05	2.028E+00	-6.279E-03	70	130
0.5	7.184E-04	-1.961E-04	1.743E+00	1.898E-02	70	130

Table G.2.3-2
GMPE Coefficients for Cluster 2, Midcontinent Region (Sheet 1 of 2)

High Curve									
Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9
100	-7.709E+00	3.787E+00	-5.000E-01	2.170E-02	-2.693E+00	3.243E-01	1.614E-01	-3.865E-03	-2.854E-05
25	3.463E-01	2.886E-01	4.643E-03	-1.578E-03	-2.500E+00	3.002E-01	1.519E-01	-4.288E-03	2.666E-05
10	-7.616E+00	4.280E+00	-6.293E-01	3.088E-02	-2.651E+00	3.058E-01	1.674E-01	-3.348E-03	6.314E-05
5	-2.282E+01	1.095E+01	-1.625E+00	8.046E-02	-2.544E+00	2.771E-01	1.768E-01	-2.797E-03	8.068E-05
2.5	-1.370E+01	5.552E+00	-7.189E-01	3.353E-02	-2.614E+00	2.899E-01	9.939E-02	-2.955E-03	2.950E-04
1	-4.622E+00	1.532E-02	1.854E-01	-1.315E-02	-3.128E+00	3.995E-01	5.889E-02	-3.016E-03	4.848E-04
0.5	-6.920E+00	1.103E-02	2.609E-01	-1.948E-02	-3.291E+00	4.352E-01	5.389E-02	-2.403E-03	4.176E-04
Median Curve									
Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9
100	-3.738E+00	2.318E+00	-2.634E-01	8.203E-03	-2.925E+00	3.044E-01	2.060E-01	-5.209E-03	2.607E-04
25	-3.297E+00	2.551E+00	-3.267E-01	1.261E-02	-2.951E+00	3.136E-01	2.043E-01	-5.333E-03	2.453E-04
10	-1.548E+00	1.581E+00	-1.876E-01	6.226E-03	-2.905E+00	3.141E-01	1.875E-01	-4.107E-03	2.144E-04
5	-1.182E+01	5.062E+00	-5.837E-01	2.059E-02	-2.424E+00	2.343E-01	1.604E-01	-3.891E-03	2.842E-04
2.5	-1.527E+01	5.412E+00	-5.534E-01	1.602E-02	-2.246E+00	2.193E-01	1.470E-01	-3.463E-03	3.825E-04
1	-2.030E+01	6.868E+00	-7.453E-01	2.524E-02	-2.530E+00	2.623E-01	1.747E-01	-2.268E-03	3.570E-04
0.5	-2.651E+01	8.708E+00	-9.685E-01	3.560E-02	-2.496E+00	2.609E-01	1.550E-01	-1.852E-03	3.285E-04
Low Curve									
Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9
100	9.375E+00	-3.378E+00	6.098E-01	-3.561E-02	-3.081E+00	2.714E-01	2.179E-01	-8.817E-03	8.775E-04
25	8.657E+00	-2.236E+00	4.056E-01	-2.389E-02	-3.485E+00	3.281E-01	1.994E-01	-8.201E-03	7.111E-04
10	-4.012E+00	2.860E+00	-3.493E-01	1.202E-02	-2.979E+00	2.882E-01	2.132E-01	-6.515E-03	6.072E-04
5	-2.431E+01	1.070E+01	-1.393E+00	5.803E-02	-2.230E+00	1.765E-01	1.822E-01	-5.683E-03	5.755E-04
2.5	-2.056E+01	7.546E+00	-8.576E-01	2.973E-02	-1.942E+00	1.713E-01	1.637E-01	-4.415E-03	4.946E-04
1	-3.454E+01	1.334E+01	-1.674E+00	6.694E-02	-1.970E+00	1.351E-01	2.772E-01	-2.111E-03	3.024E-04
0.5	-4.021E+01	1.472E+01	-1.802E+00	7.154E-02	-1.712E+00	9.196E-02	2.523E-01	-2.285E-03	3.816E-04

Table G.2.3-2
GMPE Coefficients for Cluster 2, Midcontinent Region (Sheet 2 of 2)

High Curve					
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**
100	1.343E-04	-3.671E+00	8.593E-01	-3.748E-01	5.8
25	1.158E-04	-6.680E-01	2.715E-01	-3.441E-01	5.8
10	4.686E-05	-4.119E-01	3.345E-01	-3.332E-01	5.8
5	-2.880E-05	-1.841E-01	3.630E-01	-5.366E-01	5.8
2.5	-5.291E-05	-1.300E+00	5.627E-01	-2.887E-01	5.8
1	-5.643E-05	-2.070E+00	6.302E-01	-1.715E-01	5.8
0.5	-6.663E-05	-1.904E+00	5.819E-01	-1.641E-01	5.8
Median Curve					
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**
100	-4.905E-05	5.719E-03	3.629E-01	-7.923E-02	5.8
25	-4.371E-05	6.974E-02	3.513E-01	-4.640E-02	5.8
10	-4.316E-05	3.146E-01	3.066E-01	-6.699E-02	5.8
5	-6.888E-05	-2.284E-01	4.259E-01	-1.991E-01	5.8
2.5	-9.736E-05	-1.516E+00	6.191E-01	-2.994E-01	5.8
1	-9.500E-05	-1.321E+00	5.725E-01	-2.209E-01	5.8
0.5	-9.018E-05	-1.083E+00	5.213E-01	-2.120E-01	5.8
Low Curve					
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**
100	-2.916E-04	2.025E+00	9.247E-02	1.355E-01	5.8
25	-2.179E-04	1.096E+00	3.018E-01	2.184E-01	5.8
10	-2.223E-04	6.107E-01	3.378E-01	7.885E-02	5.8
5	-1.698E-04	-4.214E-01	5.205E-01	-1.417E-01	5.8
2.5	-5.700E-05	-1.526E+00	6.114E-01	-2.739E-01	5.8
1	-1.211E-04	1.708E-01	3.537E-01	-1.513E-01	5.8
0.5	-1.491E-04	8.019E-01	2.328E-01	-1.221E-01	5.8

Table G.2.3-3
GMPE Coefficients for Cluster 3, Midcontinent Region (Sheet 1 of 2)

High Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	-1.152E+00	1.466E+00	-1.084E-01	-2.755E+00	1.739E-01	-4.456E-01	3.018E-02	-2.525E+00	1.684E-01
25	-2.207E-01	1.409E+00	-9.901E-02	-2.661E+00	1.510E-01	-4.064E-01	1.547E-02	-3.362E+00	1.852E-01
10	-2.407E+00	1.627E+00	-1.104E-01	-2.276E+00	1.435E-01	-2.181E-01	1.117E-02	-1.974E+00	1.192E-01
5	-5.689E+00	2.332E+00	-1.575E-01	-2.131E+00	1.365E-01	-2.260E-01	2.205E-02	-1.107E+00	5.907E-02
2.5	-1.043E+01	3.435E+00	-2.312E-01	-2.078E+00	1.362E-01	-2.418E-01	2.506E-02	-8.422E-01	3.742E-02
1	-1.792E+01	5.110E+00	-3.396E-01	-2.100E+00	1.465E-01	-2.985E-01	2.971E-02	-7.946E-01	3.720E-02
0.5	-2.103E+01	5.522E+00	-3.542E-01	-2.271E+00	1.738E-01	-2.850E-01	2.658E-02	-8.754E-01	5.484E-02
Median Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	-2.270E+00	1.679E+00	-1.277E-01	-2.649E+00	1.655E-01	-4.737E-02	-9.272E-03	-2.610E+00	1.876E-01
25	-1.350E+00	1.624E+00	-1.184E-01	-2.554E+00	1.425E-01	-7.665E-03	-2.411E-02	-3.471E+00	2.084E-01
10	-3.440E+00	1.818E+00	-1.282E-01	-2.176E+00	1.357E-01	1.136E-01	-1.666E-02	-1.999E+00	1.279E-01
5	-6.752E+00	2.532E+00	-1.758E-01	-2.015E+00	1.269E-01	6.214E-02	-3.979E-03	-1.122E+00	6.538E-02
2.5	-1.150E+01	3.635E+00	-2.495E-01	-1.961E+00	1.264E-01	4.284E-02	-4.893E-04	-8.568E-01	4.361E-02
1	-1.901E+01	5.311E+00	-3.578E-01	-1.982E+00	1.366E-01	2.700E-02	8.474E-04	-8.034E-01	4.278E-02
0.5	-2.222E+01	5.726E+00	-3.720E-01	-2.133E+00	1.624E-01	3.288E-02	-4.211E-04	-8.856E-01	6.077E-02
Low Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
100	-3.387E+00	1.892E+00	-1.469E-01	-2.544E+00	1.571E-01	3.513E-01	-4.880E-02	-2.695E+00	2.068E-01
25	-2.462E+00	1.837E+00	-1.377E-01	-2.450E+00	1.345E-01	3.929E-01	-6.395E-02	-3.581E+00	2.320E-01
10	-4.478E+00	2.011E+00	-1.461E-01	-2.074E+00	1.276E-01	4.439E-01	-4.426E-02	-2.023E+00	1.365E-01
5	-7.819E+00	2.732E+00	-1.941E-01	-1.898E+00	1.171E-01	3.467E-01	-2.948E-02	-1.137E+00	7.169E-02
2.5	-1.256E+01	3.837E+00	-2.678E-01	-1.844E+00	1.165E-01	3.279E-01	-2.606E-02	-8.706E-01	4.971E-02
1	-2.010E+01	5.511E+00	-3.759E-01	-1.865E+00	1.269E-01	3.541E-01	-2.821E-02	-8.142E-01	4.863E-02
0.5	-2.341E+01	5.931E+00	-3.897E-01	-1.996E+00	1.511E-01	3.506E-01	-2.736E-02	-8.959E-01	6.670E-02

Table G.2.3-3
GMPE Coefficients for Cluster 3, Midcontinent Region (Sheet 2 of 2)

High Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
100	-6.815E-04	1.348E-05	3.059E+00	-1.670E-01	70	140
25	1.003E-04	9.821E-06	2.950E+00	-1.377E-01	70	140
10	-1.846E-03	-1.132E-05	2.984E+00	-1.656E-01	70	140
5	-2.142E-03	-1.408E-05	2.984E+00	-1.734E-01	70	140
2.5	-1.503E-03	-1.647E-05	2.972E+00	-1.756E-01	70	140
1	-6.309E-04	-2.377E-05	2.931E+00	-1.693E-01	70	140
0.5	-1.901E-04	-3.068E-05	2.870E+00	-1.583E-01	70	140
Median Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
100	-1.255E-03	3.347E-05	3.049E+00	-1.689E-01	70	140
25	-4.193E-04	2.056E-05	2.934E+00	-1.382E-01	70	140
10	-2.493E-03	2.176E-05	2.980E+00	-1.694E-01	70	140
5	-2.706E-03	2.053E-05	2.979E+00	-1.778E-01	70	140
2.5	-2.063E-03	1.800E-05	2.965E+00	-1.801E-01	70	140
1	-1.216E-03	1.282E-05	2.921E+00	-1.738E-01	70	140
0.5	-7.902E-04	4.342E-06	2.859E+00	-1.638E-01	70	140
Low Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
100	-1.827E-03	5.335E-05	3.038E+00	-1.709E-01	70	140
25	-9.334E-04	3.054E-05	2.920E+00	-1.392E-01	70	140
10	-3.142E-03	5.509E-05	2.973E+00	-1.729E-01	70	140
5	-3.267E-03	5.484E-05	2.970E+00	-1.822E-01	70	140
2.5	-2.626E-03	5.281E-05	2.955E+00	-1.846E-01	70	140
1	-1.796E-03	4.872E-05	2.912E+00	-1.788E-01	70	140
0.5	-1.390E-03	3.937E-05	2.847E+00	-1.698E-01	70	140

Table G.2.3-4
GMPE Coefficients for Cluster 4 Rifted, Midcontinent Region

High Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
100	6.912E-01	9.348E-01	-7.286E-01	8.810E-02	-4.375E-03	-5.870E-01	1.757E-02	6.275E+00	6.4	8.5	50
25	1.378E+00	9.348E-01	-7.286E-01	8.810E-02	-4.375E-03	-5.870E-01	1.757E-02	6.275E+00	6.4	8.5	50
10	1.340E+00	9.348E-01	-7.286E-01	8.810E-02	-4.375E-03	-5.870E-01	1.757E-02	6.275E+00	6.4	8.5	50
5	1.244E+00	9.359E-01	-7.340E-01	8.912E-02	-4.500E-03	-5.671E-01	1.793E-02	6.319E+00	6.4	8.5	50
2.5	1.073E+00	9.358E-01	-7.188E-01	8.915E-02	-4.201E-03	-6.470E-01	-3.387E-02	6.324E+00	6.4	8.5	50
1	1.632E-01	9.320E-01	-7.525E-01	8.956E-02	-3.107E-03	-8.574E-01	-8.425E-02	6.322E+00	6.4	8.5	50
0.5	-6.014E-01	9.259E-01	-7.960E-01	8.983E-02	-1.662E-03	-	-1.226E-01	6.380E+00	6.4	8.5	50
Median Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
100	2.390E-01	8.050E-01	-6.790E-01	8.610E-02	-4.980E-03	-4.770E-01	0.000E+00	6.000E+00	6.4	8.5	50
25	9.260E-01	8.050E-01	-6.790E-01	8.610E-02	-4.980E-03	-4.770E-01	0.000E+00	6.000E+00	6.4	8.5	50
10	8.880E-01	8.050E-01	-6.790E-01	8.610E-02	-4.980E-03	-4.770E-01	0.000E+00	6.000E+00	6.4	8.5	50
5	7.930E-01	8.050E-01	-6.790E-01	8.610E-02	-4.980E-03	-4.770E-01	0.000E+00	6.000E+00	6.4	8.5	50
2.5	6.220E-01	8.050E-01	-6.640E-01	8.610E-02	-4.680E-03	-5.570E-01	-5.180E-02	6.000E+00	6.4	8.5	50
1	-3.070E-01	8.050E-01	-6.960E-01	8.610E-02	-3.620E-03	-7.550E-01	-1.020E-01	6.000E+00	6.4	8.5	50
0.5	-	8.050E-01	-7.280E-01	8.610E-02	-2.210E-03	-9.460E-01	-1.400E-01	6.000E+00	6.4	8.5	50
Low Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
100	-2.099E-01	6.754E-01	-6.303E-01	8.405E-02	-5.586E-03	-3.669E-01	-1.757E-02	5.711E+00	6.4	8.5	50
25	4.771E-01	6.754E-01	-6.303E-01	8.405E-02	-5.586E-03	-3.669E-01	-1.757E-02	5.711E+00	6.4	8.5	50
10	4.391E-01	6.754E-01	-6.303E-01	8.405E-02	-5.586E-03	-3.669E-01	-1.757E-02	5.711E+00	6.4	8.5	50
5	3.459E-01	6.743E-01	-6.251E-01	8.303E-02	-5.461E-03	-3.867E-01	-1.793E-02	5.662E+00	6.4	8.5	50
2.5	1.753E-01	6.744E-01	-6.103E-01	8.300E-02	-5.159E-03	-4.668E-01	-6.973E-02	5.657E+00	6.4	8.5	50
1	-7.732E-01	6.782E-01	-6.406E-01	8.261E-02	-4.133E-03	-6.525E-01	-1.198E-01	5.658E+00	6.4	8.5	50
0.5	-	6.843E-01	-6.616E-01	8.232E-02	-2.758E-03	-8.382E-01	-1.574E-01	5.595E+00	6.4	8.5	50

Table G.2.3-5
GMPE Coefficients for Cluster 4 Non-rifted, Midcontinent Region

High Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
100	8.738E-01	9.387E-01	-7.786E-01	6.695E-02	-5.406E-03	-4.105E-01	1.757E-02	6.276E+00	6.4	8.5	50
25	1.555E+00	9.387E-01	-7.786E-01	6.695E-02	-5.406E-03	-4.105E-01	1.757E-02	6.276E+00	6.4	8.5	50
10	1.527E+00	9.387E-01	-7.786E-01	6.695E-02	-5.406E-03	-4.105E-01	1.757E-02	6.276E+00	6.4	8.5	50
5	1.433E+00	9.399E-01	-7.840E-01	6.793E-02	-5.531E-03	-3.906E-01	1.793E-02	6.318E+00	6.4	8.5	50
2.5	1.306E+00	9.398E-01	-7.840E-01	6.795E-02	-4.903E-03	-5.125E-01	-3.387E-02	6.318E+00	6.4	8.5	50
1	3.346E-01	9.360E-01	-7.965E-01	6.837E-02	-3.468E-03	-7.609E-01	-8.425E-02	6.321E+00	6.4	8.5	50
0.5	-3.980E-01	9.300E-01	-8.229E-01	6.861E-02	-2.633E-03	-8.090E-01	-1.226E-01	6.384E+00	6.4	8.5	50
Median Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
100	4.180E-01	8.080E-01	-7.280E-01	6.510E-02	-6.010E-03	-3.010E-01	0.000E+00	6.000E+00	6.4	8.5	50
25	1.099E+00	8.080E-01	-7.280E-01	6.510E-02	-6.010E-03	-3.010E-01	0.000E+00	6.000E+00	6.4	8.5	50
10	1.071E+00	8.080E-01	-7.280E-01	6.510E-02	-6.010E-03	-3.010E-01	0.000E+00	6.000E+00	6.4	8.5	50
5	9.780E-01	8.080E-01	-7.280E-01	6.510E-02	-6.010E-03	-3.010E-01	0.000E+00	6.000E+00	6.4	8.5	50
2.5	8.510E-01	8.080E-01	-7.280E-01	6.510E-02	-5.380E-03	-4.230E-01	-5.180E-02	6.000E+00	6.4	8.5	50
1	-1.390E-01	8.080E-01	-7.390E-01	6.510E-02	-3.980E-03	-6.590E-01	-1.020E-01	6.000E+00	6.4	8.5	50
0.5	-9.320E-01	8.080E-01	-7.540E-01	6.510E-02	-3.180E-03	-7.020E-01	-1.400E-01	6.000E+00	6.4	8.5	50
Low Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
100	-3.467E-02	6.775E-01	-6.782E-01	6.322E-02	-6.614E-03	-1.914E-01	-1.757E-02	5.710E+00	6.4	8.5	50
25	6.464E-01	6.775E-01	-6.783E-01	6.322E-02	-6.614E-03	-1.914E-01	-1.757E-02	5.711E+00	6.4	8.5	50
10	6.183E-01	6.775E-01	-6.782E-01	6.322E-02	-6.614E-03	-1.914E-01	-1.757E-02	5.710E+00	6.4	8.5	50
5	5.269E-01	6.762E-01	-6.730E-01	6.224E-02	-6.489E-03	-2.113E-01	-1.793E-02	5.664E+00	6.4	8.5	50
2.5	4.000E-01	6.763E-01	-6.731E-01	6.222E-02	-5.858E-03	-3.334E-01	-6.973E-02	5.665E+00	6.4	8.5	50
1	-6.087E-01	6.801E-01	-6.826E-01	6.181E-02	-4.492E-03	-5.570E-01	-1.198E-01	5.660E+00	6.4	8.5	50
0.5	-	6.861E-01	-6.866E-01	6.156E-02	-3.727E-03	-5.948E-01	-1.574E-01	5.591E+00	6.4	8.5	50

Table G.2.3-6
GMPE Coefficients for Cluster 1, Gulf Region (Sheet 1 of 2)

High Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-2.159E+00	1.055E+00	-4.377E-02	-2.010E+00	1.163E-01	-2.207E+00	1.021E-01	-2.576E+00	1.453E-01
25 Hz	-2.405E+00	1.227E+00	-4.590E-02	-1.705E+00	7.282E-02	-2.519E+00	1.796E-01	-3.251E+00	2.478E-01
10 Hz	-1.944E+00	1.090E+00	-4.327E-02	-1.892E+00	1.096E-01	-1.934E+00	8.137E-02	-3.151E+00	2.588E-01
5 Hz	-4.064E+00	1.279E+00	-3.757E-02	-1.344E+00	4.074E-02	-1.216E+00	8.035E-03	-1.940E+00	1.092E-01
2.5 Hz	-8.421E+00	2.171E+00	-8.651E-02	-1.003E+00	-1.949E-03	-8.483E-01	-2.208E-02	-1.173E+00	1.950E-02
1 Hz	-1.709E+01	4.119E+00	-2.047E-01	-6.747E-01	-3.986E-02	-5.072E-01	-4.889E-02	-8.610E-01	5.250E-03
0.5 Hz	-2.303E+01	5.675E+00	-3.159E-01	-1.188E+00	3.527E-02	-2.029E-01	-1.033E-01	-4.462E-01	-5.320E-02
Median Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-3.833E+00	1.419E+00	-7.259E-02	-1.840E+00	9.716E-02	-2.303E+00	1.308E-01	-2.281E+00	1.016E-01
25 Hz	-2.753E+00	1.363E+00	-6.691E-02	-1.827E+00	9.000E-02	-2.312E+00	1.201E-01	-2.433E+00	9.792E-02
10 Hz	-3.540E+00	1.424E+00	-6.876E-02	-1.702E+00	8.629E-02	-2.074E+00	1.101E-01	-2.154E+00	8.372E-02
5 Hz	-4.928E+00	1.628E+00	-8.059E-02	-1.624E+00	8.616E-02	-1.934E+00	1.136E-01	-1.885E+00	8.987E-02
2.5 Hz	-8.736E+00	2.487E+00	-1.365E-01	-1.538E+00	8.120E-02	-1.835E+00	1.118E-01	-1.799E+00	1.004E-01
1 Hz	-1.698E+01	4.384E+00	-2.556E-01	-1.378E+00	6.559E-02	-1.621E+00	9.204E-02	-1.635E+00	9.224E-02
0.5 Hz	-2.438E+01	6.039E+00	-3.526E-01	-1.258E+00	5.250E-02	-1.389E+00	6.730E-02	-1.428E+00	7.216E-02
Low Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-5.161E+00	1.687E+00	-9.482E-02	-1.693E+00	8.118E-02	-2.406E+00	1.596E-01	-2.125E+00	8.030E-02
25 Hz	-2.399E+00	1.335E+00	-7.922E-02	-2.041E+00	1.206E-01	-2.072E+00	5.485E-02	-1.782E+00	-2.556E-02
10 Hz	-4.888E+00	1.691E+00	-8.995E-02	-1.533E+00	6.554E-02	-2.197E+00	1.349E-01	-1.158E+00	-9.290E-02
5 Hz	-6.307E+00	2.055E+00	-1.228E-01	-1.754E+00	1.078E-01	-2.802E+00	2.422E-01	-1.767E+00	5.952E-02
2.5 Hz	-1.004E+01	2.946E+00	-1.841E-01	-1.773E+00	1.163E-01	-3.093E+00	2.882E-01	-2.242E+00	1.521E-01
1 Hz	-1.781E+01	4.765E+00	-3.008E-01	-1.760E+00	1.190E-01	-3.024E+00	2.790E-01	-2.203E+00	1.469E-01
0.5 Hz	-2.590E+01	6.430E+00	-3.891E-01	-1.276E+00	6.175E-02	-2.617E+00	2.446E-01	-2.378E+00	1.930E-01

Table G.2.3-6
GMPE Coefficients for Cluster 1, Gulf Region (Sheet 2 of 2)

High Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
PGA	-2.002E-03	1.003E-04	1.823E+00	3.646E-02	70	140
25 Hz	-1.695E-03	1.211E-06	1.403E+00	9.841E-02	70	140
10 Hz	-1.728E-03	-2.839E-05	1.873E+00	2.476E-02	70	140
5 Hz	-4.090E-03	2.867E-04	1.347E+00	9.246E-02	70	140
2.5 Hz	-4.157E-03	3.217E-04	9.154E-01	1.543E-01	70	140
1 Hz	-2.798E-03	1.783E-04	6.314E-01	1.919E-01	70	140
0.5 Hz	-3.030E-03	2.659E-04	1.567E+00	5.423E-02	70	140
Median Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
PGA	-3.944E-03	3.559E-04	1.726E+00	4.827E-02	70	140
25 Hz	-3.849E-03	3.563E-04	1.794E+00	4.660E-02	70	140
10 Hz	-4.206E-03	3.411E-04	1.727E+00	4.437E-02	70	140
5 Hz	-3.740E-03	2.239E-04	1.713E+00	3.651E-02	70	140
2.5 Hz	-2.733E-03	1.108E-04	1.733E+00	3.074E-02	70	140
1 Hz	-1.701E-03	4.306E-05	1.752E+00	2.628E-02	70	140
0.5 Hz	-1.489E-03	3.894E-05	1.710E+00	2.799E-02	70	140
Low Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
PGA	-5.612E-03	5.755E-04	1.647E+00	5.708E-02	70	140
25 Hz	-5.674E-03	6.671E-04	2.294E+00	-2.215E-02	70	140
10 Hz	-6.687E-03	7.225E-04	1.599E+00	6.098E-02	70	140
5 Hz	-3.455E-03	1.765E-04	1.788E+00	2.717E-02	70	140
2.5 Hz	-1.718E-03	-3.409E-05	1.896E+00	1.100E-02	70	140
1 Hz	-1.056E-03	-2.064E-05	2.032E+00	-7.235E-03	70	140
0.5 Hz	4.521E-06	-1.806E-04	1.745E+00	1.833E-02	70	140

Table G.2.3-7
GMPE Coefficients for Cluster 2, Gulf Region (Sheet 1 of 2)

High Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-1.348E+01	6.288E+00	-8.261E-01	3.637E-02	-2.332E+00	2.323E-01	1.431E-01	-1.020E-02	9.570E-04
25 Hz	-4.854E+00	2.590E+00	-3.011E-01	1.228E-02	-2.178E+00	2.169E-01	1.410E-01	-1.060E-02	1.003E-03
10 Hz	-1.038E+01	5.510E+00	-7.915E-01	3.802E-02	-2.476E+00	2.611E-01	1.652E-01	-7.719E-03	6.269E-04
5 Hz	-2.398E+01	1.152E+01	-1.699E+00	8.346E-02	-2.467E+00	2.529E-01	1.817E-01	-6.146E-03	4.922E-04
2.5 Hz	-1.398E+01	5.664E+00	-7.283E-01	3.376E-02	-2.572E+00	2.786E-01	9.559E-02	-4.864E-03	4.654E-04
1 Hz	-4.568E+00	-6.739E-03	1.896E-01	-1.340E-02	-3.135E+00	3.998E-01	5.857E-02	-3.827E-03	5.124E-04
0.5 Hz	-6.872E+00	-9.137E-03	2.649E-01	-1.972E-02	-3.297E+00	4.354E-01	5.355E-02	-3.215E-03	4.453E-04
Median Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-7.318E+00	3.559E+00	-3.206E-01	1.024E-02	-2.351E+00	1.232E-01	6.287E-02	-9.814E-03	1.130E-03
25 Hz	-6.973E+00	3.767E+00	-3.741E-01	1.444E-02	-2.318E+00	1.207E-01	4.836E-02	-1.010E-02	1.146E-03
10 Hz	-6.846E+00	3.633E+00	-4.308E-01	1.721E-02	-2.492E+00	2.198E-01	1.287E-01	-8.037E-03	7.200E-04
5 Hz	-1.262E+01	5.230E+00	-5.774E-01	1.996E-02	-2.244E+00	1.928E-01	1.206E-01	-6.240E-03	4.982E-04
2.5 Hz	-1.568E+01	5.587E+00	-5.757E-01	1.713E-02	-2.228E+00	2.135E-01	1.393E-01	-4.703E-03	4.182E-04
1 Hz	-2.035E+01	6.901E+00	-7.501E-01	2.546E-02	-2.539E+00	2.630E-01	1.749E-01	-3.004E-03	3.702E-04
0.5 Hz	-2.658E+01	8.750E+00	-9.747E-01	3.588E-02	-2.504E+00	2.614E-01	1.552E-01	-2.591E-03	3.422E-04
Low Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	5.464E+00	-4.022E-01	2.498E-01	-1.879E-02	-3.455E+00	1.673E-01	1.472E-01	-6.612E-03	8.848E-04
25 Hz	5.750E+00	1.829E-01	1.663E-01	-1.235E-02	-3.762E+00	1.832E-01	7.175E-02	-5.867E-03	7.320E-04
10 Hz	-5.944E+00	2.884E+00	-2.267E-01	6.533E-03	-2.298E+00	1.252E-01	2.414E-02	-8.916E-03	9.041E-04
5 Hz	-2.447E+01	1.032E+01	-1.281E+00	5.258E-02	-1.924E+00	1.114E-01	9.318E-02	-7.352E-03	6.638E-04
2.5 Hz	-2.088E+01	7.698E+00	-8.788E-01	3.082E-02	-1.942E+00	1.693E-01	1.583E-01	-5.389E-03	4.770E-04
1 Hz	-3.456E+01	1.337E+01	-1.678E+00	6.705E-02	-1.983E+00	1.360E-01	2.787E-01	-2.795E-03	3.060E-04
0.5 Hz	-4.021E+01	1.474E+01	-1.805E+00	7.161E-02	-1.724E+00	9.269E-02	2.538E-01	-2.972E-03	3.856E-04

Table G.2.3-7
GMPE Coefficients for Cluster 2, Gulf Region (Sheet 2 of 2)

High Curve					
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**
PGA	9.728E-05	-2.734E+00	7.812E-01	9.945E-02	5.8
25 Hz	5.811E-05	-5.688E-01	3.571E-01	1.309E-01	5.8
10 Hz	1.699E-05	-1.485E-01	3.262E-01	-1.318E-01	5.8
5 Hz	-8.754E-05	2.598E-01	3.073E-01	-4.064E-01	5.8
2.5 Hz	-3.632E-05	-1.190E+00	5.515E-01	-2.381E-01	5.8
1 Hz	-5.057E-05	-2.060E+00	6.310E-01	-1.659E-01	5.8
0.5 Hz	-6.064E-05	-1.913E+00	5.863E-01	-1.583E-01	5.8
Median Curve					
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**
PGA	3.098E-04	-3.146E-01	5.480E-01	2.998E-01	5.8
25 Hz	3.307E-04	-4.263E-01	5.719E-01	3.344E-01	5.8
10 Hz	1.917E-04	-3.855E-01	4.734E-01	1.704E-01	5.8
5 Hz	1.564E-04	-4.591E-01	4.855E-01	-3.326E-02	5.8
2.5 Hz	-2.063E-05	-1.497E+00	6.216E-01	-2.513E-01	5.8
1 Hz	-8.752E-05	-1.286E+00	5.683E-01	-2.155E-01	5.8
0.5 Hz	-8.278E-05	-1.054E+00	5.183E-01	-2.071E-01	5.8
Low Curve					
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**
PGA	-1.103E-04	2.106E+00	2.331E-01	2.184E-01	5.8
25 Hz	1.464E-05	1.441E+00	3.907E-01	2.705E-01	5.8
10 Hz	4.751E-04	-7.493E-01	6.429E-01	3.345E-01	5.8
5 Hz	3.023E-04	-1.067E+00	6.534E-01	6.503E-02	5.8
2.5 Hz	1.258E-05	-1.503E+00	6.126E-01	-2.381E-01	5.8
1 Hz	-1.175E-04	2.128E-01	3.485E-01	-1.473E-01	5.8
0.5 Hz	-1.455E-04	8.362E-01	2.291E-01	-1.192E-01	5.8

Table G.2.3-8
GMPE Coefficients for Cluster 3, Gulf Region (Sheet 1 of 2)

High Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-1.960E+00	1.710E+00	-1.230E-01	-2.694E+00	1.548E-01	-3.964E-01	-4.314E-03	-2.425E+00	1.041E-01
25 Hz	-1.033E+00	1.653E+00	-1.133E-01	-2.597E+00	1.311E-01	-3.576E-01	-1.887E-02	-3.262E+00	1.208E-01
10 Hz	-2.934E+00	1.785E+00	-1.181E-01	-2.190E+00	1.203E-01	-3.344E-02	-3.665E-02	-1.420E+00	-2.997E-02
5 Hz	-5.848E+00	2.373E+00	-1.583E-01	-2.071E+00	1.228E-01	-7.493E-02	-9.426E-03	-5.845E-01	-5.157E-02
2.5 Hz	-1.044E+01	3.437E+00	-2.308E-01	-2.064E+00	1.327E-01	-1.950E-01	1.544E-02	-6.844E-01	5.216E-03
1 Hz	-1.793E+01	5.114E+00	-3.399E-01	-2.101E+00	1.462E-01	-2.997E-01	2.900E-02	-7.792E-01	3.297E-02
0.5 Hz	-2.104E+01	5.527E+00	-3.545E-01	-2.271E+00	1.735E-01	-2.862E-01	2.588E-02	-8.606E-01	5.069E-02
Median Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-3.021E+00	1.912E+00	-1.419E-01	-2.603E+00	1.483E-01	-2.438E-02	-4.092E-02	-2.578E+00	1.317E-01
25 Hz	-2.103E+00	1.858E+00	-1.324E-01	-2.505E+00	1.245E-01	1.525E-02	-5.563E-02	-3.439E+00	1.524E-01
10 Hz	-3.967E+00	1.980E+00	-1.364E-01	-2.098E+00	1.132E-01	2.875E-01	-6.401E-02	-1.495E+00	-1.696E-02
5 Hz	-6.908E+00	2.573E+00	-1.767E-01	-1.958E+00	1.138E-01	2.073E-01	-3.425E-02	-6.211E-01	-4.083E-02
2.5 Hz	-1.151E+01	3.637E+00	-2.491E-01	-1.947E+00	1.231E-01	8.772E-02	-9.709E-03	-7.069E-01	1.301E-02
1 Hz	-1.902E+01	5.316E+00	-3.582E-01	-1.982E+00	1.363E-01	2.556E-02	2.336E-04	-7.886E-01	3.877E-02
0.5 Hz	-2.223E+01	5.731E+00	-3.724E-01	-2.133E+00	1.621E-01	3.144E-02	-1.034E-03	-8.708E-01	5.676E-02
Low Curve									
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
PGA	-4.084E+00	2.116E+00	-1.608E-01	-2.512E+00	1.417E-01	3.467E-01	-7.736E-02	-2.732E+00	1.592E-01
25 Hz	-3.162E+00	2.062E+00	-1.514E-01	-2.416E+00	1.184E-01	3.882E-01	-9.238E-02	-3.618E+00	1.843E-01
10 Hz	-5.004E+00	2.177E+00	-1.548E-01	-2.003E+00	1.057E-01	6.064E-01	-9.120E-02	-1.572E+00	-4.116E-03
5 Hz	-7.971E+00	2.772E+00	-1.950E-01	-1.843E+00	1.044E-01	4.891E-01	-5.918E-02	-6.501E-01	-3.170E-02
2.5 Hz	-1.257E+01	3.840E+00	-2.675E-01	-1.831E+00	1.134E-01	3.704E-01	-3.476E-02	-7.306E-01	2.112E-02
1 Hz	-2.011E+01	5.517E+00	-3.763E-01	-1.865E+00	1.266E-01	3.525E-01	-2.877E-02	-7.996E-01	4.475E-02
0.5 Hz	-2.342E+01	5.937E+00	-3.901E-01	-1.996E+00	1.508E-01	3.491E-01	-2.792E-02	-8.814E-01	6.284E-02

Table G.2.3-8
GMPE Coefficients for Cluster 3, Gulf Region (Sheet 2 of 2)

High Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
PGA	-3.297E-03	4.088E-04	2.919E+00	-1.411E-01	70	140
25 Hz	-2.514E-03	4.052E-04	2.825E+00	-1.145E-01	70	140
10 Hz	-5.916E-03	6.118E-04	2.846E+00	-1.382E-01	70	140
5 Hz	-5.621E-03	4.206E-04	2.918E+00	-1.603E-01	70	140
2.5 Hz	-3.282E-03	1.200E-04	2.955E+00	-1.725E-01	70	140
1 Hz	-1.463E-03	6.124E-06	2.925E+00	-1.685E-01	70	140
0.5 Hz	-1.021E-03	-9.828E-07	2.863E+00	-1.574E-01	70	140
Median Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
PGA	-3.581E-03	3.957E-04	2.912E+00	-1.431E-01	70	140
25 Hz	-2.744E-03	3.827E-04	2.813E+00	-1.153E-01	70	140
10 Hz	-6.385E-03	6.317E-04	2.836E+00	-1.403E-01	70	140
5 Hz	-6.103E-03	4.384E-04	2.911E+00	-1.643E-01	70	140
2.5 Hz	-3.812E-03	1.485E-04	2.947E+00	-1.768E-01	70	140
1 Hz	-2.046E-03	4.168E-05	2.914E+00	-1.729E-01	70	140
0.5 Hz	-1.620E-03	3.320E-05	2.852E+00	-1.629E-01	70	140
Low Curve						
Freq.	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**
PGA	-3.852E-03	3.814E-04	2.903E+00	-1.450E-01	70	140
25 Hz	-2.958E-03	3.587E-04	2.802E+00	-1.164E-01	70	140
10 Hz	-6.850E-03	6.530E-04	2.821E+00	-1.419E-01	70	140
5 Hz	-6.616E-03	4.631E-04	2.898E+00	-1.681E-01	70	140
2.5 Hz	-4.338E-03	1.756E-04	2.936E+00	-1.812E-01	70	140
1 Hz	-2.626E-03	7.711E-05	2.904E+00	-1.777E-01	70	140
0.5 Hz	-2.220E-03	6.771E-05	2.839E+00	-1.687E-01	70	140

Table G.2.3-9
GMPE Coefficients for Cluster 4 Rifted, Gulf Region

High Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
PGA	6.858E-01	9.194E-01	-7.289E-01	9.309E-02	-6.041E-03	-6.133E-01	1.787E-02	6.289E+00	6.4	8.5	50
25 Hz	1.373E+00	9.195E-01	-7.289E-01	9.309E-02	-6.041E-03	-6.133E-01	1.787E-02	6.288E+00	6.4	8.5	50
10 Hz	1.340E+00	9.230E-01	-7.290E-01	9.198E-02	-5.947E-03	-6.056E-01	1.783E-02	6.288E+00	6.4	8.5	50
5 Hz	1.247E+00	9.231E-01	-7.344E-01	9.265E-02	-5.831E-03	-5.815E-01	1.734E-02	-6.335E+00	6.4	8.5	50
2.5	1.070E+00	9.283E-01	-7.193E-01	9.095E-02	-5.248E-03	-6.571E-01	-3.403E-02	6.327E+00	6.4	8.5	50
1 Hz	1.647E-01	9.249E-01	-7.520E-01	9.090E-02	-3.721E-03	-8.738E-01	-8.506E-02	6.306E+00	6.4	8.5	50
0.5	-6.000E-01	9.187E-01	-7.954E-01	9.117E-02	-2.276E-03	-1.070E+00	-1.234E-01	6.364E+00	6.4	8.5	50
Median Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
PGA	2.325E-01	7.892E-01	-6.790E-01	9.121E-02	-6.620E-03	-5.077E-01	2.664E-04	6.007E+00	6.4	8.5	50
25 Hz	9.195E-01	7.892E-01	-6.790E-01	9.121E-02	-6.620E-03	-5.077E-01	2.664E-04	6.007E+00	6.4	8.5	50
10 Hz	8.865E-01	7.932E-01	-6.791E-01	9.000E-02	-6.529E-03	-4.994E-01	2.700E-04	6.007E+00	6.4	8.5	50
5 Hz	7.967E-01	7.921E-01	-6.796E-01	8.963E-02	-6.315E-03	-4.907E-01	-6.449E-04	6.019E+00	6.4	8.5	50
2.5	6.192E-01	7.977E-01	-6.646E-01	8.787E-02	-5.730E-03	-5.664E-01	-5.194E-02	6.005E+00	6.4	8.5	50
1 Hz	-3.049E-01	7.978E-01	-6.956E-01	8.742E-02	-4.237E-03	-7.710E-01	-1.029E-01	5.985E+00	6.4	8.5	50
0.5	-1.130E+00	7.978E-01	-7.276E-01	8.742E-02	-2.827E-03	-9.620E-01	-1.409E-01	5.986E+00	6.4	8.5	50
Low Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
PGA	-2.172E-01	6.589E-01	-6.300E-01	8.928E-02	-7.196E-03	-4.026E-01	-1.740E-02	5.712E+00	6.4	8.5	50
25 Hz	4.698E-01	6.589E-01	-6.300E-01	8.928E-02	-7.196E-03	-4.026E-01	-1.740E-02	-5.712E+00	6.4	8.5	50
10 Hz	4.364E-01	6.635E-01	-6.301E-01	8.795E-02	-7.107E-03	-3.937E-01	-1.734E-02	-5.710E+00	6.4	8.5	50
5 Hz	3.501E-01	6.612E-01	-6.257E-01	8.657E-02	-6.800E-03	-3.997E-01	-1.863E-02	5.683E+00	6.4	8.5	50
2.5	1.725E-01	6.674E-01	-6.109E-01	8.474E-02	-6.212E-03	-4.756E-01	-6.986E-02	5.663E+00	6.4	8.5	50
1 Hz	-7.704E-01	6.707E-01	-6.403E-01	8.394E-02	-4.752E-03	-6.680E-01	-1.207E-01	5.645E+00	6.4	8.5	50
0.5	-1.654E+00	6.768E-01	-6.613E-01	8.365E-02	-3.377E-03	-8.537E-01	-1.583E-01	5.582E+00	6.4	8.5	50

Table G.2.3-10
GMPE Coefficients for Cluster 4 Non-rifted, Gulf Region

High Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
PGA	8.620E-01	9.145E-01	-7.775E-01	7.470E-02	-6.941E-03	-4.600E-01	1.802E-02	6.258E+00	6.4	8.5	50
25 Hz	1.541E+00	9.144E-01	-7.770E-01	7.469E-02	-6.941E-03	-4.603E-01	1.800E-02	-6.249E+00	6.4	8.5	50
10 Hz	1.520E+00	9.200E-01	-7.775E-01	7.302E-02	-6.879E-03	-4.470E-01	1.798E-02	-6.259E+00	6.4	8.5	50
5 Hz	1.430E+00	9.223E-01	-7.832E-01	7.306E-02	-6.778E-03	-4.200E-01	1.751E-02	6.306E+00	6.4	8.5	50
2.5	1.300E+00	9.313E-01	-7.836E-01	7.011E-02	-5.923E-03	-5.270E-01	-3.399E-02	-6.308E+00	6.4	8.5	50
1 Hz	3.373E-01	9.292E-01	-7.965E-01	6.968E-02	-4.092E-03	-7.739E-01	-8.499E-02	6.311E+00	6.4	8.5	50
0.5	-3.954E-01	9.232E-01	-8.229E-01	6.992E-02	-3.257E-03	-8.220E-01	-1.233E-01	6.374E+00	6.4	8.5	50
Median Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
PGA	4.032E-01	7.827E-01	-7.260E-01	7.304E-02	-7.508E-03	-3.571E-01	3.164E-04	5.964E+00	6.4	8.5	50
25 Hz	1.084E+00	7.827E-01	-7.260E-01	7.304E-02	-7.508E-03	-3.571E-01	3.164E-04	5.964E+00	6.4	8.5	50
10 Hz	1.063E+00	7.888E-01	-7.265E-01	7.127E-02	-7.451E-03	-3.429E-01	3.623E-04	-5.974E+00	6.4	8.5	50
5 Hz	9.760E-01	7.905E-01	-7.273E-01	7.015E-02	-7.263E-03	-3.294E-01	-4.965E-04	5.989E+00	6.4	8.5	50
2.5	8.449E-01	7.998E-01	-7.277E-01	6.720E-02	-6.405E-03	-4.366E-01	-5.190E-02	5.992E+00	6.4	8.5	50
1 Hz	-1.359E-01	8.012E-01	-7.391E-01	6.639E-02	-4.607E-03	-6.715E-01	-1.028E-01	5.991E+00	6.4	8.5	50
0.5	-9.289E-01	8.012E-01	-7.541E-01	6.639E-02	-3.807E-03	-7.145E-01	-1.408E-01	5.991E+00	6.4	8.5	50
Low Curve											
Freq.	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**m1**	**m2**	**R1**
PGA	-5.014E-02	6.509E-01	-6.758E-01	7.136E-02	-8.071E-03	-2.544E-01	-1.744E-02	5.663E+00	6.4	8.5	50
25 Hz	6.309E-01	6.509E-01	-6.759E-01	7.136E-02	-8.071E-03	-2.544E-01	-1.744E-02	-5.664E+00	6.4	8.5	50
10 Hz	6.090E-01	6.576E-01	-6.763E-01	6.947E-02	-8.019E-03	-2.393E-01	-1.732E-02	-5.673E+00	6.4	8.5	50
5 Hz	5.258E-01	6.587E-01	-6.725E-01	6.722E-02	-7.747E-03	-2.388E-01	-1.851E-02	5.655E+00	6.4	8.5	50
2.5	3.940E-01	6.685E-01	-6.729E-01	6.426E-02	-6.887E-03	-3.463E-01	-6.981E-02	5.658E+00	6.4	8.5	50
1 Hz	-6.051E-01	6.732E-01	-6.828E-01	6.310E-02	-5.123E-03	-5.689E-01	-1.206E-01	5.653E+00	6.4	8.5	50
0.5	-1.456E+00	6.792E-01	-6.868E-01	6.285E-02	-4.358E-03	-6.067E-01	-1.582E-01	5.584E+00	6.4	8.5	50

Table G.2.4-1
Cluster 1 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	-9.373E-02	-1.649E+00	1.027E+00	1.227E+00	1.475E+00
1	-9.014E-02	-1.647E+00	1.026E+00	1.227E+00	1.478E+00
2.5	-8.572E-02	-1.644E+00	1.024E+00	1.220E+00	1.481E+00
5	-8.104E-02	-1.642E+00	1.023E+00	1.214E+00	1.484E+00
10	-7.652E-02	-1.641E+00	1.022E+00	1.218E+00	1.487E+00
25	-7.855E-02	-1.644E+00	1.023E+00	1.237E+00	1.487E+00
100	-8.178E-02	-1.645E+00	1.024E+00	1.231E+00	1.485E+00

Table G.2.4-2
Cluster 1 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	-7.118E-02	-1.654E+00	1.021E+00	1.450E+00	1.514E+00
1	-6.008E-02	-1.648E+00	1.018E+00	1.444E+00	1.516E+00
2.5	-4.912E-02	-1.642E+00	1.015E+00	1.429E+00	1.521E+00
5	-3.726E-02	-1.636E+00	1.011E+00	1.414E+00	1.526E+00
10	-1.927E-02	-1.632E+00	1.007E+00	1.404E+00	1.534E+00
25	-2.004E-02	-1.638E+00	1.008E+00	1.430E+00	1.532E+00
100	-3.616E-02	-1.643E+00	1.012E+00	1.435E+00	1.529E+00

Table G.2.4-3
Cluster 2 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	-3.543E-03	-1.624E+00	1.006E+00	4.780E-01	1.723E+00
1	-2.833E-03	-1.621E+00	1.005E+00	4.792E-01	1.724E+00
2.5	1.407E-02	-1.611E+00	9.995E-01	4.389E-01	1.733E+00
5	2.432E-02	-1.607E+00	9.969E-01	4.320E-01	1.764E+00
10	3.057E-02	-1.603E+00	9.948E-01	3.971E-01	1.791E+00
25	4.144E-02	-1.598E+00	9.917E-01	3.682E-01	1.810E+00
100	3.824E-02	-1.599E+00	9.926E-01	3.773E-01	1.801E+00

Table G.2.4-4
Cluster 2 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	3.068E-02	-1.635E+00	9.995E-01	7.302E-01	1.776E+00
1	3.210E-02	-1.628E+00	9.982E-01	7.314E-01	1.774E+00
2.5	6.480E-02	-1.602E+00	9.868E-01	6.673E-01	1.783E+00
5	9.423E-02	-1.590E+00	9.790E-01	6.425E-01	1.813E+00
10	1.120E-01	-1.582E+00	9.740E-01	5.866E-01	1.847E+00
25	1.301E-01	-1.573E+00	9.690E-01	5.468E-01	1.867E+00
100	1.227E-01	-1.576E+00	9.711E-01	5.607E-01	1.857E+00

Table G.2.4-5
Cluster 3 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	-3.737E-01	-1.740E+00	1.099E+00	1.617E+00	1.319E+00
1	-3.659E-01	-1.737E+00	1.097E+00	1.605E+00	1.323E+00
2.5	-3.517E-01	-1.731E+00	1.093E+00	1.583E+00	1.331E+00
5	-3.422E-01	-1.726E+00	1.090E+00	1.574E+00	1.337E+00
10	-3.373E-01	-1.724E+00	1.088E+00	1.583E+00	1.336E+00
25	-3.605E-01	-1.732E+00	1.094E+00	1.649E+00	1.320E+00
100	-3.592E-01	-1.732E+00	1.094E+00	1.629E+00	1.321E+00

Table G.2.4-6
Cluster 3 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	-5.022E-01	-1.703E+00	1.105E+00	2.018E+00	1.232E+00
1	-4.606E-01	-1.710E+00	1.101E+00	1.961E+00	1.256E+00
2.5	-4.123E-01	-1.708E+00	1.094E+00	1.899E+00	1.282E+00
5	-3.903E-01	-1.704E+00	1.089E+00	1.877E+00	1.293E+00
10	-3.724E-01	-1.696E+00	1.084E+00	1.880E+00	1.291E+00
25	-3.779E-01	-1.700E+00	1.083E+00	1.940E+00	1.274E+00
100	-4.035E-01	-1.707E+00	1.091E+00	1.939E+00	1.272E+00

Table G.2.4-7
New Cluster 4 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	-6.387E-02	-1.630E+00	1.018E+00	1.126E+00	1.503E+00
1	-5.829E-02	-1.627E+00	1.016E+00	1.110E+00	1.509E+00
2.5	-9.460E-02	-1.637E+00	1.025E+00	1.167E+00	1.481E+00
5	-1.198E-01	-1.643E+00	1.031E+00	1.209E+00	1.461E+00
10	-1.198E-01	-1.643E+00	1.031E+00	1.209E+00	1.461E+00
25	-1.199E-01	-1.643E+00	1.031E+00	1.209E+00	1.461E+00
100	-1.199E-01	-1.643E+00	1.031E+00	1.209E+00	1.461E+00

Table G.2.4-8
New Cluster 4 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures)

Frequency	C1	C2	C3	C4	C5
0.5	3.517E-03	-1.606E+00	9.980E-01	1.293E+00	1.546E+00
1	1.942E-02	-1.599E+00	9.939E-01	1.264E+00	1.556E+00
2.5	-2.725E-02	-1.603E+00	1.003E+00	1.350E+00	1.498E+00
5	-5.770E-02	-1.609E+00	1.010E+00	1.405E+00	1.465E+00
10	-5.858E-02	-1.609E+00	1.011E+00	1.406E+00	1.465E+00
25	-5.804E-02	-1.609E+00	1.011E+00	1.405E+00	1.465E+00
100	-5.849E-02	-1.609E+00	1.011E+00	1.406E+00	1.465E+00

Table G.2.4-9
Cluster 1 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-1.883E+00	7.829E-01	-2.203E-02	-3.873E+00	1.039E+00	-1.133E+00	-8.340E-01	-4.720E-02	3.966E-01	1.061E+00	1.643E+00
1	-1.859E+00	7.852E-01	-2.398E-02	-4.008E+00	1.097E+00	-1.151E+00	-8.383E-01	-7.933E-02	3.709E-01	9.986E-01	1.644E+00
2.5	-1.820E+00	7.807E-01	-2.261E-02	-4.064E+00	1.117E+00	-1.127E+00	-8.545E-01	-1.092E-01	3.545E-01	9.573E-01	1.645E+00
5	-1.610E+00	6.310E-01	3.848E-03	-4.220E+00	1.165E+00	-1.264E+00	-7.748E-01	-2.445E-02	2.974E-01	9.623E-01	1.646E+00
10	-1.756E+00	7.586E-01	-1.076E-02	-4.358E+00	1.228E+00	-1.137E+00	-8.673E-01	-1.499E-01	3.086E-01	8.593E-01	1.652E+00
25	-1.782E+00	7.991E-01	-1.292E-02	-4.431E+00	1.235E+00	-1.169E+00	-8.724E-01	-1.903E-01	3.382E-01	8.707E-01	1.661E+00
100	-1.416E+00	5.204E-01	3.003E-02	-3.444E+00	7.651E-01	-1.424E+00	-7.295E-01	-7.070E-03	2.735E-01	9.158E-01	1.650E+00

Table G.2.4-10
Cluster 1 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-7.036E-01	-3.731E-01	2.196E-01	-3.668E+00	7.883E-01	-1.847E+00	-3.380E-01	2.585E-01	5.802E-02	1.211E+00	1.650E+00
1	-1.236E+00	1.394E-01	9.749E-02	-3.372E+00	5.942E-01	-1.587E+00	-4.705E-01	6.592E-02	1.988E-01	1.318E+00	1.665E+00
2.5	-2.773E-01	-7.456E-01	3.135E-01	-3.538E+00	7.220E-01	-2.031E+00	-2.662E-01	2.594E-01	-2.731E-02	1.045E+00	1.672E+00
5	-7.426E-01	-2.622E-01	1.946E-01	-3.597E+00	6.862E-01	-1.775E+00	-3.914E-01	1.050E-01	6.079E-02	1.071E+00	1.696E+00
10	-4.037E-01	-5.725E-01	2.737E-01	-3.460E+00	7.024E-01	-1.962E+00	-3.275E-01	1.677E-01	9.143E-03	9.881E-01	1.739E+00
25	-8.474E-01	-1.229E-01	1.698E-01	-3.416E+00	6.220E-01	-1.802E+00	-4.268E-01	5.486E-02	1.220E-01	1.154E+00	1.727E+00
100	-1.052E+00	9.440E-02	1.069E-01	-3.415E+00	5.974E-01	-1.654E+00	-4.790E-01	4.549E-02	1.686E-01	1.294E+00	1.671E+00

Table G.2.4-11
Cluster 2 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-1.793E+00	5.638E-01	1.808E-02	-9.154E+00	4.174E+00	3.059E-01	-1.301E+00	4.939E-04	4.375E-01	1.047E+00	1.662E+00
1	-1.795E+00	5.421E-01	2.068E-02	-9.138E+00	4.156E+00	2.702E-01	-1.288E+00	-3.041E-02	4.158E-01	1.008E+00	1.661E+00
2.5	-1.839E+00	5.860E-01	3.521E-02	-8.822E+00	4.018E+00	3.027E-01	-1.308E+00	-5.959E-02	3.533E-01	9.398E-01	1.650E+00
5	-1.801E+00	5.196E-01	5.854E-02	-9.448E+00	4.288E+00	1.399E-01	-1.314E+00	-1.533E-01	2.444E-01	6.779E-01	1.682E+00
10	-1.783E+00	4.536E-01	6.954E-02	-9.423E+00	4.259E+00	2.946E-01	-1.437E+00	-2.471E-01	2.219E-01	5.745E-01	1.683E+00
25	-1.703E+00	3.892E-01	8.999E-02	-9.543E+00	4.306E+00	2.411E-01	-1.429E+00	-2.719E-01	1.522E-01	4.515E-01	1.686E+00
100	-1.624E+00	3.960E-01	7.820E-02	-9.509E+00	4.291E+00	1.429E-01	-1.360E+00	-2.306E-01	1.556E-01	4.660E-01	1.687E+00

Table G.2.4-12
Cluster 2 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-1.317E+00	1.329E-01	8.096E-02	-1.101E+00	1.390E-01	-8.219E-01	-5.920E-01	1.173E-01	2.078E-01	1.363E+00	1.567E+00
1	-1.416E+00	1.640E-01	7.088E-02	-1.470E+01	-1.318E+01	-4.843E-01	-5.188E-01	5.558E-02	2.782E-01	1.367E+00	1.651E+00
2.5	-1.449E+00	1.895E-01	9.233E-02	-1.476E+01	-1.319E+01	-4.744E-01	-5.167E-01	-4.674E-02	2.018E-01	1.197E+00	1.666E+00
5	-1.686E+00	3.861E-01	6.327E-02	-2.670E+01	1.286E+01	-1.328E-01	-1.022E+00	-2.234E-01	1.339E-01	1.209E+00	1.541E+00
10	3.516E-01	-9.807E-01	2.169E-01	-2.568E+01	1.244E+01	-9.139E-01	-7.481E-01	-3.474E-01	6.672E-02	-2.063E+00	3.139E+00
25	-1.308E+00	4.938E-02	1.288E-01	-2.606E+01	1.247E+01	-4.377E-01	-9.158E-01	-3.646E-01	-1.420E-02	4.866E-01	1.745E+00
100	1.718E+00	-4.187E-01	1.450E-01	-2.210E+00	2.486E-01	-8.774E-01	-1.137E+00	-4.310E-01	-1.212E-01	-4.340E+00	1.618E+00

Table G.2.4-13
Cluster 3 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-1.605E+00	8.614E-01	-9.744E-02	-2.749E+00	6.303E-01	-1.362E+00	-6.364E-01	3.119E-01	7.331E-01	1.628E+00	1.631E+00
1	-1.571E+00	8.611E-01	-8.617E-02	-2.829E+00	6.759E-01	-1.340E+00	-6.470E-01	2.654E-01	6.854E-01	1.529E+00	1.638E+00
2.5	-1.478E+00	8.380E-01	-7.618E-02	-2.920E+00	7.342E-01	-1.341E+00	-6.567E-01	2.373E-01	6.167E-01	1.420E+00	1.645E+00
5	-1.386E+00	8.138E-01	-7.358E-02	-3.315E+00	9.215E-01	-1.381E+00	-6.485E-01	2.183E-01	5.559E-01	1.331E+00	1.649E+00
10	-1.330E+00	8.152E-01	-7.136E-02	-3.103E+00	7.907E-01	-1.407E+00	-6.540E-01	1.490E-01	5.119E-01	1.217E+00	1.653E+00
25	-1.111E+00	8.121E-01	-7.372E-02	-3.929E+00	1.167E+00	-1.487E+00	-6.858E-01	9.662E-02	4.374E-01	1.024E+00	1.659E+00
100	-1.202E+00	8.422E-01	-8.141E-02	-3.165E+00	8.089E-01	-1.499E+00	-6.186E-01	2.194E-01	6.116E-01	1.393E+00	1.650E+00

Table G.2.4-14
Cluster 3 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-1.191E+00	4.580E-01	-4.620E-02	-3.147E+00	6.303E-01	-1.580E+00	-3.437E-01	3.498E-01	5.519E-01	1.861E+00	1.577E+00
1	-9.029E-01	2.017E-01	2.836E-02	-2.910E+00	5.095E-01	-1.783E+00	-2.342E-01	3.989E-01	4.452E-01	1.746E+00	1.592E+00
2.5	-2.592E-01	-3.541E-01	1.707E-01	-3.193E+00	7.208E-01	-2.017E+00	-1.456E-01	4.032E-01	1.807E-01	1.349E+00	1.606E+00
5	-7.102E-01	1.027E-01	6.436E-02	-3.384E+00	7.669E-01	-1.759E+00	-2.729E-01	2.561E-01	2.725E-01	1.392E+00	1.628E+00
10	-1.542E-01	-4.367E-01	2.084E-01	-3.432E+00	7.367E-01	-2.018E+00	-1.496E-01	3.234E-01	1.179E-01	1.200E+00	1.649E+00
25	5.247E-01	-9.710E-01	3.453E-01	-1.954E+01	8.505E+00	-2.228E+00	-7.400E-02	3.816E-01	2.230E-02	1.002E+00	1.684E+00
100	-3.842E-01	-1.663E-02	8.994E-02	-3.228E+00	6.031E-01	-1.973E+00	-1.821E-01	3.938E-01	3.328E-01	1.583E+00	1.629E+00

Table G.2.4-15
Cluster 4 Adjustment from Epicentral to Joyner-Boore Distance (centered ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-1.026E+00	-9.506E-02	1.780E-01	-2.989E+00	6.427E-01	-1.581E+00	-5.865E-01	1.569E-01	3.879E-02	6.332E-01	1.645E+00
1	-8.127E-01	-2.690E-01	2.180E-01	-3.275E+00	7.778E-01	-1.595E+00	-5.923E-01	1.746E-01	-4.950E-02	4.452E-01	1.648E+00
2.5	-1.866E+00	7.148E-01	7.822E-03	-4.331E+00	1.332E+00	-8.766E-01	-9.877E-01	-2.504E-01	1.535E-01	3.195E-01	1.642E+00
5	-1.799E+00	6.953E-01	1.044E-02	-4.481E+00	1.396E+00	-8.896E-01	-9.885E-01	-2.467E-01	1.475E-01	2.528E-01	1.639E+00
10	-1.329E+00	3.958E-01	3.577E-02	-4.589E+00	1.438E+00	-1.229E+00	-8.026E-01	-7.017E-03	4.444E-02	3.268E-01	1.639E+00
25	-1.739E+00	6.993E-01	8.204E-03	-4.481E+00	1.396E+00	-9.071E-01	-1.007E+00	-2.696E-01	1.352E-01	1.140E-01	1.639E+00
100	-1.794E+00	6.970E-01	8.299E-03	-4.482E+00	1.394E+00	-8.979E-01	-9.833E-01	-2.425E-01	1.437E-01	2.489E-01	1.639E+00

Table G.2.4-16
Cluster 4 Adjustment from Epicentral to Joyner-Boore Distance (random ruptures) – Additional Aleatory Variability

Freq.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
0.5	-6.354E-01	-7.208E-01	3.464E-01	-2.265E+38	1.132E+38	-1.711E+00	-3.039E-01	8.409E-02	-1.394E-01	7.190E-01	1.699E+00
1	-4.813E-01	-8.746E-01	3.899E-01	-3.455E+00	7.472E-01	-1.767E+00	-3.539E-01	7.841E-02	-2.024E-01	5.563E-01	1.723E+00
2.5	-5.480E-01	-7.777E-01	3.614E-01	-1.282E+01	5.163E+00	-1.595E+00	-4.073E-01	-4.895E-02	-2.332E-01	2.269E-01	1.734E+00
5	-1.704E-01	-1.196E+00	4.804E-01	-4.066E+00	8.852E-01	-1.715E+00	-3.520E-01	8.129E-03	-3.131E-01	5.820E-02	1.717E+00
10	-6.765E-02	-1.265E+00	4.908E-01	-4.272E+00	1.035E+00	-1.749E+00	-3.454E-01	4.085E-02	-3.268E-01	6.057E-02	1.705E+00
25	-1.511E-01	-1.202E+00	4.794E-01	-4.046E+00	9.182E-01	-1.729E+00	-3.508E-01	1.991E-02	-3.177E-01	7.821E-02	1.701E+00
100	-1.402E-01	-1.192E+00	4.713E-01	-4.530E+00	1.144E+00	-1.722E+00	-3.535E-01	2.900E-02	-3.113E-01	8.109E-02	1.717E+00

Table G.2.5-1
Aleatory Uncertainty (sigma) in Ground-Motion Amplitude

Freq (Hz)	Sigma ($M \leq 5$)	Sigma ($M = 6$)	Sigma ($M \geq 7$)
100	0.68	0.63	0.60
40	0.74	0.69	0.67
25	0.74	0.69	0.67
10	0.74	0.69	0.67
5	0.72	0.68	0.66
2.5	0.72	0.69	0.67
1	0.75	0.74	0.73
0.5	0.78	0.78	0.77
0.25	0.79	0.79	0.78

Table G.3.4-1
List of Attachments Contained in Appendix_G_Electronic_Attachments_March.zip

File Name	Description
C1_March_05.csv	GMPE Coefficients for Midcontinent: Cluster 1
C1_March_50.csv	
C1_March_95.csv	
C2_March_05.csv	GMPE Coefficients for Midcontinent: Cluster 2
C2_March_50.csv	
C2_March_95.csv	
C3_March_05.csv	GMPE Coefficients for Midcontinent: Cluster 3
C3_March_50.csv	
C3_March_95.csv	
C4NR_March_05.csv	GMPE Coefficients for Midcontinent: Cluster 4, non-rifted RLME sources
C4NR_March_50.csv	
C4NR_March_95.csv	
C4R_March_05.csv	GMPE Coefficients for Midcontinent: Cluster 4, rifted RLME sources
C4R_March_50.csv	
C4R_March_95.csv	
C1G_March_05.csv	GMPE Coefficients for Gulf: Cluster 1
C1G_March_50.csv	
C1G_March_95.csv	
C2G_March_05.csv	GMPE Coefficients for Gulf: Cluster 2
C2G_March_50.csv	
C2G_March_95.csv	
C3G_March_05.csv	GMPE Coefficients for Gulf: Cluster 3
C3G_March_50.csv	
C3G_March_95.csv	
C4NRG_March_05.csv	GMPE Coefficients for Gulf: Cluster 4, non-rifted RLME sources
C4NRG_March_50.csv	
C4NRG_March_95.csv	

Table G.3.4-1 (continued)

File Name	Description
C4RG_March_05.csv	GMPE Coefficients for Gulf: Cluster 4, rifted RLME sources
C4RG_March_50.csv	
C4RG_March_95.csv	
EPRI_medians.f	Code with implementation of equations for Clusters 1 and 3, and for Cluster 2
driver.f	
CEUS_gulfsourceregion.dat	Geometry of Gulf GMPE region
Distance_ConversionCoefficients_March.xlsx	Coefficients for distance conversions
GMPE_medians_March.xlsx	Test values of GMPE medians
GMPE_medians_Gulf_March.xlsx	
Distance_Conversions_March.xlsx	Test values of distance conversions
Additional_Sigma_from_Distance_Conversion_March.xlsx	Test values of additional sigma introduced by distance conversion

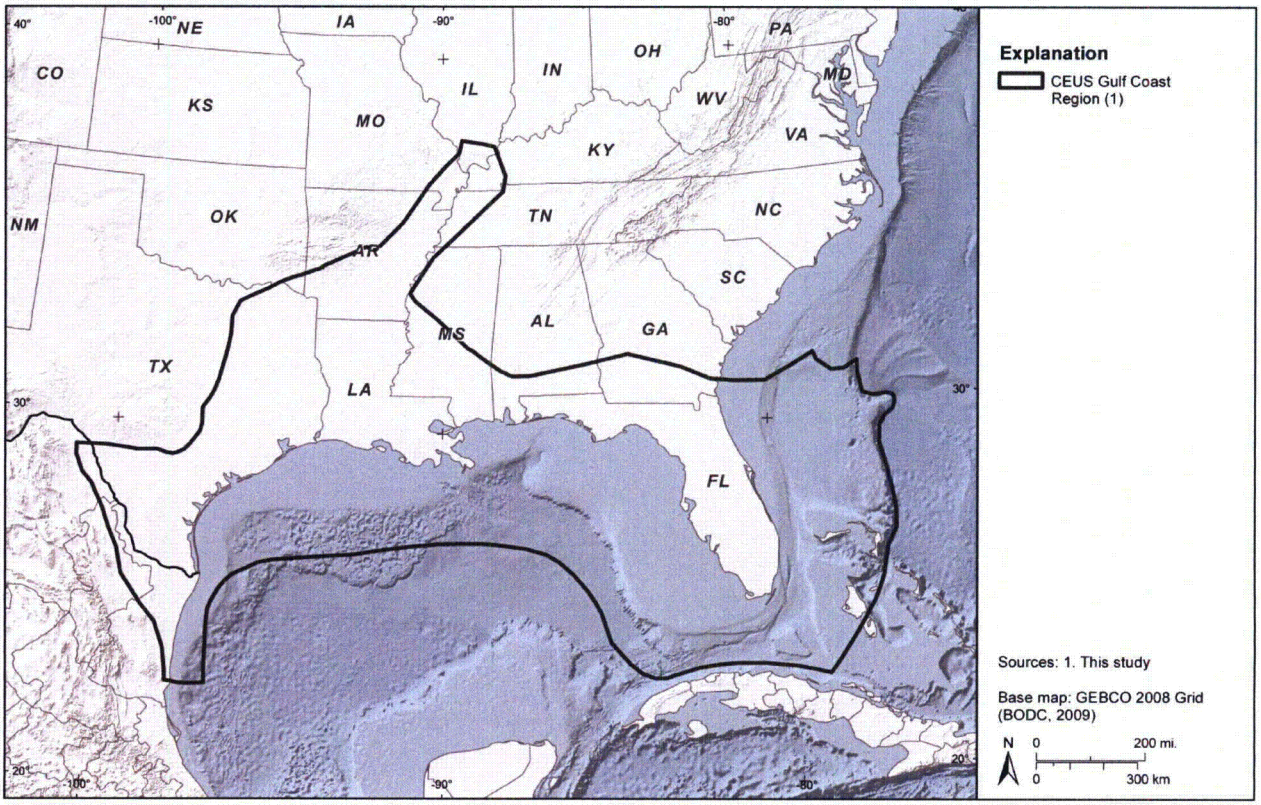

Figure G.2.2-1
Map defining the Gulf Coast region

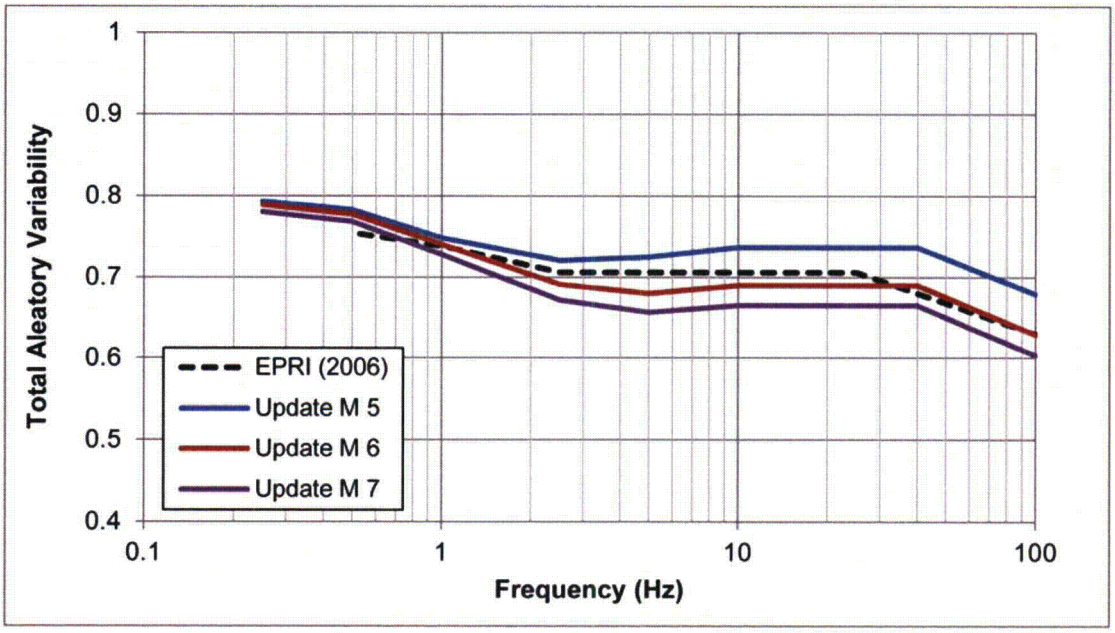

Figure G.2.5-1
Frequency and magnitude-dependent portion of the aleatory uncertainty

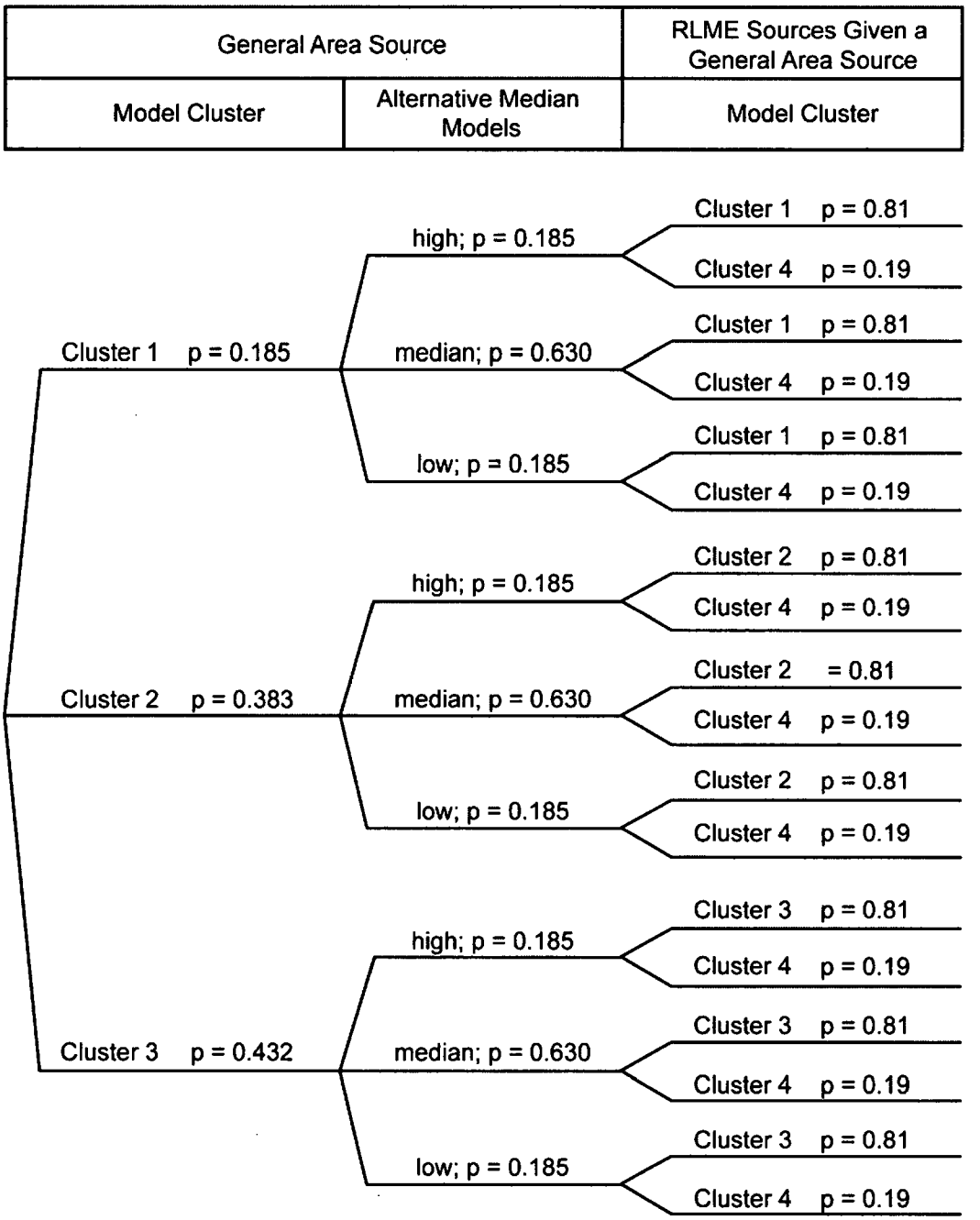

Figure G.3.3-1
Logic tree for sites affected by both RLMEs and distributed-seismicity sources